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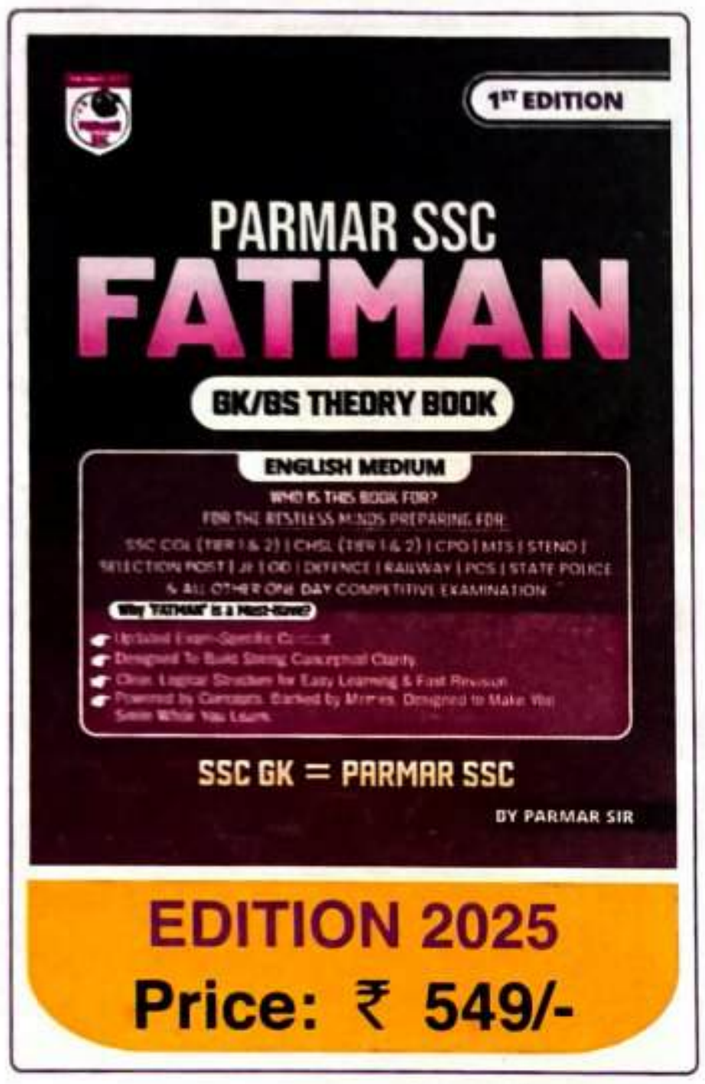

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AUTHORED BY PARMAR SIR

- STRATEGIZED BY : SANJOG SAINI
- REVIEWED & EDIT BY : RONIK SINGH
- DESIGNED BY : PIYALI DAS
  ANJALI YADAV
- COVER PAGE : HARSHIT RAJPUT

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PREFACE

So Hello Everyone, umeed karta hoon aap sabhi thik honge!

In the realm of knowledge, where words are the architects of understanding, I present to you **FATMAN**—not merely a book, but a testament to the labor of love, effort, and collaboration.
This work is the product of long nights, boundless discussions, and the unwavering belief of my cherished family and most profoundly, the entire fellowship of **PARMARians**, whose wisdom and support have been the true catalyst behind this creation.

Each page herein is not just ink on paper, but a story of shared struggles, dreams, and the unrelenting pursuit of excellence. For me it is not only my effort that has birthed this work but the combined energy of minds devoted to a singular cause: to make General Knowledge and General Studies
A Journey, Not a Chore. A Challenge, Not a Burden.

I offer this book to you, my fellow travelers, in the hope that it enriches your minds and strengthens your resolve.

THANKOO :)

PARMAR SIR

TsuNamî

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index

GEOGRAPHY

1. SOLAR SYSTEM 1-4
2. LONGITUDE AND LATITUDE 5-8
3. EARTH'S INTERIOR AND PLATE TECTONICS 9-11
4. ROCKS CONTINENTS AND OCEAN 12-14
5. GEOMORPHOLOGY AND LANDFORMS 15-17
6. ATMOSPHERE 18-20
7. WIND, OCEAN CURRENT AND CYCLONE 21-23
8. INDIA AND ITS LOCATION 24-27
9. HIMALAYAS 28-31
10. PENINSULAR PLATEAUS 32-33
11. NORTHERN PLAIN AND ISLANDS 34-37
12. HIMALAYAN RIVER SYSTEM 38-40
13. PENINSULAR RIVERS 41-43
14. DAMS, LAKES AND WATERFALL 44-46
15. MONSOON 47-49
16. FOREST AND GRASSLAND 50-52
17. SOIL AND AGRICULTURE 53-57
18. MINERALS 58-62
19 WORLD MAP 63-68
20. NATIONAL PARKS 69-74

ANCIENT HISTORY

1. STONE AGE 75-76
2. INDUS VALLEY CIVILIZATION 77-80
3. VEDIC AGE 81-83
4. JAINISM AND BUDDHISM 84-86
5. MAHAJANPADAS 87-88
6. MAURYA DYNASTY 89-91
7. POST-MAURYA DYNASTIES 92-94
8. GUPTA DYNASTY 95-96
9. POST-GUPTA DYNASTIES 97-99
10. SANGAM AGE 100-101
11. TRIPARTITE STRUGGLE AND CHOLAS 102-104

MEDIEVAL HISTORY

1. DELHI SULTANATE 105-108
2. VIJAYANAGARA AND BAHMANI KINGDOM 109-111
3. MUGHAL EMPIRE 112-116
4. MARATHAS 117-118
5. BHAKTI AND SUFI MOVEMENTS 119-121

MODERN HISTORY

1. ADVENT OF EUROPEANS 122-124
2. SOCIO-RELIGIOUS REFORMS 125-127
3. REVOLT OF 1857 128-129
4. INDIAN NATIONAL CONGRESS 130-131
5. BENGAL PARTITION 132-134
6. GANDHIAN ERA 135-136
7. CDM AND SIMON COMMISSION 137-139
8. QUIT INDIA MOVEMENT 140-143
9. GOVERNOR-GENERAL AND VICEROY 144-145

POLITY

1. MAKING OF CONSTITUTION 146-148
2. SALIENT FEATURES OF THE CONSTITUTION 149-150
3. PREAMBLE 151
4. PART 1 AND PART 2 OF THE CONSTITUTION 152-153
5. FUNDAMENTAL RIGHTS 154-157
6. DPSP AND FUNDAMENTAL DUTIES 158-160
7. PRESIDENT AND VICE PRESIDENT OF INDIA 161-163
8. PRIME MINISTER AND COUNCIL OF MINISTERS 164-166
9. PARLIAMENT 167-172
10. STATE LEGISLATURE 173-175
11. EMERGENC AMENDMEI
12. SUPREME
13. LOCAL GO
14. CONSTITU CONSTITU
15. IMPORTAI
16. SOURCES

1. BASICS O
2. DEMAND
3. NATIONA
4. INFLATI
5. BUDGET
6. MONETA
7. MONEY
8. BALANC
9. FIVE YE RESOLU

1. MOTIO
2. FORCE
3. GRAVI
4. SOUND
5. REFLE
6. HUMA
7. ELECT
8. MAGN

1. MATT
2. ATOM
3. PERI
4. CHEM
5. META
6. ACID
7. CARE

TsuNamî

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index

GEOGRAPHY

1. SOLAR SYSTEM 1-4
2. LONGITUDE AND LATITUDE 5-8
3. EARTH'S INTERIOR AND PLATE TECTONICS 9-11
4. ROCKS CONTINENTS AND OCEAN 12-14
5. GEOMORPHOLOGY AND LANDFORMS 15-17
6. ATMOSPHERE 18-20
7. WIND, OCEAN CURRENT AND CYCLONE 21-23
8. INDIA AND ITS LOCATION 24-27
9. HIMALAYAS 28-31
10. PENINSULAR PLATEAUS 32-33
11. NORTHERN PLAIN AND ISLANDS 34-37
12. HIMALAYAN RIVER SYSTEM 38-40
13. PENINSULAR RIVERS 41-43
14. DAMS, LAKES AND WATERFALL 44-46
15. MONSOON 47-49
16. FOREST AND GRASSLAND 50-52
17. SOIL AND AGRICULTURE 53-57
18. MINERALS 58-62
19 WORLD MAP 63-68
20. NATIONAL PARKS 69-74

ANCIENT HISTORY

1. STONE AGE 75-76
2. INDUS VALLEY CIVILIZATION 77-80
3. VEDIC AGE 81-83
4. JAINISM AND BUDDHISM 84-86
5. MAHAJANPADAS 87-88
6. MAURYA DYNASTY 89-91
7. POST-MAURYA DYNASTIES 92-94
8. GUPTA DYNASTY 95-96
9. POST-GUPTA DYNASTIES 97-99
10. SANGAM AGE 100-101
11. TRIPARTITE STRUGGLE AND CHOLAS 102-104

MEDIEVAL HISTORY

1. DELHI SULTANATE 105-108
2. VIJAYANAGARA AND BAHMANI KINGDOM 109-111
3. MUGHAL EMPIRE 112-116
4. MARATHAS 117-118
5. BHAKTI AND SUFI MOVEMENTS 119-121

MODERN HISTORY

1. ADVENT OF EUROPEANS 122-124
2. SOCIO-RELIGIOUS REFORMS 125-127
3. REVOLT OF 1857 128-129
4. INDIAN NATIONAL CONGRESS 130-131
5. BENGAL PARTITION 132-134
6. GANDHIAN ERA 135-136
7. CDM AND SIMON COMMISSION 137-139
8. QUIT INDIA MOVEMENT 140-143
9. GOVERNOR-GENERAL AND VICEROY 144-145

POLITY

1. MAKING OF CONSTITUTION 146-148
2. SALIENT FEATURES OF THE CONSTITUTION 149-150
3. PREAMBLE 151
4. PART 1 AND PART 2 OF THE CONSTITUTION 152-153
5. FUNDAMENTAL RIGHTS 154-157
6. DPSP AND FUNDAMENTAL DUTIES 158-16(
7. PRESIDENT AND VICE PRESIDENT O INDIA 161-16
8. PRIME MINISTER AND COUNCIL O MINISTERS 164-16
9. PARLIAMENT 167-17
10. STATE LEGISLATURE 173-17

TsuNamî

Scanned with OKEN Scanner

11. EMERGENCY & CONSTITUTIONAL AMENDMENT 176-178
12. SUPREME COURT AND HIGH COURT 179-181
13. LOCAL GOVERNMENT 182-184
14. CONSTITUTIONAL AND NON-CONSTITUTIONAL BODIES 185-187
15. IMPORTANT ACTS 188-190
16. SOURCES OF THE INDIAN CONSTITUTION 191

ECONOMICS

1. BASICS OF ECONOMY 192-193
2. DEMAND AND SUPPLY 194-197
3. NATIONAL INCOME 198-200
4. INFLATION AND UNEMPLOYMENT 201-203
5. BUDGET AND TAXATION 204-206
6. MONETARY POLICY 207-209
7. MONEY AND BANKING 210-214
8. BALANCE OF PAYMENT AND POVERTY 215-217
9. FIVE YEAR PLAN AND INDUSTRIAL POLICY RESOLUTION 218-221

PHYSICS

1. MOTION 222-224
2. FORCE AND LAWS OF MOTION 225-227
3. GRAVITATION AND WORK DONE 228-231
4. SOUND 232-234
5. REFLECTION AND REFRACTION 235-239
6. HUMAN EYE AND VISION 240-243
7. ELECTRICITY 244-246
8. MAGNETIC EFFECT OF ELECTRIC CURRENT 247-249

CHEMISTRY

1. MATTER 250-254
2. ATOM AND ITS STRUCTURE 255-259
3. PERIODIC TABLE 260-264
4. CHEMICAL REACTIONS 265-266
5. METALS AND NON-METALS 267-271
6. ACID, BASE AND SALT 272-275
7. CARBON AND ITS COMPOUNDS 276-281

BIOLOGY

1. CELL 182-286
2. PLANT TISSUE AND ANIMAL TISSUE 287-292
3. PLANT AND ANIMAL KINGDOM 293-299
4. NERVOUS SYSTEM 300-302
5. HORMONES AND PLANT MOVEMENTS 303-305
6. REPRODUCTION 306-310
7. DIGESTION AND RESPIRATION 311-313
8. CIRCULATORY SYSTEM AND EXCRETORY SYSTEM 314-317
9. DISEASES 318-321
10. NUTRIENTS 322-325
11. HEREDITARY AND EVOLUTION 326-329

ENVIRONMENT

1. BASICS OF ENVIRONMENTAL SCIENCES 330-331
2. ECOSYSTEM 332-334
3. TROPHIC DYNAMICS AND ENERGY TRANSFER 335-336
4. BIOGEOCHEMICAL CYCLES 337
5. ENVIRONMENTAL CONVENTIONS 338-339

STATIC GK

1. CLASSICAL DANCE 340-343
2. FOLK DANCES OF INDIA 344-351
3. CENSUS 352-354
4. MUSICAL INSTRUMENTS 355-357
5. GHARANAS 358-360
6. IMPORTANT DAYS 361-363
7. BOOKS AND AUTHORS 364-371
8. SPORTS 372-379
9. INTERNATIONAL ORGANISATIONS 380-384
10. NATIONAL ORGANISATIONS 385-387
11. FESTIVALS OF INDIA 388-393
12. GOVERNMENT SCHEMES 394-398
13. AWARDS AND HONOURS 399-402

TsuNamî

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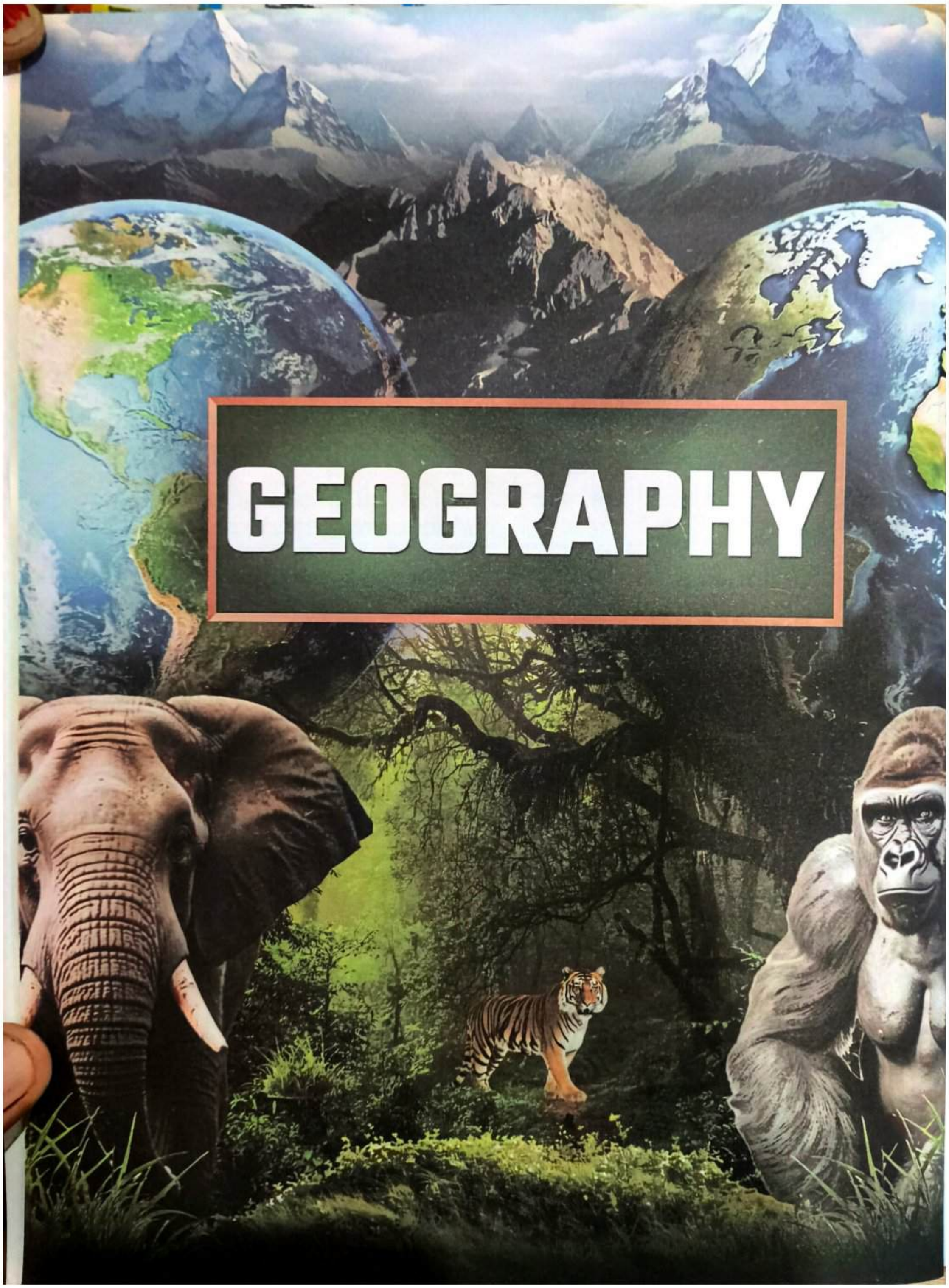

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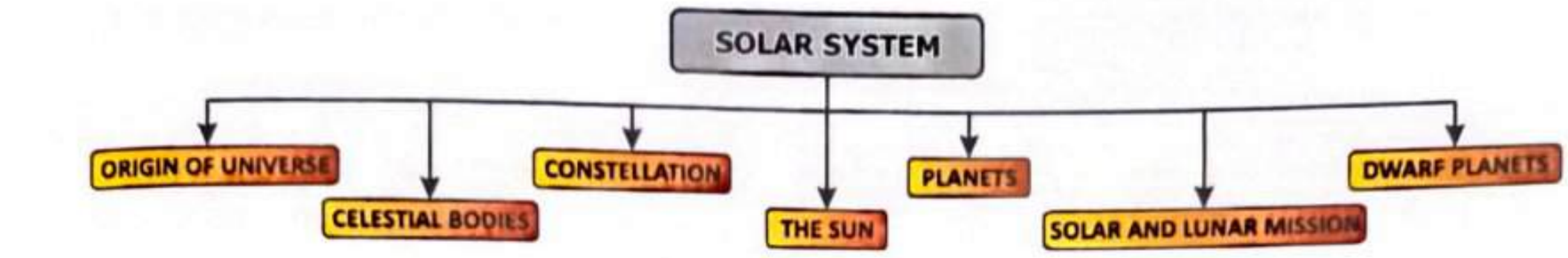

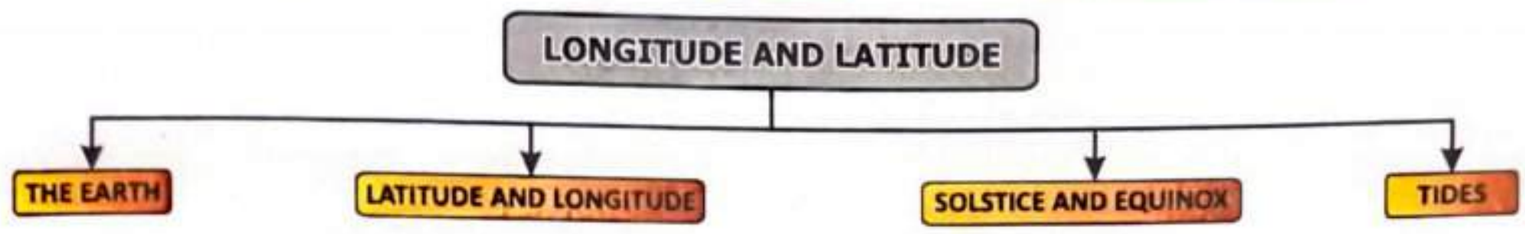

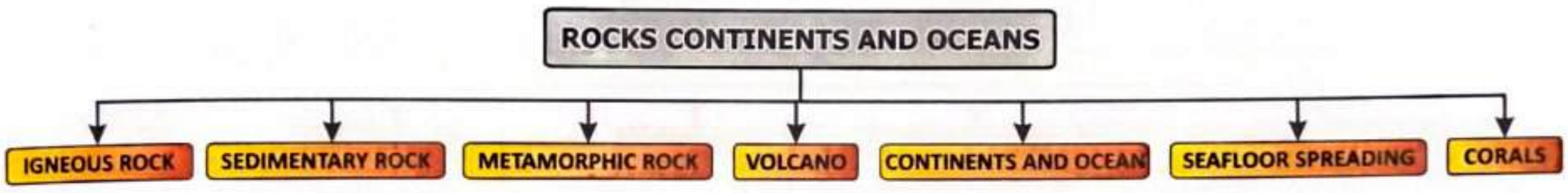

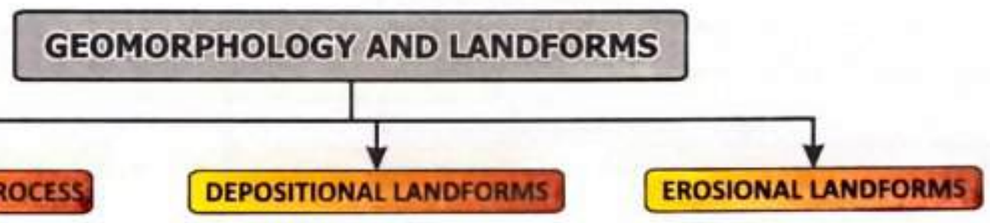

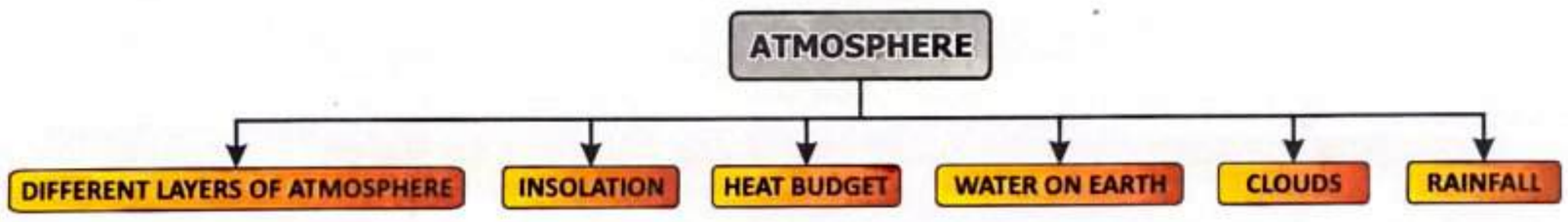

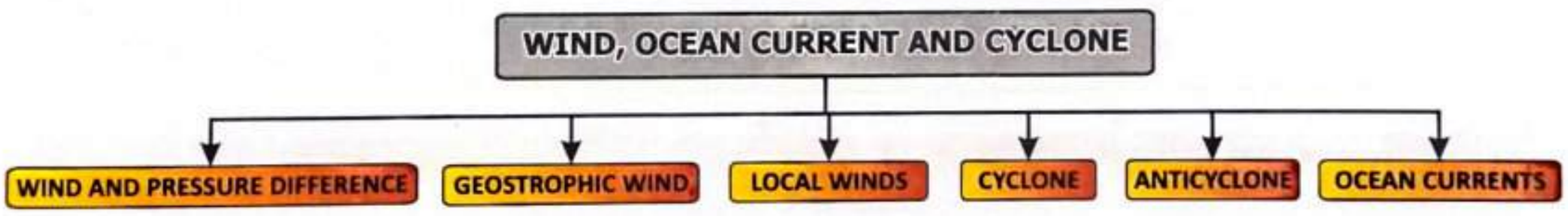

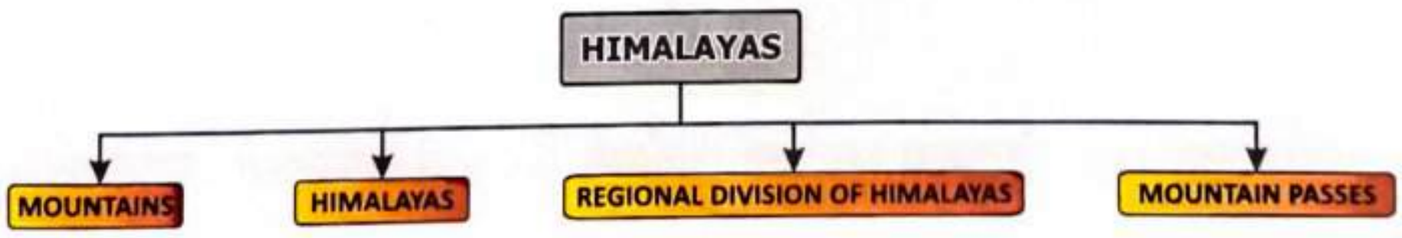

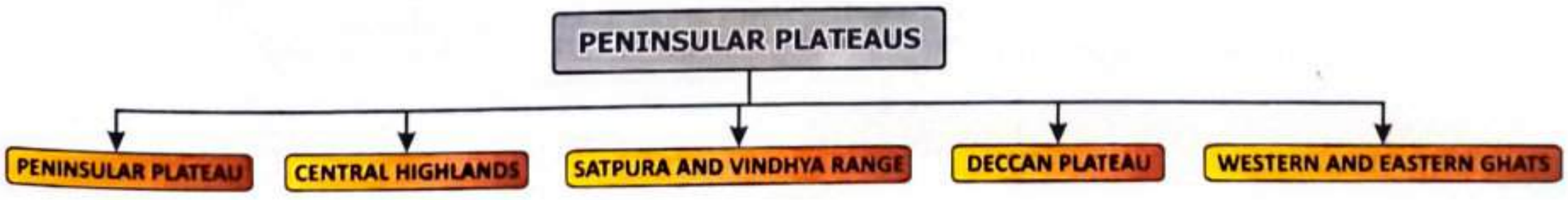

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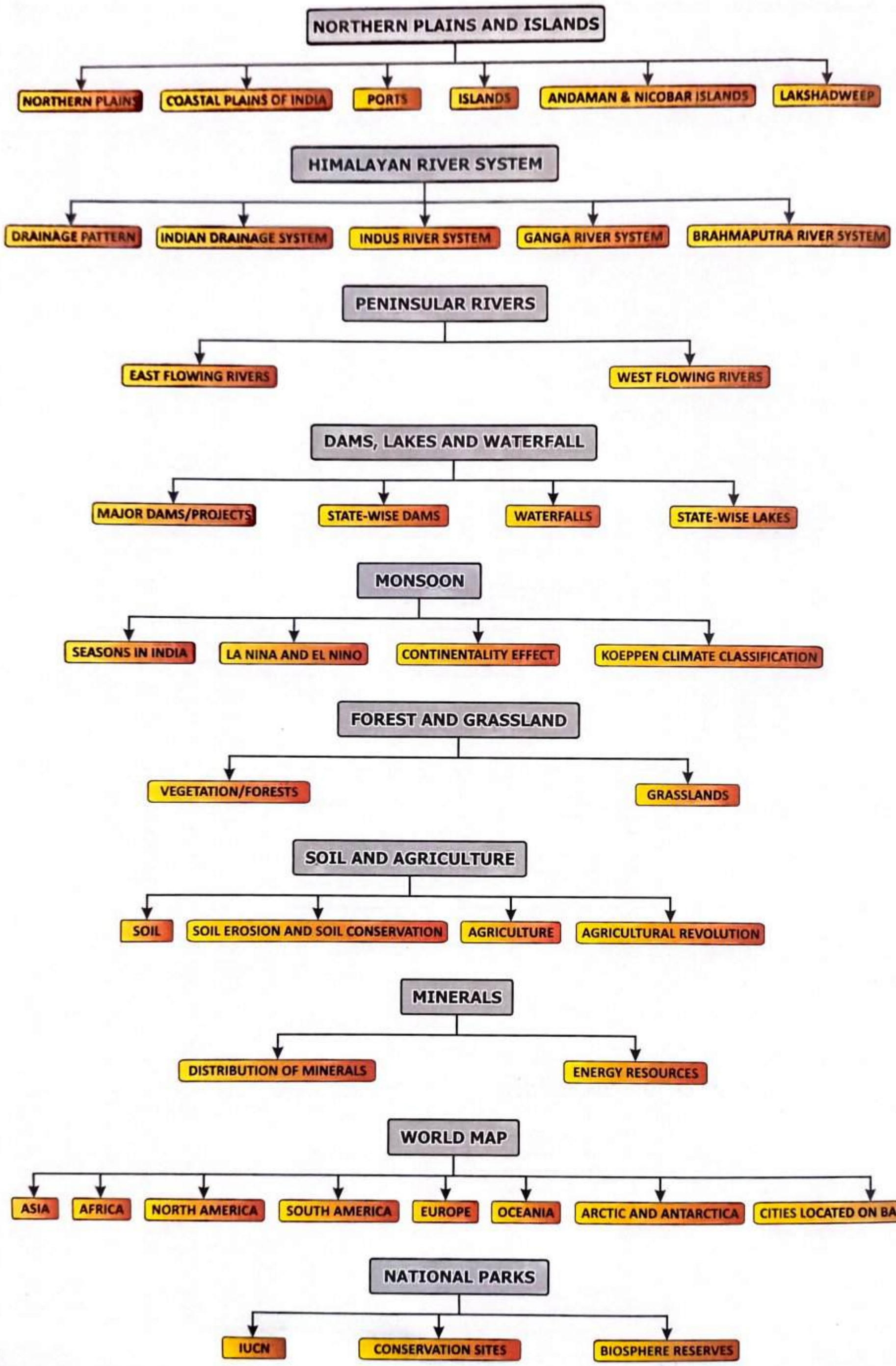

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• Study of Universe is known as: *Cosmology.*

Universe Milky → Way Galaxy → Solar System → 8 planets

• Branch of science that deals with celestial bodies: *Astronomy.*

ORIGIN OF UNIVERSE

• Various theories have been given on how the universe came into existence.

Big Bang Theory

• Big Bang was an explosion of concentrated matter in the universe that occurred *13.8 billion years ago*, leading to the formation of galaxies of stars and other heavenly bodies.

• Origin of Big Bang Theory (also known as Big Bang Explosion) was given by *George Lemaitre* in *1931*.

Infinitely hot and dense single point exploded

Fig 1: Accelerated expansion of the Universe

Steady State Theory

• It was given by *Fred Hoyle*, Hermann Bondi, and Thomas Gold.

• This theory proposes that the *universe is constantly expanding, but its average properties remain unchanged.*

Galaxy

• A galaxy is a massive collection of stars, gas, dust, and dark matter held together by gravity.

• Our galaxy is *Milky Way Galaxy (or the Akash Ganga)* formed after the Big Bang.

• *Andromeda* is the nearest galaxy to the Milky Way.

Orion arm/Orion spur where our Solar System is located

Fig 2: Milky Way galaxy

Origin of Solar System

• The formation of Solar System began *4.8 Billion years ago.*

• The process started when a cloud of gas and dust collapsed, forming a spinning disk called the solar *Nebula.*

• Gravity pulled material to the center, forming the Sun, while the rest flattened into a spinning disk. Dust and gas clumped into planetesimals, which merged to form planets. The Sun formed in the center, and the planets formed in a thin disk orbiting around it → It is the most widely accepted hypothesis.

Fusion of Hydrogen nuclei

Fig 3: Solar System formation from Nebula

Planetesimal Theory of Origin of Solar System

• *Proposed by: Thomas Chowder Chamberlin* and *Forest Ray Moulton* in *1905*

Nebular Hypothesis

• First proposed by *Immanuel Kant in 1755* and independently expanded upon by *Pierre-Simon Laplace in 1796.*

• The age of Earth: *4.5 Billion years old*

Fig 4: Solar System

Solar System

• Our Solar System has *8 planets and 5 Dwarf planets.*

• The Sun is at the centre, the *brightest and nearest star of Earth (only star of our Solar System).*

• It makes up for about *99.86 %* of the total mass of the Solar System.

Copernicus Theory (1543)

• It predicted that the *Sun is at the center* of the universe, with the Earth and other planets orbiting around it.

CELESTIAL BODIES

• Celestial bodies are objects in space that *glow in the night sky*, such as planets, stars, moons, asteroids, comets, and galaxies.

They are classified into:

- ***Luminous:*** Those celestial bodies that emit their own light.
  E.g. Stars
- ***Non-luminous:*** Those celestial bodies that do not emit their own light.
  E.g. Moon, Comets, Asteroids, Meteorites, Meteor, Meteoroid

Comets

• Comets are *large, icy objects* that orbit the Sun. They are made of dust, rock, and frozen gases like water, carbon dioxide, ammonia, and methane.

• ***Halley's Comet:*** It is *seen every 76 years*. It was last seen in 1986 and is expected to return in 2061.

Asteroid

• An asteroid is a *rocky, metallic, or icy object* that orbits the Sun.

Meteoroid

• A meteoroid is a *small, rocky or metallic space rock* that orbits the sun. Meteoroids are *much smaller than asteroids*, ranging in size from dust grains to objects up to a meter wide.

Meteor

• When a meteoroid enters Earth's atmosphere (in Mesosphere), *it burns up and creates a streak of light* called a meteor (also known as Shooting Star).

• ***Meteor shower name Quadrantids is visible in the early month of January.***

Meteorite

• If the meteoroid survives its trip through the atmosphere, it hits the ground and is called a meteorite.

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Fig 5: Comet, Asteoroid, Meteoroid, Meteor, Meteorite

CONSTELLATION

• A constellation is a group of stars that appear to form a pattern or shape in the night sky. Every constellation forms an asterism which is a group of stars that form a pattern in the night sky.

Ursa Major Constellation

• It is also known as the *Great Bear and Saptarishi (in India)*, is a constellation in the northern sky. *Big Dipper asterism* is seen in Ursa Major.

Cassiopeia

• It is a W-shaped constellation. *The brightest star of Cassiopeia is Schedar* (also known as Alpha Cassiopeia).

Cygnus

• Cygnus is a prominent northern constellation known for its distinctive *cross shape.*

> ***Sagittarius: Bow and cross shaped constellation.***

Orion

• Orion (also known as *The Hunter*) is a prominent set of stars visible during winter in the northern celestial hemisphere. The brightest star of Orion is *Rigel.*

• Brightest star in night sky: *Sirius.*

• Nearest star to earth after sun: *Proxima Centauri.*

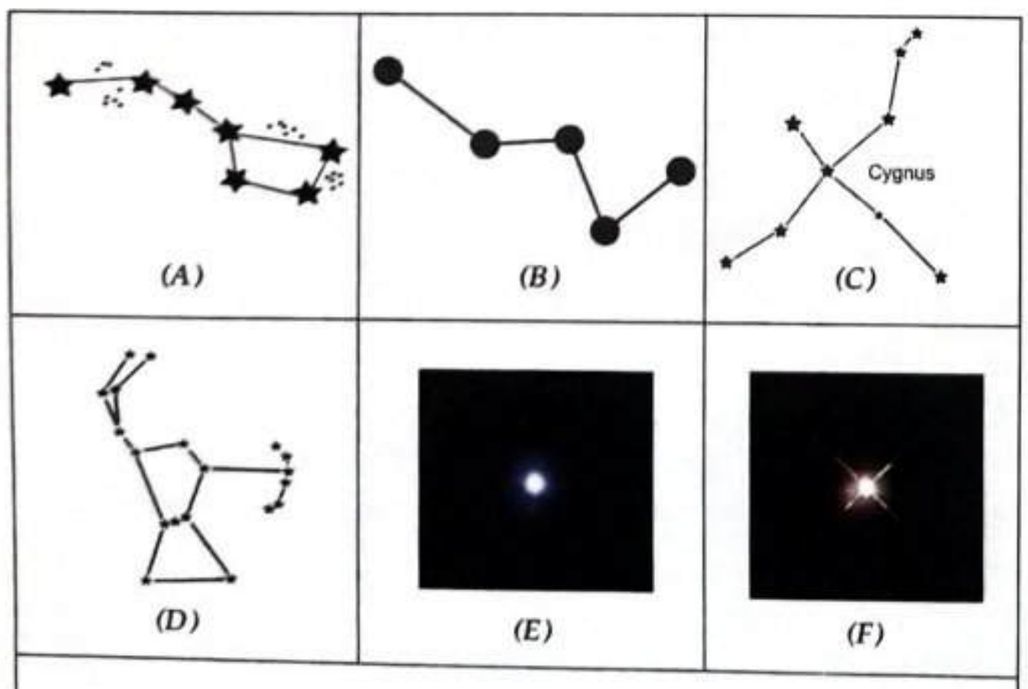

Fig 6: Major Constellations (A) Ursa Major; (B) Cassiopeia; (C) Cygnus; (D) Orion; (E) Sirius; (F) Proxima Centauri

THE SUN

• The only star in our solar system and powerhouse of the solar system. It is composed of *Hydrogen (73%), Helium (25-28%) and other gases.*

• Approximately *15 crore Kilometres (149.6 Million Km)* further away from Earth. It takes around *8 minutes 20 seconds* for light at the speed of *3 lakh Km/sec* to reach the earth.

• ***Temperature at surface = 5800 K or 5600°C***

• ***Temperature at the centre = 15.7 million K***

> ***Note:***
> ***K: Kelvin***

Light Year

• A Light Year is a unit of length used to measure distance between two astronomical objects. *It's the distance that light travels in a vacuum in one Julian year (365 days).*

• *1 Light Year = 9.461 X 10^{12} km*

> • ***Parsec (pc)*** is an astronomical unit ***greater than Light Year.***
> • ***1 Parsec: 3.26 Light Year***

Layers of Sun

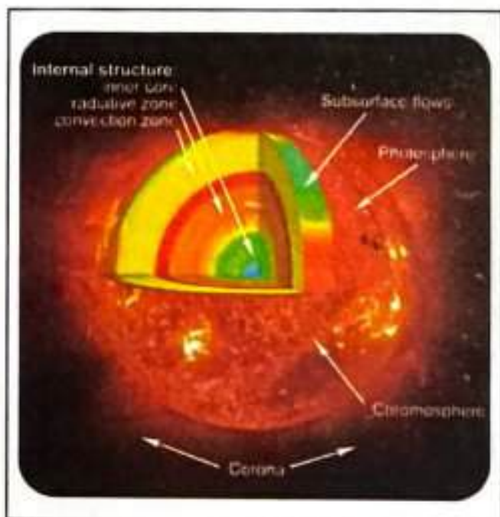

Fig 7: Layers of Sun

• ***Photosphere:*** The only *visible surface* of the Sun.

• ***Chromosphere:*** Visible as a dim red ring just above the photosphere.

• ***Corona:*** The outermost layer of the Sun's atmosphere, which is *extremely hot* (more temperature in-comparison to Photosphere) and *only visible during solar eclipses.*

PLANETS

Classification of Planets

Terrestrial Planets	*Jovian Planets*
They are relatively very small	They are immense in size
They are made of rocky material	They are made of gaseous material
Their surface is solid	They do not have a solid surface
They are nearer to Sun	They are far away from Sun
They have few/no moons	They have multiple moons
They do not have rings	They support ring systems
Eg: Mercury, Venus, Earth, Mars	*Eg: Jupiter, Saturn, Uranus, Neptune*

> ***Jupiter and Saturn (gas giants)***
> ***Uranus and Neptune (ice giants)***

Mercury

• It is the closest planet to the Sun.

• It is smallest planet in the solar system with a diameter of *4900 Km.*

• It is the fastest planet with speed of *172500 Km/hour* or *47 km/sec* to complete revolution around Sun in *88 days.*

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Venus

- It is the ***hottest planet*** in the solar system.
- It is also known as ***"Earth's Twin"***. It is because of the similarity in size and mass between Venus and Earth.
- ***Brightest planet in the Solar system.*** It can be seen in the morning and evening with open eyes.
- This planet has the ***slowest rotation.*** It takes ***243 Earth days*** to complete one rotation.
- Venus is covered with thick clouds of ***Sulfuric acid (H_2SO_4).***
- ***Other names for Venus:*** Morning star, Evening star, Lucifer (light bringer)

> - ***All planets have satellites except Mercury and Venus***
> - ***All planets rotate from West to East except Venus and Uranus (they rotate from East to West)***

Earth

- The only Planet to give support to life with a pleasant atmosphere.
- It is also known as ***"Blue Planet"*** because of the presence of water ***(70%)*** on it.
- It has ***one natural satellite named "Moon".***
- It is a planet with ***highest density (5.5 g/cm³).***
- Closest planet to Earth is Venus.

Mars

- It is known as ***"Red Planet" because of Iron-rich red soil.***
- It is the ***second smallest planet*** in the solar system after Mercury.
- It has two natural moons ***"Phobos"*** and ***"Deimos".***
- It has a thin atmosphere and surface with valleys, craters, deserts, and ice caps etc.
- ***"Olympus Mons" (height: 22-25 km)*** is the largest volcano and the tallest mountain in the solar system lies on Mars.
- Length of a day is equal to ***1 day and 37 minutes.***

- ***The asteroid belt is found between the orbits of Mars and Jupiter***

The International Astronomical Union (IAU) has approved the name "Pandit Jasraj" for an asteroid 2006 VP32 after it was discovered in November 2006.

- ***Asteroid Bennu studied by NASA's OSIRIS-REx mission***

Fig 8: Asteroid belt between Mars and Jupiter

Jupiter

- It is the largest planet of the solar system with the ***shortest rotation of 9 hours 55 minutes.***
- It has an atmosphere filled with Hydrogen, Helium and other gases.
- Jupiter is the ***third brightest object in the night sky*** after the Moon and Venus.
- Great Red Spot, a giant storm in the solar system exists on this planet.
- At present it has ***95 moons,*** including four large Moons ***"Io, Europa, Ganymede, and Callisto"*** also known as ***Galilean Moons*** because they were discovered by ***Galileo. "Ganymede"*** is the ***largest*** among them.
- It has an unclear ring around it.

Saturn

- It is the ***second largest planet*** in the solar system.
- It has bright and concentric rings around it which are made up of tiny rocks and pieces of ice.
- Saturn is the planet with ***least density (0.69 g/cm³).*** Apparently, it can float in water.
- At present it has ***146 moons and Titan is the largest*** among them.
- Satellites of Saturn → ***Titan (largest moon) and Enceladus show possibility of life on it.***
- ***In 1655:*** Huygenes discovered Saturn's rings.
- ***In 1675:*** Cassini discovered the gap between rings.
- Its rotation time is ***11 hours.***

Uranus

- It is greenish in colour hence known as ***"Green Planet" due to presence of Methane gas in its atmosphere (CH_4).***
- It was discovered by ***William Herschel in 1781.***
- The atmosphere of Uranus is composed of Hydrogen and Helium primarily, but it also contains more water, ammonia etc.
- It has ***coldest planetary atmosphere*** in the solar system.
- It has ***at least 27 moons.*** Famous moons → ***Miranda, Ariel and Umbriel.***
- It is tilted to 98° at the axis hence called as ***"Rolling/Lopsided Planet".***
- Its rotation time is ***17 hours.***

Neptune

- It is the farthest planet from the Sun with ***longest/slowest revolution of 165 years.***
- Its rotation time is ***16 hours.***
- Atmosphere primarily composed of Hydrogen and Helium. It is the windiest planet.
- ***It is bluish in colour because of Methane.***
- It was discovered by ***Johann Galle and Urbain Le Verrier in 1846.*** The only planet in the solar system found by Mathematical Predictions.
- It is known to have ***14 satellites*** and the most famous moon is ***Triton.***
- It is the windiest planet of our Solar System.

Planets from Increasing to Decreasing Order

J	S	U	N	E	V	M	M
Jupiter	*Saturn*	*Uranus*	*Neptune*	*Earth*	*Venus*	*Mars*	*Mercury*

Fig 9: Planets of our Solar System

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Moon

- The Moon is Earth's only natural satellite.
- It is non-luminous in nature.
- ***Radii = 1.74×10^6 m***
- Moon's light takes *1.26 seconds* to reach Earth's surface.
- ***Distance between Earth and Moon = 3,84,000 km***
- ***Gravity on Moon = $\frac{\text{Earth's gravity}}{6}$***

> • *Thin gaseous envelope around the Moon is known as Lunar Exosphere.*

- Only one side *(near side)* of the Moon is visible (roughly 60% of it is visible) and the remaining side *(far side)* is not visible to the naked eye.
  - ***Reason***
    Rotation time = Revolution time → 27.3 days
- Highest point on moon: *Mt. Leibniz (Now officially known as Mons Huygens)*

SOLAR AND LUNAR MISSION

Sun

- *Aditya-L1 Mission* is India's first solar observatory mission launched by *Indian Space Research Organisation (ISRO)* to study the Sun.

L_1 refers to the first *Lagrange Point* on the Sun. There are a total of *5 Lagrange Points (L_1 to L_5).*

> ***Headquarter of IAU: Paris, France***

Moon

Chandrayan 3

- It is the third lunar-exploration mission of Indian Space Research Organisation (ISRO).
- ***Lander:*** Vikram.
- ***Rover:*** Pragyaan.
- ***Point:*** Shiv Shakti Point.
- Chandrayaan-3 landed on the *near side of the moon (Lunar South Pole).*

> ***The Lagrange Points are positions where the gravitational pull of two large masses precisely equals the centripetal force required for a small object to move with them.***

DWARF PLANETS

Kuiper Belt

- It is a *ring of bodies beyond Neptune* containing a number of asteroids, rocks, and comets.

Pluto

- As per the new definition of Planets determined by International Astronomical Union (IAU), *Pluto has been omitted from the list of planets in 2006.*
- Pluto is considered as a dwarf planet (size between planets and asteroids) now and it is now a member of *Kuiper Belt.*
- ***Pluto's largest satellite:*** *Charon.*
- ***1 revolution of Pluto = 248 Earth years***
- Pluto's oblong orbit overlaps with that of Neptune.

Fig 10: Kuiper Belt

> • ***Each orbit of International Space Station (ISS) takes 90-93 minutes to complete one orbit around the Earth.***

Three Characteristics of Dwarf Planets

1. To be around the Sun.
2. To have a nearly spherical shape.
3. They should not be able to clear their orbit of debris.

Largest Dwarf Planet

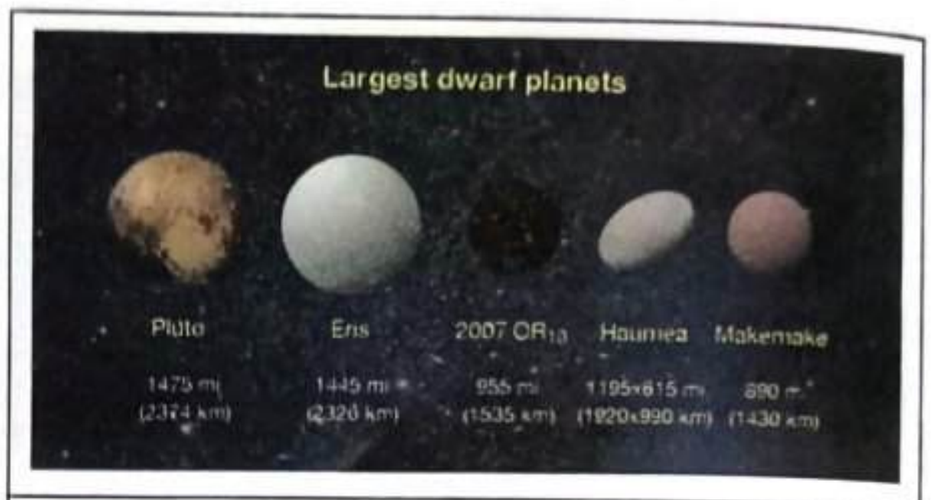

Fig 11: Largest Dwarf Planets

- ***Pluto:*** Largest and brightest dwarf planet.
- ***Eris:*** Second largest dwarf planet.
- ***Makemake:*** Third largest and it orbits in 310 years.
- ***Haumea:*** Fastest rotating dwarf planet in Kuiper Belt.

} ***Located in Kuiper Belt***

- ***Ceres:*** This dwarf planet is present in Asteroid Belt.

Terms to Understands

- ***Supernova:*** Explosion of star.
- ***Pulsar:*** A neutron star.
- ***Black Hole:*** A place in space with immense gravity.
- ***Van Allen Radiation Belts:*** These are two concentric rings of charged particles that surround the Earth.

For an interactive recap of this topic, see the crossword on Page Number 8.

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THE EARTH

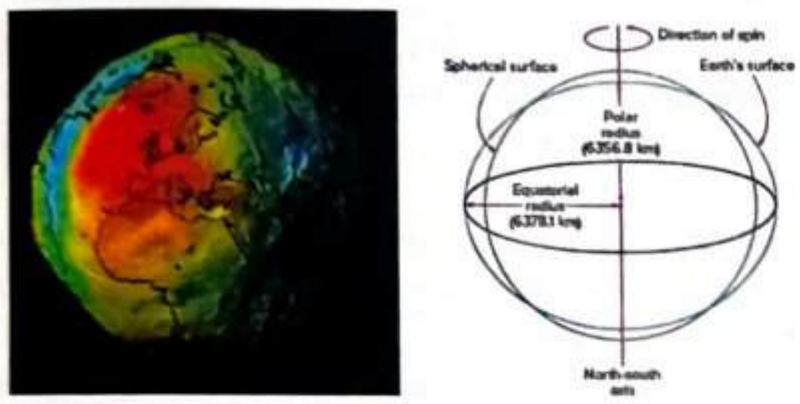
Shape of Earth

- Shape of Earth is *Geoid or Oblate Spheroid* (a little flat from top and bottom) and bulged at the centre.
  - *Reason:* Centrifugal force (due to rotation of Earth).

Radius of Earth	Circumference of Earth
• ***Equatorial radius:*** 6378 km	• ***Polar:*** 40,007.863 km
• ***Polar radius:*** 6357 km	• ***Equatorial:*** 40,075 km
• ***Mean radius:*** 6371	• ***Mean:*** 40,040 km

- ***Equatorial speed > Polar speed.***
- ***Equatorial radii > Polar radii.***
- ***Equatorial circumference > Polar circumference.***

(All because the Earth is bulged at the equator and flattened at the poles)



(A) (B)

Fig 1: (A) Actual Shape of Earth; (B) Radius of Earth

Rotation of Earth

- Earth rotates on its own axis, from West to East (Anticlockwise).
- One rotation of Earth = 23 hour 56 minutes 4 seconds.
- Rotational speed is maximum at the equator and minimum at the poles.

- *Day and night are caused by the Earth's rotation on its axis.*

Revolution of Earth

- Earth revolves around the Sun in elliptical orbit.
- One revolution = 365 days 6 hours 9 minutes and 9 seconds.
- Orbital speed = 29.8 km/sec.
- Mercury has the maximum orbital speed.
- Neptune has the minimum orbital speed.
- *The Earth's revolution around the sun and the tilt of its axis cause the seasons.*

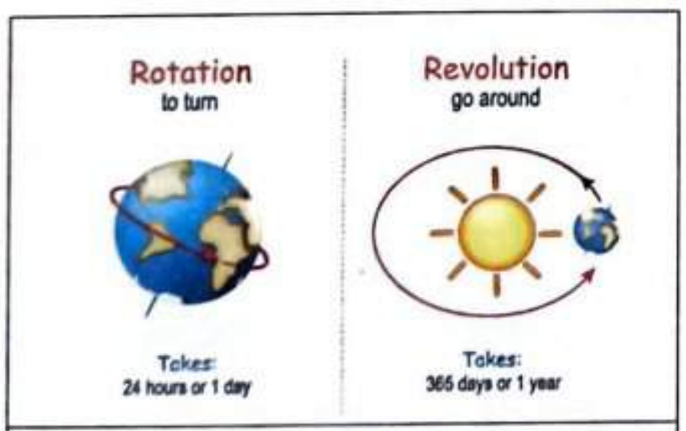


Fig 2: Rotation vs Revolution

Distance of Earth from Sun and Moon

Sun	*Moon*
• The point in a planet's orbit when it is closest to the Sun is called *Perihelion. On January 3rd, the Earth is nearest to the Sun* (147 million km). • The point in a planet's orbit when it is *farthest from the Sun* is called *Aphelion. On July 4th,* the *Earth is farthest from Sun* (152 million km).	The point in the moon's orbit when it is *closest to Earth* is called *Perigee.* At perigee, *the moon appears larger in the sky.* • The point in the moon's orbit when it's *farthest from Earth* is called *Apogee.* At apogee, the moon's *tide-raising force is smaller, and the tidal ranges are less than average.*

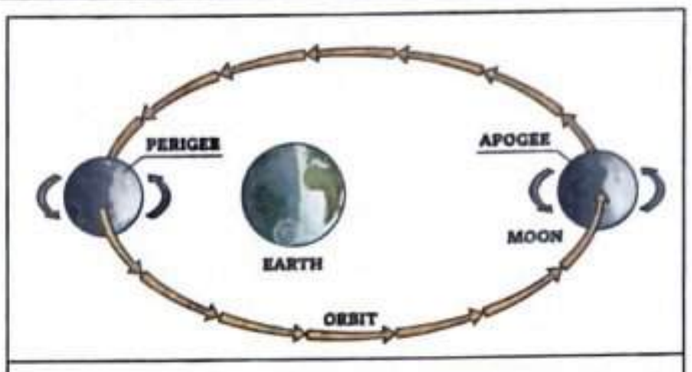


Fig 3: Perigee and Apogee

Inclination of Earth's Axis

- ***Axial inclination:*** Inclination of Earth on its axis = $23\frac{1}{2}^{\circ}$
- ***Orbital inclination:*** Inclination of Earth on its orbital plane = $66\frac{1}{2}^{\circ}$

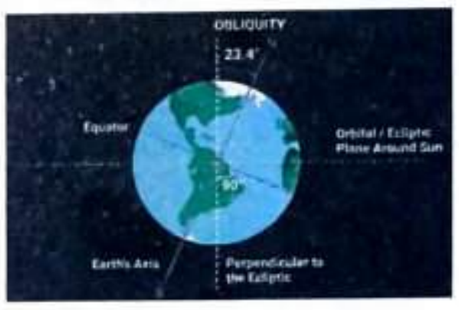


Fig 4: Inclination of Earth's Axis

LATITUDE AND LONGITUDE

Latitude

- They are imaginary horizontal lines on the globe that run from *East to West.*
- It is the angular distance of a place from the equator.
- Total latitude = 181.
- Distance between each latitude is same.
- 1° of latitude = 111 km.

Important Latitudes

- 0°: Equator (divides Earth into two equal parts) → Northern and Southern Hemisphere.
- $23\frac{1}{2}^{\circ}$N: Tropic of Cancer.
- $66\frac{1}{2}^{\circ}$N: Arctic Circle.
- $23\frac{1}{2}^{\circ}$S: Tropic of Capricorn.
- $66\frac{1}{2}^{\circ}$S: Antarctic Circle.

> • ***All parallel circles from the equator to the poles are known as "Parallels of Latitude".***

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- Largest latitude: Equator.
- Smallest latitude: Poles (North and South).

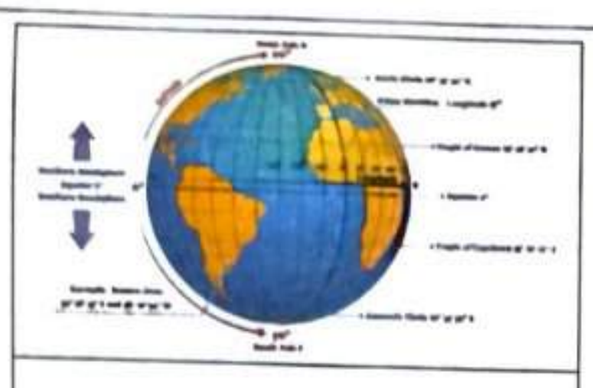

Fig 6: Latitude Lines of Earth

Longitude

- They are *imaginary vertical lines* over the globe that run North to South.
- Distance between each longitude decreases from Equator towards poles, at the poles it is *0*, while it is maximum at the equator *(111.32 km)*.
- Total longitudes = 360.

Uses of Latitude
1. *Climatology*
• Temperature zones and wind
• Pressure system
• Planetary wind system
2. *Location of place*

Important Meridians *(Longitudes)*

- Prime Meridian = 0° longitude (passes through Greenwich, London).
- International Date Line = 180° Meridian.
- Prime Meridian also known as *International Meridian or Greenwich Meridian*. It passes through:

	→	B
Burkina Faso	→	S
Spain	→	F
France	→	G
Ghana	→	A
Algeria	→	Me
Mali	→	In TOGO
Togo	→	KINGDOM
UK		

TRICK TO REMEMBER
BSF GAme in TOGO KINGDOM

Fig 7: Longitudes of Earth

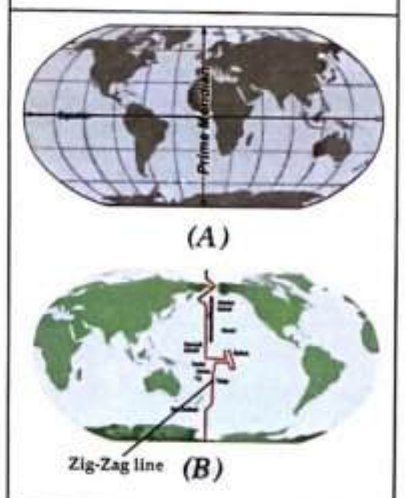

Fig 9(A): Prime Meridian; (B): International Date Line

Concept of Time using Longitude

- 360° = 24 hours
- $\frac{360°}{24}$ = 1 hour → Distance rotated by Earth in 1 hour
- 15° = 1 hour
- 1° = $\frac{60}{15}$ = 4 minutes → Time taken in each 1°

- Moving *East away from Prime Meridian*, the time will *increase* by an *hour* for *every 15°*, consecutively if we *move to West* from the *Prime Meridian*, the time will *decrease* by an *hour* for *every 15°*
- Entire earth is divided into *24 Times Zones*. *France* has the *most number* of Time Zones *(13)*, *Russia* (11 time zones), *US* (6 time zones).

International Date Line *(180° E/W)*

- It is the imaginary zig-zag line passing through the Pacific Ocean from where the date changes.
- While crossing International Date Line eastbound i.e. from *East to West (eg: Japan to USA)* → Date is subtracted by 1 or in other words, *the person gains a day* and vice versa.

> • ***Isochrones: They are lines joining points located at equal travel time from a common centre.***

Concept of Great Circle

- A great circle is the largest possible circle that can be drawn around a sphere.
- It divides the Earth into *two equal parts called Hemispheres* (Northern and Southern).
- *All longitudes are considered great circles*, but only one latitude is considered a great circle and that is *Equator* (0° latitude).

Hemisphere

- Equal division of Earth in two parts.
- ***Equator:*** It divides the globe horizontally into two equal parts: *Northern and Southern hemisphere.*
- ***Prime Meridian:*** It divides the globe vertically in two equal parts: *Eastern and Western Hemisphere.*

Fig 5: Hemisphere of Earth

SOLSTICE AND EQUINOX

- **Solstice:** A solstice is an astronomical event that occurs twice a year when the sun reaches its highest or lowest point in the sky, resulting in the longest day or shortest day of the year.

Summer Solstice	*Winter Solstice*
It occurs on *21st June*	It occurs on *22nd December*
It is the longest day of the year in Northern Hemisphere	It is the shortest day and longest night of the year in Northern Hemisphere
The vertical rays of Sun are directly overhead on *Tropic of Cancer*	The vertical rays of Sun are directly overhead on *Tropic of Capricorn*
Northern Hemisphere gets more heat	Southern Hemisphere gets more heat
Continuous sun rays fall on the North Pole for 6 months	Continuous sun rays fall on the South Pole for 6 months

- **Equinox:** An equinox is a time when the *Sun's apparent path in the sky crosses the equator, making day and night approximately equal in length.* At this position, neither of the pole is tilted towards the Sun.

- ***Vernal or Spring equinox: 21st March.***
- ***Autumnal or Fall equinox: 23rd September.***

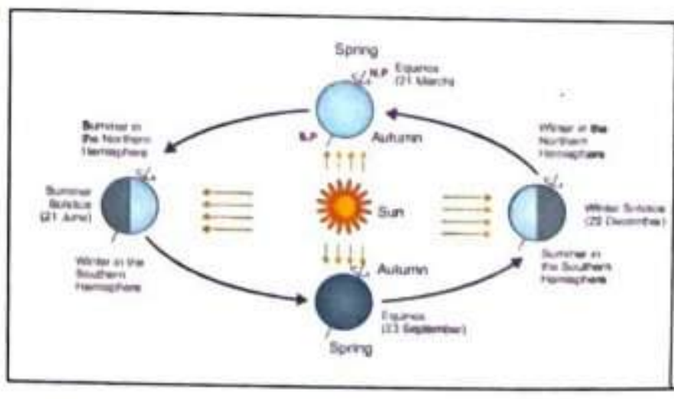

Fig 10: Solstice and Equinox

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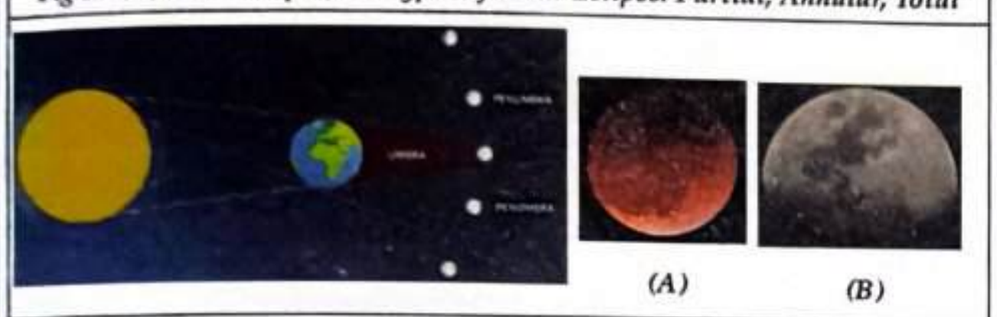
• **Lunar Eclipse:** It occurs when the *Earth passes between the Moon and the Sun*, casting a shadow on Moon. This can only happen during a *full moon (Purnima)*.

(A) (B)

Fig 11: (A) Solar Eclipse; (B) Types of Solar Eclipse: Partial, Annular, Total



(A) (B)

Fig 12: Lunar Eclipse; (A) Red Moon (When Earth blocks the Sun's light (light refraction), it causes blue colour (scatters more) light to vanish and red light to reach moon (scatters less)); (B) Blue moon (occurs when there are two full moons within a single calendar month)

Supermoon

• A supermoon occurs when the *Moon's orbit is closest to the Earth during a full/new moon.*

• The moon appears *bigger* than its normal size.

Fig 13: Perigee + Lunar Eclipse

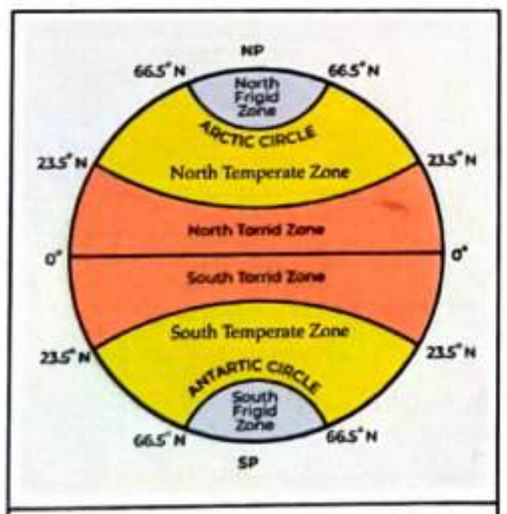
When the Sun, Moon and Earth, all are aligned in a straight line, the alignment is known as Syzygy.

Torrid, Temperate, and Frigid Zone

• ***Torrid Zone:*** Receives direct overhead rays of the Sun due to which it is the *hottest zone*. It is located between Tropics.

• ***Temperature Zone:*** Region between Tropic of Cancer & Arctic Circle or Tropic of Capricorn & Antarctic Circle. It receives slanting rays of the Sun.

• ***Frigid Zone:*** *Coldest region* on Earth which experiences daylight for 6 months and 6 months of night (due to the tilt of Earth). Located beyond Arctic ($66\frac{1}{2}^\circ$ N) & Antarctic Circle ($66\frac{1}{2}^\circ$ S).



Frigid, Temperate and Torrid Zone

TIDES

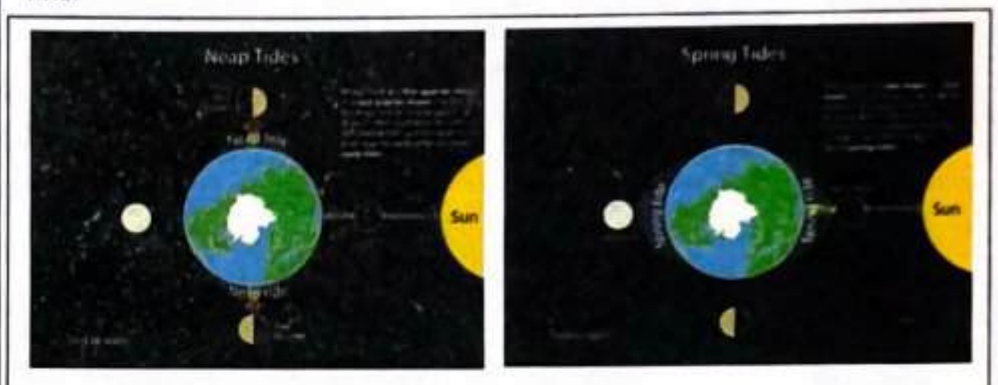
• **Tides:** Tides are the periodic rise and fall of the ocean's water levels. They are caused by the gravitational pull of the moon and the sun on the Earth's oceans. They are of two types:

Neap Tides

• They occur when Earth, Moon, and Sun are in perpendicular alignment.

Spring Tides

• They occur when the Earth, Moon, and Sun are all aligned along a straight line.

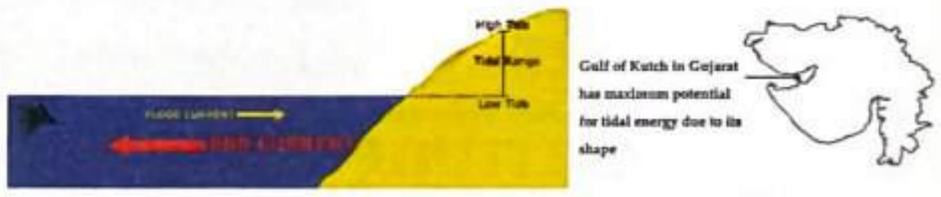


(A) (B)

Fig 14: (A) Neap tides; (B) Spring tides

Flood Tide and Ebb Tide

• The change from low to high tide is called the *"flood tide"* or *"flow"*. The change from high to low tide is called *"ebb tide"*.



(A) (B)

Fig 15(A): Flood current and Ebb current; Tidal energy in Gulf of Kutch

For an interactive recap of this topic, see the crossword on Page Number 8.

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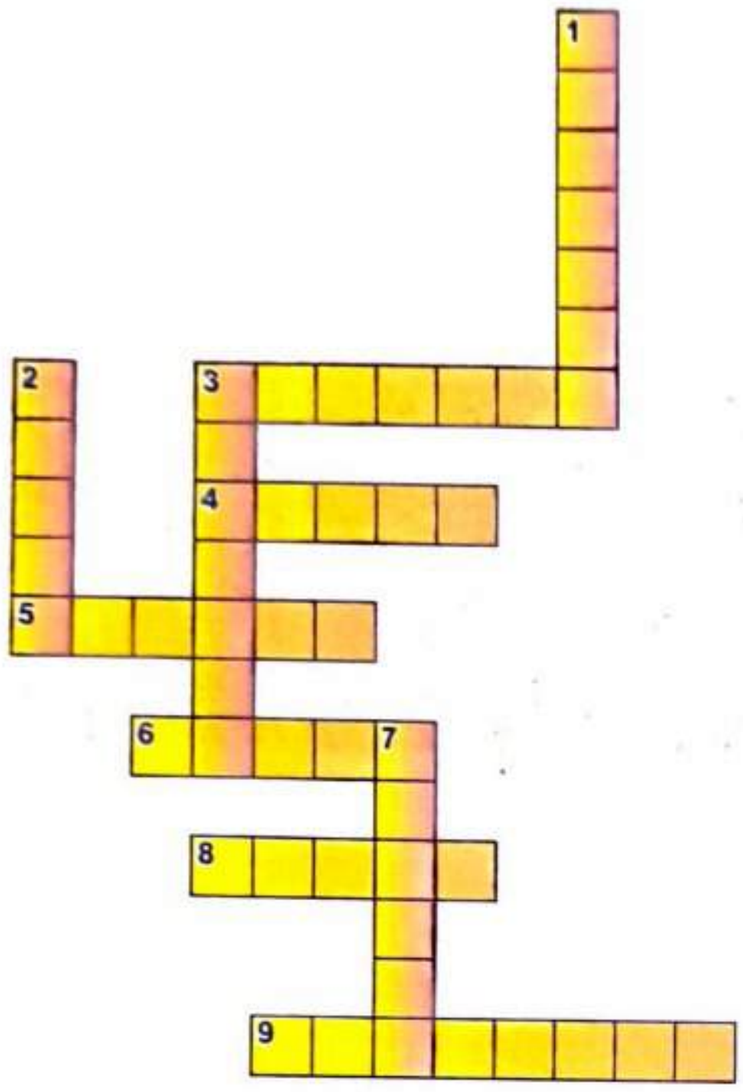
PARMAR'S CROSSWORD

SOLAR SYSTEM



Across

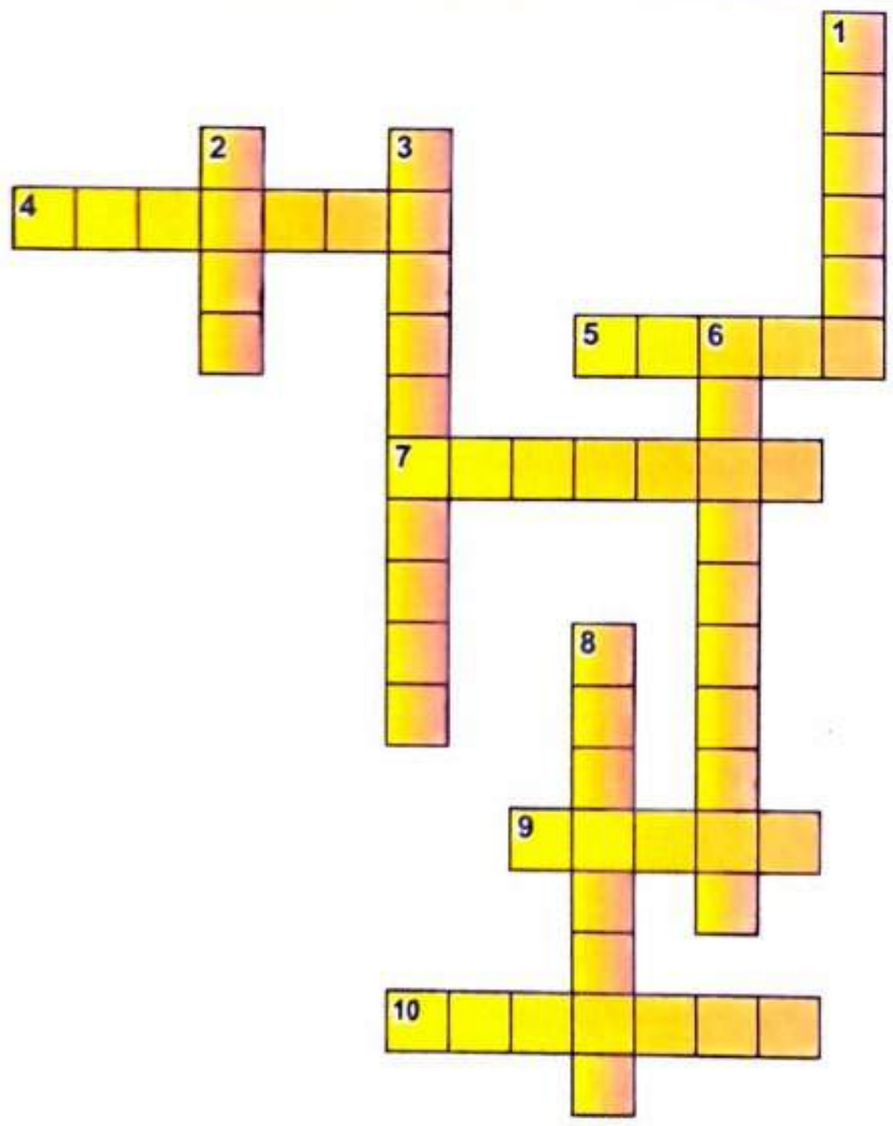
3. Origin theory of the solar system
4. Planet with Charon as a moon
5. Brightest rings & second largest planet
6. Planet also known as Lucifer
8. Densest planet in the solar system
9. Radiation belts around Earth

Down

1. Planet with Great Red Spot storm
2. Planet with thick sulphuric acid clouds
3. Farthest & windiest planet
7. Largest number of moons

PARMAR'S CROSSWORD

LATITUDE LONGITUDE ROTATION REVOLUTION



Across

4. Farthest & windiest planet.
5. Shape of Earth that bulges at equator due to rotation.
7. Longest latitude line.
9. Caused by gravity of Moon & Sun.
10. Equal day and night.

Down

1. Zone between Arctic Circle and North Pole.
2. Low pressure equatorial convergence zone.
3. Earth closest to Sun.
6. Lines of equal travel time.
8. It deflects winds due to Earth's rotation.

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EARTH'S INTERIOR

Four methods to know about Earth's interior:

1. ***Temperature:*** Indirect source.
2. ***Volcanoes:*** Direct source.
3. ***Rocks:*** Direct source.
4. ***Meteorites:*** Indirect source.
5. ***Earthquake:*** Indirect source.

Father of Geology: James Hutton

Layers of Earth

Crust

- It is made of *Silica* and *Aluminium layer (SiAl)*.
- ***Thickness:*** *5-70 km.*
- ***Crust has two divisions:***

Continental Crust	*Oceanic Crust*
It is the land of the crust, the outermost layer of the Earth that makes up the continents and continental shelves	It is the water part of the crust, the solid layer Earth's crust that lies beneath the ocean.
It is thick (30 km)	It is thin (5km)
It is lighter	It is denser
It is made of granitic rock	It is made of Basaltic rock.

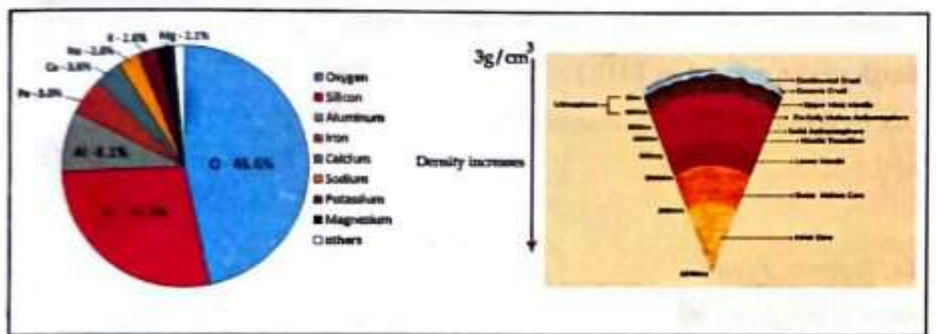


Fig 1: (A) Composition of Earth's crust; (B): Layers of Earth

Mantle

- It is made of *Silica* and *Magnesium (SiMa)*.
- ***Thickness:*** *2900 km.*
- Mantle has two divisions: *Upper Mantle and Lower Mantle.*
- ***Asthenosphere:*** It is a *semi-solid/semi-molten layer* of earth's upper mantle that is mechanically weak, and ductile. It lies *beneath the lithosphere* (the rigid outermost layer of earth made up of crust and upper solid mantle with 10-200 km of thickness). Asthenosphere is a source of *magma/lava*.

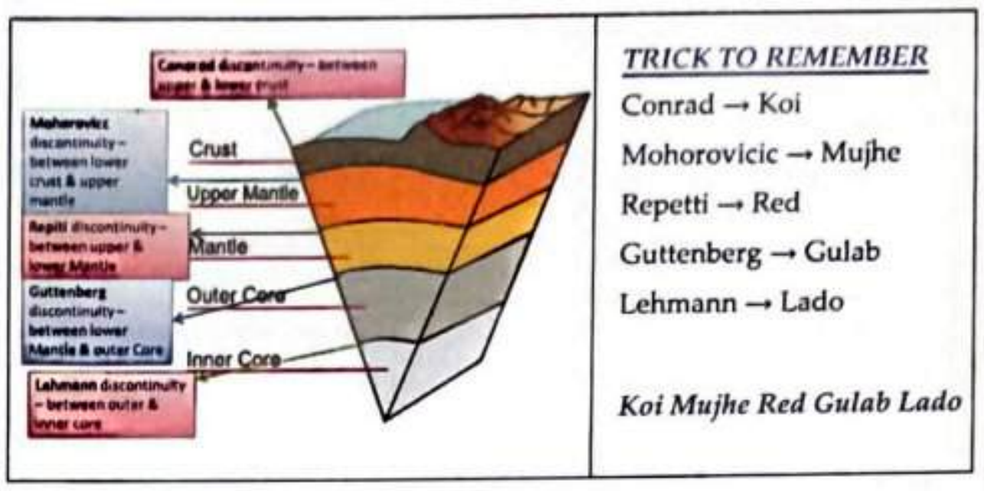
Asthenosphere is not a part of Lithosphere.

Core

- It is made of *Nickel* and *Iron (NiFe)*.
- ***Core has two divisions:***
  1. ***Inner core:*** It is in *solid form* (2200 km).
  2. ***Outer core:*** It is in *liquid form* and shows magnetic properties (1300 km).

By	*Crust*	*Mantle*	*Core*
Volume	1%	84%	15%
Mass	1%	68%	31%

Earth's Discontinuity



Force of Drifting

- ***Theory of Plate Tectonics:*** It is given *Mckenzie* and *Parker* in *1967*. This theory suggests that the *Earth's lithosphere*,(crust and uppermost mantle) is broken into large, rigid plates that move and interact with each other, driving various geological phenomena.
- ***Convection Current Theory:*** It is given by *Arthur Holmes*. Holmes theorised that convection currents move through the mantle, the same way heated air circulate through a room and radically reshape the Earth's surface in the process.

Earthquake

- An earthquake is an intense shaking of Earth's surface, which caused due to *shifting of Earth's plate*. It is a sudden release of energy along the fall line in the form of waves (also known as *seismic waves*).

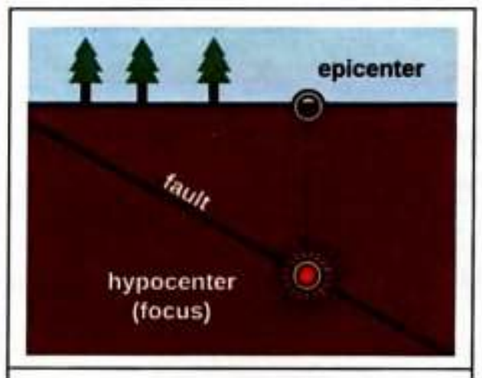


Fig 2: Earthquake

- ***Epicentre:*** It is the point on the Earth's surface directly above the *earthquake's focus* (also known as the hypocentre), where the earthquake originates underground.
- ***Hypocentre:*** It is the point within the Earth where the *earthquake begins*.

- All natural earthquake occur in *lithosphere*.
- Earthquake generate seismic waves, which are vibrations that travel through the earth in the form of body waves and surface waves.

Body Waves

- These waves travel through the Earth's interior with high speed.
- They are of two types: *P-waves and S-waves.*

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P-waves	S-waves
They are also known as primary waves	They are also known as secondary waves
They are the fastest seismic waves (first to record on seismograph) → 7-8 km/sec	They are the slow seismic waves in-comparison to P-waves → 4-6 km/sec
They can travel through all medium (solid > liquid > gas)	They can travel through only solids
P-waves are longitudinal compression waves, similar to sound waves	S-waves are transverse waves, that causes the ground to vibrate perpendicular to the direction of the wave
They create compression and rarefaction and also causes stretching and squeezing	They create crest and trough

Note:

Shallow focus, earthquakes have more intensity than the deeper ones.

Surface Waves

- When body waves come in contact with *surface rocks*, they form surface waves.
- They are more destructive in nature.
- *Rayleigh waves/Love waves* (L-waves) are types of surface waves.
- They are the *last to record* on seismograph.

A seismograph is an instrument that measures and registers seismic waves that travel through the Earth as the outcome of an earthquake.

Scales to Measure Earthquake

Richter Scale	Mercalli Scale
It is an instrument to measure magnitude of the earthquake	It is an instrument to measure the intensity of the earthquake
It measures magnitude from 0 to 10	It measures intensity from 1 to 12
It is a limitless scale	

Shadow Zone of Waves

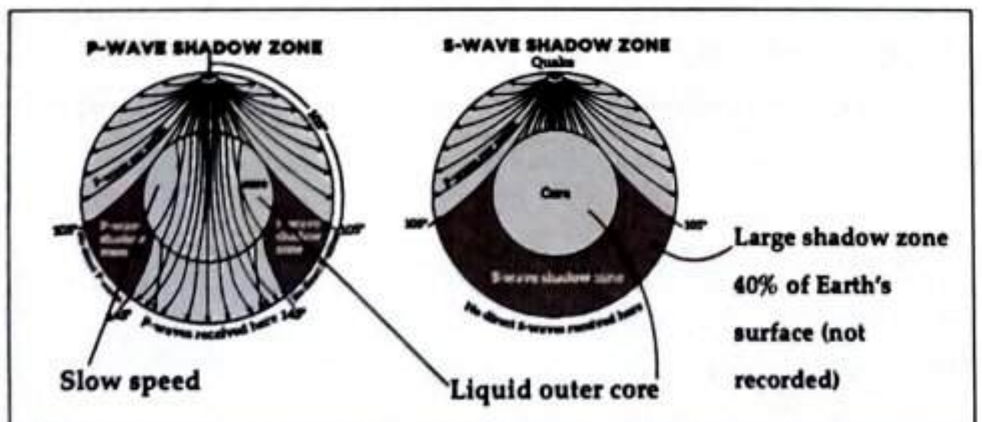

Fig 3: Shadow zone of Earthquake

- The shadow zone of an earthquake is the area of the Earth, where certain seismic waves are not detected. *The shadow zone of S-waves is larger than the shadow zone of P-waves.*

Effects of Earthquake

- Tsunami (Japanese term): These are *harbour waves*. It occurs when earthquake occur, occurs at sea floor.
- Soil liquefaction
- Landslide
- Avalanche
- Floods
- Fire

Types of Earthquake

- *Collapse earthquake:* These are small earthquake that occurs when the roof of underground *mine or caverns collapse.*
- *Explosion earthquake:* An earthquake caused by detonation of a *chemical or nuclear device.*
- *Tectonic earthquake:* An earthquake caused by movement of earth's *tectonic plates.*
- *Reservoir induced earthquake:* An occurrence of earthquakes caused by construction of *large reservoirs.* This is *human-induced earthquake.*
- *Volcanic earthquake:* An earthquake that occurs as result of *volcanic eruption.*

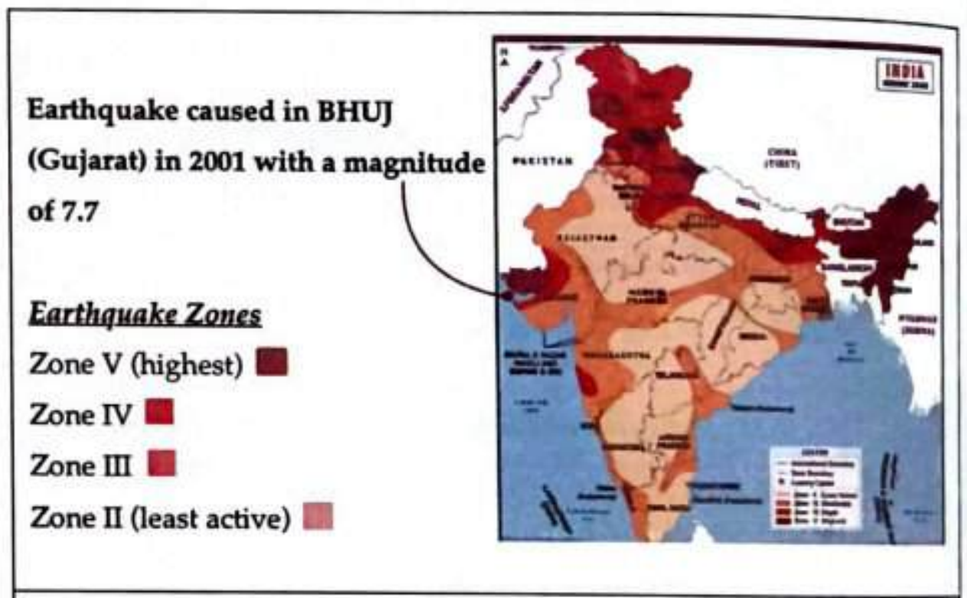

Fig 4: Earthquake zones in India

Tectonic Plates

- Lithosphere makes plates comprising crust and upper solid part of Mantle.
- There are 7 major + few minor plates.

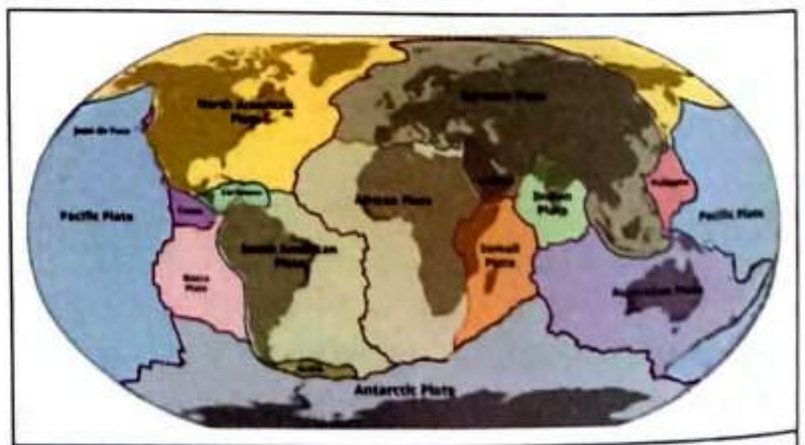

Fig 5: Major and Minor tectonic plates

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Major Tectonic Plates	Minor Tectonic Plates
Pacific plate	Cocos plate
North American plate	Nazca plate
South American plate	Caribbean plate
African plate	Indian plate
Antarctic plate	Philippine plate
Eurasian plate	
Australian plate	

Three Types of Plate Boundary

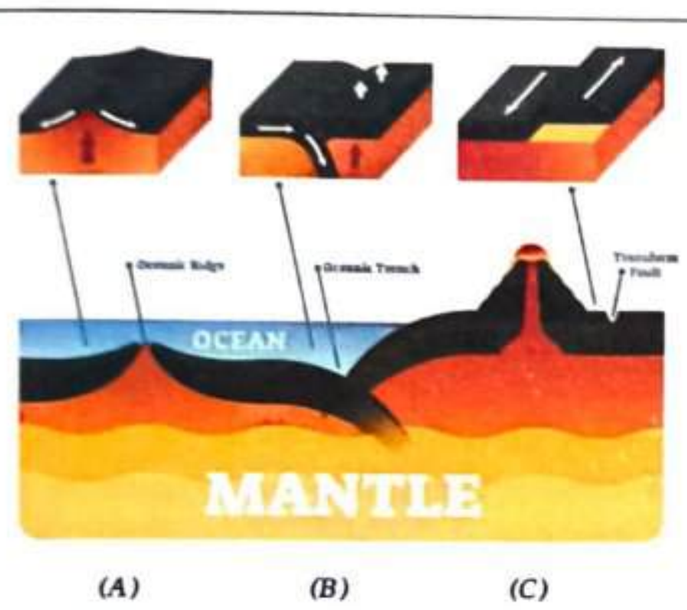
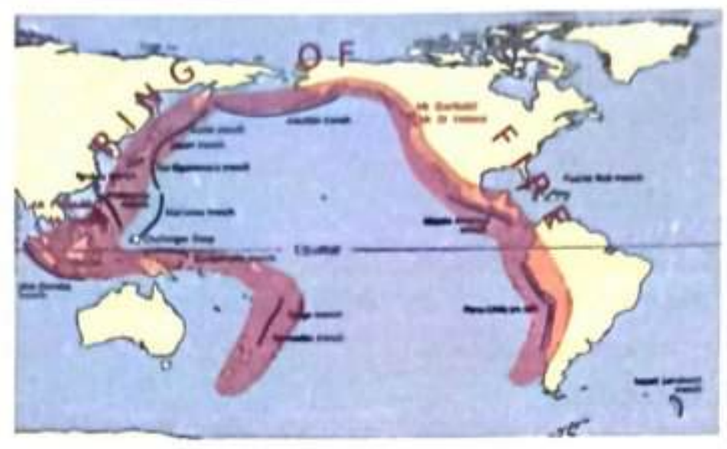


Fig 6: (A) Divergent Plate Boundary; (B) Convergent Plate Boundary; (C) Transform Plate Boundary

Divergent	Convergent	Transform
Occurs when two tectonic plates move away from each other, causes lava to explode, *leading to new crust formation*	It happens when plates collide, causing one plate to subduct beneath the other creating a subduction zone, potentially *destroying the crust*	It is a plate boundary where plates slide pass each other horizontally, *neither creating not destroying crust*

Ring of Fire

- It is a result of plate tectonics. It is a *horse-shoe-shaped* region around the *Pacific Ocean*. It is a *high earthquake and volcano prone region.*



Volcano: 75%

Earthquake: 90%

Fig 7: Ring of Fire

- Convection current that occurs in the asthenosphere is the force behind the plate movement. The heat from the Earth's interior causes currents of hot rising magma and cooler sinking magma to flow, moving the lithospheric plates along with them.

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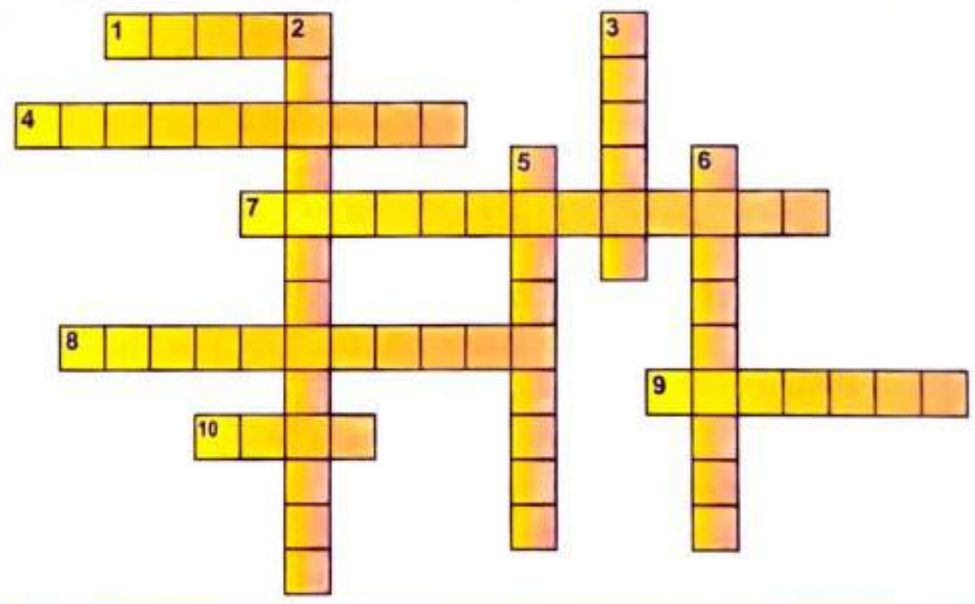
EARTH'S INTERIOR AND PLATE TECTONICS



Across

1. Minor tectonic plate.
4. Process that drives plate tectonics.
7. Study of Earth's landforms.
8. Crust + upper mantle.
9. Seaquake-triggered wave.
10. Boundary between crust and mantle.

Down

2. Weak, ductile mantle layer.
3. Father of Geology.
5. Surface point above earthquake focus.
6. 7th most abundant crust element.

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FORMATION OF ROCKS

• Petrology: The study of rocks is called Petrology.

Age of rocks is calculated using Carbon Dating.

Igneous Rocks

• Igneous rocks are formed through the cooling and solidification of molten rock, known as *magma or lava.*

Two Types of Igneous Rocks

1. ***Intrusive Igneous Rocks/Plutonic Rocks***
   • When the magma cools and solidify slowly within the Earth's crust, it forms intrusive igneous rocks.
   E.g. Granite, Gabbro, etc.
2. ***Extrusive Igneous Rocks***
   • When the magma erupts on the Earth's surface as lava, it cools and solidifies quickly. This rapid cooling results in the formation of small crystals or glassy texture.
   E.g. Basalt, Pumice (it floats in water), etc.

• ***Granite: It is found in Continental crust.***
• ***Basalt: It is found in Oceanic crust.***

Plutonic Bodies

• Plutonic bodies, also known as plutons, are *large bodies of intrusive igneous rock* that form beneath the Earth's surface.

Types of Plutonic Bodies

Batholiths

• A batholith is a large *mass of igneous rock* that forms deep within the Earth's crust and is exposed at the surface through erosion and uplift.

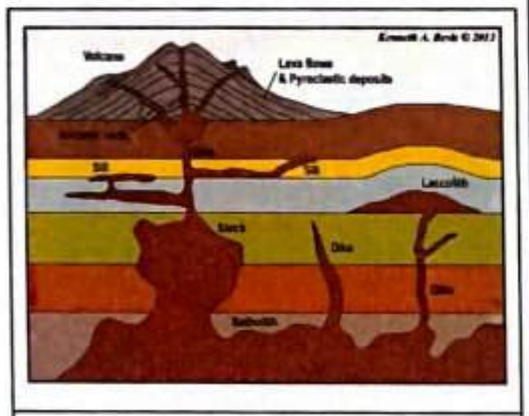

Fig 1: Plutonic Bodies

Dykes

• Dykes are vertical or *steeply inclined sheets of magma* that cut across the layers of surrounding rock.

Sills

• Sills are horizontal sheets of magma that intrude between layers of pre-existing rock.

Phacolith

• A phacolith is a *lens-shaped igneous rock pluton* that forms in folded sedimentary rock found at *Anticlines* and *Synclines.*

Laccoliths

• *Dome-shaped intrusions* with a flat base that push overlying layers upward.
• It is connected by a *pipe-like structure.*

Lapoliths

• These are *saucer-shaped intrusions* with concave top and bottom.

SEDIMENTARY ROCKS

• Sedimentary rocks are a type of rock that forms from the *accumulation and consolidation of sediments* over time.
• *Lithification* occurs, it is a process by which loose sediments are transformed into solid sedimentary rock. This occurs through a combination of *compaction and cementation* over long periods of time.
• They exist in layers/strata.
• *Fossils are found in sedimentary rocks.*

Types of Sedimentary Rocks

1. ***Mechanically/Clastically formed:*** Sandstone, limestone, conglomerate, shale, loess, etc.
2. ***Organically formed:*** Chalk, limestone, coal, geyserite, etc.
3. ***Chemically formed:*** Limestone, halite, chert, etc.

METAMORPHIC ROCK

• Metamorphic rocks are rocks that form when existing rocks (igneous, sedimentary, or even other metamorphic rocks) are subjected to *intense heat, pressure, or volume change,* causing them to undergo physical and chemical changes. This process is also called *Metamorphism.*
• These rocks are formed by recrystallisation and reorganisation of materials within the original rocks.

Types of Metamorphic Rocks

1. ***Thermal Metamorphism***
   • Metamorphic rocks formed due to *sudden temperature change.*
2. ***Dynamic Metamorphism***
   • Metamorphic rocks formed *without any chemical change.*
   • These are generally formed as a result of *high pressure.*

Types of Thermal Metamorphism

1. ***Contact Metamorphism***
   • It occurs when rocks are altered by intense heat due to their proximity to magma or lava.
2. ***Regional Metamorphism***
   • It occurs when rocks are subjected to *high pressure and temperature.*

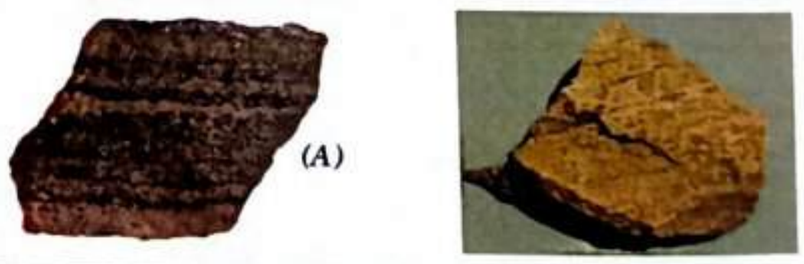

Fig 2: (A) Alterante light and dark bands called Banding ; (B) Lines formed called Lineation

• *Quartz is not a rock, it is a mineral.*

• ***Taj Mahal is made of: Metamorphic rock.***
• ***Red Fort is made of: Red sandstone (sedimentary rock).***

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Granite (Igneous) —Metamorphism→ *Gneiss*

Shale (Sedimentary) —Metamorphism→ *Slate, Schist*

Sandstone (Sedimentary) —Metamorphism→ *Quartzite*

Limestone (Sedimentary) —Metamorphism→ *Marble*

Basalt/Gabbro (Igneous) —Metamorphism→ *Amphibolite*

Clay (Sedimentary) —Metamorphism→ *Slate*

Types of Rock

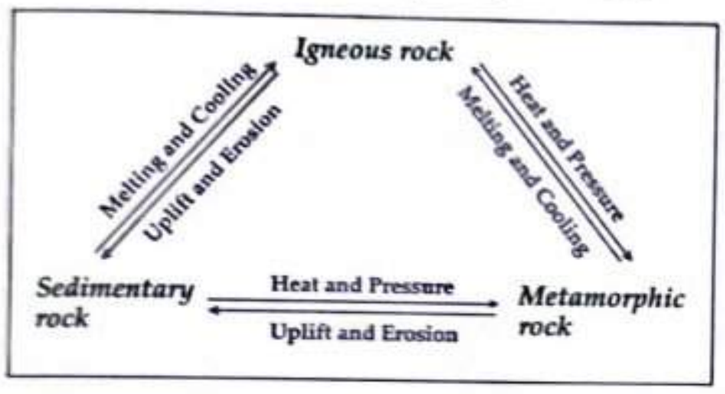
- *Soft rock:* Talc
- *Hard rock:* Diamond
- *Feldspar* consist of *50%* of the *Earth's crust* and is widely used in glass and ceramic industries.

Limestone is one of the key minerals used in cement making.

Mica is used in electrical industry, constitutes 4% of Earth's crust.

Rock Cycle

- It is a geological process that describes how the three main types of rock igneous, metamorphic, and sedimentary change over time.



Acidic vs Basic Rocks

Acidic Rocks	*Basic Rocks*
They are high in silica (mostly feldspar and quartz minerals) upto 80%	They are poor in silica (mostly feldspar and quartz minerals) about 40%
They are light in color	They are dark in color
Due to high silica content, acidic magma cools faster	Due to low silica content, basic magma cools slowly
E.g. Granite, Quartz, Feldspar	*E.g. Basalt, Gabbro, Dolerite*

VOLCANO

- A volcano is a geological feature formed by the *eruption of molten rock (magma)* from beneath the Earth's crust.

Types of Volcano

1. ***Cinder cone:*** They are *small, steep-sided* volcanoes formed by moderately explosive eruptions.
2. ***Flood Basalt Province:*** These volcanoes outpour, highly fluid lava that flows for long distances. ***E.g. Deccan Traps (in West Cenral region).***
3. ***Shield:*** They are primarily formed by eruption of *basaltic lava* which is *non-viscous fluid*. ***E.g. Kilauea Volcano in Hawaii, USA.***
4. ***Composite:*** They are generally *cooler* and *viscous* in nature. ***E.g. Mt. Chimborazo and Mt. Fuzi (also known as Stratovolacano).***
5. ***Caldera:*** It is the *most explosive* types of volcano, it collapses on itself.

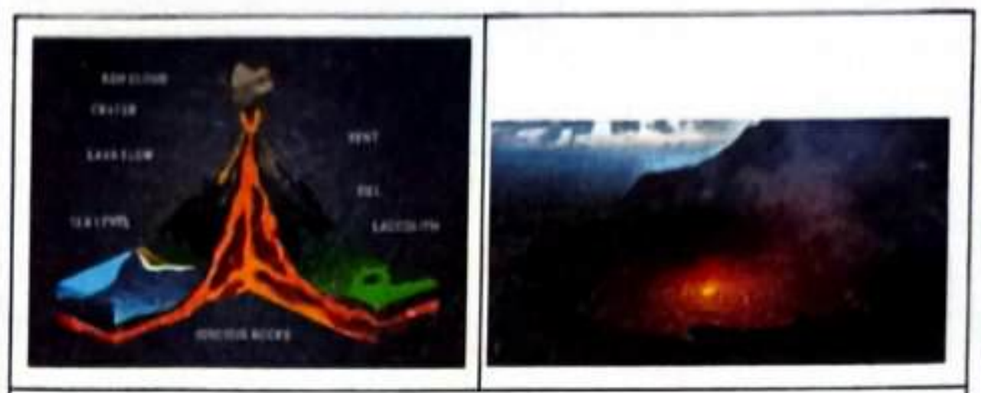


Fig 3: Volcanic Crater

Geyser

- A geyser is a *hot spring that intermittently erupts steam* and hot water due to geothermal activity beneath the Earth's surface.
- Geysers are commonly found in areas of volcanic activity because the heat from magma or hot rocks below the Earth's surface heats the groundwater, leading to the formation of geysers.

- ***Highest volcano: Ojas del Salado*** (it is located between *Chile* and *Argentina* in *Andes* mountain range).
- ***Lighthouse of Mediterranean: Mount Stromboli***

CONTINENTS AND OCEAN

- *In 1912, Alfred Wegener gave Continental Drift Theory.*
- All of the modern day continents had previously been clunk together in a supercontinent called *Pangaea* and the water body is called *Panthalassa*.

Evidences

- Jig-saw fit.
- Fossil deposits (Palaentology is the study of Fossils).
- Placer deposits (gold).
- Botanical evidences.
- Rocks of same age across the oceans.

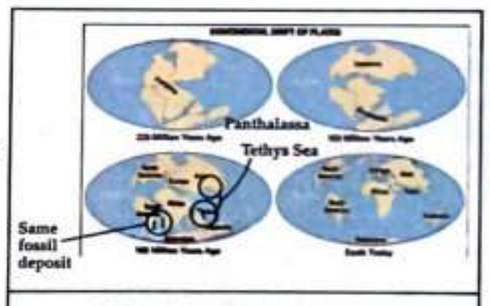


Fig 5: Continental drift

- **Reason for Continental drift**

1. *Tidal force*
2. *Polar fleeing force*

} ***As suggested by Alfred Wegener***

- Actual reason was later given by *Arthur Holmes* in *1930*.
- Continental drift occurs due to the movement of tectonic plates, which is driven by *convection cells in the Earth's mantle*.
- The heat that drives convection cells in the Earth's mantle and plate motion comes mainly from three sources:

1. ***Radioactive decay of elements.***
2. ***Residual heat from the Earth's formation about 4.6 billion years ago when gravitational energy was converted into heat.***
3. ***Latent heat released by the solidification of the Earth's core as it cools down.***

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FACTS

- *Mariana Trench* is the deepest part of the *Pacific Ocean (11 km)*.
- *Challenger Deep* is the *deepest* known point in Mariana Trench.
- Atlantic Ocean is the *busiest* ocean. *Sargasso Sea* is a unique region in the Atlantic Ocean, which is a *borderless sea (brown algae Sargassum is seen here)*.

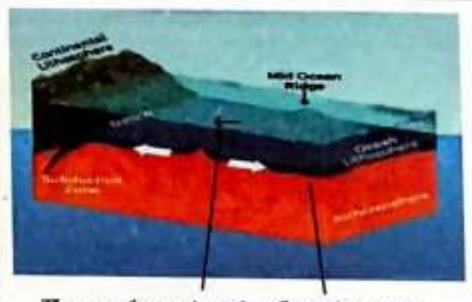
Milankovitch Theory

- It describes the collective effects of changes in Earth's movement on its climate over thousands of years.
- In *1596, Abraham Ortelius's* work, *"Thesaurus Geographicus"*, first suggested that Earth's continents were not always in their current locations.

SEAFLOOR SPREADING

- *Harry H. Hess in 1962, gave Seafloor Spreading Theory.*
- Seafloor Spreading is a process by which new oceanic crust is formed at mid-ocean, due to divergent plate boundary. The magma erupts from beneath pushing the older crossed away from the ridge in the centre.

Fig 6: Seafloor Spreading theory



- The *Mid-Atlantic Ridge* is a mid-ocean ridge located along the floor of the *Atlantic Ocean*, and *part of the longest relief feature in the world*.
- It got created due to divergent plate boundary.

Relief features are of two types:

1. ***Major Relief Features***

Four major relief features are there:

Continental Shelf → Continental Slope → Continental Rise → Abyssal plain/ Deep sea plains

1. ***Minor Relief Features***

E.g. Seamount, Guyot (flat-topped sea mount), Mid-Ocean ridge, Trench, Coral, Atoll, etc.

- *Continental Shelf is the shallowest part of the ocean, having a gradient of 1° or less.*
- *The gradient of the Continental Slope region varies between 2-5°.*

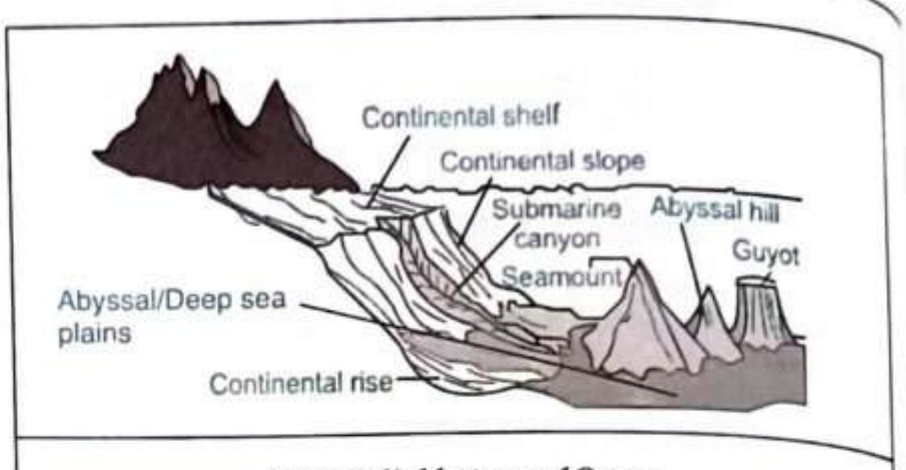


Fig 7: Relief features of Ocean

Corals

- Corals are marine organisms known as *"Rainforest of Sea"*.
- They exist in symbiotic relationship with *Zooxanthella* algae. The corals secrete $CaCO_3$ that provides protection to the algae and in return the algae make food for the corals.
- The corals exists in colony.

Favourable Conditions Required for Corals to Survive

1. Saline water (they cannot survive in fresh water).
2. Sunlight.
3. Clear water.
4. Temperature (they require moderate temperature: 30°-35°C).

Great Barrier Reef in Australia is the largest barrier reef (colony of corals) in the world.

Coral Bleaching

- When water is *too warm, corals will expel the algae* (Zooxanthella) living in their tissues, causing the coral to turn completely white. *Climate change is a major key factor in this change.*

FACTS

- Petroleum is extracted from *Continental Shelf* (start of ocean basin and is very narrow.
- *Siberian Shelf in the Arctic Ocean is the widest Continental Shelf (1500 km wide).*
- *West Coast of South America* is the *narrowest* Continental Shelf.

For an interactive recap of this topic, see the crossword on Page Number 17.

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GEOMORPHOLOGY PROCESS

• Geomorphy is a scientific discipline, concerned with description and classification of earth's topographic features. All geomorphologic process occur due to two types of forces: *Endogenic Forces (internal) and Exogenic Forces (external).*

• ***The study of distribution and movement of water, both in and below the earth surface as well as the impact of human activity on water availability and condition is known as Hydrology.***

Endogenic Processes

• These are geological processes that occur due to endogenic forces. All relief features on earth are subject to endogenic and exogenic forces.

E.g.

• ***Himalayas:*** They are continuously *increasing (endogenic forces are significantly greater than exogenic forces).*

• ***Aravali:*** They are continuously *decreasing* (exogenic forces are significantly greater than endogenic forces).

• Endogenic forces get their energy from within the earth (recall Convection Current Theory).

Effects of Endogenic Forces

1. **Diastrophism:** It is a process of *deformation and movement* of *Earth's crust.* These movements are responsible for shaping large-scale landforms over geological time periods.

Types of Diastrophism

a) Orogenic Process: It is a process through which mountains are built.

b) Epeirogenic Process: It involves upliftment or warping of large parts of the Earth's crust.

c) Earthquake: It involves shaking of Earth.

d) Plate Tectonics: It explains how major landforms are created as a result of Earth's subterranean movements.

2. **Volcanoes:** They are commonly described as openings/vents where lava or magma erupts.

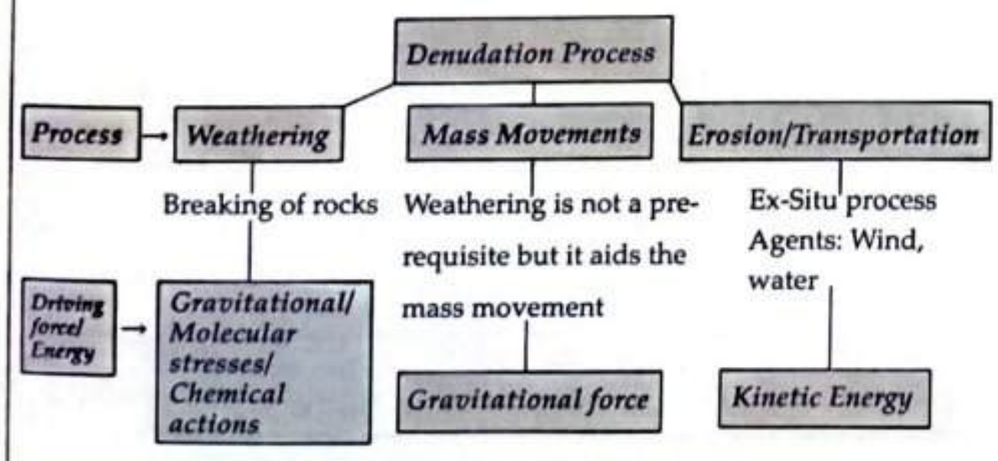
Exogenic Processes

• These are geological processes that occur on the Earth's surface due to external forces (exogenic forces).

• *Denudation* refers to long-term processes that cause the wearing away of earth's surface, leading to a reduction in elevation and relief of landforms and landscapes.

• ***Exogenic agents are: Wind, glaciers, water (they are also termed as Denudation)***

• *Source of energy* for exogenic forces is the *Sun*.



Weathering

• Weathering is the process of rocks and minerals breaking down or dissolving on the Earth's surface.

Types of Weathering

1. ***Physical Weathering:*** This involves the breakdown of rocks and soils *through direct contact* with atmospheric conditions, such as *heat, water, ice, and pressure. E.g. Unloading and Expansion, Frost Wedging, Salt Crystallisation.*
2. ***Chemical Weathering:*** This involves the decomposition of rocks and soils *through chemical reactions,* such as *oxidation and reduction, carbonation, solution,* and *hydration.*
3. ***Biological Weathering:*** It is also known as *organic weathering,* is the breakdown of rocks and soils through the activities of living organisms such as earthworms, rodents,etc.

Weathering is an in-situ process.

Effects of Weathering

1. ***Exfoliation:*** It is a process when *large, curved plates, or slabs of rocks are stripped away* from the outer surface of a rock mass.
2. ***Mass Movements:*** It is the downslope movement of soil, rock, and other debris *under the influence of gravity*. Gravity is not a prerequisite.

   Types:
   1. ***Rapid*** Landslides (due to deforestation), avalanche, earthflow, mudflow (leads to soil liquefaction).
   2. ***Slow:*** Creep (slow down slope movement of particles), solifluction (slow progressive movement of mass down a slope seen mainly in temperate regions).

• **Erosion:** It involves transportation of rock debris through geomorphic agents like running water, groundwater, glaciers, winds and waves.

LANDFORMS

• Landforms are natural or human-made features on the Earth's surface. They include hills, mountains, plains, and more. The landforms are formed due to various agents such as river, glaciers, wind, sea waves, groundwater, etc.

Types of Landforms

1. **Erosional Landforms:** They are created by the process of erosion.
2. **Depositional Landforms:** These are created when sediments are deposited in areas of reduced flow energy.

Landforms Created by River

• A river goes through three stages: *Youthful, mature, and old*. The course of a river includes the *upper stage, the middle stage, and the lower stage*.

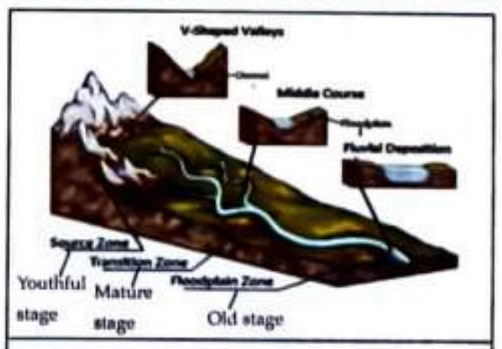


Fig 1: Landforms created by River

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Youthful Stage	Mature Stage	Old Stage
River flows in *speed*. *E.g. V-shaped valley, Gorges, Canyon, Waterfalls, Entrenched meander*	The river flows through *gradient to flat plain*. *E.g. Meanders*	The *final stage* of river's journey *E.g. Ox-bow lakes, Delta, Flood plains*

• **Erosional Landforms:** Potholes (kettle-shaped depressions in the rocky beds of river valleys), Waterfalls, Plunge pools, V-shaped valley, Gorges, Canyons, River terraces, Entrenched meanders.

• **Depositional Landforms:** Flood plains, *ox-bow lakes (U-shaped lake that forms when a river's meander is cut off from the main river)*, Meanders, Alluvial fans, Levees, Braided channel, Alluvial fan.

Kabartal lake (Bihar) is Asia's largest ox-bow lake.

Landforms Created by Glaciers

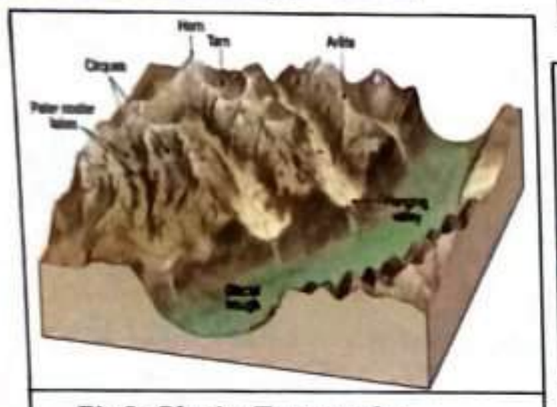

Fig 3: Glacier Topography

Fig 2: Ox-bow Lake Formation

• **Erosional Landforms:** Cirque (they are created in heads of glacial valleys), Ridges/Arete, Horn, Hanging valleys, Glacial valleys.

• **Depositional Landforms:** Moraines, Eskers, Drumlins (oval-shaped), Outwash plains.

Fjord: Sea water entering into the glacial valley.
Tarn lakes: Created when water fills up in cirque.

Landforms Created by Groundwater *(also known as Karst Topography)*

• They are found in rocks that are permeable thinly bedded and highly jointed and cracked like limestone and dolomite, which are rich in *calcium carbonate*.

• **Erosional Landforms:** Sink holes, Dolines, Lapies, Uvalas, Limestone pavements.

• **Depositional Landforms:** Stalactite, Pillars, Stalagmite.

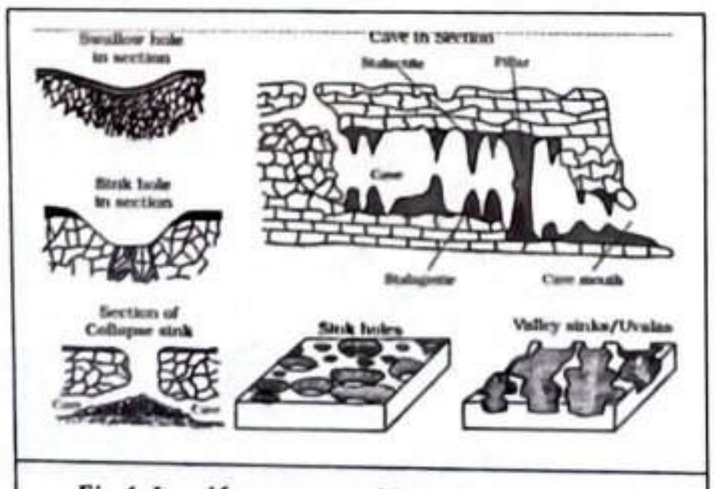

Fig 4: Landforms created by Groundwater

• ***Stalactite:*** *Hanging from the ceiling*

• ***Stalagmite:*** *Rising from the ground*

• ***Aquifer:*** Groundwater stored between *layers of hard rock* below the water table.

Landforms Created by Sea Waves

• **Erosional Landforms:** Cliff, Caves, Stack, Arch.

• **Depositional Landforms:** Beaches, Dunes, Bars, Barriers, Spits, Tombolo.

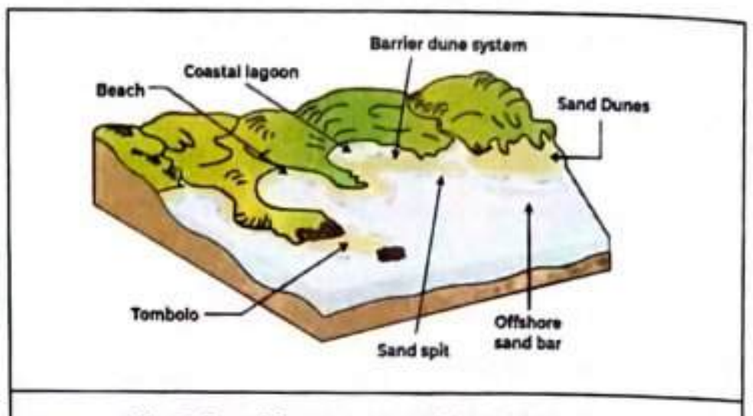

Fig 5: Landforms created by Sea Waves

Landforms Created by Wind (also known as Aeolian Landforms)

• **Erosional Landforms:** Pediplain, Playas, Mushroom rock, Pedestal rocks.

• **Depositional Landforms:** Sand dunes → ***Types:*** *Barchan and Seif*.

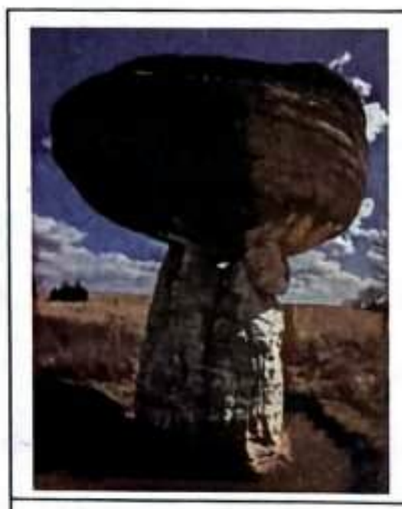

Fig 6: Mushroom Rock

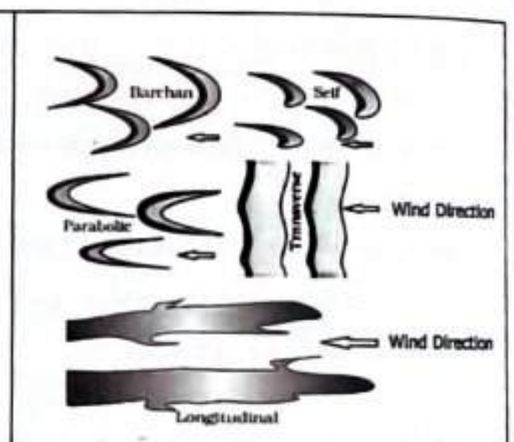

Fig 7: Action of Wind on Barchan and Seif Dunes

• ***Oasis:*** Small patches of fertile land with water sources.

Loess

• When the grains of sand are very fine and light, the wind can carry it over a very long distance, such sand gets deposited in large areas and is called as loess.

• Barchans: They are Crecent shaped dunes, whose points or wings are directed away from wind direction. They are found in Jaisalmer (Rajasthan).
• Seif: It is similar to a Barchan with only one wing.

For an interactive recap of this topic, see the crossword on Page Number 17.

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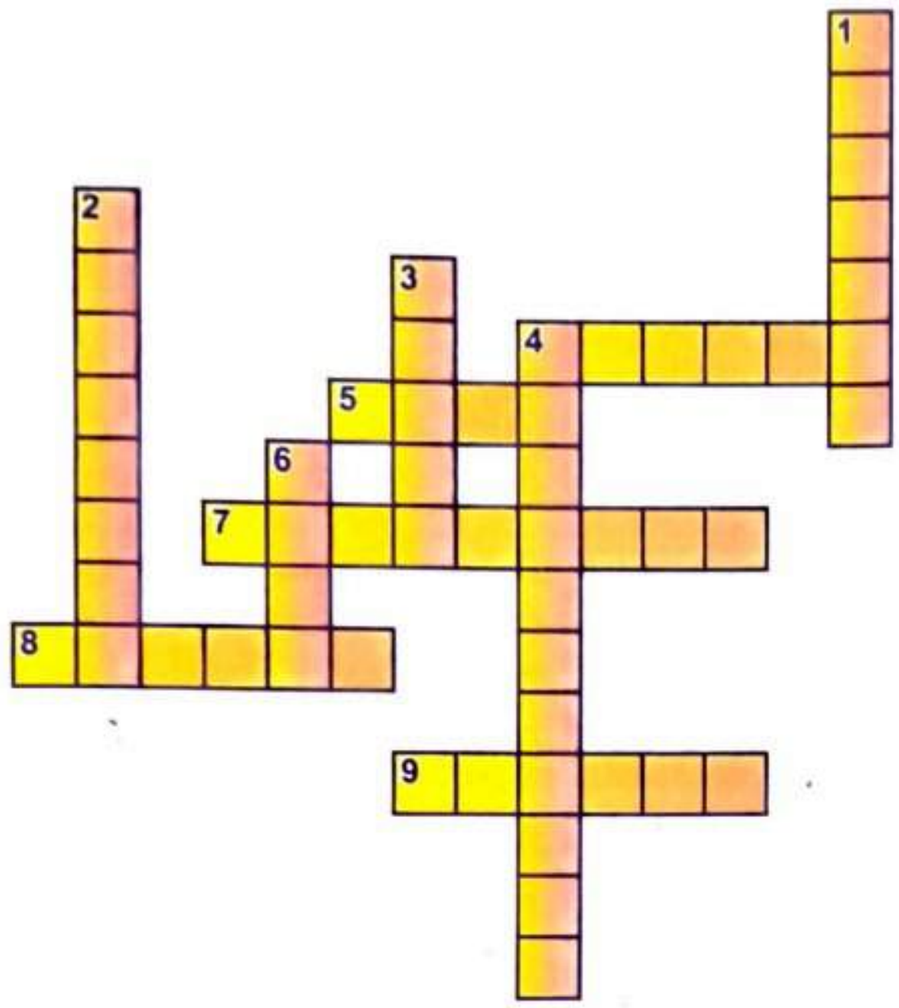
PARMAR'S CROSSWORD

ROCKS, CONTINENTS AND OCEANS



Across

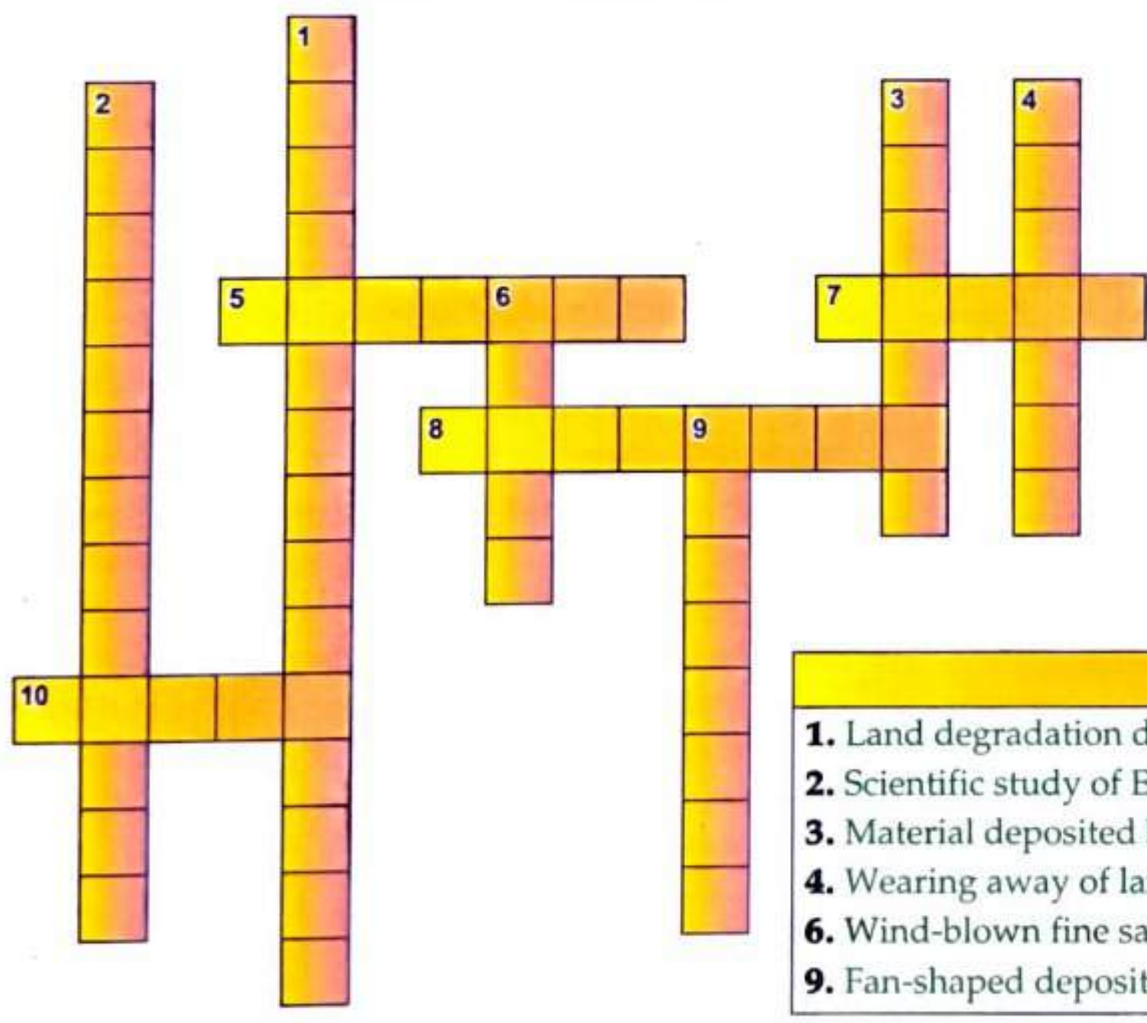
4. Rock that floats on water.
5. Molten rock from volcanoes.
7. Biological sedimentary rock.
8. Depression at top of volcano.
9. Mineral, not a rock.

Down

1. Underground water storage in rocks.
2. Most abundant rock-forming mineral.
3. Formed by metamorphism of shale.
4. Super ocean around Pangaea.
6. Periodic sea level rise and fall.

PARMAR'S CROSSWORD

GEOMORPHOLOGY AND LANDFORMS



Across

5. Oval-shaped hill sculpted by glacial flow
7. Plains formed due to weathering of soluble rocks
8. Largest dun formation in India
10. Fine-grained bed of ephemeral desert lake

Down

1. Land degradation due to human activity and climate change
2. Scientific study of Earth's topographic features
3. Material deposited by glaciers
4. Wearing away of landscape by water, wind, and ice
6. Wind-blown fine sand deposits
9. Fan-shaped deposits by streams from higher slopes

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ATMOSPHERE

• The atmosphere is a mixture of gases surrounding Earth, held in place by Earth's gravity.

Evolution of the Atmosphere

1. ***Loss of Primordial Atmosphere:*** Initially composed of hydrogen and helium, however this atmosphere was lost due to excessive solar flares.
2. ***Volcanism:*** The hot interior of Earth release gases through volcanic eruptions to form a new atmosphere (Degassing).
3. ***Biological Modification:*** Plants and living organisms played a key role in further transforming the atmosphere through Photosynthesis.

DIFFERENT LAYERS OF ATMOSPHERE

Troposphere → (Tropos: Region of mixing)

• Troposphere is the *lowest layer* of Earth's atmosphere.

• All weather phenomena *(rain, stroms, clouds, etc.)* occur in this layer.

Height variation

• ***At poles:*** 8 km
• ***At equator:*** 18 km
} ***Average:*** 13 km

Composition of Gases

• ***Nitrogen (N_2): 78%***
• ***Oxygen (O_2): 21%***
• ***Argon (Ar): 0.9%***
• ***Carbon dioxide (CO_2): 0.036%***

• A tropopause is a line that separates Troposphere from Stratosphere.

• As we move upwards in the atmosphere, the density of the air decreases, and that is why the densest air is found in Troposphere.

Fig 1: Layers of Atmosphere

Temperature Behavior

• *Lapse rate* is the rate at which temperature decreases with altitude in the atmosphere.

Standard Lapse Rate

• 165 meters → 1°C decrease
• 1 km → 6.5°C decrease

• ***Reason for temperature drop:*** The atmosphere does not heat up directly from solar radiation (insolation). Instead, the Earth's surface absorbs solar energy and then emits it as long-wave infrared radiation (Terrestrial Radiation), which warms the lower atmosphere. As the altitude increases, less terrestrial radiation is available, leading to drop in temperature.

Temperature at Tropopause

• ***At Equator: -80°C***
• ***At Poles: -45°C***

Effects of Insolation

• ***At Equator:*** Insolation is less here, *due to presence of clouds.*

• ***At Tropics:*** Insolation is maximum here *due to minimal cloud covering.*

E.g. Desert

Factors influencing Insolation include:

1. ***Transparency of the atmosphere***
2. ***Length of the day***
3. ***Earth's tilt and Rotation***
4. ***Latitude***
5. ***Altitude***
6. ***Position of Earth***
7. ***Surface reflection (Albedo)***

Key Greenhouse Gases

• Greenhouse gases keeps earth warm by trapping heat in the atmosphere.

• ***Key greenhouse gases:*** *Water vapor, CO_2, CH_4(Methane), N_2O (Nitrous Oxide, O_3 (Ozone), SO_2 (Sulfur Dioxide)*

> **Note**
> • NO_2 is not a Greenhouse gas.

Heat Transfer Mechanism

• The transfer of heat in the atmosphere occurs through three primary mechanisms: *Conduction, Convection, and Advection.*

• ***Conduction:*** The process by which heat is transferred directly from one molecule to another without actual movement of air.

• ***Convection:*** The vertical transfer of heat through the movement of air masses.

• ***Advection:*** The horizontal transfer of heat due to the movement of air.

E.g. Loo is a result of advection.

Albedo

• Albedo refers to the proportion of incident light or radiation that is reflected by a surface.

• *Highest albedo* is seen in *ice caps* or *glaciers.*

Albedo Values of Different Surfaces and Clouds

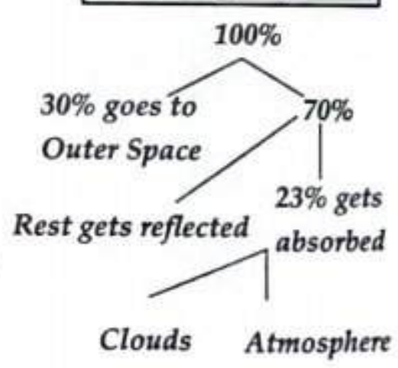
Earth surface	(%)	Clouds	(%)
Oceans, Lakes	8	Shallow broken clouds Cu, Ci, Cs, Cc	30 35
Land Surfaces	14-18	St	40
Sand, Desert	27	Thick clouds (Cs)	74
Ice and Snow		Ac, As, Sc	68
Sea ice	35	Cu	75
Old snow	59	Ns	85
Fresh snow	80	Cb	90

Table 1: Albedo Values

Heat Budget

• A heat budget is the balance between the heat that the Earth absorbs from the sun and the heat that it radiates back into space.

Heat Budget of Earth



Temperature Inversion

• A phenomenon where temperature increases with height instead of decreasing.

Favourable Conditions for Temperature Inversion

1. ***Long winter night:*** During long nights, the Earth's surface loses heat rapidly through radiation, cooling the air near the surface.
2. ***Still air:*** Calm and stable air prevents the mixing of cold surface air with warmer air above, maintaining the inversion layer.
3. ***Clear cloudless sky:*** Clear skies enhance heat loss from the surface through terrestrial radiation, promoting rapid cooling and inversion formation.

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Stratosphere *(upto 50 km)*

- This layer of atmosphere contains the *Ozone layer* (30-35 km above Earth's surface), which protects from harmful *UV rays*.
- While moving upwards, *temperature increases with altitude*.
- Jet planes fly in this layer.
- *Stratopause* divides Stratosphere and Mesosphere.

> - *Ozone Day* is celebrated on *16 September* to commemorate the adoption of the *Montreal Protocol in 1987* in *Montreal, Canada*. This international agreement aimed to phase out *Chlorofluorocarbons (CFCs), which deplete the ozone layer and contribute to the formation of the ozone hole.*
> - Ozone layer thickness is measured by *Dobson unit*.
> - *Kigali Amendment* was made to *phase out HFCs (Hydrofluorocarbons).*

Mesosphere *(upto 85 km)*

- It is the *coldest* layer of atmosphere.
- *Meteorites burn up and end in the mesosphere layer.*
- While moving upwards, *temperature decreases with altitude*.

Thermosphere *(between 80-400 km)*

- It is the *hottest* layer of atmosphere.
- While moving upwards, *temperature increases with altitude*.
- It contains electrically charged particles known as *ions*, and hence, it is also known as the *ionosphere*.
- Radio waves transmitted from the earth are reflected back to the earth by this layer.

Exosphere

- It is the 5th and last layer of atmosphere. Mostly composed of *Hydrogen* and *Helium*.

Karman Line

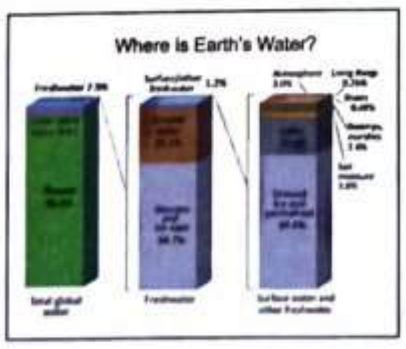
- It is an imaginary boundary located *100 kilometers (about 62 miles)* above sea level that *separates Earth's atmosphere from outer space*.

Isotherm Line

- These are lines or points on map/chart of the Earth's surface connecting points having same temperature at a given time.

WATER ON EARTH

- *97.2%* of Earth's water is *saline*; only *2.8%* is *freshwater*.
- ***Out of 2.8% freshwater:*** *Ice caps/glaciers (2%), Groundwater (0.68%), Lakes (0.4%), Atmosphere, River.*
- ***As a whole (Freshwater):*** *Ice caps/glaciers (68.7%), groundwater (30.1%).*



> - ***71% of Earth's surface covered with water***
> - ***29% of Earth's surface is covered with land***

Humidity

- Humidity is the concentration of water vapour present in the air.

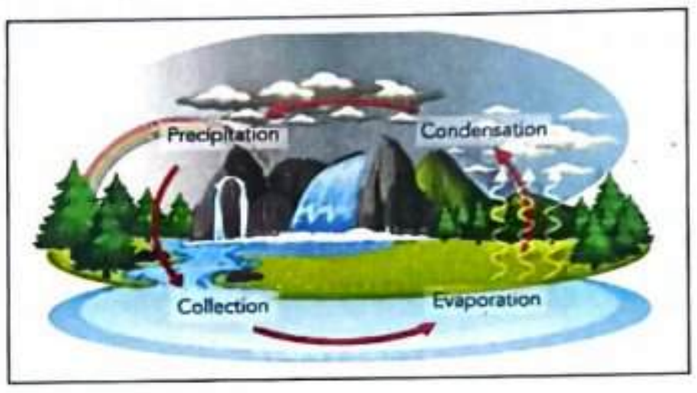
Types

1. ***Absolute Humidity:*** It is the *total mass of water vapor present in a unit volume* of air at a given temperature.
2. ***Relative Humidity:*** Actual moisture percentage compared to maximum capacity.

> ***Absolute humidity is higher in warm air compared to cold air. This is because warm air can hold more water vapor due to its higher energy level.***

Water Cycle

- Water cycle is the continuous *movement of water between the Earth's atmosphere and surface.*



Evaporation

- Evaporation is a process in the water cycle that *changes liquid water into water vapour.*

Precipitation

- Precipitation is any *liquid or frozen water* that forms in the atmosphere and falls back to the earth *in the form of rain, snow or hail.*

Types of Precipitation

1. ***Rain:*** Liquid water droplet that fall when the air temperature is above freezing point.
2. ***Snow:*** Frozen water crystals that are formed when temperature is below freezing point.
3. ***Sleet:*** Small pallets of ice that forms when raindrops freeze before reaching the surface.
4. ***Hail:*** It is a type of precipitation that falls to the ground in the form of ice balls or lumps.

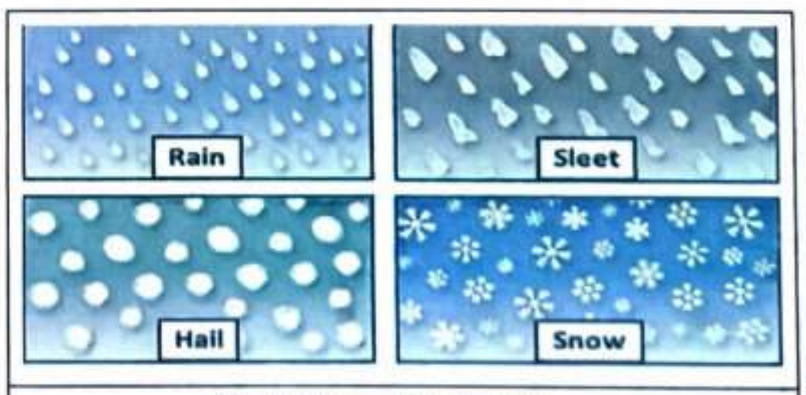


Fig 2: Types of Precipitation

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Condensation

• It is the process where water vapour (gas) becomes water (liquid).

Different forms:

• **Dew:** It is the moisture that form as a result of condensation.

• **Fog:** It is the thick clouds that forms close to the ground and reduce visibility. *In fog the size of water droplets tend to be larger compared to those in mist.*

• **Mist:** Mist is a phenomenon caused by small droplets of water suspended in the cold air, usually by condensation. Mist contains more moisture than fog.

In fog and mist, water vapor condenses around *hygroscopic particles* (aerosols like dust and smoke particles) instead of requiring a solid surface

• **Frost:** It forms when water vapor (gas) directly turns into solid ice crystals without becoming liquid first.

• **Clouds**

> • ***Smog: Smog is a type of air pollution that results from the combination of smoke and fog.***

Dew Point

• The dew point is the temperature at which air becomes fully saturated with moisture, *causing water vapor to condense into liquid droplets.*

• In winter air cools down due to which *dew point reduces,* water vapour condenses into water.

CLOUDS

• Clouds are visible masses of tiny water droplets or ice crystals suspended in the Earth's atmosphere.

> • ***Isoneph: Line drawn on map, connecting the points containing same amount of clouds.***

Different Types of Clouds

Clouds	*Features*	*Height*
Nimbus	Rain bearing; Opaque; Grey	Low-level
Stratus	Layered clouds	Low-level
Cumulus	Wool/Cauliflower shaped; flat base	4000-7000 m Middle level
Cirrus	Feather shape clouds, do not cause rain	8000-12000 m High altitude
Cumulonimbus	Produce severe weather that contribute to cyclones	Extensive vertical development

Fig 3: Types of Clouds

Rainfall

• Rainfall is the amount of water that falls from the atmosphere as precipitation over a specific period and area.

Types of Rainfall

• ***Conventional Rainfall*** It occurs when the surface of *earth is heated up by the Sun.*

• ***Orographic Rainfall*** Precipitation that occurs when moist air is forced to rise *over a mountain range.*

Windward and Leeward Side of Orographic Rainfall

1. ***Windward Side (wet side):*** This side of the mountain facing the wind (mostly affected by Anabatic wind) receives the heavy rainfall as the air rises and cools there. ***E.g. Western Ghats.***
2. ***Leeward Side (dry side):*** This side of the mountain faces away from the wind (mostly affected by Katabatic wind) receives less rainfall because the air loses its moisture on the windward side before descending dry. It is also called a *rain-shadow region.* ***E.g. Leeward side of Western Ghats.***

• ***Frontal/Cyclonic Rainfall:*** It is a type of precipitation that occurs *when warm, moist air meets cold, dry air mass.*

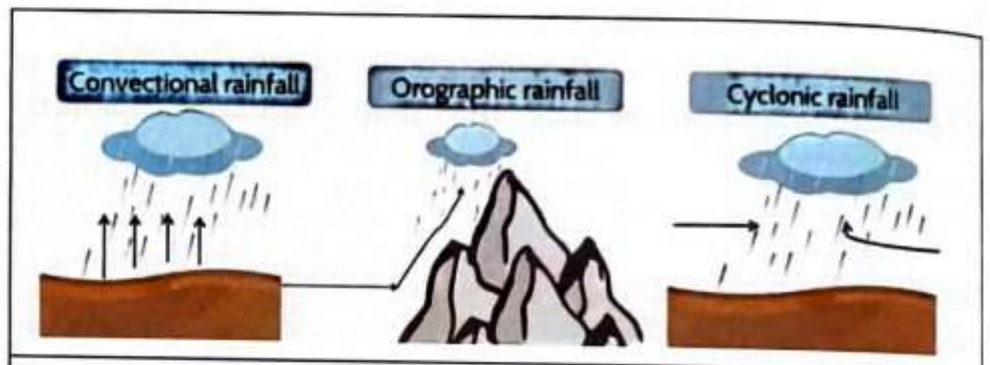

Fig 4: Types of Rainfall

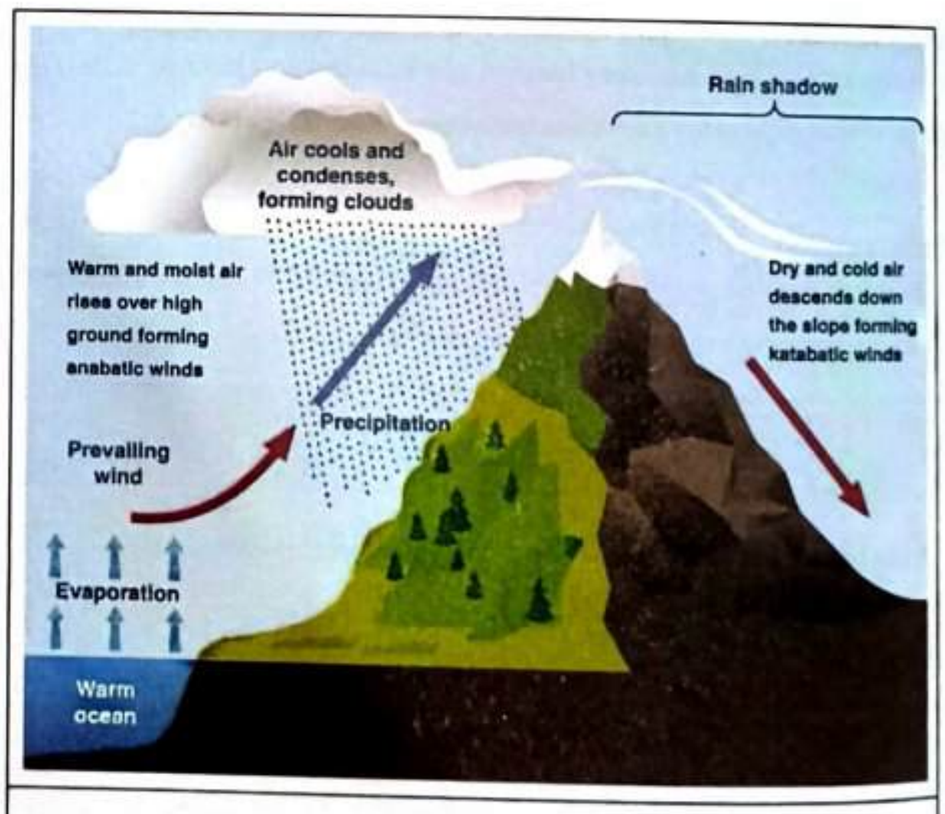

Fig 5: Windward and Leeward Side of Mountain

For an interactive recap of this topic, see the crossword on Page Number 31.

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WIND AND PRESSURE DIFFERENCE

• Wind blows because of differences in air pressure in the Earth's atmosphere. Air moves from *high pressure to low pressure*. The sun heats the Earth unevenly, so some places get warmer than others. At the Equator, there is generally low air pressure due to the rising of warm and light air; while at the Poles, there is high air pressure because of the sinking of cold and dense air.

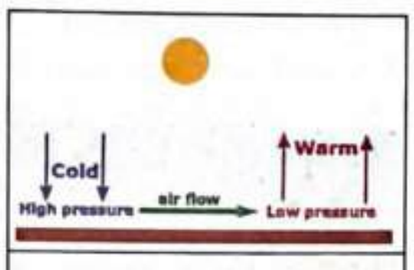

Fig 1: Movement of Air

Types of Wind

1. ***Trade Winds:*** Trade winds blow from *subtropical high-pressure areas* to the *equatorial low-pressure belt*. They are permanent winds.
   • *They are of two types: Westerlies and Easterlies*

> *A wind is named based on the direction from which it originates.*

2. ***Local Winds:*** Local winds are winds that blow over short distances and are typically caused by *local geographic features and temperature differences* in specific areas.

Easterlies and Westerlies

Easterlies

• They are steady winds that blow from *east to west* near the Earth's *equator*.

Location

• They are found between approximately *30° latitude* (north and south) and the equator.

• They blow from northeast in the Northern Hemisphere and southeast in the Southern Hemisphere towards the equator.

Cause

• They are created due to *Coriolis effect (rotation of the Earth)* and the unequal heating of the Earth's surface.

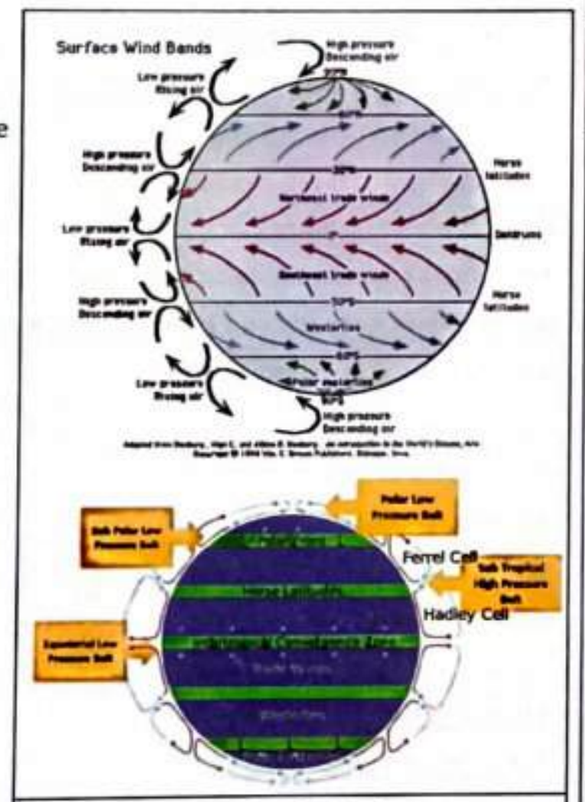

Fig 2: Trade Winds

> *When the barometric readings suddenly decrease, it indicates that the weather will be very stormy.*

Westerlies

• Westerlies are winds that blow from *west to east* in the mid-latitudes.

Location

• They blow between *30° and 60° latitude* (in both hemispheres).

• They come from the *southwest in the Northern Hemisphere* and the *northwest in the Southern Hemisphere*.

Cause

• The *Coriolis effect* causes these winds to deflect toward the east.

Roaring Forties, Furious Fifties, Shrieking Sixties

• These are names given to strong Westerly winds in Southern Hemisphere that blow over the *40°S, 50°S, and 60°S* latitudes. Reason for their high speed is less landmass in Southern Hemisphere.

Aila! Aaj pata chal gaya ki - "Kyu Chalti Hai Pawan".

Coriolis Force

• Coriolis force is an apparent force that is caused due to *rotation of Earth.*

• The Coriolis force is responsible for deflecting winds towards the *right in the Northern Hemisphere* and towards the *left in the Southern Hemisphere.*

• Coriolis force is *maximum at the Poles* and *zero at the Equator.*

• The Coriolis force is directly *dependent on the wind speed.* The faster the wind moves, the stronger the Coriolis force becomes and greater is the wind deflection.

GEOSTROPHIC WIND

• Geostrophic wind is the wind that blows when two forces, the pressure difference and Earth's rotation, balance each other out.

• The wind *moves parallel to isobars* (isobars are lines on a weather map that connect areas with the same air pressure) or *perpendicular to Pressure Gradient Force,* without changing direction, usually higher up in the atmosphere where there's less friction.

ITCZ, Doldrums, and Horse Latitude

ITCZ

• ***Full form:*** *Intertropical Convergence Zone*

• The ITCZ forms where the *northeast trade winds from the Northern Hemisphere* meet the *southeast trade winds from the Southern Hemisphere.*

• It is typically found between *the Tropic of Cancer and Tropic of Capricorn.* In the month of July it is located at 20°N-25°N.

> • ***Wind direction*** is measured using: *Wind vane*
> • ***Wind speed*** is measured using: *Anemometer*
> • ***Humidity*** is measured using: *Hygrometer*

Movement of ITCZ

• The ITCZ *moves seasonally,* following the *sun's position.*

• In the Northern Hemisphere, it moves north in the summer and south in the winter.

• The ITCZ moves more north and south over land than over water because the ocean heats up more slowly as compared to land.

Doldrums

• The Doldrums is a *low pressure area* around the Equator where the *prevailing winds are calm.*

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- They are found between *10°N and 10°S.*
- The Doldrums *overlap with the ITCZ region.*

Horse Latitude

- Horse latitudes are regions located about *30°N and 30°S of the equator.*
- It is an area of subtropical high.
- It is a high-pressure area at divergence of trade winds and westerlies.
- They are characterised by Sunny skies, calm winds, and a very little precipitation.

LOCAL WINDS

- Local winds are winds that occur in a specific area and are caused by local temperature differences, topography, or other geographical features.

Types of Local Winds

Winds	Warm/Cold Wind	Place where it Blows
Chinook	It is warm, dry wind and is also known as "Snow Eaters" because it melt snow cover	Canada, eastern side of Rockies
Sirocco	It is warm, hot, and dry wind. It also causes "blood rain"	Siberia, Canada, the US Sahara, West Africa
Khamsin	It is hot, dry, and dusty wind	Gulf of Guinea
Harmattan	They are dry, dusty warm winds. These winds are also known as "Dr. Wind"	Egypt Sahara Desert
Brickfielder	It is hot, dry, and dusty wind	Australia
Blizzard	They are very cold and carry snow	Australian Desert
Mistral	These are strong, cold, and dry winds	France
Bora	These are strong and cold winds	Adriatic Sea
Fohn	It is cold and dry wind	Southern Alps mountain
Pampero	These are cold winds	Pampas region, Argentina

Map 1: Warm and Cold Winds

Land Breeze and Sea Breeze

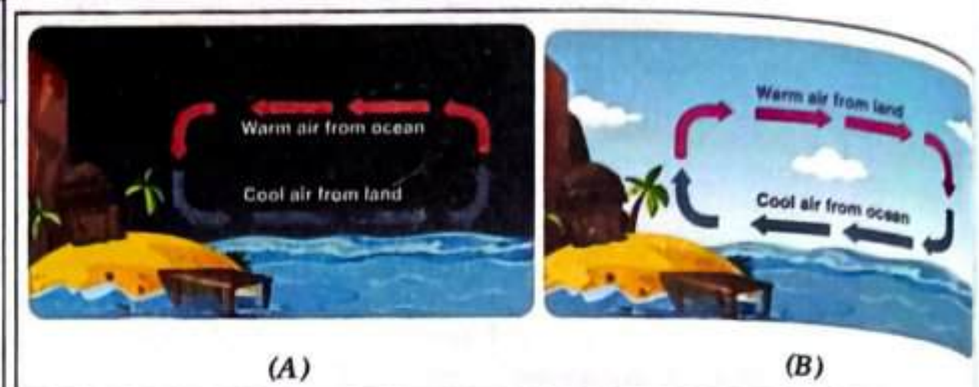
- Land Breeze and Sea Breeze are types of local winds that occur due to temperature difference between land and water.

Land Breeze

- It occurs at night when land cools faster than sea, creating high-pressure over land and low pressure over the sea, causing air to move from *land to sea*; more common in *autumn and winter.*

Sea Breeze

- It occurs during the day when land heats up faster than the sea, creating low pressure over land and high-pressure over the sea, causing air to move from *sea to land*; more common in *spring and summer.*



(A) *(B)*

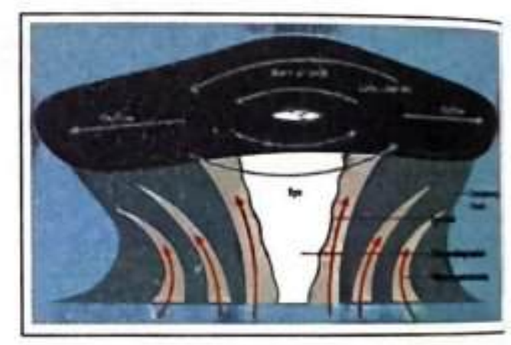
Fig 3: (A) Land Breeze (B) Sea Breeze

CYCLONE

- *Cyclones are rotating mass of air.*
- They are large, powerful storm that forms over warm ocean waters, with strong winds and heavy rain.

Formation of Cyclones

- Cyclones form when warm, moist air rises over the ocean. As the air rises, it creates low pressure, and cooler air rushes in to replace it. The Earth's rotation causes the air to spin, and the storm grows stronger. When the storm gets big enough, it becomes a cyclone with strong winds and heavy rain.
- A cyclone rotates *anti-clockwise* in *Northern Hemisphere* and *clockwise* in *Southern Hemisphere.*



Favorable Conditions for Formation of Cyclone

- *Large sea surface temperature*
- *Atmospheric Instability*
- *Coriolis Force*
- *Pre-existing weak low pressure area*

The eye of cyclone (calm region)

Fig 4: Formation of Cyclone

Different Names of Cyclones around the World

- *Hurricane: Atlantic Ocean*
- *Typhoon: South China Sea and Western Pacific Ocean*
- *Willy-Willy: Australia*
- *Cyclone: India*

During cyclone, Cumulonimbus clouds are formed with extensive vertical development.

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Tropical and Temperate Cyclone (Extra-Tropical Cyclone)

Tropical Cyclone	*Temperate Cyclone*
They originate over sea	They originate over sea and land
They are formed due to certain favourable condition over the sea, as mentioned above	They are formed due to frontogenesis i.e. where the warm and cold air mass meet each other
They cover less area but cause major destruction	They cover large area but cause less destruction
They occur rarely	They occur frequently
They move from east to west	They move from west to east

Anticyclone

- An anticyclone is formed around an *area of high pressure where the air sinks, causing clear skies and calm weather*. It usually brings dry, sunny conditions.
- An anticyclone rotates clockwise in Northern Hemisphere and anti-clockwise in Southern Hemisphere.

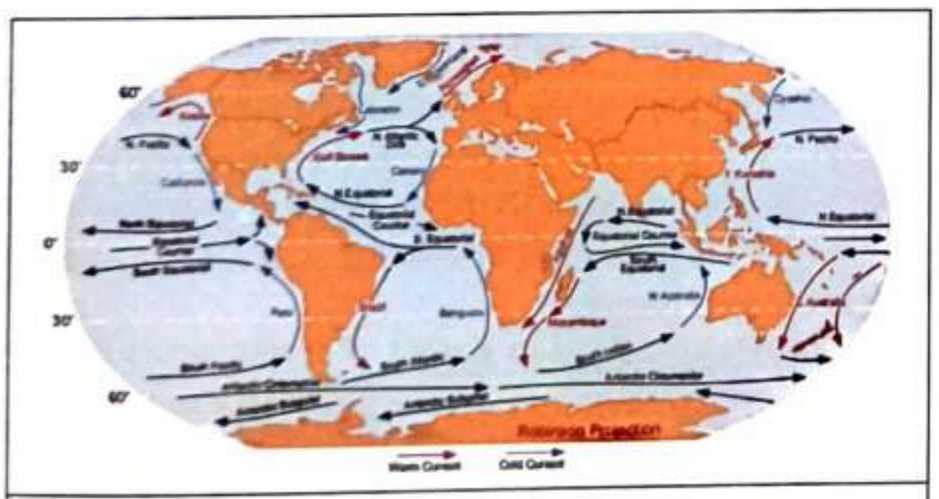
OCEAN CURRENTS

- Ocean currents are large movements of water in the ocean that flow in a specific direction.
- Ocean water moves in two directions: *horizontally and vertically*.
- *Horizontal movements* are referred to as *currents*, while *vertical changes* are called *upwellings* or *downwellings*.

Reasons for Movement of Ocean Currents

1. *Wind*
2. *Density difference*
3. *Gravity*
4. *Coriolis force*
5. *Coast line*

- ***Cold water moves from Poles to Equator.***
- ***Warm water moves from Equator to Poles.***



Map 2: Warm and Cold Ocean Currents

Warm Currents: Represented by RED

Cold Currents: Represented by BLUE

TRICK TO REMEMBER

Cold Ocean Currents → (BP GOLF World Cup California)

B	P	G	O	L
Benguela	*Peru/Humbolt*	*Greenland*	*Oyashio*	*Labrador*

F	World	Cup	California
Falkland	*West Australian Drift*	*Canary*	*California*

Warm Ocean Currents

- *Brazil, Mozambique, Agulhas, Gulf Stream, Alaska, Norwegian, Kuroshio, E. Australia.*

Effects of Ocean Currents

1. *Cold ocean currents:* They largely contribute to the formation of *coastal deserts in west coast regions of tropical and sub-tropical continets*. This is because the cold water makes the air above it cooler and less able to hold moisture.
2. *Warm ocean currents* + *Cold ocean currents:* Together they create *best fishing zones due to deposition of planktons*. The meeting of warm and cold ocean currents also *creates fog that is dangerous for harbouring*.

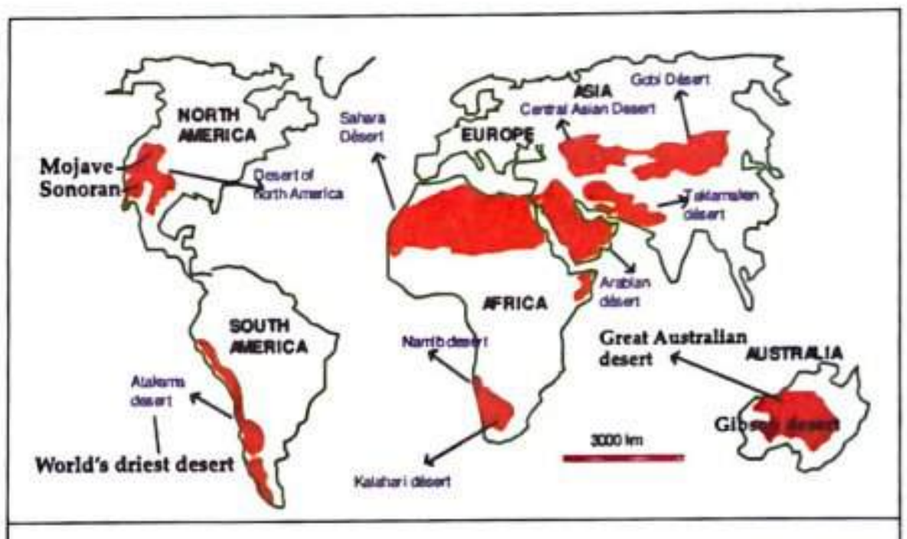


Fig 5: Desert around the world

For an interactive recap of this topic, see the crossword on Page Number 27.

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INDIA

Some Facts About India

- India was a part of *Gondwana land* and is situated in continent of *Asia*.
- ***In terms of area:*** *7th* (India occupies 2.4% of the world's area).
- ***In terms of population:*** *1st* (17.7% of world's population lives in India).

Rank of countries around the world in terms of area

1. ***Russia***
2. ***Canada***
3. ***China***
4. ***USA***
5. ***Brazil***
6. ***Australia***
7. ***India***
8. ***Argentina***

Smallest country in the world: Vatican City

- India has 28 States and 8 Union Territories

According to:

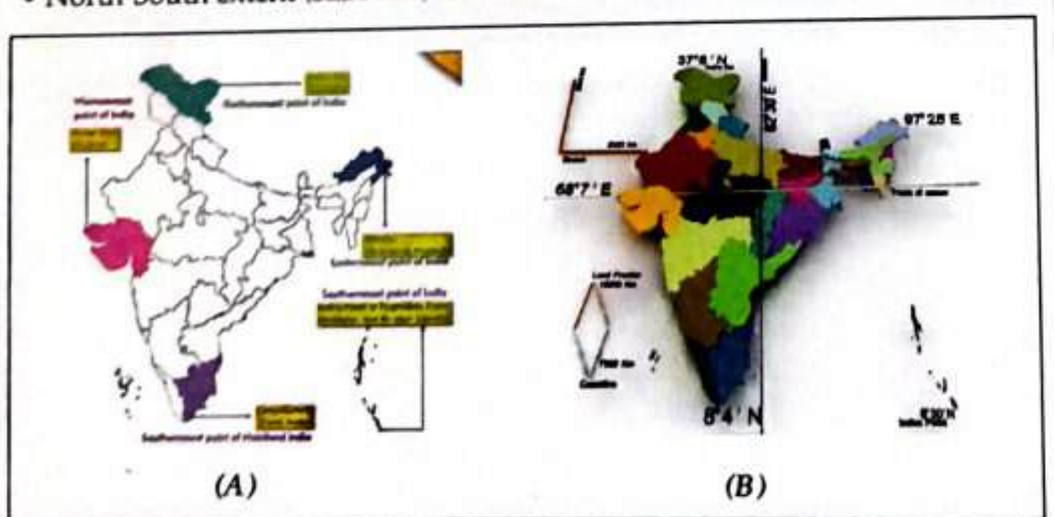
Area	*State*	*UT*
Largest	Rajasthan	Ladakh
Smallest	Goa	Lakshadweep
Population		
Largest	Uttar Pradesh	Delhi
Smallest	Sikkim	Lakshadweep

Extreme Points in India

Extremes	*State*	*Point*
Northernmost	Himachal Pradesh	Indira Col (Ladakh)
Southernmost	Tamil Nadu	Kanyakumari/Cape Camorin (Tamil Nadu)/Indira Point/ Pygmalion Point (A&N islands)
Easternmost	Arunachal Pradesh	Kibithu
Westernmost	Gujarat	Guhar Moti/Sir Creek

Longitudinal and Latitudinal Extent

- It lies completely in the Northern hemisphere and Eastern hemisphere between *latitudes 8°4'N and 37°6'N* and *longitudes 68°7'E and 97°25'E.*
- North-South extent *(3214 km)* and East-West extent *(2933 km).*



(A) *(B)*

Map 1(A): Extreme Points of India; 1(B): Longitudinal and Latitudinal Extent of India

Tropic of Cancer

- India is divided by Tropic of Cancer *23°30'N* in almost *two equal parts.*
- The Tropic of Cancer passes through *8 States.*

TRICK TO REMEMBER → *(Gujarati Raja Made Chief Justice Win The Meeting)*

Gujarati	***Raja***	***Made***	***Chief***
Gujarat	*Rajasthan*	*Madhya Pradesh*	*Chhattisgarh*
Justice	***Win***	***The***	***Meeting***
Jharkhand	*West Bengal*	*Tripura*	*Mizoram*

Indian Standard Time

- The difference of time between *Gujarat* and *Arunachal Pradesh* is 2 *hours*; but both their clocks show the same timing. This is because India follows a standard time. *Indian Standard Time* (IST is 5:30 hrs ahead of GMT) is along *longitude 82.30°E.* It passes through the city of *Mirzapur in Uttar Pradesh.*

- ***The IST passes through 5 States:***

TRICK TO REMEMBER → *(MOUCA)*

M	***O***	***U***	***C***
Madhya Pradesh	*Odisha*	*Uttar Pradesh*	*Chhattisgarh*

A

Andhra Pradesh

- ***Time Zones:*** *France (13), Russia (11), USA (4) → because of many territories)*
- ***Tropic of Cancer meets IST at:*** *Korea district, Chhattisgarh (Baikunthpur)*

Map 2: Indian Standard Time of India

LAND BORDER OF INDIA

India's International Boundary

Countries that share boundary with India:

TRICK TO REMEMBER → *(Ba Ch PaN में MBA)*

B	***Ch***	***Pa***
Bangladesh (4096.7 km)	*China (3488 km)*	*Pakistan (3323 km)*

N	में	***M***	***B***
Nepal (1751 km)		*Myanmar (1643 km)*	*Bhutan (699 km)*

A

Afghanistan (106 km)

Total Border Area: 15,106.7 km

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India and Bangladesh Border Shared By

TRICK TO REMEMBER → (MAM Take Water)

M	A	M	Take	Water
Meghalaya	*Assam*	*Mizoram*	*Tripura*	*West Bengal*

It is surrounded by Bangladesh on three sides

- The *Radcliffe Line* is the boundary that separates India and Bangladesh.
- ***Train between Bangladesh and India:*** Maitree Express, Bandhan Express, Mitali Express.

India and Nepal Border Shared By

TRICK TO REMEMBER → (SUBBU)

S	U	B	B	U
Sikkim	*Uttar Pradesh*	*Bihar*	*West Bengal*	*Uttarakhand*

- *Treaty of Sugauli* was signed in *1816*, that established the boundary line between India and Nepal.

India and Bhutan Border Shared By

TRICK TO REMEMBER → (BASA)

B	A	S	A
West Bengal	*Assam*	*Sikkim*	*Arunachal Pradesh*

India and Pakistan Border Shared By

TRICK TO REMEMBER → (GRP J&K Ladakh)

G	R	P	J&K	Ladakh
Gujarat	*Rajasthan*	*Punjab*	*Jammu and Kashmir*	*Ladakh*

- The *Radcliffe Line (Sir Cyril Radcliffe drew the line)* is the boundary that separates India and Pakistan.
- The *Line of Control (LoC)* is a military control line that separates *India* and Pakistan in the *disputed region of J&K.*
- ***Train between India and Pakistan:*** Samjhauta Express, Thar Express.
- ***Book written by Khushwant Singh:*** *"Train to Pakistan".*

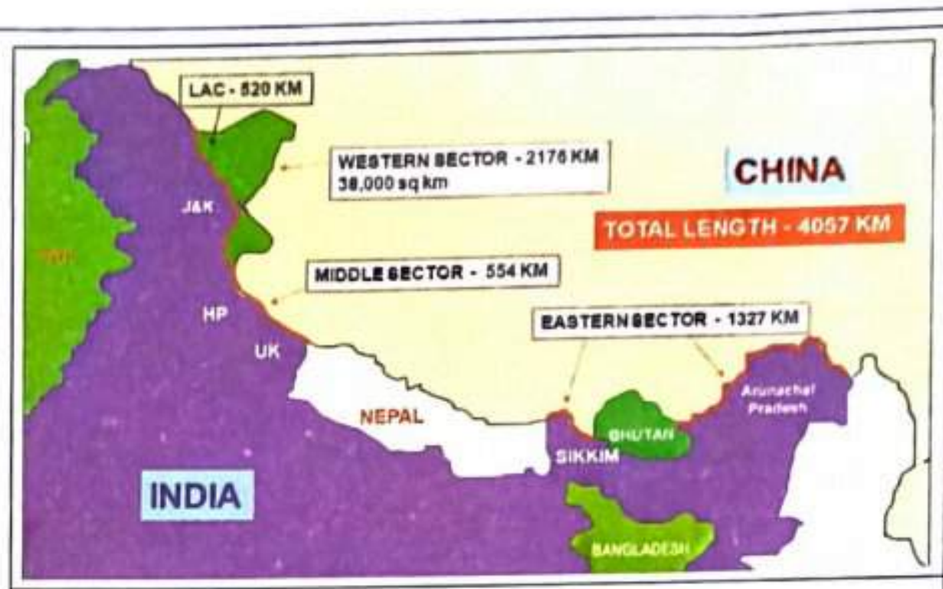
India and China Border Shared By

- J& K, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh.
- ***Indo-China Border is divided into three sectors:***

1. ***Western sector (Johnson Line*** defines the boundary between *India* and *China* in the Western sector).
2. ***Middle sector.***
3. ***Eastern sector (McMahon Line*** defines the boundary between *India* and *China* in the Eastern sector).

Map 3: LOC and LAC

- The *Line of Actual Control (LAC)* is a military control line that separates Indian areas of *Ladakh from Aksai Chin.*



Map 4: Indo-China Border

Vibrant Villages Programme

- It is a ***Centrally*** sponsored Scheme announced in ***Union Budget 2022-2023 (to 2025-2026) for development of villages*** on India-China border.

India and Myanmar Border Shared By

TRICK TO REMEMBER → (AruNa MaMi)

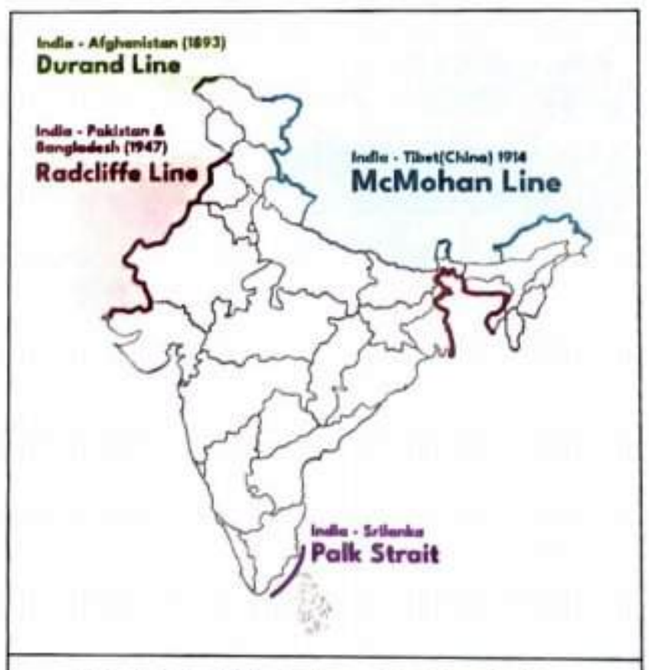
Aru	Na	Ma	Mi
Arunachal Pradesh	*Nagaland*	*Manipur*	*Mizoram*

India and Afghanistan

- India and Afghanistan is separated by Union Territory: *Ladakh.*
- The border between India and Afghanistan is called the *Durand Line.*

India and Sri Lanka

- India and Sri Lanka is separated by *Palk Strait* (a narrow water body, which connects two large water bodies or separates two landmasses).



Map 5: Dividing Lines of India with its Neighbouring Countries

- **Gulf:** A gulf is a portion of the ocean that penetrates land. They are generally *larger* and *more deeply indented than bays.* Gulfs are sometimes connected to the ocean by narrow passages of water called straits.

- **Bay:** A bay is a body of water that is *partly surrounded by land.* Bays *empty out* into larger bodies of water like *oceans and lakes.*

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Some Important Facts

- *Largest Gulf in the world: Gulf of Mexico.*
- *Largest Bay in the world: Bay of Bengal.*
- *State sharing boundary with maximum number of states: Uttar Pradesh* (with 8 States + 1 UT (Delhi)).
- *State sharing border with only one state: Sikkim* (with West Bengal) and *Meghalaya* (with Assam).
- *States sharing border with three countries:*

1. *Sikkim* (with Nepal, Bhutan, China).
2. *Arunachal Pradesh* (with Bhutan, China, Myanmar).
3. *West Bengal* (with Nepal, Bhutan, Bangladesh).

- *One UT that shares boundary with three countries: Ladakh* (with Pakistan, Afghanistan, and China).

Few Organisations

- **Border Road Organisation (1960):** BRO (under *Ministry of Defence*) develops and maintains road networks in India's border areas and friendly neighboring countries.
- The *Border Area Development Programme (BADP)* was introduced during the *7th Five-Year Plan (1985-1990)* in India. The programme aims to meet the special development needs of the people living in remote and inaccessible areas situated near the international borders *(Pakistan, China, Nepal, Bhutan, Bangladesh, and Myanmar).*

Organisations under Central Armed Police Force (CAPF)

- **Indo-Tibetan Border Police** *(1962)*: ITBP (under Ministry of Home Affairs) guards the country's border with China along the Indo-Tibetan region.
- **Sashastra Seema Bal** *(1963)*: SSB (under Ministry of Home Affairs) guards the country's borders with Nepal and Bhutan.
- **Border Security Force** *(1965)*: BSF is known as "India's first line of Defence" and was established after Indo-Pak War. It guards country's border with Pakistan and Bangladesh.
- **Assam Rifles:** It is under Ministry of Home Affairs but the operation control is under Ministry of Defence.
- **Central Reserve Police Force (CRPF):** It is India's largest paramilitary force and is under Ministry of Home Affairs.

> *Naxalite affected areas are called as "Red Corridors"*

Indian Armed Forces (IAF)

- **Air Force/Navy/Army:** They are under *Ministry of Defence.*

COASTAL BOUNDARY OF INDIA

- India's total coastal boundary length is approximately *7,516.6 km.*

This includes:

- *Mainland coastline: 5,422 km.*
- *Island territories: 2,094.6 km.*

- India's coastline touches the Arabian Sea, Bay of Bengal, and the Indian Ocean, spanning across *9 coastal states* (Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Odisha, West Bengal) and 2 island groups (Andaman & Nicobar Islands and Lakshadweep Islands).

Longest coastline of India:

- *UT: Andaman & Nicobar Islands → 1912 km*
- *State: Gujarat → 1600 km*
- *Shortest coastline of India: Goa → 160 km*

States with longest coastline

1. *G: Gujarat*
2. *T: Tamil Nadu*
3. *A: Andhra Pradesh*

} TRICK GTA

> *Largest coastal boundary of the world: Canada*

- *Union Territories of India that share coastal boundaries are:*

1. *Andaman and Nicobar Islands (Bay of Bengal) → located on eastern coast of India.*
2. *Lakshadweep (Arabian Sea).*
3. *Puducherry (Bay of Bengal).*
4. *Daman and Diu (Arabian Sea).*

Sea Borders of India

- India shares its sea borders with two countries: *Sri Lanka and Maldives.*
- India's sea borders include the *Bay of Bengal to the east, the Arabian Sea to the west, and the Indian Ocean to the south.*
- *Gulf of Mannar* is a shallow sea between *India and Sri Lanka,* located near the southern tip of India.

United Nations Convention on the Law of the Sea (UNCLOS)

- It was adopted on *1982* but came into force on *1994.*
- It is an international treaty that establishes rules and guidelines for the use and protection of the world's oceans
- *It covers 5 zones: Internal Waters, Territorial Sea, Contiguous Zone, Exclusive Economic Zone (EEZ)* and *High Seas.*

Territorial Limit of India

- The length of coastline is measured in *Nautical Miles (nm). 1 nautical miles = 1.852 km.*
- *India's territorial limit extend upto 12 nm (12 nm = 22 km) from the coast.*
- **Contiguous Zone:** A contiguous zone is a maritime area that lies beyond a country's territorial sea. It extends upto *24 nm.*
- **Exclusive Economic Zone:** It is a maritime area that extends upto *200 nm* from a coastal nation's territorial sea.

> *Kanyakumari is a place in India where the Bay of Bengal, the Indian Ocean, and the Arabian Sea meet.*

> *New Pamban Bridge, the first Vertical lift sea Bridge of India which has been inaugurated recently connects Pamban (Rameswaram island) to Mandapam (Mainland India).*

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**PLEASE NOTE THAT

- Recently Government of India on 29th April 2025 released that the length of India's coastline has been recalculated and is now *11098.81 kms.*

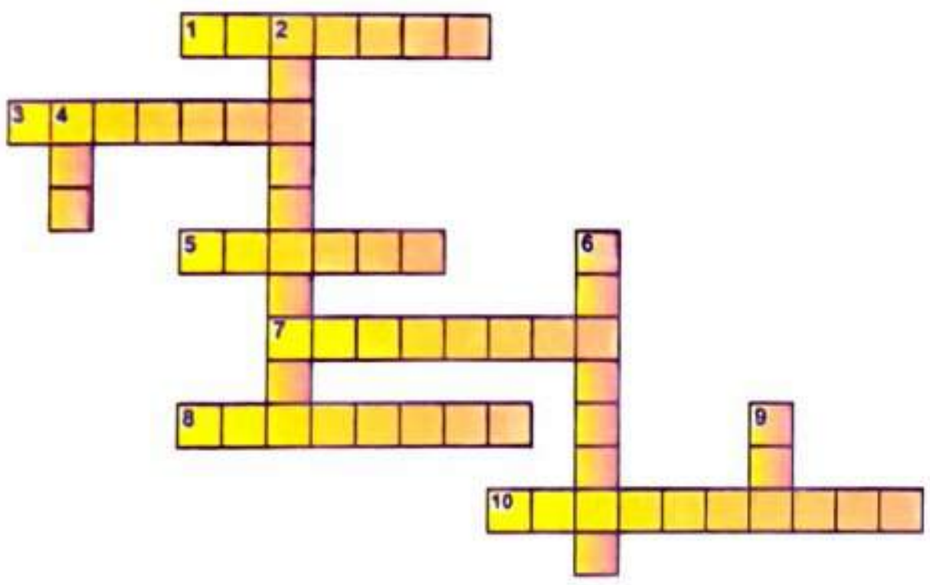
Length of Coastline of India

The State-wise UT-wise 'Length of Coastline of India' are here by mentioned below.

Sl.No.	State/Union Territory	Coastline length (in Km)
1.	Gujarat	2,340.62
2.	Maharashtra	877.97
3.	Goa	193.95
4.	Karnataka	343.30
5.	Kerala	600.15
6.	Tamil Nadu	1,068.69
7.	Andhra Pradesh	1,053.07
8.	Odisha	574.71
9.	West Bengal	721.02
10.	Daman & Diu	54.38
11.	Pondicherry	42.65
12.	Lakshadweep Islands	144.80
13.	Andaman & Nicobar Islands	3,083.50
	Total Length of Coastline of India	**11,098.81**

PARMAR'S CROSSWORD

WIND, OCEAN CURRENT AND CYCLONE



Across

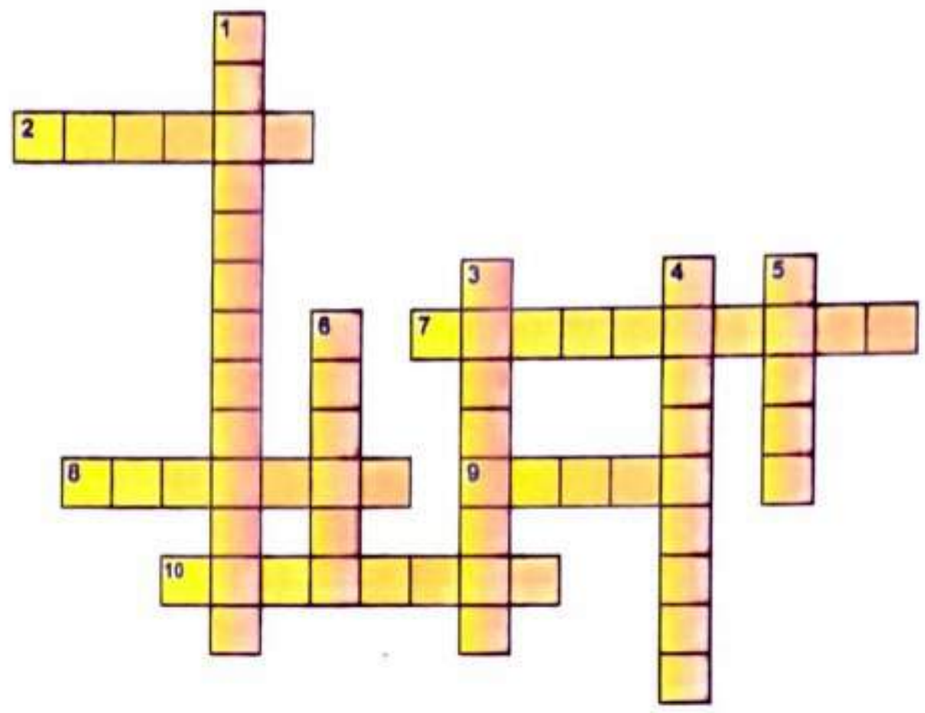
1. Day-to-day atmospheric condition
3. Long-term weather pattern over 30 years
5. Tropical grasslands of Brazil
7. Zone between 23.5°N and 23.5°S
8. A warm ocean current
10. Fast upper-level winds over the Himalayas

Down

2. Instrument to measure wind speed
4. Hot dry summer wind in North India
6. Isohalines connect areas of equal this
9. Calm center of a cyclone

PARMAR'S CROSSWORD

INDIA AND ITS LOCATION



Across

2. Cancer passes through 8 Indian states
7. Country sharing the longest land border with India
8. Indian state with the longest coastline
9. Capital of Afghanistan
10. Country west of India with major geopolitical significance

Down

1. Northernmost city among options listed
3. Highest mountain in Bhutan
4. Commission that drew India–Pakistanboundary
5. India's open border country allowing freemovement
6. State capital closest to the Equator

TsuNamî

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Physiographic Divisions of India

• India is divided into *six physiographic divisions* based on the varied physical features.

1. ***Himalayas/Northern Mountains***
2. ***Northern Plains***
3. ***Peninsular Plateau***
4. ***Indian Desert***
5. ***Coastal Plains***
6. ***Islands***

MOUNTAINS

• Mountains are landforms that are much higher than the surrounding land. They are usually steeper than hills and often have a sharp peak, or summit.

Types of Mountains

1. **Fold Mountains:** They are formed when tectonic plates collide, causing the Earth's crust to buckle and fold. These mountains are often characterized by parallel ridges and valleys.

   Types

   1. ***Young Fold Mountains:*** Mountains that were formed by *tectonic activity* a few million years ago.
      E.g. Himalayas, Andes (located in South America and is world's longest mountain range), Alps (Europe), Rockies (North America), Atlas (Africa), Caucasus mountains.
   1. ***Old Fold Mountains:*** Mountains that were formed by the *folding of the Earth's crust* in the distant past. ***E.g. Aravalli (residual mountains), Ural (separates Asia and Europe), Appalachians (North America).***

2. **Block Mountains:** Block mountains are formed when large areas of the Earth's crust are broken and displaced due to vertical slippage.
   Horst → raised block of land bounded by faults, often appearing as a ridge or plateau and *Graben (also known as Rift Valley)* → lowered *block of land between two faults,* often forming a valley are formed in block mountains.
   E.g. Vindhya and Satpura, Vosges Mt. (France), Harz Mt. (Germany), Great African Rift Valley (world's longest Rift Valley).

3. **Volcanic Mountains:** They are formed when magma from the Earth's mantle rises to the surface and erupts, creating lava flows that build up over time.
   E.g. Mt. Stromboli (known as "Lighthouse of Mediterranean", Mt. Cotopaxi (Ecuador), Fujiyama (Japan), Barren and Narcondam (Andaman & Nicobar Islands), Ojas del Salado (world's highest active volcano in Chile-Argentina border), Mt. Kilimanjaro (Africa).

HIMALAYAS

• The Himalayas are one of the *youngest fold mountain* ranges in the world of tectonic origin and comprise mainly sedimentary rocks.

Formation of Himalayas

• They were formed when the *Indo-Australian tectonic plate* and *Eurasian (Asian) tectonic plate collided,* this caused the closure of the ancient *Tethys Sea,* leading to the folding and uplifting of sediments deposited on its seabed. This resulted in creation of multiple massive mountain ranges which are collectively know as the Himalayas.

Different Mountain Ranges in Himalayas

Trans-Himalayas

• It is located north of the Great Himalayas, this region is characterized by high plateaus and arid landscapes.

• ***Average elevation: 3000 m.***

The prominent ranges under Trans Himalayas are (in North to South order)

1. ***Karakoram Range***
   • It forms India's boundary with *Afghanistan and China.*
   • Highest peak of this range is *K2,* also known as *Mt. Godwin-Austen (8611 m),* which is also *world's second highest peak.*
2. ***Ladakh Range***
   • It has the *highest slope.*
   • *Shyok* (tributary of Indus) river flows between *Karakoram* and *Ladakh* range.
3. ***Zanskar Range***
   • *Kamet peak* is the *highest peak* of this range.
   • Indus river flows between *Ladakh* and *Zanskar* range.

Greater Himalayas

• They are also known as *Himadri /Inner Himalayas.*

• They are formed due to asymmetrical folding.

• The core of Greater Himalayas is composed of *granitic rock.*

• ***Average height: 6000 m.***

• ***Axial range: 2500 km.***

• ***Width: 120-190 km.***

• ***It's westernmost point is: Nanga Parbat (8126 m).***

• ***It's easternmost point is: Namcha Barwa (shows syntaxial bending).***

Glacier of Karakoram Range

1. ***Siachen***
   • *2nd longest non-polar glacier.*
   • *Highest battlefield (5700 m above)*
   • *Operation Meghdoot (1984).*
2. ***Baltoro (Gilgit-Baltistan of Pakistan)***
3. ***Hisper***
4. ***Biafo***

Longest non-polar glacier in the world: Fedchenko Glacier in Tajikistan

Longest glacier in the world: The Lambert Glacier in Antarctica

Highest Peaks of Greater Himalayas

1. ***Mt. Everest*** (Highest mountain in the world with *8848 m* height) → *local names: Sagarmatha (in Nepal)* and *Chomolungma (in Tibet).*
2. ***Mt. Kanchenjunga*** (highest in India *(Sikkim) with 8598 m* height).
3. ***Mt. Lhotse*** (in *Tibet* and *Khambu* region of *Nepal* with *8516 m* height).
4. ***Mt. Makalu (8485 m).***
5. ***Dhaulagiri (8167 m)*** → Also known as *White Mountain.*
6. ***Annapurna (8091 m).***

   } *Nepal*

7. ***Nanda Devi*** (highest peak in *Uttarakhand* with *7816 m* height).
8. ***Mt. Kamet (7756 m* in *Uttarakhand).***

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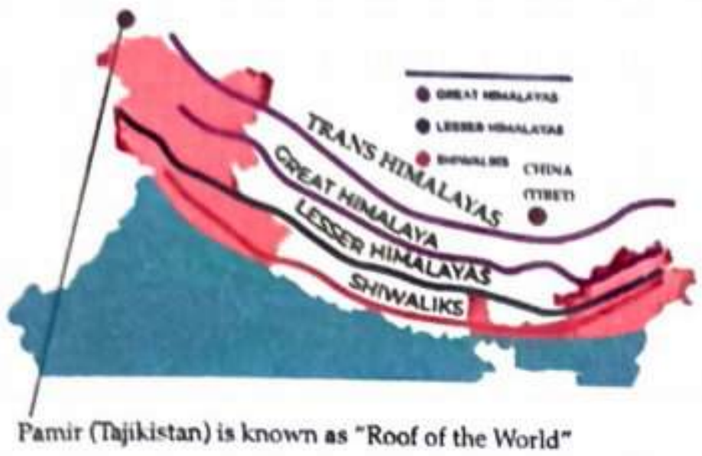


Pamir (Tajikistan) is known as "Roof of the World"

Map 1: Divisions of Himalayas

Lesser Himalayas

- They are also known as *Middle Himalayas/Himachal.*
- Average height: *4000 m.*
- Width: *60-80 km.*

Its Different Names:

- *J&K: Pir Panjal Range.*
- *Himachal Pradesh: Dhauladhar.*
- *Uttarakhand: Nagtibba.*
- *Nepal: Mahabharat Range.*

Valley

- A valley is a low area of land between hills or mountains, typically with a river or stream flowing through it.
- Kashmir Valley is between *Great Himalayas* and *Lesser Himalayas.*

Shiwaliks/Outer Himalayas

- They are also known as *Outer Himalayas.*
- *Average height: 1000 m.*
- In the eastern part they disappear and *Duars* (they are soft unconsolidated deposits that are good for tea cultivation) take its place.
- Longitudinal valleys called *Duns* are formed between *Lesser Himalayas and Shiwaliks. Largest Dun* in India is *Dehradun.*
- The portion of the Shiwalik lying in the region of Nepal is called the *Churia Range.*

REGIONAL DIVISION OF HIMALAYAS

- *Punjab Himalayas* between *Indus* and *Sutlej* river.
- *Kumaon Himalayas* between *Sutlej* and *Kali* river.
- *Nepal Himalayas* between *Kali* and *Teesta* river.
- *Assam Himalayas* between *Teesta* and *Dihang* river.

Kashmir Valley

- The Kashmir Valley is also known for the *Karewa formations* (composed of *glacial* and *lacustrine* deposits), which are used to grow *Zafran, a local variety of saffron.*
- Zoji La on the Greater Himalayas, Banihal on the Pir Panjal, Photu La (Ladakh) on the Zanskar, and Khardung La on the Zanskar are some of the region's most important passes.
- This region also has some of the most important *freshwater lakes,* such as *Dal* and *Wular,* as well as *saltwater lakes,* such as *Pangong Tso* and *Tso Moriri [Locate it on Map].*
- The Indus River and its tributaries, such as the Jhelum and Chenab, drain in this region.

Himachal and Uttarakhand Himalayas

- *They are spread across three states: J&K, Himachal Pradesh, and Uttarakhand.*
- It is drained by two of India's largest river systems, the Indus and the Ganga.
- The *Bhotia tribe* live largely in the valleys of the Greater Himalayan range. These are nomadic people who travel to the *'Bugyals' (summer grasslands in the mountains)* in the summer.

Important Hill Stations

- *Dharamshala*
- *Mussoorie*
- *Shimla*

Darjeeling and Sikkim Himalayas

- It is home to India's highest peak *Mt. Kanchenjunga.*
- The *Lepcha/Bhutia tribe* live in the higher elevations of this region.
- *Duar formation* can also be seen here.

Arunachal Himalayas

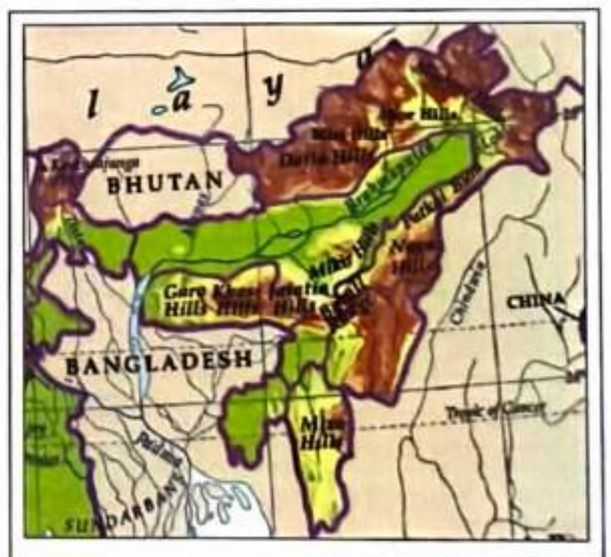
- The eastern border of *Eastern Himalayas* is formed by *Arunachal Himalayas.*
- *Important peaks include: Kangtu and Namcha Barwa.*
- *Important river include: Kameng, Subansiri, Dibang.*
- The *Monpa, Abor, Mishmi, Nyishi,* and *Nagas* are some of the most well-known tribes from west to east.
- *Jhumming* is practiced by the majority of these groups. It's also known as *slash and burn cultivation* or *shifting cultivation.*

Eastern/Purvanchal Hills

- Eastern Hills/Purvanchal Hills are part of the Himalayan mountain chain, with a basic alignment from north to south.
- They extend from *Arunachal Pradesh in the north to Mizoram in the south.*

Prominent ranges

- *Patkai Hills.*
- *Naga Hills.*
- *Manipur Hills.*
- *Mizo/Lushai Hills.*
- In Manipur and Mizoram *(also known as Molasses Basin),* the *Barak* is a significant river.
- The state of Manipur is known for *world's only floating lake → Loktak Lake. Keibul Lamjao National Park* is located here *(only floating National Park in the world).*



Map 2: Eastern/Purvanchal Hills

MOUNTAIN PASSES

- A mountain pass is a route that runs through or over a mountain range.
- Mountain passes between mountain peaks may form during the formation of the mountain range, or they may form as a result of the action of glaciers, running water, or precipitation in the form of rain or snow.

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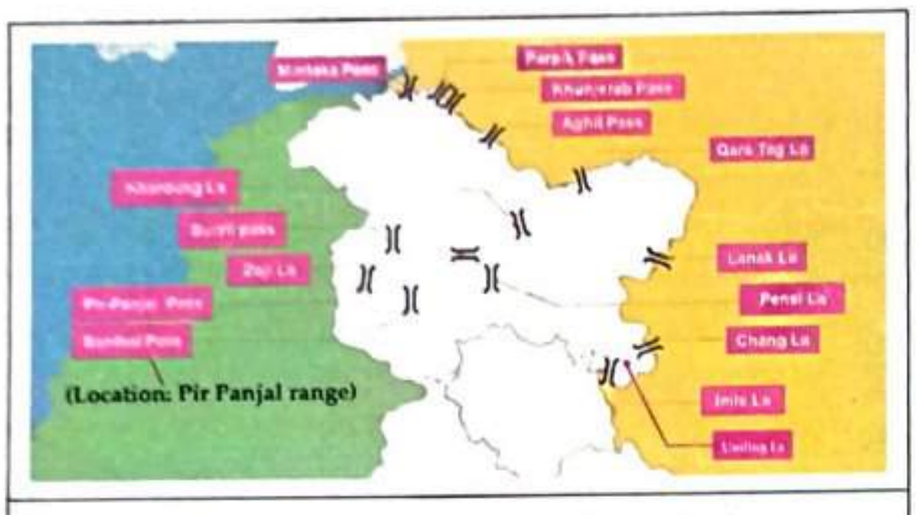
J&K and Leh-Ladakh

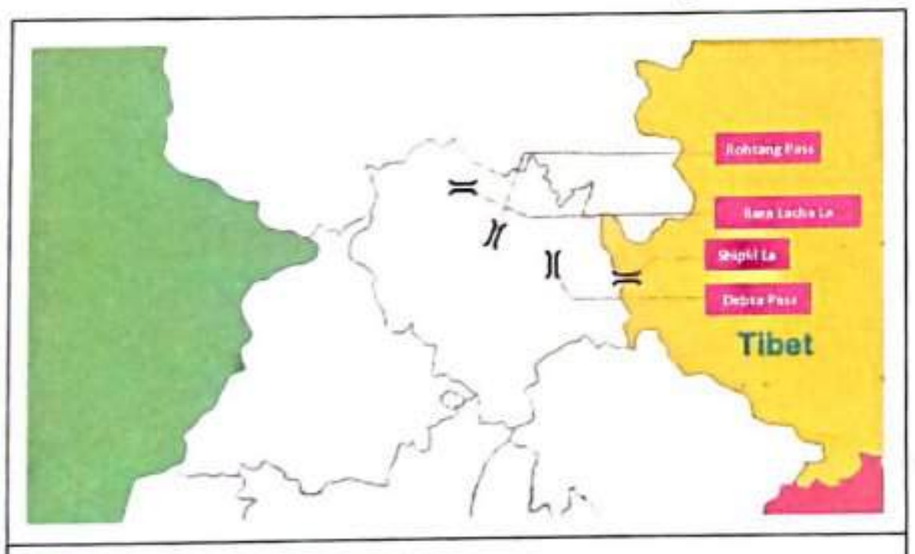
- ***Karakoram Pass:*** It is the *highest pass* that connects *India and China*.
- ***Pir Panjal Pass and Banihal Pass:*** They connect *Jammu to Srinagar*.
- ***Burzil Pass:*** It is between *Srinagar* and *Gilgit*.
- ***Zoji La:*** It connects *Srinagar in Kashmir to Leh-Ladakh*.
- ***Umling La:*** World's *highest motorable road* (constructed through *Project Himank*) in *Ladakh*.



Map 3: Major Passes in J&K and Leh-Ladakh

Himachal Pradesh

- ***Shipki La Pass:*** It connects *Kinnaur district* of *Himachal Pradesh* to Tibet, China. *Sutlej* enters in India through this pass.
- ***Rohtang Pass:*** It connects the *Kullu Valley* to the *Lahaul* and *Spiti valleys* in Himachal Pradesh *(Atal Tunnel, the longest highway tunnel (9.02 km) is built under the Rohtang Pass).*
- ***Bara-Lacha La Pass:*** It connects *Lahaul* and *Leh* by crossing the Zanskar range.



Map 4: Major Passes in J&K and Leh-Ladakh

Uttarakhand

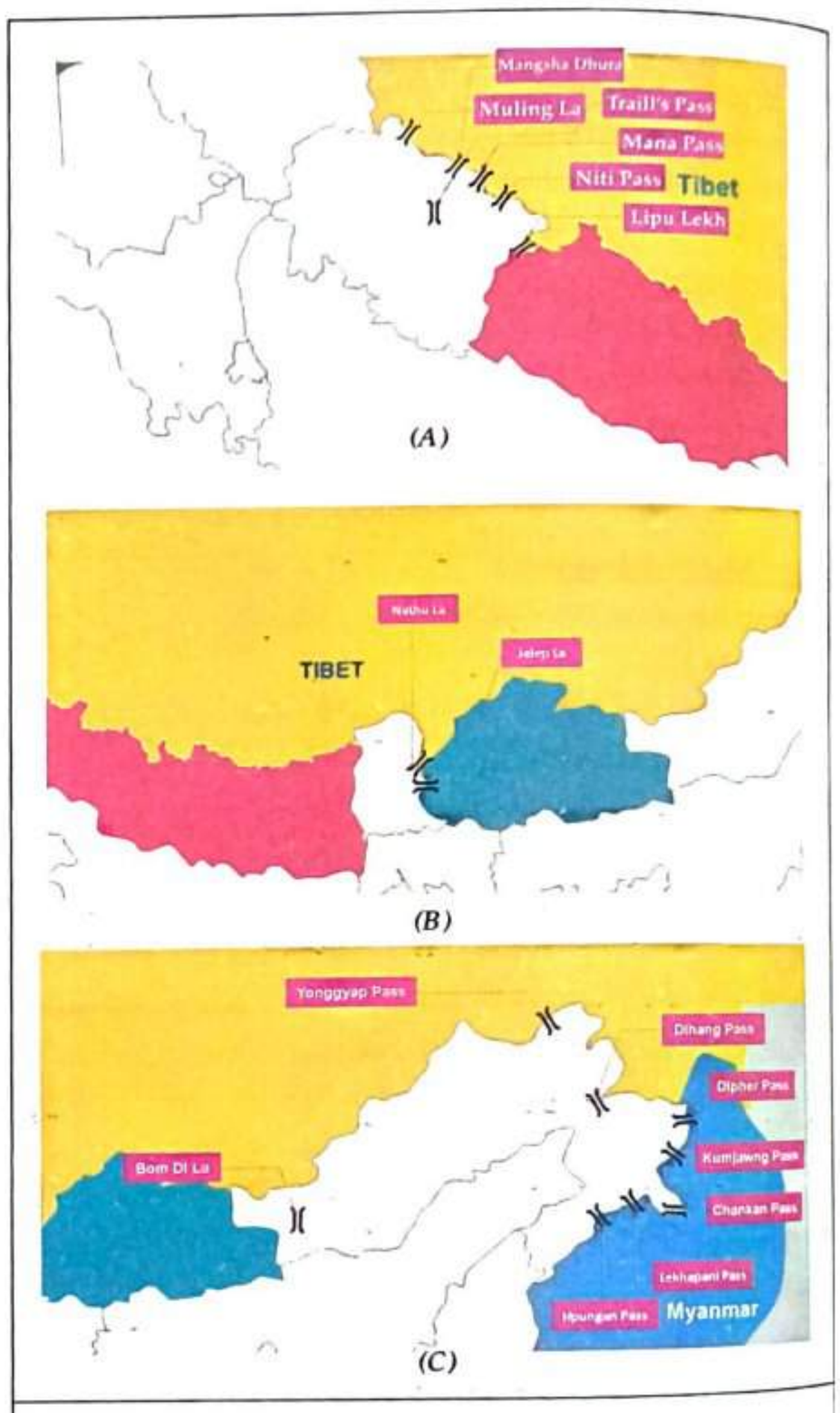
- ***Mana Pass:*** It connects the *Mana* with *Tibet*.
- ***Niti Pass:*** It also connects *Uttarakhand* and *Tibet*.
- ***Lipu Lekh Pass:*** It is between *Uttrakhand, Tibet and Nepal*, it acts as a tri-junction.
- ***Mauling La Pass:*** During the winter, this seasonal pass connecting *Uttarakhand* and *Tibet*.

Sikkim

- ***Nathu La Pass:*** It links *Sikkim* and *Tibet*.
- ***Jelep La Pass:*** It is located on the border of *Sikkim* and *Tibet*.

Arunachal Pradesh

- ***Bom Di La Pass:*** It connects *Arunachal Pradesh with Lhase (Tibet)*.
- ***Dihang La Pass:*** This pass connects the states of *Arunachal Pradesh* and *Myanmar*.
- ***Pangsu Pass:*** It connects *Arunachal* and *Myanmar*.
- ***Bum La Pass:*** It is a border pass between *China* and *Tawang* district of *Arunachal Pradesh*.
- ***Diphu Pass:*** It is in *Arunachal Pradesh* that borders *Myanmar* and is clo to the trijunction of *India, Myanmar, and China*.
- ***Yangyap Pass:*** It is a pass from where *Brahmaputra river enters India*.



Map 5: Major Passes of (A) Uttarakhand; (B) Sikkim; (C) Arunachal Pradesh

Some Important Mountain/Peaks

- ***Mt. Jhopuno:*** Sikkim.
- ***Gorichen Peak:*** Arunachal Pradesh.
- ***Saramati:*** Highest peak of Nagaland.
- ***Kangto:*** Highest peak of Arunachal.
- ***Thaidawr Tlang:*** Tripura.
- ***Phawngpui*** (also known as ***Blue Mountain***): Highest peak of Mizoram

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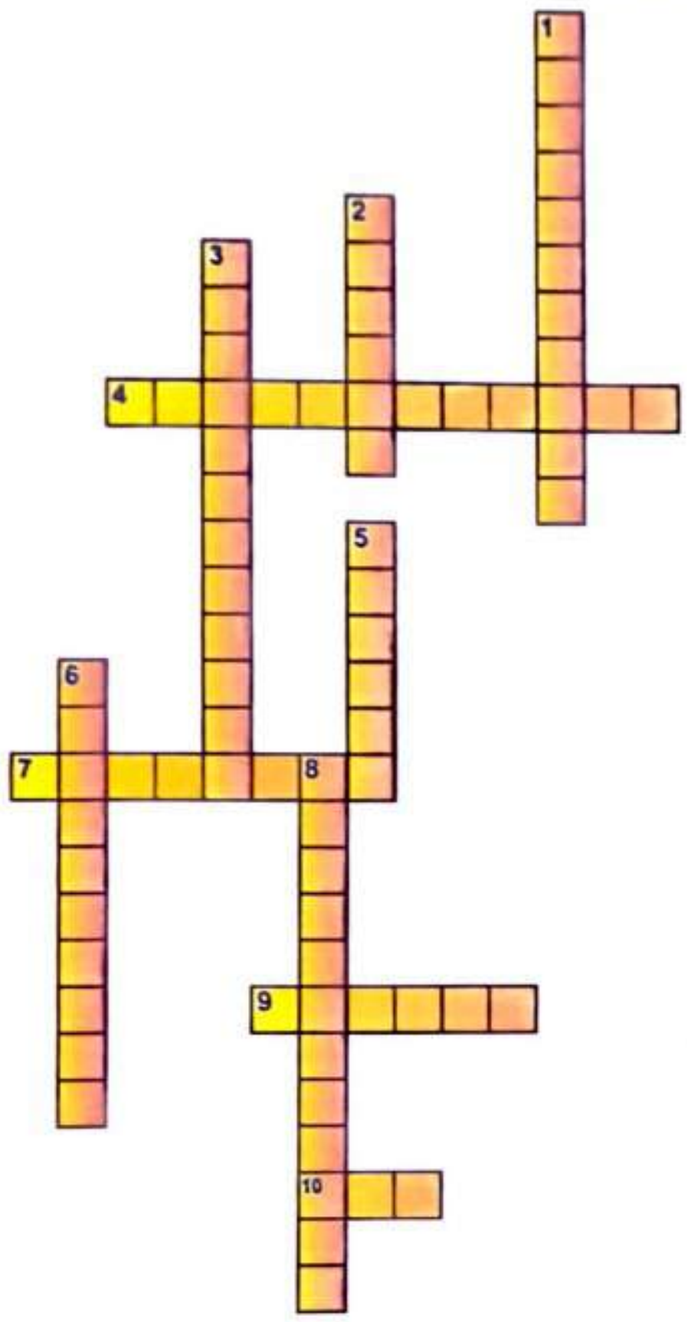
ATMOSPHERE



Across

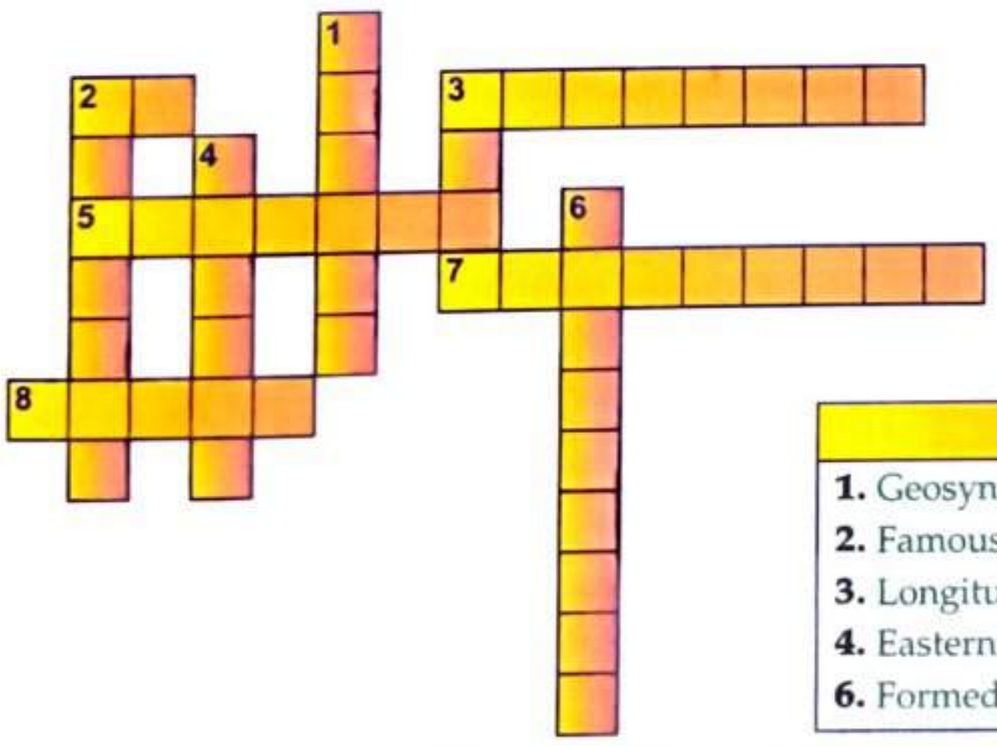
4. Ozone layer is found here
7. Lines showing equal cloud cover
9. Cirrus and Cumulus are types of these
10. Main cause of ozone depletion

Down

1. All weather and climate changes occur here
2. Greenhouse effect increases due to its rising concentration
3. Layer aiding radio transmission
5. Rain-bearing cloud type
6. Meteorites burn in this coldest layer
8. Another name for water cycle

PARMAR'S CROSSWORD

HIMALAYAS



Across

2. Peak located in Karakoram Range
3. Largest dun of Shiwaliks
5. Glacier in Karakoram range
7. Outermost range of the Himalayas
8. Glacier not located in Jammu & Kashmir

Down

1. Geosyncline from which Himalayas uplifted
2. Famous for Karewa formations
3. Longitudinal valleys between Siwalik andLesser Himalayas
4. Easternmost hills of India
6. Formed by collision of Indian and Eurasianplates

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PENINSULAR PLATEAU

Peninsula

- A peninsula is a landform that is *surrounded by water on three sides*, but connected to a *large landmass on one side*.

Plateau

- A plateau is a *flat or gently sloping elevated landform* that rises above the surrounding area. It is often referred to as *tableland* due to its flat top. Plateaus can be formed due to volcanic activity, tectonic, movements, or erosion.
- ***General elevation:*** West to East.
- Peninsular Plateau is the *largest physiographic division of India*, covering a vast area in the southern part of the country.
- The Peninsular Plateau is one of the *world's oldest landforms*.
- ***General elevation of Peninsular Plateau:*** 600-900 m above sea level
- The Peninsular plateau is a tableland made up of old crystalline, igneous and metamorphic rocks.
- It was developed as a result of the breakup and drifting of the *Gondwana Land* (it was earlier a part of *African continent*).
- The plateau has large and shallow valleys as well as rounded hills.
- ***This plateau is divided into two sections:*** the *Central Highlands* and the *Deccan Plateau*.

> ***Highest plateau in the world: Tibetan Plateau (4500 m), also known as "Roof of the World".***

CENTRAL HIGHLANDS

- The Central Highlands are located to the north of the Narmada, covering major area of Malwa Plateau.
- It is bordered by *Aravalli Range in the northwest* and the *Vindhya Range in the south*.
- ***General elevation:*** 700-1000 m
- *Malwa Plateau (largest)* → on *western* side and *Chotanagpur Plateau* → on the *eastern* side.
- Central Highlands are *wider in west but narrower in the east*.
- The Chotanagpur plateau marks the further eastward extension, drained by the *Damodar river*.

Map 1: Peninsular Plateaus

Chotanagpur Plateau

- It is spread across *Jharkhand, Chhattisgarh, Odisha, West Bengal*.
- It is often referred to as the *"Ruhr of India"* due to its rich mineral deposits, similar to Ruhr region in Germany.
- Netarhat in Jharkhand is known as *"Queen of Chotanagpur"* because of its scenic beauty, pleasant climate, and dense forests.
- ***It comprises of three major plateaus:*** *Ranchi Plateau, Hazaribagh Plateau, and Koderma Plateau*
- The highest peak of the Chotanagpur Plateau is *Parasnath Hill*, located in *Jharkhand (on the name of 23rd Tirthankar)*, which rises to an elevation of *1,365 m*.
- The Damodar River flows through the center of the plateau, creating a rift valley that runs from west to east.

Marwar/Mewar Plateau

- It is located in eastern *Rajasthan*.

> ***Jaduguda mines of Jharkhand is famous for Uranium mines***

Malwa Plateau

- The plateau is an extension of the Deccan Traps and is spread across *Rajasthan* and *Madhya Pradesh*.
- It is composed of extensive lava flow and is covered with *black soil*.
- Rivers like *Mahi, Chambal, Betwa, Sindh, Ken* flow southwest to northeast of this region.

Bundelkhand

- It is spread across the states of *Uttar Pradesh* (Districts: Chitrakoot, Jhansi, Jalaun, Hamirpur) and *Madhya Pradesh*.
- ***General elevation:*** 300-600 m

Baghelkhand

- It is spread across the states of *Uttar Pradesh, Madhya Pradesh* (Districts: Rewa, Satna, Shahdol, and Sidhi).

Aravallis

- The Aravallis Range is a group of *old fold mountains* that run from southwest to northeast.
- ***General elevation:*** 800 m
- The Aravalli Range stretches from *Delhi to Gujarat*, passing through *Haryana and Rajasthan*.
- *Guru Shikhar (1722 m)* situated in *Mt. Abu Hills* is the *highest peak of Aravalli*.

> ***• Rashtrapati Bhavan is located on Raisina Hill (400-600 m) in New Delhi, India.***
> ***• Dilwara Jain Temple is located on Mt. Abu Hills in Rajasthan.***

SATPURA AND VINDHYA RANGE

Satpura Range

- It lies north of Deccan Plateau and runs parallel to Vindhya Range.
- It is a block mountain that extends through the states of *Madhya Pradesh, Maharashtra, Chhattisgarh, and Gujarat*.
- It comprises of three hills

1. ***Mahadeo Hills to the north*** → highest point of Satpura range *"Dhupgarh" (1350 m)* in *Madhya Pradesh* is located here.
2. ***Maikal Range to the east*** → highest peak of Maikal range is *Amarkantak Plateau (in Madhya Pradesh)* from where river *Narmada and Son originates*. Amarkantak (has abundant deposits of *Bauxite*) is the *meeting point of Satpura and Vindhya range*.
3. ***Rajpipla Hills*** to the west.

- ***Hill Station:*** *Pachmarhi (also known as "Queen of Satpura")*

Vindhya Range

- The Vindhya range (also a block mountain) mostly extends through the Indian states of *Gujarat, Rajasthan, and Madhya Pradesh*.

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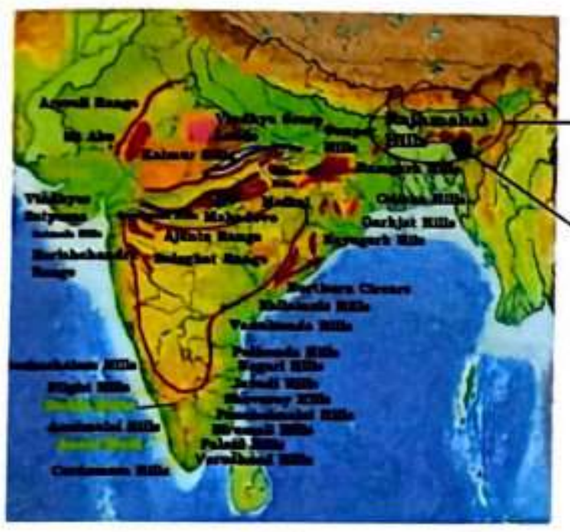
- The highest point of the Vindhya Range is known as *Sadbhawna Shikhar/ Kalumar Peak/Goodwill Peak (2467 m)*.
- *Panna* in *Madhya Pradesh* is located in Vindhya Range and is famous for its *diamond mines*.

DECCAN PLATEAU

- The Deccan Plateau is a *trigular landmass* to the south of the Narmada river and covers the southern states of *Kerala, Tamil Nadu, Andhra Pradesh, Telangana, Karnataka,* and *Maharashtra*.
- The Deccan Plateau is bordered by the *Western Ghats to the west* and the *Eastern Ghats to the east*. The Satpura Range forms its northern boundary.
- The *Mahadev, Kaimur, and Maikal* ranges form its eastern extensions.
- It is higher in the west and slopes gently eastward (the rivers in this region flow towards east).
- An extension of the Plateau is also visible in the northeast, locally known as the *Meghalaya Plateau, Karbi-Anglong Plateau* and *North Cachar Hills*.



Marks the northeastern boundary of Deccan Plateau

Malda fault/Malda gap separates entire part of Deccan Plateau from Karbi Anglong Plateau/Meghalaya Plateau/North Cachar Plateau

(A)

- *Garo, Khasi and Jaintia Hills are part of Meghalaya Plateau.*
- *Mikir and Rengma Hills are part of North Cachar Hills.*

(B)

Map 2: (A) Plateaus; (B) Mountain Ranges in North-East

WESTERN AND EASTERN GHATS

- The Western Ghats and the Eastern Ghats mark the western and the eastern edges of the Deccan Plateau respectively.
- These are *block mountains*.
- The Western and Eastern Ghats *meet at Nilgiri Hills* in *Tamil Nadu*.

Western Ghats	*Eastern Ghats*
They are continuous and can be crossed through passes only	They are discontinuous, irregular and dissected by rivers
Average height: 1200 m (higher than Eastern Ghats)	Average height: 600 m (lower and narrower than Western Ghats)
They stretch from Tapi to south of Nilgiri Hills	They stretch from Mahanadi Valley to the Nilgiri Hills in the south
They spread across Gujarat, Maharashtra, Karnataka, Kerala, Tamil Nadu, Goa	They spread across Odisha, Telangana, Andhra Pradesh, Karnataka, Tamil Nadu
Highest peaks: *Anamudi (2695 m → on Annamalai Hills)* in *Kerala* and *Doddabetta (2637 m → on Nilgiri Hills)* in *Tamil Nadu*	Highest peak: *Jindhagada (1690 m)* and *Mahendragiri (1501 m → in Odisha)*
In Maharashtra, they are known as Sahyadri Hills	
Their height increases from North to South	

Passes in Western Ghats

- ***Thal Ghat:*** It connects *Mumbai to Nasik*.
- ***Bhor Ghat:*** It connects *Mumbai to Pune*.
- ***Pal Ghat (Palakkad Gap):*** It connects (*Nilgiri* to *Annamalai*) and *Coimbatore (Tamil Nadu)* to *Palakkad (Kerala)*.

Some Famous Hills

- *Dhinodhar Hills:* ***Maharashtra.***
- *Kalsubai Peak:* ***Maharashtra.***
- *Mt. Saramati:* ***Nagaland.***
- *Shatrunjaya Hills:* ***Gujarat.***
- *Ananthagiri Hills:* ***Andhra Pradesh (Borra Caves are situated in these hills).***

For an interactive recap of this topic, see the crossword on Page Number 37.

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NORTHERN PLAINS

Formation of Northern Plains

- The Northern Plains are *flat, fertile lands* formed by the deposition of alluvial soil from the Himalayan river system namely ***Indus, Ganga, and Brahmaputra***.
- The deposited material forms a vast and fertile stretch of land, ideal for farming.

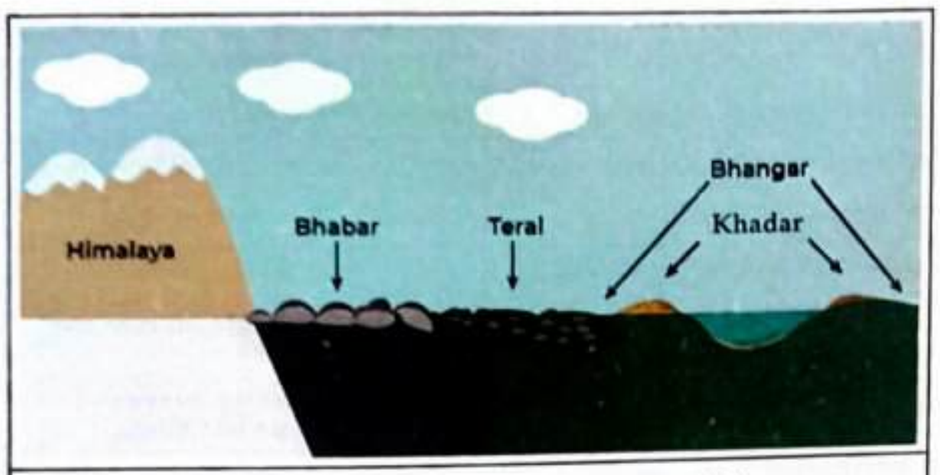


Fig 1: Physiographic Divisions of Northern Plains

Classification of Northern Plains

1. **Bhabar**

- It is a *narrow belt (8-16 km wide)* lying south of the *Shiwaliks*.
- River coming down from the mountains deposit stones and pebbles, due to which it disappears.
- This region is *not suitable for agriculture* due to *excessive porosity*.

2. **Terai**

- It lies south of the Bhabar region *(width: 15-30 km)*.
- *Streams reappear* as they seep through the Bhabar layer, forming a *marshy area*.
- Terai region is rich in lush green vegetation and fertile soil, making it *suitable for agriculture*.
- ***Important National Parks in the Terai Region:*** *Jim Corbett National Park* (Uttarakhand), *Dudhwa National Park* (Uttar Pradesh), *Valmiki National Park* (Bihar), *Rajaji National Park* (Uttarakhand), *Chitwan National Park* (Nepal)

3. **Alluvial Flood Plains**

- The fertile lands formed by the deposition of river sediments. They are divided into:

Khadar (New Alluvial Soil)

- It is newly deposited *floodplain*, renewed annually by river floods.
- Khadar is *more fertile than Bhangar*, suitable for *intensive farming*.

Bhangar (Old Alluvial Soil)

- It is *older, elevated floodplain* with deposits over thousands of years.
- The region has *more calcareous (kankar-rich)* deposits, making it less fertile.

COASTAL PLAINS OF INDIA

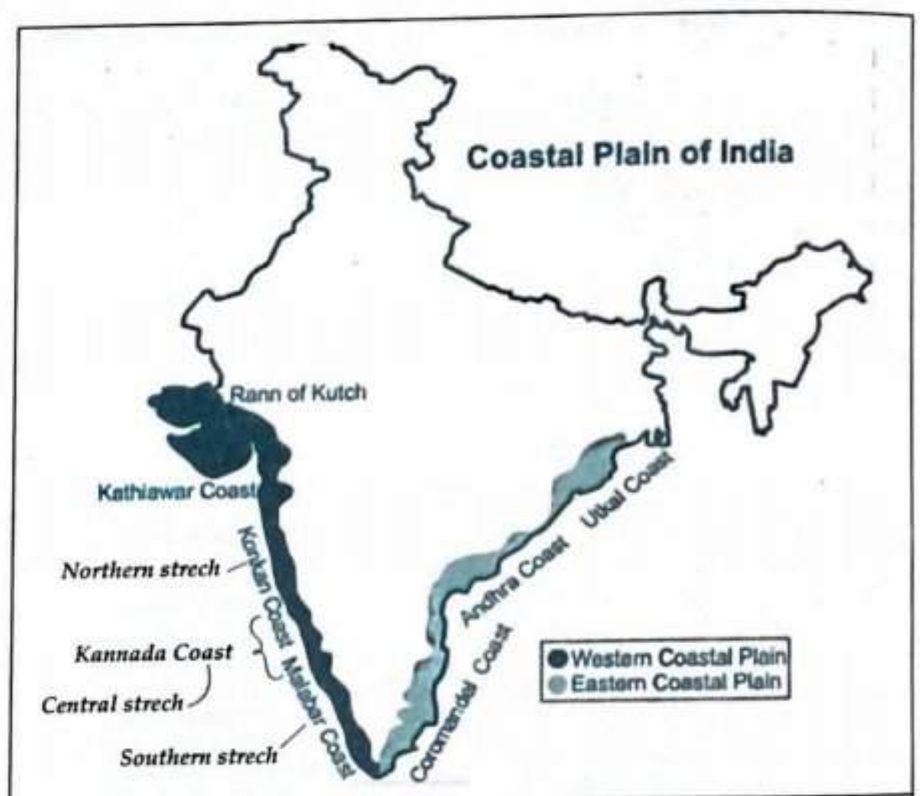
- India has two major coastal plains along the *Arabian Sea and the Bay of Bengal*. The coastal regions play a key role in trade, tourism, and port development.

Western Coastal Plains

- They are narrow in the middle, wider at the ends *(Dumbbell-like shape)*.
- The Western Coastal Plains of India are called *submerged coastal plains* because a part of the land near the coast has sunk below sea level over time.
- Rivers do not form deltas because they flow quickly into the sea.
- They are famous for formation of *backwaters (Kayals)*. ***E.g. Punnamada Kayal in Kerala (famous for the Nehru Trophy Boat Race)***.

Eastern Coastal Plains

- The Eastern Coastal Plains lie along the *Bay of Bengal* and stretch from *West Bengal to Tamil Nadu*.
- They are wider than the Western Coastal Plains and have *emerging coastline* with *large river deltas*.
- They are formed by rivers like *Ganga, Mahanadi, Godavari, Krishna, and Kaveri* that bring soil and deposit it along the sediments.
- It is not much suitable for port development.



Map 1: Western and Eastern Coastal Plains

PORTS

Classification of Indian Ports

Major Ports

- ***Total major ports: 13***
- ***Public Ports: 12 (ownership and management by Central Government)***
- ***Privately managed port: 1 → Kamarajar port*** (located in Ennore in Tamil Nadu) is the *only corporate-owned port by GOI*.

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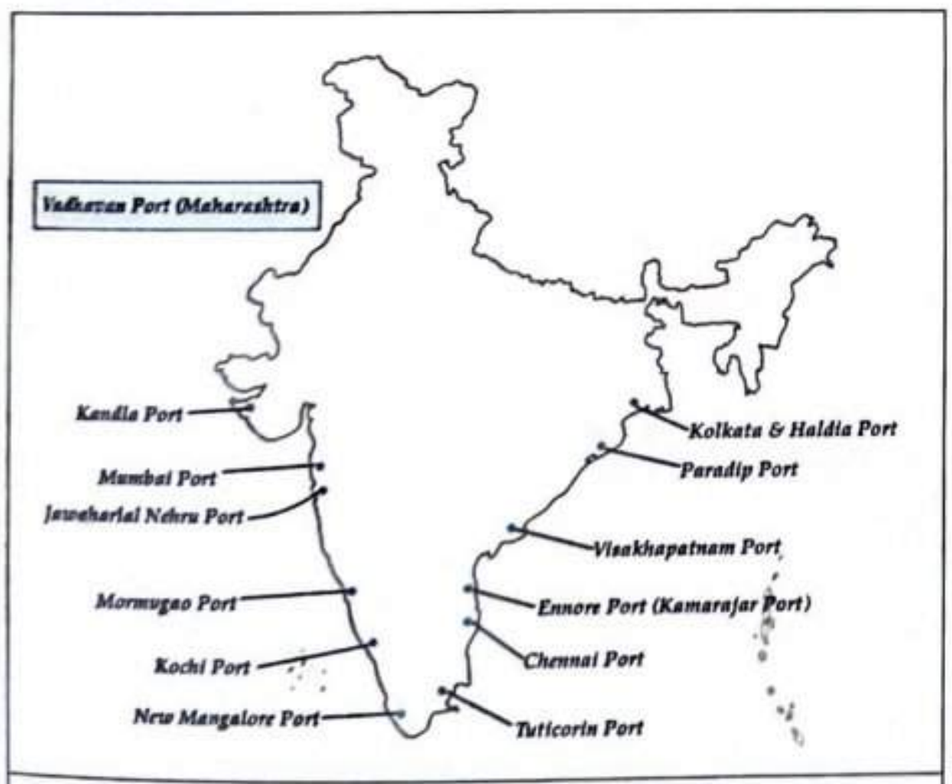
Vizhinjam International Seaport (in Kerala) is the first transhipment port in India.

13 Major Ports of India

Port Name	Location	Special Features
Kandla Port (Deendayal Port)	Gujarat	Tidal port
Mumbai Port	Maharashtra	Largest natural harbour
Jawaharlal Nehru Port (Nhava Sheva Port)	Maharashtra	Largest container port in India/Satellite port
Mormugao Port	Goa	On the estuary of Zuari river
Mangalore (New Mangalore port)	Karnataka	
Cochin Port	Kerala	It is also known as *"Queen of Arabian Sea"*
Ennore Port (Kamarajar Port)	Tamil Nadu	India's first corporate port
Chennai	Tamil Nadu	India's southernmost port
Tuticorin Port (V.O. Chidambaranar Port)	Tamil Nadu	
Vishakhapattnam Port	Andhra Pradesh	Deepest landlocked port in India
Paradip Port	Odisha	
Kolkata Port (Shyama Prasad Mukherjee Port)	West Bengal	India's only riverine port (also the oldest port developed by British)
Haldia Port	West Bengal	It is also known as *"Diamond Harbour"*



Map 2: Major ports in India

Great Indian Desert (Thar Desert)

- The Thar Desert lies to the northwest of the *Aravalli Range*.
- It experiences *low rainfall* (about 150 mm per year).
- Summers are extremely hot, while winters are cold and dry.
- It is also known as *"Marusthali"* meaning *"Land of Dead"*.
- Most rivers here are ephemeral, meaning they only flow during the rainy season.

ISLANDS

- An island is a piece of land that is completely surrounded by water and is smaller than a continent.

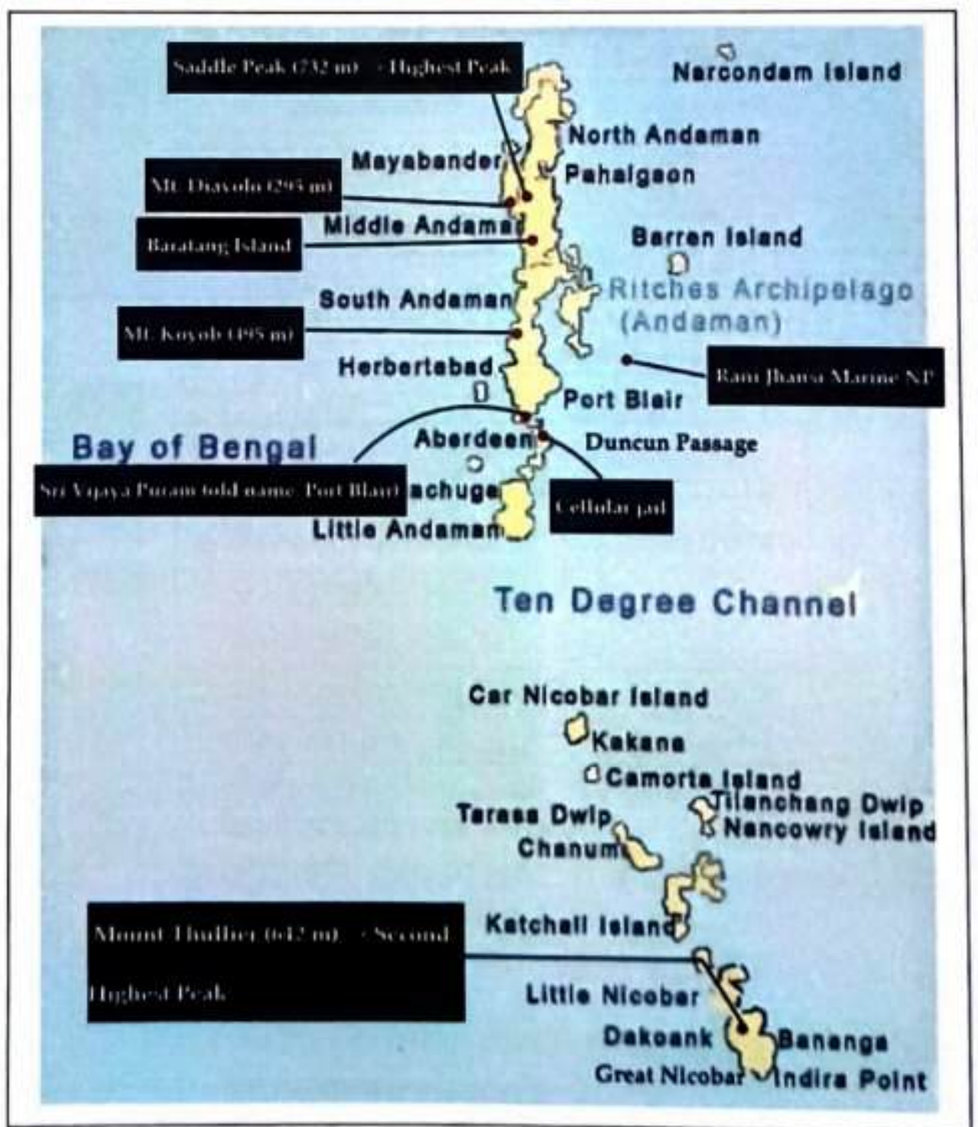
Islands of India

- ***India has two major island groups: Lakshadweep Islands*** (in the Arabian Sea) and *Andaman & Nicobar Islands* (in the Bay of Bengal).

1. ***Lakshadweep Islands:*** It was formed from coral deposits, making them classified as *"coral islands"*.
   - ***Total islands:*** *36.*
   - ***Largest island:*** *Androtti Island.*
   - ***2nd largest island:*** *Minicoy.*
2. ***Andaman and Nicobar Islands:*** They are considered as a submerged extension of the *Arakan Yoma mountain range (Myanmar).*
   - ***Total Islands:*** *572.*
   - ***Largest Island:*** *Great Nicobar.*

ANDAMAN & NICOBAR ISLANDS

Highest Peaks in Andaman and Nicobar Islands



Map 3: Andaman and Nicobar Islands

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Important Passages and Channels

Channel/Passage	Separates
10° channel	Andaman and Nicobar group of islands OR Little Andaman and Car Nicobar
Duncan Passage	South Andaman and Little Andaman
Coco Channel	A&N Islands and Myanmar

Indigenous Tribes

- ***Andaman:*** North Andamanese, Jarawa, Onge, Senthalese.
- **Nicobar:** Shompen, Nicobarese.

Renamed Islands in Andaman & Nicobar

- ***Ross Island → Netaji Subhas Chandra Bose Island.***
- ***Neil Island → Shaheed Dweep.***
- ***Havelock Island → Swaraj Dweep.***

National Park	Location
Saddle Peak NP	North Andaman
Mount Harriet NP	South Andaman
Mahatma Gandhi NP	South Andaman
Rani Jhansi Marine NP	Ritchie's Archipelago
North Button Island NP	North Andaman
Middle Button Island NP	Middle Andaman
South Button Island NP	South Andaman
Campbell Bay NP	Great Nicobar
Galathea Bay NP	Great Nicobar

LAKSHADWEEP

Important Channels of Lakshadweep

Channel/Passage	Separates
8° channel	Lakshadweep and Maldives OR Minicoy and Maldives
9° channel	Lakshadweep and Minicoy
11° channel	Aminidivi and Cannanore

Important Disputed Islands

- ***New Moore Island:*** Between *India* and *Bangladesh.*
- ***Kachchatheevu Island*** (small uninhabited island in *Palk Strait*) : Between *India* and *Sri Lanka.*
- ***Sir Creek Line:*** Between *India* and *Pakistan.*

Important Indian Islands

- ***APJ Abdul Kalam Island*** (earlier known as *Wheeler Island*): *Chandipur, Odisha* → *Missile testing site.*
- ***Alia Bet Island:*** *Gujarat* → River island in the delta of *Narmada river* (situated near *Gulf of Khambhat*).
- ***Pamban Island:*** *Tamil Nadu* → It is also known as *Rameshwaram Island* (Ram Setu bridge connects Rameshwaram to Mannar Island of Sri Lanka).
- ***Gulf of Mannar:*** It is between south-eastern tip of *India and West coast* of *Sri Lanka* in *Coromandel coast* region.
- *Parikud island:* Odisha.

Some Facts

- The southwestern portion of *Palk Strait* is *Palk Bay.*
- *Satish Dhawan Space Centre (SDSC)* → in *Sriharikota, Andhra Pradesh,* is the primary launch site of the Indian Space Research Organisation *(ISRO).*
- On January 23, 2023, *PM Narendra Modi* renamed *21 unnamed islands* of Andaman and Nicobar in honor of *Param Vir Chakra (PVC) awardees.*
- *Pygmalion Point,* now known as *Indira Point,* is the *southernmost point* of Indian territory that is located in the *Great Nicobar Island* of *Andaman and Nicobar Islands.*

For an interactive recap of this topic, see the crossword on Page Number 37.

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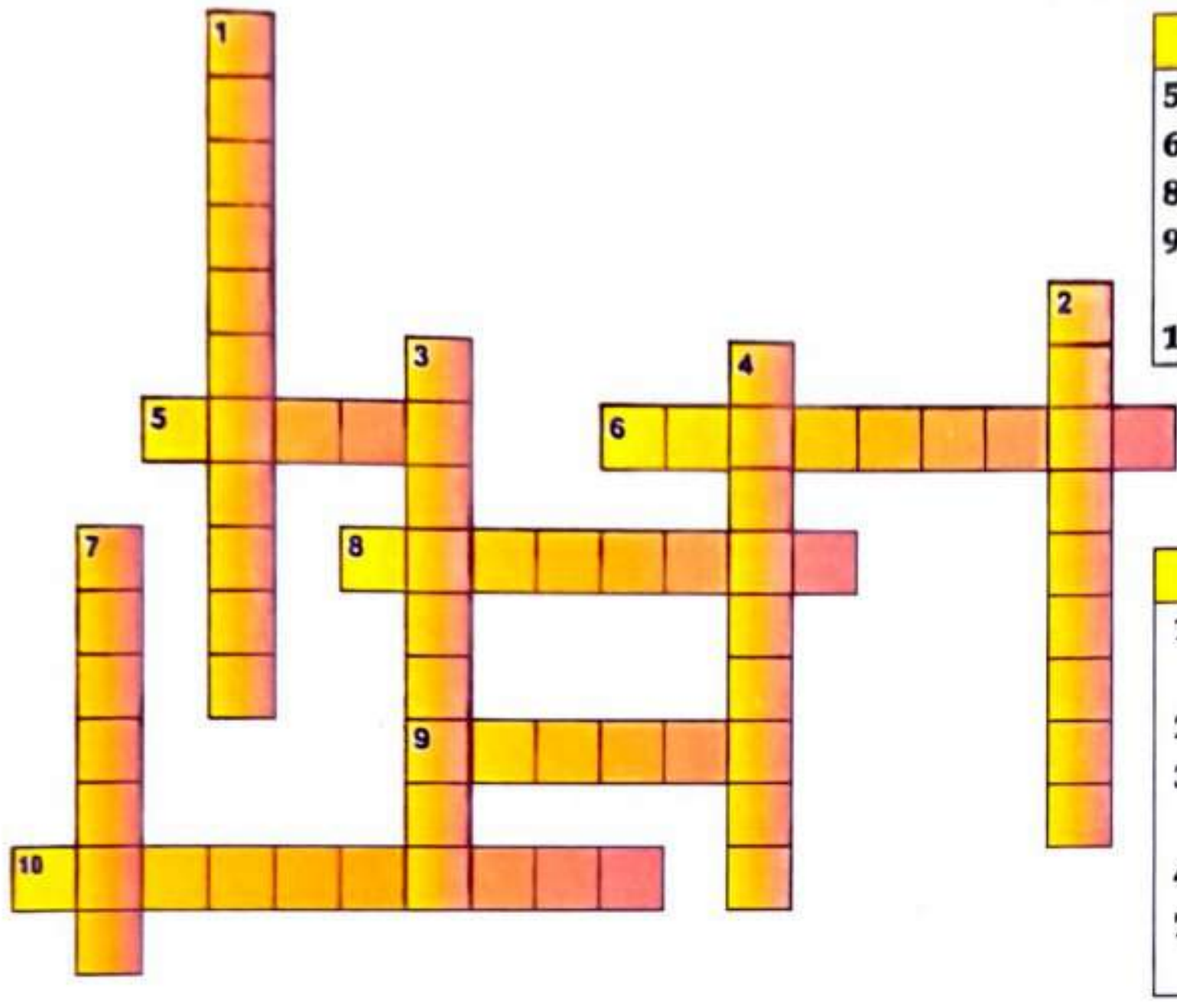
PARMAR'S CROSSWORD

PENINSULAR PLATEAUS



Across

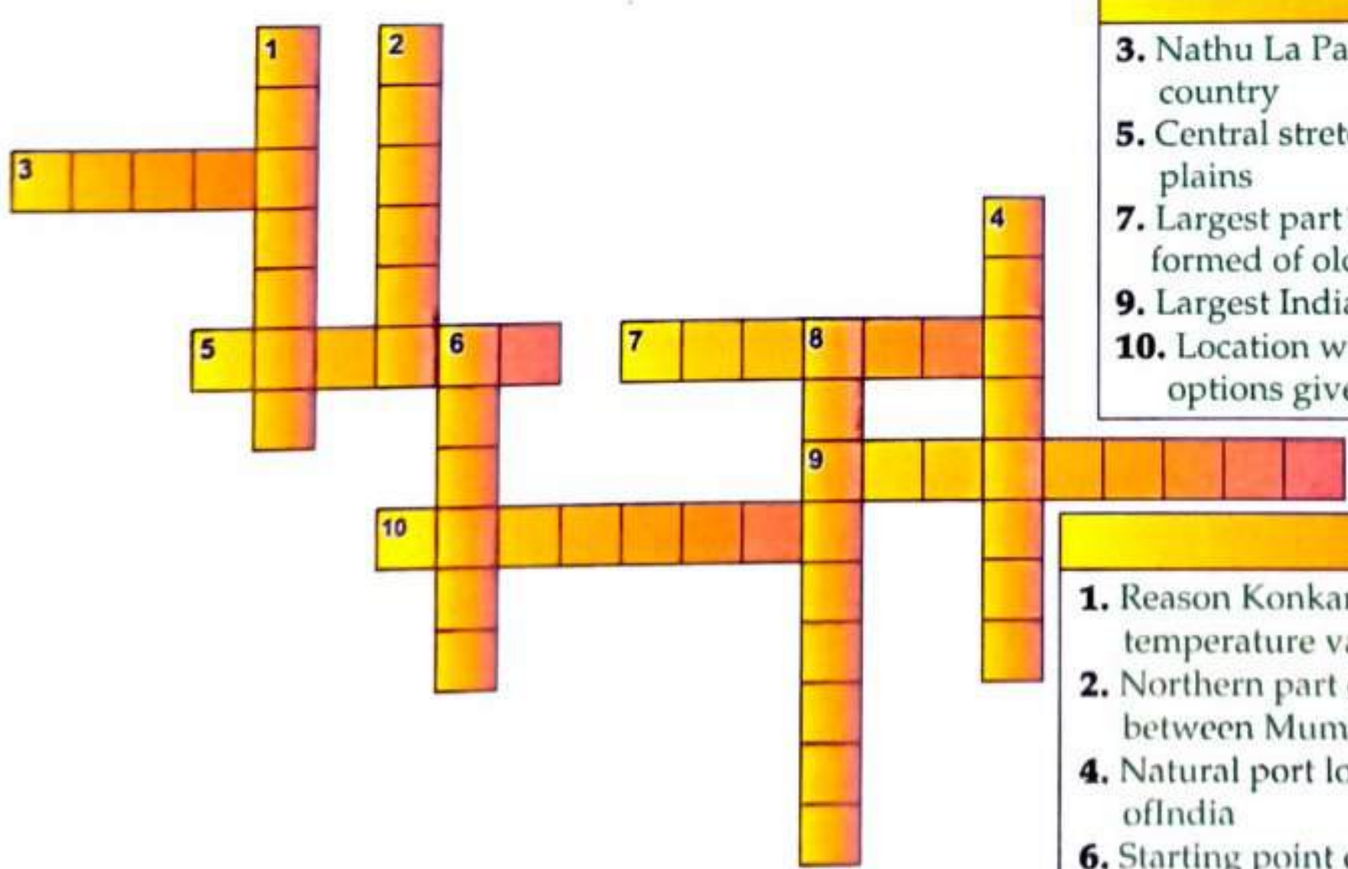
5. Plateau located in Madhya Pradesh
6. Location of Palamu Plateau
8. Range near Bhimbetka rock shelters
9. Continent Peninsular plateau was part ofearlier
10. Shape of Deccan Plateau

Down

1. Region where Mundari language is spoken
2. Highest peak of West Bengal
3. State where Shevaroy Hills are located
4. Highest peak of Jharkhand
7. Hills where Western and Eastern Ghats meet

PARMAR'S CROSSWORD

NORTHERN PLAIN AND ISLANDS



Across

3. Nathu La Pass connects India to this country
5. Central stretch of the western coastal plains
7. Largest part of the northern plains formed of older alluvium
9. Largest Indian state by area
10. Location with highest altitude among options given

Down

1. Reason Konkan coast avoids extreme temperature variations
2. Northern part of western coastal plain between Mumbai and Goa
4. Natural port located along the west coast ofIndia
6. Starting point of plains stretching to Sundarbans
8. Natural habitat of White-bellied Heron

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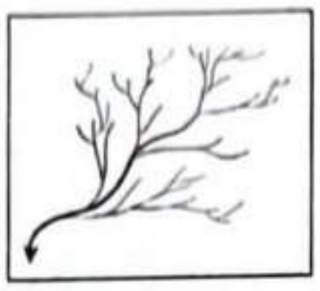
DRAINAGE PATTERN

• Drainage pattern refers to the system of flow of surface water mainly through the forms of rivers and basins.
• The drainage system depends upon factors such as slope of land, geological structure, amount of volume of water and velocity of water.

Different Drainage Patterns

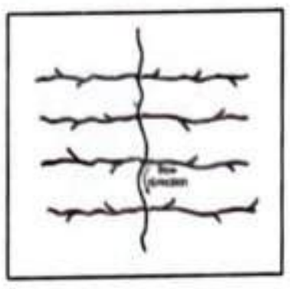
There are four types of drainage patterns formed by a river: Dendritic, Trellis, Radial, and Centripetal pattern.

Dendritic



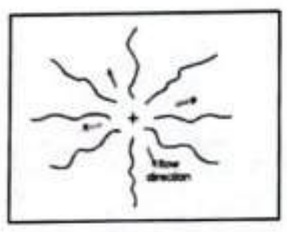
• The most common drainage pattern that resembles a *tree's branching roots*.
• It occurs when a stream receives water from tributaries, which are fed by smaller tributaries.
Tributaries join larger streams at *acute angles* (less than 90°).
E.g. The rivers of the Northern Plains: Indus, Ganga and Brahmaputra.

Trellis



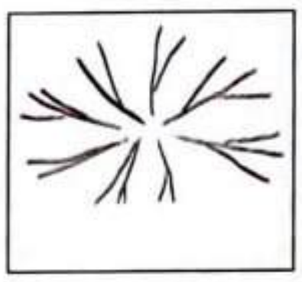
• This type of drainage pattern is formed when primary tributaries of main rivers flow *parallel to each other* and secondary tributaries join them at *right angles*.
E.g. The rivers in the upper part of the Himalayan region: Indus, Ganga and Brahmaputra.

Radial



• This type of drainage pattern is a pattern of streams and rivers that radiate outward from a central high point. It's common around volcanoes and other conically shaped features.
E.g. The rivers like Narmada, Son and Mahanadi originating from Amarkantak Hills are examples of drainage pattern.

Centripetal



• It is just the opposite of the radial pattern.
The streams flow toward a *central depression/basin.*
E.g. Loktak Lake (Manipur).

INDIAN DRAINAGE SYSTEM

The Indian river system can be broadly classified as:

1. *Himalayan River System*
2. *Peninsular River System*

Himalayan River System

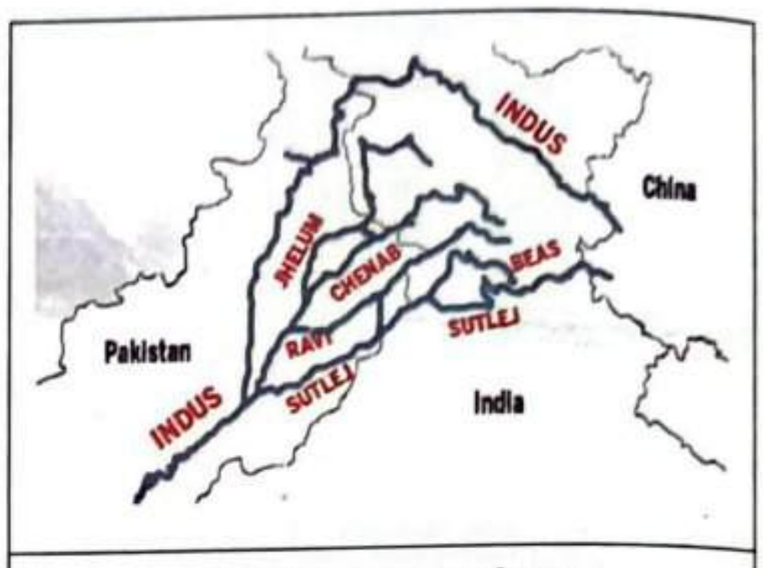
• They are *perennial* rivers (flow throughout the year) and they do not depend on monsoon for their water flow.
• They originate from *glaciers* in the Himalayas.
• They have long courses from source to the sea.
• Three major Himalayan Rivers are: *Indus, Ganga, Brahmaputra* (originating from northern mountain ranges).
• Some Himalayan rivers are *antecedent* (they follow their original course despite geological changes). *E.g. Sutlej, Kosi, Indus, Ganga.*

Peninsular River System

• They are *ephemeral* (they are seasonal rivers).
• They have shorter and shallower course.
• Some major Peninsular Rivers are: *Narmada, Tapi, Godavari, Krishna, etc.*

Now, Let us Learn about Himalayan Rivers.

INDUS RIVER SYSTEM



Map 1: Indus River System

• ***Length:*** *2,880 km* (1,114 km in India)
• ***Origin:*** *Bokhar Chu Glacier* (Tibet) in the Kailash mountain range near Lake Mansarovar and it enters India at *Demchok* (Ladakh).
• ***Flows through:*** China → India → Pakistan
• ***Drains into:*** Arabian Sea
• In Tibet, it is known as *'Singi Khamban'* (meaning: Lion's mouth).

Tributaries:

• ***Left Bank:*** Jhelum, Chenab, Ravi, Beas, Sutlej
• ***Right Bank:*** Shyok, Gilgit, Hunza.
• *Leh* is located on the banks of Indus river.

Indus Water Treaty (1960)

This treaty was signed between *India and Pakistan* in Karachi (mediated by *World Bank*). It has been *suspended by India* in **2025** after *Pahalgam attack.*

The Treaty Allocates the Rivers to the Countries:

• ***Western Rivers:*** Indus, Jhelum, and Chenab to *Pakistan* (80% water used by Pakistan and 20% used by India)
• ***Eastern Rivers***: Ravi, Beas, and Sutlej to *India* (80% water used by India and 20% used by Pakistan)

• **Doab:** It refers to the area of land situated between two rivers.

Doabs Formed

• *Indus + Jhelum: Sindh Sagar Doab.*
• *Jhelum + Chenab: Jech Doab.*
• *Chenab + Ravi: Rechna Doab.*
• *Ravi + Beas: Bari Doab.*
• *Beas + Sutlej: Bist Doab.*

> ***Panchnad:*** *It refers to the confluence of five rivers in Punjab → Jhelum, Chenab, Ravi, Beas, Sutlej*

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Tributaries of Indus River

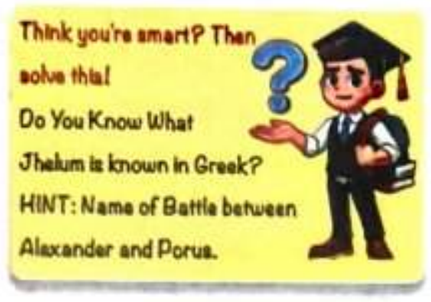
Jhelum

- Jhelum river meanders in its youthful stage.
- *Ancient Name:* Vitasta
- *Origin:* Verinag (Jammu & Kashmir)
- Srinagar is located on the bank of Jhelum river.
- Wular lake *(largest freshwater lake in India)* is fed by Jhelum river.

> *Jhelum is also known as "Vyath" in Kashmir.*

Chenab

- Chenab river is formed by the confluence of two rivers → *Chandra* and *Bhaga* in Lahaul Valley.
- *Ancient Name:* Askini
- *Origin:* Baralacha La Pass
- *It is the largest tributary of Indus.*



Ravi

- *Ancient Name:* Purushni
- *Origin:* Rohtang Pass
- It is a *transboundary* river → it flows through both *India* and *Pakistan*.

Beas

- *Ancient Name:* Bipasha
- *Origin:* Rohtang Pass
- It is the only tributary of Indus that *does not enter Pakistan*. It joins Indus near *Harike* (Punjab).

Sutlej

- *Ancient Name:* Shutudri
- *Origin:* Rakshastal Lake (Mansarovar Lake, Tibet)
- It enters India through Shipki La Pass.
- *It is the longest tributary of Indus river.*
- In Tibet it is known as *Langquen Zangbo*.

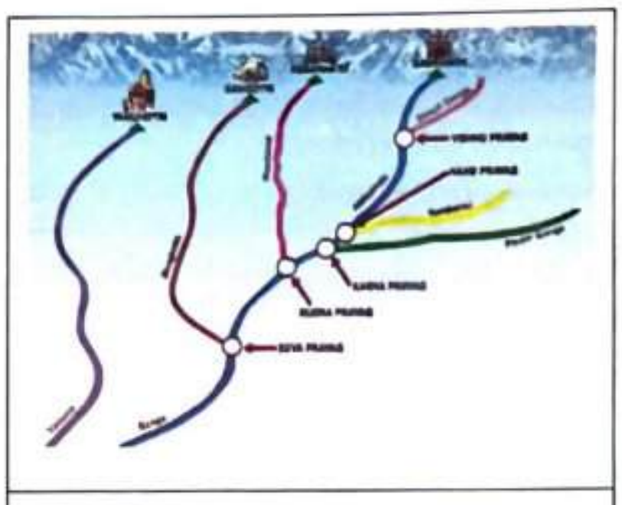
GANGA RIVER SYSTEM

Map 2: Ganga River System

- *Length:* 2,525 km (*longest* river and has the *largest* river basin in India).
- *Origin:* *Gangotri Glacier* (Gaumukh, Uttarakhand).
- *Drains into:* Bay of Bengal
- Ganga was declared as *National river of India* in *2008*. The water from Ganga stored in bottle remains fresh due to the presence of *Bacteriophage viruses*.
- Endangered species found in Ganga: *Susu Dolphins*
- *It passes through: Uttarakhand, Uttar Pradesh (longest), Bihar, Jharkhand (shortest),* and *West Bengal*
- *Major cities on the banks of Ganga: Kanpur → Prayagraj → Varanasi → Patna (in west to east order).*

Famous Confluences (Prayags) Formed:

- *Devprayag:* Alaknanda + Bhagirathi (meets to form Ganga).
- *Rudraprayag:* Alaknanda + Mandakini.
- *Karnaprayag:* Alaknanda + Pindar.
- *Nandaprayag:* Alaknanda + Nandakini.
- *Vishnuprayag:* Alaknanda + Dhauliganga.



Map 3: The Famous Five Prayags

- Ganga splits into two branches near *Murshidabad, West Bengal* → *Padma river* (flows through *Bangladesh*) and *Bhagirathi-Hugli river* (flows through *West Bengal*).
- The Ganga is known as Padma (in Bangladesh), where it meets *Brahmaputra (Jamuna)* to form *Meghna* river and finally drains into *Bay of Bengal* forming *Sunderban Delta*.

Farakka Agreement (1996)

- It is a treaty between *India* and *Bangladesh* to share the Ganges river water at the *Farakka Barrage* where it divides into *Hugli* river.
- *Mayurkashi, Kangsabati, Damodar,* and *Rupnarayan* are tributaries of Hugli.

Tributaries of Ganga

Right Bank Tributaries

Yamuna

- *Length:* 1,370 km (*longest* tributary of Ganga in the Northern Plains).
- *Origin:* *Yamunotri Glacier, Banderpoonch Peak* (Uttarakhand).
- *Tributaries:* Chambal, Sindh, Betwa, Ken, Tons (largest tributary of Yamuna).

> **Chambal River**
>
> - Originates from *Mhow Plateau* (Janapav Hills) of *Madhya Pradesh*.
> - It is well-known for its *badland topography* (due to ravines formed by gully erosion).
> - *Tributaries:* Banas, Shipra, Kalisindh, Parvati

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Son/Sone River

- ***Origin:*** Amarkantak Plateau (it forms a radial drainage pattern).
- ***Tributaries:*** North Koel, Rihand
- It joins at just above Patna.

Punpun

- ***Origin:*** Palamu district of Jharkhand.
- It joins Ganga at *Fatuha* near Patna.

> - ***Ganga Plains lies between Ghaggar and Teesta river.***
> - ***River Ganga divides Bihar into two parts.***

Left Bank Tributaries

Gomti

- ***Origin:*** Fulhar lake (Uttar Pradesh).
- It joins Ganga at *Kaithi, Ghazipur* (Uttar Pradesh).

Ghagra

- ***Origin:*** Mapchachungo glacier (Tibet).
- It is also known as *Karnali* in Nepal.
- It joins Ganga at *Chapra* (Bihar).
- ***Tributaries:*** *Sharda, Tila, Seti, Beri.*

> **Sharda** *(Goriganga)*
> - ***Origin:*** Milam Glacier.
> - It is also known as *Kali* river.

Gandak

- ***Origin:*** Nhubine Himal glacier (Nepal).

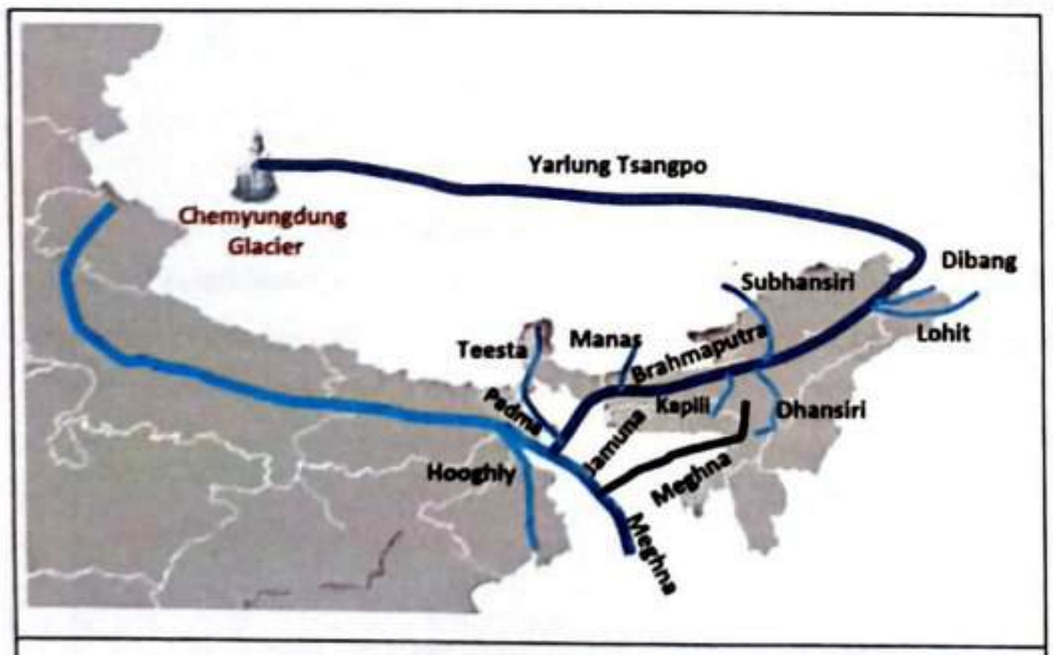
Kosi

- ***Origin:*** Nepal Himalayas. It is formed by the confluence of Sun Kosi, Arun Kosi, Tamur Kosi.
- It is also known as *"Sorrow of Bihar"*, as it brings frequent floods.
- It joins Ganga at *Katihar* district (Bihar).

Ramganga

- ***Origin:*** Doodhatoli ranges (Pauri Garhwal).

BRAHMAPUTRA RIVER SYSTEM



Map 4: Brahmaputra River System

- ***Length:*** *2,900 km* (length in India: 916 km)
- ***Origin:*** *Chemayungdung Glacier/Angsi Glacier, Tibet*
- It makes the easternmost boundary of the Himalayas.

Major Tributaries:

- ***Left Bank:*** Lohit, Dhansiri, Dibang
- ***Right Bank:*** Kameng, Manas, Teesta, Subansiri, Sankosh.
- The Brahmaputra river takes a sharp U-turn at *Namcha Barwa* (Tibet) and enters Arunachal Pradesh and then it takes a South turn at *Dhubri (Assam).*

> ***Names in Different Regions***
> - ***Tibet: Yarlung Tsangpo***
> - ***Arunachal Pradesh: Siang/ Dihang***
> - ***Assam: Brahmaputra***
> - ***Bangladesh: Jamuna***

- *Majuli* (world's largest river island) and *Umananda* (world's smallest river island) is located on the Brahmaputra river.
- It forms *Sundarbans Delta* (largest delta in the world).
- The *Barak* river originating in Manipur hills, enters Bangladesh as *Surma* and *Kushiyara* rivers and later, the river is known as *Meghna* where it receives the combined flow of the *Padma* (Ganga in India) and *Jamuna* (Brahmaputra in India) rivers.
- The region of Ganga-Brahmaputra Basin lies between *10°N-30°N* latitude.
- The *Dhola-Sadiya Bridge* also known as *Bhupen Hazarika Bridge* connecting *Assam* and *Arunachal Pradesh*, spans over *Lohit* river.

Cities on River

Cities	*River*
Lucknow	Gomati
Kanpur/Allahabad/Varanasi/Patna	Ganga
Delhi/Agra	Yamuna
Jabalpur	Narmada
Ahmedabad	Sabarmati
Surat	Tapi
Ayodhya	Sarayu
Dibrugarh (Assam)	Brahmaputra
Ujjain	Shipra
Nasik	Godavari
Amravati	Krishna
Kolkata	Hugli
Lucknow	Gomti
Hyderabad	Musi
Kota/Gwalior/Dholpur	Chambal
Srinagar	Jhelum
Ludhiana	Sutlej
Jamshedpur	Subarnarekha
Vijayawada	Krishna

For an interactive recap of this topic, see the crossword on Page Number 43.

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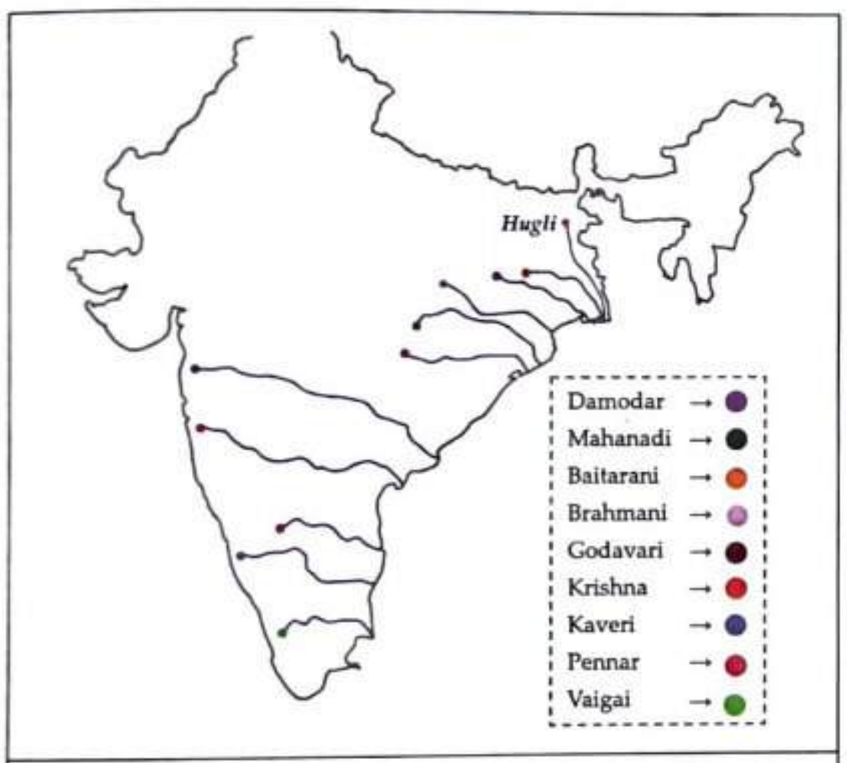
PENINSULAR RIVERS

• The Peninsular Rivers originate in the Deccan Plateau, flowing into the Bay of Bengal or the Arabian Sea. They are seasonal/ephemeral, relying on monsoon rains, with shorter courses and gentler slopes than Himalayan Rivers.

Based on the direction of flow, they are divided into two categories

1. ***East Flowing Rivers:*** These rivers flow from *West to East* due to the naatural tilt of the Deccan Plateau and drain into the *Bay of Bengal*. They *form delta*. ***E.g. Damodar, Subarnarekha, Mahanadi, Godavari, Kaveri, Krishna, Pennar, Baitarani and Brahmani***
2. ***West Flowing Rivers:*** These rivers flow from *East to West* and drain into the *Arabian Sea*. They *form estuary*. ***E.g. Narmada, Tapti, Mahi, Sabarmati, and Luni rivers***

EAST FLOWING RIVERS



Map 11: East flowing Peninsular Rivers

Damodar

• The Damodar River originates and *flows through the rift valley* in the Chotanagpur Plateau of Jharkhand.

• It flows through Jharkhand and West Bengal before joining the Hugli river (a distributary of the Ganga).

• It is also known as *"Sorrow of Bengal"* because of devastating floods it causes in West Bengal.

• ***Tributaries:*** Bokaro, Barakar, Konar.

Subarnarekha

• Subarnarekha river originates in the *Ranchi Plateau of Jharkhand*.

• It flows through Jharkhand, West Bengal, and Odisha.

• The river's sand contains gold particle, which is why it is named Subarnarekha (meaning "Streak of Gold").

Biatarani

• Baitarani river originates from Gonasikha/Guptaganga hills in Odisha.

Brahmani

• It is formed by the confluence of the Sankh and South Koel rivers near Rourkela, Odisha (later joins Baitarani to form a delta).

Some Important Facts

• *APJ Abdul Kalam Islands* (formerly known as Wheeler Islands) is located near the mouth of Dhamra river (the confluence of Baitarani and Brahmani).

• *Bhitarkanika National Park* in Odisha is located in the delta of the Brahmani, Baitarani, and Dhamra rivers.

• *Gahirmatha Marine Sanctuary* (world's largest) and *Rushikulya beach* (second largest) are the largest nesting site for *Olive Ridley Turtles* in India.

Mahanadi

• Mahanadi river is 900 km in length and is the *3rd largest* Peninsular river.

• Mahanadi river originates from *Sihawa hills in Chhattisgarh.*

• The River flows through *Chhattisgarh* and *Odisha* before draining into Bay of Bengal. Its basin extends across Jharkhand, Maharashtra, and Madhya Pradesh.

• ***Tributaries:*** Tel, Jonk, Ong, Hasdeo, and Mand.

• *Hirakud Dam (in Odisha)* → India's largest dam.

Godavari

• The length of Godavari river is 1465 km and is the *largest Peninsular river of South India*.

• It is also known as *"Dakshin Ganga"* or *"Vridha Ganga"*.

• The Godavari river originates from *Trimbakeshwar Plateau* (Western Ghats) in Nasik, Maharashtra.

• It flows through Maharashtra, Chhattisgarh, Telangana, and Andhra Pradesh.

• The decommissioned Havelock Bridge has been built over Godavari river.

TRICK TO REMEMBER TRIBUTARIES *(M S WWI PPP)*

M	*S*	*W*	*W*	*I*	*P*	*P*
Manjira	*Sabari*	*Wainganga*	*Wardha*	*Indravati*	*Penganga*	*Purna*

P
Pranhita

Gautami river is a branch of Godavari that joins Bay of Bengal through Yanam enclave.

Krishna

• The length of Krishna river is 1400 km and is the *second longest river of South India*.

• It originates from the Western Ghats at Mahabaleshwar in Maharashtra.

• It flows through Maharashtra, Karnataka, Telangana and Andhra Pradesh.

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• *Tributaries:* Bhima, Tungabhadra, Ghataprabha, Malaprabha, Musi, Koyna, Dudhganga, Yerla, Warna and Dindi.

Pennar

• The Pennar river originates from *Nandi Hills, Karnataka (Chikkaballapura).*

• It is also known as 'Uttara Pinakini'.

• It is an *independent flowing river* of Andhra Pradesh.

Kaveri

• The length of Kaveri river is 800 km.

• It originates from *Brahmagiri Hills, Kodagu district, Karnataka.*

• It flows through Karnataka, Tamil Nadu, Kerala and Puducherry.

• It is the only river of South India that flows throughout the year (Perennial river).

• It is known as *"Ganga of South India"* (the flow of the river is like Ganga and the tributaries resemble Ganga).

• *Tributaries:* Hemavati, Kabini, Bhavani, Shimsha, Amaravati.

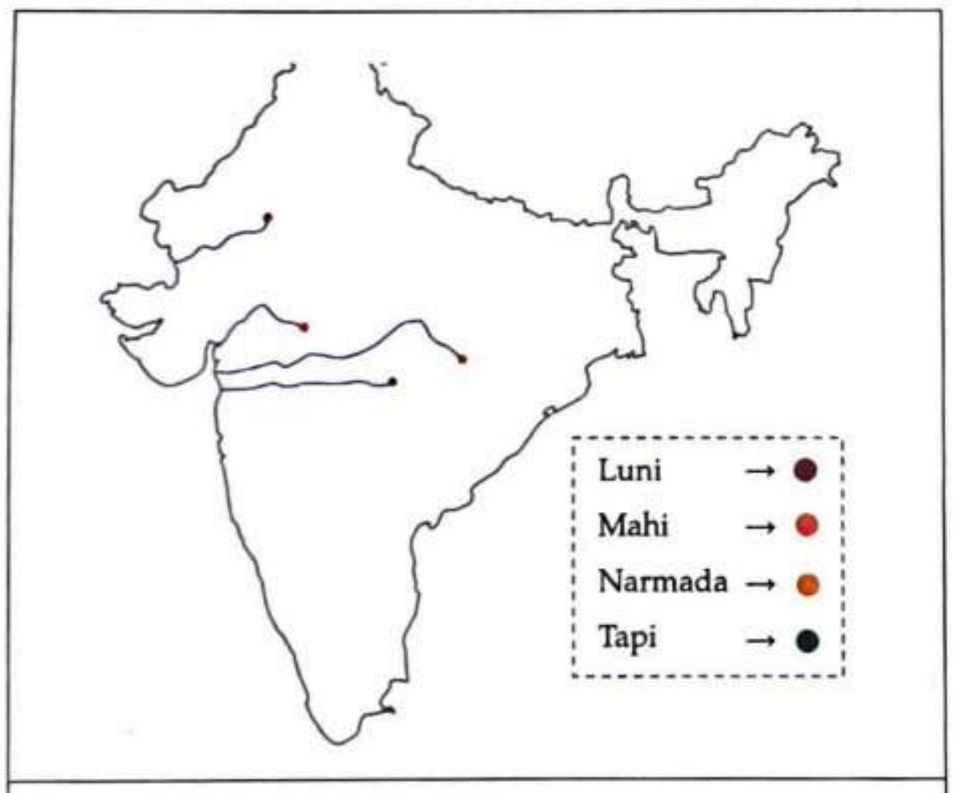
• The Kaveri delta is known as *"Granary of South India".*

• It is known as *"Ponni"* in *Tamil Nadu.*

Vaigai

• It is the *southernmost river* of India.

WEST FLOWING RIVERS



Map 10: West flowing Peninsular Rivers

Luni

• It is also known as "Lavanavari" or "Lavanavati" river.

• The Luni river originates from *Nag Pahar/Nag hills* in the Ajmer district of Rajasthan.

• It flows through Rajasthan and Gujarat.

• The Luni River is an *endorheic river,* meaning it drains into an inland basin and does not reach the sea. Instead, it ends in the *Rann of Kutch.*

• It is the only major river in India that contains *saline water* due to its high rate of evaporation.

Mahi

• Mahi river originates from the Vindhya mountains.

• It flows through Madhya Pradesh, Rajasthan and Gujarat.

• It crosses the *Tropic of Cancer twice.*

Narmada

• The length of Narmada river is *1312 km.* It is the *longest west flowing river* that drains itself into the Arabian Sea *(flows into Gulf of Khambhat)*

• It originates from *Amarkantak Plateau in Madhya Pradesh.*

• It flows through Madhya Pradesh, Maharashtra, and Gujarat.

• The Narmada River *flows through a rift valley between the Vindhya and Satpura* mountain ranges in India.

• *Tributaries:* Banjar, Tawa, Shakkar, Halon.

Tapi/Tapti

• The length of Tapi river is *724 km.*

• It originates from *Multai in Betul district of Madhya Pradesh* in the Satpura Range and 80% of its basin lies in Maharashtra.

• It flows through Maharashtra, Gujarat, and Madhya Pradesh.

• Tapti river flows through a rift valley alongside Narmada *(2nd longest westward flowing river).*

• *Tributaries:* Aner, Gomai, Purna, Bori, Girna, Arunawati.

• Surat is located on the banks of this river.

Rivers of Goa

• *Zuari river:* It forms an estuary that *meets Arabian Sea at Mormugaon Bay* in Goa.

• *Mandovi river:* It is known as *"lifeline of goa".* It forms an *estuary* and the city of *Panaji* is located on the bank of this river.

Rivers of Kerala

• *Bharathappuzha:* It is also known as Ponnani river.

• *Periyar:* It is known as *"lifeline of Kerala"* and is the *longest river* in Kerala.

• *Pamba:* Pamba river drains into *Vembanand* lake.

River of Karnataka

• *Kali:* It is also known as *Kalinadi* river.

• *Sharavati: Jog waterfalls* is on the Sharavati river.

• *Varahi: Kunchikal waterfalls (highest waterfall in India)* is on the Varahi river.

The Drainage Basin of a river covers the entire area drained by that river as well as its tributaries and distributaries.

For an interactive recap of this topic, see the crossword on Page Number 43.

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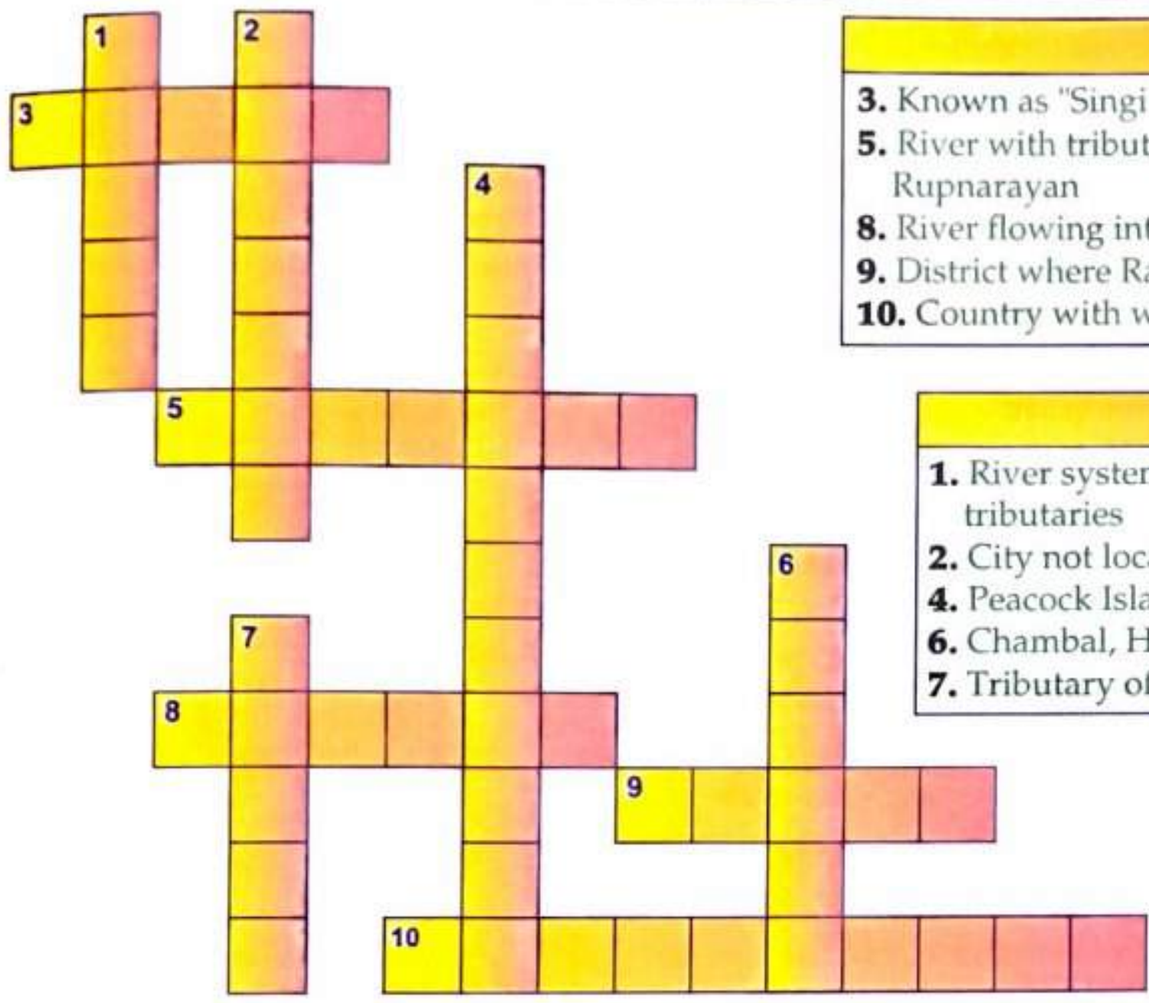
PARMAR'S CROSSWORD

HIMALAYAN RIVER SYSTEM



Across

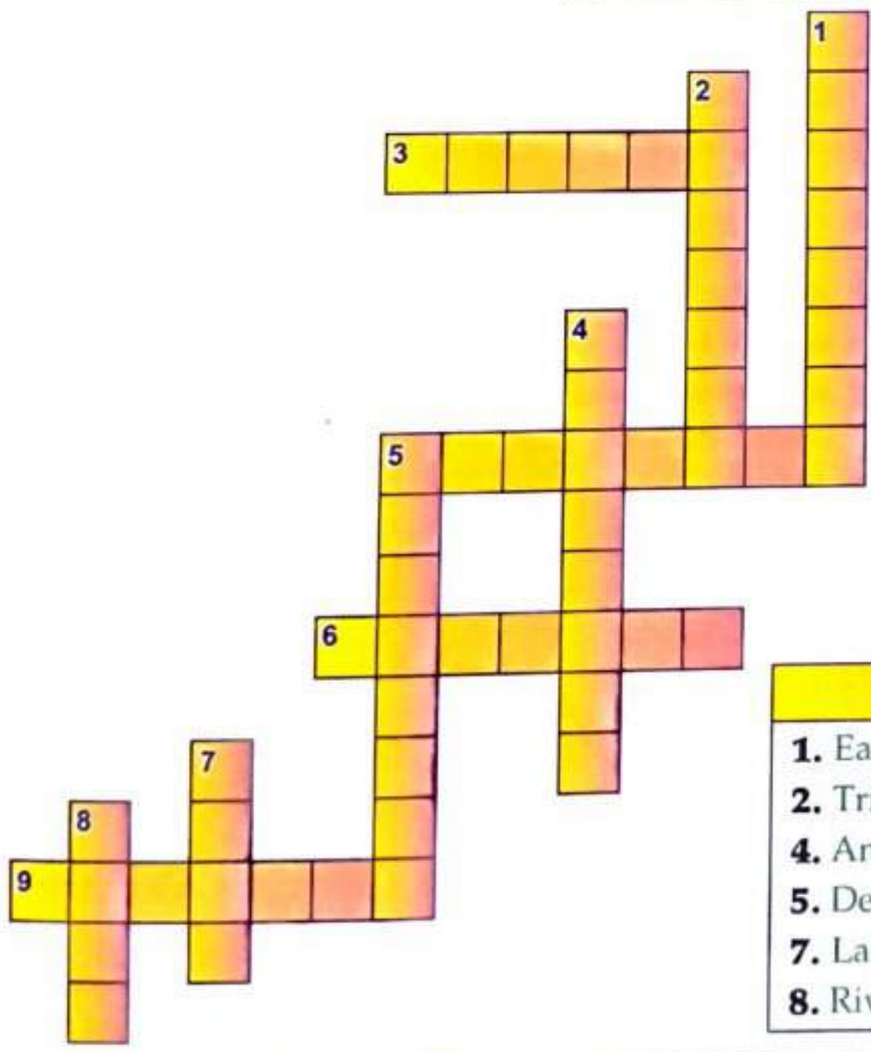
3. Known as "Singi Khamban" in Tibet
5. River with tributaries Mayurakshi, Damodar, Kangsabati, Rupnarayan
8. River flowing into Wular Lake and Baramulla
9. District where Ramganga river originates
10. Country with which India signed Farakka Treaty

Down

1. River system formed by Shyok, Gilgit, Shigar tributaries
2. City not located on river Ganga's path
4. Peacock Island is located in this river
6. Chambal, Hindon, Tons are tributaries of thisriver
7. Tributary of Indus River

PARMAR'S CROSSWORD

PENINSULAR RIVERS



Across

3. River that formed the Gandikota canyon.
5. River basin spread across Maharashtra, Andhra Pradesh, Chhattisgarh, etc.
6. Two west-flowing rivers.
9. Other name of Bharathapuzha river.

Down

1. Eastern Ghats stretch from which valley.
2. Tributaries Yerla, Warna, and Dindi belong to which river.
4. An east-flowing river.
5. Decommissioned Havelock Bridge is built over which river.
7. Largest river system of Rajasthan.
8. River known as 'Sorrow of Bihar'.

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Hydroelectric Power Projects & Multipurpose Projects

- A dam is a structure built across a river to store water, generate electricity, control floods, and irrigation. Many dams in India serve multiple purposes, such as irrigation, hydroelectric power, and drinking water supply and that is why they are also known as Multipurpose Projects.
- *Jawaharlal Nehru* called dams the *"Temples of Modern India"*.

Drawbacks

- ***Displacement of communities:*** They displace a large number of tribals or peasants residing in the affected areas. Large-scale dam construction often leads to the forced relocation of thousands.
- Multi-purpose projects can significantly harm ecosystems. They cause *biodiversity loss.*
- These projects often create disputes between states and countries over water-sharing rights. This can lead to political tensions, legal battles, and conflicts over resource allocation.

Hydroelectric Power Generation

- In hydroelectric power plant Potential Energy of stored water is first converted to Kinetic Energy when the water falls into turbines which in turn convert it into electrical energy.

MAJOR DAMS/PROJECTS

1. Damodar Valley Project

- It is India's *first river valley project (1948)* based on the *Tennessee River Project (USA).*

The Damodar River has four main dams:

Dams	Location	River
Maithon	Jharkhand	Barakar river
Tilaiya	Jharkhand	Barakar river
Panchet	Jharkhand	Damodar
Konar	Jharkhand	Konar

2. Bhakra Nangal Project

- ***Built on:*** Sutlej river *(during the First Five-Year Plan).*
- It is India's *highest Gravity Dam* and the *largest dam in terms of area.*
- ***It consists of two dams:*** *Bhakra Dam* (located in *Himachal Pradesh,* which also forms *Gobind Sagar Lake*) and *Nangal Dam* (located in *Punjab*).

3. Hirakud Dam

- ***Built on:*** Mahanadi river *(Sambalpur district of Odisha).*
- It is the *longest earthen dam in the world* (the main dam is 4.8 km long and the dam and dykes together measure 25.8 km).

4. Tehri Dam

- ***Built on:*** Bhagirathi river *(Uttarakhand).*
- It is the *highest dam of India (Height: 261 m).*

5. Farakka Dam

- ***Built on:*** Ganga river *(West Bengal).*
- This dam was built to provide water to *Hugli river.*

STATE-WISE DAMS

Jammu and Kashmir

- ***Dul Hasti Dam***
- ***Baglihar Dam***
- ***Salal Hydroelectric Project***
- ***Ratle Hydroelectric Project***

} Chenab River

- *The Chenab Rail Bridge (height: 359 m high (1,178 ft))* in *J&K* is the *highest railway bridge* constructed on *Chenab river* near *Salal Hydroelectric Project.*
- ***Kishanganga Project***
- ***Tulbul Project***
- ***Uri Project***

} Jhelum River

Himachal Pradesh

- ***Pong Dam:*** Beas river (Pong Dam is in *Kangra district* and is also known as *Maharana Pratap Sagar Dam*).
- ***Chamera Dam***
- ***Baira Siul Dam (Chamba district)***
- ***Bassi Dam***

} Ravi river

- ***Nathpa Jhakri:*** Sutlej river

Punjab

- ***Thein Dam*** (also known as *Ranjit Sagar Dam*).
- ***Shahpur Kandi Dam***

} Ravi river

- ***Harike Dam:*** It is on the confluence of Sutlej and Beas river → from which *Indira Gandhi Canal (longest canal of India)* originates.

Uttar Pradesh

- ***Matatila Dam***
- ***Lakshmibai Dam***

} Betwa river

- ***Rihand Dam:*** Rihand river (Rihand Dam is also known as *Govind Vallabh Pant Sagar Reservoir* → *largest artificial lake of India*).

Gujarat

- ***Ukai Dam***
- ***Kakrapar Dam***

} Tapi river

- ***Sardar Sarovar Dam:*** Narmada river
- ***Kandana Dam:*** Mahi river

> ***Cofferdam:*** *It is a temporary dam constructed to exclude water from a specific area.*

Madhya Pradesh

- ***Tawa Dam:*** Tawa river *(Tawa river is a tributary of Narmada river).*
- ***Indira Sagar***
- ***Omkareshwar Dam***

} Narmada river

- ***Ban Sagar:*** Son river
- ***Gandhi Sagar Dam:*** Chambal river

Rajasthan

- ***Mahi Bajaj Sagar Dam:*** Mahi river

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- *Rana Pratap Sagar (at Rawatbhata)*
- *Jawahar Sagar Dam*

} Chambal river

- *Bisalpur Dam:* Banas river

Maharashtra *(state with most no. of dams)*

- *Jayakwadi Dam:* Godavari river
- *Koyna Dam:* Koyna river *(largest dam in Maharashtra)*
- *Dhom Dam*
- *Ujjaini Dam*

} Krishna river

- *Isapur Dam:* Penganga river

Jharkhand

- *Panchet Dam:* Damodar river
- *Maithon Dam*
- *Tilaiya Dam*

} Barakar river *(Barakar river is a major tributary of Damodar river).*

- *Konar Dam:* Konar river

Chhattisgarh

- *Indravati Dam:* Godavari river
- *Hasdeo Bango Dam:* Hasdeo river *(It is the largest tributary of Mahanadi.*

Telangana

- *Pochampad Dam* (also known as *Sriram Sagar Project*)
- *Kaleshwaram Lift Irrigation Project*

} Godavari river

- *Nagarjuna Sagar Dam:* Krishna river
- *Nizam Sagar Dam:* Manjira river *(tributary of Godavari river).*

Karnataka

- *Linganamakki Dam:* Sharavati river
- *Shivanasamudram Dam*
- *Krishna Raja Sagar Dam*

} Kaveri river

- *Almatti Dam:* Krishna river

Kerala

- *Idukki Dam*
- *Mullaperiyar Dam*

} Periyar river (Periyar river is considered as *"lifeline of Kerala"*)

Tamil Nadu

- *Mettur Dam:* Kaveri river
- *Pykara Dam:* Pykara river

Andhra Pradesh

- *Srisailam Dam*
- *Nagarjuna Sagar Dam*

} Krishna river

- *Somasila Dam (Nellore district):* Pennar river

WATERFALLS

Types of Waterfalls

- ***Cataract Waterfall:*** A large, powerful waterfall that occurs when large amount of *fast moving water (or large volume of water) falls over a cliff.*
- ***Plunge Waterfall:*** A waterfall where water falls straightly down *without touching the cliff face below (water velocity is very high).*
- ***Cascade Waterfall:*** A waterfall that consist of series of *small falls* where water flows *over rocks or boulders (multi-step waterfall).*

Some Important Waterfalls of India

Name	*River*	*State*
Kunchikal (highest waterfall: 455 m)	Varahi	Karnataka (Shimoga)
Jog/Gersoppa/Mahatma Gandhi (2nd highest waterfall in India)	Sharavati	Karnataka
Shivsamundram	Kaveri	Karnataka
Chulia	Chambal	Rajasthan
Dhuandhar and Kapildhara	Narmada	Madhya Pradesh
Hundru	Subarnarekha	Jharkhand
Dudh Sagar	Mandovi	Goa

- ***Highest waterfall in the world:*** *Angel waterfall in Venezuela*
- ***Second highest in the world:*** *Niagara Falls (in USA-Canada border)*
- ***Niagara Falls of India:*** *Chitrakoot waterfall in Chhattisgarh*

Some more Waterfalls

- ***Barehipani and Khandadhar waterfalls: Odisha.***
- ***Sikri Waterfalls: Andhra Pradesh.***
- ***Athirappilly waterfalls: Kerala.***
- ***Duduma waterfalls: Odisha (Koraput).***
- ***Gokak waterfalls: Karnataka (Ghataprabha).***
- ***Nohkalikai falls: Meghalaya.***
- ***Hebbe waterfalls: Karnataka.***
- ***Bhambavli Vajrai waterfalls: Maharashtra (Satara) (located on Urmodi river).***

STATE-WISE LAKES

Jammu & Kashmir

- ***Largest freshwater lake in India:*** *Wular Lake* (it was formed as a result of *tectonic activity*).
- Anchar lake, Mansar lake, and Dal lake *(Jewel of Srinagar).*

Ladakh

- ***Salt water lakes:*** Pangong Tso lake (In Aksai-Chin border), Tso kar, Tso Moriri.

Uttarakhand

- Dodital lake, Bhimtal lake, Roop Kund lake, Nainital lake, Suryadhar lake.

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Bihar

- **Largest ox-bow lake:** Kanwar Tal
- Gogabil lake.

Gujarat

- Nalsarovar lake, Rann of Kutch lake, and Thol lake (Ramsar site in *2021*).

Madhya Pradesh

- ***Asia's largest artificial lake:*** Bhojtal/Bhopal lake which was formally known as *Upper lake* was constructed by *Raja Bhoj* (Parmar Dynasty's most famous and powerful ruler, who also established Bhopal city).

Rajasthan

- Pushkar lake in Ajmer.
- ***Largest inland saltwater lake:*** Sambhar lake *(Chilika is a coastal lake).*
- ***Second largest artificial lake in Asia:*** Jaisamand/Dhebar lake (Udaipur).

Uttar Pradesh

- ***Man-made reservoir:*** Keetham lake/Sur Sarovar (in Agra) added to Ramsar site in the year *2020*.
- ***Largest artificial lake in India:*** Govind Ballabh Pant Sagar (in Sonbhadra district).

Himachal Pradesh

- Govind Sagar lake and Renuka lake.

Haryana

- Surajkund lake.

Maharashtra

- Bhushi lake and Lonar lake *(also called crater lake (created due to meteorite impact) in Buldhana district).*

Kerala

- ***Longest lake in India:*** Vembanad lake (Pamba river falls on it).
- Sasthamkotta lake and Ashtamudi lake.

Tamil Nadu

- ***India's second largest brackish water lake:*** Pulicat lake is located between Andhra Pradesh and Tamil Nadu.
- Kaliveli lake.

Telangana

- Srisailam lake, Nagarjuna Sagar lake, Hussain Sagar lake (connects Hyderabad and Secunderabad), and Nizam Sagar lake.

Andhra Pradesh

- Kolleru lake (located between *Godavari* and *Krishna*) and Pulicat lake (located between *Andra and Tamil Nadu*).

Odisha

- Anshupa lake
- ***Largest brackish water (freshwater + salt water) lake in India:*** *Chilika lake* (*first Ramsar site* to be added in the year *1981*).

Sikkim

- ***Highest lake in India:*** Gurudongmar lake
- Tso Lhamo lake/Cholamu lake and Tsomgo Chho lake.

Assam

- Haflong lake, Chandubi lake, and Deepor Beel lake.

Meghalaya

- Barapani/Umiam lake in *Shillong*.

Manipur

- ***World's only floating lake:*** Loktak lake (it is famous for *phumdis* floating over it. *Keibul Lamjao National Park* (world's only floating National Park is located here).

Map 1: Important Lakes of India

Some Facts

- *Largest lake in the world: Caspian Sea*
- *Highest Navigable lake in the world: Lake Titicaca (Peru & Bolivia)*
- *Deepest lake of the world: Lake Baikal (Russia)*
- *Largest Freshwater Lake in the world: Lake Superior (USA & Canada)*

For an interactive recap of this topic, see the crossword on Page Number 52.

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MONSOON

Factors Affecting Climate of Any Place

1. ***Latitude:*** The Tropic of Cancer divides India into tropical and subtropical zones.
2. ***Altitude:*** As the altitude (height) increases, the atmosphere becomes thinner leading to low temperature and air pressure.
3. ***Himalayas:*** They act as a barrier to cold winds and influence monsoonal flow.
4. ***Distribution of Land and Water:*** Differential heating of land and sea creates *pressure differences*.
5. ***Distance from the Sea:*** Coastal regions have *moderate climates*, while inland regions experience *extreme temperatures*.
6. ***Pressure and Wind Systems:*** Influence monsoon winds and seasonal variations.
7. ***Relief Features:*** Mountains cause orographic rainfall, and plateaus influence wind movement.
8. ***Ocean Currents:*** They influence temperature and rainfall patterns.

Climate vs Weather

• ***Climate:*** The average weather of a place over a long period *(30 years or more)*. It includes the average temperature, humidity, rainfall, and other weather conditions.

• ***Weather:*** The day-to-day short-term atmospheric conditions like temperature, wind, and precipitation.

Seasons in India

Winter Season (December–February)

• Winter season is affected by *Cold, dry, chilling winds* from *Arctic/Central Asia*, but they are blocked to a certain extent by the Himalayas.

• ***Jet Streams:*** They are high-speed winds that blow in *Upper Troposphere (9-13 km altitude)* that influence *Northern Plains*, this causes winter rainfall by bringing Western Disturbances (known as *"Mahawat" in Rajasthan*).

• ***Western Cyclonic Disturbances:*** Cyclonic storms from the *Mediterranean Sea* and *Caspian Sea* bring winter rainfall.

• Winter Rainfall is beneficial for cultivation of *Rabi crops*.

Map 1: Arrival of Western Disturbances in India

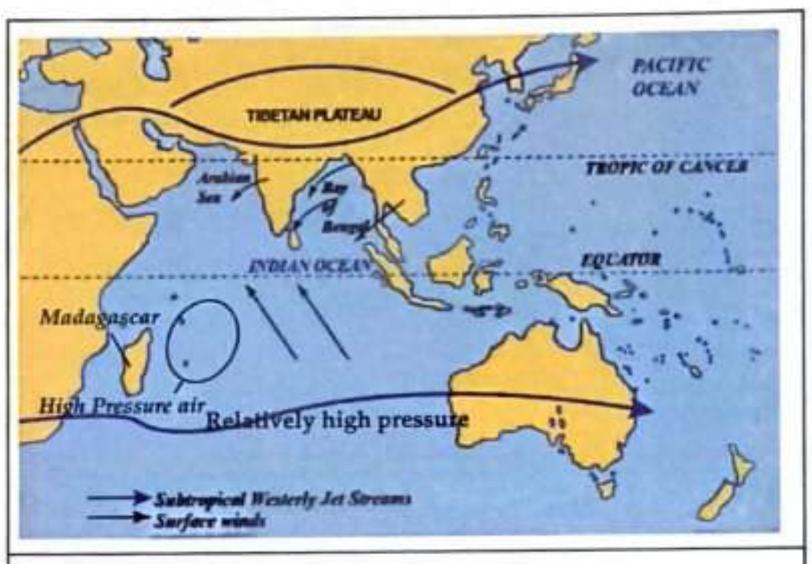
• An increase in the *prevailing night temperature in winter months* in Northern parts of India generally indicates the arrival of Western Disturbances in India.

Summer Season (March-May)

• The *Inter-Tropical Convergence Zone (ITCZ)* is a *low-pressure zone* located near to equator where *trade winds converge* and air tends to ascend.

• It is shifted around *20°N-25°N latitudes* (over the Gangetic plain) in July month and is sometimes called the *monsoon trough*.

• This monsoon trough leads to the formation of *thermal low over north and northwest regions in India*.



Map 2: Monsoon Winds and Subtropical Jet Streams

• Intense heating of the *Tibetan Plateau* creates low pressure, attracting winds.

• Intertropical Convergence Zone (ITCZ) shifts *northward*, leading to the onset of the *southwest monsoon* over the Indian subcontinent.

• Easterly jet streams blowing at *13-14°N latitude* on the Indian subcontinent also help in the arrival of monsoon.

• High pressure on East of Madagascar also facilitates monsoon.

Pre-Monsoon Showers

• Pre-monsoon is the period of rainfall that occurs in the *summer before the rainy season*.

Pre-Monsoon Showers across India

• ***Nor westers:*** They are known as *Kal Baisakhi* (calamity in the month of Baisakh) in *West Bengal* (they help in growth of *jute* and *tea* crops) and *Bardoli Chheerah/Bordoisila* in *Assam*.

• ***Blossom Showers in Kerala and nearby areas:*** They help in growth and cultivation of *coffee crops*.

• ***Mango Showers in coastal Karnataka and Kerala:*** They help in early *ripening of mangoes*.

Monsoon Season (June–September)

• The term "Monsoon" is derived from an *Arabic* word ***"Mausim"*** meaning *seasonal reversal of winds*.

• ***Onset of monsoon:*** It begins in *Kerala* (first week of *June*) in the Western ghats *(orographic rainfall)*.

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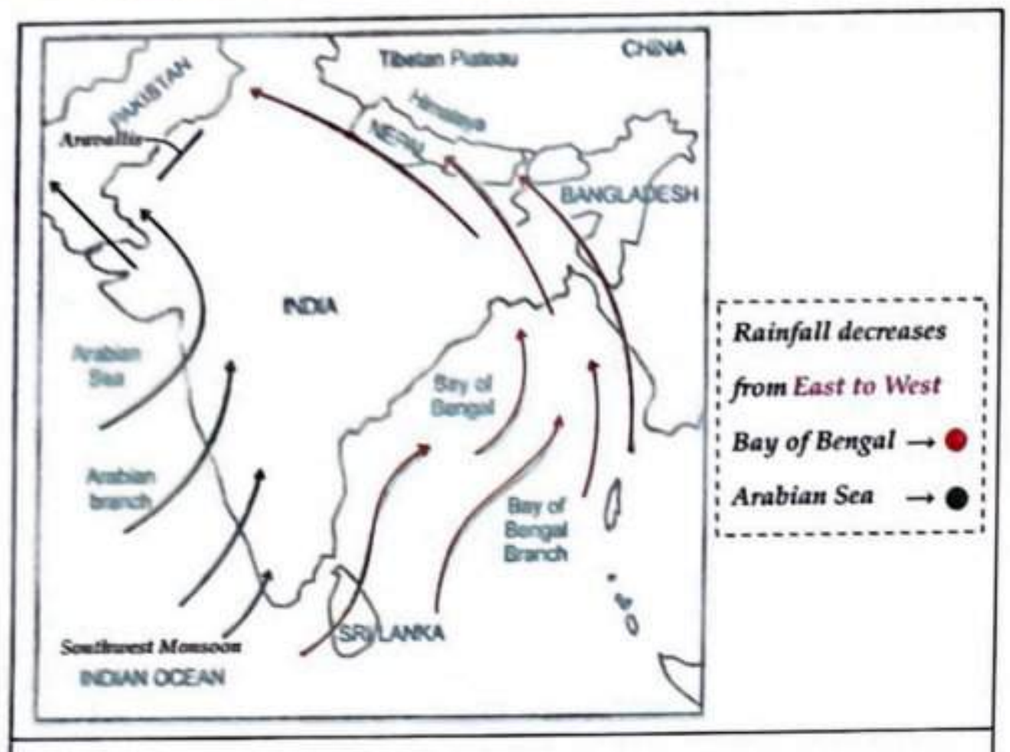
- ***Rain Shadow Zone:*** Areas like Leeward side of Western Ghats *receive less rain*.
- ***Southwest Monsoon*** is divided into two branches: *Bay of Bengal* and *Arabian Sea Branch*.
- Both branches meet Northwest of Ganga Valley and Punjab Plains.
- ***Highest rainfall recorded in:*** *Mawsynram* and *Cherrapunji* (Khasi Hills of Meghalaya).
- ***Break in Monsoon:*** A temporary period during the monsoon season, when there is a *significant decrease* or *complete absence of rainfall*.

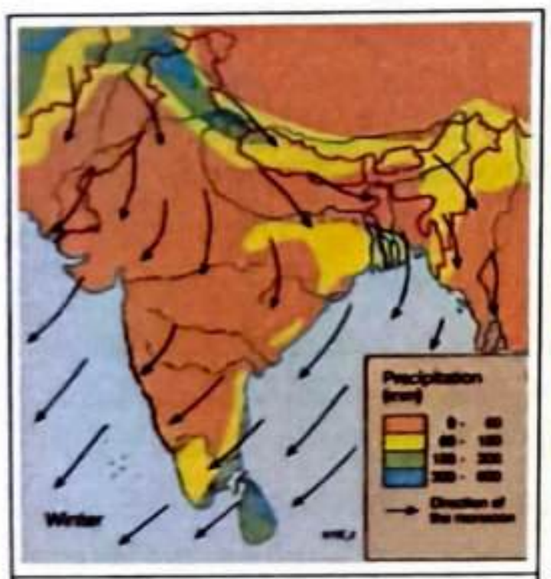


Map 2: Orographic Rainfall

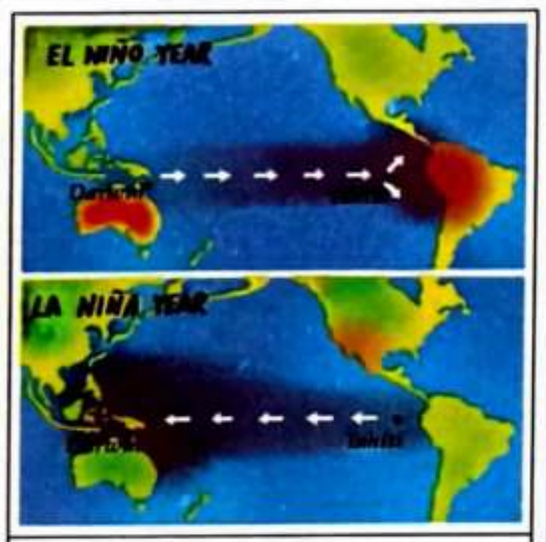
Retreating Monsoon (October–November)

- Monsoon starts its retrieval from northwest part. When it passes from Bay of Bengal it causes cyclonic disturbances and also causes heavy rainfall in *Coromandel Coast (Tamil Nadu)*. This is called *North-East monsoon* or *Retreating monsoon*.
- *"October heat"* refers to the rising temperature and humidity in India during October due to retreating monsoons and clear skies, leading to *oppressive weather conditions*.

Leh on being the Rain Shadow Zone of the Himalayas experiences least rainfall.



Map 3: Retreating Monsoon causing Cyclonic disturbances



Map 4: Effects of La Niña and El Niño

La Niña and El Niño

- In relation to El Niño and La Niña, *Darwin* (Australia) experiences *higher air pressure* than *Tahiti* during an *El Niño*, while during a *La Niña*, the pressure is *higher* in *Tahiti* compared to *Darwin*.

La Niña	*El Niño*
Meaning: *Small girl*	Meaning: *Child Christ/Small boy*
Below average sea surface temperature in east-central equatorial Pacific (cold phase of ENSO cycle)	Above average sea temperatures in east-central equatorial Pacific (warm phase of ENSO cycle)
Trade winds strengthen, pushing warm water western Pacific	Trade winds weaken, allowing warm water to spread eastwards
It is seen in every 2-7 yrs	It is seen in every 3-7 yrs
Pressure difference between Tahiti and Darwin is positive	Pressure difference between Tahiti and Darwin is negative
It can cause intense rainfall in Australia and India along with heavy floods; drier conditions in South America	It can cause droughts in Asia and Australia and in the US. India experiences below average and late monsoon
Fishing industries in South America coast will flourish	Fishing industries won't flourish

Variation in Temperature & Rainfall

- ***Diurnal Temperature Range:*** It is the difference between the *highest* and *lowest* temperatures in a *24-hour period*.
- ***Annual Temperature Range:*** It is the difference between the average temperature of the *hottest month* and the average temperature of the *coldest month*.
- ***Annual Rainfall Variation:*** It is the difference in the amount of rainfall received *over a year,* either across *different regions* or within the *same region* over multiple years.

ENSO: El Niño Southern Oscillation

Continentality Effect

- It is the experience of extreme weather conditions due to *distance from the sea*.
- The far we go from the ocean into the continent, the moderating influence of sea decreases and the climate becomes more extreme this is called as *continentality effect*.

→ Coastal cities do not experience extreme climate due to *"moderating influence of sea"*. ***E.g. Mumbai, Chennai, Bangalore, etc.***

→ Whereas cities like *Kanpur, Delhi, Jalandhar* experiences extreme climate due to continentality effect.

Koeppen Climate Classification (1884)

- It is an empirical classification for categorising the world's climates into *five main groups*. It's based on *average monthly* and *annual temperatures* and *precipitation*.

Classification Groups	*Characteristics*
A: Tropical	Average temperature of the coldest month is 18°C or higher
B: Dry Climate	Potential evaporation exceeds precipitation
C: Warm Temperate	The average temperature of the coldest month of the (Mid-latitude) climate years is higher than -3°C but below 18°C
D: Cold Snow Forest	The average temperature of the coldest month is -3°C or below
E: Polar Type (Cold)/Tundra	Average temperature for all months is below 10°C

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Climate Codes

- S: Steppe
- W: Desert
- m: Monsoon
- f: Full Rainfall
- w: Winter Dry
- s: Summer Dry

Map 4: Koeppen Classification

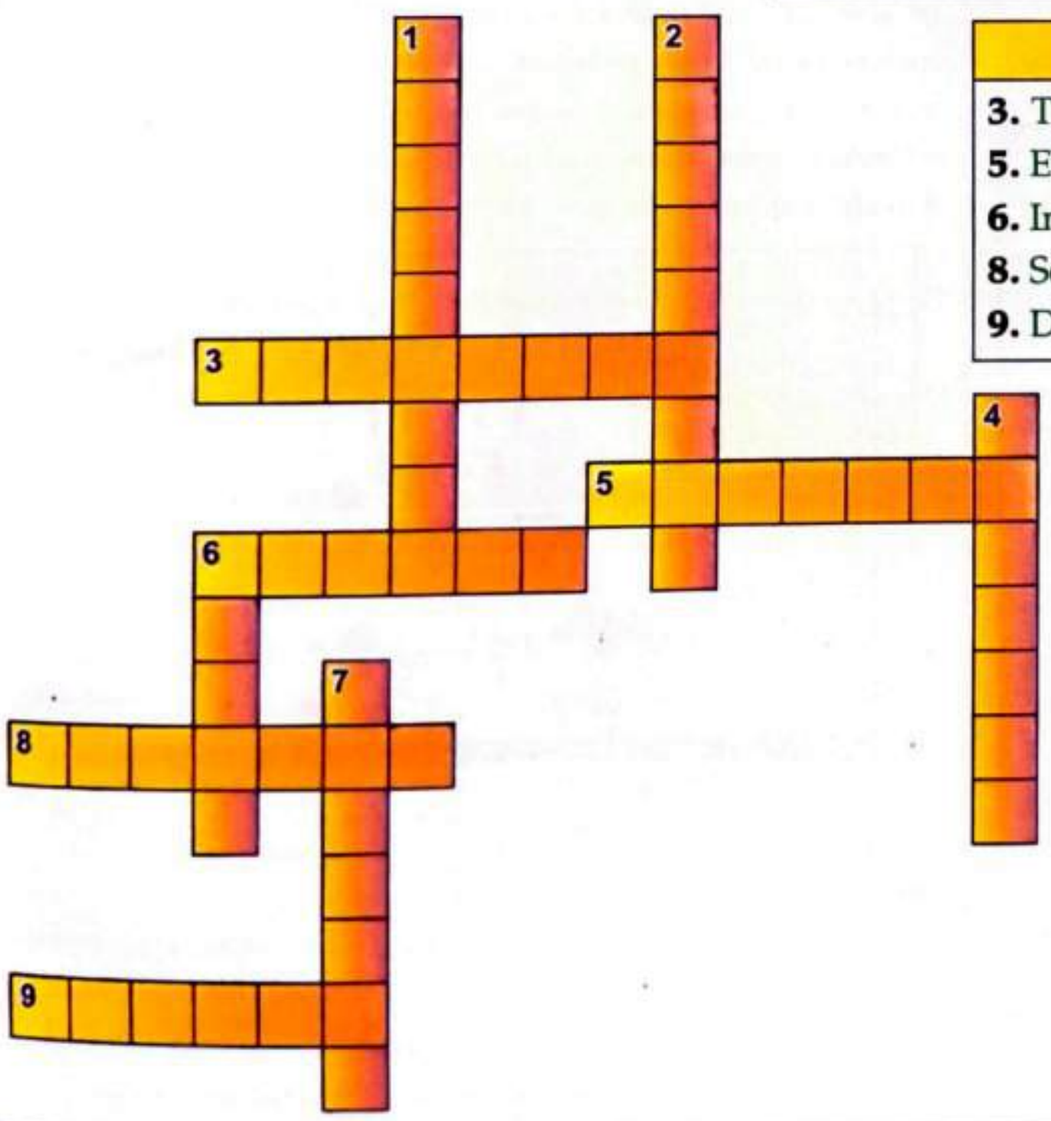
Seasons and Months

Seasons	Months (According to Indian Calender)	Months (According to General Calender)
Vasanta	Chaitra-Vaisakha	March-April
Grishma	Jyaistha-Asadha	May-June
Varsha	Sravana-Bhadra	July-August
Sharada	Asvina-Kartika	September-October
Hemanta	Margashira-Pausa	November-December
Shishira	Magha-Phalguna	January-February

I have a Question for you! Let's see if you can crack it!
Q. What will be the Koeppen Climatic classification of Mediterranean region located just above the Tropic of Cancer region and having no rainfall in summers?

PARMAR'S CROSSWORD

MONSOON



Across

3. Type of rainfall called Mahawat.
5. El Nino occurs in which ocean.
6. Initial rainfall by Arabian Sea branch.
8. Seasonal reversal of wind direction.
9. Dry climate denoted by W in Koppen classification.

Down

1. State with highest annual rainfall.
2. Region with cold humid winters and short summers.
4. Retreating monsoon months.
6. Hills where Mawsynram gets rainfall.
7. Rainfall from Bay of Bengal branch.

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VEGETATION/FORESTS

• India's vegetation is broadly divided into 5 groups.

Evergreen Forests/Tropical Rainforests

• They are *layered forests* (due to different stratas present in the forest).

Different Stratas in Evergreen Forest

1. ***Top vertical:*** Trees.
2. ***Middle vertical:*** Shrubs.
3. ***Bottom:*** Herbs and Bushes.

> ***Herbs are smaller, have soft stems, less branching. Shrubs are taller, have woody and hard stems, are profusely branched, and are mainly perennial***

• They appear green all year because the trees in these forest *don't shed their leaves at the same time*. Evergreen forests are also known as *Deserts covered by trees* because soil of these forest is low in humus due to high rate of decomposition of organic material.

• They are seen in places of high-temperature *(above 22°C)* and high rainfall *(200 cm)*.

• In India, they are seen in western side of Western Ghats, Andaman and Nicobar Islands, North-East, Tamil Nadu coast (in heavy rainfall regions).

• *Tropical evergreen* forests have the *highest biodiversity* on Earth.

• ***Vegetation seen:*** Ebony, mahogany, rosewood, rubber, and cinchona, epiphytes.

Deciduous Forest

• These are the most widespread forest of India and are also called *Monsoon forests*.

• They are spread over a region, receiving rainfall between *70 cm* and *200 cm*. They shed their leaves for *6-8 weeks* during summer.

• Deciduous forests are also found in the *foothills of the Himalayas*.

They are broadly divided into two categories:

1. ***Moist deciduous***
2. ***Dry deciduous***

Moist Deciduous	*Dry Deciduous*
Found in: Areas receiving rainfall 100-200 cm	Found in: Areas receiving rainfall 70-100 cm
Mostly in eastern part: Northeastern states, foothills of Himalayas, Jharkhand, West, Odisha, and Chhattisgarh and on eastern slopes of Western Ghats	Mostly in: rainier part of Peninsular Plateau and plains of Bihar and Uttar Pradesh
E.g. Teak (most dominant), bamboos, sal, shisham, sandalwood, khair, kusum, arjun, and mulberry, etc.	***E.g. Teak, sal, peepal, neem, tendu, palas, amaltas, bel, khair, axlewood, etc.***
	*Tendu leaves are used to make Bidi. On the wetter margins, it has a transition to the moist deciduous, while in the drier margins to thorn forests.

Thorn Forests

• ***Found in:*** Regions with *<70cm* of rainfall.

• Thorns are modified form of leaves *(to avoid water loss)*.

• These forests are seen in *Northwestern part* of the country *(semi-arid areas)* of Gujarat, Rajasthan, Madhya Pradesh, Chhattisgarh, Uttar Pradesh, and Haryana.

• ***Main plant species:*** *Acacias, palms, euphorbias, cacti, etc.*

• ***Special type of grass is seen here:*** *Tussocky grass (height upto: 2m).*

• Trees are scattered with long roots penetrating deep inside soil.

Coniferous Forests

• They are seen in areas of high snowfall → *Upper Himalayas in India.*

• The trees in coniferous forest are *cone-shaped* which help them to shed snow in cold climates.

• ***Trees include:*** Softwood trees such as *Chir, pine, cedar, deodar, spruce, etc.*

Montane Forests

• Montane forests are found in *mountainous areas*.

• In mountainous areas, the *decrease in temperature with increasing altitude* leads to the corresponding change in natural vegetation.

• These forests cover mostly the southern slopes of the Himalayas, places having high altitudes in southern and north-east India.

• There is succession of natural vegetation belts in same order as we see from *Tropical to Tundra region*.

• Montane forests are extensively used for grazing by nomadic tribes *(Gujjars and Bakarwals)*.

Succession with Changing Altitude

• ***Foothills of Himalayas:*** Deciduous forests.

• ***1000-2000 m:*** Wet Temperate Forests; Evergreen Broad Leaf Trees *(Oaks, Chestnuts, etc.)*.

• ***1500-3000 m:*** Temperate Forests are characterised by Coniferous trees *(pine, deodar, silver fir, spruce, and cedar, etc.)*.

• ***Above 3600 m:*** Temperate Forests and grasslands → Alpine vegetation *(silver fir, junipers, pines, rhododendrons, and birches, etc.)*.

• ***Shrubs + Scrubs:*** Alpine grasslands *(also called as Bugyals)*.

• ***At higher altitudes:*** Mosses + Lichens *(Tundra vegetation)*.

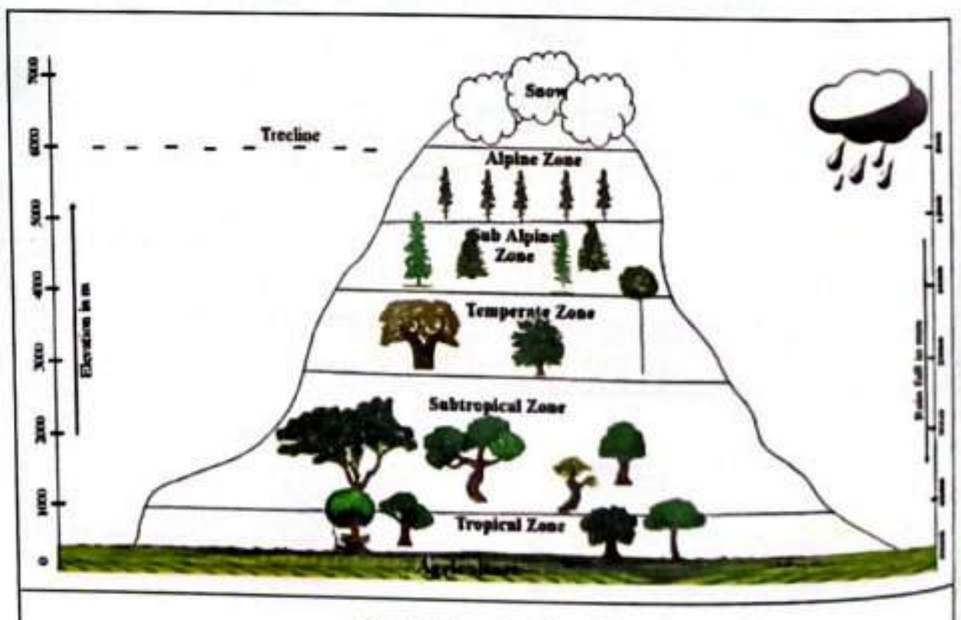

Fig 1: Vegetation Zones

Southern Montane Forests

• These forests are found in three distinct areas of Peninsular India: *Western Ghats, Vindhyas, Nilgiris.*

• They are closer to tropics → Only *1500 m* above the sea level.

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Vegetation includes:

- *Temperate:* In higher regions.
- *Subtropical:* On lower regions of Western Ghats (Kerala, Tamil Nadu, Karnataka).
- *Temperate grasslands/forests:* They are called *Sholas* in Nilgiris (Western Ghats), Anaimalai and Palani hills.

Mangrove Forests

- They are known as *Littoral/Swamp forests.*
- They are mostly seen in the coastal areas that are highly influenced by tides → the deltas of *Ganga*, the *Mahanadi*, the *Krishna*, the *Godavari* and the *Kaveri* are covered by such vegetations.
- They are found more in Sundarban delta → *Sundari trees are found here* (region: West Bengal). Palm, coconut, keora, agar trees are also found.
- The trees are *viviparous* (produce embryos that develop before detaching from the parent plant) and are also called *Pneumatophores* (living roots).

Biomes/Forests across the World

- *Temperate Evergreen Forests:* Found in mid-latitudinal coastal areas (US, Canada, Europe, Asia). They lie on the eastern coastal margins.
- *Temperate Deciduous Forests:* They are found between 40°-60°North and South of equator where *rainfall is high* (between: 500-1500 mm a year) → Birds like *Pheasant* and *Monal* are found here (35°-50°N/S).
- *Taiga/Boreal Biome (untouched):* 50°-70°N/S.
- *Tundra:* Beyond 70°N/S (in Arctics).

Indian State of Forest Reports

- It is released by *Forest Survey of India (FSI).*
- *It was first published in: 1987* (It is a *Biennial report*).
- *18th* Indian State of Forest Reports was published in: *2023.*

According to 2023 Report:

- *Forest cover: 21.7%.*
- *Tree cover: 3.41%.*
- Forest + Trees cover: *25.17%.*
- *Forest cover (area-wise): Madhya Pradesh > Arunachal Pradesh > Chhattisgarh.*
- *Forest cover (% wise): Lakshadweep > Mizoram > Andaman and Nicobar Islands.*
- *Maximum increase (Forest + Tree cover): Chhattisgarh > Uttar Pradesh.*
- *Maximum increase (Forest cover): Mizoram > Gujarat.*
- *Largest decrease: Madhya Pradesh > Karnataka.*
- *Indian Forest Policy (NFP) 1952 (last revised in 1988) states that: 33%* geographical area should be under forest or tree cover.

Social Forestry

- Social forestry means the management and protection of forest and afforestation on barren lands with the purpose of helping in the environmental, social, and rural development.

Chipko Movement

- The Chipko Movement was a forest conservation movement in India.
- It began in *1973* in the *Chamoli* district of *Uttarakhand* (then Uttar Pradesh) → Led by *Sundarlal Bahuguna* along with local villagers to protect trees from being cut down by government-backed commercial loggers.
- *Forest Day is celebrated on: 21st March.*
- *Indian Forest Research Institute* is located in *Dehradun, Uttarakhand.*

GRASSLANDS

Types of Grasslands

1. *Tropical Grasslands*
2. *Temperate Grasslands*

Tropical Grasslands	*Temperate Grasslands*
They have tall, non-nutritious, elephant grass	They have short and nutritious
Different names around the world: ***Savannah:*** Africa (known as Big Game country due to extreme poaching of animals) ***Campos grasslands:*** Brazil ***Llanos grasslands:*** Venezuela	***Different names around the world:*** ***Prairies:*** North America (known as wheat granaries of the world) ***Steppes:*** Asia/Europe ***Velds:*** South Africa ***Downs:*** Australia ***Pustaz:*** Hungary ***Canterbury:*** New Zealand ***Pampas:*** Argentina (Alpha Alpha grass, a nutrient rich grass is seen here)

Shifting Cultivation

- It is also known as *"Slash and Burn agriculture".*
- This type of cultivation is not good for the environment as it causes air pollution, deforestation, and the soil loses its productivity.

Different Names across the World

- *Indonesia: Ladang.*
- *Mexico: Milpa.*
- *Sri Lanka: Chena.*
- *Vietnam: Ray.*
- *Brazil: Roca.*
- *Venezuela: Konuko.*

Shifting Cultivation

Different Names across India

- *North-East: Jhum.*
- *Western Ghats: Kumari.*
- *Odisha: Pama Dabi/Bringa.*
- *Andhra Pradesh: Penda/Podu.*
- *Chhattisgarh (Bastar district) and Andaman and Nicobar Islands: Dipa.*
- *Rajasthan: Waltre.*
- *Jharkhand: Kuruwa.*
- *Madhya Pradesh: Bewar/Dahiya.*

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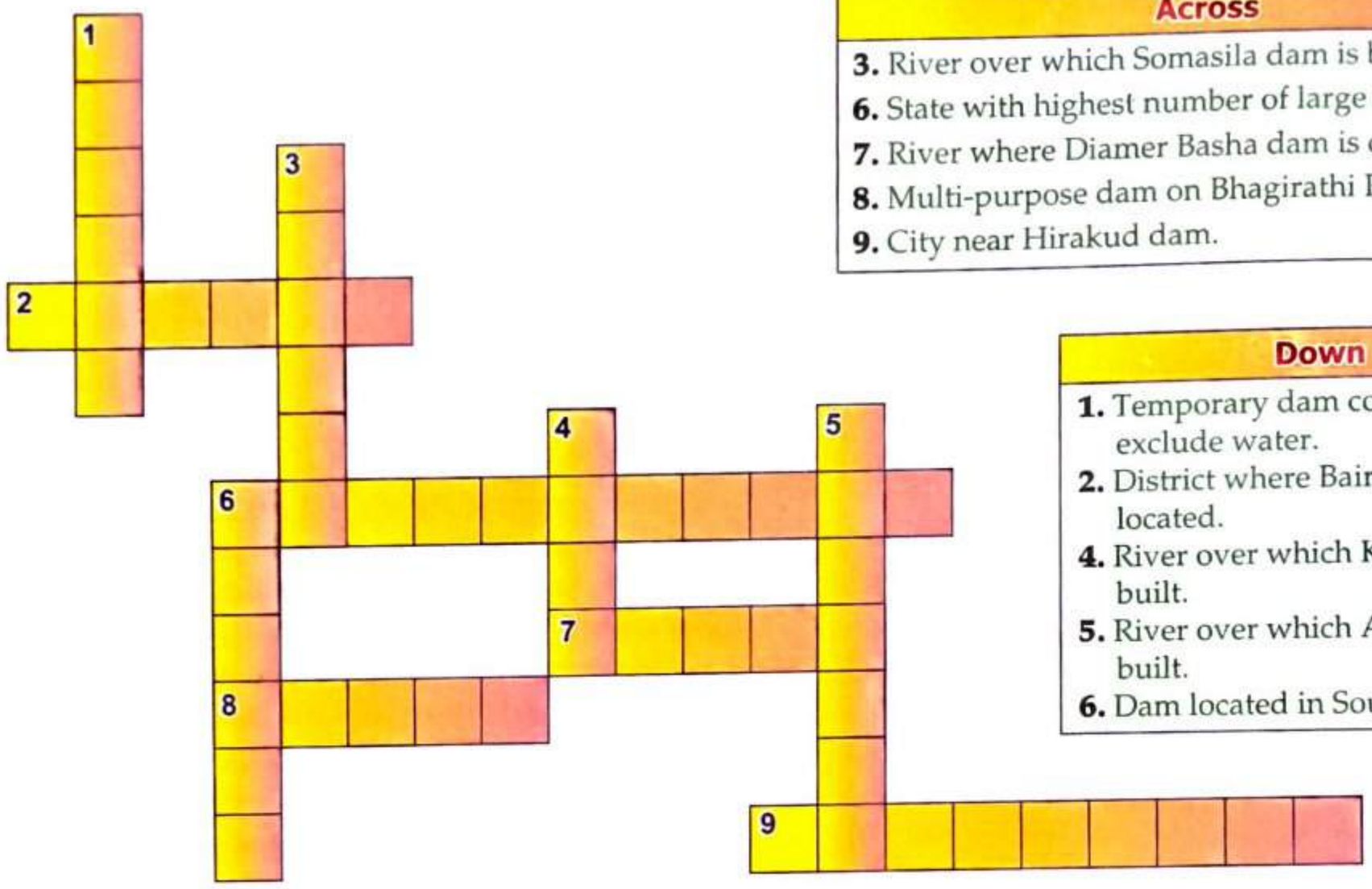
PARMAR'S CROSSWORD

DAMS, LAKES AND WATERFALLS



Across

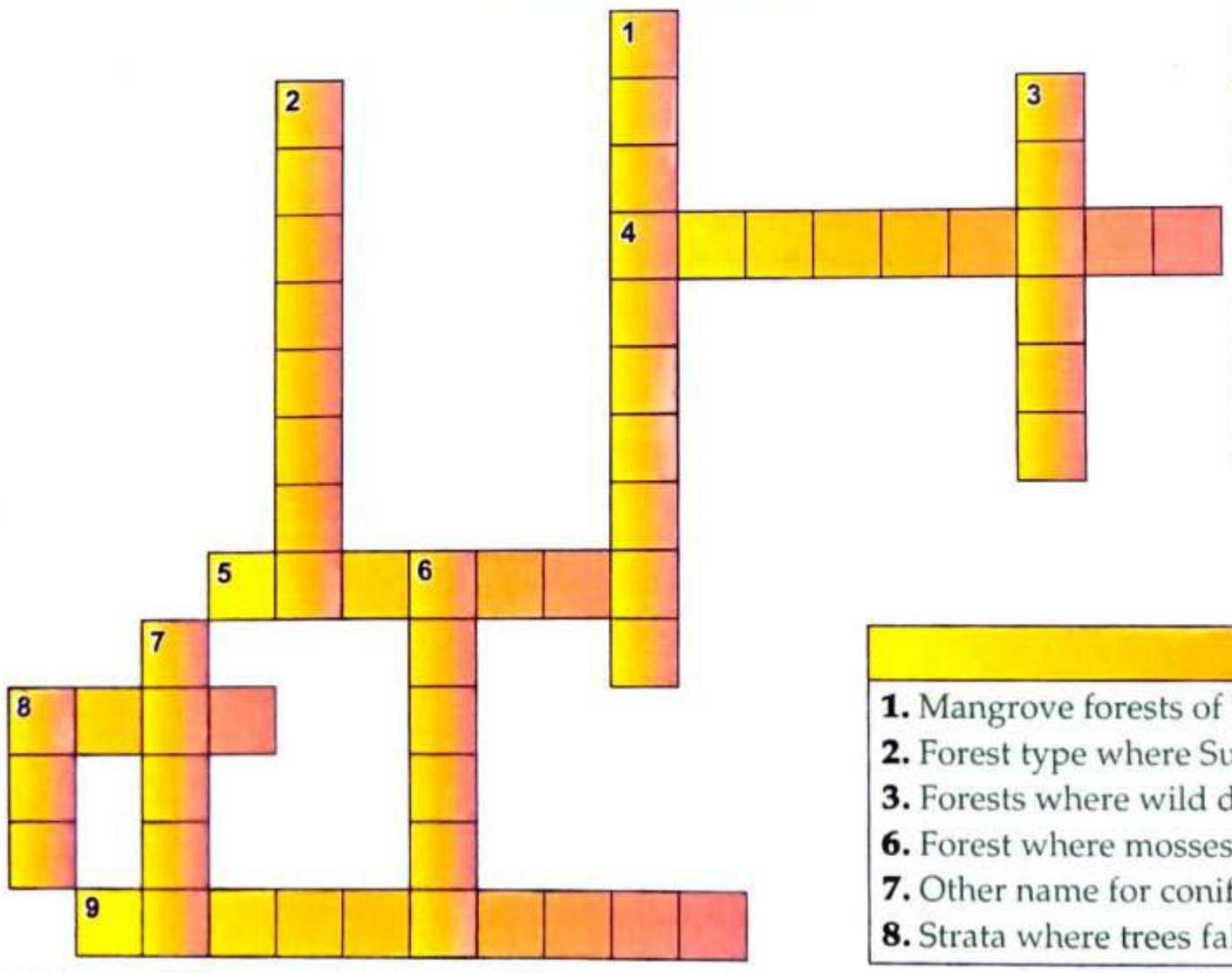
3. River over which Somasila dam is built.
6. State with highest number of large dams.
7. River where Diamer Basha dam is constructed.
8. Multi-purpose dam on Bhagirathi River.
9. City near Hirakud dam.

Down

1. Temporary dam constructed to exclude water.
2. District where Baira Siul dam is located.
4. River over which Kadana dam is built.
5. River over which Almatti dam is built.
6. Dam located in South India.

PARMAR'S CROSSWORD

FOREST AND GRASSLAND



Across

4. Forest type found in foothills of Himalayas.
5. Tropical evergreen forests found in which ghats.
8. Most dominant species of tropical deciduous forests.
9. Country sharing Sunderbans forest with India.

Down

1. Mangrove forests of West Bengal are called.
2. Forest type where Sundari trees are found.
3. Forests where wild donkeys and camels are found.
6. Forest where mosses and lichens are found.
7. Other name for coniferous forests.
8. Strata where trees fall in forest ecosystem.

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SOIL

- The study of soil is called *Pedology*.
- Soil is a renewable natural resource made up of organic (humus) and inorganic materials.

Factors Affecting Soil Formation

- ***Parent Rock:*** It determines *soil color, texture, mineral content,* and *permeability*.
- ***Climate:*** Temperature and rainfall affect the *rate of weathering* and *humus* formation.
- ***Time:*** It determines the *thickness* of soil layers.
- ***Relief:*** It affects *soil accumulation* and *erosion*.

ICAR (Indian Council of Agricultural Research)

- ***HQ:*** *New Delhi*
- This institute has categorized Indian soils into *8 types*.

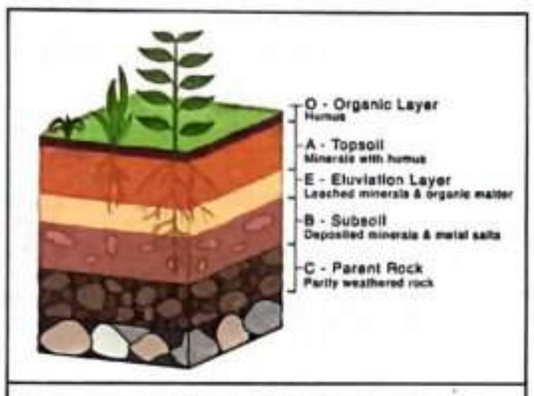

Fig 1: Soil Horizon

- Soil can be divided into certain types on the basis of factors responsible for soil formation, colour, thickness, texture, age, chemical, and physical properties.

Types of Soil in India

Soil	*Coverage*
Alluvial	40%
Red	18%
Black	15%
Laterite	4.3%
Arid	
Montane	
Marshy / Peaty	
Saline / Alkaline	

Alluvial Soil

- Alluvial soil is the *most widely spread* soil in India.
- It is found in the *Northern Plains* (Uttar Pradesh, Bihar, West Bengal, Assam) and *Deltas of Peninsular rivers*.
- It is formed due to deposition of three important Himalayan river system: Indus, Ganga, and Brahmaputra.
- Alluvial soil is found in eastern coastal plains → *Deltas of Mahanadi, Godavari, Krishna, Kaveri*.
- It is rich in *potash* and poor in *phosphorus*.
- Sand content decreases from west to east of the plains.

Alluvial Soil

Types

- ***Old alluvium:*** *Bhangar* → Calcareous concentration; poor in humus and nitrogen *(less fertile)*.
- ***New alluvium:*** *Khadar* → More suitable for agriculture *(more fertile)*. Its colour varies from *light grey* to *ash grey*.

Black Soil

- Black soil is also known as *'Regur'*.
- It is ideal for cotton cultivation ***(Cotton requires 210 frost free days)***.
- Black soil is formed due to *eruption of Lava*.
- It is found in Northwestern part of Peninsular Plateau (also known as Deccan Traps) → *Maharashtra and Gujarat*.
- It is *clayey* in nature (made of extremely fine materials).
- This soil has *self-ploughing* characteristics (It develops cracks when dry and becomes sticky when moist). The soil is also *impermeable* in nature (water does not percolate easily).
- It is rich in iron, calcium carbonate, magnesium, potassium, lime, alumina and poor in humus, nitrogen, phosphate.

Black Soil

Red Soil and Yellow Soil

- It is formed due to *weathering* of metamorphic rock.
- It is red due to presence of *iron oxide* in the soil.
- It develops on crystalline igneous rocks, especially in *areas of low rainfall* such as Tamil Nadu, Karnataka, Maharashtra, Odisha, Chhattisgarh and Piedmont zone of Western Ghats.
- It turns *yellow* when it becomes ***hydrated*** (iron oxide that gives it its red color changes form to a hydrated state, appearing yellowish).

Red Soil

> • ***Leaching:*** *Leaching is a process where all important minerals of soil wash away or percolate underground.*

Laterite Soil

- The name is derived from Latin word *'later'* which means *'brick'*.
- Laterite soil is also considered as *deep Red Soil*.
- It is formed as a result of *intense leaching process* (where important mineral such as silica washes away with the water)
- This type of soil is found in regions of *high temperature* and *heavy rainfall* such as Karnataka, Kerala, Tamil Nadu, Madhya Pradesh, and hilly areas of Odisha and Assam.
- ***Red laterite soil is found in:*** Tamil Nadu, Andhra Pradesh, Kerala → these regions are suitable for growing *cashew nut crops*.
- Laterite soil is also suitable for growing *tea and coffee (Karnataka)*.

Laterite Soil

> **Almost all Indian soils are poor in Humus and Nitrogen.*

Arid Soil

- Arid soil range from *red to brown* in colour.

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• It is generally *sandy* in texture and *saline* in nature *(rate of evaporation is greater than the rate of precipitation)*.
• Arid soil is found in parts of *Rajasthan* and *Gujarat*.
• The Kankar layer formation in bottom horizon restrict the infiltration of water.

Arid Soil

• *Saline soil is treated with Gypsum.*
• *Acidic soil is treated with Lime.*

Marshy/Peaty Soil

• Marshy/Peaty soil is primarily found in *coastal areas* of West Bengal, Odisha, and Tamil Nadu.
• It develops in *waterlogged areas* with *high organic matter* accumulation due to decaying vegetation.
• It is also seen in regions of *high humidity* and *high rainfall*.

Marshy/Peaty Soil

Desert Soil

• Desert soil is dry, sandy and low in organic matter.
• It is seen in extremely *arid, low rainfall areas (rainfall: <50 cm)* → Western Rajasthan, Gujarat, Haryana.

Desert Soil

Montane Soil

• Montane soil is found in mountainous region.
• This type of soil is more acidic, with decreased mineral nutrients.
• Montane soil is rich in organic matter (has high humus content).

Loess is a type of soil that consists of silt and dust.

Macronutrients vs Micronutrients (required for soil)

Macronutrients	*Micronutrients*
Nitrogen (N)	Chlorine (Cl)
Phosphorous (P)	Iron (Fe)
Potassium (K)	Boron (B)
Sulfur (S)	Manganese (Mn)
Calcium (Ca)	Zinc (Zn)
Magnesium (Mg)	Copper (Cu)
	Molybdenum (Mo)

USDA (United States Department of Agriculture) Soil Classification System

• ***Entisol:*** Weakly developed soil with no horizon.
• ***Inceptisol:*** Recently formed soil that has weakly or quickly developed horizons. It covers the largest geographical area of India.
• ***Vertisol:*** Vertisols are *clay-rich soil* and tend to *swell when wet* and *shrink upon drying*. They are also called inverted soils because the name comes from the Latin word vertere, which means *"to invert"*. ***E.g. Black soil.***
• ***Alfisol:*** Alfisols are a type of soil that are *rich in clay and minerals*, and are found in humid and semi-arid regions.
• ***Oxisol:*** Oxisols are *highly weathered soils* that are mainly found in tropical and subtropical regions.
• ***Gelisols:*** Gelisols are soils that contain *permafrost* within *2m* of the soil surface.
• ***Histosol:*** Histosols are soils that are made up mostly of *organic matter*, like peat and muck. They are found in wetlands, like swamps,

SOIL EROSION AND SOIL CONSERVATION

Soil Erosion

• The *denudation* of soil cover and subsequent *washing down* is described as soil erosion.

Soil Erosion due to Water

Sheet Erosion
• When *top soil gets washed* away due to heavy shower.

Gully Erosion
• It is a permanent process when *surface water run-off cuts* deeply into soil, removing it along drainage lines.

Soil Conservation Methods

• **Contour Bunding/Ploughing:** A land management practice for marginal, *sloping and hilly land* where the soil productivity is very low. It involves *placement of the lines of stone* along the natural rises of a landscape.
• **Mulching:** The process of *covering the top soil*, with plant material, such as leaves, grass, crop residue, etc.
• **Shelter Belts:** It involves *planting rows of trees on one side* of an area that prevents the wind from eroding the soil.
• **Terrace Farming:** It is the practice of *cutting flat areas out of a hilly* or *mountainous landscape* in order to grow crops. Mostly practised in hilly region, such as Himachal Pradesh, Uttarakhand, and certain North-Eastern provinces.
• **Strip Farming:** It is a type of farming that involves *dividing fields into long, narrow strips*, and *alternating crops* in a rotation system.

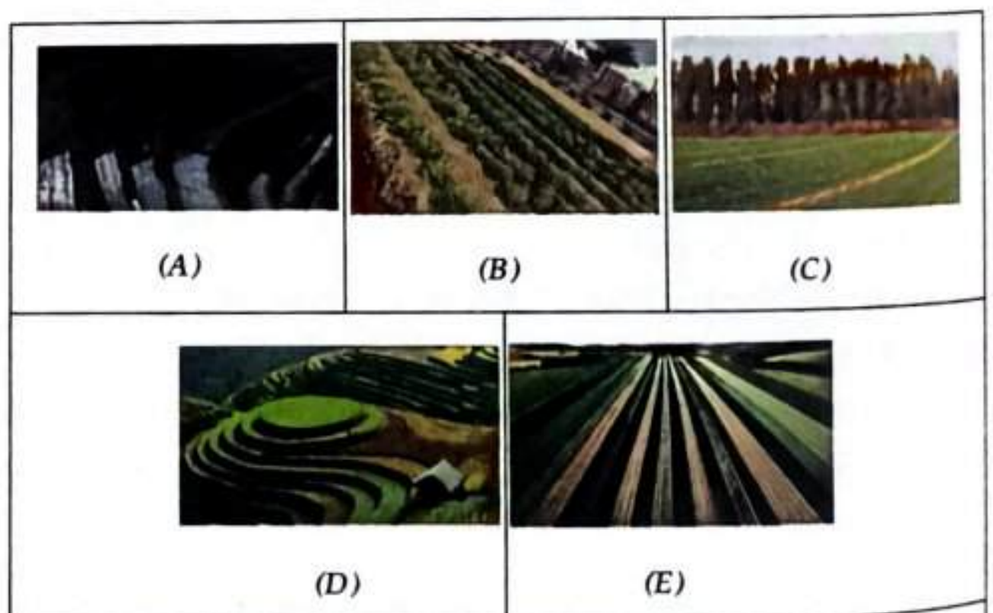

Fig 1: (A) Contour Bunding; (B) Mulching; (C) Shelter Belts; (D) Terrace Farming (E) Strip Farming

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AGRICULTURE

Types of Farming

1. **Primitive Subsistence Farming**

- It is practised on small patches of land with the help of *primitive tools* like hoe, dao, digging sticks, and family/community labour.
- This type of farming depends upon monsoon, natural fertility of soil, and suitability of other environmental conditions.
- It is also known as *"slash and burn agriculture"* or *"shifting cultivation"*.

2. **Intensive Subsistence Farming**

- It is practised in areas with *high population pressure* on land.
- It is labour intensive farming where there is a use of *high doses of biochemical inputs* and *irrigation* to obtain higher production.
- Through *"Right of Inheritance"*, division of land among successive generation has rendered land-holding uneconomical in size.

3. **Commercial Farming**

- Crops are grown and animals are reared for sale in market.
- There is a usage of *higher doses of modern inputs* such as High Yielding Variety (HYV) seeds, chemical fertilisers, insecticides, and pesticides, etc., to obtain high productivity.
- *Plantation Farming:* It involves farming on large areas of land to maximize output and profits → ***Important crops grown:*** Tea, coffee, rubber, sugarcane, banana, etc.

> • ***Truck Farming: Regions where farmers specialise in vegetables only.***

> • ***Mixed Farming: It involves growing crops and raising livestock on the same farm. This type of farming can help farmers generate stable income.***

Mixed Cropping vs Intercropping

Mixed Cropping	*Intercropping*
Mixed cropping is when two or more crops are grown on a same piece of land without following any particular pattern	Intercropping is when two or more crops are grown on a same piece of land following a specific pattern
Seeds of two different crops are mixed before sowing	Seeds are not mixed and grown in a row format
This minimises the risk of crop failure	This increases the productivity of land

Different Cropping Seasons

Kharif	*Rabi*	*Zaid*
• *Sowing: July* • *Harvesting: Sept-Oct* • Kharif crops are also known as *Monsoon crops.* • ***E.g. Rice, sugarcane, jute, cotton, tobacco, maize, soyabean, groundnut, etc.***	• *Sowing: Oct* • *Harvesting: April* • *Winter rainfall* is beneficial for such crops. • ***E.g. Wheat, barley, gram, mustard, linseed, pea, rapeseed, castor, etc.***	• *Short cropping season.* • Between *May and June* • ***E.g. Watermelon, muskmelon, cucumber, fodder crops, etc.***

Some Major Crops

> • ***India's most consumed staple crops: Rice and Wheat***

Rice

- Rice is also known as *paddy* before processing.
- India is the *2nd largest producer* of rice after *China*.
- It is sowed in *swampy areas* → *Methane* and other gases are emitted from flooded rice fields by bacteria.
- ***It requires:*** High-temperature *(>25°C)* and high rainfall *(>100 cm)*.
- In Eastern India, particularly in *West Bengal*, the three seasons for growing rice are: ***Aus, Aman, and Boro.***

Wheat

- ***Rain required: 50-70 cm.***

Sugarcane

- ***Temperature required: 21-27°C.***
- ***Rain required: 75-100 cm.***

Tea

- Tea is grown in *acidic, fertile, well-drained* soil (laterite soil) with high organic matter that is *rich in humus.*
- Tea plants grow well in the shade.
- ***Topmost producer:*** *China > India > Kenya.*
- ***Topmost producer (India):*** *Assam.*

Leguminous Crops

- India is *largest consumer/producer* of leguminous crops.
- Leguminous plants have *Nitrogen Fixing Bacteria (Rhizobium)* that reside in the *roots* (symbiotic relationship) of these plant (they convert atmospheric nitrogen into ammonia which the plant can use as nutrient).
- ***E.g. Pulses, rajma (no nitrogen fixing bacteria are present in the roots of rajma plants), soyabeans (Top producer: Madhya Pradesh), etc.***

Millets

- Millets are also known as *Superfoods/Sri Anna.*
- ***Topmost producer:*** *Rajasthan.*
- ***E.g. Bajra, ragi (finger millets), jowar (Sorghum), etc.***

Oil Seeds

- India is *2nd largest producer* of oil seeds after *China.*
- ***Topmost producer (India):*** *Gujarat.*
- ***E.g. Groundnut, coconut, mustard, sesame, cotton seed, soyabean, etc.***

Horticulture Crops

- Horticultural crops are plants that are grown for food, medicine, aroma, or aesthetics. They include fruits, vegetables, ornamental plants, and more.
- India produces *13%* of world's vegetables.
- It is associated with *Golden Revolution.*

Coffee

- *Blossom showers* help in growth of coffee.
- ***Soil required:*** *Laterite.*
- ***Coffee bowl of the world:*** *Brazil (topmost producer).*
- ***India (topmost producer):*** *Karnataka (Baba Budan Hills).*
- ***According to 2008 data:*** India produces *3.2%* of the world's coffee.
- Coffee is grown in the Western Ghats of Karnataka, Kerala, and Tamil Nadu, Andhra Pradesh, Odisha, and the North East states.
- Few widely used varieties of coffee plant: ***Arabica, Liberica, Robusta.***

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Fibre Crops

1. **Cotton**

- Cotton is cultivated on *black soil.*
- It is a fibre crop and also known as *"Silver Fibre"*.
- It requires: *210 frost free days* and *6-8 months* to mature.

2. **Jute**

- This fibre crop is also called as *"Golden Fibre"*.
- ***Topmost producer:*** *India (West Bengal).*
- ***Topmost exporter:*** *Bangladesh.*
- *Nor-westers* are considered beneficial for the growth of jute as they bring heavy rainfall which is crucial for early stages of jute cultivation.

3. **Hemp**

- It is a fast-growing, annual plant that's cultivated for its strong, durable, and natural bast fibers.

4. **Silk**

- Silk is a natural fiber that comes from the *cocoons of silkworms,* which are raised in a process called *sericulture.*
- Silk is an animal fiber, and is one of the *strongest natural fibers.*

Irrigation and Its Types

- Irrigation is the process of supplying water to land for growing crops, lawns, and plants.

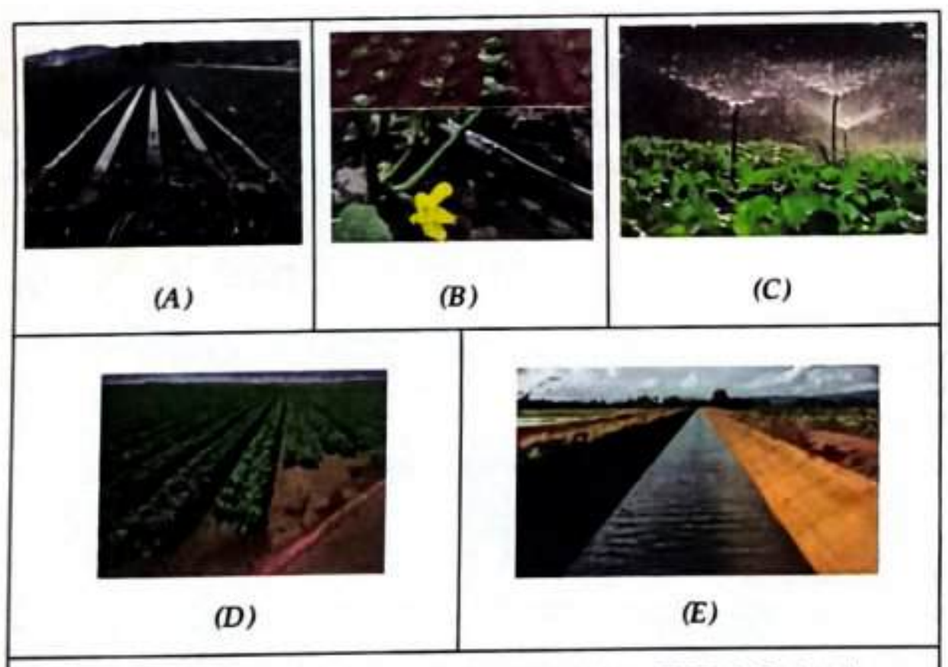

Fig 1: Types of Irrigation; (A) Surface Irrigation; (B) Drip Irrigation (C) Sprinkler Irrigation (D) Subsurface Irrigation (E) Canal Irrigation

Drip Irrigation

- ***Drip irrigation is a method of watering plants by slowly dripping water onto the soil at the base of the plant.***

AGRICULTURAL REVOLUTION

Different Types of Revolution

Green Revolution

- Green Revolution first began in *Mexico* and *Latin America* (from 1940-1960).
- ***The term "Green Revolution" was given by:*** *William S. Gaud.*
- ***Father of Green Revolution (world):*** *Norman Borlaug (USA)* → he received *Nobel Peace Prize* in *1970* for his work in developing *High Yielding Varieties* (HYVs) of wheat.
- ***Father of Green Revolution (India):*** *M. S. Swaminathan* (received Bharat Ratna in 2024).

Phases of Green Revolution in India

- Green Revolution was introduced in India in *two phases.*

First Phase

- ***Time Period:*** *Mid 1960-1970.*
- The first phase was when the use of High-yielding variety (HYV) seeds was limited to wealthier states like *Punjab, Andhra Pradesh,* and *Tamil Nadu* and it was also limited to *rice and wheat.*
- ***During the Third Five Year Plan (1961-1966):*** *CACP* (Commission for Agricultural Costs and Prices), *FCI* (Food Corporation of India) were established in *1965.*
- In *July 1968, Indira Gandhi* released a special stamp called the *"Wheat Revolution"* to mark the progress of the Green Revolution in India.

> - Under *PL-480 Scheme,* India used to import HYV seeds of wheat from *Mexico, USA* before Green Revolution.

- *IR8 (Miracle Rice):* A HYV seed of rice developed by International Rice Research Institute (IRRI) which was introduced in *Philippines* and *India.*

> - ***Father of Wheat Revolution: Dr D. S. Athwal.***
> - ***He developed a new variety of wheat known as Kaliyansona in 1967.***

Second Phase

- ***Time Period:*** *Mid 1970-1980*
- The second phase was when HYV technology spread to more states and crops.
- This phase focused on *increasing agricultural productivity, food security* and on *holistic development in agriculture.*
- The second phase was successful in increasing food production and reducing the dependence on food imports.
- The headquarters of the Second Green Revolution (SGR) cell is located at the *ICAR-RCER* (Indian Council of Agricultural Research-Research Complex for Eastern Region) in *Patna, Bihar.*

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Drawbacks of Green Revolution

- Intensive irrigation practices depleted *groundwater levels* in many regions.
- It significantly contributed to *increased soil alkalinity* due to the widespread use of chemical fertilizers, particularly nitrogen-based ones, which raised the pH level of the soil.
- It led to an *increased disparity between farmers* with large landowners and wealthier farmers benefiting disproportionately as compared to small and marginal farmers.
- It benefited more to farmers who had access to *land, capital* and *technology* and it also led to the *displacement of tenant cultivators* in many cases.

GM Crops (Genetically Modified Crops)

- These are crops/plants that have had their *DNA modified* using *genetic engineering techniques.*

E.g. Bt brinjal, Bt cotton.

Important Agriculture Revolution in India

●	Black Revolution		Petroleum
●	Blue Revolution		Fish
●	Brown Revolution		Leather
●	Golden Revolution		Fruit / Honey
●	Green Revolution		Food Grains
●	Grey Revolution		Fertilizer
●	Pink Revolution		Onion
●	Red Revolution		Meat / Tomato
●	Silver Revolution		Egg / Poultry
●	White Revolution		Milk / Dairy
●	Yellow Revolution		Oil Seeds
●	Evergreen Revolution		Overall Development

Table 1: Agriculture Revolution in India

Blue Revolution

- ***Father:*** *Hiralal Chaudhuri* and *Arun Krishnan.*
- It was a program to *increase fish production* and aquaculture in a sustainable way.

White Revolution

- White Revolution is also known as *"Operation Flood"*.
- It was a dairy development program to *increase milk production* in India.
- ***Launched in:*** *1970* → led by *Amul* [a brand owned by Gujarat Cooperative Milk Marketing Federation (GCMMF)]
- ***Father:*** *Verghese Kurien* (Autobiography: "I Too Had A Dream"; "The Man Who Made Elephant Dance").

Yellow Revolution

- ***Father:*** *Sam Pitroda*
- The Yellow Revolution was an agricultural program in India that increased the *production of edible oilseeds.*

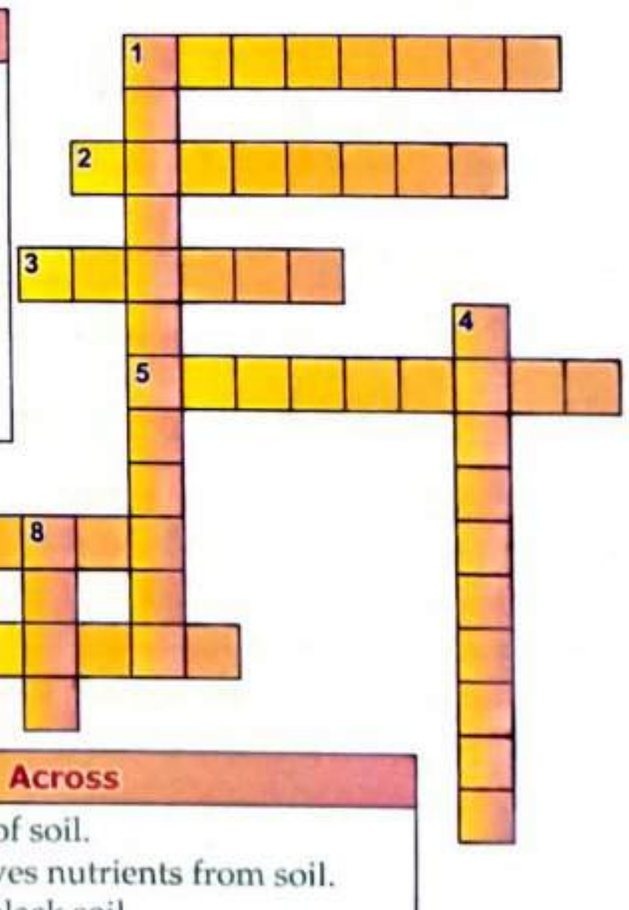
Types of Culture

Types	*Culture*
Vegetable farming	Horticulture
Silk rearing	Sericulture
Bee keeping	Apiculture
Fish farming	Pisciculture
Flower framing	Floriculture
Rearing aquatic plants and animals	Aquaculture
Cultivation of grapevines	Viticulture/Viniculture
Bird farming	Aviculture

You might find this interesting but did you know?
Agriculture Census is conducted at an interval of 5 years!

PARMAR'S CROSSWORD

SOIL AND AGRICULTURE



Down

1. Trees planted to control wind erosion.
4. Mineral lacking in black soil.
6. Soil with self-cultivating feature.
8. Micronutrient supplied by soil.

Across

1. Not a component of soil.
2. Process that removes nutrients from soil.
3. Crop suitable for black soil.
5. Arid soil found in which state.
7. Soil found in North Indian Plain.
9. Soil made of silt and dust.

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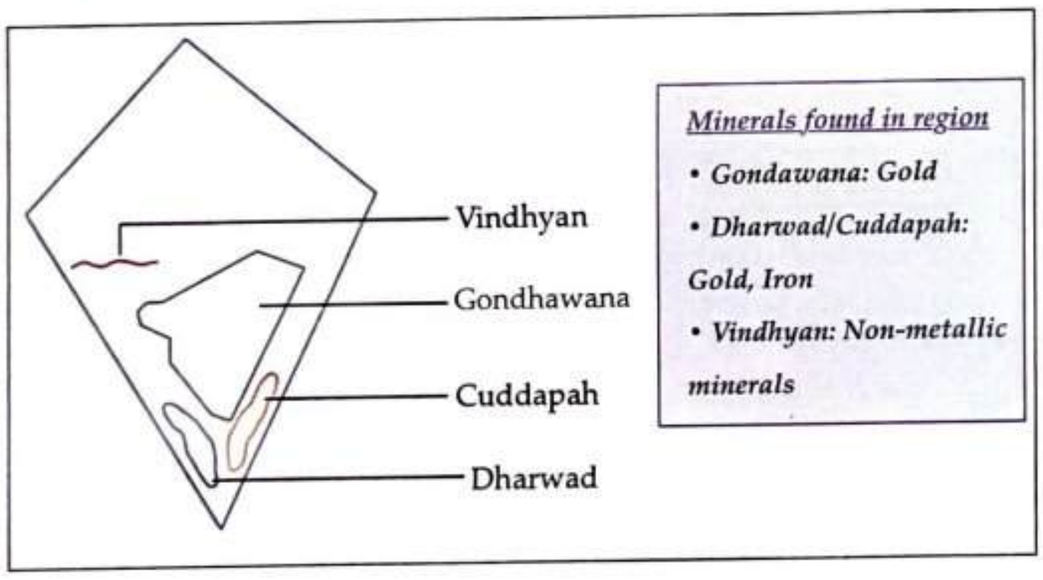
MINERALS

- A mineral is a natural substance of organic or inorganic origin with definite chemical and physical properties.
- It is a *homogenous* naturally occurring substance with a definable internal structure.
- ***Minerals are of three types:*** *Metallic, Non-Metallic, and Energy Minerals*

Minerals		
Metallic	**Non-Metallic**	**Energy Minerals**
1. *Ferrous (containing iron):* Iron ore, manganese, nickel, cobalt, etc. 2. *Non-Ferrous:* Copper, lead, tin, bauxite, etc. 3. *Precious:* Gold, silver, platinum, etc.	E.g., Mica, salt, potash, sulphur, granite, limestone, marble, sandstone, etc.	E.g., Coal, Petroleum, Natural Gas

Distribution of Minerals in India

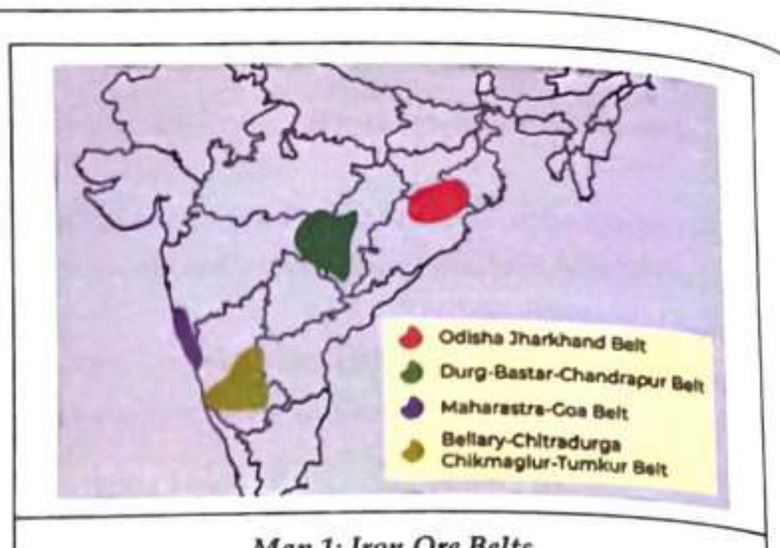
- Most of the metallic minerals in India are found in the Peninsular Plateau.
- Over 97% of coal reserves are found in the valleys of *Damodar, Son, Mahanadi and Godavari.*
- Petroleum reserves are located in the sedimentary basins of *Assam, Gujarat and Mumbai High* i.e. off-shore region in the *Arabian Sea.*
- Most of the major mineral resources occur to the east of a line linking *Mangaluru and Kanpur.*



FERROUS MINERALS

Iron Ore

- *Magnetite* is the finest iron ore with a very *high content of iron* up to *70%.*
- *Hematite* ore is the most important industrial iron ore in terms of the quantity used, but it has a slightly *lower iron content than magnetite (50-60%).*
- In 2018–19, almost entire production of iron ore *(Approx. 97%)* came from the states of *Odisha, Chhattisgarh, Karnataka and Jharkhand.*
- ***Reserve (topmost):*** *Odisha*
- ***Production:*** *Odisha > Chhattisgarh > Karnataka*
- More than 72% of Magnetite deposits in India are found in Karnataka.



Map 1: Iron Ore Belts

4 Major Iron Ore Belt in India

1. **Odisha-Jharkhand Belt**
- ***Jharkhand:*** *Singhbhum (Region: Noamudi and Gua)*
- ***Odisha region:*** *Sundargarh, Mayurbhanj, Jhar*
- ***Odisha:*** *Badampahar mines*

2. **Durg-Bastar-Chandrapur Belt** *(Chhattisgarh and Maharashtra)*
- *Dalli rajhara, Bailadila (Chhattisgarh)*

3. **Maharashtra-Goa Belt**
- ***Goa:*** *Mormugao*

4. **Bellary-Chitradurga-Chikmanglur-Tumkur Belt (Karnataka)**
- *Mangalore, Kudremukh, Baba Budan Hills*
- ***Karnataka:*** *Shivamogga*

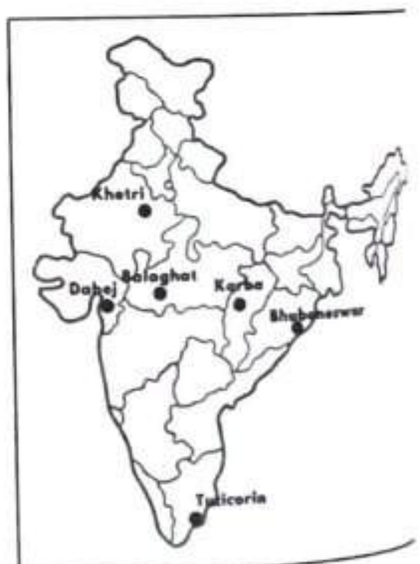
Manganese

- Manganese is mainly used in the manufacturing of *steel and ferro-manganese alloy.*
- It is also used in manufacturing bleaching powder, insecticides, and paints.
- ***Topmost producer (India):*** *Madhya Pradesh*
- ***Odisha:*** *Sundargarh deposits*

Non-Ferrous Minerals

Copper

- *First metal to be discovered by humans.*
- The *Balaghat mines* in Madhya Pradesh, *Khetri mines* in Jhunjhunu and *Alwar region* in Rajasthan.
- *Singhbhum* district of Jharkhand.



Map 2: Major Copper Production

Aluminium

- ***Primary ore:*** *Bauxite*
- It is used in aircraft because of its *lightweight.*
- India's bauxite deposits are mainly found in the *Amarkantak plateau, Maikal hills,* and the plateau region of *Bilaspur-Katni.*

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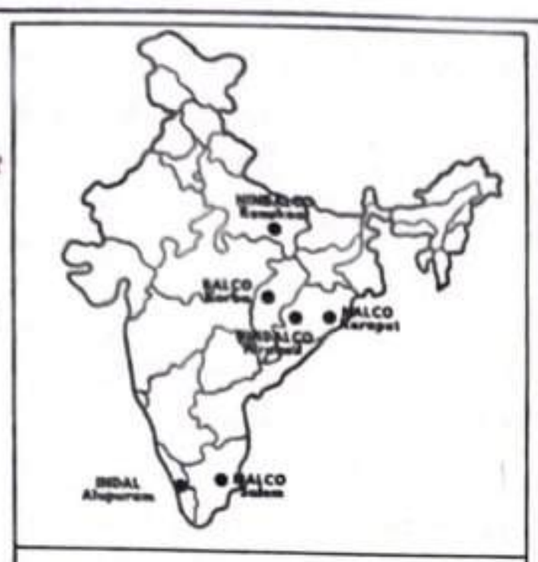
- *Odisha* is the *largest producer* of Bauxite.
- *Panchpatmali* deposits in *Koraput* district are the most important bauxite deposits in Odisha.
- Largest producer of bauxite in the world: *Australia*



Map 3: Major Aluminium Production

Precious Metals

Gold

- ***Topmost producer (World):*** *China > Australia*
- ***Topmost producer (India):*** Karnataka *(Kolar Gold Field, Hutti Gold Field)*
- ***Andhra Pradesh:*** *Ramagiri*
- ***Largest reserves (India):*** *Bihar*

Hornblende is a inosilicate amphibole mineral used in highway construction.

Non-Metallic Minerals

Mica

- It is used in electric and electronic industries due to its excellent di-electric strength, low power loss factor, insulating properties and resistance to high voltage (consists of 4% of Earth's crust).
- Mica deposits are found in northern edge of the *Chota Nagpur Plateau.*
- *Koderma Gaya-Hazaribagh* belt of *Jharkhand* is the leading producer of Mica.
- In Rajasthan, the major Mica producing area is around *Ajmer.*
- *Nellore* mica belt of Andhra Pradesh is also an important producer in the country.

Map 4: Largest Mica Producing States

Limestone

- It is a ***sedimentary rock*** that is found in association with rocks, composed of *calcium carbonates*, or a mixture of *calcium* and *magnesium carbonates.*
- It is a basic raw material for the cement industry and essential for melting iron ore in blast furnace.

Diamond

Do you know why diamond sparkles?

- *Madhya Pradesh (Panna)*, is the only state that produces diamond.

ENERGY RESOURCES

Sources of Energy

- ***Conventional Sources***
  - ***Commercial***: Coal, Petroleum, Electricity
  - ***Non-Commercial***: Fire-wood, Straw, Dried dung
- ***Non-Conventional Sources***: Bio-energy, Solar energy, Tidal energy, Wind energy, Energy from urban waste

Conventional Sources of Energy

- These are traditionally used energy sources, often *non-renewable* and derived from *fossil fuels. E.g. Fossil fuels (coal, oil, natural gas) and nuclear fuel (Uranium used in power plants).*

Non-Conventional Sources of Energy

- These are energy sources that are replenished naturally and can be used continuously without depletion, often referred to as *renewable energy* sources. ***E.g. Solar energy, wind energy, geothermal energy, etc.***

CONVENTIONAL SOURCES OF ENERGY

1. **Coal**

- Coal is also known as ***buried sunshine/black diamond/black gold.***
- In India, coal is the most abundantly available fossil fuel.
- In India coal occurs in rock series of two main geological ages, namely Gondwana, a little over 200 million years in age and in tertiary deposits which are only about 55 million years old.
- The major resources of Gondwana coal (metallurgical coal) are located in *Damodar valley. Jharia, Raniganj, Bokaro* are important coalfields.
- The *Godavari, Mahanadi, Son* and *Wardha* valleys also contain coal deposits.
- Tertiary coals occur in the north eastern states of *Meghalaya, Assam, Arunachal Pradesh and Nagaland.*
- ***Reserve (topmost):*** *Odisha > Jharkhand > Chhattisgarh*
- ***Production (topmost):*** *Chhattisgarh > Odisha*

Map 5: Major Coal Mines in India

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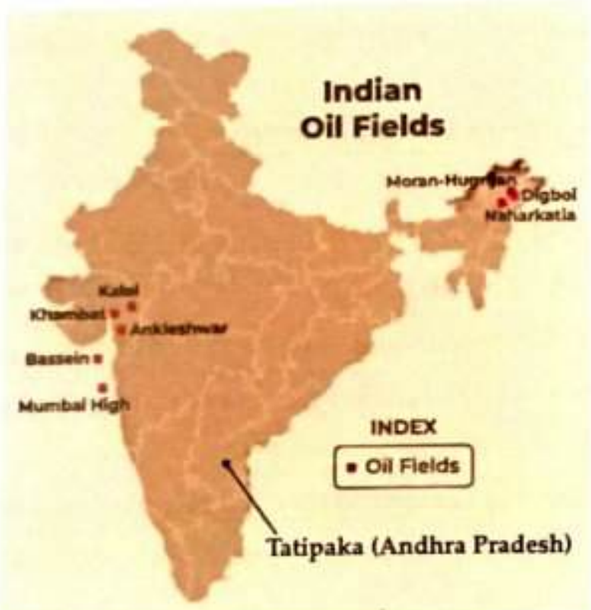
Types of Coal

- *A good coal has:* High calorific value, Low moisture content, High carbon content.
- *Anthracite: 80-90%* carbon, Highest quality, Hard coal.
- *Bituminous: 70-80%* carbon; coal that has been buried deep and subjected to high temperatures (also known *metallurgical coal/coking coal*).
- *Lignite: 50-70%* carbon; a *great brown coal* which is soft with *high moisture* content. Neyveli in Tamil Nadu is an important source of Lignite.
- *Peat: Less than 50%* carbon; decaying plants in swamps produce peat. It has a *low carbon* and *high moisture* content and *low heating capacity*.

2. Petroleum

- The majority of petroleum deposits in India are found within the rock formations of the Tertiary geological era, trapped in structures like anticlines (upward folds) and fault traps.
- Petroleum is found in fault traps between porous and non-porous rocks. Gas being lighter usually occurs above the oil.
- Mumbai High, Gujarat, and Assam are major petroleum production areas in India.
- *Ankleshwar* is the most important oil field of Gujarat.
- Assam is the oldest oil producing state of India. *Digboi* (commissioned in: *1901* and is the *1st refinery of India*), *Naharkatiya* and *Moran-Hugrijan* are the important oil fields in the state.



Map 6: Major Indian Oil Fields

3. Natural Gas

- *Methane (CH_4)* is a primary component of natural gas *(70-90%)*.
- Natural Gas is found with petroleum deposits and is released when crude oil is brought to the surface.
- It is used as fuel in power sector to generate electricity.

The majority of India's natural gas reserves are located in the *Mumbai High* and associated fields along the west coast, with additional reserves being found in the *Cambay Basin*.

- Along the *East Coast*, new reserves of natural gas have been discovered in the *Krishna-Godavari basin*.
- The first *1,700 km* long *Hazira (Guj)-Vijaipur (MP)-Jagdishpur (UP)* (HVJ pipeline established in *1986*) cross country gas pipeline, constructed by *GAIL (India)*, linked *Mumbai High and Bassein gas fields* with various fertilizer, power and industrial complexes in western and northen India.

4. Electricity

- ***Hydro-energy/Hydroelectricity:*** Hydroelectricity is a renewable energy source that uses the *power of moving water* to generate electricity.
- ***Thermal:*** It uses the power of *Coal, Petroleum and Natural Gas* to generate electricity.

Mundra Thermal Power Plant: *Kutch, Gujarat.*

5. Thermal Energy Power Plant

- Thermal energy power plants, also known as thermal power stations are facilities that *convert heat energy*, often from burning fossil fuels or nuclear fission, into *electrical energy*, typically by using *steam to drive turbines*.

Map 7: Thermal Power Plants of India

NON-CONVENTIONAL SOURCES OF ENERGY

1. Nuclear/Atomic Energy

- Nuclear fission is a reaction in which the nucleus of an atom splits into *two or more smaller nuclei*. The fission process often produces gamma photons, and releases a very large amount of energy which is used to generate electric power.
- ***E.g. Uranium and Thorium mines, which are available in Jharkhand and the Aravalli ranges of Rajasthan.***
- *Monazite sand* of Kerala is also rich in *Thorium*.

- *Apsara: 1st Nuclear Reactor of Asia. It was set up in 1956 in Bombay. It was shut down in 2009.*
- *Father of nuclear programme H. J. Bhabha*

Function of Moderator, Control Rods, and Coolant in Nuclear Reactors

Moderator

- Moderator *slows down the fast-moving neutrons* produced during fission, making them more likely to cause further fission events.

E.g. Common moderators include, heavy water (deuterium oxide) and graphite.

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Control Rods

• Control rods *absorb neutrons*, thus regulating the rate of fission and preventing the *chain reaction* from becoming *uncontrolled*. ***E.g. Control rods are typically made of boron, cadmium, silver, etc.***

> ***Chernobyl disaster took place on 26th April 1986 in Ukraine, Soviet Union.***

Coolant

• Coolants remove the heat generated by fission, *preventing* the reactor core from *overheating* and allowing the heat to be used to *produce steam for electricity generation*. ***E.g. Heavy water, gas like helium or CO_2.***

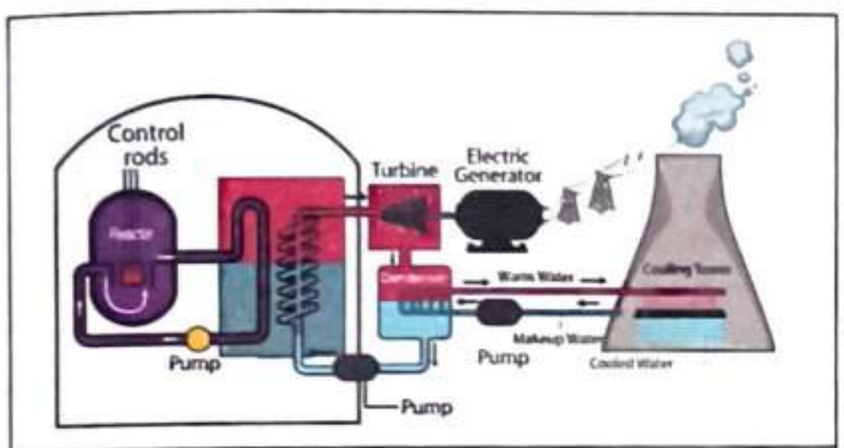


Fig 1: A Nuclear Reactor

Nuclear Power Plants of India

- *Tarapur:* Maharashtra *(1st nuclear power plant)* commissioned in 1969.
- *Kudankulam* and *Kalpakkam:* Tamil Nadu
- *Kaiga:* Karanataka
- *Narora:* Uttar Pradesh
- *Rawatbhata:* Rajasthan
- *Kakrapar:* Gujarat

2. **Solar Energy**

• It is a *renewable* source of energy.

• Solar energy is the radiant heat and light from the sun that can be harnessed to generate electricity, heat, and other forms of energy.

• *Photovoltaic technology* is a technology which converts sunlight directly into electricity.

• ***HQ of International Solar Alliance:*** *Gurugram.*

• *Bhadla Solar Park* in *Rajasthan* is the largest.

3. **Wind Energy**

• It is a *renewable* source of energy.

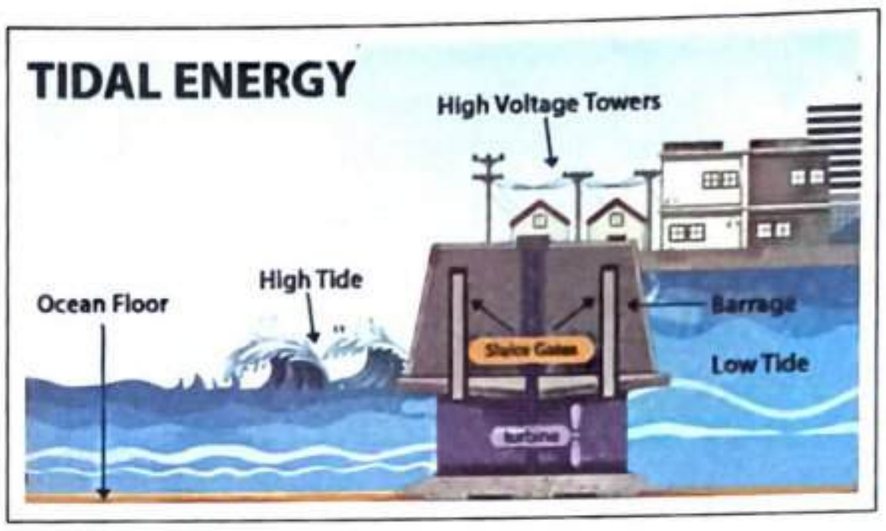
• India has a great potential of wind power.

• The largest wind farm cluster is located in Tamil Nadu from *Nagercoil* to *Madurai.*

4. **Tidal Energy**

• Ocean tides can be used to generate electricity.

• In India, the *Gulf of Khambhat*, the *Gulf of Kutch in Gujarat* on the western coast and *Gangetic delta in Sunderban* regions of West Bengal provide ideal conditions for utilising tidal energy.



Renewable Vs Non-Renewable Resources

Renewable Resources	*Non-Renewable Resources*
They can be easily recycled	They cannot be easily recycled as they take millions of years to form once exhausted
They are also called as inexhaustible resources	They are also called as exhaustible resources
They are environment friendly and do not release any particles to the atmosphere	They are not environment friendly, they release carbon dioxide, methane, and other toxic gases
They are found abundantly in nature	They are scarce in nature

> ***• Philosopher's stone convert all base metals like iron into gold.***
> ***• Approximate amount of silica present in cement is between 17% and 25%.***
> ***• Rock forming silicate mineral that constitutes more than 50% of Earth's crust and is used in glass and ceramic industry is Feldspar.***

5. **Geothermal Energy**

• Geothermal energy refers to the heat and electricity produced by using the heat from the *interior of the Earth*.

• Two experimental projects have been set up in India to harness geothermal energy → *Parvati valley* near *Manikarn (Himachal Pradesh)* and *Puga Valley (Ladakh).*

6. **Biomass**

• Shrubs, farm waste, animal and human waste are used to *produce biogas* for domestic consumption in rural areas.

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- Decomposition of organic matter yields gas, which has higher thermal efficiency in comparison to kerosene, dung cake, and charcoal.
- The plants that utilise cattle dung are known as *'Gobar gas plants'* in rural India.

Anaerobic Digestion

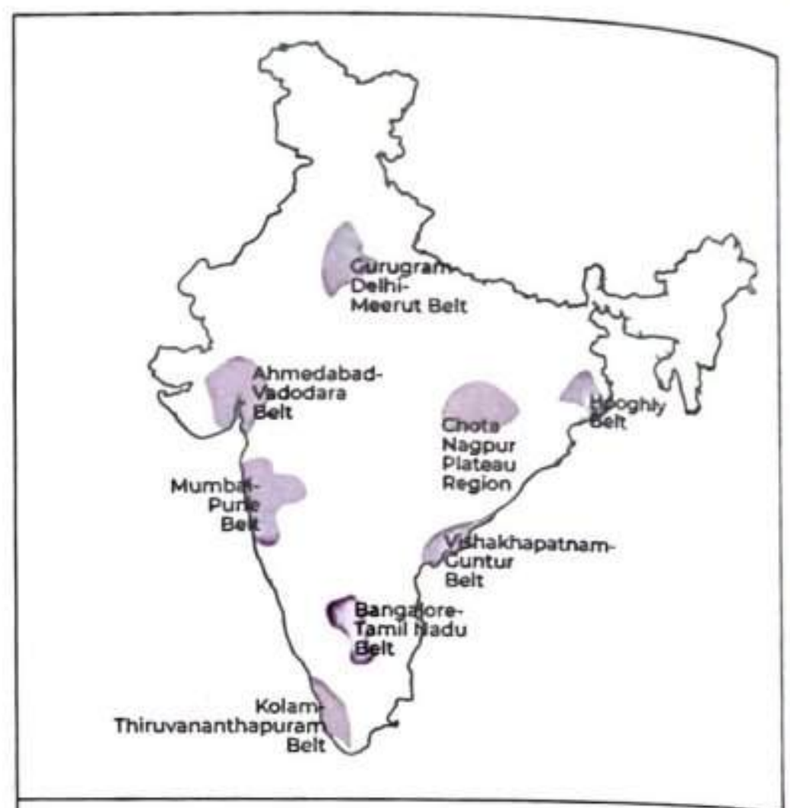
- In anaerobic respiration, microorganism breaks down biodegradable material in *absence of oxygen.*
- Biogas is generated through *anaerobic respiration.*

Biogas composition

- CO_2: 30-40%
- CH_4: 55-70%

Major Industrial Regions of India

- *Mumbai-Pune Industrial Region.*
- *Hugli Industrial Region.*
- *Bangalore-Tamil Nadu Industrial Region.*
- *Gujarat Industrial Region.*
- *Chotanagpur Industrial Region.*
- *Vishakhapatnam-Guntur Industrial Region.*
- *Gurgaon-Delhi-Meerut Industrial Region.*
- *Kolfam-Thiruvananthapuram Industrial Region.*



Map 8: Major Industrial Regions in India

PARMAR'S CROSSWORD

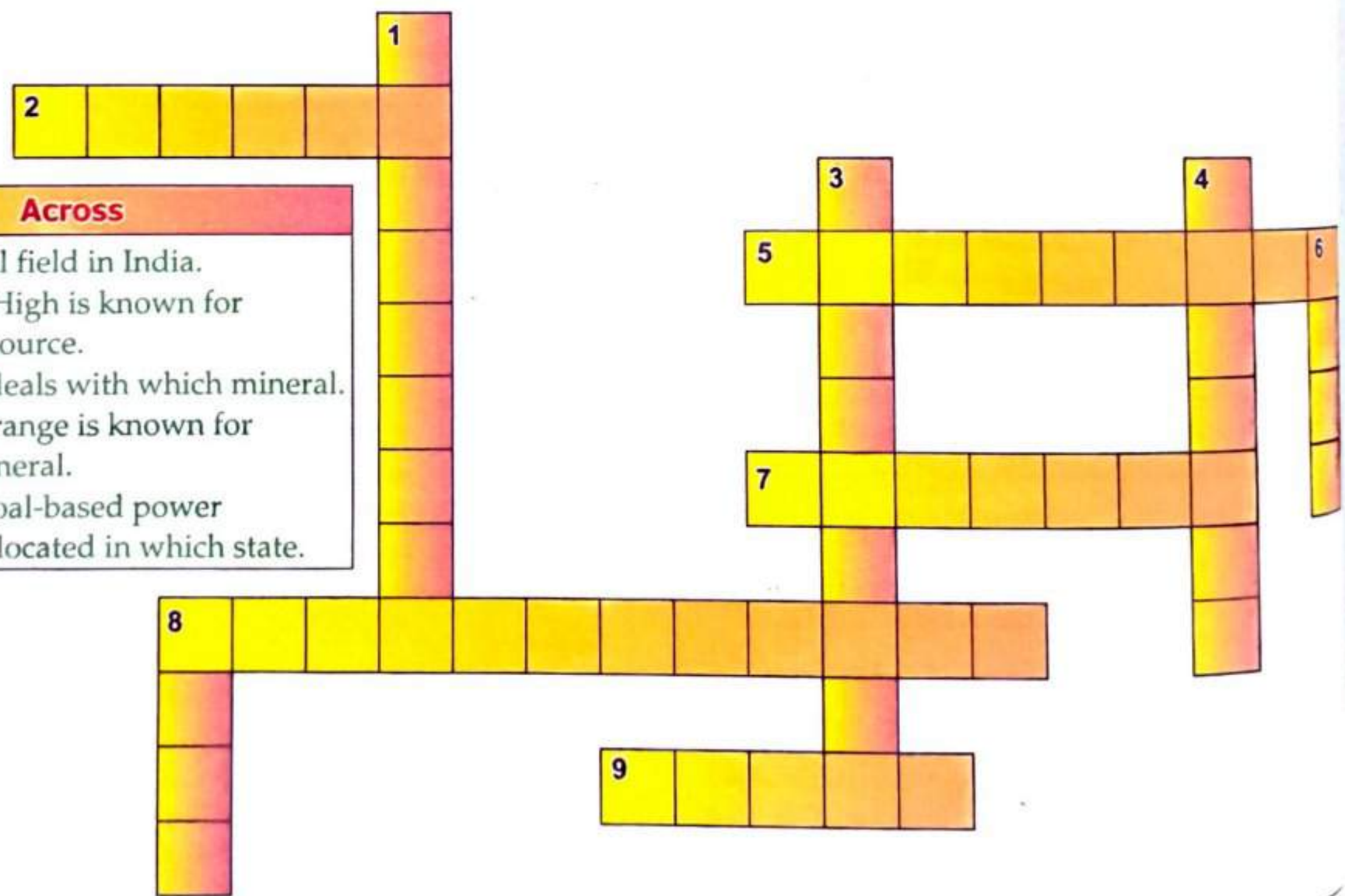
MINERALS

Down

1. Shivamogga district known for iron ore is in which state.
3. Tertiary coal occurs in which state.
4. Lignite coal production site.
6. Koderma Gaya Hazaribagh belt is famous for which mineral.
8. Jharkhand and Chhattisgarh are rich in which mineral.

Across

2. Major coal field in India.
5. Mumbai High is known for which resource.
7. NALCO deals with which mineral.
8. Bailadila range is known for which mineral.
9. Barauni coal-based power station is located in which state.



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Continents

Area wise

Asia
Africa
North America
South America
Antarctica
Europe
Australia/Oceania

Decreasing ↓

Population wise

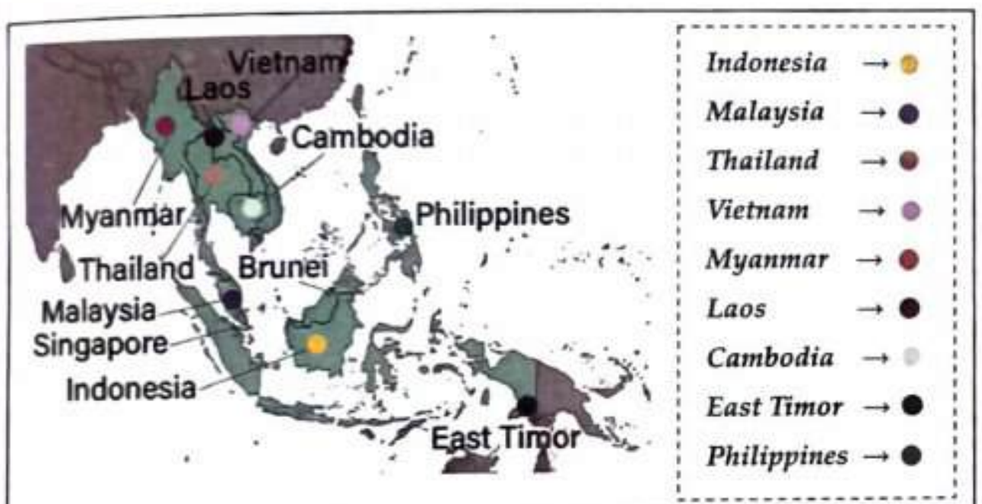
Asia
Africa
Europe
North America
South America
Australia/Oceania
Antarctica

Decreasing ↓

- *Top (Area + Population wise): Asia*
- *2nd (Area + Population wise): Africa*

ASIA

SOUTHEAST ASIA



Map 1: Southeast Asia

Indonesia

- It is a country with *highest Muslim population* around the world.
- ***Capital:*** Nusantara (old capital: Jakarta)
- ***Five main islands in Indonesia:*** *Sumatra (largest island of all), Kalimantan, Sulawesi, Java, Papua.*
- Most of the islands in Indonesia are *volcanic islands*.

Malaysia

- ***Capital:*** Kuala Lumpur

Thailand

- ***Capital:*** Bangkok

Vietnam

- ***Capital:*** Hanoi

Myanmar

- ***Capital:*** Naypyidaw
- Myanmar was earlier known as "Burma".

Laos

- ***Capital:*** Vientiane
- It is a *landlocked* country *(only surrounded by land and no ocean).*

Cambodia

- ***Capital:*** Phnom Penh

East Timor

- ***Capital:*** Dili

Philippines

- ***Capital:*** Manila

Strait

- A strait is a narrow passage of water body that connects *two large bodies of water* or *separates two landmasses*.

Strait of Malacca

- It connects *South China Sea* (part of Pacific Ocean) and *Andaman Sea* (part of Indian Ocean) and separates *Malaysia* and *Indonesia*.

Sunda Strait

- It connects the *Java Sea* and the *Indian Ocean* and separates the Indonesian islands of *Sumatra* and *Java*.

EAST ASIA

Map 2: East Asia

China

- ***Capital:*** Beijing
- ***Desert:*** Taklamakan *(largest desert of China)* and Gobi Desert (China and Mangolia) *(cold desert)*.

South Korea

- ***Capital:*** Seoul
- It shares border with *North Korea*.

Taiwan

- ***Capital:*** Taipei
- Taiwan was earlier known as *Formosa*.

Yellow Sea

- It is located between mainland *China* and *Korean Peninsula*.

Japan

- Capital: Tokyo
- *Honshu* island is the *largest island* of Japan.

North Korea

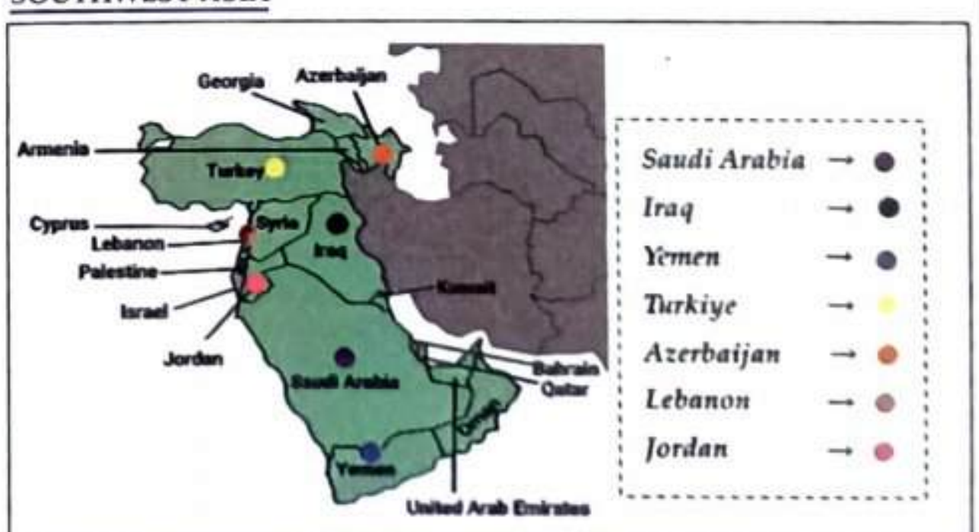
- ***Capital:*** Pyongyang
- It shares borders with *China* and *Russia*.

South and North Korea are separated by 38th Parallel.

Kuril Islands

- This island under territorial dispute between *Japan and Russia*.

SOUTHWEST ASIA



Map 3: Southwest Asia

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Saudi Arabia

- ***Capital:*** Riyadh

Turkiye

- ***Capital:*** Ankara
- It is spread across two continents: *Europe and Asia*
- ***Currency:*** Lira

Jordan

- Capital: Amman

Iraq

- ***Capital:*** Baghdad
- ***Old name of Iraq:*** *Mesopotamia*
- It is referred to as *"the land between two rivers"* → *Tigris* and *Euphrates* rivers.

Yemen

- ***Capital:*** Sana'a

Lebanon

- ***Capital:*** Beirut

CENTRAL ASIA

- *Turkmenistan* → ●
- *Uzbekistan* → ●
- *Kazakhstan* → ●
- *Kyrgyzstan* → ●
- *Tajikistan* → ●

Map 4: Central Asia

Turkmenistan

- ***Capital:*** Ashgabat

Uzbekistan

- ***Capital:*** Tashkent

Kazakhstan

- ***Capital:*** Astana

Kyrgyzstan

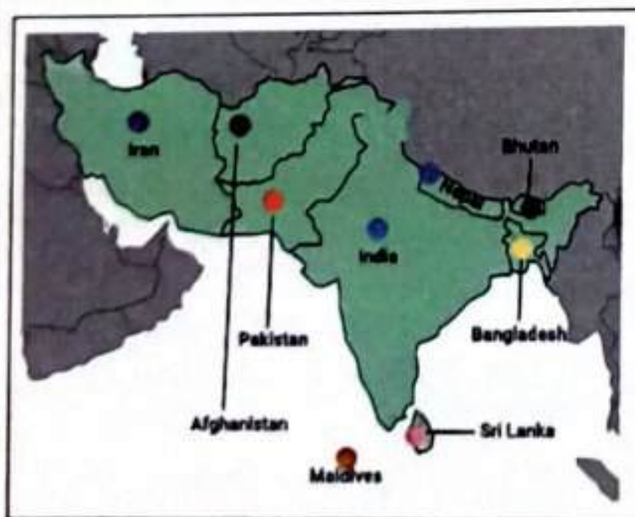
- ***Capital:*** Bishkek

Tajikistan

- ***Capital:*** Dushanbe

> ***Liechtenstein and Uzbekistan are the only doubly landlocked countries (countries that are surrounded by landlocked countries).***

SOUTH ASIA



- *Iran* → ●
- *India* → ●
- *Pakistan* → ●
- *Afghanistan* → ●
- *Nepal* → ●
- *Bangladesh* → ●
- *Bhutan* → ●
- *Sri Lanka* → ●
- *Maldives* → ●

Map 5: South Asia

Iran

- ***Capital:*** Tehran
- ***Old name of Iran:*** *Persia*

India

- ***Capital:*** New Delhi

Pakistan

- ***Capital:*** Islamabad

Afghanistan

- ***Capital:*** Kabul

Nepal

- ***Capital:*** Kathmandu

Bangladesh

- ***Capital:*** Dhaka

Bhutan

- ***Capital:*** Thimphu

Sri Lanka

- ***Capital:*** Sri Jayawardenepura Kotte *(Legislative capital)* and Colombo *(Judicial capital)*

Maldives

- ***Capital:*** Male; Official language: Dhivehi

Straits

Kerch Strait

- It connects the *Black Sea* and the *Sea of Azov* and separates *Kerch* (in *Ukraine*) and *Russia*.

Bosphorous Strait

- It connects the *Black Sea* to the *Sea of Marmara*.

Strait of Hormuz

- It connects the *Persian Gulf* (west) to the *Gulf of Oman* and the *Arabian Sea* (in the southeast).

Bab-al-Mandab Strait

- This strait is also known as *Gateway of Grief* or the *Gate of Tears*.
- It connects the *Red Sea* to the *Gulf of Aden*.

Palk Strait

- It connects the *Bay of Bengal* to *Gulf of Mannar* and separates *India* and *Sri Lanka*.

Sea

Caspian Sea

- It is surrounded by *five* countries *(TRICK: TARIK)*

T	A	R	I	K
Turkmenistan	*Azerbaijan*	*Russia*	*Iraq*	*Kazakhstan*

- Caspian Sea is a lake and is a *landlocked* water body of *Europe and Asia*.
- Rivers *Volga, Ural, and Terek* discharge themselves into the Caspian Sea.

Black Sea

- It is bordered by *six* countries *Bulgaria, Georgia, Romania, Russia, Turkiye, and Ukraine (TRICK: The BuRGUR).*

The	Bu	R	G	U	R
Turkiye	*Bulgaria*	*Russia*	*Georgia*	*Ukraine*	*Romania*

- Rivers *Danube, Dnieper,* and *Dniester* discharge themselves into the Black Sea.

Red Sea

- It is bordered by *six* countries *Djibouti, Eritrea, Saudi Arabia, Sudan, Egypt, Yemen (TRICK: DESSEY).*

D	E	S	S	E	Y
Djibouti	*Eritrea*	*Saudi Arabia*	*Sudan*	*Egypt*	*Yemen*

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Dead Sea

- It is a salt water lake with *highest salinity in the world* (salinity: 34.2%).
- It is bordered by two main countries: *Jordan and Israel*.

TRANS-SIBERIAN RAIL LINK

- It is world's *longest rail link* with the length of *9288 km*.
- It connects *Vladivostok* and *Siberia*.

Map 6: Trans-Siberian Link between Siberia and Vladivostok

Russia

- *Capital:* Moscow
- It is a *trans-continental country*.

Ukraine

- *Capital:* Kyiv

Canal

- It is an *artificial waterway* constructed to allow the passage of boats or ships inland or to convey water for irrigation.

Suez Canal

- It connects the *Mediterranean Sea* to the *Red Sea*.

Map 7: Straits, Canal, and Sea

AFRICA

- It is known as *"Continent of Continents"*, *"Dark Continent"*, and *"Black Continent"*.
- It is the only continent from where all three important latitudes pass *(Equator, Tropic of Cancer, Tropic of Capricorn)*.

Map 8: Africa Continent

Ethiopia

- *Capital:* Addis Ababa
- *Old name of Ethiopia: Abyssinia*

Malawi

- *Capital:* Lilongwe
- *Old name of Malawi: Nyasaland*

Zimbabwe

- *Capital:* Harare

Egypt

- *Capital:* Cairo
- It is a transcontinental country.

Zambia

- *Capital:* Lusaka

Strait of Gibraltar →
Atlas Mountain →
Namib desert →
Kalahari Desert →
Benguela Current →
Canary Current →
Great Rift Valley →
Lake Turkana →
Lake Victoria →
Madagascar →
Egypt →

Zimbabwe and Zambia were previously known as Rhodesia.

Mountain Ranges and Peaks

Atlas

- It is a series of mountain ranges located in *Northern Africa*.

Mt. Kilimanjaro

- It is a *dormant volcano* and the *highest peak* of Africa (in *Tanzania*)

Desert

Sahara Desert

- It is world's *largest hot desert* spanning across *North Africa*.

Kalahari Desert

- It is located in *Southern Africa* covering *Botswana, Namibia,* and *South Africa*.

Namib Desert

- It is located in west coast of *Southern Africa* covering *Namibia, Angola,* and *South Africa*.

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Great Rift Valley

- The Great Rift Valley is a series of continuous geographical trench that features the deepest lakes and highest mountains.
- It is one of the *most extensive rifts* on the Earth's surface that runs along the part of East Africa.

River

Nile River

- It is the *longest river* of the world.
- It is formed from *Blue Nile (origin: Lake Tana in Ethiopia)* and *White Nile (origin: Lake Victoria of Tanzania.*
- The Nile river empties at *Mediterranean Sea.*

Map 9: River Nile

Congo River

- It cuts the *equator twice.*

Limpopo River

- It cuts the *Tropic of Capricorn twice.*

NORTH AMERICA

Map 10: North America

Alaska

- It was earlier a part of *Russia.*

Greenland

- It is the largest island of the world located in North Atlantic Ocean.

Canal and Strait

Panama Canal

- Panama Canal links *North America* to *South America* and separates the *Atlantic Ocean* from the *Pacific Ocean.*

49th Parallel Line

- It is a boundary between *USA* and *Canada.*

Bering Strait

- Bearing strait connects *Arctic Ocean* to *Pacific Ocean* and separates *Asia* and *North America.*

Mountains

Rocky Mountains

- They are also known as *Rockies.* They are the largest and major mountain range in *North America.*
- They are *young fold mountains.*

Appalachian Mountains

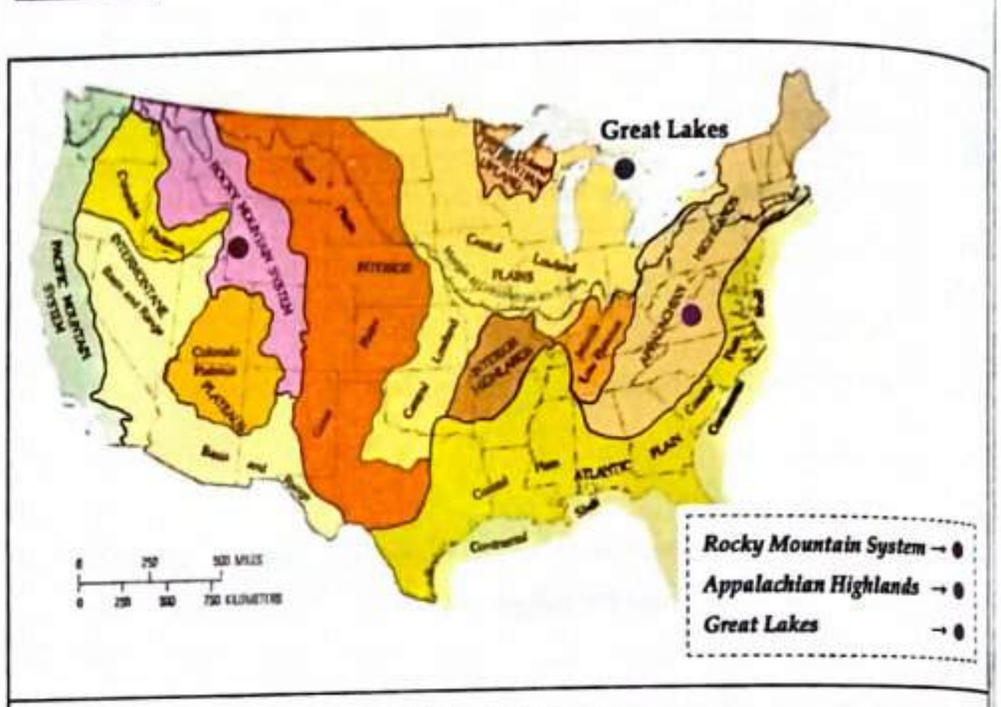
- They are among the oldest mountain ranges on Earth.
- They are *old fold mountains.*

- ***Desert:*** Mojave desert and Sonoran desert.

Peak

- *Mt. Mckinley* (also called as *Mt. Denali*) is the *highest peak* of North America.

CANADA



Map 11: Canada

- Canadas has the *most no. of natural lakes* in the world.

H: Lake Huron
O: Lake Ontario
M: Lake Michigan
E: Lake Erie
S: Lake Superior (world's largest freshwater lake)

These lakes are known as "The Great Lakes" and are shared by both USA and Canada.

SOUTH AMERICA

Chile

- ***Capital:*** Santiago

Argentina

- ***Capital:*** Buenos Aires

Paraguay

- ***Capital:*** Asuncion

Bolivia

- ***Capital:*** Sucre

Uruguay

- ***Capital:*** Montevideo

Brazil

- ***Capital:*** Brasilia
- Currency: Brazilian Real

Venezuala

- ***Capital:*** Caracas

Mountains

Ojas del Salado

- It is the *highest mountain* (dormant complex volcano) in the *Andes* range on *Argentina-Chile* border.

Mt. Cotopaxi

- It is located in the Andes mountains of *Ecuador.*

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Andes Mountain Range

- It is the *longest chain of mountain range* on land that runs along the western coast of *South America*. It is a *young fold mountain range*.
- ***It passes through seven countries:*** *Venezuela, Colombia, Ecuador, Peru, Bolivia, Chile, and Argentina.*

Mt. Aconcagua

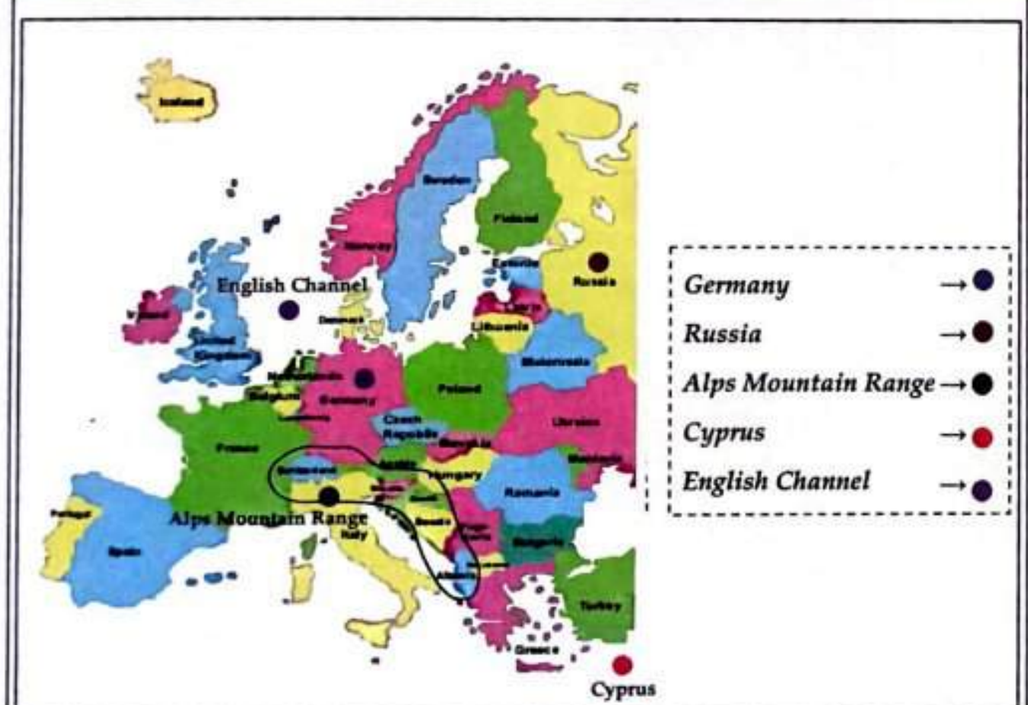
- It is the *highest peak (6960 m)* of Andes.
- It is located in *Argentina*.

Atacama Desert

- It is the *driest desert* located in *Northern Chile* bordered by *Pacific Ocean* (west) and *Andes Mountains* (east).

Map 12: South America

EUROPE



Map 13: Europe

Russia

- Russia is considered a part of both *Europe* and *Asia*.
- *Mt. Elbrus (5642 m)* is the *highest peak* of *Russia* and *Europe*.

Mountain Ranges

Ural Mountain Ranges

- It separates *Europe* and *Asia* and is an *old fold mountain range*.

Alps Mountain Range

- The Alps are the *highest mountain range* in Europe and are *young fold mountains*.

Scandinavian Countries and Nordic Countries

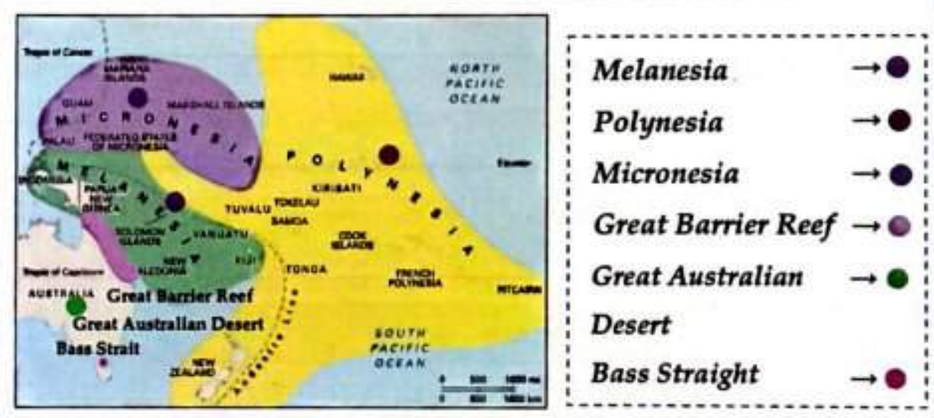
Map 14: Scandinavian and Nordic Countries

- ***Scandinavian countries:*** *Norway, Sweden, Denmark*
- ***Nordic countries:*** *Denmark, Finland, Sweden, Norway, Iceland*

Hidenburg Line

- It is a line between *Germany* and *Poland* (*German defensive line* in French territory during *World War I*).

OCEANIA



Map 15: Oceania

- Oceania is made up of *Micronesia, Polynesia, and Melanesia*, in addition to *Australasia*, which includes *Australia and New Zealand*.

River

- The longest river of Australia is *Murray*.

Strait

Bass Strait

- It separates *Tasmania* from *Victoria* in Australia.

Great Barrier Reef

- It is the world's *largest barrier reef* located in North Eastern coast of Australia.
- It is also the world's *largest coral reef system*.

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Desert

Great Australian Desert

- The Great Australian Desert covers *central* and *western Australia*.
- It is made up of several interconnected deserts, making it the *largest in Australia*.

ARCTIC AND ANTARCTICA

ANTARCTICA

- ***Highest Peak:*** *Mt. Vinson Massif*
- ***Indian Research Centre in Antarctica:*** *Bharati, Dakshin Gangotri (established in 1984)*, and *Maitri*.

ARCTIC

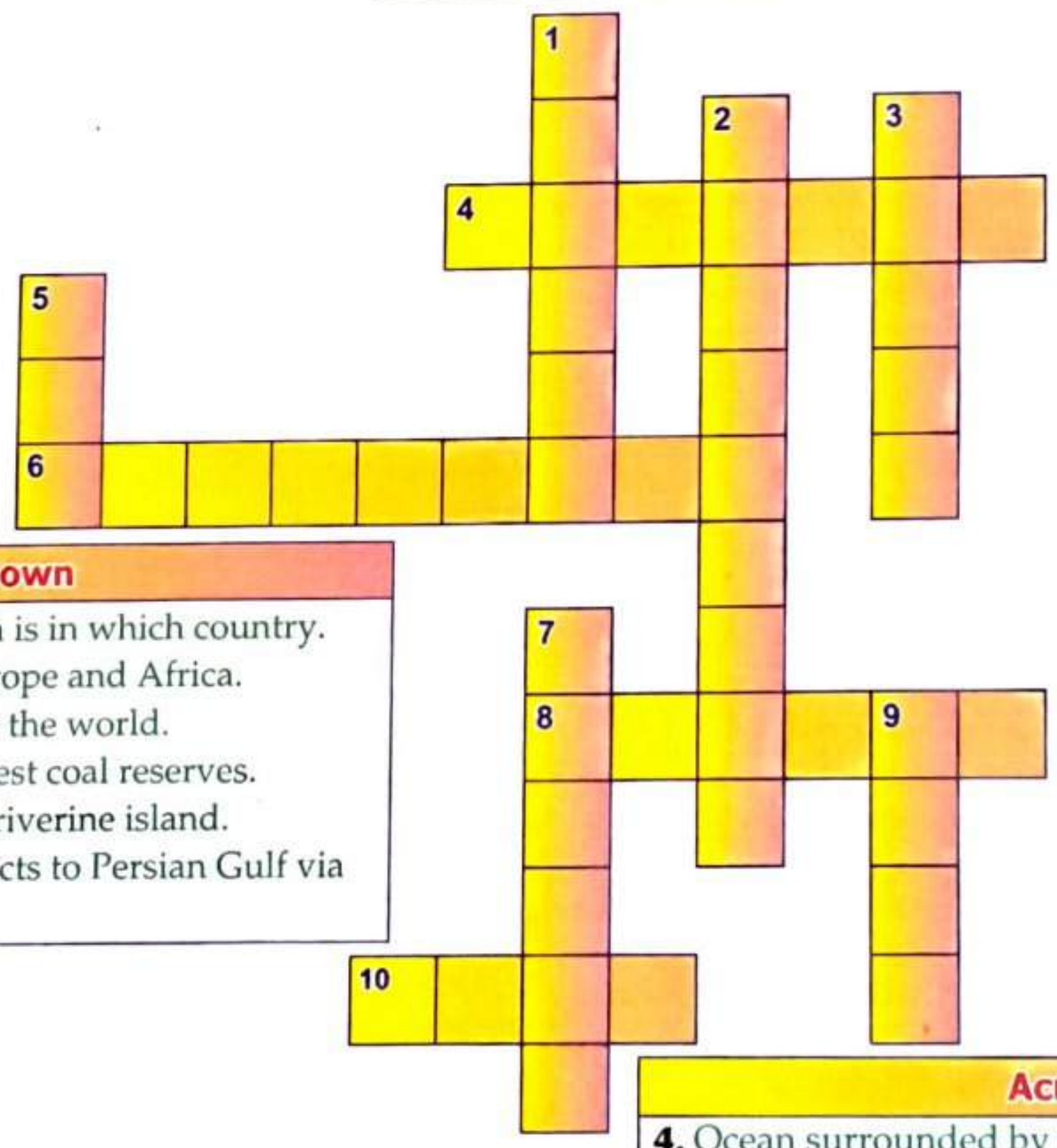
- India's *first research centre "Himadri"* was established here in *2008*.

CITIES LOCATED ON BANKS OF RIVER

River	*Cities*
Seine river	Paris
Thames river	London
Tigris river	Baghdad
Danube river	Budapest
Nile river	Cairo
Ravi river	Lahore
Moskva river	Moscow
St. Lawrence river	Montreal/Quebec

PARMAR'S CROSSWORD

WORLD MAP



Down

1. Copacabana beach is in which country.
2. Strait between Europe and Africa.
3. Highest plateau in the world.
5. Country with largest coal reserves.
7. Largest inhabited riverine island.
9. Arabian Sea connects to Persian Gulf via which gulf.

Across

4. Ocean surrounded by North and South America to the east.
6. Great Barrier Reef is located in which country.
8. World's largest drainage basin.
10. Strait separating India and Sri Lanka.

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Conservation Sites

• Areas that are legally protected to preserve their natural or cultural significance are called *"protected areas"*, which can include *national parks, wildlife sanctuaries, biosphere reserves*, and *cultural heritage sites.*

Different Conservation Sites:

In-Situ Conservation	Ex-Situ Conservation
Conserving the wildlife in the natural habitat	Conserving the wildlife outside their natural habitat
E.g. National Parks, Wildlife Sanctuary, Biosphere Reserves	*E.g. Zoo/Zoological gardens, Aquarium, Botanical gardens*

National Park, Wildlife Sanctuary, and Biosphere Reserve

National Park

• A national park is a protected area of land that is managed by the government to preserve the natural environment.

• They prohibit activities like hunting, deforestation, and industrialisation.

Wildlife Sanctuary

• A wildlife sanctuary is a protected area of land where *plants (flora)* and *animals (fauna)* can live and thrive.

• It is established to protect *endangered species* and their *habitats.*

• They can be owned by the *government* or a *nonprofit organization.*

Biosphere Reserve

• These are large area of protected land for *conservation of wildlife, plants, animals,* and *traditional life* of the *tribals* living in the area.

Biosphere Reserve Zones

• ***There are three zones of Biosphere: Core zone, Buffer zone and Transition zone***

• Core Zone: In this zone, *human intervention is strictly prohibited* to preserve the natural ecosystem and its biodiversity.

• Buffer Zone: The buffer zone is the area surrounding the core zone. *Humans are permitted to conduct only research and education related work.* These activities should not interfere with the core area's conservation goals.

• Transition Zone: It is a biosphere reserve's periphery where *human activities such as cropping, recreation, forestry, and settlements* are permitted with the cooperation of reserve management and local people.

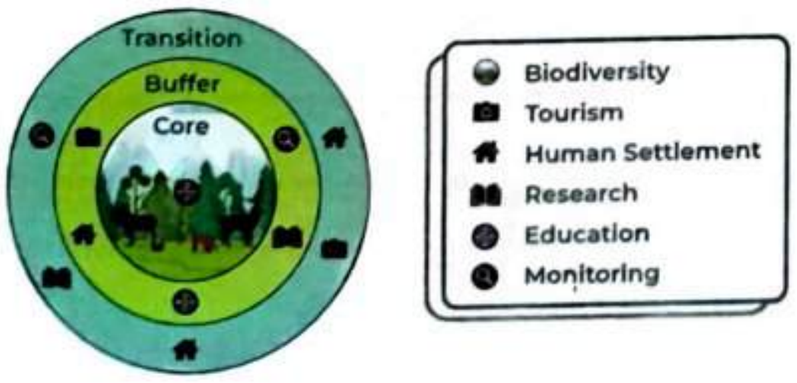

Fig 1: Types of Biosphere Reserve Zones

International Union for Conservation of Nature (IUCN)

• ***HQ:*** Gland, Switzerland

• ***Established in:*** 1948

• IUCN maintains a *Red Data Book* (it records endangered species to raise awareness and protect biodiversity).

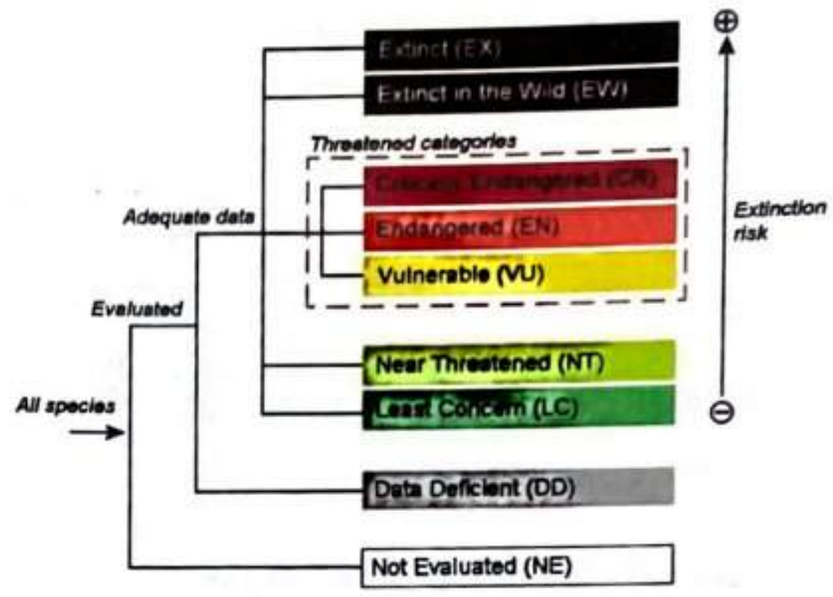

Fig 2: IUCN Red List Data Book

Wildlife Protection Act 1972

• It is an Act of the Parliament of India enacted for the protection of plants and animal species.

• The act has played a critical role in conserving the country's diverse wildlife.

Schedules under this Act

• ***Total:*** *6 schedules*

• *Schedule I:* It covers *endangered species* that need rigorous protection → Black buck, snow leopard, Asiatic cheetah, etc.

• *Schedule II:* Animals under this list are also accorded high protection with the *prohibition on their trade* → Indian cobra, Assam Macaque, Himalayan black bear, etc.

• *Schedule III & IV:* Species that are *not endangered* → Sambar deer, chital, etc. (Schedule III) and Crabs, Flamingo, etc. (Schedule IV).

• *Schedule V:* This schedule contains animals that are considered as *vermin* (small wild animals that carry disease and destroy plants and food) → Fruit bat, rats, common crow, etc.

• *Schedule VI:* It provides for regulation in the cultivation of a *specified plant* and restricts its possession, sale, and transportation → Blue orchid, red orchid, pitcher plants, etc.

CONSERVATION SITES

Representation in Maps

• ***NP:*** National Parks (represented in red •)

• ***WLS:*** Wildlife Sanctuary (represented in green •)

• ***BR:*** Biosphere Reserve (represented in blue •)

• ***RS:*** Ramsar Site (represented in purple •)

• ***TR:*** Tiger Reserve Lakes (represented in orange •)

• ***BS:*** Bird Sanctuary (represented in yellow •)

• ***Lakes/Jheel:*** Represented in sky blue •)

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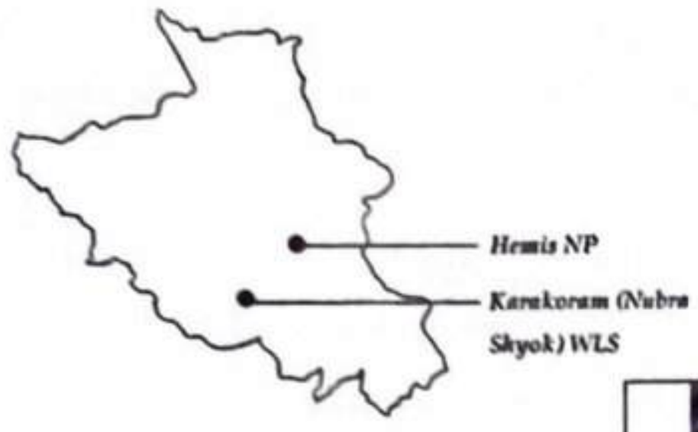
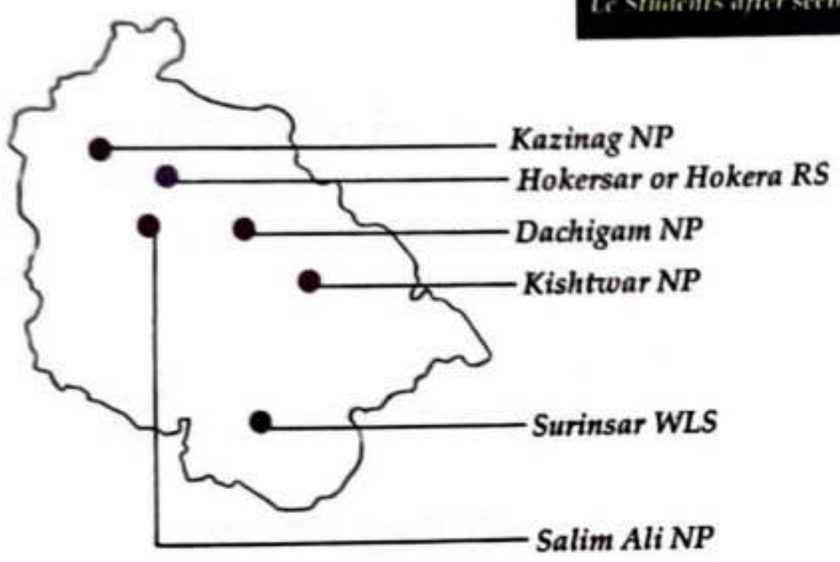
Ladakh



Le Students after seeing Tricks

Jammu and Kashmir

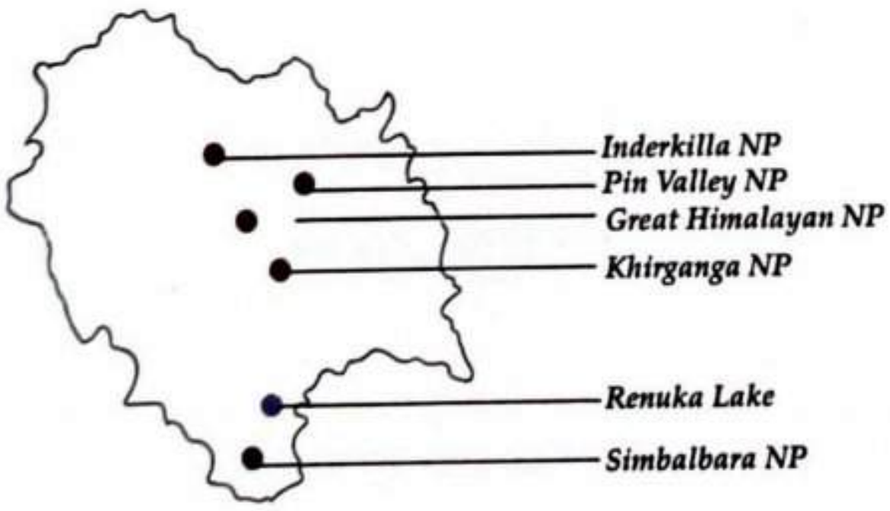


TRICK TO REMEMBER NP (Salim ने Do Gram Kish दी Kazi ko)

Salim	ने	Do Gram	Kish	दी	Kazi ko
Salim Ali NP		Dachigam NP	Kishtwar NP		Kazinag NP

- ***Animals found in Kashmir:*** Hangal (Kashmir stag), snow leopard, etc.

Himachal Pradesh

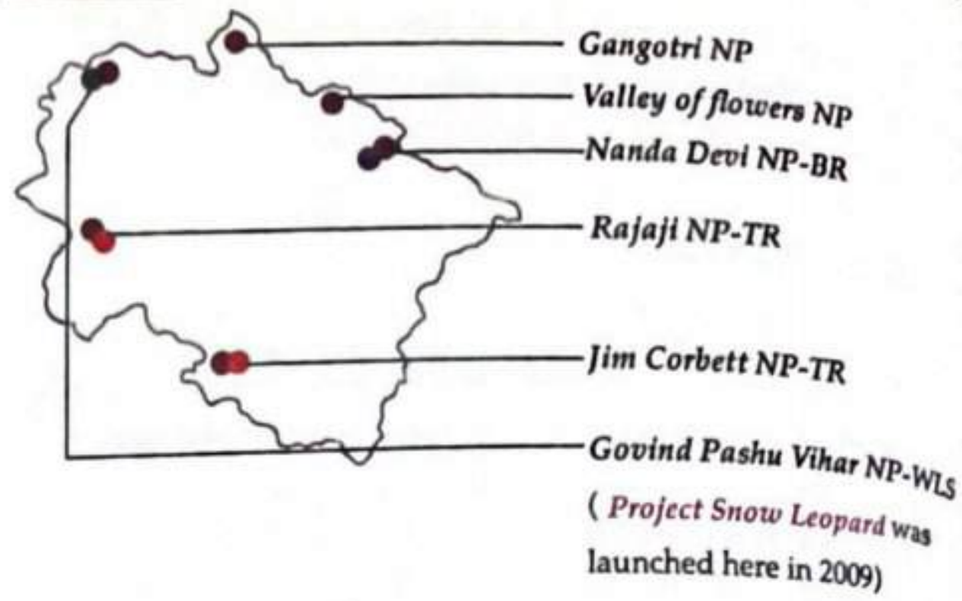


TRICK TO REMEMBER NP (Inder Him पे Khir खा रहा था और Pin से Sim निकल रहा था)

Inder	Him	पे	Khir	खा रहा था और
Inderkilla NP	Great Himalayan NP		Khirganga NP	

Pin	से	Sim	निकल रहा था
Pin Valley NP		Simbalbara NP	

Uttarakhand



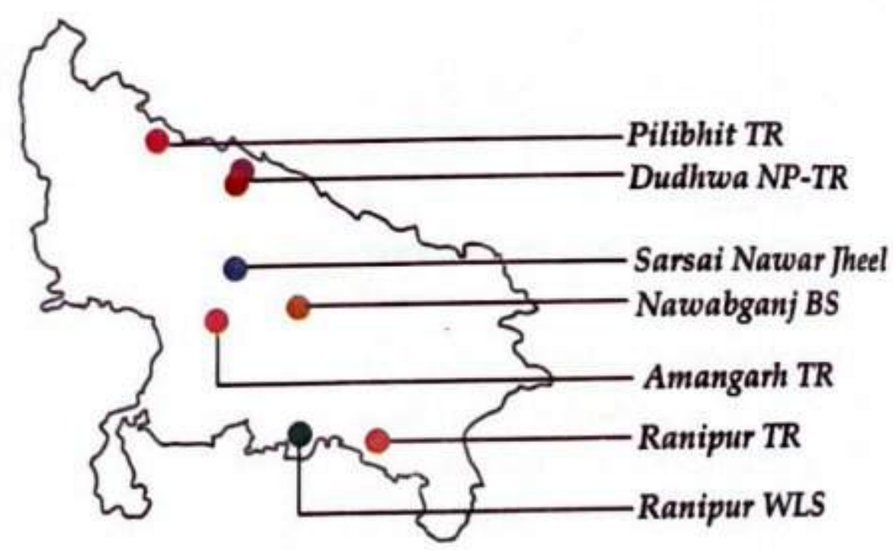
TRICK TO REMEMBER NP (Rajaji Flowers लेके Jimmy Devi से मिलने पहुंचे Pashu Vihar me)

Rajaji	Flowers	लेके	Jimmy	Devi
Rajaji NP	Pin Valley Flowers NP		Jim Corbett NP	Nanda Devi NP

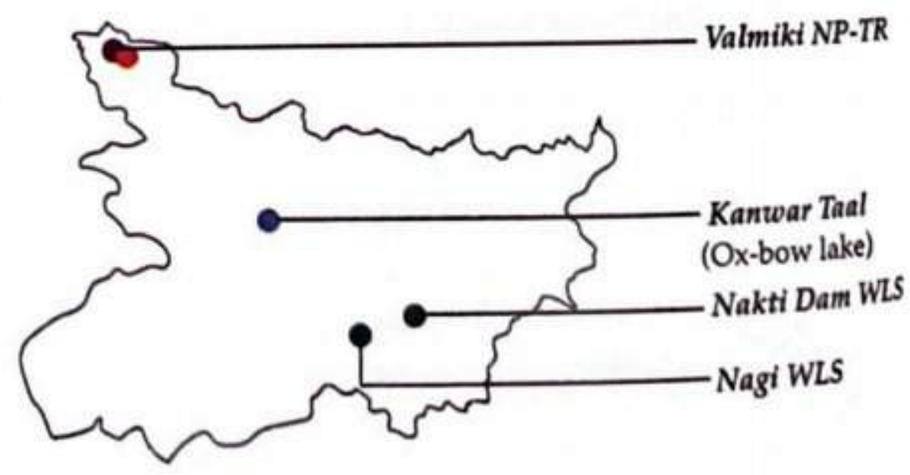
से मिलने पहुंचे	Pashu Vihar Me
	Gobind Pashu Vihar NP

- ***First National Park of India: Jim Corbett National Park (1936).***
- ***Project Tiger*** was launched from Jim Corbett NP in ***1973.***
- ***Project Elephant*** was launched on ***1992.***

Uttar Pradesh



Bihar



- ***Nagi*** and ***Nakti*** were declared ***81st*** and ***82nd Ramsar Sites*** on ***World Environment Day, 5th June 2024.***

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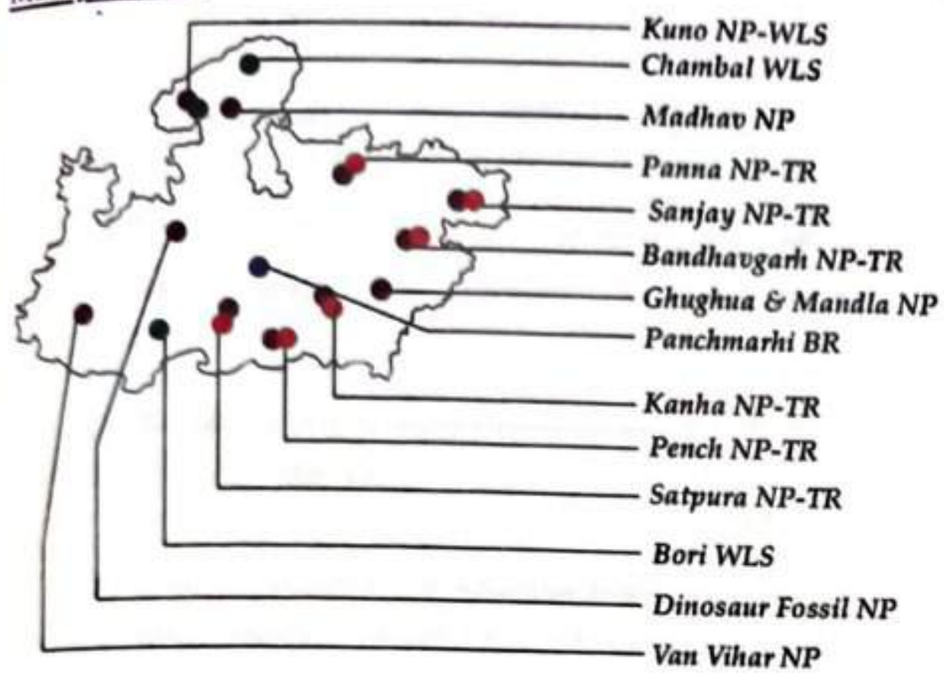
Madhya Pradesh



TRICK TO REMEMBER NP (Sanjay Madhav Paan खाके अपने Bandhu Kanha से मिलने Paanch पैसे लेके Saat बजे Van पहुँचे)

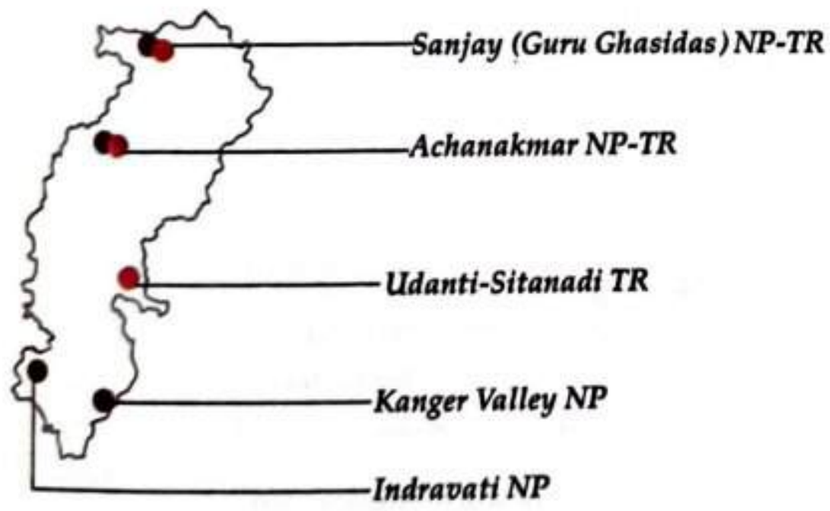
Sanjay	Madhav	Paan	खाके अपने	Bandhu
Sanjay NP	Madhav NP	Panna NP		Bandhavgarh NP

Kanha	से मिलने	Paanch	पैसे लेके	Saat
Kanha NP		Panchmarhi NP		Satpura NP

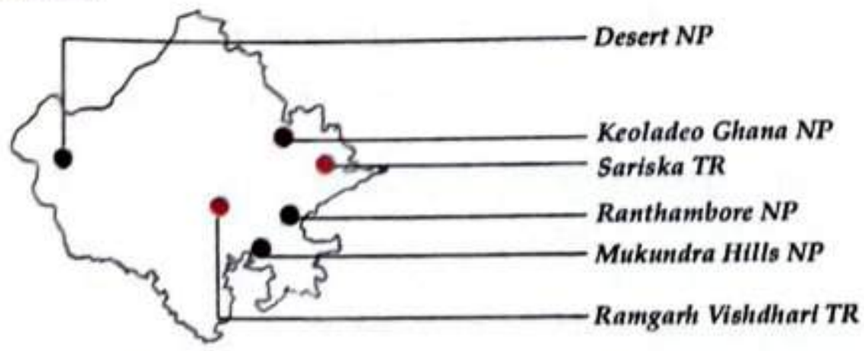
बजे	Van	पहुँचे
	Van Vihar NP	

- Madhya Pradesh has the *most no. of National Parks.*
- *Cheetahs* were brought from *Namibia* to *Kuno NP* as a part of *Project Cheetah.*
- *Chambal WLS:* Famous for *Gharial* and *Red-crowned roofed turtle.*

Chhattisgarh



Rajasthan



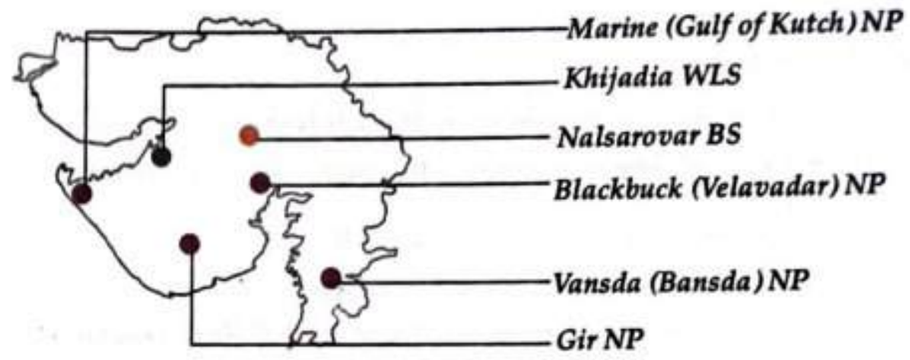
TRICK TO REMEMBER NP (Raja Mukund Is Running In Saree In Desert kyunki Ram Ne Vish Pi Liya)

Raja	Mukund	Is Running	In Saree	In Desert
	Mukundra Hills NP	Ranthambore NP	Sariska TR	Desert NP

Kyunki	Ram Ne Vish Pi Liya
Keoladeo Ghana NP	Ramgarh Vishdhari TR

- *State Bird of Rajasthan:* Great Indian Bustard *(critically endangered).*

Gujarat



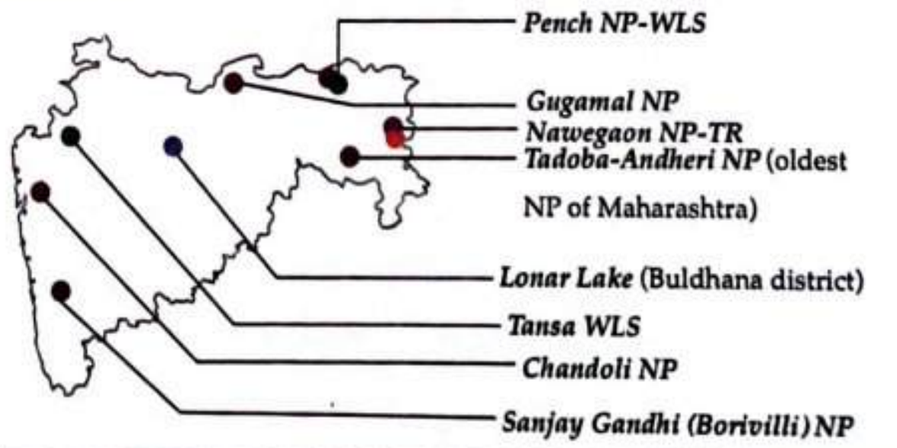
TRICK TO REMEMBER NP (Gujarat Me Meri Black Van बीच पर Gir Gai)

Gujarat	Me Meri	Black	Van	बीच पर	Gir Gai
	Marine NP	Blackbuck NP	Vansda NP		Gir NP

- *Gir NP* is the only habitat of the *Asiatic Lion* in the world.

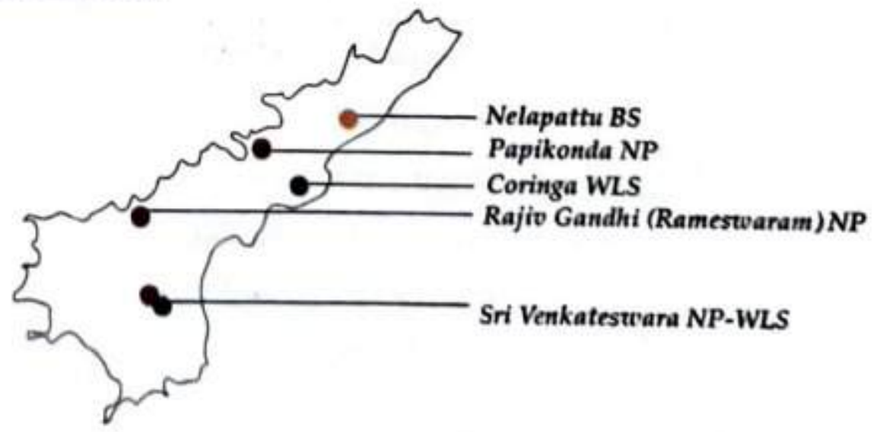
India is the only country to have both Tigers and Lions.

Maharashtra



**Pench Tiger Reserve in Maharashtra is India's first Dark Sky Park.*

Andhra Pradesh



- *Seshachalam* is home to certain endemic species such as *Red Sandlers* and *Slender Loris.*

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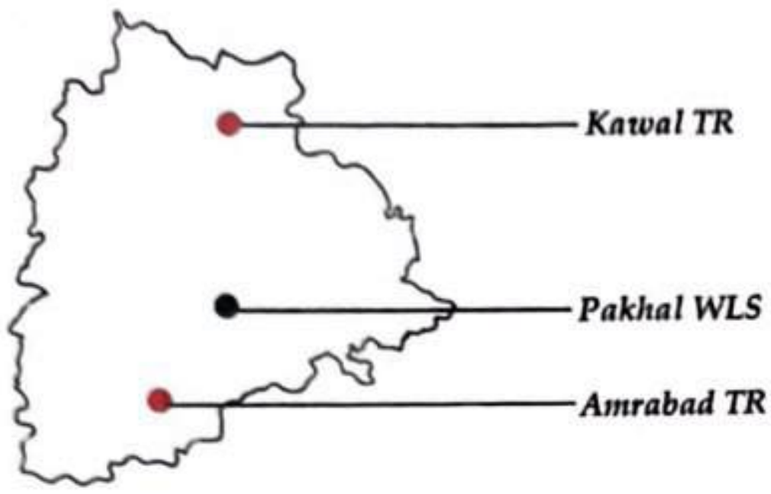
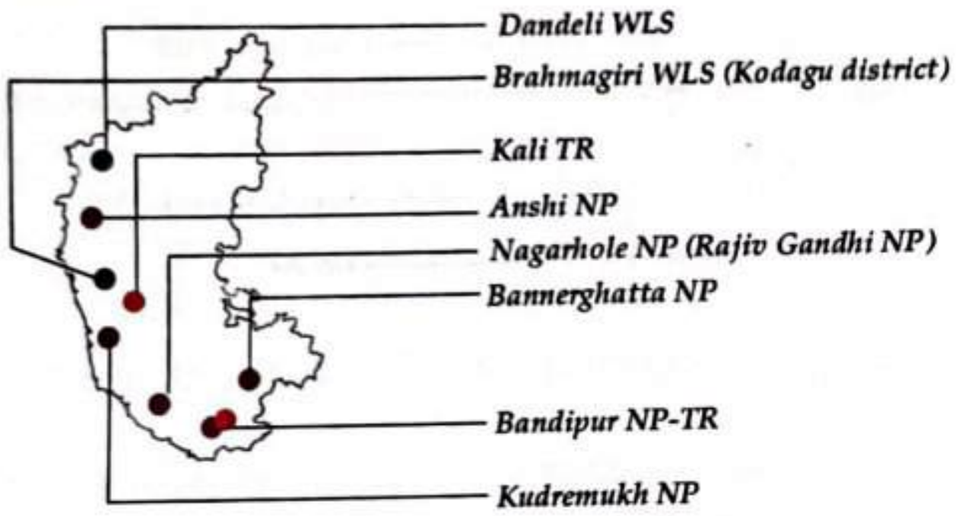
Telangana



Karnataka



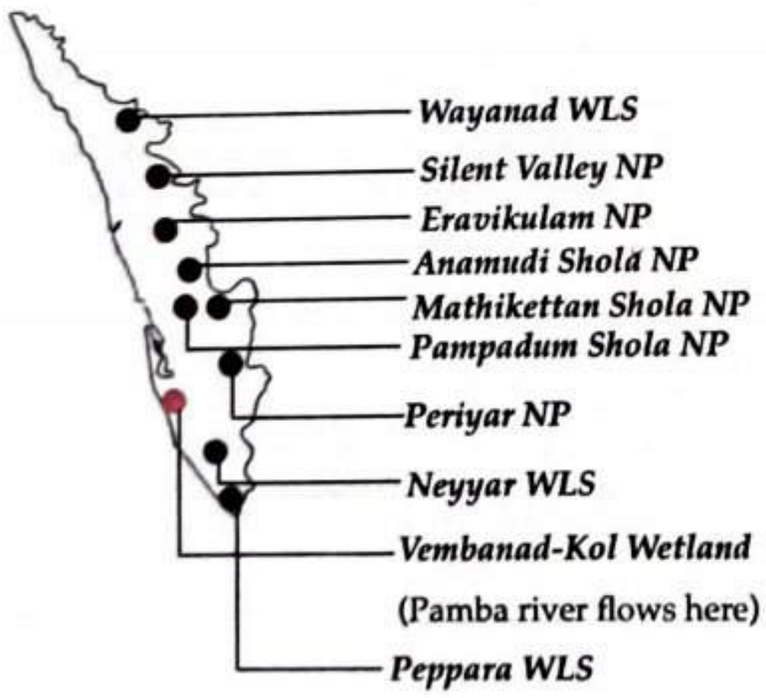
TRICK TO REMEMBER NP (Bandi Nagar मे Kude का एक Ansh भी Ban है)

Bandi	Nagar	मे	Kude	का एक	Ansh
Bandipur NP	Nagarhole NP		Kudremukh NP		Anshi NP

भी	Ban	है
	Bannerghatta NP	

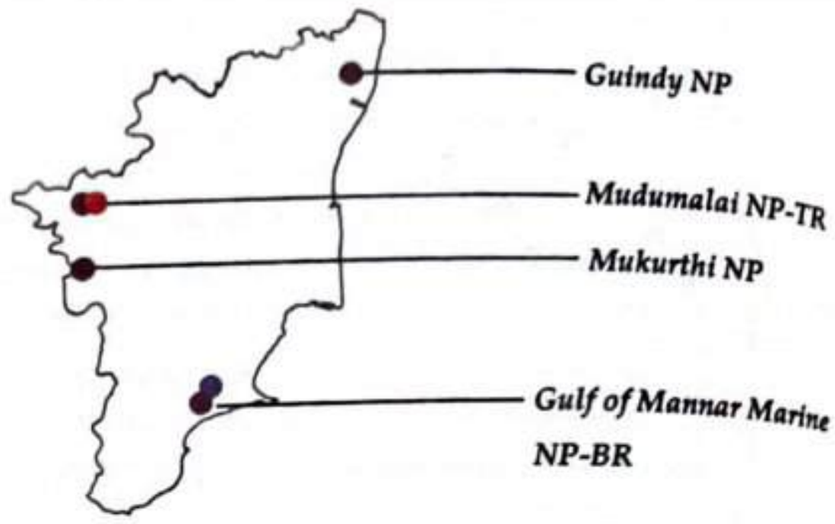
- *Gaur* is a domestic cattle protected at *Nagarhole* and *Bandipur*.

Kerala



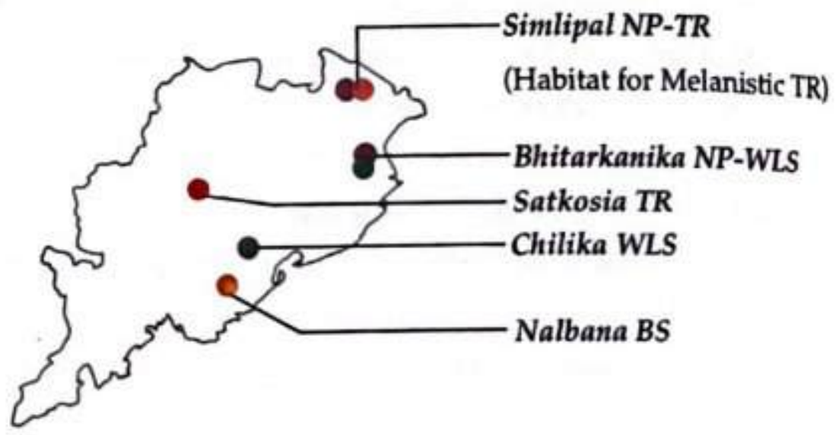
TRICK TO REMEMBER: National Parks that have *"Shola"* in their names belong to Kerala.

Tamil Nadu



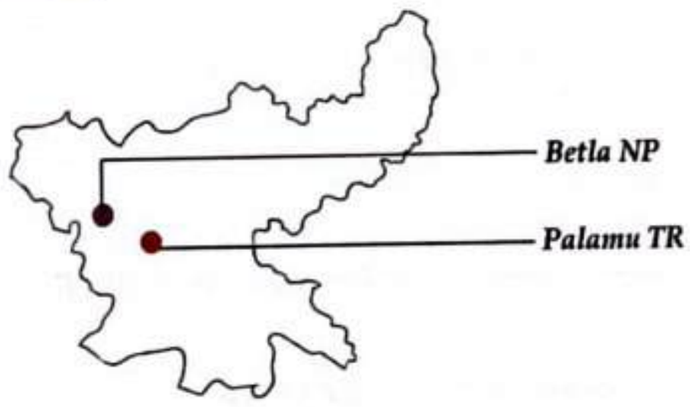
- *Annamalai NP-TR* falls in the *border of Tamil Nadu and Kerala.*
- *Dugong* (sea cow) and *Sea turtles* are found in *Gulf of Mannar BR.*

Odisha

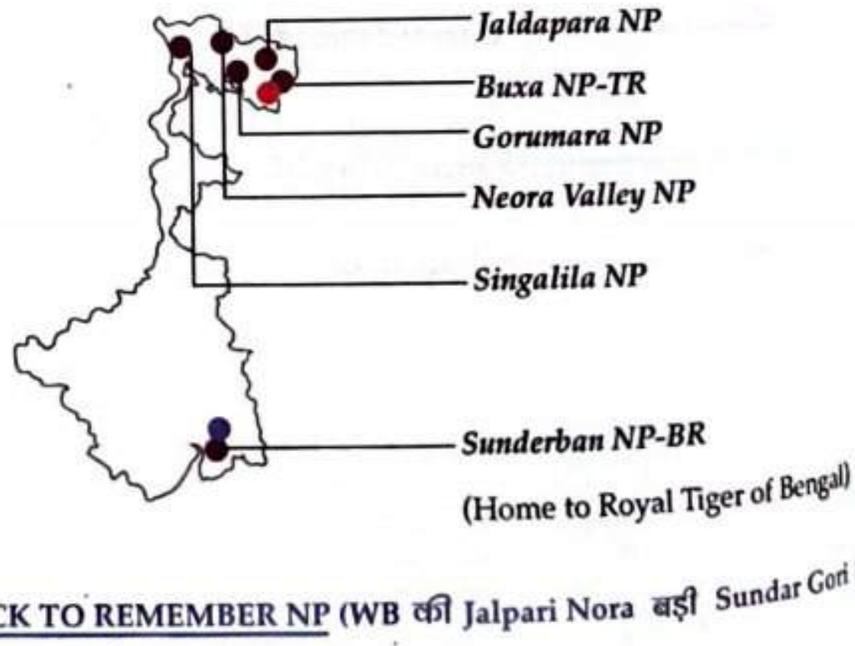


- *Bhitarkanika WLS* is famous for *estuarine crocodiles.*

Jharkhand



West Bengal



TRICK TO REMEMBER NP (WB की Jalpari Nora बड़ी Sundar Gori है Single भी क्योंकि Boxer Hai)

WB	की	Jalpari	Nora	बड़ी	Sundar
West Bengal		Jaldapara NP	Neora Valley NP		Sunderban NP

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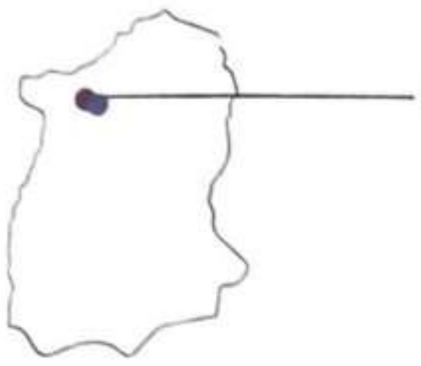
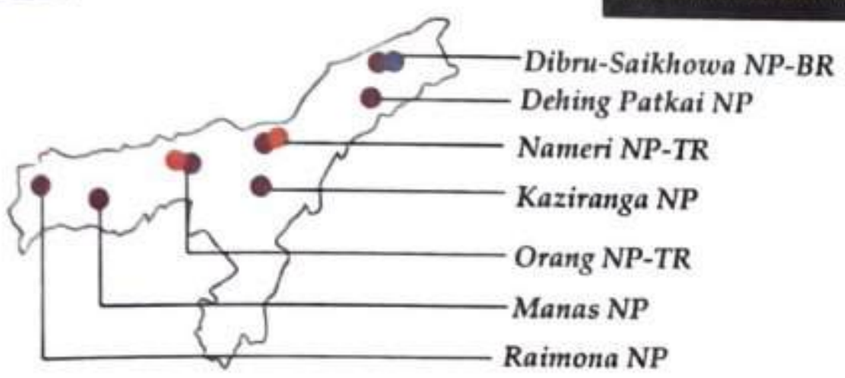
Gori	है और	*Single*	भी क्योंकि	*Boxer Hai*
Gorumara NP		Singalila NP		Buxa NP

Sikkim



Assam



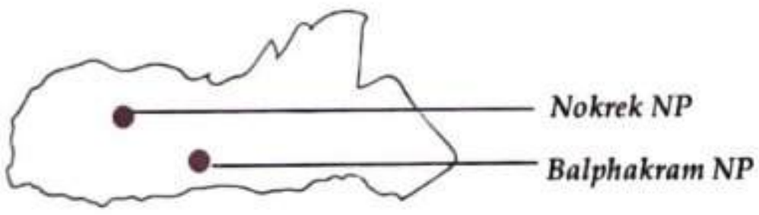
TRICK TO REMEMBER NP (Mana Na Meri Kazi करवा दी Mona Ki शादी Aurang Sheikh के साथ)

Mana	*Na Meri*	*Kaazi*	करवा दी	*Mona Ki*	शादी
Manas NP	Nameri NP	Kaziranga NP		Raimona NP	

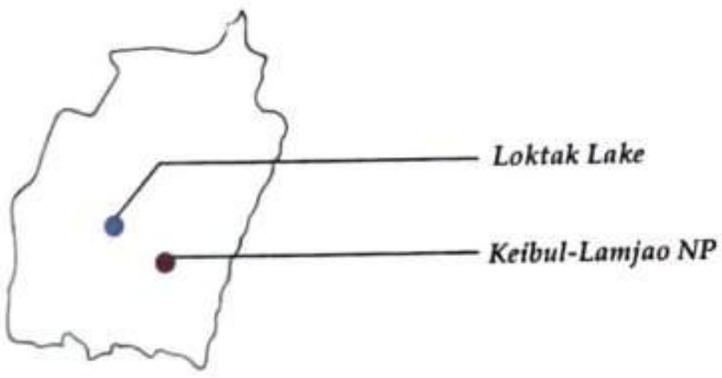
Aurang	*Sheikh*	के साथ
Orang NP	Dibru-Saikhowa NP	

- *Kaziranga NP has the highest population of one-horned rhinoceros.*

Meghalaya

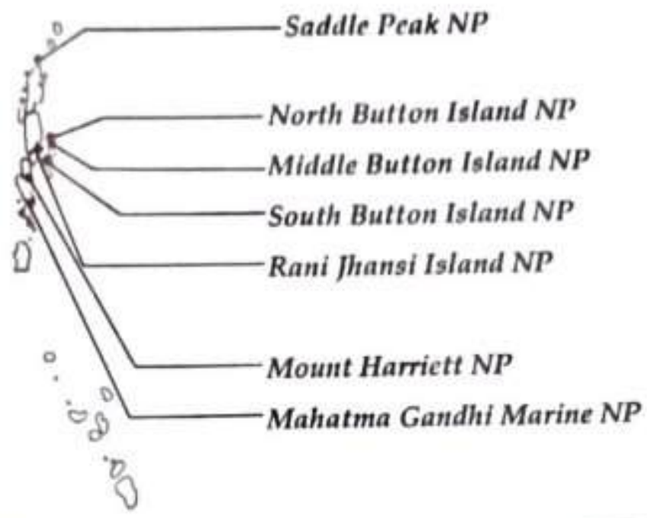


Manipur

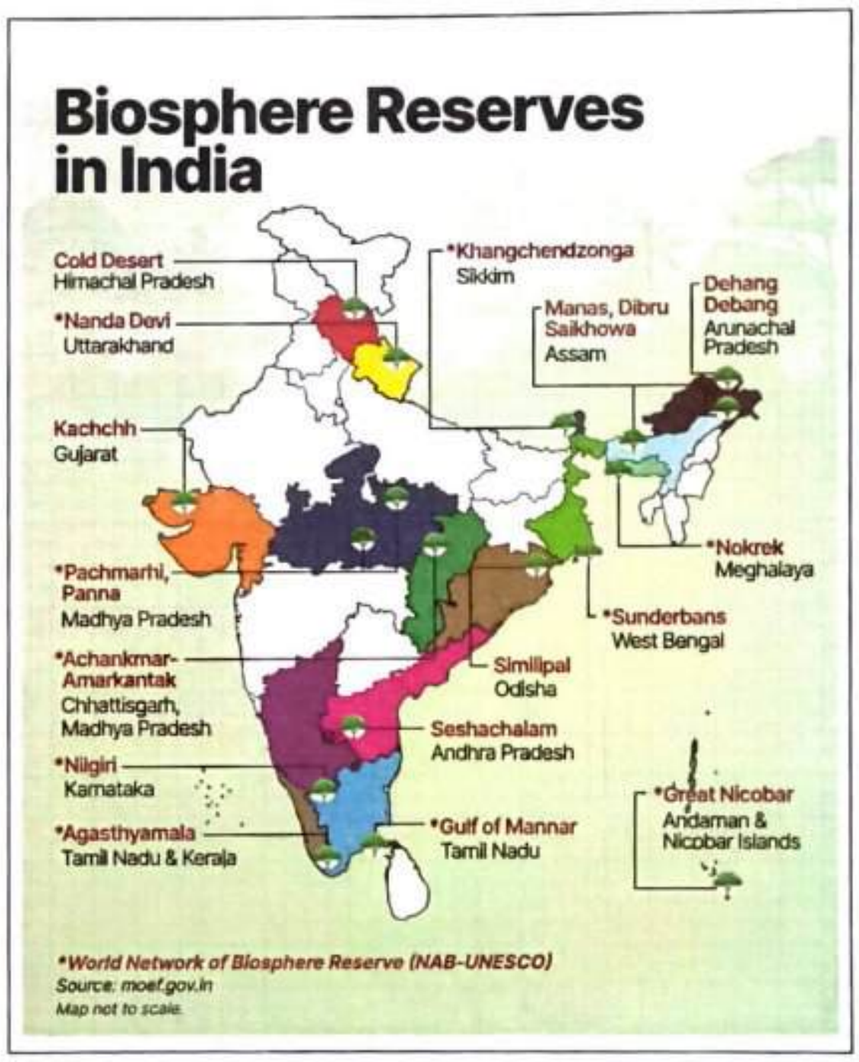


- ***State animal of Manipur:*** Sanghai deer (seen mostly in Keibul-Lamjao NP)
- Keibul-Lamjao NP is *world's only floating National Park* that is located in Loktak Lake (*phumdis* is seen here). This National Park is also famous for *Eld's deer* species.

Andaman and Nicobar



BIOSPHERE RESERVES



- ***First Reserve Forest of India:*** *Satpura National Park* (also known as *Satpura Tiger Reserve*)
- ***Total Biosphere Reserve:*** *18*
- ***Oldest BR:*** *Nilgiri BR* (spread across *Kerala, Tamil Nadu, Karnataka*)
- ***Largest BR:*** *Great Rann of Kutch*
- ***Cold Desert NP:*** *Himachal Pradesh*

Under UNESCO's, MAB Programme(1971) → *12 Biosphere Reserve in India*

1. *Nilgiri (1st under MAB)*
2. *Gulf of Mannar*

MAB: Man and Biosphere Reserve

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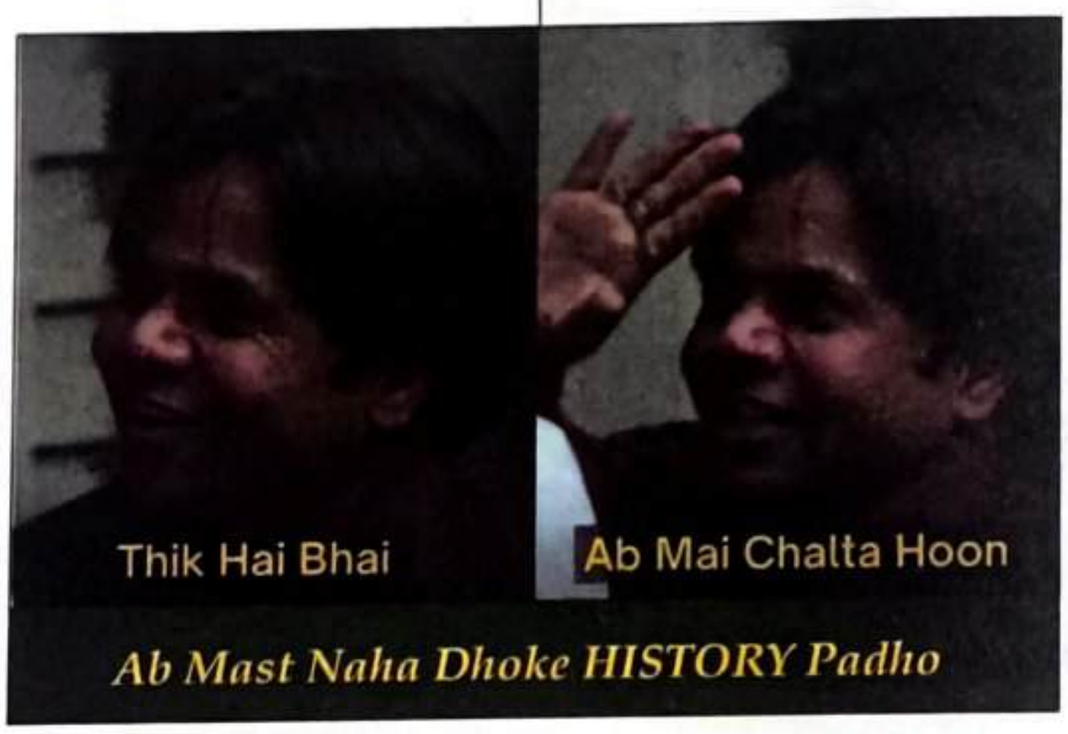
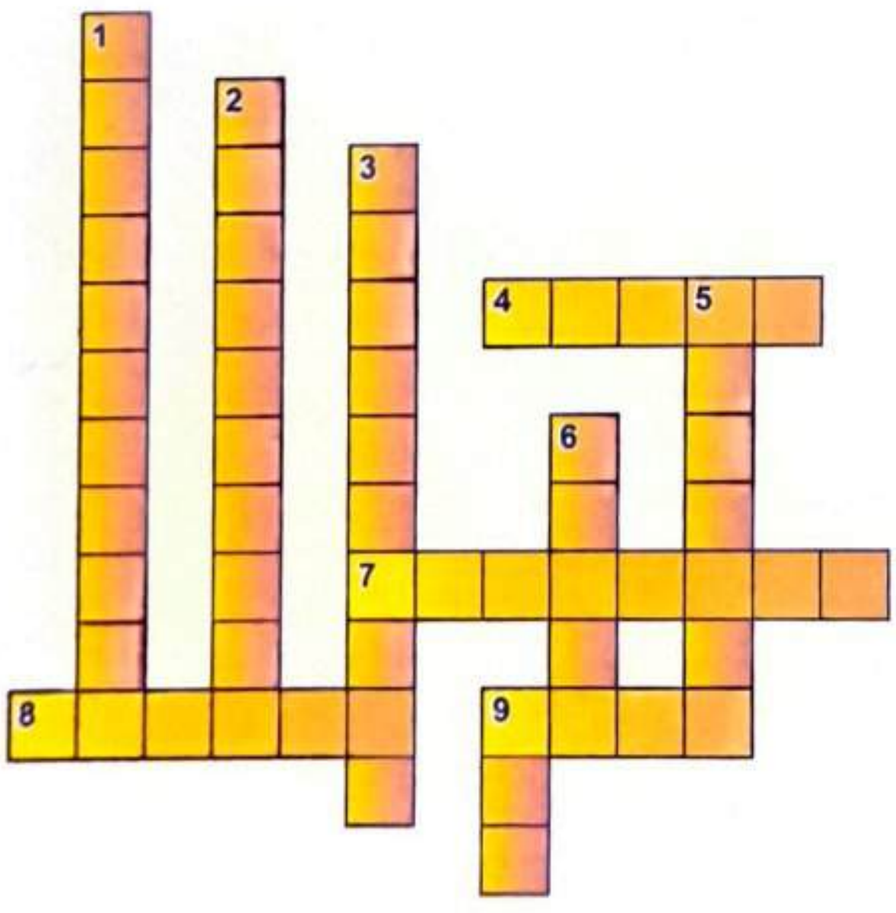
3. ***Sundarban***
4. ***Nanda Devi***
5. ***Nokrek***
6. ***Pachmarhi***
7. ***Simlipal***
8. ***Achanakmar-Amarkantak*** *(Chhattisgarh-Madhya Pradesh border)*
9. ***Great Nicobar***
10. ***Agasthyamalai***
11. ***Kangchenjunga (added in 2008)*** → *Highest mixed World Heritage Site* in UNESCO
12. ***Panna*** *(latest BR)*



PARMAR'S CROSSWORD

NATIONAL PARKS



Across

4. Dachigam National Park is in which Union Territory.
7. Largest protected area in Eastern Himalayas.
8. Bhitarkanika National Park is located in which state.
9. Closest wild relative of domestic cattle in India.

Down

1. Nanda Devi Biosphere Reserve is in which state.
2. Endangered species in Kaziranga National Park.
3. Gorumara National Park is in which state.
5. Eld's deer found in which National Park.
6. Only country with both lions and tigers.
9. Natural habitat of Asiatic Lion.

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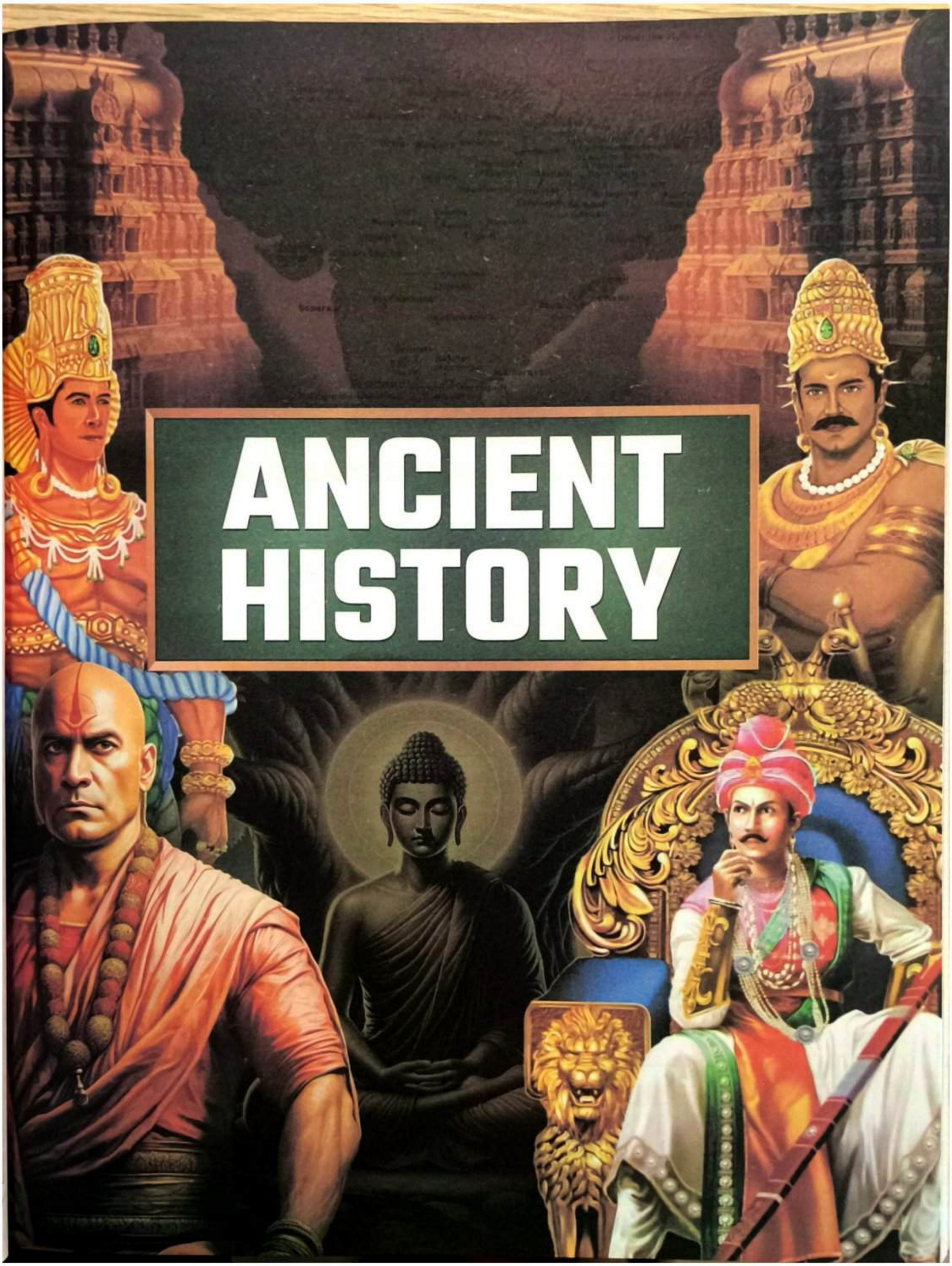

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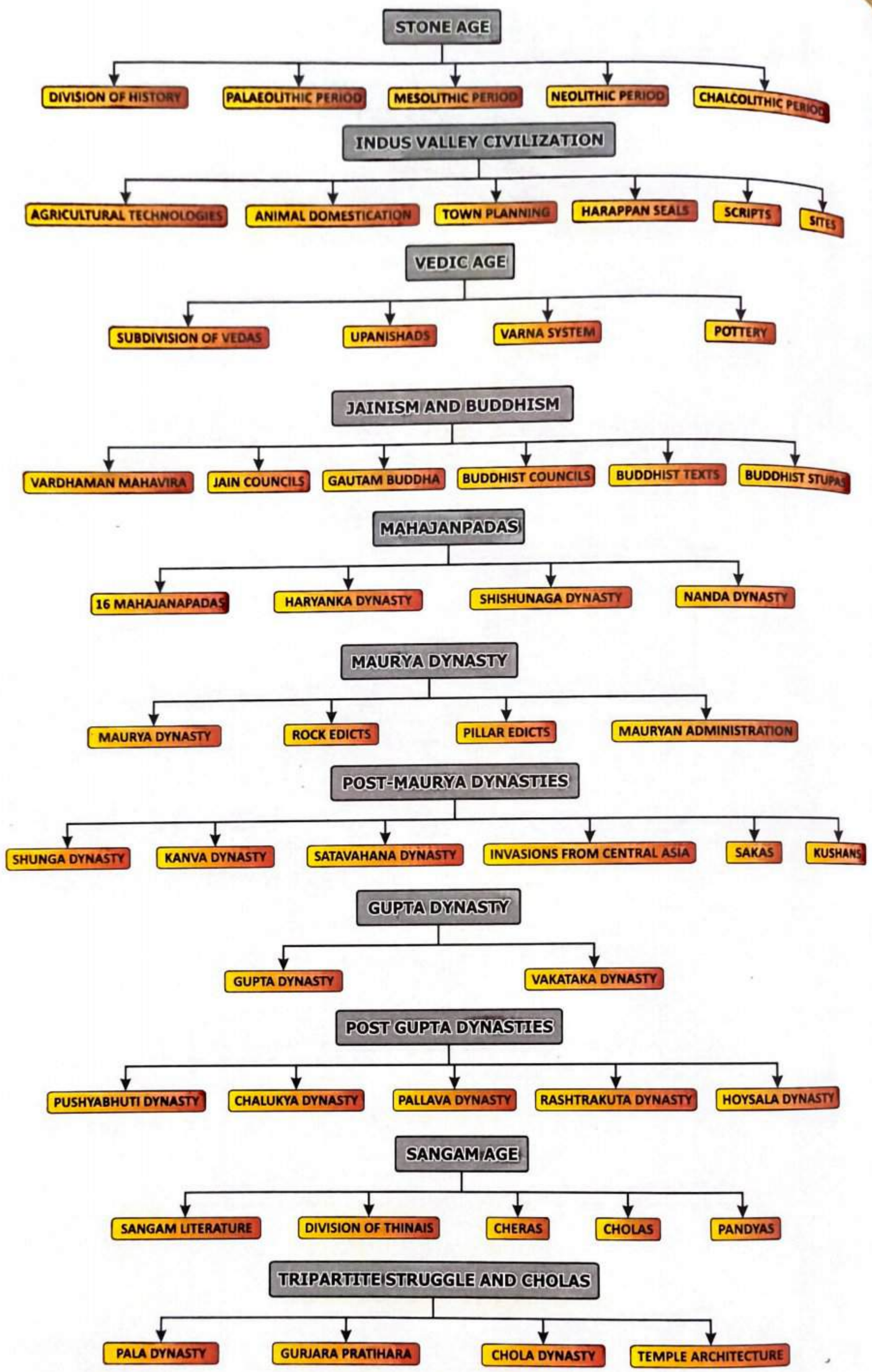

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DIVISION OF HISTORY

1. **Ancient History:** Time period starts from earliest times to 7th Century AD
2. **Medieval History:** Time period starts from 8th Century AD to 18th Century AD, which is the start of Islamic invasion
3. **Modern History:** Time period starts from 18th Century AD onwards till now, which is the start of British Rule

Understanding Timeline

1000 — 900 — 800 — 100 — 50

BC (Before Christ)/BCE (Before Common Era — *Birth of Jesus Christ* — *AD (Anno Domini)/CE (Common Era)*

***The number decreases in BC as we move ahead in timeline.*

Note

- Century means: 100

For example:

- 8th Century BC is: 700-800 BC
- 3rd Century AD is: 200-300 AD
- 18th Century AD is: 1700-1800 AD
- ***Earth is 4.5 Billion years old***

Quaternary Stage of Life

- It is the current geological era, which began 2.58 million years ago and continues to the present.
- ***It can be divided into two parts:***
  - *Pleistocene* (Palaeolithic humans were living here) → *Ice Age*
  - *Holocene* → *After Ice Age*

ANCIENT HISTORY

Ancient History

- *Archaeology*: No written evidences and they were obtained through excavation
- *History*: Written evidences were obtained that could be deciphered

Stone Age: Use of stones to make tools and other things.

Copper Age: Use of Copper

Bronze Age: Use of Bronze

Pre-history — *Proto-history*

PALAEOLITHIC PERIOD (PALAEO: OLD; LITHIC: STONE)

- In this period, there was a use of slightly bigger stones

Palaeolithic Period

Lower/Early Palaeolithic

- *Time period:* 5 Lakh BC-50,000 BC
- It was during Ice Age

Sites:

- ***Soan/Sohan Valley:*** Punjab
- ***Belan Valley:*** Uttar Pradesh (Caves/Rock shelters discovered)
- ***Didwana:*** Rajasthan
- ***Hunasagi/Hungsi:*** Karnataka
- ***Pahalgam:*** Kashmir
- ***Patne:*** Maharashtra *(Ostrich evidence found for the first time here)*

Middle Palaeolithic

- *Time period:* 50,000 BC-40,000 BC

This period was based upon *'flake technology'*

- Main Occupation of people: Hunting and food gathering

Site:

- ***Attirampakkam*** is a Palaeolithic site

Upper Palaeolithic

- *Time Period:* 40,000 BC-10,000 BC
- This period coincided with the last phase of *Pleistocene*
- Period of Homo Sapiens (modern man)
- Use of *flint stone* can be seen here

Sites:

- ***Bhimbetka (Madhya Pradesh), Inamgaon and Nevada (Maharashtra), Didwana (Rajasthan)***

Fig 2: Bhimbhetka Cave Paintings (Madhya Pradesh)

- *V. S. Wakankar* (Indian archaeologist) discovered Bhimbhetka rock caves in *1957*. *It is India's oldest painting.*

Flake technology

- It is a stone tool-making technique that involves striking a stone core to remove flakes

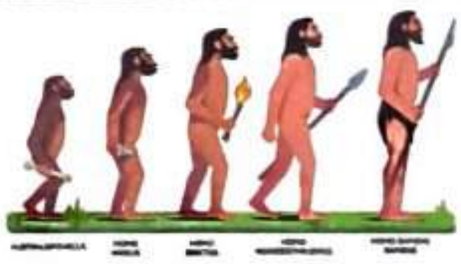

Fig 1: Evolution of Man

Australopithecus → Homo Habilis → Homo Erectus → Homo → Neanderthalensis → Homo Sapiens

Archibald Campbell

- He was the first one to identify/discover few rock paintings in India

Fact: The *skull of Homo Erectus* was found in *Hathnora* (Madhya Pradesh near Narmada river)

STONE AGE

- *Stone Age:* The stone age is categorised on the basis of type of stone tool used

Palaeolithic	Mesolithic	Neolithic
Time period 5 lakh BC-10,000 BC	*Time period* 9000 BC-7000 BC ***Note*** ***SSC considers this time period to be: 12,000 BC-10,000 BC***	*Time period* 7000 BC-1000 BC

MESOLITHIC PERIOD (MESO: MIDDLE; LITHIC: STONE)

- *Meaning:* Middle stone age/Mesolithic/Microlithic period
- *Time period:* 9000 BC- 7000 BC
- Transitional phase between *Palaeolithic and Neolithic*
- *Mesolithic humans were hunters and hearders*
- Domestication of animals began in this period.

Geographical Distribution

- ***Langhnaj*** (Uttar Pradesh); ***Mehsana*** (Gujarat)

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Fig 4: Brick granary of Harappa

- Six granaries in each row (two rows)
- Total: 12 granaries
- Found in: Harappa

Fig 5: Grid Pattern

- Roads cut each other at 90°

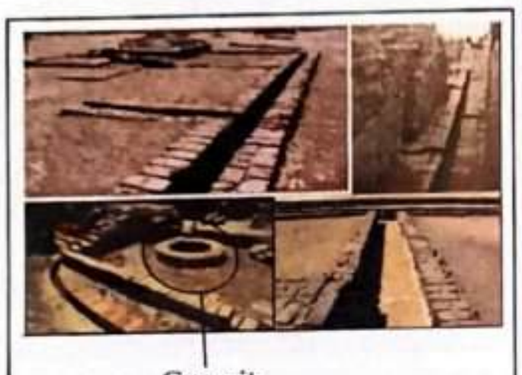
Drainage System

- Most distinctive feature of Harappa Civilization.
- Grid pattern roads/streets, intersecting at *right angle*. ***E.g. Lothal.***

Domestic Architecture

The IVC was known for its advanced *urban planning* and well-structured houses.

- The houses were made of *burnt bricks* (baked bricks).
- Doors were made of wood.
- Every house had its own bathroom.
- *Sump* or *Cesspit* were made between drains to clean and trap solid waste.
- *Limestone slabs* were used as drain covers.
- Many houses had their own private wells.



Cesspit

Fig 6: Drainage system of IVC

Tracking Social Differences

Studying Burials

- Some of the graves contain pottery and ornaments as belief that it can be used in afterlife.
- Jewelleries were found in burial of both men and women.
- Dead were buried with *copper mirrors*.
- Burial of dogs along with their masters.

***Note**

- ***Ornaments, consisting of three shell rings, a Jasper Bead and hundred of micro beads, was found near the skull of a male at Harappa.***

Fig 7: Coffin burial excavated in Harappa

Fig 8: Harappans buried with ornaments and potteries

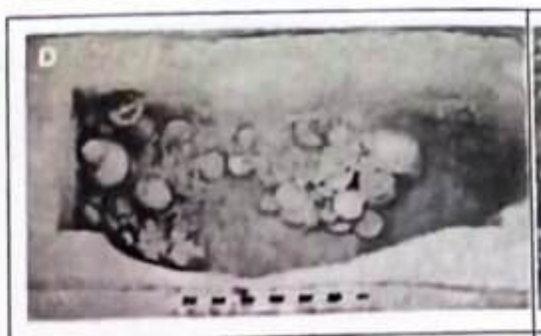


Fig 9: Urn burial

Fig 10: Double/Joint burial excavated from Lothal

Craft Production

- *Chanhudaro:* Devoted to craft production including bead making, shell cutting, metal working, seal making, and weight making.
- *Nageshwar (Gujarat)* and *Balakot (Pakistan):* They were centres for shell making (Bangles, Ladles, and Inlay).

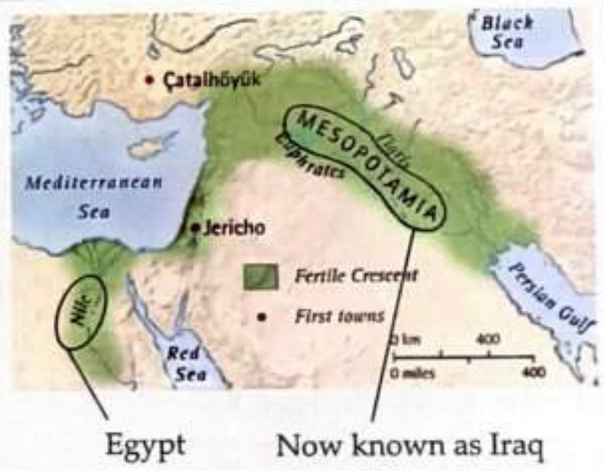
Fig 11: Ornaments from IVC

Fig 12: Jadeite stone

Trade & Commerce

- ***Nageshwar and Balakot:*** *Shell*
- ***Shortugai:*** *Lapis Lazuli*
- ***South Rajasthan & North Gujarat:*** *Carnelian*
- ***Khetri and Oman:*** *Steatite (soft stone)*
- ***South India:*** *Copper and Gold*
- ***Kolar (Karnataka):*** *Gold*

Fig 13: Carnelian (orange stone) and Lapis Lazuli (blue stone)



Map 2: Mesopotamia Civilisation around Tigris and Euphrates river

Harappan Seals

- Harappan seals were made of *steatite* (a kind of soft stone).
- Seals often contained *animal motifs* and a *pictographic script*.
- The seals usually have a line of writing probably containing the name and title of the owner.

The Harappans were not aware about lion

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Scripts

- The scripts are not in *alphabetical order* and are *pictographic*.
- Most inscriptions are short and the longest script contains about *26 signs*.
- They are written from *right to left* (script was known as: *Boustrophedon*).
- They were found on jewellery, bone rods, seals, copper tools, jars, and an ancient signboard.
- The scripts are undeciphered till date.

Weights

- *Barter system* was prominent in IVC.
- Exchange was regulated by a precise system of weights, usually made of a stone called *"Chert"*.
- ***Sukkur and Rohri hills:*** *Limestone* and *Chert blades* were mass produced and sent to various Harappan settlements in Sindh.
- ***Lower denomination of weights:*** *Binary*
- ***Higher denomination of weights:*** *Decimal*

IVC people did not know about Iron.

Religious Practises

- They worshipped unusual or unfamiliar objects such as *Mother Goddess, Priest King, etc.*
- Fire altars were found at *Kalibangan* and *Lothal*.

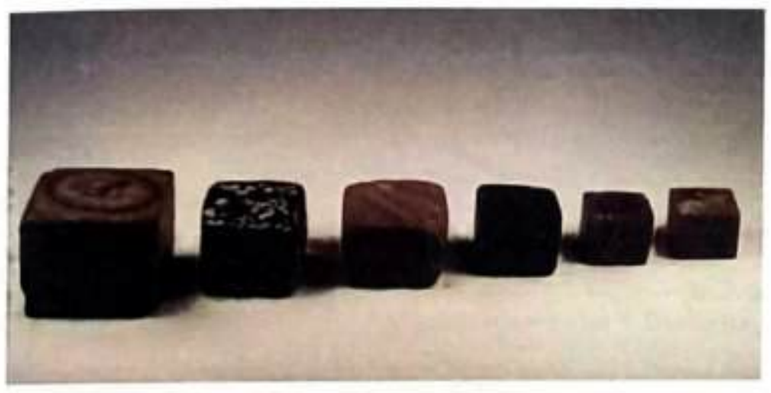

Fig 14: Weights used were seen in Multiples of 16

- The weights were uniform

Fig 15: Terracotta figure of a Mother Goddess symbolises a Tree Growing out of an Embryo made of Clay

- Found in: Mohenjadaro

Fig 16: Priest King made of steatite obtained from Mohenjodaro

- Height: 17.5 cm (6.9 inch)

Fig 17: The dancing girl statue made of bronze in Tribhanga Mudra

- Height: 10.5 cm

Fig 18: Linga

Fig 19: Shiva in yogic posture (Pashupati seal)

Fig 20: One horned animal (Unicorn)

Religious Practises

Examining Seals

- Unicorn: One Horned Animal.
- Lingas: Conical stone objects worshipped as symbol of Shiva.
- Proto Shiva seal (Pashupati).

Pottery Used

- Ochre coloured pottery.
- Black-Red ware pottery.
- Painted-Grey ware pottery.

Possible Reasons for Decline of Harappa Civilization

- Climate Change
- Deforestation
- Excessive Floods
- Shifting or Drying up of Rivers
- Foreign invasion

Site	*River*	*Characteristic Features*
Harappa (1921) by D. R. Sahini in Punjab; Pakistan	Ravi	Six granaries in a row
Mohenjodaro (1922) by R. D. Banerjee in Sindh; Pakistan	Indus	Great Bath; Great Granary; protoshiva; dancing girl statue; goddess earth; bearded man
Chanhudaro in Sindh	Indus	City without Citadel
Lothal in Gujarat by S. R. Rao	Bhogava	Ancient port/dockyard; fire altar; double burial
Kalibangan in Rajasthan	Ghaggar	Fire altars; black bangles; ploughed field
Rakhigarhi in Haryana	Ghaggar	Largest IVC site; terracotta wheel; toys

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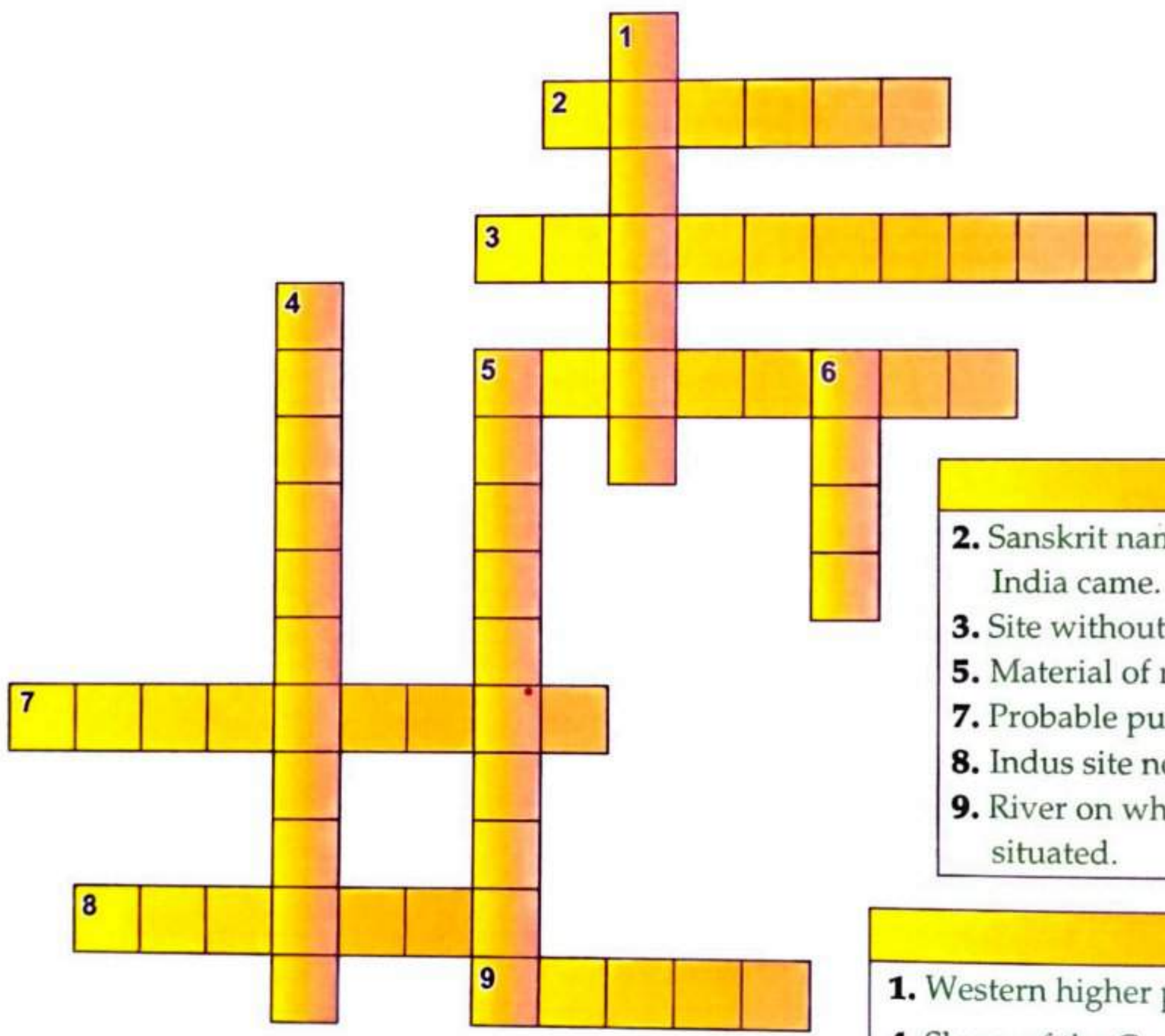
Site	River	Characteristic Features
Dholavira in Kutch area; Gujarat		Giant water reservoir; city was divided into three parts
Banawali in Haryana		Barley; lack of grid patterns
Bhirrana in Haryana		Oldest IVC site
Ropar in Punjab	Sutlej	Pit burial
Sonauli (UP)		Extended burial

PARMAR'S CROSSWORD

INDUS VALLEY CIVILIZATION



Across

2. Sanskrit name from which the word India came.
3. Site without a citadel.
5. Material of most Harappan seals.
7. Probable purpose of the Great Bath.
8. Indus site now located in Pakistan.
9. River on which Mohenjodaro was situated.

Down

1. Western higher part of Harappan cities.
4. Shape of the Great Bath.
5. Harappan site in Afghanistan.
6. Material not found at Indus Valley sites.

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Vedic Age (1500-600 BC)

- *Early Vedic Age (1500-1000 BC)* → They were *pastoral community*
- *Later Vedic Age (1000-600 BC)*

- *Boghazkoi Inscription (Turkey).*
- It mentioned names such as Indra, Varun, etc.

Similar sounding words

Brahta	Brother
Sapta	Seven
Andar	Under

- It is believed that Aryans arrived from Central Asia, where one group migrated from Turkey towards Europe and other came towards India.
- Language of Aryans: *Sanskrit*
- Aryans are considered to have *codified the Vedas.*

VEDAS

- *There are four Vedas: Rigveda, Samveda, Yajurveda, Atharvaveda.*
- *Oldest Text:* Compiled during *Zend-Avesta (Iran).*
- *Meaning:* Knowledge
- They were orally passed *(Shruti)* from one generation to another.
- *Apaurasheya:* It is not created by *man but gifted by God.*

Bal Gangadhar Tilak

- ***He compiled the book:*** *The Arctic Home in the Vedas* (he said *"all Indians were Aryans"*).

Subdivisions of Vedas

Samhita	*Brahmanas*	*Aranyakas*	*Upanishads*
Collection of Hymns (Sukta)	Sacrifices and Rituals	Hermits (those who lived in jungles)	Bhakti (talks about Bhakti Marga)

Rig Veda

- It was the first Veda to be compiled.
- It is made up of *10 mandalas.*
- It has the *oldest* and *largest* collection of *Sanskrit hymns.*
- ***Total:*** *1028 hymns*
- ***Verses:*** *10,600*
- Hymns recited by *Hotri.*
- ***Deities:*** Indra, Agni, Vishnu, and Varuna.
- ***Female deities:*** Aditi, Usha *(goddess of dawn).*
- *Gayatri Mantra* was written by *Sage Vishwamitra* for *Goddess Savitri* (mentioned in *3rd mandala*).
- Mandala no. 2-7 were created first.
- *10th mandala* mentions *Purusha Sukta* (considered a cosmic being).

- Upanishads are also known as *"Vedanta"* (end of Vedas).
- Total: 108 Upnishads (Traditional)

Purusha Sukta

- Mouth: Brahmans
- Arms: Kshatriya
- Thighs: Vaishya
- Feet: Shudra

These four varnas are believed to have emerged from different parts of Purusha.

- *9th mandala* mentions: *Lord Soma (Lord of Plants).*
- *Somras* is an *energy drink.*

Sama Veda

- It is the oldest *book on music.*
- It consists of *chanting melodies.*
- It is composed of two Upanishads → *Chandogya* and *Kena*

Yajur Veda

- It is the collection of mantras (rituals and sacrifices).
- It is divided into two section → *Shukla* (meaning: *White;* contains *Sathapatha Brahmana)* and *Krishna* (meaning: *Black*).

Jabala Upanishad is a part of Yajur Veda.

Important Upanishads

- *Brihadaranyaka* (oldest upnishad).
- *Katha* (contains story of *Nachiketa* and *Yama* (God of *Death*)).

Atharva Veda

- Veda of magic formulas to ward off *evil spirits* and *diseases* (black magic).
- It is divided into *20 khandas.*

Important Upanishads of Atharva Veda

- ***Mundaka Upanishad:*** *Satyameva Jayate* taken from here.
- ***Maha Upanishad:*** *Vasudhaiva Kutumbkham* (meaning: *"the whole world is one family"*) taken from *Chapter 6* of *Maha Upanishad.*
- ***Mandukya Upanishad.***

6 Schools of Philosophy	Propounded By
• Samkhya (oldest of all)	Kapila
• Nyaya	Gautam (scientific approach)
• Vaisheshika	Kannada (metaphysics) → Kannada proposed that all substances are composed of indivisible particles called *"Parmanu"* (atoms).
• Yoga	Patanjali
• Uttar Mimansa (Vedanta)	Badrayana
• Purva Mimansa	Jaimini

Vedangas

- They are tools to understand Vedas.
- They are philosophical teachings of Upanishads.
- There are total *six Vendangas.*

Siksha	Study of phonetics
Kalpa	Study of practices
Vyankaran	Study of grammar
Nirukta	Study of etymology
Jyoti	Study of light
Chhanda	Study of poetic matters

Early Vedic Age: Rig Veda

- ***Mention of:*** *Himvanta* (Himalaya) and *Munjavat* (Hindu Kush) in *Rig Veda.*
- ***Mention of:*** *Sapta Sindhu* in *Rig Veda.*

River	*Old Name*
Indus	Sindhu
Jhelum	Vitasta
Chenab	Askini
Ravi	Purushini
Beas	Bipasha
Sutlej	Shutudri
Saraswati	A mythical river

TsuNami
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Ravi	Purushini
Beas	Bipasha
Sutlej	Shutudri
Saraswati	A mythical river

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Battle of 10 Kings

- Battle of 10 Kings *(Dasarajna Yuddha)* mentioned in the *7th mandala* of *Rig Veda.*
- Between: *Bharata tribe* (leader: Sudas) vs *10 kings.*
- ***Won by:*** Bharata tribe
- It was fought on the banks of *Purushini (Ravi river).*

Society

- The society was divided into *four varnas.*
- Varna system was not *hereditary,* but based on *profession.*
- Child marriage was not prevalent.

Widow Remarriage	Niyogya (was allowed)
Society	The condition of women was good
Cow (Aghanya meaning sacred)	Cow was considered as wealth decider (Gomat: wealthy person)
Gavisthi	Battle for Cows

Polity

- *Elective monarchy.*

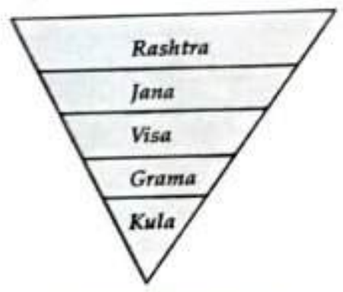
Sabha	Community of privileged	*Women could participate in both Sabha and Samiti*
Samiti	Community of common people	
Vidhata	Community for religious purpose	

Ranking of Officials

Purohit	Priest
Senani	Army Chief
Gramani	Village head

Religion

- They worshiped nature *(naturalistic polytheism)* and *no animals* were worshipped.
- They *did not* worship any idol.
- They performed *sacrificial prayers.*



Deities	*God Of*
Indra	Purandara; destroyer of forts (lord of plough)
Prithvi	
Agni	Intermediary between human and God
Soma	
Vayu	
Rudra	Protector of cattles
Aditi	Mother of Indra
Savitri	Gayatri Mantra is dedicated to her

Pottery

- Ochre/black and red ware coloured pottery was used.

Pottery

Later Vedic Period (1000-600 BC)

- Other three vedas were compiled

Ganga Yamuna Doab

- Aryans expanded from *Punjab* to western *Uttar Pradesh.*
- ***Upper portion:*** *Kuru*
- ***Middle part:*** *Panchal*
- *Iron was used for the first time.*

→ Towards the later vedic period, they shift from Doab area to eastern UP.

- Expansion was possible due to: *Iron weapons + Horses*
  - *Krishna Ayas/Shyam Ayas* (black metal)
  - Ayas means: Metals

Agriculture

- It was a chief means of livelihood.
- King also did manual labour in the field.
- *Vrihi* means rice.
- *Yava* means barley.
- *Godhuma:* Wheat
- *Dhanya:* Grains and Cereals

Political Organisation

- The political organisation became *centralised.*

Sabha	Dominated by Brahmins; women participation not allowed now
Samiti	Same as before (early Vedic period)
Vidhata	Disappeared during later Vedic period

Society: Varna System

Brahmans	Performed rituals/sacrifices
Kshatriya	Participated in war and protected people
Vaishya	Conducts trade
Sudra	They did manual work

- *Conditions of women deteriorated.*
- *Gotra (clan)* system emerged.

Ashrams Mentioned in Jabala Upanishad

Brahmacharya	1st phase of life (0-25 yrs)
Grihasta	2nd phase of life (25-50)
Vanaprastha	3rd phase of life
Sannyasa	4th phase of life

Marriage

- *Anulom vivah:* Boy is from *higher caste* + girl is from *lower caste.*
- *Pratiloma vivah:* Girl is from *higher caste* + boy is from *lower caste.*

Eight types of marriage are there:

Brahma Vivah	Marriage within same Varna with Vedic rituals
Gandharva Vivah	Love marriage
Daiva Vivah	Father donates his daughter to priest as Dakshina
Arsha Vivah	Token bride price of a cow and Bull were given
Prajapati Vivah	Marriage without dowry
Asur Vivah	Marriage by purchase

TsuNamî
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Rakshasa Vivah	Marriage by abduction
Paishacha Vivah	In this type of marriage, a girl who is not in her senses is forcibly married off

Religion

- Other Gods like *Rudra gained more importance* while *Indra* and *Agni lost their importance.*
- *Pushan* (god of cattle) came to be regarded as *God of Shudras.*
- *Prajapati: Creator of Universe*
- Idol worship gained importance.
- Animal sacrifice increased during this period.
- Different kind of *Yajnas* were performed: *Ashwamedha yajna, Rajasuya sacrifice, vajapya.*

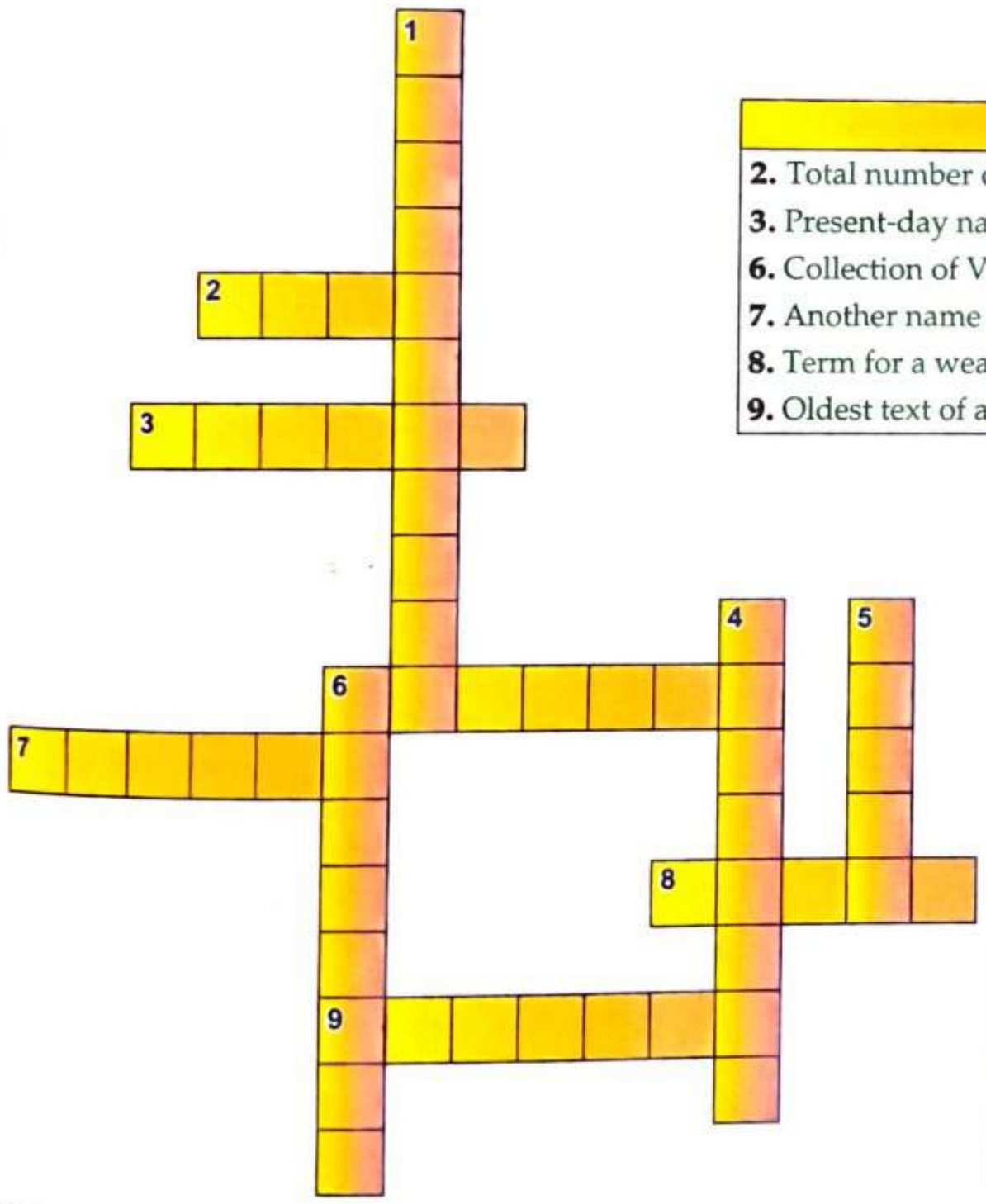
Pottery

- *Grey* coloured pottery were seen here.

Early Vedic Period	*Later Vedic Period*
Pastoral community	Agriculturists
Better women condition	Condition of women deteriorated
Varna system was based on profession and was not rigid	Varna system became hereditary and rigid
No idol worship	Idol worship started
Rigveda was compiled during this time	Samveda, Yajurveda, and Atharvaveda were compiled during this time

PARMAR'S CROSSWORD

VEDIC AGE



Across

2. Total number of Ashramas in early Hindu philosophy.
3. Present-day name of Asikni river.
6. Collection of Vedic hymns.
7. Another name for hymns in Rigveda.
8. Term for a wealthy person in Vedic age.
9. Oldest text of ancient India.

Down

1. Veda with magic spells and charms.
4. Main occupation in Early Vedic economy.
5. God called "Lord of the Plough" in Later Vedic age.
6. Language of Aryan texts.

TsuNamî

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Cause of Origin

- ***Brahminical domination:*** Jainism and Buddhism were against the *ritualistic interpretation of Vedas* and opposed *Brahminical Domination*.
- ***Agricultural Economy:*** Trade was impacted due to ritualistic sacrifices. Trade was carried out by *Vaishyas*.
- ***Punch marked coins:*** Use of *punch marked coins* started.
- ***Varna System:*** Jainism and Buddhism did not attach themselves to Varna system and everyone treated equally. Jainism believed Varnas were on the *basis of occupation and not by birth*.
- ***Belief in Non-violence:*** Both the religions believed in path of *Ahimsa*.
- Mahavir and Buddha were *Kshatriyas*.
- Jainism and Buddhism are considered *"heterodox"* in context of Indian philosophy (It means that they do not accept the authority of the Vedas, unlike orthodox Hindu traditions).
- ***Worship:*** Jainism believed in *divine figure* however Buddhism did not.

JAINISM

- In Jainism, *Tirthankaras* are considered to be *great teachers*.
- There are total *24 Tirthankaras*.

Important Tirthankaras

No.	Names	Birth Place	Represented By
1st	Rishabh Dev	Ayodhya	Bull
23rd	Parshavnath	Varanasi	Serpent
24th	Vardhaman Mahavir	Kundagram (Vaishali)	Lion

- In Vedas, only *two* Tirthankaras are mentioned: *Rishabh Dev (1st)* and *Arishtanemi (22nd)*.

Vardhaman Mahavir

- ***Birth:*** 540 BC (approx.); *Kundagram (Vaishali; Bihar)*.
- ***Death:*** 468 BC; *Pavapuri* (Bihar); during the age of *72 years*.
- ***Father:*** Siddhartha (Clan: Jnatrika; he was a Kshatriya).
- ***Wife:*** Yashoda
- ***Daughter:*** Priyadarshana (also known as Anojja) who married *Jamali* (he was the *first disciple of Mahavir*).
- Mahavir left home at the age of *30 years*; along with *Makkhali Gosala*.
- ***Enlightment:*** At the age of *42 years*; under a *Sal tree* at Jambhikagrama near river *Rijupalika*.
- ***First Sermon at:*** *Pava, Kushinagar (UP)*

Meaning of Terms related to Jainism

Death	Moksha
Enlightment	Kaivalya
Basadis	Jain monasteries
Kevalin	Perfectly learned
Jina	Jina is a being who has achieved enlightenment and is liberated from cycle of rebirth

Ajivika Sect

- ***Founder:*** *Makkhali Gosala*
- This sect believed in extreme *fatalism* (fate) and *asceticism* (living extreme form of life by abstinence from worldly pleasure).

Jain Philosophy (Triratnas)

- According to Jainism, three principles to achieve *Moksha*:

K	Right Knowledge (Samyaka Jnana)
F	Right Faith (Samyaka Darshana)
C	Right Conduct (Samyaka Charitra)

Five Principles of Living (Vows) → Panch Vrata

Ahimsa	Non-violence
Satya	Only speak the truth
Asteya	Do not steal
Brahmacharya	Sexually monogamous
Aparigraha	Detach from materialistic things, people, and places

Division among Jains

- *Chandragupta Maurya* and *Bhadrabahu* left Magadha for Karnataka due to severe famine in Magadha and settled in *Shravanabelagola*, where Chandragupta Maurya embraced Jainism. He eventually undertook *Sallekhana* (ritual fasting) and passed away. Meanwhile, another group of Jains chose to remain in Magadha under the leadership of *Sthulabhadra*.
- Overtime, differences arose between these two groups.
- The followers of Bhadrabahu, who migrated to the *South*, adhered to strict ascetic practises, including *nudity as a mark of renunciation*, and came to be known as *Digambaras (sky-clad)*.
- On the other hand, the Jains who stayed in *Magadha*, led by *Sthulabhadra*, adopted more liberal monastic rules, permitting monks to *wear white clothes*. This group became known as *Shwetambaras (white-clad)*.

Jain Councils

1st Jain Council	*2nd Jain Council*
Leader: Sthulabhadra	
Time period: 298 BC	Time period: 512 AD
Place: Pataliputra Patronised by: Bindusara (son of Chandragupta Maurya)	Place: Vallabhi, Gujarat

Important Books of Jains

- ***Bhagavati sutra (mentions about Mahajanapadas)***
- ***Tattvartha sutra***
- ***Agam sutra (sacred books of Jain religion)***
- ***Kalpa sutra***

- ***Bhadrabahu boycotted 1st Jain Council.***
- ***Jain literature*** is written in ***Prakrit language.***

TsuNamî

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Architecture

Architecture	Places
Rock Cut Cave Temples	Odisha
Hathigumpha Caves	Odisha, Kharavela
Udayagiri and Khandagiri Caves	Odisha
Dilwara Jain Temple	Rajasthan (Mt. Abu)
Statue of Gomateshwara/Bahubali	Karnataka, Shravanabelagola
Ellora Caves	Maharashtra
Khajuraho	Madhya Pradesh

BUDDHISM

Gautam Buddha

- *He belonged to:* Shakya Clan.
- He was also known as *Shakyamuni, Tathagat.*
- *Birth:* 563 BC; *Lumbini, Nepal*
- *Death:* 483 BC; *Kushinagara, Uttar Pradesh*
- *Childhood name: Siddhartha*
- *Father:* Suddhodhana
- *Mother:* Mahamaya (belonged to *Koliya tribe*).
- *Step-mother:* Mahaprajapati Goutami *(first Bhikkhuni).*
- *Wife:* Yashodhara
- Son: Rahul
- Buddha left home at the age of *29 years.*
- *First teacher:* Alara Kalama
- *Second teacher:* Udraka Ramputra
- *Enlightment: Uruvela* (Bodh Gaya); under a *Bodhi tree* (peepal tree) for *49 days* near river *Niranjana.*
- *First sermon: Sarnath; Varanasi*
- Gautam Buddha is considered as *"Light of Asia".*

Important Symbols of Buddha's Life

Terms	Meaning	Symbol
Birth	Janma	Lotus/Bull
Enlightenment	Nirvana	Bodhi tree
First Sermon	Dharmachakrapravartana	Wheel
House renunciation	Mahabhinishkramana	Horse
Death	Parinirvana/Mahaparinirvana	Stupa

Philosophy of Buddhism

There are four noble truths:

1. The truth of suffering.
2. The truth of the cause of suffering (i.e., desire).
3. the truth of the end of suffering.
4. The truth of the path to the end of suffering (i.e. Eight Fold

Eight Fold Path or Ashtangika Marga

It is followed to end sufferings.

- *Right mindfulness*
- *Right view*
- *Right intention*
- *Right concentration*
- *Right speech*
- *Right action*
- *Right effort*
- *Right livelihood*

In 4th Buddhist Council, Buddhism was divided into two sects: Mahayana and Hinayana.

Triratnas of Buddhism

- *Buddha*
- *Dhamma*
- *Sangha (community of monks)*

Buddhist Councils

Buddhist Council	Place	Patronage	Presidency
1st	Rajgriha (400 BC/483 BC)	Ajatshatru	Mahakashyapa
2nd	Vaishali (383 BC)	Kalashoka	Sabakami
3rd	Pataliputra (250 BC)	Ashoka	Moggaliputta Tissa
4th	Kashmir (72 AD); Kundalvana	Kanishka	Vasumitra

Sects of Buddhism

Hinayana	Mahayana	Vajrayana
They do not believe in idol worship	They believe in idol worship	Tantric Buddhism (In the East)
Text: Pali	Text: Sanskrit	Roots: Tibet
They do not believe in rebirth of Buddha	They believe in rebirth of Buddha	
Seen mostly in: Sri Lanka, Cambodia, etc. *Eg: In Southern India*	Seen mostly in: Japan, China, South Korea	*Eg: Sikkim, West Bengal*

Buddhist Texts

- *Sutta pitaka:* Buddha's teachings/sermons.
- *Vinaya pitaka:* Monastic courts and rules.
- *Abhidhamma pitaka:* Interpretation of Suttapitaka.

- ***Theravada Buddhism origin: India***
- ***Pitaka meaning: Basket***

In Pali Language

- *Milindpanho:* Dialogue between *Milinda* (Indo-Greek King Menander I) and *Nagasena.*

Bodhisattvas

- A Bodhisattva is a being who seeks *enlightenment* (Bodhi) not just for themselves, but for the benefit of all sentient beings. The concept is central to *Mahayana Buddhism,* where Bodhisattvas delay their own *Nirvana* to help others attain liberation.

Some well-known Bodhisattvas include:

- ***Padmapani:*** A bodhisattva who is also known as *Avlokiteshvara.*
- ***Vajrapani:*** A bodhisattva who is a *protector* and a *guide.*
- ***Manjusri:*** A bodhisattva who represents *wisdom* and is considered the *Buddha-to-be.*

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In Sanskrit Language

- *Buddhacharitra:* Buddha's biography by *Asvaghosha.*
- *Jataka tales:* it is about previous births of Buddha in both *human* and *animal forms.*

Terms	Meaning
Chaitya	Place of worship
Vihara	Place of residence
Dhamma	Dharma
Stupa	Mound where the relics of Buddha have been placed

Buddhist Stupas

Stupas	Places
Kesariya Stupa	Bihar (largest Stupa in India)
Dhamek	Sarnath, Uttar Pradesh
Ramabhar	Kushinagara, Uttar Pradesh
Sanchi	Madhya Pradesh (oldest Stupa in India)
Shanti Stupa	Ladakh (white in colour)
Chir Tope (Dharmarajika Stupa)	Taxila, Pakistan
Piprahwa Stupa	Uttar Pradesh (first built by Sakya Dynasty)
Bharhut Stupa	Madhya Pradesh
Borobudur Stupa	Java, Indonesia (largest Stupa in the world)

Kesariya Stupa

- *Discovered by:* Colin Mackenzie
- *Excavated by:* K. K. Muhammed

Important Monasteries

1. *Thiksey: Ladakh*
2. *Hemis: Ladakh*
3. *Rumtek: Sikkim*
4. *Kye/Key Gompa: Himachal Pradesh*
5. *Alchi Gompa: Ladakh*

***Note**

- *Namdroling Monastry* (a Buddhist Monastry) is located in *Bylakuppe, Karnataka* is also known as *"The Golden Temple"*.

Eight Holy Places of Buddhism

- *Lumbini*
- *Bodh Gaya*
- *Sarnath*
- *Kushinagara*
- *Rajgir*
- *Vaishali*
- *Shravasti*
- *Sankosia*

Sanchi Stupa

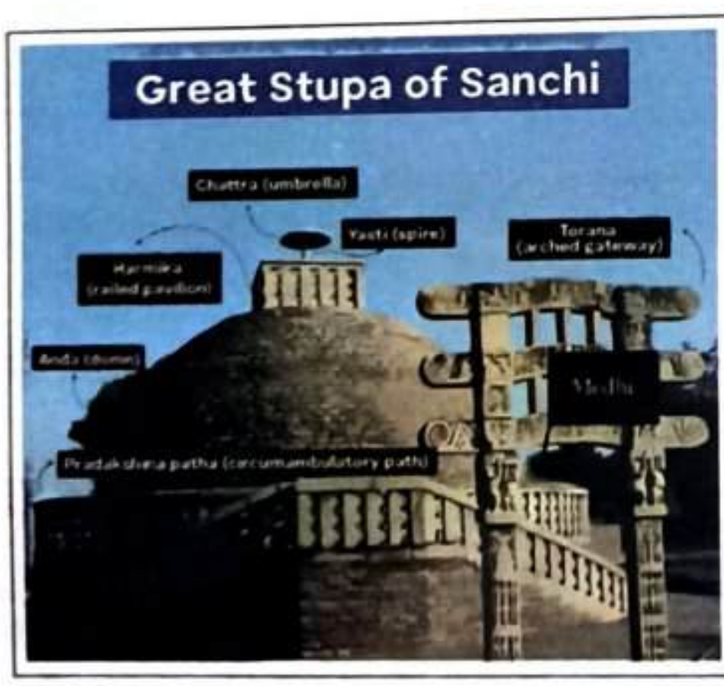

Fig 1: Sanchi Stupa

- It is the *oldest Stupa of India* built by *King Ashoka* in 3rd Century BC.
- The carving on Stupa was done using *Sandstone* by *Shunga Dynasty.*
- It has *four Gateways* which represent cardinal points → North, South, West and East direction.
- ***First discovered by:*** *Henry Taylor in 1818.*
- *Chethiyagiri festival* is celebrated at Sanchi.
- Relics of two important disciples of Buddha → *Sariputta* and *Moggallana* are kept here.

Fig 2: Sala Tree

Parts of a Stupa

- *Anda:* Hemispherical dome
- *Torana:* Gateway
- *Medhi:* Pedestrial Path
- *Vedika:* Railings
- *Pradakshina patha:* A circular path around stupa where devotees walk around

Fig 3: Salabhanjika Yakshi (reference to mother of Buddha (Maya) under Sala tree giving birth to Buddha

For an interactive recap of this topic, see the crossword on Page Number 94.

TsuNamî

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• Aryans are considered the most powerful tribes during the Vedic period, and gradually transitioned to "*Mahajanapadas*" (great kingdoms) by the end of *later Vedic Period*. By forming territorial units called "*Janapadas*".

Aryans → Tribes → Jana → Janapadas → Mahajanapadas (consolidation of Jana (Aryans))

MAHAJANAPADAS

• **Total:** *16 Mahajanapadas*

Sources

• Texts: *Ashtadhyayi* (in Sanskrit) written by *Panini* (oldest book on *Sanskrit Grammar* written in *4th-6th Century BC*).

Buddhist Literature

• *Anguttara Nikaya* (A total of *16* Mahajanapadas are mentioned in it).

• *Digha Nikaya* (A total of *12* Mahajanapadas are mentioned in it).

Jain Literature

• *Bhagavati Sutra*.

• Mahajanapadas were either *Monarchial* (single decision makers) or *Republic* (multiple decision makers), also known as *oligarchy*.

• The following Mahajanapadas were Republic → *Kuru, Kamboja, Vajji, Malla, Assaka*.

Mahajanapadas	*Capital*
Anga	Champa
Magadh	Rajagir / Pataliputra
Kasi	Varanasi
Vatsa	Kausambi
Kosala	Sravasti / Ayodhya
Surasena	Mathura
Panchala	Achichchatra / Kampilya
Kuru	Indraprastha
Matsya	Viratnagar
Chedi / Chetiya	Sothivati / Banda
Avanti	Ujjain (north) / Mahismati (south)
Gandhar	Taxila
Kamboj	Pooncha
Asmaka	Pratisthan / Paithan / Potana
Vajji	Vaishali
Malla	Kusinara

Map 1: Mahajanapadas Territory

• *Vajji* consisted of *eight clans* and *three* of them were the most powerful kingdoms → *Jnatrika, Videha, Lichchavi*.

Reasons for the Rise of Magadha

• Its advantageous position → situated *south of Ganga*.

• The capital *Rajgriha* was surrounded by by *five hills* and *Pataliputra* was situated at the confluence of *Ganga* and *Son*.

• The availability of large number of *elephants* (as it was marshy-doab region).

• It had many great leaders.

• Availability of *Iron mines* (in *Jharkhand region*).

DYNASTIES THAT RULED MAGADHA

HARYANKA DYNASTY

Bimbisara (544 BC-492 BC)

• *Title: Seniya*

• He led military campaign against *Anga*.

• He had *three wives*:

- *Kosala Devi* → Sister of *Prasenjit* (son of Kosala King)
- *Chellana* (Lichchavi princess)
- *Khema* → Madra Clan (Punjab)

• He sent his physician *'Jivaka'* to *Ujjain* (to treat *King Pradyota*, who was suffering from jaundice)

Ajatshatru

• He was the son of *Chellana* and *Bimbisara*.

• He conquered *Lichchavi* and *Vaishali*.

• He defeated Kosala King and married his daughter.

• He patronised the *1st Buddhist Council*.

• He later killed his father Bimbisara.

• He was contemporary of Buddha and Mahavira.

Udayin

• He shifted his capital from *Rajgriha* to *Pataliputra* (now: *"Patna"*).

SHISHUNAGA DYNASTY

• *Founder: Shishunaga*

• He defeated *Avanti* and merged it with *Magadha*.

• *Kalashoka* patronised *2nd Buddhist Council*.

NANDA DYNASTY

Mahapadmananda

• He was the founder of *Nanda dynasty*.

• *Title taken: Ekrat* (Meaning: *Empire builder/Uprooter of Kshatriya*).

Dhananada

• Alexander invaded India during his reign (*326 BC*).

• He was the *last king* of Nanda Dynasty.

TsuNamî

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Battle of Hydaspes was fought between Alexander and Porus (Porus was defeated in the battle) on the banks of Jhelum (326 BC).

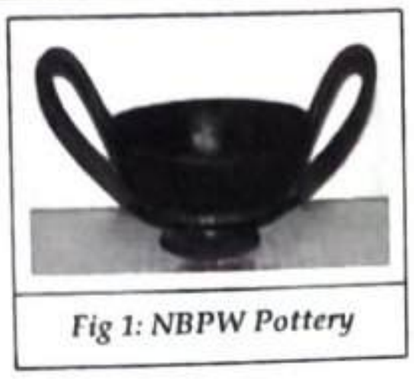


Fig 1: NBPW Pottery

Society

Pottery

- *Northern black polished wares* (NBPW) were used for pottery.

Coins

- *Punch-marked coins* made of *silver* were used as the form of money for trade purposes.
- Gold coins such as *Nishka* and *Satmana* were also used.

Trade

- Artisans and merchants formed associations called *Shrenis (Guilds)* that were collectively referred to as *Nigama*.

Craft and Architecture

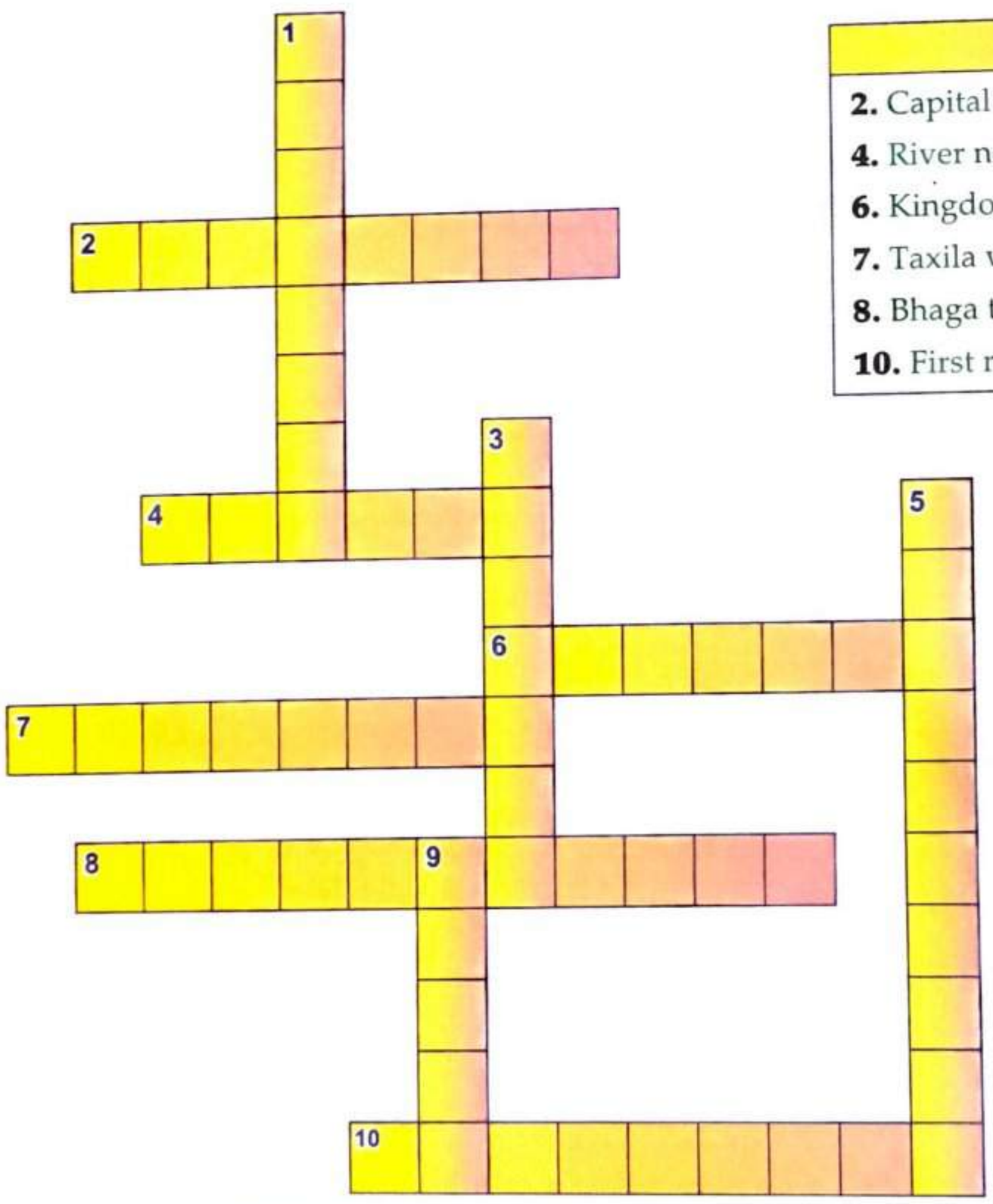
- Craft was hereditary.
- Iron ploughshare played a crucial role in the empire's agricultural success (second urbanization after Harappa).

Post

- Village headman was known as *Bhojaka*.
- Peasants had to pay tax called *Bhaga (1/6th of their produce)*.
- *Gahapatis* were wealthy property owners who employed slaves or hired labourers to work on their lands.
- *Bali* was a *voluntary offering* to the King; however it was not compulsory.
- *Toll tax persisted* and were collected by officers known as *Shaulkika/ Shulkadhyaksha*.

PARMAR'S CROSSWORD

MAHAJANPADAS



Across

2. Capital of Vajji Mahajanapada.
4. River not part of Sapta Sindhu.
6. Kingdom that emerged most powerful.
7. Taxila was capital of which Mahajanapada.
8. Bhaga tax was levied on whom.
10. First ruler of Haryanka dynasty.

Down

1. Capital of Vatsa Mahajanapada.
3. River near Mahishmati (capital of Avanti).
5. Last ruler of Nanda dynasty.
9. Example of Gana-Sangha Mahajanapada.

TsuNamî
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Sources

- *Kautilya's Arthashastra:* He was contemporary to Chandragupta Maurya. Arthashastra describes the *administration* and *state policies* of Mauryan Empire during Chandragupta Maurya's time.
- *Vishakadutta's Mudrarakshasa:* It is a *Sanskrit* play that narrates the ascent of emperor Chandragupta Maurya to power in India. This play describes them as belonging to a *lower caste*.
- *Indica* written by *Megasthenes*: It includes all the detailed account of how things were run in Mauryan Empire.
- *Buddhist Literature*: Jataka tales, Dipavamsa/Mahavamsa, Divyadana.

MAURYA DYNASTY

Chandragupta Maurya *(322 BC-298 BC)*

- He was the founder of Mauryan Dynasty and ascended the throne by defeating the last ruler of Nanda Dynasty → *Dhanananda*, with the help of *Kautilya* (also known as *Chanakya/Vishnugupta*) in *322 BCE*.
- He defeated *Seleucus Nicator* (Frontier of *Alexander The Great*).
- Son: *Bindusara*
- He built a department *"Kosthagara"*: For storage of *grains* (mentioned in *Sohgaura Copper Plate inscription*).

About Seleucus Nicator

- Seleucus Nicator founded *Seleucid Dynasty* (member of Macedonian Greek Dynasty) ruling in Northwestern parts of the Indian subcontinent.
- *Megasthenes* was in the court of Seleucus Nicator.
- Chandragupta Maurya defeated Seleucus Nicator and was married to his daughter *Helena*.

Bindusara *(297 BC-273 BC)*

- He is also known as *"Amitrochates"* by the *Greek*.
- He asked for sweet wine, dry figs and a philosopher from *Antiochus 1* of Syria.
- He is known for conquering the land between the two seas.
- He patronised *Ajivikas*.
- He was visited by Greek ambassador → *Deimachus*.
- *Son: Ashoka*

Ashoka *(268 BC-232 BC)*

- Ashoka ascended the throne with the help of *Radhagupta (Minister)*.
- He fought *Kalinga War (261 BCE), 8 years* after his coronation.
- He replaced *Berighosha* (physical conquest) with *Dhammagosha* (cultural conquest) after the Kalinga War.
- He sent his son *Mahendra* and daughter *Sanghamitra* to *Ceylon* (now known as *Sri Lanka*) to spread Buddhism.

Ashokan Edict

- Edicts of Ashoka are found in *Rocks and Pillars*.
- *Rock Edicts*: There are *14 Major Rock Edicts* of Ashoka meaning a maximum of *14 lines* are engraved in Rocks.

William Jones (founder of Asiatic Society of Bengal, 1784) was also involved in deciphering of major Ashokan Rock Edicts.

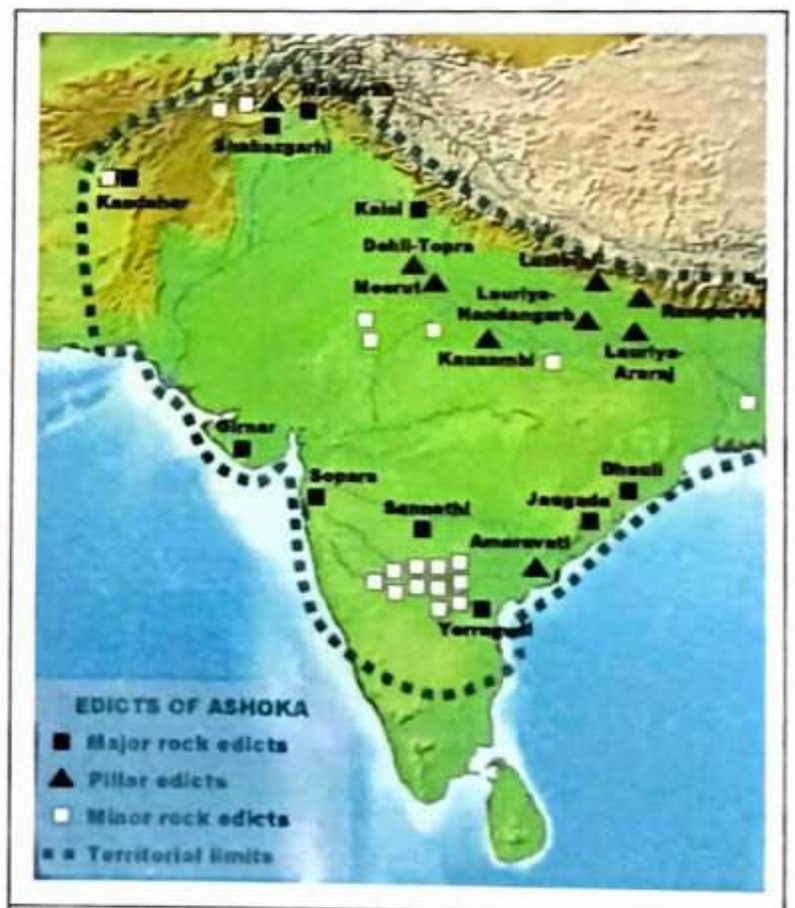
James Princep was the 1st to decipher Ashokan inscriptions in 1837.

Major Rock Edicts

- *Total:* 14
- *Total languages:* 3
- *Total scripts used:* 4
- *Most inscriptions were in: Prakrit language* in *Brahmi script*
- *Script used in Afghanistan:* Greek and Aramaic
- *Script used in Northwestern parts of India:* Kharosthi
- *In inscriptions he is mentioned as: Devanami Piyadassi* (Meaning: Devon ka Priya → Beloved of God)

10 Places where Ashokan Rock Edicts have been Found

1. *Kandahar Bilingual Inscription → Kandahar, Afghanistan*
2. *Shahbazgarhi in Kharoshthi script → Khyber Pakhtunkhwa, Pakistan*
3. *Mansehra Rock Edicts → Mansehra, Khyber Pakhtunkhwa province, Pakistan*
4. *Kalsi → Dehradun, Uttarakhand*
5. *Girnar → Gujarat (14 lines are inscribed in Girnar major Rock Edicts)*
6. *Sopara → Maharashtra*
7. *Dhauli → Bhubaneshwar, Odisha*
8. *Jaugada → Odisha*
9. *Sannati → Karnataka*
10. *Yerragudi → Kurnool district, Andhra Pradesh*



Map 1: Ashoka's Rock Edicts

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14th Major Rock Edicts of Ashoka	
**Edict 1	Prohibits animal slaughter. Ban festive gatherings and the killing of animals. Only two peacocks and one deer were killed in Ashoka's kitchen. He wished to discontinue this practice also.
Edict 2	Providing care for man and animals describes Chola, Pandaya, kingdoms of south India.
Edict 3	Generosity to Brahmans.
**Edict 4	Dhammaghosa over bherighosa.
Edict 5	Concerns over policy towards slaves.
Edict 6	Welfare measures
**Edict 7	Requests tolerance for all religions
Edict 8	Describes Ashoka's first Dhammayatra to Bodh Gaya and Bodhi tree
Edict 9	Condemns popular ceremonies. Stress on ceremonies of dhamma.
Edict 10	Condemns the desire for fame and glory. It stresses the popularity of Dhamma.
Edict 11	Elaborates dhamma.
**Edict 12	Directed and determined requests for tolerance among different religious sects.
**Edict 13	Ashoka's victory over Kalinga
Edict 14	Describes engraving of inscriptions in different parts of the country.

*Table 1: 14 Rock Edicts and Inscriptions of Ashoka (** are important)*

- *Edict XIII (13): Kalinga War* (Kalinga was the ancient name of Odisha).

Minor Rock Edicts

- Four Edicts where Ashoka has been mentioned by his name.
- *These four are:*

Maski → Karnataka

Nettur → Andhra Pradesh

Brahmagiri → Karnataka

Gujjara → Madhya Pradesh

Fig 1: Name "Ashoka" mentioned in Maski Stone Slab

Pillar Edicts

- *Total: 7 (meaning: 7 lines)*

Delhi Topra Pillar Edict

- It comprises all the 7 Ashokan Pillar Edicts and only the *7th Edict* is considered as the *longest* amongst them all.
- Only one language *(Prakrit)* and only one script *(Brahmi)* is used.
- Delhi Topra Pillar was transferred from *Haryana* to in *Delhi* by *Firoz Shah Tughlaq*.
- *Lauriya Areraj*
- *Lauriya Nandangarh*

} *Both in Bihar*

Fig 2: Delhi Topra Pillar Edict

Fig 3: Rampurva Bull

- Placed in President House

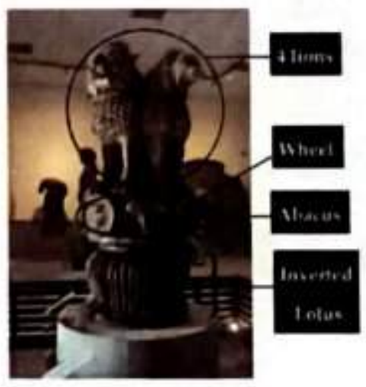

Fig 5: Ashoka Pillar, Sarnath

- It was adopted as the National Emblem on *24th Jan 1950* and it shows Dhammaparivartan of Ashoka.
- Here, Ashoka commemorated the first Sermon of Buddha.
- Animals: Lion, Elephants, Horse, Bull

- *Barabar Hill Caves* in Bihar → Built by Ashoka for *Buddhist monks*.
- *Lomas Rishi Caves* in Bihar.
- *Nagarjuni Caves* in Bihar → Built by *Dasrath Maurya* (grandson of Ashoka).
- *Konagamana/Kanakamuni Stupa* → Rebuilt by Ashoka (after he visited *Nigali Sagar*).

Inscriptions

Fig 6: Nigali Sagar Inscription in Nepal

Fig 7: Rummindei Pillar Inscription (also known as Lumbini Pillar Edict) in Nepal

- It depicts that Ashoka traveled to the Buddha's birthplace. He reduced the taxes of the people living in that area.

- The last ruler of Mauryan Dynasty: *Brihadratha* (who was defeated by *Pushyamitra Shunga*).

Mauryan Administration

- *Saptanga Theory* by *Kautilya*:

He mentioned *7 elements* to rule an administration effectively.

1. *King: Raja*
2. *Secretary: Amatya*
3. *Territory: Janpada*
4. *Fort: Durga*
5. *Treasury: Kosha*
6. *Army: Danda*
7. *Friend: Mitra*

Five Provinces under Mauryan Administration

Province	Capital
Prachyapatha (East)	Tosali
Avantipatha (West)	Ujjain
Uttarapatha (North)	Taxila
Dakshinapatha (South)	Suvarnagiri
Prachi (At present: UP + Bihar)	Patliputra

Tax System

- *Tax paid in gold: Hiranya*
- *Emergency tax: Pranaya*
- *Taxes paid in kind by villages: Pindakara*
- *Army maintenance tax: Senabhaktam*
- *Extra tax: Parsvam*

Two Types of Courts

1. *Dharmasthiya Nyayalaya:* Presided by Vyavaharika (personal disputes)
2. *Kantakasodhana Nyayalaya:* Presided by Pradeshta (disputes between state and people).

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Officers

- *Sannidhata:* Chief treasury officer (CTO)
- *Samaharta:* Collector general of revenue
- *Gopa:* Responsible for account
- *Akshapatalik:* Accountant General / Audit Officer
- *Nagaraka:* Responsible for city administration
- *Sitadhyaksha:* Superintendent of Agriculture
- *Samsthadhyaksha:* Responsible for market
- *Navadhyaksha:* Superintendent of ships
- *Ashwadhyaksha:* Commanding officer of the cavalry *(Ghode wali fauj)*
- *Shulkadhyaksha:* Superintendent of Toll Tax
- *Dhamma Mahamatta:* New post created by Ashoka to check if people are following the concepts of Dhamma

According to Megasthenes, administration consisted of (as mentioned in Indica):

- *Municipal* administration of *6 committees* with *5 members* each.
- *Army* of *6 Committee* with *5 member* each.

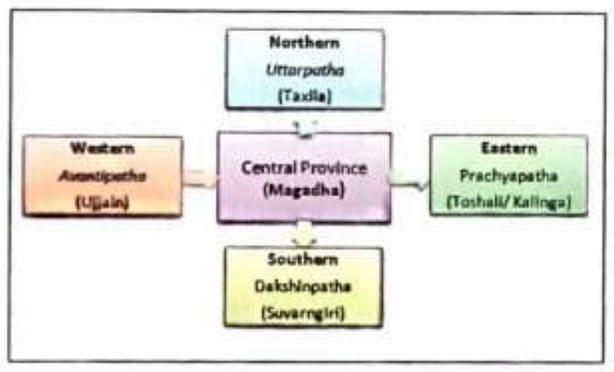
- *Kautilya* proposes a seven-part structure for the state including the king, ministers, territory, forts, treasury, military, and allies (also known as *Saptanga theory*).

According to Arthashastra

- Women occupied a *high position* in society and were a *part of Army*.

Ports

- *West: Bharuch, Sopara*
- *East: Tamralipti (Bengal)*



Provincial Administration

Society

- Society was divided into *4 varnas*
- Society was divided into *7 classes*, as described by Megasthenes in *"Indica"*. They were divided into:

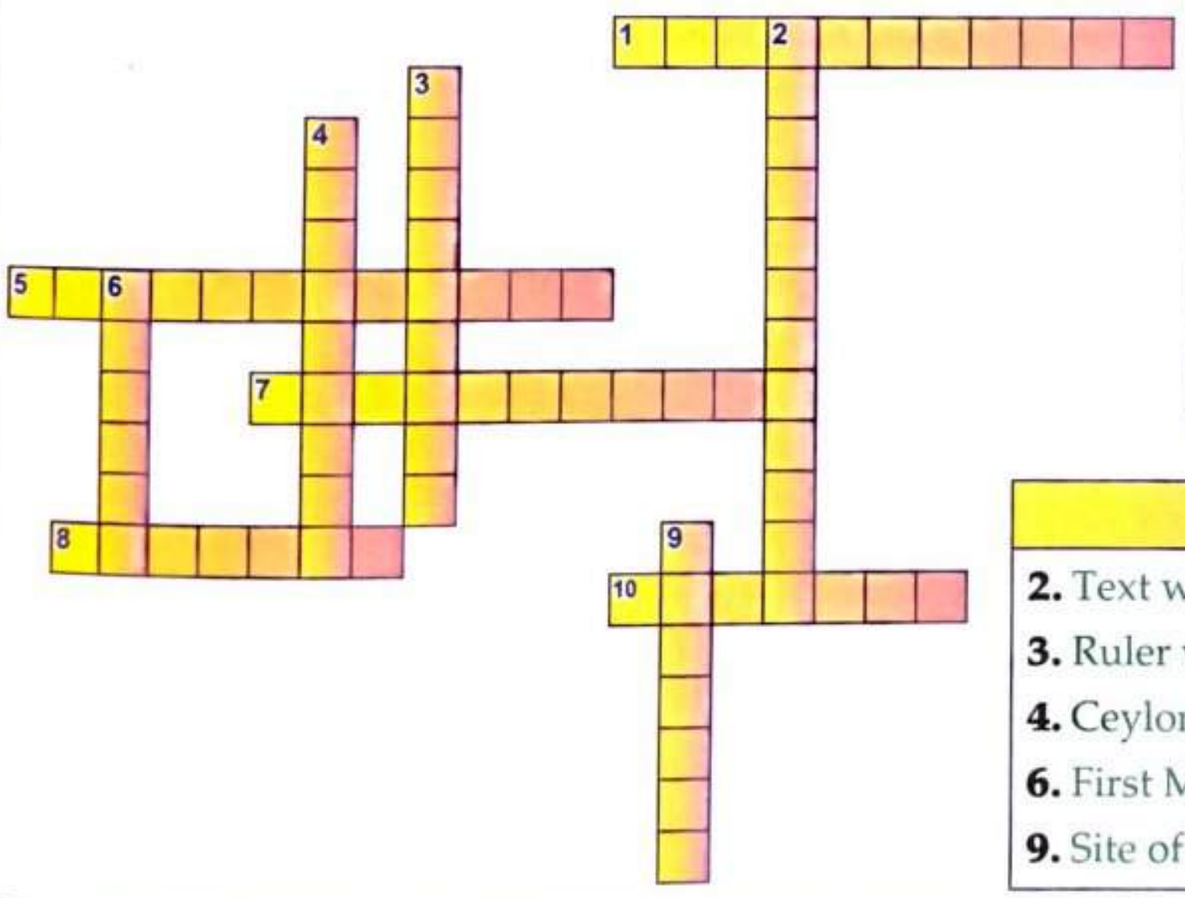
		TRICK (PCS TWO C)
1. *Philosophers*	→	*P*
2. *Cultivators/Farmers*	→	*C*
3. *Hunters and Shepherd*	→	*S*
4. *Traders*	→	*T*
5. *Warrior*	→	*W*
6. *Overseer (spy)*	→	*O*
7. *Councillor*	→	*C*

- *Antyaja:* Without any caste
- *8 types* of marriages were mentioned and *divorce was allowed.*

Megasthenes described Pataliputra as a large and beautiful city, surrounded by a massive wall. The city had 570 towers and 64 gates, showcasing its grandeur and strategic importance.

PARMAR'S CROSSWORD

MAURYA DYNASTY



Across

1. Greek ambassador at Chandragupta's court.
5. Founder of Mauryan dynasty.
7. Capital of Chandragupta Maurya.
8. First subcontinental empire.
10. First to use elephants in large scale wars.

Down

2. Text written by Chanakya.
3. Ruler who succeeded Chandragupta Maurya.
4. Ceylonese chronicle on Mauryas.
6. First Mauryan ruler to use inscriptions.
9. Site of the Lion Capital.

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• The last ruler of Mauryan Dynasty *Brihadratha Maurya* was *killed* by his military commander *Pushyamitra Shunga* which led to the start of Shunga Dynasty.

SHUNGA DYNASTY

Pushyamitra Shunga

• Founder of *Shunga Dynasty*.
• ***Capital:*** *Vidisha* (presently in *Madhya Pradesh*).
• He followed *Brahmanism* and was a devotee of *Krishna*.
• He patronised *Buddhism*.
• ***Son:*** *Agnimitra* → A play by *Kalidasa "Malvikagnimitra"* tells a story about love of *Agnimitra* and *Malvika*.
• According to *Patanjali's* book *"Mahabhashya"*, Pushyamitra Shunga performed two *Ashwamedha Yagya* (Patanjali was contemporary to Pushyamitra Shunga).

Devbhuti

• He was the *last ruler* of Shunga Dynasty and was killed by his Commander *Vasudev*

KANVA DYNASTY

• ***Founder:*** *Vasudeva Kanva*
• Kanva's were known as *"Shungabhrityas"* which means *"Servants of Shungas"*.

SATAVAHANA DYNASTY (60 BC-225 AD)

• Satavahanas were also known as *Andhras/Andhrabhrityas* (they ruled in Deccan → Present day: Maharashtra region).
• ***Capital:*** *Paithan/Pratisthan* (Maharashtra)
• ***Greatest ruler:*** *Gautamiputra Satkarni*
• This dynasty embraced *Brahmanism*.
• They had *matrilineal* society (they took names of their mothers).
• This dynasty started the practice of donating the land to Brahman and Buddhist monks.
• They started *lead coins* (traded these lead coins with the Romans) and other form of coins such as Copper, Bronze, Potin.

Gautamiputra Satakarni *(106 AD-130 AD)*

• He defeated *Kshatrapa Nahapana*, one of the Saka rulers (this is known through *Nasik Inscription* built by Gautamiputra Satkarni's mother Gautami Balashri after his death).
• ***Title:*** *Ekabrahmana*
• He claimed to have started the practice of fourfold *Varna system*.

Architecture

• Many Chaityas, Viharas were cut out from rocks, ***E.g., In Nasik, Kanheri caves and Karle Chaitya (both in Maharashtra).***
• *Ajanta* and *Ellora Caves* were first to be built during their reign.
• ***Stupas built:*** *Amravati* and *Nagarjunakonda* (Andhra Pradesh).

INVASIONS FROM CENTRAL ASIA (2ND CENTURY BC ONWARDS)

• Around 200 BCE, though no empire matched the Mauryas in size, the period was crucial for growing Indo–Central Asian contacts. It saw Invasions from multiple tribes located in the region west of China till Iran.

Causes of Invasion

1. Building of the Great Wall of China.
2. Weakening of the Seleucid Empire.

Indo Greeks

> ***Menander had his capital as:*** *Sialkot*

• Greeks were the first to cross Hindu Kush mountain.
• *Bactrians* are also known as *Indo-Greeks*.
• ***Most famous ruler:*** *Meander/Milinda* (converted to Buddhism) → Dialogue between *Milinda* and *Nagasena* (a Buddhist monk) written in *Milindapanho*.
• They were the *first* to introduce *Gold coins*.
• They were first to introduce coins that were ***attributed to the King*** (coins had picture of the King).
• They introduced *Hellenistic art* (seen in *Gandhara* Art) in North Western region.

SAKAS

• They ruled in North-West and North India.
• They were also known as *Scythians*.
• They divided themselves into *5 branches*: One of the branches settled over Western part of India that ruled until *4th Century AD* (300 AD-400 AD).

Vikramaditya Parmar

• In *57 BC* defeated Sakas (this marked the beginning of Vikram Samvat).
• Vikramaditya became a coveted title.
• He was the ruler of ***Ujjain***.

> ***Junagarh Rock Inscription is the earliest rock inscription in Sanskrit language.***

Rudradaman I *(130 AD-150AD)*

• He was the *most famous* Saka ruler.
• *Junagarh Rock Inscriptions* (also known as *Girnar inscriptions*) in *Gujarat* mentions about him.
• Repaired the *Sudarshan Lake* which was constructed by: *Pushyagupta Vaishya* (he was the Governor of Chandragupta Maurya).
• *Parthians* also came to Indian subcontinent after Sakas. *St. Thomas* (disciple of Jesus) is said to have visited during *Gondophernes (Indo-Parthian King)*.

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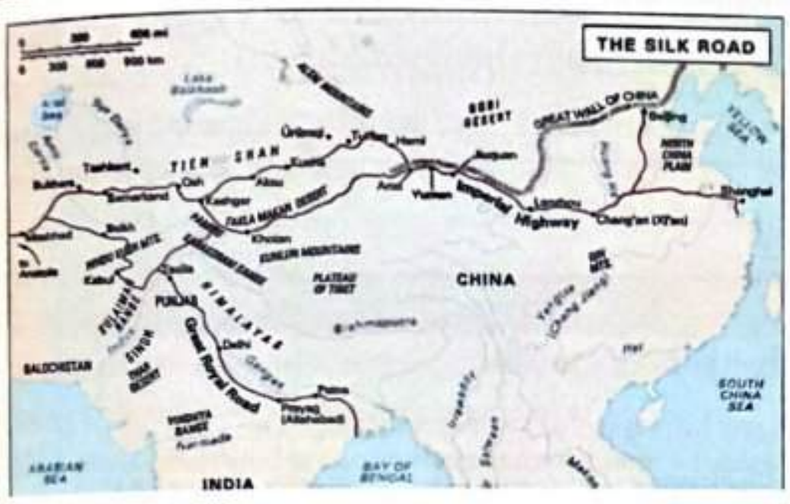
KUSHANS (1st Century AD-3rd Century AD)

- They were also known as *Yuezhis/Tocharians.*
- ***Capital:*** *Purushpura (Peshawar)* (first) → Later: *Mathura.*
- They called themselves *Devaputra* i.e., *"Sons of Gods/King of Kings"* (It shows Divinity of King).
- ***First Dynasty:*** *Kadphises*

Rulers:

1. ***Kujula Kadphises (1st ruler)***
2. ***Vima Kadphises (2nd ruler)***
3. ***Kanishka (son of Vima Kadphises)***



The Kushans held significant power over the ***Silk Road,*** facilitating trade between *China, India,* and the *Roman Empire.*

Kanishka

- He started the *Saka Era* (followed by *Govt. of India*) in *78 AD* when he ascended the throne.
- ***Started:*** *Purest form of Gold coins.*
- He is also known as *2nd Ashoka.*
- He patronised *4th Buddhist Council.*
- We get to know about him from *Rabatak Inscriptions* (Found in *Afghanistan*) which dates back to *2nd Century CE,* written in *Bactrian language.*

Impact on Indian Society

- They completely immersed themselves in indigenous culture (as warriors or Kshatriyas).
- ***Pottery:*** *Red Ware*
- Horseman technique, Turban wearing, and Sherwani wearing were introduced.
- The *Kushans* introduced the *largest hoard* of *Gold coins.*

Polity

- ***Introduced:*** *Satrap system* of Government (Satraps were called as *"Strategos"* (Military General) by *Greeks*).

Culture

- They worshipped *Shiva* and *Lord Buddha.*

> ***• Under Satrap system kingdom was divided into provinces, each under military governor "Mahakshatrapa" and the governors of lower status were called "Kshatrapas".***

Literature

- *Buddhacharitra: Ashvaghosha*
- *Mahavatsu and Divyadana*
- *Kamasutra: Vatsyayana*

Science

- ***Medicine:*** *Charaksamhita* (A book that mentions about different medicines) by *Charak* (Father of Medicine).
- *Sushruta:* Father of Surgery.

Gandhara School of Art vs Mathura School of Art

Gandhara School of Art	*Mathura School of Art*
Introduced by Kushan Dynasty	It is an indigenous art that was later developed by Kushans
It is a hellenistic style of Buddhist visual art	It deals with imagery subjects from Hinduism + Jainism + Buddhism
Halo behind Buddha's idol is not well developed	Halo is well developed
Grey sandstone is used for art	Red sandstone is used for art

Fig 1: Gandhara School of Art and Mathura School of Art

For an interactive recap of this topic, see the crossword on Page Number 94.

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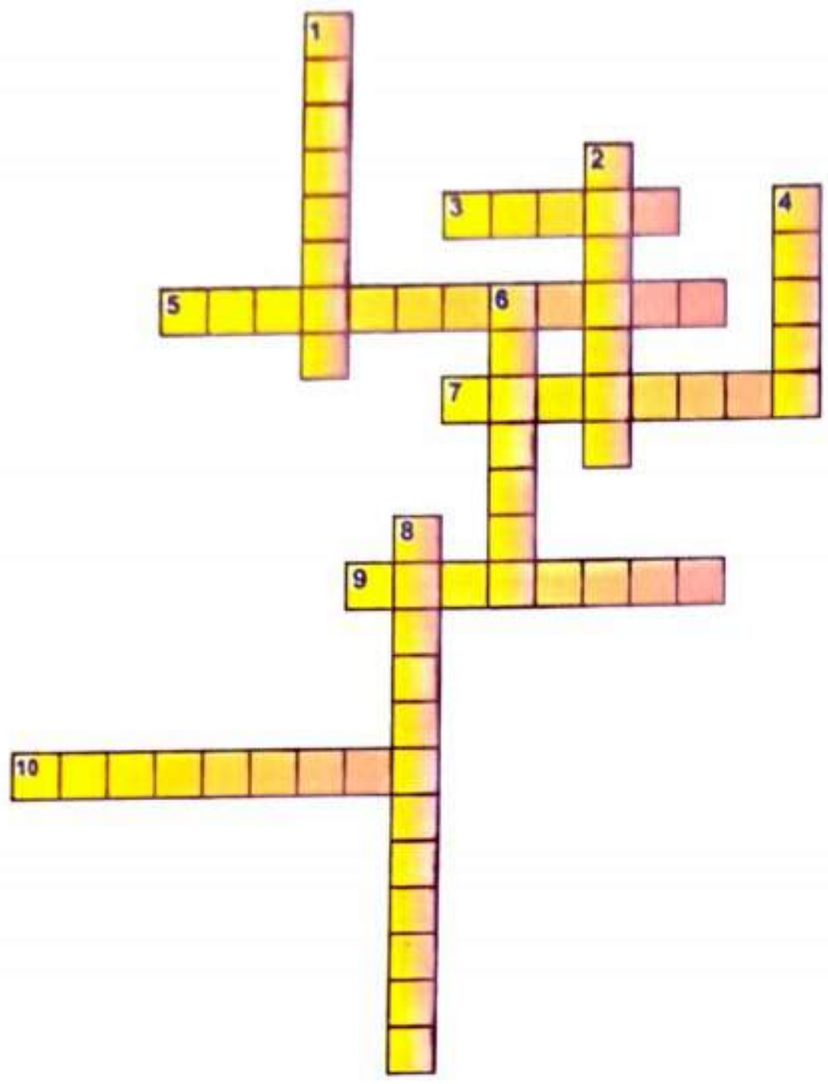
PARMAR'S CROSSWORD

JAINISM AND BUDDHISM



Across

3. Birthplace of Mahavira.

5. Jain Agam describing non-violence.

7. Place where Buddha attained enlightenment.

9. Place where Mahavira attained Moksha.

10. Meaning of the term 'Jina' in Jain philosophy.

Down

1. Last Tirthankara of Jainism.

2. Place where Jain teachings were compiled.

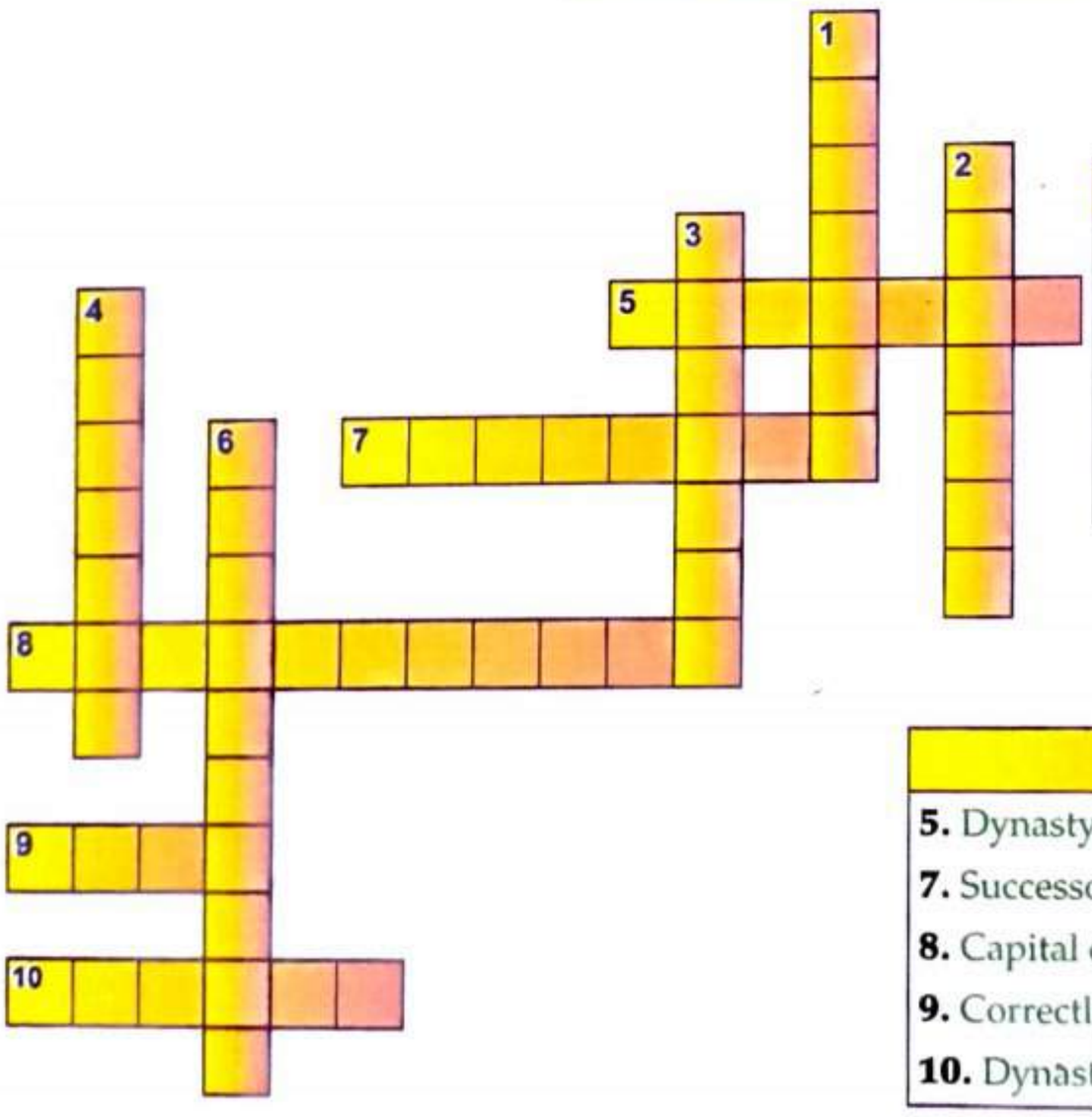
4. Jain text containing biographies of Tirthankaras.

6. Birthplace of first and fourth Jain Tirthankaras.

8. Builders of Jain temple at Pattadakal.

PARMAR'S CROSSWORD

POST MAURYA DYNASTY



Down

1. Deity worshipped by Pushyamitra Shunga.

2. City ruled by Maukharis in western Uttar Pradesh.

3. Period of Brahmanical sculptures in Mathura art.

4. First foreign rulers of northwest India.

6. Dynasty that defeated the Kanvas.

Across

5. Dynasty of Vasudeva I.

7. Successor of Vima Kadphises.

8. Capital of Pushyamitra Shunga.

9. Correctly matched pair of Sakas and Vakatakas.

10. Dynasty founded by Pushyamitra after killing Brihadratha.

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GUPTA DYNASTY (320 AD-543 AD)

Gupta Dynasty (320 AD-543 AD)

- *Founder: Sri Gupta* (Son: *Ghatotkach*)
- Guptas ruled over *Madhyadesha* (Uttar Pradesh + Madhya Pradesh + Bihar).
- They are considered to be feudatories of *Kushans*.
- The Gupta age in ancient India has been called the *"Golden Age of India"* because of the many achievements in the field of arts, science, and literature that Indians made under the Guptas.

Chandragupta I (319 AD-335 AD)

- *Title: Maharajadhiraja*
- Married to: Kumaradevi *(Lichchavi Princess)*
- He started Gupta Era in *320 AD/319 AD*.
- Gold coins introduced by him were called *Dinars*.

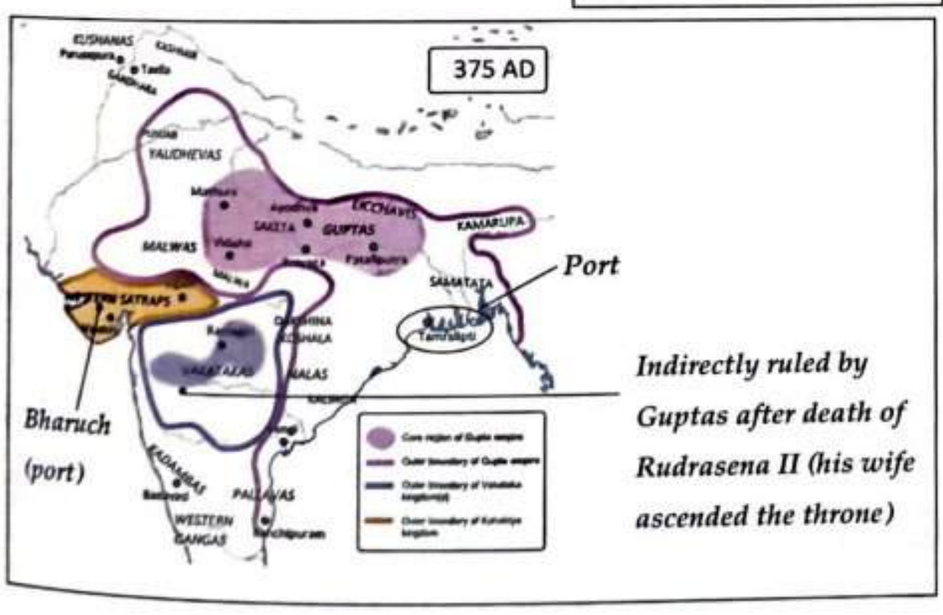
Samudragupta (335 AD-375 AD)

- He was the most powerful and greatest king of the dynasty.
- Record of his reign is mentioned in *Prayag Prasasti* (Allahabad Pillar Inscription → Composed by *Harisena* (his court poet)).
- Samudragupta is considered to have remained undefeated in battles.
- He is titled *"Napoleon of India"* by *V. A. Smith*.
- *Other titles taken:* Param Bhagavat, Sarva-raj-ochchetta (uprooter of all king), Lichchavi dauhitra
- He has been shown *playing Veena on coins*.
- He performed Ashwamedha Yagya.
- Samudragupta granted permission to *Meghavarman*, the Buddhist king of *Ceylon (Sri Lanka)* to build a monastery in *Bodh Gaya*.

Chandragupta II (380 AD-415 AD)

- He achieved power by assassinating his brother *Ramgupta* and *Saka* invader.
- He married his brother's wife *Dhruvadevi*.
- He formed matrimonial alliance by marrying off his daughter *Prabhavati Gupta* with Vakataka Prince *Rudrasena II*.

Fig 2: Samudragupta shown playing Veena on gold coin



- He was the first Gupta to introduce *Silver coins* after the victory over Sakas (this is mentioned in *Mehrauli* Iron Pillar in Delhi).
- He took the title *Vikramaditya after defeating Sakas*.

- His court was adorned with nine *Navratnas*. They were:

Amarsimha	Lexicographer
Dhanvantri	Physician
Harisena	Court poet
Kalidas	Shakespeare of India
Sanku	Architect
Varahamihira	Astronomer
Vararuchi	Grammarian, Sanskrit scholar
Vatalbhatta	Magician
Kahapanaka	Astrologer

- He was visited by *Fa-Hein*, the *first Chinese traveller* during his reign.

Books by Kalidasa

- Abhigyan Shakuntalam
- Malvikagnimitra
- Raghuvamsa
- Meghadutta
- Kumar Sambhavam
- Ritusamhara

> - *Amarsimha wrote "Amarkosh".*
> - *Vetala Bhatta wrote "Mantra Shastra".*

Books by Sudraka

- *Mrichchhakatika:* It is a love story of *Charudatta* and *Vasantasena* (also known as: *The little clay art*).

Kumaragupta I (415 AD-455 AD)

- He was the son of *Chandragupta II*.
- His empire was attacked by Huns.
- He founded *Nalanda University*.

Mehrauli Iron Pillar

Skandagupta I (455 AD-467 AD)

- He successfully resisted the attack of *Huns*.
- *Title taken: Vikramaditya* (source: *Bhitari Pillar Inscription*)
- He also repaired *Sudarshan lake*.
- He moved his capital to *Saketa* and renamed it *Ayodhya* after the legendary city in the Ramayana.

Administration → *Decentralised*

Empire → *Bhuktis* (under the charge of Uparika)
↓
Divided into districts
↓
Vishayas (under the charge of *Vishaya Patis*)
↓
Vithis (under the charge of *Nagarpati*)
↓
Villages (under the charge of *Gramika*)

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Important Officers

Kumaramatyas	Provincial Officer (most important Officer)
Mahadanda Nayaka	Officer responsible for punishment (Minister of Justice)
Sandhivigrahika	The officer of war and peace
Nagara Shresthi	Chief Banker of the city

> ***Note*
> *Harisena held all these posts except Nagara Shresthi*

Economy

Taxes

Bhaga	1/6th of the produce to be paid by cultivators
Bhoga	Periodic supplies of fruit, flowers to the King
Bali	Oppressive
Uparikara	Extra tax
Vishti	Form of forced labour
Halivarika	To be paid by one who owned a plough
Udakabhaga	Tax on water
Hirayana	Tax for special purpose

Culture

Fig 3: Idol of Varah
- Built by: Chandragupta II
- Avatar of Lord Vishnu
- Place: Udaygiri, Vidisha, Madhya Pradesh

Fig 4: Dasavatara Temple
- Place: Deogarh, Lalitpur, Uttar Pradesh

Fig 6: Bagh Cave, Madhya Pradesh
- Famous for ancient mural paintings

Fig 5: Bhitargaon Temple (UP)
- Dedicated to Lord Krishna
- It is also known as Brick Temple (one of the oldest)

Fig 7: Eran Pillar Inscription
- The first known inscriptional evidence of the practice of Sati is the Eran Pillar Inscription (MP) of Bhanugupta, which dates back to the 5th Century CE

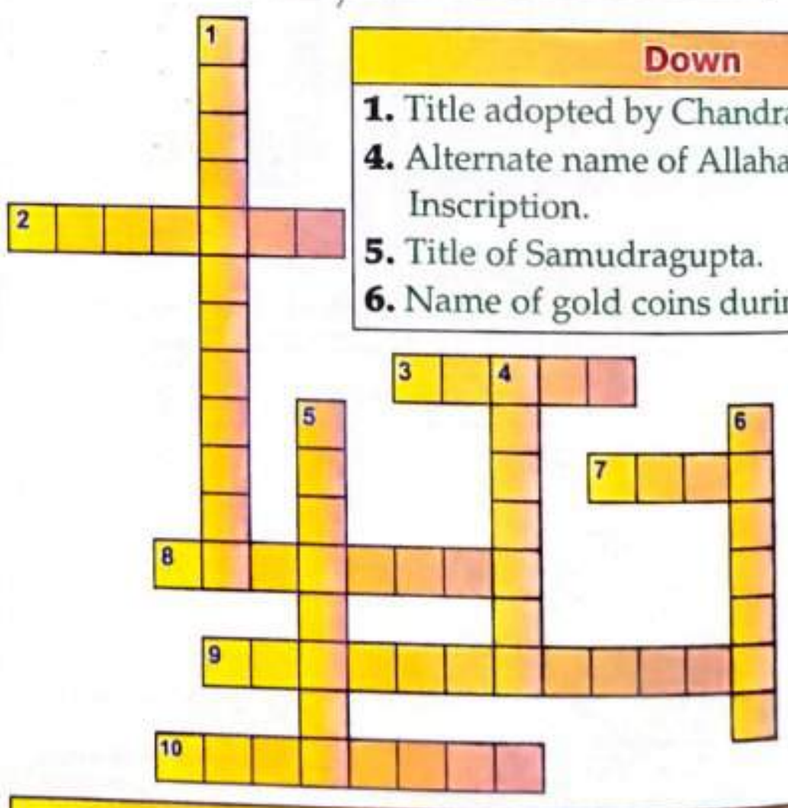
VAKATAKA DYNASTY

- ***Founder:*** *Vindhyashakti*
- They were feudatories of *Satavahanas.*
- They were the contemporaries of *Guptas.*
- They followed *Brahamanism* but also patronised *Buddhism.*
- They ruled in the Central and Southern part of India.
- In Puranas, they have been mentioned as *Vindhyakas.*
- The rock-cut Buddhist Viharas and Chaityas of *Ajanta Caves* were built under the patronage of *Vakataka king, Harishena.*

> - *Total Puranas: 18*
> - *Written by: Sage Vyasa*
> - *Compiled by: 3rd-10th Century AD*

PARMAR'S CROSSWORD

GUPTA DYNASTY



Down

1. Title adopted by Chandragupta II.
4. Alternate name of Allahabad Pillar Inscription.
5. Title of Samudragupta.
6. Name of gold coins during Gupta era

Across

2. Maukharis emerged in which area.
3. Period of Bagh cave paintings.
7. Practice first seen in Gupta period inscription.
8. Author of Samudragupta's Prayag Prashasti.
9. First Gupta to hold title Maharajadhiraj.
10. Rudrasena II belonged to which dynasty.

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PUSHYABHUTI/VARDHANA DYNASTY

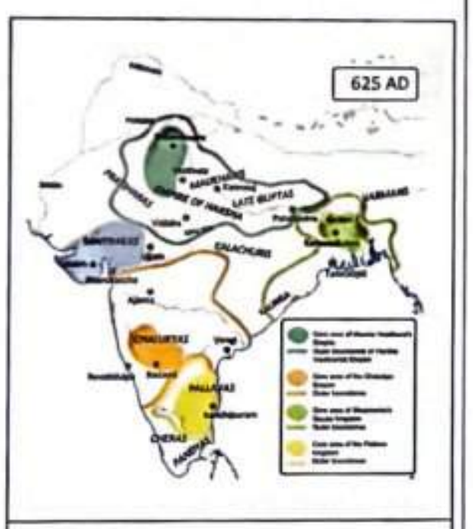
- ***Founder:*** *Pushyabhuti*
- They were ruling in *Thaneshwar* (now in Haryana).
- ***Son:*** *Prabhakarvardhan*

Prabhakarvardhan had two sons and a daughter:

- *Rajyavardhana* (eldest)
- *Harshavardhana* (youngest)
- *Rajyashri* (daughter) who married *Grahavarman* (he was a member of the Maukhari Dynasty, ruling at kannauj)
- Grahavarman was killed by the combined armies of *Devgupta* (Ruler of Malwa) and *Shashanka* (Ruler of Gauda). Subsequently, Rajyavardhana was also killed. Harshvardhana took revenge by defeating the Gauda King Shashanka.

Harshavardhana *(606 AD-647 AD)*

- ***Capital:*** *Kannauj*
- ***Defeated:*** *Dhruvasena II* (ruler of *Maitraka Dynasty* and then married his daughter to him to secure the western boundary).
- ***Visited by traveller:*** *Hiuen-Tsang* (Xuang-Zang) → *2nd Chinese traveller.*
- ***Book by Hiuen Tsang →*** *Si-yu-ki: Records of the Western World.*
- He was a *shaivite* and patronised *Buddhist* religion
- ***He authored 3 books:*** Ratnavali, Nagananda, and Priyadarshika.
- Biography of Harshavardhana *"Harshacharitra"* written by his court poet *Banabhatta* (he also wrote: *Kadambari*).
- He was defeated by *Pulakeshin II* (Chalukyan king) on the banks of Narmada river.
- His administrative empire was divided into two parts: directly administered territories and feudatory states.



Map 1: Post-Gupta Period

Maukhari Dynasty

- ***Ishanvarman, an important ruler of Maukhari Dynasty took title of Maharajadhiraja.***

CHALUKYA DYNASTY

- Chalukya Dynasty rulers were feudatories of *Kadambas of Banavasi.*
- They were divided into three distinct dynasties:
  - *Badami Chalukya* (Early Chalukya) → Capital: Vatapi
  - *Eastern Chalukya* → Capital: Vengi
  - *Western Chalukya* (Later Chalukya) → Capital: Kalyani

BADAMI CHALUKYA

Jayasimha

- He was the founder this dynasty.
- ***Capital:*** *Vatapi*

Pulakeshin I *(543 AD-566 AD)*

- He was the founder of *Badami Chalukya Dynasty.*
- ***Pulakeshin I had two son:*** *Kirtivarman I* and *Mangalesha* (Mangalesh was killed by Kirtivarman I's son *Pulakeshin II,* who later ascended the throne).

Pulakeshin II *(610 AD-642 AD)*

- He is considered the *greatest ruler* of this dynatsy.
- After defeating Harshavardhana, Pulakeshin II took the title of *"Dakshinapatheshwara"* (Lord of South).
- ***Other title taken by him:*** *Parameshwara*
- He also defeated *Mahendravarman I* (Pallava ruler) in the *Battle of Pullalur.*
- He was defeated by *Narasimhavarman I* (son of Mahendravarman I), who later took the title of *"Vatapikonda"* (Conquerer of Vatapi) after defeating Pulakeshin II.
- *Aihole Pillar Inscription* (Karnataka) was about Pulakeshin II, composed by his court poet *Ravikirti.*

Vikramaditya I

- He was the third son of Pulakeshin II
- His great grandson *Kirtivarman II (last ruler of Badami Chalukya)* was defeated by *Dantidurga* who later founded Rashtrakuta Dynasty.

Chalukyan Architecture

- Chalukyas built temples at *Aihole* and *Pattadakal.* They introduced a new temple architecture called *Vesara Style* (covered in next chapter).

Aihole

(A)

(B)

(C)

Fig 1: (A) Ravana Phadi Caves; (B) Lad Khan Temple; (C) Durga Temple (it is made on apsidal plane)

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Pattadakal

Fig 2: Virupaksha temple

- ***Built by:*** *Queen Lokamahadevi* (she married Chalukyan King → *Vikramaditya II*)
- ***Dedicated to:*** Lord Shiva.
- ***Built in:*** Dravida style.

Fig 3: Pattadakal temple

- A total of 10 temples seen here: 4 (Nagara style) and 6 (Dravida style).
- Declared as *UNESCO World Heritage Site* in *1987*.
- Pattadakal group of temples are known as *"Cradle of Indian Architecture"*.

Fig 4: Sangameshwara Temple

- ***Built in:*** Dravida style.
- ***Dedicated to:*** Lord Shiva.

Fig 5: Galaganatha Temple

- ***Built in:*** Nagara style.

PALLAVA DYNASTY (575 AD-897 AD)

- ***Founder:*** *Simha Vishnu*
- ***Capital:*** *Kanchipuram*
- Pallavas were feudatories to *Kalabhras*.
- ***Greatest ruler:*** *Mahendravarman I*
- ***Son:*** *Narasimhavarman I* (Ruling period: 630 AD-668 AD) (Title taken: *Mahamalla*).
- Narasimhavarman I also founded the port city *Mahabalipuram*.
- They developed the Dravida architecture temples.

Pallava Architecture

Fig 6: Shore temple, Mahabalipuram

- Added to UNESCO World Heritage Site in *1984*.
- ***Built by:*** *Narasimhavarman II*
- ***Dedicated to:*** Lord Shiva.

Fig 7: Kailasanathar temple

- ***Built by:*** *Narasimhavarman II*

Fig 8: Seven Ratha temple, Mahabalipuram, Tamil Nadu

- ***Built by:*** *Narasimhavarman I.*
- These temples are also known as *Pancha Rathas* or *Pandava Rathas*.

RASHTRAKUTA DYNASTY (755 AD-878 AD)

- ***Founder:*** Dantidurga (he established the dynasty by overthrowing the Chalukyas of Badami).
- ***Capital:*** Manyakheta
- Dantidurga performed *'Hiranyagarbha'* (golden womb).

Krishna I (756 AD-774 AD)

- Son of Dantidurga.
- He built Kailasha Temple of Ellora (this temple is a Monolithic Stone Temple (built with a single rock)).
- Aurangzeb, the Mughal Emperor, once attempted to destroy the temple.

Govinda III (793 AD-814 AD)

- He defeated *Pratihara king Nagabhatta II*.

Amoghavarsha (814 AD-878 AD)

- He was converted to *Jainism*.
- ***Books written by him:*** *Kavirajamarga, Prashnottara Ratnamalika.*

Krishna III (939 AD-967 AD)

- He defeated the *Cholas*.

Architecture

- *Ellora Caves* (Aurangabad, Maharashtra) showcase temples of *Hindu, Jain,* and *Buddhist* architecture which were primarily built by the Rashtrakutas with contribution from *Chalukyas* and *Yadavas*.

Fig 9: Ellora Caves

Fig 10: Dashavatara Temple

- ***Dedicated to:*** Lord Vishnu.

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HOYSALA DYNASTY

- They were feudatory to *Chalukyas of Kalyani* (Later Chalukyas)
- Capital: *Dwarasamudra (Halebidu)*
- Founder: *Nripa Kama II*

Architecture

Fig 11: Chennakeshava Temple (Belur, Karnataka)

- Star-shaped temple.
- ***Built by:*** *King Vishnuvardhana.*
- Style of architecture: *Bhumija style* of architecture.
- ***Dedicated to:*** Lord Vishnu.

Fig 12: Hoysaleswara Temple (Halebidu, Karnataka)

- *42nd UNESCO World Heritage* site
- ***Dedicated to:*** Lord Shiva
- *3 Jain Basadis* are within the complex.

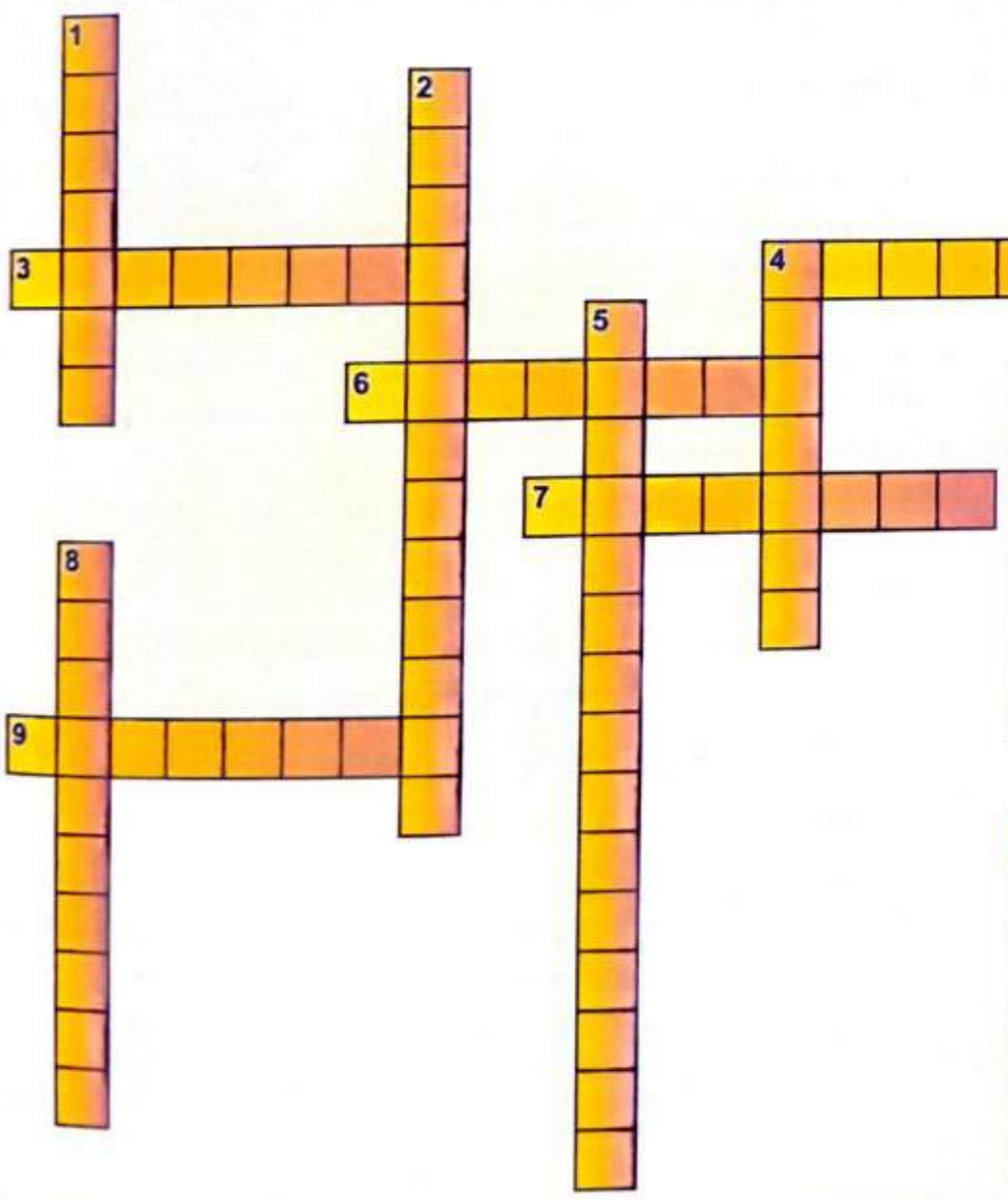
Pulakeshin II defeated Harshavardhana

Pulakeshin II defeated Mahendravarman I

Narsimhavarman I defeated Pulakesin II

PARMAR'S CROSSWORD

POST GUPTA DYNASTIES



Across

3. Vindhyashakti founded which dynasty.
4. Capital of the Pallava dynasty.
6. Capital city of Maitraka dynasty.
7. Pushyabhuti was the founder of which dynasty.
9. Dhruvasena II was a ruler of which dynasty.

Down

1. Mahendravarman I belonged to which dynasty.
2. Temple architecture centre under Pallavas.
4. Rashtrakuta king who defeated the Cholas.
5. Pallava king who defeated Chalukyas.
8. Court poet of Harshavardhana.

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History of South India

- According to historical evidence, South India did not experience a distinct *Bronze Age* and directly transitioned to *Megalithic Age* (also known as *Iron Age in South India*) where there was use of *large stone*.
- ***Time period:*** *2500-500 BC*

Structures found in India

Fig 1: Dolmen (Found in graves)

Fig 2: Menhir

Pottery

- *Black* and *red* ware potteries were used.

Community

- They belonged to *pastoral community*. They knew about agriculture but did not practised it.

The history of South India starts with Chera, Pandya and Chola Dynasty.

SANGAM AGE *(3rd Century BC-3rd Century AD)*

- Meaning of the term 'Sangam': *Assemblies*.
- The area lying to the *South of Krishna* and *Tungabhadra*.
- A total of *3 Sangams* were held and all were patronised by *Pandyas*
- Assemblies were held at: *Tamil Nadu* and were known as *Muchchangam*.

The assemblies were:

Sangam	*Places*	*Chairman*
1st	Madurai	Rishi Agastya
2nd	Kapadapuram	Tolkappiyar
3rd	Madurai	Nakkirar

Sangam Literature

They are in two forms:

1. *Narrative (story)*: They are collectively called *Melkannakku* → *18 major work*.
2. *Didactic (poetic)*: They are collectively called *Kilkanakku* → *18 minor works* (these are about Love *(Akam)* and War *(Puram)*.

Tolkapiyyam is the earliest grammatical Tamil text composed by Tolkappiyar in 2nd Sangam.

Epics written during this time

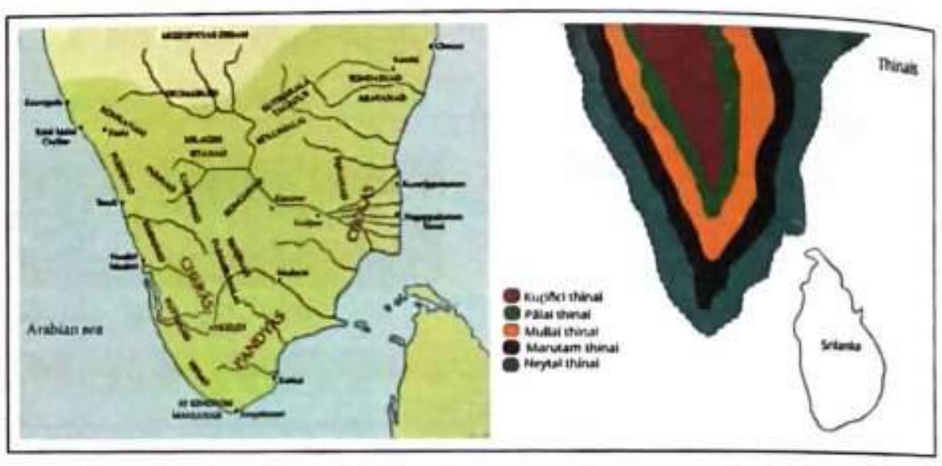
- *Silapathikaram:* It is written by *Ilango Adigal* that tells a story about a young merchant *Kovalan's* marriage to the virtuous *Kannagi* and his love for the courtesan *Madhavi*.
- *Manimekalai:* It is written by *Chithalai Chathanar* which is an epic story of Kovalan and Madhavi's daughter *Manimekalai*.

Geography

- *Thinais:* It refers to different types of landscape or geographical divisions of *Tamil Nadu*.
- Each Thinai had a chief called *Muvendar* (which was later divided into the *Cheras, Cholas, and Pandyas*).

Division of Thinais in five parts:

- *Kurinci thinai:* They engaged into *hunting* and *gathering*.
- *Palai thinai:* They were *cattle lifters* and *plunderers*.
- *Mullai thinai:* They did *animal husbandry*.
- *Marutam thinai:* They engaged in *agriculture*.
- *Neytal thinai:* They did *fishing* and *salt collection*.



Cheras

- They were ruling in *Kerala* and parts of *Tamil Nadu*.
- ***Capital:*** *Vanji/Vanchi/Karur*
- ***Port cities:*** *Muziris/Muchiris* and *Tondi* (mainly for trading).
- ***Emblem:*** *Bow and Arrow*
- ***Greatest Chera:*** *Senguttuvan* (He is also known as *'Red Chera'*) → he founded ***Pattini cult***.
- They worshipped *Kannagi* (Goddess of *purity* and *chastity* → Pattini cult was related to this) .
- *Pugalar Inscription* of Karur, Tamil Nadu mentions about them.

Cholas

- They were called as *'Cholamandalam' (Coromandels)*.
- ***Capital:*** *Puhar* and *Uraiyur* (alternate capital).
  - Puhar is a port city and is also known as *Kaveripattinam*.
- ***Emblem:*** *Tiger*
- ***Earliest ruler:*** *Elara*
- ***Greatest ruler:*** *Karikala* (he fought *Battle of Venni* along the Kaveri river and also defeated the combined armies of *Chera* and *Pandya*)
- They traded in cotton cloth (from Uraiyur).
- They were known for their *efficient Naval power*.

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Pandyas

- They ruled in ***Tamil Nadu.***
- ***Capital:*** *Madurai* (on the banks of *Vaigai river*)
- ***Emblem:*** *Fish*
- They were the first to be mentioned in Megasthenes book as *"as being famous for their pearl trade"*.
- ***Port city:*** *Korkai*
- They traded with Roman Empire.

Society

The society was divided into:

Ruling Classes	Arasar
Traders	Vaishiyar
Rich class	Vellalar (rich landlords)
Lower class (landless labourers/slaves)	Kadaisiyar/Adimai
Ordinary Ploughmen	Uzhavur

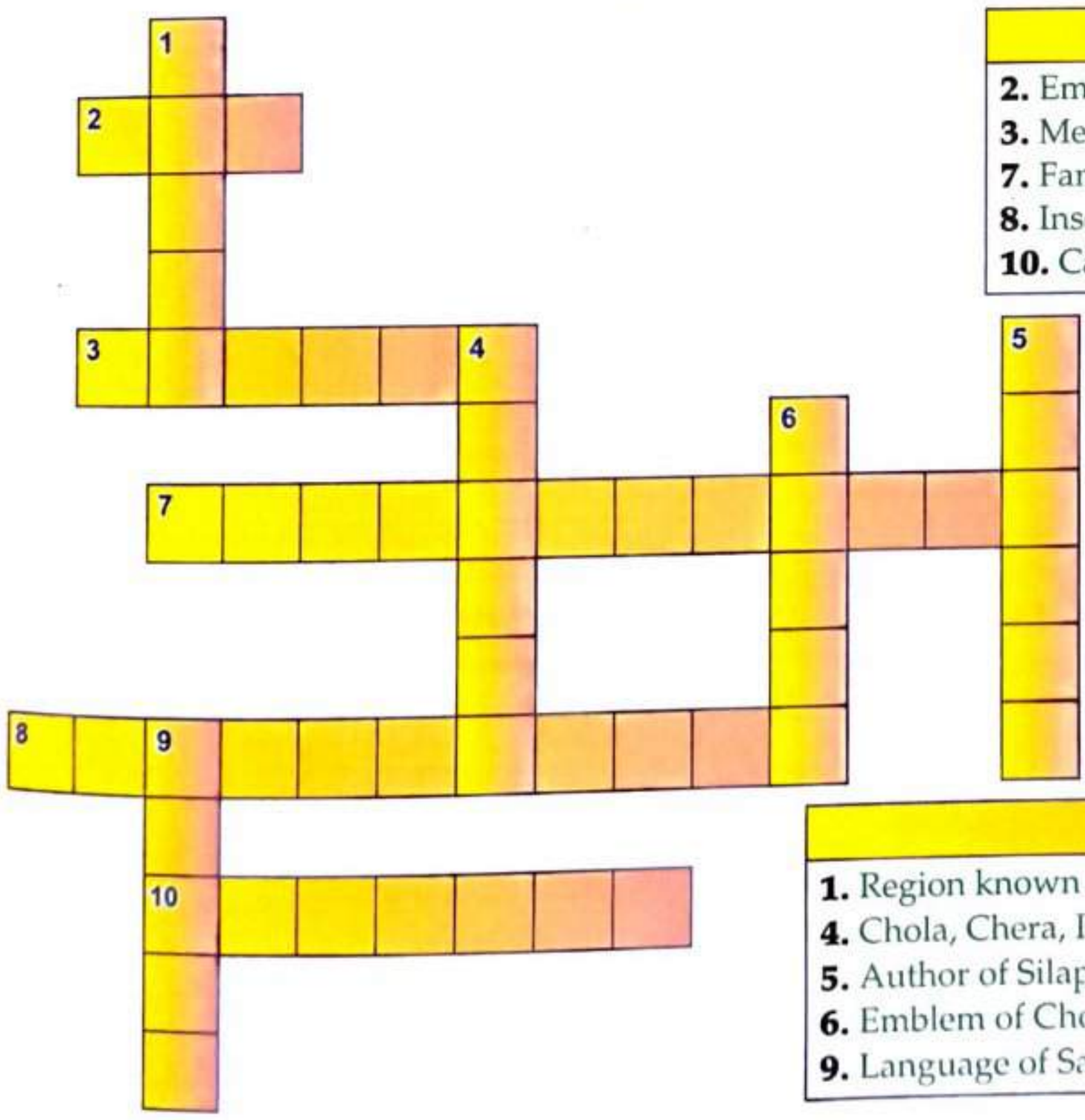
***Note**
Muvendavelan and Araiyar were titles of rich landowners.

Form of Government

- During the Sangam period hereditary *monarchy* was the form of government.

PARMAR'S CROSSWORD

SANGAM AGE



Across

2. Emblem of Chera dynasty.
3. Meaning of Tamil word 'Muvendar'.
7. Famous ruler of Pandya dynasty.
8. Inscription detailing Chola sabha system.
10. Capital of Pandya kingdom.

Down

1. Region known for gold in Mauryan period.
4. Chola, Chera, Pandya period belonged to which age.
5. Author of Silappathikaram.
6. Emblem of Chola dynasty.
9. Language of Sangam literature.

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Tripartite Struggle

- It is also known as *Kannauj Triangle Wars* that took place between *Palas, Pratiharas,* and *Rashtrakutas* during *8th* and *10th Centuries.*

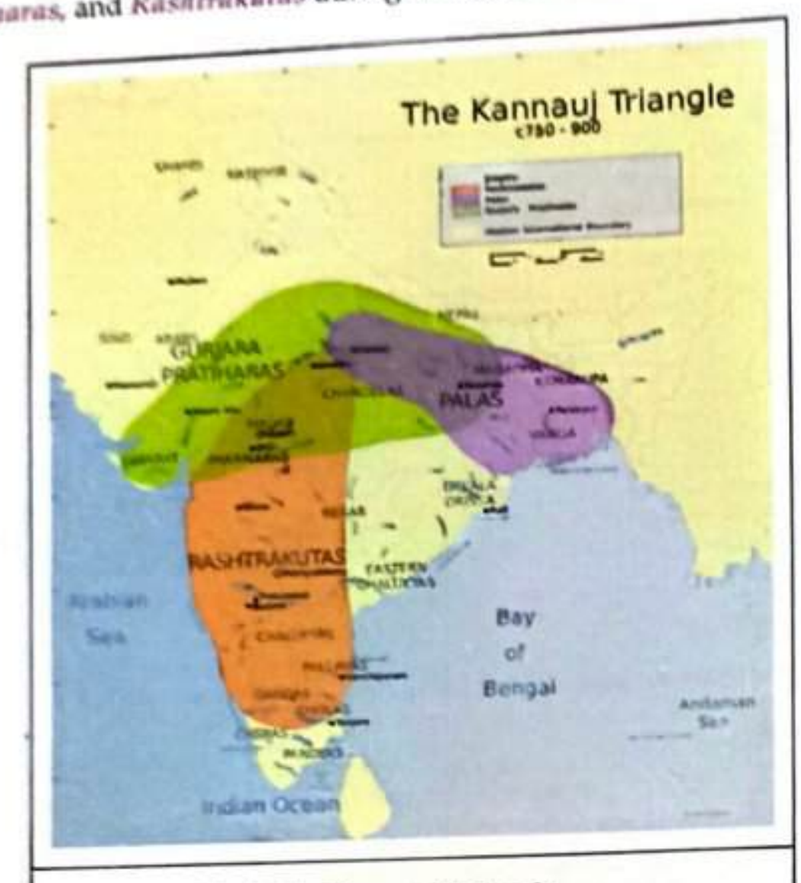

Fig 1: The Kannauj Triangle

PALA DYNASTY

- ***Founder:*** *Gopala* (founder of *Odantapuri University*)
- ***Son:*** *Dharmapala* (founder of *Vikramshila University* (Bhagalpur, Bihar).
- He also defeated *Indrayudh* and conquered Kannauj for a brief time.
- The Palas ruled over *Bengal region.*
- They were followers of *Mahayana Buddhism.*
- ***Rulers: Gopala → Dharmapala → Devapala → Mahipala → Ramapala***
- They were the followers of Mahayana Buddhism.
- *Sena Dynasty* ruled Bengal after Pala Dynasty (11th-12th century AD). During Sena Dynasty rule Jayadeva wrote *Gita Govinda.*

GURJARA PRATIHARA

- ***Founder:*** *Nagabhatta I*
- ***Capital:*** *Kannauj/Bhinmal*

Nagabhatta II

- He defeated *Dharmapala* but was defeated by *Govinda III* (Rashtrakuta ruler).

> ***Note***
> - ***Do not get confused between the early Cholas that ruled during Sangam Age (3rd Century BC-3rd Century AD) and later Cholas, who ruled between 9th and 13th Century AD.***

Mihir Bhoja (836 CE-885 CE)

- He was praised by the Arabian Scholar *Sulaiman* for keeping his empire safe from robbers.
- Sulaiman was an *Arab traveler* who visited during his reign and described his military power, riches and efficient administration.

Mahendrapala

- *Rajashekhara* was his court poet.

CHOLA DYNASTY *(850 AD-1280 AD)*

- ***Founder:*** *Vijayalaya Chola*
- They were feudatories to *Pallavas.*
- He captured *Tanjore/Thanjavur* from *Muttaraiyars* (Kaveri Delta).
- He also built a temple for goddess *Nishumbhasudeni.*

Prantaka I *(907 AD-955 AD)*

- He defeated *Pandyas* at Vellore.
- He lost to Rashtrakuta king *Krishna III* who made a *Victory Pillar* and *Krishneshwara temple* at *Rameshwaram.*

Raja Raja I *(985 AD-1014 AD)*

- He defeated *Cheras* at *Trivandrum* and conquered *Madurai* from *Pandyas.*
- He conquered *Maldives* and invaded *Sri Lanka.*
- He encouraged the *Sailendra* ruler of *Sri Vijayapuram* to build a Budhist Vihara at *Nagapattinam.*

Rajendra I *(1012 AD-1044 AD)*

- He was the son of *Raja Raja I.*
- He is also known as *"Napoleon of South India".*
- He completely conquered *Sri Lankan (Ceylon)* capital *Anuradhapur.*
- *Mahmud of Ghazni* was his contemporary.
- He crossed Ganga and defeated two local Kings of Bengal and took the title *"Gangaikondachola"* and built the city → *Gangaikondacholapuram.*

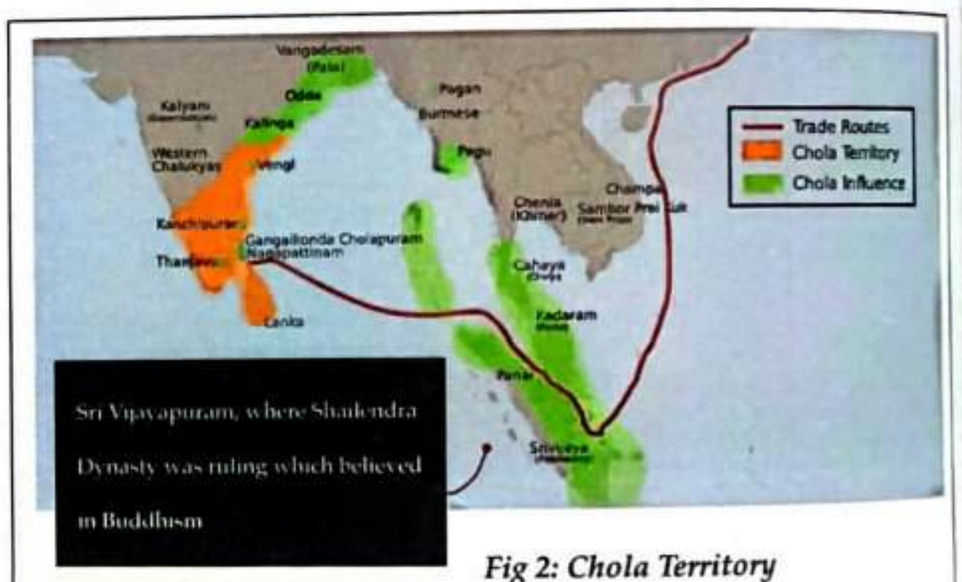

Fig 2: Chola Territory

- Chola fought against *Chalukyas of Kalyani.*
- Chola empire declined during early part of 13th Century.
- The place of Cholas was taken by *Pandyas* and *Hoysalas.*
- The place of late Chalukyas was taken by *Yadavas* and *Kakatiyas.*

Administration

- The king of Chola Dynasty has all the authority.
- He had Council of Ministers to advice him.
- Chola Empire was divided into: *Mandalams* (province) which was further divided into *Valandu* (districts) and *Nadus* (villages or sub-districts).

Chola Government

- Cholas are known for local (decentralised)/village government.

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- *There were two assemblies:*
  - *Ur:* Assembly of *common people.*
  - *Sabha:* Assembly of *learned Brahmins* (Agrahars: Land of Brahmins).

- Affairs of the village were managed by an executive committee. People with property or land were privileged to take part in the elections (Uttaramerur Inscription).

Yadava Dynasty
- *Capital: Devagiri*

Hoysala Dynasty
- *Capital: Halebidu*
- Famous for *star-shaped temple.*

Kakatiyas
- *Capital: Warangal*

Fig 3: Different Kingdoms

Land Donations

Brahmadeya	Land donated to Brahmans
Vellanvagai	Land donated to non-Brahmans/Peasants
Devadana	Land donated to temples
Pallichchhandam	Land donated to Jain community
Shalabhoga	Land donated for maintenance of school

Tax

- There were two types of taxes governed by Chola Empire: *Vetti* (forced labour) and *Kadamai* (land revenue tax).

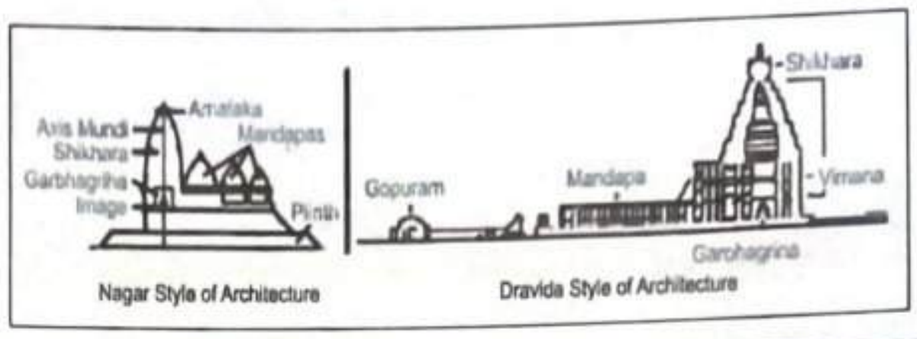
Great Living Chola Temples

- All the temples under this category are listed in *UNESCO World Heritage Site.*
- *Brihadeeshwara Temple* is built at:
  - *Tanjore,* by *Raja Raja I* (also known as *Rajarajeshwara Temple*).
  - *Gangaikonda Cholapuram* at *Tamil Nadu,* by *Rajendra I.*
- *Airavatesvara Temple* at *Darasuram,* built by *Raja Raja II.*

Temple Architecture

Fig 4: Different Temple Architectures

- *Nagara style* (in *North India*), *Dravida style* (In *South India*), and *Vesara style* (a mixture of *Nagara* and *Dravida* style).



Nagara Style	*Dravida Style*
It is commonly found in: Northern and Central regions of India	It is commonly found in Southern India
Main shrine: Shikhara which is curvilinear or conical in shape	Main shrine: Vimana
Gopuram (main entrance) is not present here	Gopuram is present here
Mandapa (pillared hall) is connected to Sanctum and features a pyramidal or conical roof	Mandapa is connected to Sanctum and has flat-roofed assembly hall
Nandi is placed inside the temple	Nandi is placed outside the temple
Chief deity is installed at Garbhagriha (Sanctum Sanctorum)	Chief deity is installed at Garbhagriha
A water tank or reservoir may or may not be present	The temples consists of large water reservoirs or temple tanks inside temple complex
They are not made on apsidal plane	They are made on an apsidal plane (elliptical in shape) known as Gaja Pristha

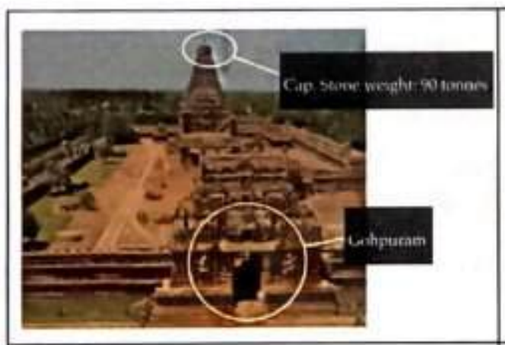


Fig 5: Brihadeshwara Temple (Tanjore)
- Added to UNESCO site in *1987.*

Fig 6: Shiva temple (Gangaikonda Cholapuram)
- Added to UNESCO site in *2004.*

Fig 7: Airavatesvara Temple
- Added to UNESCO site in *2004.*

- In early 11th century, the Chola king Rajendra I built a Shiva temple and filled it with *Sun-pedestal* seized from the *Chalukyas,* a *Ganesha* statue and several statues of *Durga;* a *Nandi* statue from the *Eastern Chalukyas;* an image of *Bhairava* (a form of Shiva) and *Bhairavi* from the *Kalinga of Orissa;* and a *Kali* statue from the *Palas of Bengal* (Brihadeeshwara temple).

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Some Other Temples

Fig 9: Kandariya Mahadeva Temple (Madhya Pradesh)

- This temple is a part of *Khajuraho temples*).
- ***Built by:*** *Chandela Dynasty* rulers.

- Walls of temple depict the Kamasutra of Vatsyayana.

Fig 10: Dancing figure of Shiva (the "King of Dance")

- Natraj performing Tandava.
- The figurine is made of Bronze using *Lost Wax Technique.*

The Cholas were known for their splendid Bronze sculptures made through Lost Wax Technique .

Other Architecture of Various Dynasties

Fig 11: Konark Sun Temple (Odisha)

- It is also known as *Black Pagoda*
- ***Built by:*** *Narasingha Deva I* (Eastern Ganga Dynasty)
- ***Style:*** Nagara + Kalinga style.
- It is seen in 10₹ note.

Fig 12: Dilwara Jain Temple (Mount Abu, Rajasthan)

- ***Built by:*** *Vastupala brothers*
- Style: *Maru Gurjara style* (developed by Solankis → Feudatories of Chalukyas in Western India).

Fig 13: Somnath Temple (Gujarat)

- ***Style:*** Maru Gurjara style.

Fig 14: Modhera Sun Temple (Modhera, Gujarat)

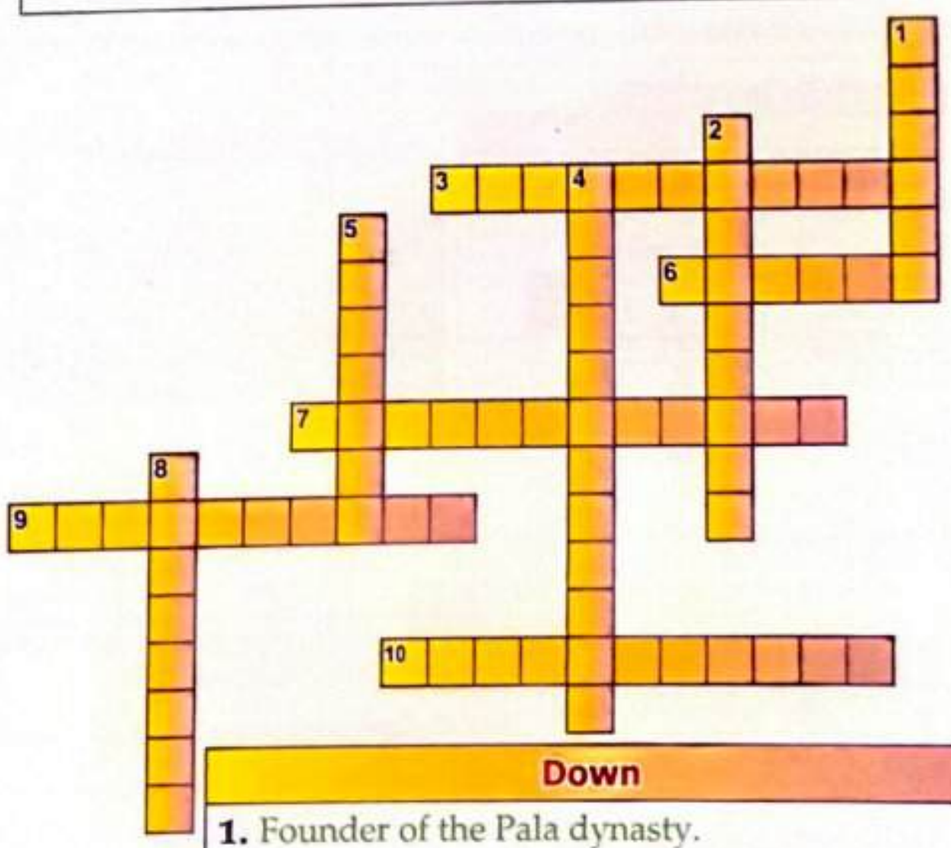
- ***Built by:*** King Bhimadeva I of Solanki Dynasty.
- ***Style:*** Maru Gurjara style.

Fig 15: Jagannath Puri Temple (Puri, Odisha)

- This temple is also known as *White Pagoda.*
- Style: *Rekha Deula* style
- ***Built by:*** *Anantavarman Chodaganga Deva* (Eastern Ganga Dynasty).

PARMAR'S CROSSWORD

TRIPARTITE STRUGGLE AND CHOLAS



Down

1. Founder of the Pala dynasty.
2. State of Brihadeshwara temple.
4. Tripartite struggle participants with Palas and Pratiharas.
5. Star-shaped temples were built by which dynasty.
8. Title "Gangaikondachola" was taken by.

Across

3. University founded by Pala rulers.
6. Gurjara-Pratihara king praised by Sulaiman.
7. Rajashekhara was court poet of which Pratihara king.
9. Founder of the Chola Empire.
10. Gopuram structure found in which temple.

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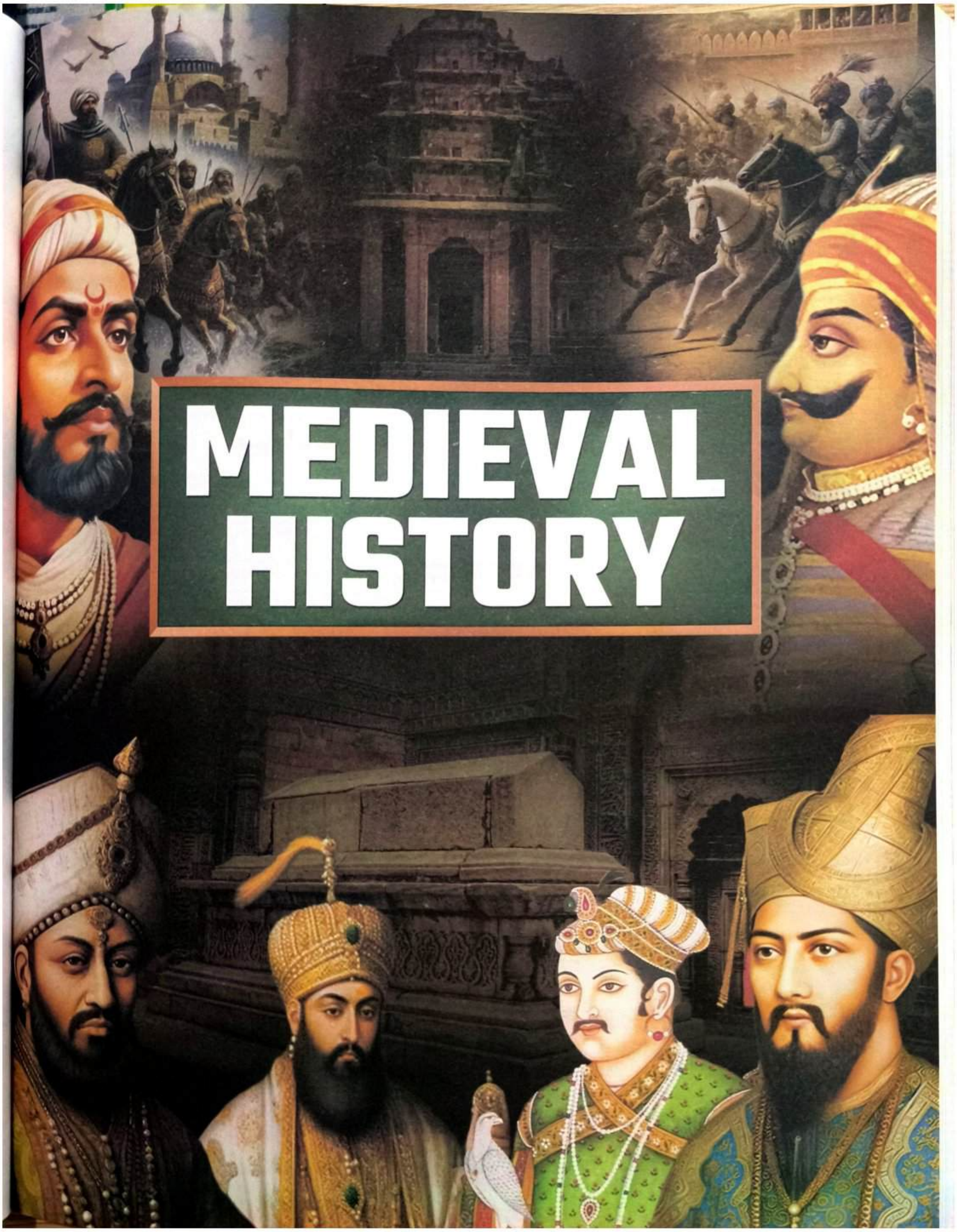

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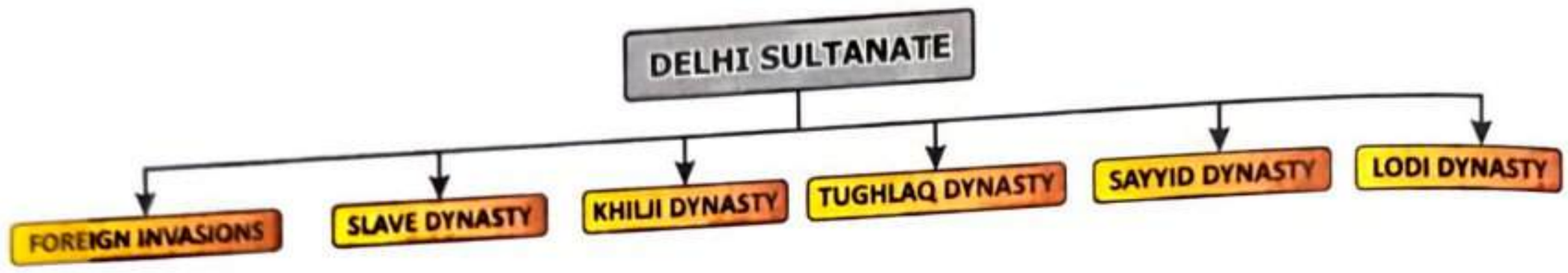

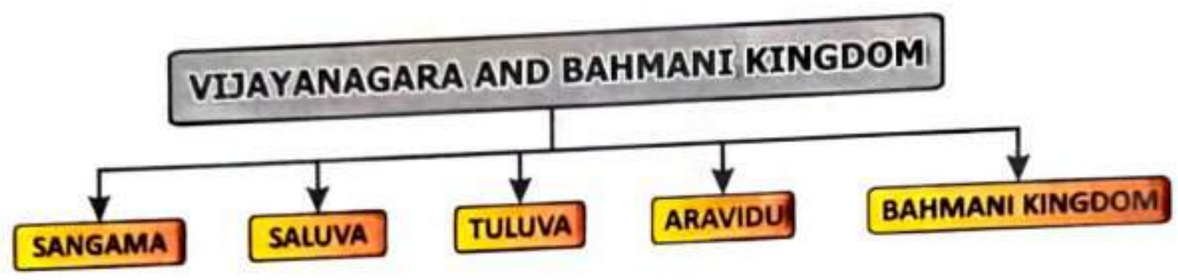

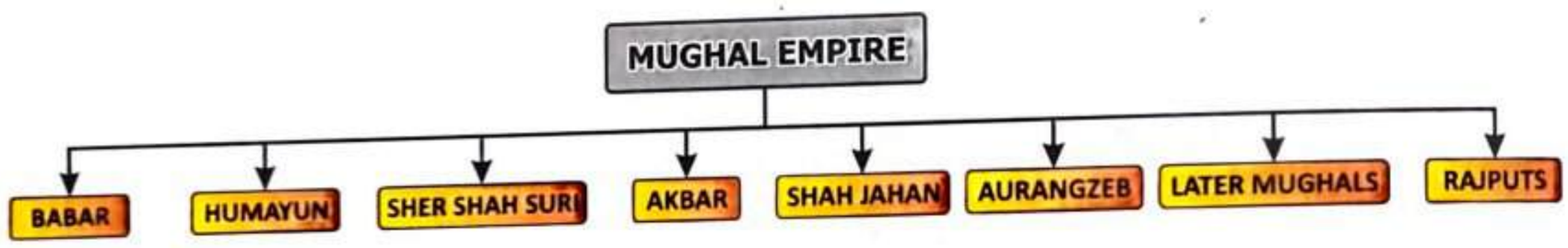

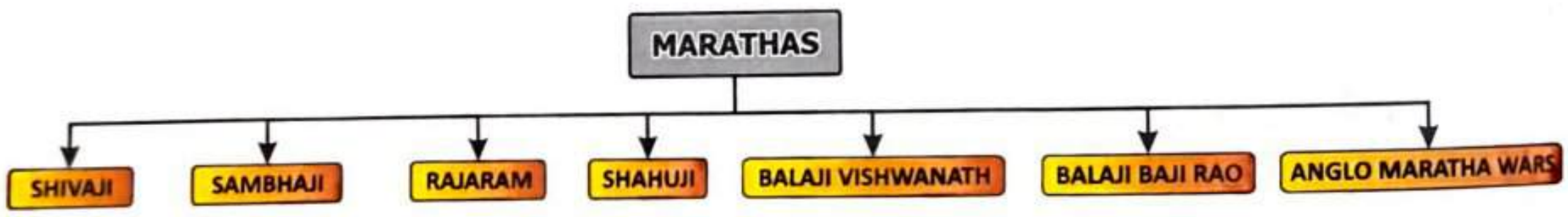

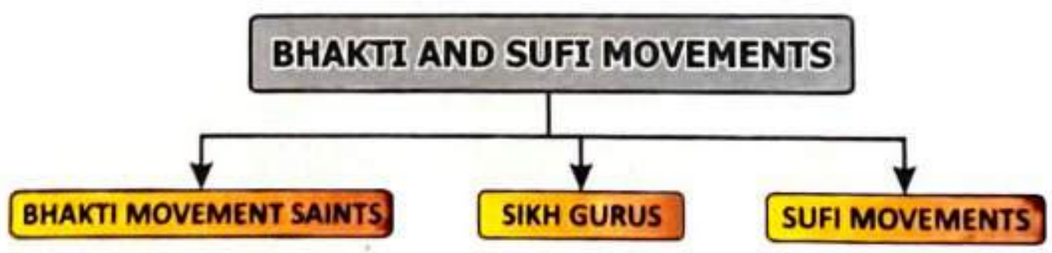

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DELHI SULTANATE PERIOD (1206 AD-1526 AD)

Foreign Invasions

Muhammad Bin Qasim → 1st Muslim Invasion (712 AD)

- This invasion took place in Sindh part of India.
- He came from *Arab* and killed *Raja Dahir* (last Hindu ruler of Sindh).
- He was the first to introduce *Jizya* in Indian subcontinent.

Mahmud of Ghazni → 2nd Islamic/1st Turk Invasion (998 AD-1030 AD)

- Turks came from *Turkmenistan*.
- He attacked *17 times* (1001 AD-1027 AD).
- The first attack took place in *1001 AD*, during the rule of *Jayapala* (*Battle of Peshwar* was fought between *Ghaznavid* army and *Raja Jayapala*).
- Ghaznavi invaded *Somnath* in his *16th attack (1025 AD)* and the 17th attack was the last attack *(1027 AD)*.
- *Battle of Waihind:* A series of conflicts between *Ghazni* and *Hindu Shahi* rulers.
- *Death: 1030 AD.*

Court language of Turks was Persian.

Writers during the reign of Mahmud of Ghazni

Writers	Writings
Firdausi	Shahnama
Al Biruni	Tahqiq-i-Hind (also known as Kitab-al-Hind)

Muhammad Ghori → 3rd Islamic/2nd Turk Invasion (1175 AD-1206 AD)

- *Persian name: Mu'izz al-Din Muhammad.*
- *His first attack took place in: 1175 AD* (in Multan) and *1178 AD* in Gujarat, where he was defeated by *Mularaja II, Bhima II* and their mother *Naikidevi*.
- Ghori attacked Delhi, which was then ruled by *Prithviraj Chauhan*.

Battle between Prithviraj and Ghori

- *1st Battle of Tarain: 1191 AD* (won by Prithviraj III/Prithviraj Chauhan).
- *2nd Battle of Tarain: 1192 AD* (won by Ghori)

Qutb-ud-din Aibak (commander of Ghori) helped him in 2nd Battle of Tarain.

Jai Chand is said to have invited Md. Ghori to attack Prithviraj Chauhan.

Writer in Prithviraj's Court

- *Chandra Bardai:* He wrote *Prithviraj Raso* (According to this epic poem, daughter of Jaichand (King of Gahadavala) *Sanyogita* was married to Prithviraj Chauhan.

Battle of Chandawar (1194 AD)

- This battle was fought between *Ghori* and *Raja Jaichand*, where Ghori won the battle.

- *Slaves of Ghori: Qutb-ud-din-Aibak, Yalduz, Kubacha, Bhaktiyar Khilji* (he destroyed Nalanda University).

Delhi Sultanate Dynasties

- *Slave Dynasty (1206 AD-1290 AD)* → *S (Sab)*
- *Khilji Dynasty (1290 AD-1320 AD)* → *K (Khatarnak)*
- *Tughlaq Dynasty (1320 AD-1414 AD)* → *T (The)*
- *Sayyid Dynasty (1414 AD- 1451 AD)* → *Sa (Saare)*
- *Lodhi Dynasty (1451 AD-1526 AD)* → *Lo (Log)*

TRICK TO REMEMBER: *Sab Khatarnak The Saare Log*

SLAVE DYNASTY (1206 AD-1290 AD)

- This dynasty is also known as *Mamluk Dynasty*.
- The rulers belonged to *Ilbari tribe/Shamshi tribe*.

Qutb-ud-din Aibak (1206 AD-1210 AD)

- He ruled from *Lahore* (it was the capital city).
- He was given the title of *'Lakh Baksh'* (the giver of Lakhs).
- *Death: 1210 AD*, while playing *Chaugan* (now known as *Polo*).
- *Architecture constructed by him:*
  - *Mosques: Quwat-ul-Islam* at Delhi and *Adhai din ka Jhopra* at Ajmer.
  - He also began construction of *Qutub Minar* (he was only able to complete the construction of basement), in honour of *Sufi Saint Khwaja Qutubuddin Bhaktiyar Kaki*.
- *He patronised writers like: Hasan-un-Nizami* (author of Tajul-Ma'asir) and *Fakhruddin*.

Fig 1: Quwwat-ul-Islam

- It is made in corbel arch technique.

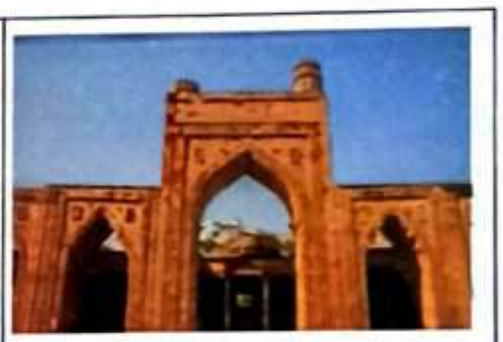

Fig 2: Adhai din ka Jhopra

- Earlier it had Jain Monasteries.

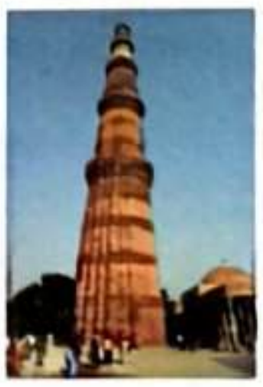

Fig 3: Qutub Minar

- It is an Indo-Islamic structure having 5-storeys (73 m high)

Qutub Minar was built by:

- Qutb-ud-din Aibak (laid foundation).
- Iltutmish (added three more stories to it).
- Firoz Shah Tughlaq (repaired and built the top storey).

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Shamsuddin Iltutmish *(1211 AD-1236 AD)*

- He was son-in-law of *Qutb-ud-din.*
- He shifted his capital from *Lahore* to *Delhi.*
- He saved Delhi Sultanate from the wrath of *Chengiz Khan* (Chengiz also attacked Transoxiana region in 1219 AD. He died in 1227 AD).
- *Nizam-ul-Mulk* was his *Wazir* (Prime Minister).
- He patronised scholars like *Minhaj-i-Siraj* (wrote: *Tabaqat-i-Nasiri*).
- He set up the official nobility of 40 loyal slaves known as *Chahalgani.* These were *Turkish* slaves.
- He introduced *Silver coin (Tanka)* and *Copper coin (Jital).*
- He introduced the *Iqta* system. Under this a part of land was given to military commander known as *Iqtadar/Muqti.*

Fig 4: Silver Tanka and Copper Jital Coins

Razia Sultana *(1236 AD-1240 AD)*

- She was the daughter of *Iltutmish.*
- *She was the first and the only women ruler of the Delhi Sultanate.*
- *Altunia,* Governer of Bhatinda refused to accept suzerainty of Razia. Razia and *Yakut* (an Ethiopian slave) marched against Altunia.
- Altunia murdered Yakut and imprisoned Razia in *Quila Mubarak of Bhatinda* (Later Altunia and Razia got married).
- In 1240 AD, Razia and Altunia became the victim of a conspiracy by *Khokhar tribe* and were assassinated near *Kaithal* (Haryana).

Ghiyasuddin Balban *(1266 AD-1287 AD)*

- He was earlier a *Naib* under *Nasiruddin Mahmud.*
- He broke the power of *Chalisa* (abolished *Chahalgani* system) and restored the prestige of the crown.
- He established the military department *Diwan-i-Arz.*
- ***Title taken:*** *Zil-i-Ilahi* (Shadow of Allah) and *Ulugh Khan* → Balban considered himself as a descendant of *Afrosiyab.*
- ***Original name:*** *Baha-ud-Din.*
- He introduced *Sijda* (prostration before the monarchy) and *Paibos* (kissing the feet of monarch) as the normal form of salutation.
- He started *"Blood and Iron Policy".*
- He started *Nowruz* (Iranian or Parsi New Year) in Delhi Sultanate.
- *Tughril Beg,* the Governor of Bengal under Sultan Balban, revolted against him and declared himself as an independent ruler of Bengal in 1279. Later Balban assassinated by him.

Qaiqabad *(1287 AD-1290 AD)*

- He was the last ruler of Slave Dynasty and grandson of Balban.

Balban

Important Officers

Wazir	Prime Minister (looked after Finance Department)
Amil	Collected revenue
Amir	Governor of Pargana
Naib	Incharge of all other departments except Finance
Muqti/Wali/Iqtedar	They hold iqta

KHILJI DYNASTY *(1290 AD-1320 AD)*

- ***Founder:*** *Jalal-ud-din Khilji* (1290 AD-1296 AD).

Alauddin Khilji (1296 AD-1316 AD)

- He was the *nephew* of Jalal-ud-din Khilji.
- ***Real name:*** *Ali Gurshasp*
- He held the title of *Amir-i-Tuzuk* (Master of Ceremonies) during the reign of Jalaluddin Khilji.
- He *abolished* iqta system in the Delhi Sultanate

Alauddin's Expeditions

- ***Gujarat (1298 AD)***
- ***Ranthambore (1301 AD)*** → Then King: Hammir Dev Chauhan (Evidence of first *Jauhar* found during this time).
- ***Mewar (1303 AD)*** → Capital: Chittor (King: Ratan Singh).
- ***Malwa (1305 AD)***
- ***Jalor (1311 AD)***

Malik Kafur

In Deccan

- Alauddin's army was led by *Malik Kafur* (he was a eunuch).
- He defeated:
  - *Ramachandra* (Yadava Dynasty ruler of Devagiri) (1308 AD)
  - *Vira Ballala III* (Hoysala Dynasty ruler of Dwarasamudra) (1309 AD)
  - *Prataprudra Deva* (Kakatiya Dynasty ruler of Warangal) (1311 AD)
  - *Vira Pandya* (Pandya Dynasty ruler of Madurai) (1311 AD)
- Title taken by Alauddin after the Deccan expedition: *Sikandar-i-Sani* (Second Alexander).

> ***Alauddin bought him from Gujarat Market at 1000 dinars, hence Malik Kafur is also known as 'Hazar Dinari'.***

Court Poet Khusrau

- Alauddin conferred the title of *Tuti-e-Hind* (Parrot of India) to *Khusrau,* his favourite court poet.
- He started *Qawwali* in India.
- Khusrau gave *Sultan-e-Jahan* title to Khilji.
- ***His famous books:*** *Tuglaq Nama* and *Nuh-i-Siphir.*
- He was the first to mention Jauhar in Persian *(Khazain-ul-Futuh).*

> ***Alauddin started the system of cash payment (Naqdi) to soldiers.***

Administrative Reforms Introduced by Alauddin

- *Dagh* (the branding of horse) and *Chehra* (also known as *Huliya,* for identification of his soldiers).
- Imposed heavy taxes: Ordered all lands to be measured [by Special Officer: *Mustakharaj* (one who collected the revenue)]. The share of state was then fixed based on this measurement.
- ***Taxes Imposed:*** *Jaziya* (levied on Non-Muslims) and *Zakat* (levied on Muslims).
- ***He introduced three new taxes:*** *Gharai* (house tax), *Charai* (a tax levied on use of grasslands for grazing animals), and *Kharaj* (a land tax imposed on peasants, amounting to *50% of their produce*).

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- ***Three markets setup by Alauddin for:***
  - Food grains.
  - Costly cloths → *Sara-i-Adl.*
  - Horses, slaves *(Bandagan)* and cattles.

> ***Alauddin formed a series of regulations to weaken the power of Nobles.***

- ***Each market was under control:*** *Shahna* (high officer) who maintained a register of the merchants, shopkeeper and the prices.
- ***Officer appointed to control grain market:*** *Shahna-i-Mandi.*
- Network of spies (intelligence officers) started by Alauddin were: *Munhiyans* and *Barid.*

Alauddin Built

- *Alai Fort*
- *Alai Darwaja (entrance of Qutub Minar)*
- *Palace of thousand Pillars (Hazar Sutun)*
- *Hauz Khas (tank)*

Fig 5: Alai Darwaza

- It is built of red sandstone

He Established

- The city *Siri* which was *second* of the seven cities of Delhi (1st city of Delhi: *Qila Rai Pithora* established by *Tomar Dynasty*).
- *Tomb of Alauddin: Delhi.*
- *He was patron of:* Art and learning.

> ***Angapala founded the Tomara Dynasty. Delhi first became the capital under their rule only.***

- *In 1316:* Malik Kafur called *Hajar-Dinari* seized the throne after Alauddin's death.
- ***Alauddin had two sons:*** *Mubarak* (1316-20 AD) and *Omar.* Mubarak killed Malik Kafur and Omar later.
- Khusrau Khan: 1320 AD → Killed Mubarak and ascended the throne.

TUGHLAQ DYNASTY *(1320 AD-1414 AD)*

Ghiyasuddin Tuglaq *(1320 AD-25 AD)*

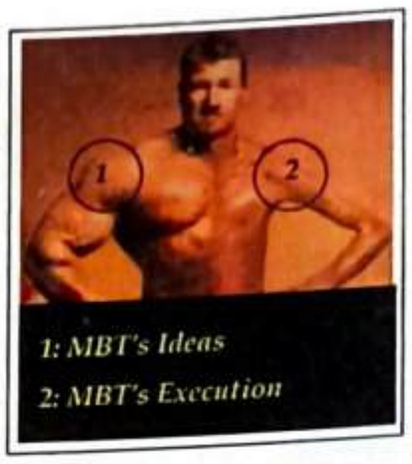
- Last King of Khilji Dynasty *Khusrau Khan* was killed by *Ghazi Malik* (took title: Ghiyasuddin Tuglaq).
- He built the city of *Tughlaqabad* and also built *Tughlaqabad Fort.*
- He died in an accident and was succeeded by son *Jauna* (Ulugh Khan) who assumed the title *Muhammad bin Tughlaq.*

Muhammad bin Tughlaq *(1325 AD-1351 AD)*

- He had the largest kingdom of all.
- He was visited by traveller *Ibn Battuta* from *Morocco* who wrote a book titled *"Rihla".*
- He increased taxation in Doab region in 1325 to fund his projects, including his large army.
- He is also known as *"wisest fool"*, due to his failed policies.
- He transferred the capital from *Delhi* to *Daulatabad* (also known as Devagiri) in *1327* and later he again reversed his decision.
- He also gave *Sondhar* loan (cash in exchange of gold) and *Taccavi* loan as agricultural loans.

His Failed Policies

- He introduced *Token* (Bronze) currency in *1329* with high value.
- *Khurasen Expedition* in *1329.*
- *Qarachil Expedition* in *1330.*



1: MBT's Ideas
2: MBT's Execution

Administrative Positions

- Muhammad bin Tughlaq appointed people from variety of background to high administrative positions (mentioned by *Ziauddin Barani* in his book *Tarikh-i-FiruzShahi* (Fatwa-i-Jahandari)).

A wine distiller	Aziz Khummar
A barber	Firuz Hajjam
A cook	Manka Tabbakh
Two gardeners	Ladha and Pira

- He also setup a agricultural department: *Diwan-i-Kohi.*
- He built the city of *Jahanpanah.*

> ***Begumpuri Mosque: It was built during the reign of Muhammad bin Tughlaq.***

Firoz Shah Tughlaq *(1351 AD-1388 AD)*

- He was the cousin of Muhammad Bin Tughlaq.
- ***Imposed four kinds of taxes mentioned in Quran:***
  - *Kharaj:* Land tax = 1/10 of the produce.
  - *Zakat:* 2% tax on property.
  - *Jizya:* Levied on Non-Muslims.
  - *Khams:* 1/5th of the booty captured during war.

> ***He collected Jizya as a separate tax.***

> ***The soldiers were not paid in cash but by assignments on land revenue of villagers known as Vajeha.***

- He repaired number of canals and imposed: *Haque-i-Sharb* (irrigation tax) and *Hasil-i-Sharb* (water tax).
- ***He built new cities:*** *Fatehabad, Hisar, Jaunpur* (in the name of Muhammed bin Tughlaq (Jauna), *Firozabad.*
- He was the first Sultan in India who started the work of translation of Hindu Religious texts into the *Persian language.*
- ***He established a hospital at Delhi:*** *Dar-ul-Shifa*
- ***New department set up by him:*** *Diwan-i-Khairat* (for the needs of poor and needy) and *Diwan-i-Bandagan* (Department of Slaves).
- ***His PM was:*** *Khan-i-Jahan Maqbul.*
- *Iqta* system made hereditary during his reign.

Timur Invasion *(1398 AD)*

- He was a mongoloid.
- He invaded during the reign of last ruler of Tughlaq Dynasty → *Mahmud Shah Tughlaq.*

SAYYID DYNASTY *(1414 AD-1451 AD)*

- ***Founder:*** *Khizr Khan* (1414 AD-1421 AD) → Title taken: *Rayat-e-Ala.*
- They were known as *"Kulah-Daran"* (cap wearers).
- After defeating the army of Delhi in *1398*, Timur appointed *Khizr Khan* as the ruler of Multan. Khizr Khan defeated *Sultan Daulat Khan* and occupied Delhi and founded Sayyid dynasty.

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• *Tarikh-i-Mubarak Shahi* written by *Yahya-bin-Ahmad Sirhindi*, where he tells that Sayyids were the descendants of *Prophet Muhammed*.

LODI DYNASTY (1451 AD-1526 AD)

• Lodi's were of Afghan origin.
• *Founder: Bahlol Lodi* (1451 AD-1489 AD).

Sikandar Lodi *(1489 AD-1517 AD)*

• He is also known as Nizam Shah.
• He founded *Agra* in *1504* and later made it his capital in *1506*.
• *He introduced: Gaz-i-Sikandari* (Sikandari's yard) of *32 digits* to measure cultivated fields.
• He was a poet and composed poems in Persian, under the name *Gulrukhi*.
• *He gave orders to build: Moth ki Masjid (in Delhi)*.

Fig 7: Moth ki Masjid
• It is a double dome structure.

Ibrahim Lodi *(1517 AD-1526 AD)*

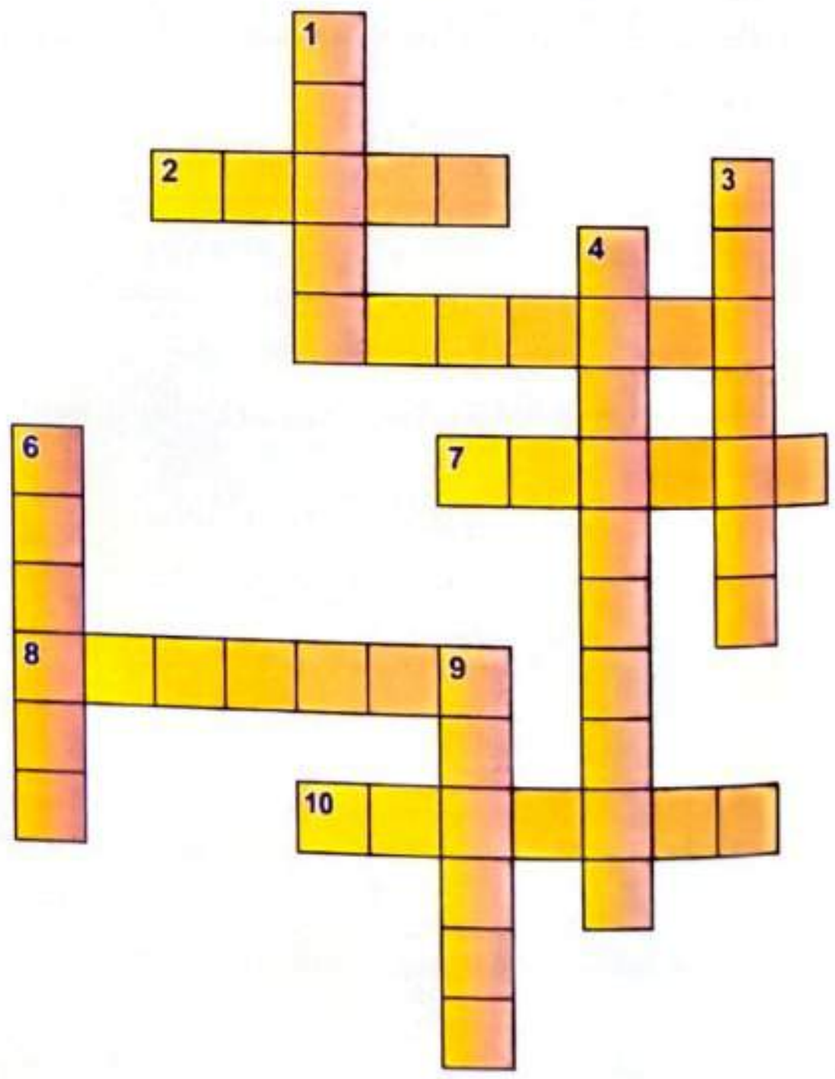
• He was the last ruler of Delhi Sultanate.
• Babur was invited to attack on Ibrahim Lodi by *Daulat Khan Lodi*, who was the *governor of Punjab* under Ibrahim Lodi.
• He fought and lost the *Battle of Panipat* against *Babur* in *1526 AD*.

Some Key Departments under Delhi Sultanate

Central Administration	Department Of	Started By
Diwan-i-Wizarat	Department of Finance	
Diwan-i-Arz	Military Department	Balban
Diwan-i-Insha	Department of Correspondence	
Diwan-i-Risalat	Department of Appeals	
Diwan-i-Mushtakharaj	Department of Arrears	Alauddin
Diwan-i-Riyasat	Department of Commerce	Alauddin
Diwan-i-Kohi	Department of Agriculture	Md. bin Tughlaq
Diwan-i-Bandagan	Department of Slaves	Firoz Shah
Diwan-i-Khairat	Department of Charity	Firoz Shah
Diwan-i-Ishthiaq	Department of Pension	

PARMAR'S CROSSWORD

DELHI SULTANATE



Across

2. Title adopted by Balban.
5. Rebelled in Bengal against Balban.
7. Copper coin introduced by Iltutmish.
8. Last ruler of Lodi dynasty.
10. Final invasion site of Mahmud Ghazni.

Down

1. Sijda and Paibos introduced in which setting.
3. Assumed title Zil-i-Ilahi.
4. Most prominent ruler of Chahamanas.
6. Only woman ruler of Delhi Sultanate.
9. First dynasty of Delhi Sultanate.

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VIJAYANAGARA EMPIRE *(1336 AD-1565 AD)*

- The meaning of Vijayanagara: *City of Victory.*
- *Capital: Hampi* (which is derived from the name of local mother goddess *Pampadevi*).
- The ruins of Hampi was brought to light in 1800 by *Colin Mackenzie.*
- Hampi was declared as *UNESCO World Heritage Site* in the year *1986.*
- Contemporaries describe this empire as *Karnataka Samrajyamu.*
- Early Vijayanagara rulers called themselves as *Hindu Suratrana.*
- Vijayanagara kings were known as *"Raya".*
- Local communities of merchants were known as *Kudirai Chettis.*

  - *Vijayanagara* rulers were known as *Narapati* (Lord of men).
  - *Odisha* rulers were known as *Gajapati* (Lord of elephants).
  - *Bahmani* rulers were known as *Ashvapati* (Lord of horses).

- Muhammad Bin Tughlaq was the ruler of Delhi Sultanate when this empire was established.

Four Important Dynasties of Vijayanagara Empire

Dynasty	*Period*	*Founder*
Sangama	1336 AD-1485 AD	Harihara and Bukka
Saluva	1485 AD-1505 AD	Saluva Narasimha
Tuluva	1505 AD-1570 AD	Veer Narasimha/Narasa Nayaka
Aravidu	1570 AD-1650 AD	Tirumala

IMPORTANT RULERS OF VIJAYANAGARA EMPIRE

Harihara I and Bukka *(1336 AD-1356 AD)*

- They are the founders of Sangama Dynasty (1336 AD-1485 AD) (sons of Sangama). They were feudatories of *Kakatiyas* and later became ministers in the court of *Kampili.*
- Title taken by *Harihara I: Karnataka Vidhya Vilas.*
- Bukka is credited with renaming *Vidyanagar* to *Vijayanagara.*

- *Deva Raya I* and *Deva Raya II* succeeded Harihara and Bukka.

Saluva Narasimha *(1485 AD-1491 AD)*

- He is the founder of Suluva Dynasty (1485 AD-1505 AD).

Veera Narasimha/Narasa Nayaka *(1505 AD-1509 AD)*

- He was the founder of Tuluva Dynasty (1505 AD-1570 AD).

Krishna Deva Raya *(1509 AD-1529 AD)*

- *Saluva Timma*, the Chief Minister of Veer Narasimha placed him on throne.
- ***He built:*** Vijaya Mahal (House of Victory), Hazara Rama Temple, Vitthal Swami Temple (dedicated to Lord Vishnu).
- ***Title taken:*** *Yavanaraja Sthapnacharya* (restorer of Yavana Kingdom i.e., Bidar Kingdom), *Abhinava Bhoja, Andhra Pitamaha/Andhra Pratimah.*
- He founded a suburban township of *Nagalapuram* named after his mother.
- He was a gifted scholar in both Telugu and Sanskrit.
- ***His works include:*** *Amuktamalayada* (Telegu work on statecraft) and *Jambavati Kalyanam* (it is a Sanskrit drama).
- ***His court was adorned by:*** *Ashtadiggajas* (example: Tenalirama).
- He gave permission to *Albuquerque* (a Portuguese Governor) to build a fort at *Bhatkal* (port).
- He defeated rulers of Odisha in his initial days.
- He defeated *Ismail Adil* and restored *Raichur Doab* (region between Krishna and Tungabhadra).
- During his reign *Amarnayakas (military commanders)* flourished.
- After Krishna Deva Raya, his brother *Achyuta Deva Raya* ascended the throne.
- When Achyuta Deva Raya died in 1542, Sadashiva Raya, the nephew of Achyuta Raya, was appointed emperor, with Aliya Rama Raya, Krishna Deva Raya's son-in-law, becoming the caretaker.
- Due to much interference by Aliya Rama Raya in the internal matters of Deccans, they decided to attack on Vijayanagara leading to Battle of Talikota also known as *Battle of Rakshasi Tangadi (1565).* In this battle combined Army of *Bijapur, Ahmednagar* and *Golconda* ransacked Vijaynagara Empire.
- After the Battle, the Vijaynagara empire continued to rule in a very small part.
- Last ruler was *Sri Ranga III (Aravidu Dynasty).*

Ayagar System

- Each village was organised as an independent unit for the operation of rural administration, and *12 officers* were appointed for their operations.

Travellers	*During the Reign Of*	*Country*
Ibn Battuta	Harihara and Bukka	Morocco
Nicolo de Conti	Deva Raya I	Italy
Abdur Razzaq	Deva Raya II	Persia
Duarte Barbosa	Krishna Deva Raya	Portugal
Domingo Paes	Krishna Deva Raya	Portugal
Fernao Nunes	Achyuta Deva Raya	Portugal

Royal Centre

- It consisted of 60 temples and 30 palaces.

Fig 1: Royal, Sacred and Urban Centre of Vijayanagara Empire

- Sacred Centre (all temples were here)
- Royal Centre (Southwest to Tungabhadra river where all Kings used to reside
- Urban Centre (residential buildings were seen here)

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Fig 2: Lotus Mahal

- Council chamber where King and his advisors met.

Fig 3: Elephant Stable (possibly by Krishna Deva Raya)

Fig 4: Hazara Rama Temple

Mahanavami Dibba

- It was spread across 11,000 sq ft
- Height: 40 ft
- It was considered as a large platform which was used for *royal ceremonies.*
- Walls have *relief carvings* on it.

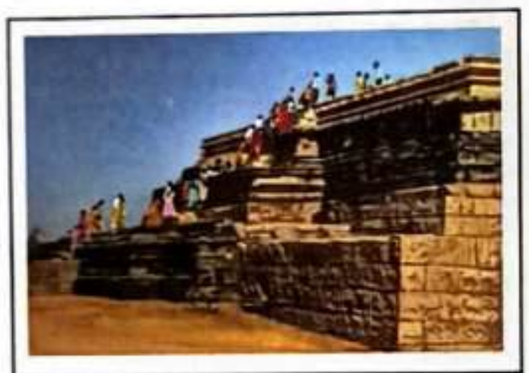

Fig 5: Mahanavami Dibba

Sacred Centre

Fig 6: Vitthal Swami Temple

- Vitthal is Lord Vishnu
- Built by: Krishna Deva Raya
- An image of it is seen in 50₹ Indian note

Fig 7: Virupaksha Temple, Hampi

- Built by: Lakkan Dandesha under Deva Raya II
- Gopuram was built by Krishna Deva Raya

Virupaksha Temple, Hampi

- *Lord Virupaksha* was considered as one of the avatars of *Lord Shiva* and most of the rulers claimed that they ruled on behalf of him.
- According to legends, *Goddess Pampadevi* performed penance on the hills along Tungabhadra river to marry Lord Virupaksha.

Fortification

- According to persian traveller *Abdur Razzaq,* there were seven levels of fortification in Vijayanagar Empire.
- *Provida style of architecture* was introduced by Vijayanagar rulers.

Fig 8: Fortification of Vijayanagara Empie

Fig 9: Kamalapuram Tank

- It is a stepped tank built by Krishna Deva Raya

- Anantaraj Sagar Tank and Hiriya Canal were also built by Vijayanagara Empire

BAHMANI KINGDOM

- They ruled in *South of Krishna river.*
- The entire Bahmani Kingdom was divided into *four* administrative units called *Province (Taraf).*

1. *Gulbarga*
2. *Bidar*
3. *Berar*
4. *Daulatabad*

Ala-ud-din Hasan Bahman Shah *(1347 AD-1358 AD)*

- Founder of Bahmani Kingdom.
- He was also known as *Hasan Gangu.*
- *Capital: Gulbarga* (first capital)
- He defeated *Kakatiyas of Warrangal.*

Taj ud-Din Firoz Shah *(1397 AD-1422 AD)*

- He is also known as *Firoz Shah Bahmani.*
- He defeated *Deva Raya I* and married his daughter, however *Taj ud-Din* got defeated in the subsequent battle.

Ahmad Shah Wali *(1422 AD-1435 AD)*

- He shifted the capital from Gulbarga to Bidar.

Mahmud Gawan *(a trader)*

- He was a *Peshwa* during Bahmani Kingdom
- ***He also received another title of:*** *Khwaja-i-Jahan.*
- Gawan conquered the Vijayanagara territories up to Kanchi. On the western coast, Goa and Dabhol were conquered.
- *Title: Malik-ut-tujjar* (chief of merchants) → by *Humayun Shah.*
- Humayun Shah was one of the Bahmani ruler who was noted for cruelty and hence got the title as *"Zalim".*

Traders during Bahmani Kingdom

- They were also known as *Amirs* and were of two types (provided military support to Bahmani rulers)

1. ***Afaqui/Pardesi: Sunni muslims from Iran and Iraq.***
2. ***Deccani: Local Shia muslims.***

- ***Khalisa land: Land that was demarcated to run the expenses of King and royal household.***
- ***Tarafdar was someone who governed the provinces and extracted revenue***

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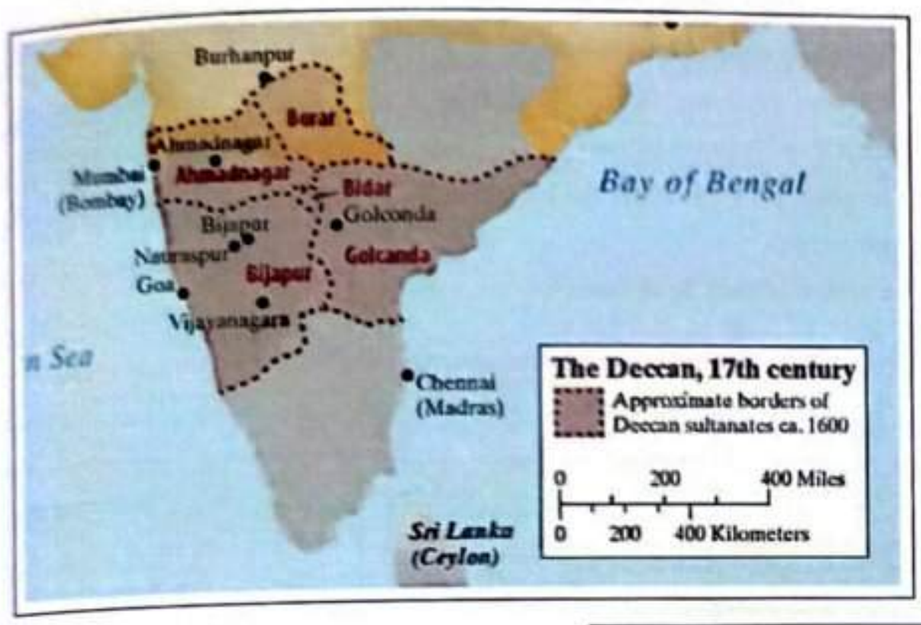
Disintegration of Bahmani Kingdom

Kingdom	Founder	Dynasty
Berar	Fathullah Imad-ul-Mulk	Imad Shahi
Bijapur	Yusuf Adil Shah	Adil Shah
Ahmednagar	Malik Ahmed	Nizam Shahi
Golconda	Quli Qutub Shah	Qutub Shahi
Bidar	Amir Ali Barid	Barid Shahi



Muhammad Adil Shah *(Adil Shahi Dynasty)*

- He intorduced *Dakhini* as court language in place of *Persian*.

Gol Gumbaj was built by Adil Shah. It is famous for "Whispering Gallery" and the architect is designed by Yakut of Dabul.

Fig 10: Gol Gumbaj

- It is the second largest dome in the world

Quli Qutb Shah

- He is the first ruler of *Qutub Shahi Dynasty*.
- The famous *Golconda Fort* was first built by Kakatiyas Dynasty and was later fortified by Qutub Shahi rulers.
- Golconda is famous for *Diamond* mines.
- He founded the city of *Hyderabad* (originally known as *Bhagyanagar* after *Bhagmati*, a local dancing girl with whom Sultan had fallen in love).
- He also built the famous *Charminar*.

Fig 11: Golkonda Fort

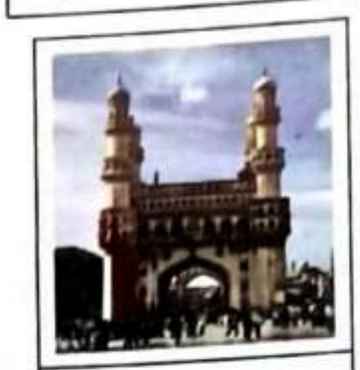
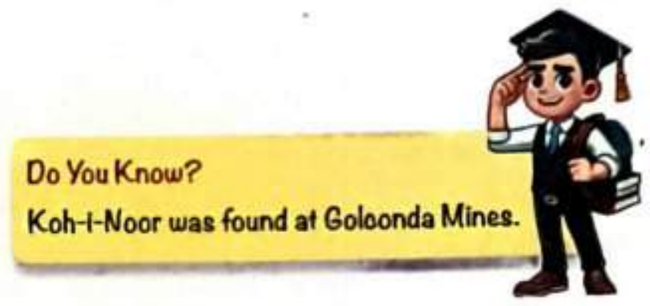
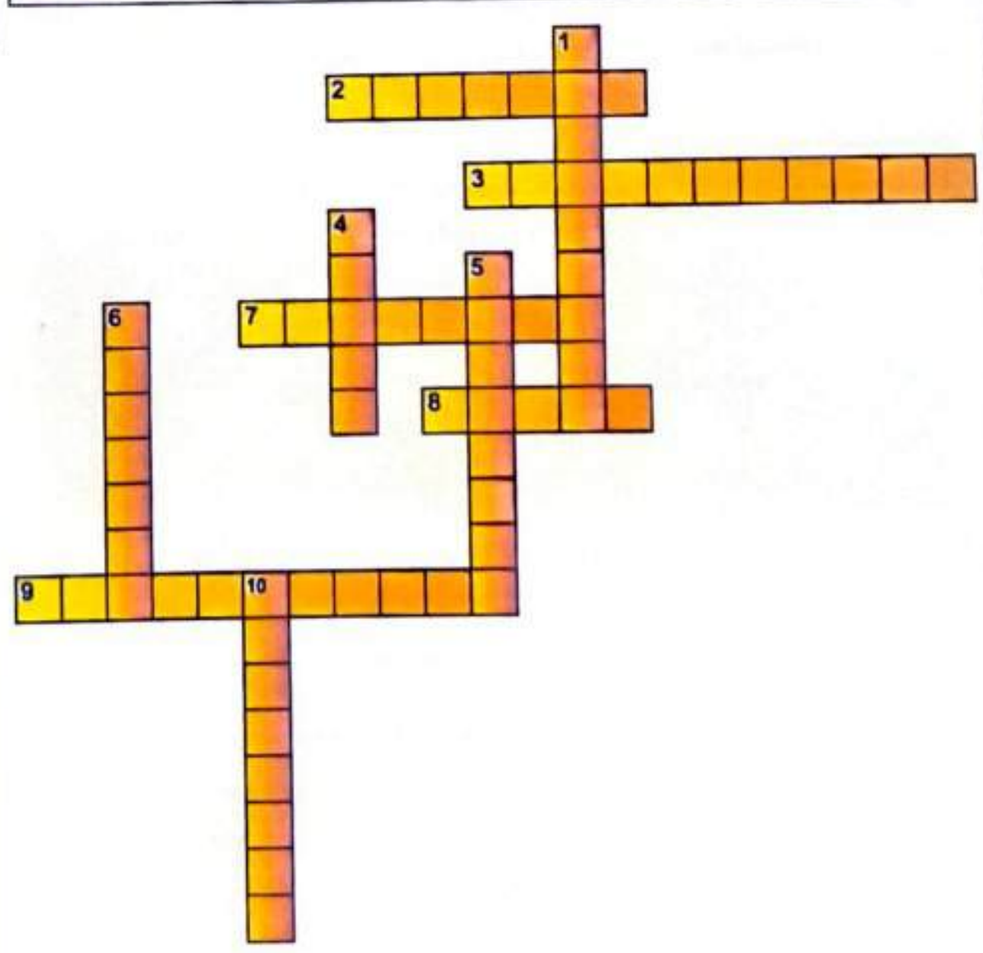


Fig 12: Charminar



PARMAR'S CROSSWORD

VIJAYANAGARA AND BAHAMANI KINGDOM



Across

2. Merchant community in Vijayanagar.
3. Main income source of Vijayanagar.
7. Founder of Vijayanagar Empire.
8. New capital of Bahmani Empire by Ahmad Shah.
9. Took title Yavanaraja Sthapnacharya.

Down

1. Location of Hampi.
4. Term for province in Bahmani Sultanate.
5. Battle that ended Vijayanagar Empire.
6. Ministers of this kingdom founded Vijayanagar.
10. Founder of Tuluva dynasty.

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THE MUGHAL EMPIRE

Babur (1526 AD-1530 AD)

- Babur defeated *Ibrahim Lodhi* in the *1st Battle of Panipat* on *April 21, 1526 AD* and was the founder of *Mughal Dynasty*.
- ***Original name:*** *Zahiruddin Muhammad Babur.*
- ***Title assumed:*** *Padshah.*
- Babur was from *Uzbekistan* and considered himself descendant of *Timur* (from father's side) and *Genghis Khan* (from mother's side).
- When he was *12 years old*, he became the ruler of *Ferghana* in *1494*.
- He was forced to leave his throne after the Uzbegs, another Mongol group, invaded.
- He conquered Kabul in *1504 AD*.
- In battles, he was the *first to use gun powder massively*.

Battles of Babur

- *1526: 1st Battle of Panipat.*
- *1527: Battle of Khanwa* (he defeated Rana Sanga of Mewar at Khanwa).
- *1528: Battle of Chanderi* (he defeated Medini Rai of Chanderi).
- *1529: Battle of Ghagra* [he defeated Afghans (Mahmud Lodi)].
- *1530:* He died at *Agra*, where his tomb was initially placed but now it is located in *Kabul*.

Fig 1: Military strategy of Babur known as Tulughma Formation

Autobiography of Babur

- *Tuzuk-i-Baburi* in *Turkish*.
  - It is translated in *Persian* language, named → *Baburnama* by *Abdur Rahim Khanekhana*.
  - It is translated in English by *Madam Beveridge*.

Architecture built by Babur

Fig 2: Kabuli Bagh Mosque in Panipat

Fig 3: Aram Bagh in Agra

Humayun (1530 AD-1540 AD and 1555 AD-1556 AD)

- He was the *eldest son* of Babur.
- He ascended the throne in *1530 AD*.
- His succession was challenged by his brothers: *Kamran, Hindal, Askari* and *Afghans* as well.
- Humayun's brother Kamran controlled Afghanistan and Punjab regions.
- He fought two battles against *Sher Shah Suri* (Afghani ruler) at *Chausa* in *1539 AD* and at *Kannauj/Bilgram* in *1540 AD*, where he was completely *defeated* by Sher Shah.
- Humayun after loosing battle took refuge at *Safavid Dynasty* (Iran).
- His sister *Gulbadan Begum*, wrote his biography *"Humayunama"*.
- After Sher Shah's death, Humayun regained his empire in 1555 AD.
- He built *Din Panah* at *Delhi* as his 2nd capital.
- He died in *1556 AD* after falling from the stairs of his library.

Sher Shah Suri (1540 AD-1545 AD)

- ***Original name:*** *Farid Khan.*
- He was the son of *Hasan Khan*, the Jagirdar of Sasaram (Bihar).
- Ibrahim Lodhi transferred his father's Jagir to him.
- ***Battles of Sher Shah Suri:***
  - *1539 AD:* He defeated Humayun in *Battle of Chausa* and then assumed the title *"Sher Shah"*.
  - *1540 AD:* He defeated Humayun in *Battle of Kannauj/Bilgram* and annexed Kannauj under him.

Fig 4: Humayun's Tomb, at New Delhi
•Built by: Bega-Biga Begum/Haji Begum (his widow).

Sarai were shelters that provided food, water, and lodging for travelers while travelling through the GT Road.

- He introduced *Rupia* as coin and fixed standard weights and measures all over the empire.
- ***He built:*** *Grand Trunk Road* [runs from *Chittagong* (Bangladesh to Peshwar).
- Land revenue system: He started a land revenue system where the land was measured and *1/3rd* of the average land was fixed as land tax. The peasants was given *Patta* (title deed) and a *Qabuliyat* (deed of agreement) which had fixed peasants rights and taxes.
- Zamindars were removed and taxes collected directly.
- ***Death:*** In *1545 AD*, while conquering *Kalinjar*.
- ***Buried in:*** *Sasaram* (Bihar).
- He built *Purana Quila* at Delhi.

Humayun after being defeated by Sher Shah

Akbar (1556 AD-1605 AD)

- One of the *greatest ruler* of Mughal Dynasty.
- *Eldest son* of Humayun.
- ***Full name:*** *Abu'l-Fath Jalal-ud-din Muhammad Akbar.*
- Akbar ascended the throne at the age of *13* at *Kalanaur, Punjab*.
- ***Regent:*** His tutor → *Bairam Khan* led Akbar's forces to victory in the 2nd *Battle of Panipat* in *1556* which was fought between him and *Hemu* (the Hindu General of Muhammad Adil Shah). Hemu was defeated, captured and slain.
- Akbar tried to win over the Rajputas wherever possible and inducted Rajput kings into Mughal service and treated them at par with Mughal nobility.

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• ***Married:*** *Harka Bai/Jodha Bai* (daughter of *Bharmal* → *Kachhwaha Rajput ruler* of *Amer*). She was later honoured with title *"Mariam-uz-Zamani"* after she gave birth to Jahangir.

• *Rana Pratap Singh* and son *Amar Singh* (Sisodiya Rajputs of Mewar, Capital: Chittor) did not recognize his supremacy.

└ ***This resulted in:***

• ***Battle of Haldighati (1576):*** Between *Rana Pratap* and Mughal army led by *Man Singh of Amer*. Rana Pratap was defeated but he never surrendered.

• ***New religion proclaimed by Akbar:*** *Din-i-Ilahi (1581)*, it was based on a synthesis of values and teachings from various religions, including *Islam, Hinduism, Jainism, Christianity,* and *Zoroastrianism*. Only Hindu to follow this religion was *Birbal*.

Architecture Built by Akbar

• He built *Fatehpur Sikri* in *1570 AD* in honour of *Salim Chisti* (a Sufi saint) and shifted his court from Agra to here.

• *Agra Fort (1565 AD)*

• *Lahore Fort (1566 AD)*

• *Buland Darwaja* at *Fatehpur Sikri (1573 AD)* to commemorate his victory over *Gujarat expedition.*

• *Allahabad Fort (1585 AD)*

• ***1569 AD:*** Akbar's son Jahangir was born.

• ***1571 AD:*** Akbar shifted capital from Agra to Sikri.

• ***1585 AD:*** Capital shifted from Sikri to Lahore.

• ***1598 AD:*** Capital shifted from Lahore to Agra.

Architecture by Akbar

Fig 6: Buland Darwaza, Fatehpur Sikri

Fig 7: Panch Mahal, Fatehpur Sikri

Fig 8: Salim Chisti's tomb

• Built by: Akbar (redone in Marble by Jahangir).

• Palace of Birbal and Palace of Tansen (Akbar's navaratna) are also inside the Fatehpur Sikri.

Navratnas of Akbar *(Nine Jewels)*

1. ***Birbal (Administrator).***
2. ***Abul Fazal (Scholar and Statesman).***
3. ***Faizi: Brother of Abul Fazal (Scholar and Statesman).***
4. ***Tordarmal (Finance Minister,Dahsala Bandobast/Zabti).***
5. ***Fakir Aziao-Din.***
6. ***Man Singh (Mansabdar, Grandson of Bharmal).***
7. ***Tansen (Musician).***
8. ***Abdul Rahim Khanekhana (Statesman, Hindi poet).***
9. ***Mulla Do Pyaja.***

Charbagh Style of architecture was introduced by Mughals in India.

• Akbar started *Ibadatkhana* (religious discussion used to happen here).

Tansen originally served under Raja Ramchandra Singh (Tomar Dynasty, ruling in Gwalior). Tansen's original name is Ramtanu Pande and he belonged to Rewa/Gwalior Gharana. He composed Dhrupads and played Rudraveena (Rabab). He was also given "Miyan" title by Akbar.

• *Abul Fazal* wrote *Akbarnama* (Biography of Akbar) that has three parts:

- *1st:* It is about ancestors of Akbar.
- *2nd:* It is about reign of Akbar.
- *3rd: Ain-i-Akbari* (it is about his *administration which was inspired from Sher Shah Suri*).

• Akbar also built a Translation Department *(Maktab Khana).*

• Ramayana was translated into *Persian* by *Abdul Qadir Badayuni.*

• Mahabharata was translated into Persian by *Faizi* and *Abdul Qadir* and was called *"Razmnama"*.

• *Lilavati* (by *Bhaskaracharya*) was converted to *Persian* by *Faizi.*

Land Revenue System

→ Revenue was fixed based on the average yield of the land *over the past 10 years estimates* known as *Dahsala*, also known as Zabti system. It was introduced by Todar Mal.

1. ***Polaj:*** The most fertile and productive land, cultivated regularly without being left fallow.
2. ***Parauti:*** Land left uncultivated for *1-2 years* to regain its fertility.
3. ***Chachar:*** Land left fallow for *3-4 years* before being cultivated again.
4. ***Banjar:*** Land that remained uncultivated for *5 years or more.*

• He abolished *Jizya.*

Administration

• He started *Mansabdari system* in *1571*. The word Mansab means *rank* or *position* which determined the *status, salary* and *number of soldiers Mansabdars* were required to maintain.

- Mansabs were graded on a numerical scale, with lowest rank being to *10* and highest reaching ***5000 (later raised to 7000 and 10,000).***
- Each Mansabs were assigned ***Zat,*** representing their personal rank.
- Mansabdars were often payed in Jagirs (land assignments) from where they had the right to collect revenue from those lands.
- Military commanders in Akbar's empire: *Faujdars.*
- Raja Man Singh had a Mansab of 7000 (Sapth Hajari).

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Last Expedition of Akbar

- Akbar defeated *Meeran Bahadur*, ruler of *Khandesh*.
- In *1601*, Akbar carried out his last expedition in *Fort of Asseergarh of Khandesh* (part of Ahmednagar). Akbar won, however his son Jahangir revolted against him.
- ***He died in:*** *1605 → Tomb of Akbar* in *Sikandra, Agra*.

Jahangir *(1605 AD-1627 AD)*

- ***Original name:*** *Nur-ud-Din Muhammad Salim/Prince Salim.*
- ***Established:*** *Zanjir-i-Adal* (i.e. Chain of Justice) at *Agra Fort* for seekers of royal justice. Jahangir was known for his strict administration of justice.
- In *1611 AD*, he married *Mehr-un-Nissa* (widow of Sher Afghan, a Persian nobleman of Bengal)
  - Later known as *Nur Jahan*.
  - She was made official *Badshah Begum*.
  - She exercised tremendous influence over the state affairs.
  - Jahangir also issued silver coins in honour of his wife Mehr-un-Nissa.
- He also married *Manmati Bai* (also known as Jagat Gosai) who was a Rathore princess. They gave birth to son *Prince Khurram* also known as *"Shah Jahan"*.

Architecture during his Reign

- The tomb of *Itimad-ud-Daulah*, built by *Nur Jahan* in fond memory of her father, inlaid with *Pietra Dura* decoration is located in *Agra*.
- The *Sarai of Nurmahal* is centrally protected monument of India, it is situated in Punjab constructed under the patronage of Nur Jahan.

- *Amar Singh* of *Mewar* accepted the suzerainty of Jahangir.
- In *1608 AD*, he was visited by *William Hawkins* (a representative of British East India Company and was given Mansab of 400).
- In *1615 AD, Sir Thomas Roe* (an ambassador of *King James I* of England) came to his court.

Fig 9: Tomb of Itimad-ud-Daula, Agra

Fig 10: The Sarai of Nurmahal, Punjab

Fig 11: Jahangir built Moti Masjid in Lahore and his mausoleum at Shahdara (Lahore)

- Jahangir granted English to establish a port in *Surat*.
- He captured a part of *Ahmadnagar* (Malik Amber ceded him the territory of Balaghat).
- Shah Jahan and Mahabat Khan (commander) revolted against him.
- He executed *5th Sikh Guru → Guru Arjan Dev* because he gave refuge to Jahangir's son *Khusrau*.

- ***He was buried in:*** *Lahore.*

Memoirs Written

- Jahangir wrote his autobiography *"Tuzuk-i-Jahangiri"* in *Persian* language.

Biography

- Matumid Khan wrote the biography of Jahangir known as *"Iqbalnama-i-Jahangiri"*.

Shah Jahan *(1628 AD-1658 AD)*

- ***Mother:*** *Jagat Gosai* (daughter of Raja Udai Singh).
- He is best known for his *Deccan* and foreign policies.
- ***Wife:*** *Mumtaz Mahal.*
  - Died in *1631*, 3 yrs after Shahjahan's accession to the throne.
  - ***Original name:*** *Arzumand Bano Begum.*
  - Shah Jahan built *Taj Mahal* in her memory in *Agra* in *1632 AD-1653 AD* (Ustad-Ahmad Lahori was the main architect of Taj Mahal).

- *1632 AD*, he defeated *Portuguese*.
- In *1637 AD*, he completely annexed *Ahmadnagar*.
- ***His reign is described by:***
  - French travellers *Bernier* (also a physician), *Tavernier* (he visited a total of 6 times) and *Italian traveller Nicoli Manucci.*
  - ***Bernier wrote:*** *"Travels in the Mogul Empire"*.
  - ***Tavernier wrote:*** "Travels in India".

- He introduced new administrative unit called *Chakla*.
- *Peter Mundi* described famine that occured during his reign.
- His reign is said to have marked *Pinnacle of Mughal Dynasty.*
- He is known to have promoted art, culture, and architecture.

Architecture Built by Shah Jahan

Fig 12: Diwan-i-Aam in Agra (where common people gathered)

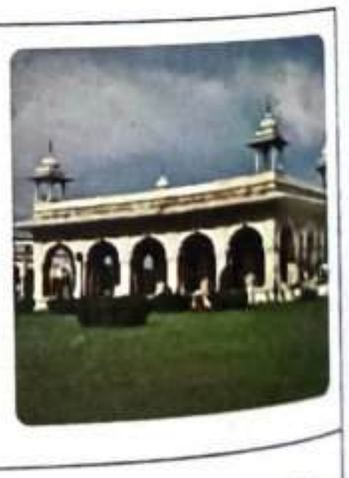

Fig 13: Diwan-i-Khas in Delhi (where all the important people King and nobility sat)

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Diwan-i-Aam *(hall of public audience)*

Builders	Location
Akbar and later by Shah Jahan	Agra (Agra Fort)
Shah Jahan (when he shifted Capital from Agra to Delh in 1638)	Delhi (Red Fort)

Diwan-i-Khas *(hall of private audience)*

Builders	Location
Initially Akbar, further enhancement by Shah Jahan	Agra (Agra Fort)
Shah Jahan	Delhi (Red Fort)

Fig 14: Taj Mahal

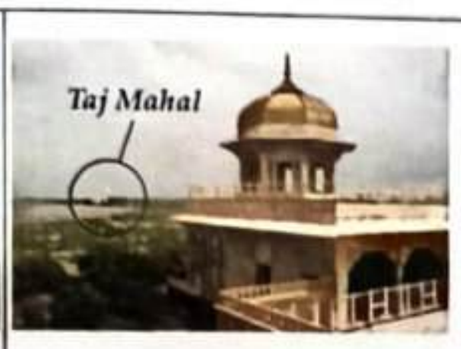

Fig 15: Mussman Burz in Agra Fort

- It is also known as *Jasmine Tower* where he spent his last years in captivity.

Fig 16: The art of decoration called Pietra Dura became popular during the reign of Shah Jahan

Fig 17: Sheesh Mahal

Fig 18: Peacock throne

- Made in elevated part with 1100 kg gold (roughly).

Fig 19: Kohinoor Diamond
(Largest diamond in human history)

The Kohinoor and the Peacock Throne, both were stolen by Nadir Shah who invaded in 1739 AD.

Fig 20: Moti Masjid at Agra Fort

- It is made up of marble and is also a UNESCO World Heritage Site.

Book

- *Padshahnama/Badshahnama* written by *Abdul Hamid Lahori* during his reign.

- In 1657 AD, his failing health set off the war of succession among his sons *Dara Shikoh, Aurangzeb, Murad Baksh*. In July 1658 AD, his son Aurangzeb emerged to be victorious.
- Aurangzeb imprisoned his father in *Agra Fort* where he died in captivity in 1666 AD. He was buried at *Taj Mahal* (Agra) next to his wife Mumtaz's tomb.

Reason for Shah Jahan's imprisonment

Shah Jahan formally confirmed *Dara Shikoh as his heir*, granting him the title of *Shahzada-e-Buland Iqbal* ("Prince of High Fortune") and wanted him to ascend the throne.

Aurangzeb *(1658 AD-1707 AD)*

- In 1658 AD, he defeated his elder brother Dara Shikoh (who was helped by Jaswanth Singh) at Dharmat (1658), Samugarh (1658), and Deorai (Varanasi).
- ***After Victory:*** He was crowned at Delhi and assumed the title *"Alamgir"*.
- He captured *Guru Teg Bahadur* (9th Guru of Sikhs) and executed him because Guru Teg Bahadur refused to embrace Islam.
- In 1686 AD, *Bijapur* was annexed by Aurangzeb.
- In 1687 AD, he annexed *Golconda*.
- He appointed *"Muhtasibs"* who were religious officers.
- ***He wrote:*** *Fatwa-i-Alamgiri* (Muslim Laws).
- He re-introduced Jaziya.
- ***Death:*** *1707 AD* at *Devgiri, Aurangabad* (present day known as *Chhatrapati Sambhajinagar*).
- ***Buried at:*** *Khuldabad* (Daulatabad)
- He was called *"Zinda Pir"*, the living saint.

Fig 22: Bibi ka Maqbara

- ***Built by:*** Azam Shah (son of Aurangzeb) in fond memory of his mother Dilras Banu Begum who was posthumously named as Rabia-ud-Durrani.

Fig 21: Moti Masjid built by Aurangzeb inside the Red Fort in Delhi

Later Mughals

Bahadur Shah *(1707 AD-1712 AD)*

- He is also known as *Shah Alam I*.

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Jahandar Shah *(1712 AD-1713 AD)*

- He ascended to throne with the help of *Zulfiqar Khan.*
- He abolished *Jaziya.*

Farrukh Siyar *(1713 AD-1719 AD)*

- He ascended throne with the help of Sayyid Brothers (they were also known as *King Makers*).
  - *Hussain Ali Khan Barha*
  - *Abdullah Khan Barha*
- He is known to issue *"Golden Farman"*. to British East India Company.
- *Sayyid Brothers* killed Farrukh Siyar with the help of *Marathas* (Peshwa Balaji Vishwanath).

Muhammad Shah *(1719 AD-1748 AD)*

- He was also known as *"Rangeela"*.
- He killed the *Sayyid Brothers* with the help of *Nizam-ul-Mulk.*
- During his reign *Nadir Shah* invaded. He sacked and plundered the city of *Delhi* in *1739 AD* and took away immense amounts of wealth.
- This invasion was followed by a series of plundering raids by the Afghan ruler *Ahmad Shah Abdali*, who invaded north India *five times* between *1748 AD* and *1761 AD.*

Ahmed Shah *(1748 AD-1754 AD)*

Alamgir II *(1754 AD-1759 AD)*

- He was also killed by nobles.

Shah Alam II *(1759 AD-1806 AD)*

- He was blinded.

Akbar II *(1806 AD-1837 AD)*

Bahadur Shah II *(1837 AD-1857 AD)*

- The last Mughal ruler.

Administration

- *Suba* (lead by Subedar/Nizam) was divided into *Sarkars* (District) which was further divided into: *Pargana* (Taluka) and *Gram* (Village).

↓ *Siqdar* (Revenue Officers) ↓ *Quanungo* (Revenue Collector)

↓ *Muqaddam* (Village Headman)

Important Officers

- *Mir Saman:* In charge of Royal Household.
- *Mir Bakshi:* Head of Military Department.
- *Diwan:* Head of Revenue Administration.
- *Fauzdar:* Maintained law and order.
- *Amalguzar:* Responsible for assessment and collection of land revenue.
- *Sadr:* Managed judicial affairs.
- *Shiqdar:* Police Chief at Pargana level.
- *Amin:* A revenue assessor at the Pargana level.

RAJPUTS

- Many Rajput kings, particularly those belonging to Amber and Jodhpur, had served under the Mughals with distinction.
- In exchange, they were permitted to enjoy considerable autonomy as *Watan Jagirs.*
- These influential Rajput families claimed the subadari of rich provinces of Gujarat and Malwa.
- *Raja Ajit Singh* of *Jodhpur* held the governorship of *Gujarat* and *Sawai Raja Jai Singh II* of *Amber* was the governor of *Malwa.*
- Sawai Raja Jai Singh II founded his new capital at *Jaipur* and was given the *Subadari* of *Agra* in *1722 AD.*

Fig 23: Mehrangarh Fort

- Built by: Rao Jodha (Rathore ruler of Marwar).
- It is in Jodhpur (known as Blue City).

Fig 24: Jantar Mantar

- Built by: Sawai Jai Singh II of Jaipur
- Total 5 Jantar Mantars built by him in: Delhi (1st to be built), Jaipur (largest), Varanasi, Ujjain, Mathura.

For an interactive recap of this topic, see the crossword on Page Number 118.

TsuNamî

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MARATHA STATE (1674-1720) AND MARATHA CONFIDERACY (1720-1818)

Shivaji *(1674-1680)*

- ***Born at:*** *Shivneri Fort* in *1630*.
- ***Father:*** *Shahji Bhonsle*.
- ***Mother:*** *Jija Bai*.
- ***Religious teacher:*** *Samarth Ramdas*.

Shivaji

Expeditions of Shivaji

Battle of Pratapgarh *(1659)*

- The battle was fought between the Maratha forces led by *Shivaji* and the *Bijapur troops* under *General Afzal Khan*, representing *Adil Shah*.

The Marathas emerged victorious.

- *Shaista Khan* (Governor of Deccan) was deputed by *Aurangzeb* to put down rising power of Shivaji in 1660 (Shivaji lost Poona but later made a bold attack against him in 1663 and plundered *Surat (1664)* and later *Ahmadnagar*).

Shivaji killing Afzal Khan using Wagh Nagh

Treaty of Purandar *(1665)*

- In *1665 AD*, *Aurangzeb* appointed *Raja Jai Singh I* of Amber to lead a campaign against Shivaji, resulting in the *Treaty of Purandar*. Shivaji agreed to give his *23 out of total 35 Forts* to Mughals.
- In *1665 AD*, Shivaji visited Aurangzeb's court in *Agra*, where he was imprisoned but managed to escape the same year.
- In *1674 AD*, Shivaji proclaimed himself *"Chhatrapati"* at his coronation ceremony held at *Raigad Fort*.
- Shivaji was considered a pioneer of *Guerilla warfare*.
- He captured *Torana Fort* at the age of *16*.
- Shivaji was helped by the *Ashtapradhan* (eight ministers).

Fig 1: Raigad Fort

Revenue Sources

- Marathas conducted raids and extracted *Chauth*, which was *1/4th* of the *land revenue*.
- *Sardeshmukhi* was an additional tax of *10%* tax imposed on top of the regular revenue collection (Chauth).

Sambhaji *(1681-1689)*

- He was the *eldest son* of *Shivaji* and *Saibai*.
- He defeated *Rajaram*, his younger brother in the war of succession.
- He also provided protection and support to *Mirza Akbar*, the rebellious son of *Aurangzeb* due to which he gave gruesome death to Sambhaji.

Rajaram *(1689-1700)*

- He was the son of Shivaji and Soyarabai.
- He succeeded the throne with the help of ministers at Rajgarh.
- ***He created a new post:*** *Pratinidhi* [Total no. of minister now nine (*Pratinidhi + Ashtapradhan*)].
- He died in *Satara* which became the capital after the fall of *Jinji* to Mughal *(1698)*.

Tarabai

- She was the wife of *Rajaram*.
- ***Son:*** *Shivaji II*.

Shahuji *(1708-1749)*

- He was the son of Sambhaji.
- He was released by Mughal Emperor *Bahadur Shah*.
- He defeated Tarabai in the *Battle of Khed (1767)*.

Balaji Viswanath *(1713-1720)*

- In *1713*, he became the *first Peshwa* (PM of Marathas).
- He began his career as small revenue official and was given the title *"Senakarte"* (Maker of the Army) by *Shahu* in *1708*.

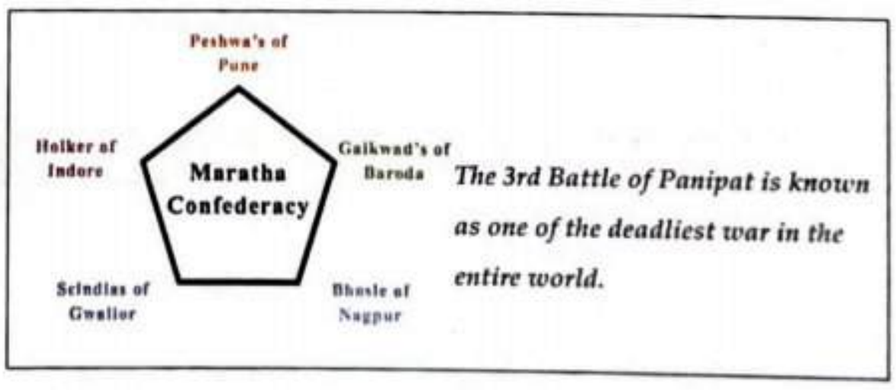
Baji Rao I *(1720-1740)*

- He was the *eldest son* of Balaji Viswanath.
- ***He defeated:*** *Nizam-ul-Mulk* and *Asaf Jah I* (*Khan Siddiqi*, the *first Nizam of Hyderabad*).
- ***He signed:*** *Treaty of Doraha Sarai* with *Jai Singh* after a victory over a combined force of the *Nizam*, *Awadh*, and *Rajput* states of *Jaipur* and *Kota*.
- In *1737* he raided Delhi.
- During Baji Rao I's tenure, the concept of the *Maratha Confederacy* emerged.
- ***Son:*** *Balaji Baji Rao*.

Baji Rao I captured Bassein from Portuguese in 1739.

Balaji Baji Rao *(1740-1761)*

- He is also known as *Nana Saheb*.
- During his tenure, the *3rd Battle of Panipat* was fought between *Marathas* and *Afghans* in *1761*. *Peshwa Sadashivrao Bhau* led the Maratha army and *Ahmad Shah Abdali* from *Durrani Empire*, led the Afghan forces. The *Marathas lost* the battle.



The 3rd Battle of Panipat is known as one of the deadliest war in the entire world.

Anglo-Maratha Wars

1st Anglo-Maratha War: *1775-1782*

- This was started due to an internal conflict *Raghunath Rao*, brother of Balaji Baji Rao wanted to become Peshwa. However, *Nana Fadnavis* (Finance Minister) didn't want him to become Peshwa.

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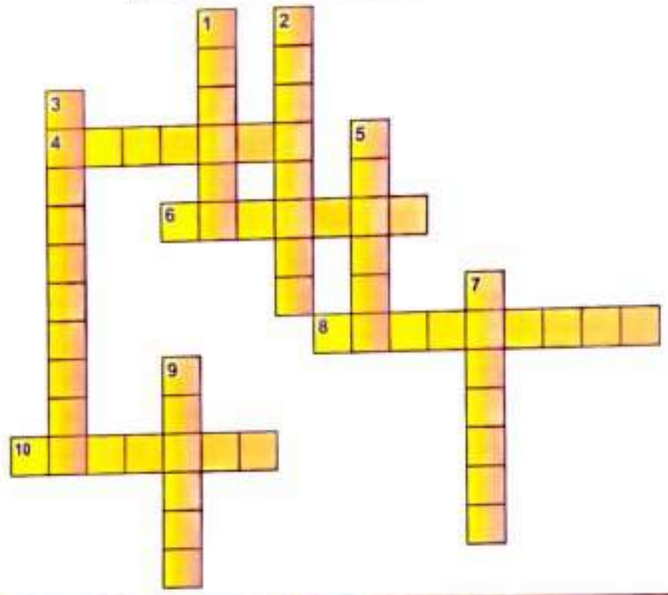
- This war began when *Raghunath Rao* signed *Treaty of Purandar (1776)* with *Britishers* to support him to become Peshwa.
- The Britishers were defeated initially and *Treaty of Wadgaon (1779)* was signed.
- Subsequently, Britishers attacked again under the leadership of Warren Hastings and defeated Marathas. *Treaty of Salbai (1782)* was signed at the end.

2nd Anglo Maratha War: *1803-1805*

- *Baji Rao II* signed a subsidiary alliance with the British in the form of *Treaty of Bassein (1802)* which led to the 2nd Anglo-Maratha War. This war was *won by British*.
- The 2nd Anglo-Maratha War ended with signing of *Treaty of Rajghat (1805)* with *Holkars*.
- The *Treaty of Deogaon* signed after *Battle of Argaon* during 2nd Anglo-Maratha War *(1803)* with *Bhonsles Dynasty*. Cuttack was acquired by Britishers after this war.

PARMAR'S CROSSWORD

MUGHAL EMPIRE



Across

4. Title assumed by Aurangzeb.
6. Burial place of Sher Shah Suri.
8. Real name of Babur.
10. City founded by Humayun in Delhi.

Down

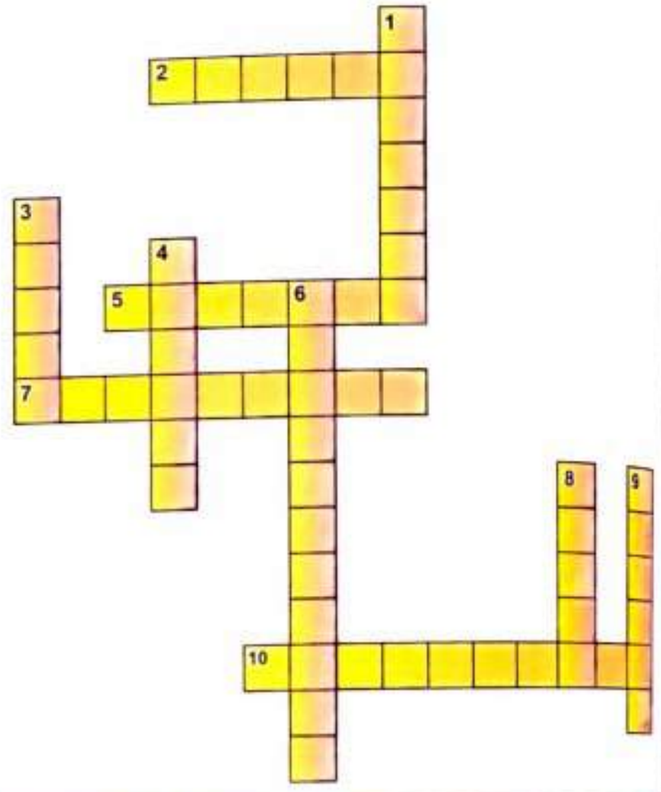
1. Battle where Babur defeated Mahmud Lodi.
2. Garden layout style introduced by Babur.
3. Sufi order followed by Babur.
5. Battle fought between Babur and Rana Sanga.
7. Eldest son of Babur.
9. Famous musician in Akbar's court.

3rd Anglo-Maratha War *(1817-1818)*

- This war is often regarded as *"Pindari War"*.
- Pindaris were *tribal people* that supported Marathas during *raids*.
- *Baji Rao II* was captured and sent to *Bithoor* (Kanpur).
- *Treaty of Mandsaur (1818)* signed between the British and the *Holkar chief*.
- From 1818, *Peshwaship was abolished*.

PARMAR'S CROSSWORD

MARATHAS



Across

2. Maratha tax collected as 25% land revenue.
5. Son of Shivaji from Saibai.
7. Killed by Shivaji in Battle of Pratapgarh.
10. Goan dance celebrating Maratha victory.

Down

1. Famous ruler of Maratha dynasty.
3. Capital of Marathas under Peshwas.
4. Father of Baji Rao I.
6. Council of ministers under Shivaji.
8. Anglo-Maratha War that merged Peshwa territories into Bombay.
9. Location of Mahakaleshwar temple.

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PARMAR'S CROSSWORD

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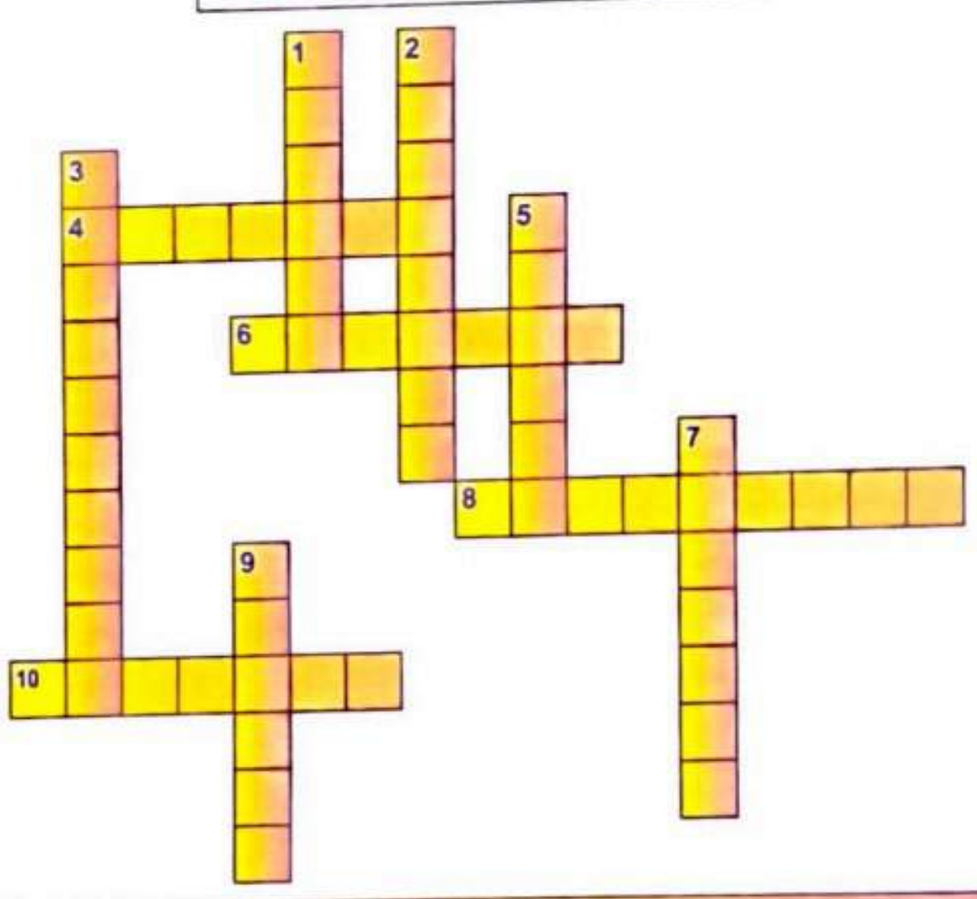

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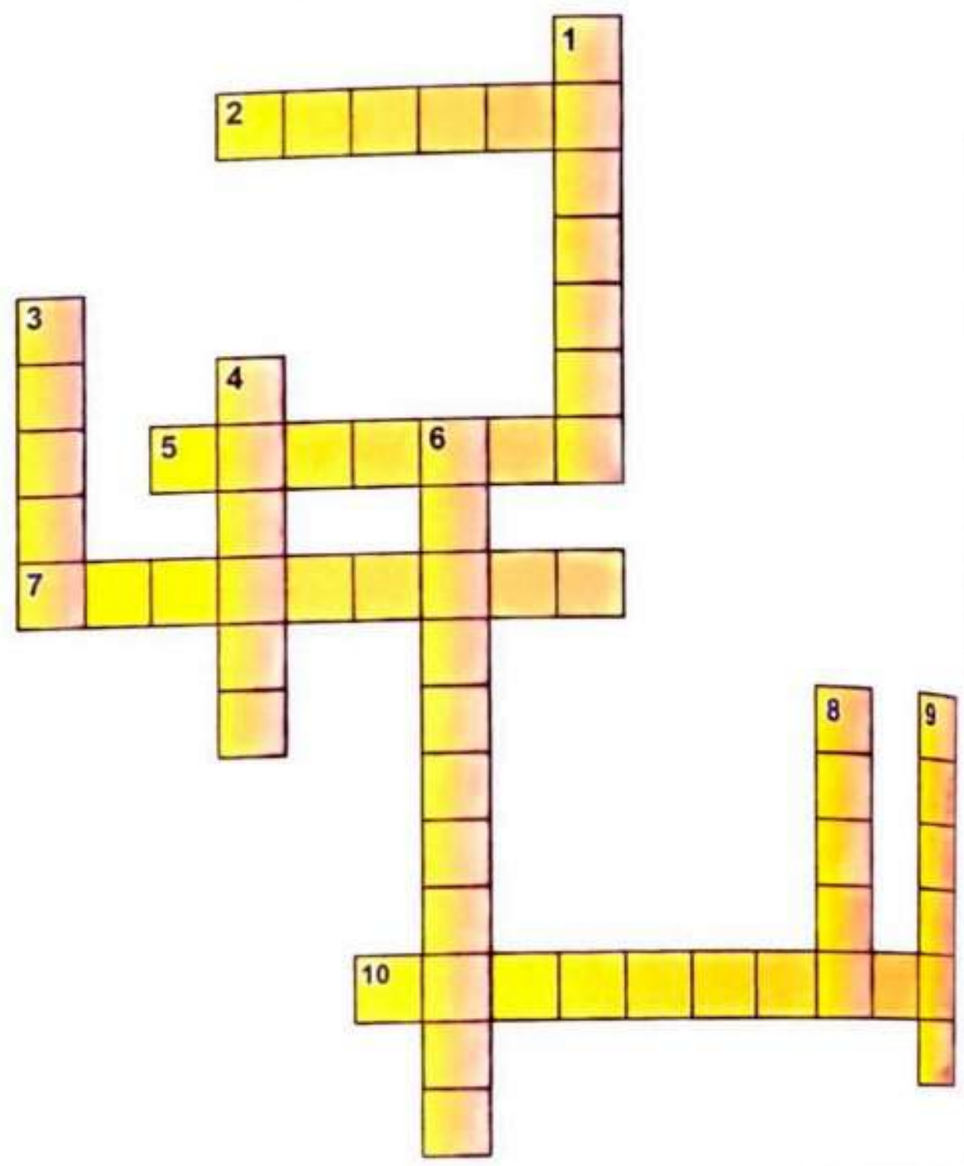
PARMAR'S CROSSWORD

MARATHAS



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BHAKTI MOVEMENTS

Main Features of Bhakti Movement

1. The Bhakti saints opposed complicated rituals, sacrifices, and strict rules followed by traditional priests.
2. They promoted *Monotheism* → Worship of single God.
3. *Saguna Hindu sects worshipped God in a specific form and Nirguna sects believed God has no form.*

The Saguna sects were divided into two major branches:

1. ***Vaishnavism:*** They worshipped *Lord Vishnu* or his incarnations and were called *Alvars (First female Alvar* was *Andal*, she was a propounder of *Bhakti Movement*). There were *12 Alvars* of Vaishnavism.
2. ***Shaivism:*** They worshipped *Lord Shiva* and were called *Nayanars*. Nayanars were a group of *63 Tamil Saints* out of which 3 were females: *Karaikkal Ammaiyar, Mangayarkkarasiyar* and *Isaignaniyar.*

→ *Kapalikas*, *Kalamukhas* and *Nathas* are sects of Shaivism while *Sahajiyas* is a sect of Vaishnavism.

- Lord Vishnu has ***10 avatars*** → ***Matsya, Kurma, Varaha, Narasimha, Vamana, Parashurama, Rama, Krishna, Buddha, and Kalki.***
- ***Chariot: Garuda (National emblem of Indonesia)***

Philosophy and Founder

Philosophy	*Founder*
Vishishtadvaita	Ramanuj Acharya
Dvaitadvaita/Bhedabhed	Nimbark Acharya
Dvaita	Madhva Acharya
Shuddhadvaita	Vallabhachariya
Advaita	Sri Adi Shankaracharya

- ***Shuddhadvaita teaches that the world is real and emphasizes worship through idols.***
- ***Sri Shankaracharya believed this life and world is a myth and did not support idol worship.***

Bhakti Movement Saints

Kabir (1440-1510)

- He was born in *Varanasi.*
- He was a disciple of *Ramananda.*
- Kabir's Doha often *criticises Hindu or Islamic Dharma* pointing out the contradictions and superficialities in both religions.
- He belonged to *Nirguna sect.*
- *Bijaka is a compilation of the preachings by Kabir.*

Ramananda (14th-15th Century)

- He belonged to ***Nirguna sect*** from *North India.*
- *Kabir Das* was his disciple.

Guru Nanak (1469-1538)

- He belonged to *Nirguna sect* and *Khatri* community.

Vallabhacharya (1479-1531)

- He gave *Shuddhadvaita* philosophy.
- He gave the philosophy of *"Pushti Marg".*
- He said ***"Ram and Krishna are avatars of Vishnu".***

Vidyapati (14-15 century)

- He composed *Padavali* (love ballads of Krishna and Radha).

Chaitanya (1486-1533)

- He propounded Bhakti Movement in *Bengal* (known as *Bengal Vaishnavism*).
- He is known as *"King of Gaudiya"*. He founded *Gaudiya Vaishnavism.*

Purandar Das (1480-1564)

- He is known as *"Father of Carnatic music" (South Indian music).*

Mirabai (1498-1546)

- ***Disciple of: Raidas/Ravidas***
- She was daughter-in-law of *Rana Sanga* of Mewar.
- She was a *Rathore princess.*
- She was a *bhakt of Krishna.*

Surdas (1483-1563)

- He was blind.
- He belonged to Agra.
- He dedicated his lifetime in *bhakti of Krishna.*

Tulsi Das (1532-1623)

- He was a *bhakt of Ram.*
- ***Famous writings:*** *Ramcharitramanas, Kavitawali, Gitawali*

Dadu Dayal (1544-1603)

- He belonged to *Nirguna sect.*
- He is the founder of *Dadu Panth.*

Sankaradeva (1449-1568)

- He spread Bhakti Movement across ***Assam.***
- He is the profounder of *Sattriya dance.*
- He gave *Borgeet.*

Thyagaraja (1767-1847)

- He was from *Tamil Nadu.*
- He was a *bhakt of Rama.*

Bhakti Saints of Maharashtra

Jnanesvara/Jnanadeva (1271-1296)

- He was the founder of Bhakti Movement in *Maharashtra.*
- He wrote *commentary* on *Bhagvad Geeta (Bhavarthadipika).*
- He composed *Abhangas.*

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Namadeva (1270-1350)

- He was the founder of *Varkari sect*.
- The followers Varkari sect worshipped *Vitthal (a form of Lord Vishnu worshipped in Maharashtra)*.

Ramdas (1608-1681)

- He wrote *Dasabodha (compilation of his sermons)*.

Bhakti Saints of Karnataka

Basavana

- He founded *Lingayat/Virshaiva sect*.
- He initially was a Jaina and a minister in the court of a *Chalukya king* in the *12th Century*.
- He was a believer of *Lord Shiva (he believed in Monotheism)*.
- He was against caste system / Vedic rituals.

SIKH GURUS

Era of Sikhism

Sikhs believed in three things that could abolish Untouchability. They were:

- ***Langar: Community kitchen***
- ***Pangat: Eating***
- ***Sangat: Decision making***

Guru Nanak Dev

Guru Nanak Dev (1469-1539)

- ***Birth:*** 1469, *Nankana Sahib* (present day: *Pakistan*)
- He founded the Sikh faith.
- ***Death:*** *Kartarpur (Pakistan)*
- He started the institution of *"Guru Ka Langar"*.
- He was contemporary to Mughal emperor *Babur*.

Guru Angad Dev

Guru Angad Dev (1539-1552)

- He created and introduced the *Gurmukhi* (written form of *Punjabi*) script.
- He compiled the *writings of Nanak Dev in Guru Granth Sahib* in Gurmukhi Script.
- He started *Mall Akhara (wrestling arena) system*.

Guru Amardas Sahib

Guru Amardas Sahib (1552-1574)

- He introduced the *Anand Karaj* marriage ceremony for the Sikhs.
- He established *Manji* and *Piri* system of religious missions for men and women respectively.
- He was contemporary to Mughal emperor Akbar.

Guru Ram Das

Guru Ram Das (1574-1581)

- He founded the city of *Amritsar (the holy city of the Sikhs)*.

Guru Arjan Dev

Guru Arjan Dev (1581-1606)

- He compiled the *Adi Granth* → the scriptures of the Sikhs.
- He started the construction of the famous *"Golden Temple"* at Amritsar.
- He requested the Muslim Sufi → *Mian Mir* to lay the cornerstone of the *Harmandir Sahib*.
- He completed construction of *Sri Darbar Sahib (Golden Temple)*.• *Jahangir* ordered his execution, because he gave shelter to *Khusrau* (rebellion son of *Jahangir*), thus he was hailed as *Shaheedan-de -Sartaj (the crown of martyrs)*.

Fig 1: Sri Harmandir Sahib Golden Temple

Gold plating of this temple was done by Maharaja Ranjit Singh

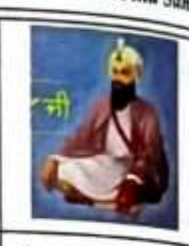
Guru Har Gobind Sahib (1606-1644)

- ***Son of:*** Guru Arjan Dev and he was also known as a *"Soldier Saint"*.
- He is the *first Sikh Guru to take up arms* to defend the faith.
- He waged wars against Mughal rulers *Jahangir* and *Shah Jahan*.
- He established *Akal Takht*.

Guru Har Gobind Sahib

Guru Har Rai Sahib (1644-1661)

- He gave shelter to *Dara Shikoh*, the eldest son of Mughal Ruler *Shah Jahan*.
- He avoided conflict with Emperor Aurangzeb and devoted his efforts to missionary work.



Guru Har Rai Sahib

Guru Har Krishan Sahib (1661-1664)

- Guru Har Krishan was the *youngest* of the Gurus *(became the leader at the age of 5 years)*.
- He was *contemporary of Aurangazeb* and was summoned to Delhi by him under framed charges of Anti-Islamic blasphemy.
- ***Death due to:*** Smallpox

Guru Har Krishan Sahib

Guru Tegh Bahadur Sahib (1665-1675)

- He established the town of *Anandpur*.
- He was killed by Aurangzeb in *1675* because he resisted the forceful conversion of *Hindu Kashmiri Pandits*.

Guru Tegh Bahadur Sahib

Guru Gobind Singh Sahib (1675-1708)

- He established *Khalsa Panth* in *13 April 1699 (on Vaisakhi)*, changing the Sikhs into a saint-soldier order to protect themselves.
- He was the last of Sikh Gurus in human form and he passed the Guruship of the Sikhs to the Guru Granth Sahib.
- He was assassinated by two Afghans, sent by *Wazir Khan* (Mughal ruler of Sirhind).
- He was succeeded by *Banda Bahadur (not a Sikh Guru)*, who was killed by Farrukhsiyar.

Guru Gobind Singh Sahib

Guru Granth Sahib

- Guru Granth Sahib (also known as the *Adi Granth*) is the scripture of the Sikhs.
- The Granth was written in *Gurmukhi script* and it contains the actual words and verses as uttered by the Sikh Gurus.
- ***It is considered the supreme spiritual authority and head of the Sikh religion, rather than any living person.***

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SUFI MOVEMENTS

Origin of Sufi Movements

- In early Islamic teachings, some believed that a *Dar al-Harb (Land of War)* could become a *Dar al-Islam (Land of Islam)* through *Jihad*, which means striving or struggle. They also believe that Mujahid (one who engages in Jihad) attains Jannat on Jihad.
- This set of belief was changed by Sufi saints.

Khwaja Ali Hujjwiri (11th Century)

- He is also known as *"Data Ganj Baksh"*.

Shaikh Bahauddin Zakaria (1182-1262)

- He founded the leading *Khanqah* in India at Multan.
- He was the founder of *Suhara-Wardi* order.

> *The Naqshbandi Silsila is a chain of succession in the Naqshbandi Sufi order of Sunni Islam.*

Khwaja Moinuddin Chisti (1141-1236)

- He was the founder of the *Chisti* order.

Fig 2: Ajmer Sarif

- Ajmer Sharif built in honour of Khwaja Moinuddin Chisti Mohammad Bin Tuglaq was the first Sultan to visit Ajmer Sharif.

Other Saints of Chisti Order

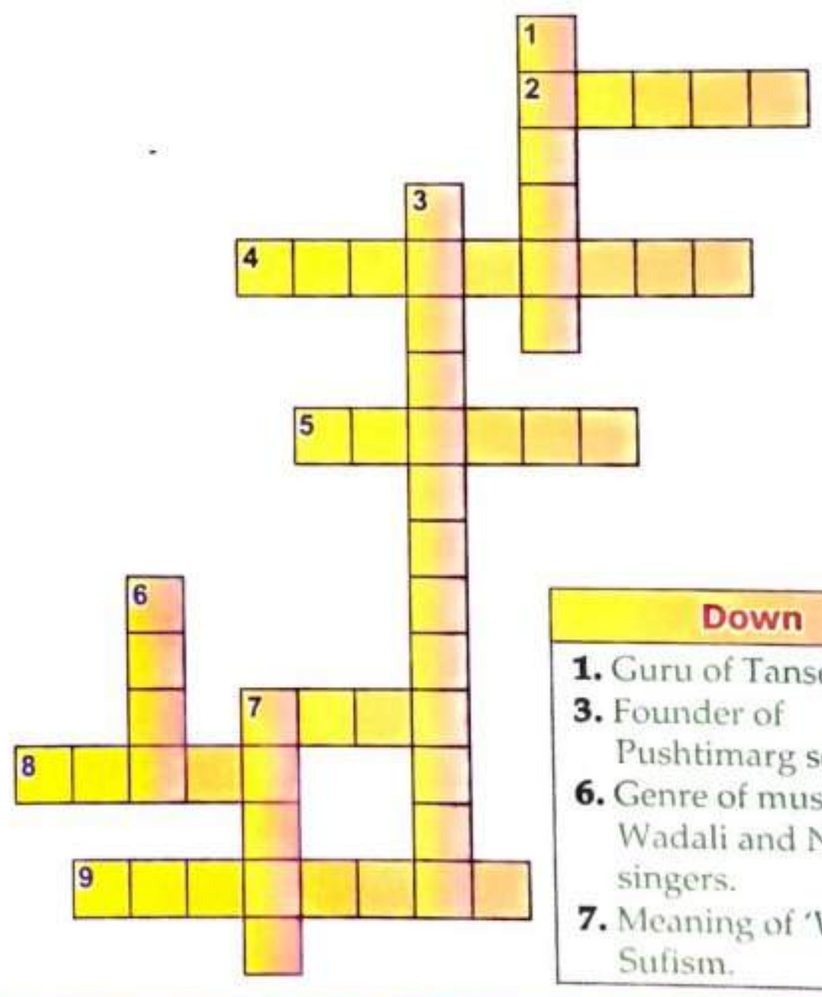
- ***Sheikh Hamiduddin Nagauri (1192 -1274)***
- ***Khwaja Qutubuddin Bhaktiyar Kaki***
  - *Disciple: Qutubuddin Aibak,* who started the construction of *Qutub Minar* on his name *(1206)*
- ***Baba Jariuddin/Ganj-i-Shankar (1175-1265)*** → He is popularly known as Baba Farid
- ***Shaikh Nizamuddin Auliya (1236-1325)*** → He is popularly known as Mehboob-i-Illahi.
- ***Syed Muhammad Gesu Daraz*** → Popularly known as Bandanawaz.
- ***Shaikh Nasiruddin Mahmud*** → He was later known as Chirag-i-Delhi
- ***Shaikh Badruddin Samarkandi (13th Century)*** → He founded Firdausi Order

Sufi Words and their Meanings

Sufi Words	*Meaning*
Tasawwuf	Sufism
Shaikh/Pir/Murshid	Spiritual teacher
Murid	Disciple
Khalifah	Successor
Khanqah	The hospice (house of resting)
Sama	Musical recital
Raksa	Dance
Fana	Self annihilation
Ziyarat	Pilgrimage to the tombs of Sufi Saints

PARMAR'S CROSSWORD

BHAKTI AND SUFI MOVEMENTS



Down

1. Guru of Tansen.
3. Founder of Pushtimarg sect.
6. Genre of music for Wadali and Nooran singers.
7. Meaning of 'Wali' in Sufism.

Across

2. Location of Moinuddin Chishti's dargah.
4. Bhakti saint from South India who was once a Jain.
5. Guru who founded Khalsa Panth.
7. Sufi term for musical recitation.
8. Nayanars were devotees of which god.
9. Charar-e-Sharif is located near which city.

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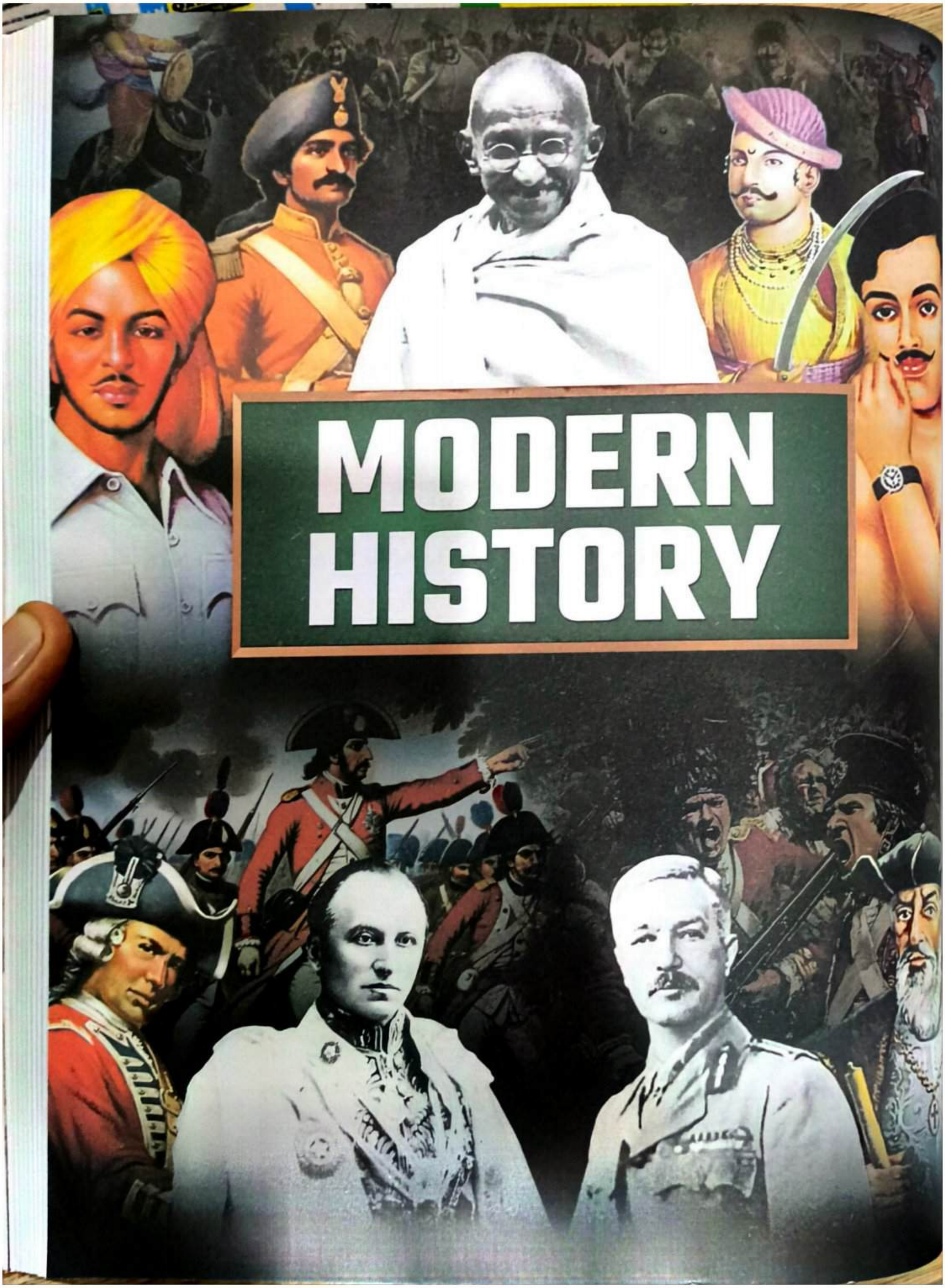

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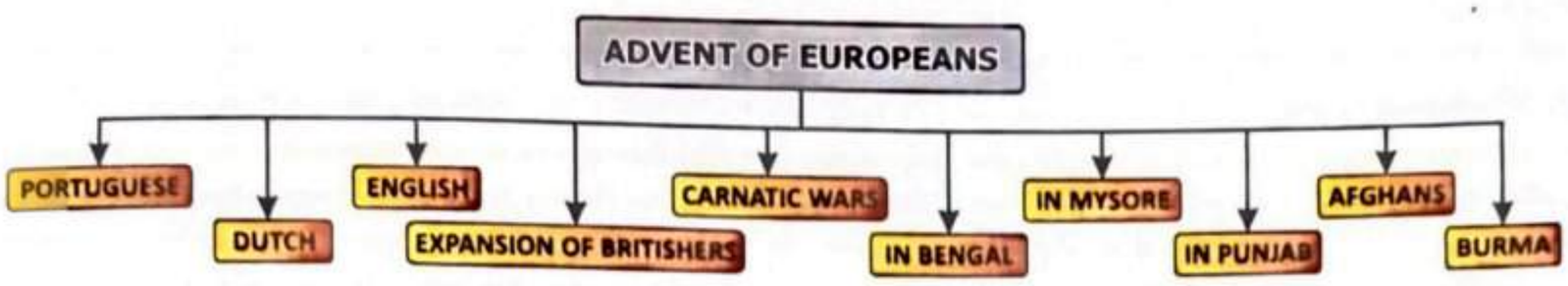

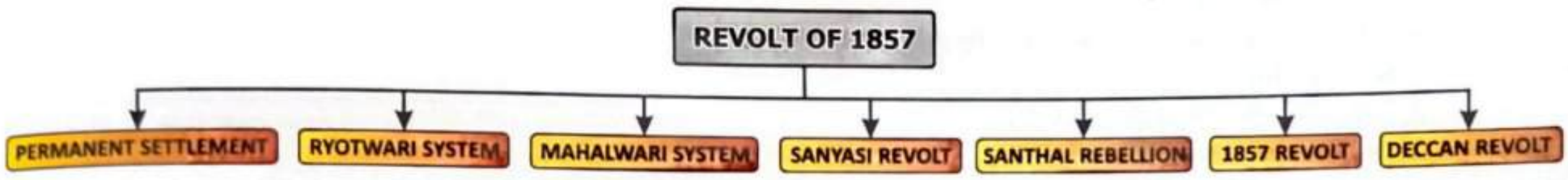

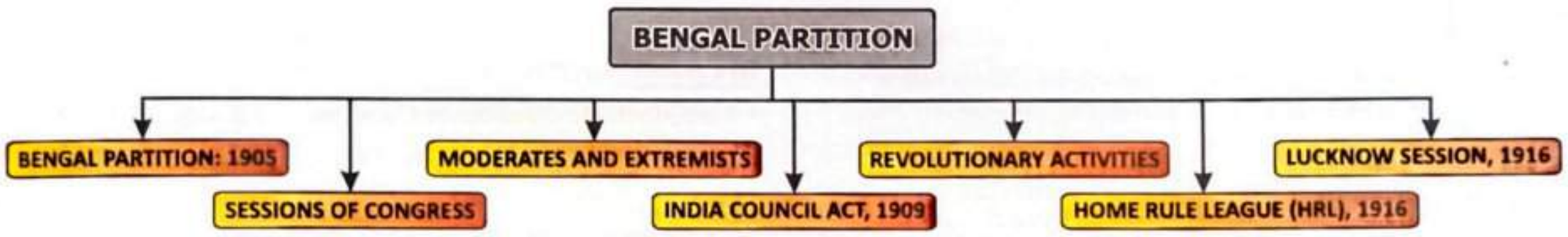

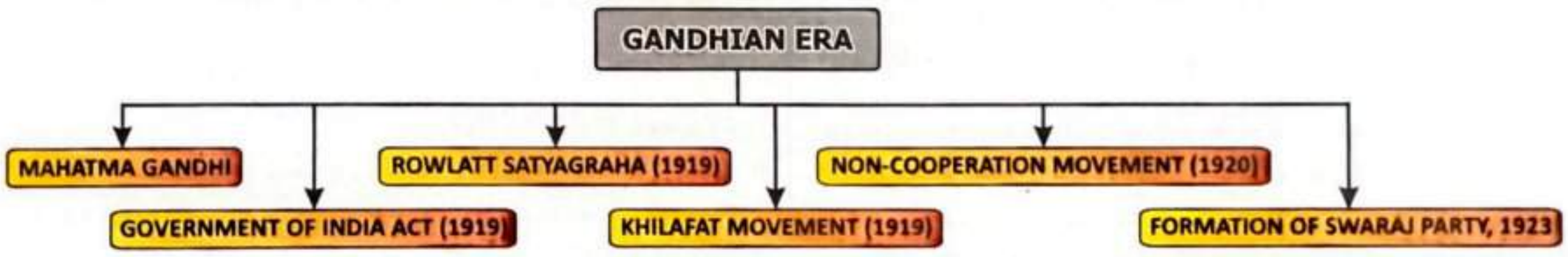

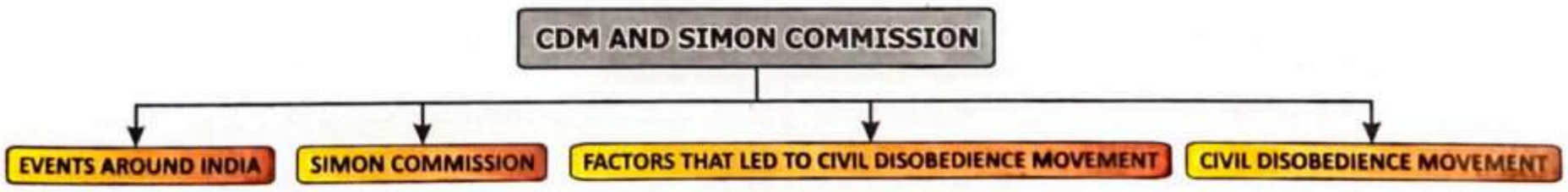

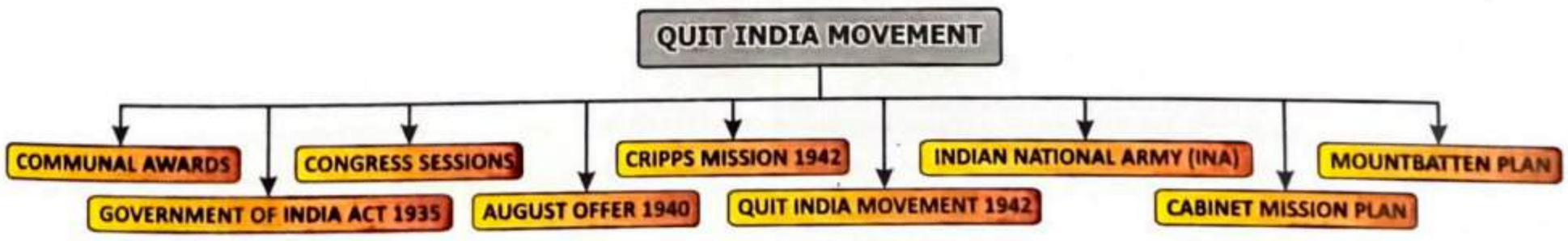

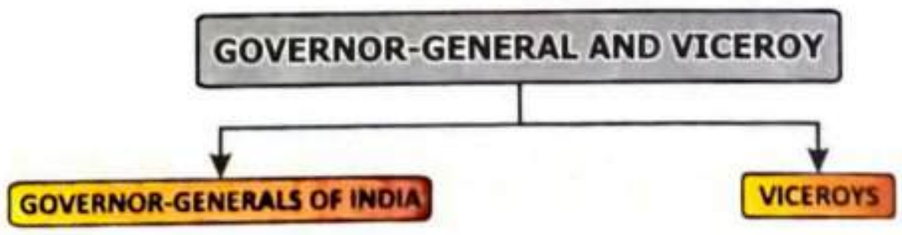

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Order of Advent of Europeans in India

1. *Portuguese (1498)*
2. *Dutch (1602)*
3. *English (1608)*
4. *Danes (1616)*
5. *French (1668)*

- *1611:* First factory at Masulipatnam (temporary).
- *1613:* First factory at *Surat* (permanent).
- *1615: Sir Thomas Roe* visited Jahangir's court to receive the trading rights.
- *1620:* Danes established their first factory at *Tranquebar* (Tamil Nadu).
- *1668:* French established their first factory at *Surat*.

PORTUGUESE

Arrival of Portuguese

- The Portuguese came to India for various economic and religious reasons. They were the *first to introduce tobacco and cashew nuts* in India. They were also the first to come and last to go.

Vasco da Gama *(1498)*

- He was also the first to discover the sea route to India.
- He was a Portuguese explorer who came to *Calicut* during the rule of *King Zamorin* (then Hindu ruler of *Calicut*).

> ***Treaty of Tordesillas, signed on 7th June 1494 was a significant agreement between Spain and Portugal. It aimed to resolve conflicts over newly discovered lands by dividing the world into two spheres of influence. The treaty established a demarcation line, with lands to the east belonging to Portugal and lands to the west to Spain.***

Francisco de Almeida *(1505)*

- He was the *first Portuguese Viceroy of India.*
- He brought *"Blue Water Policy"* (Cartaz System) which was a trade licensing system that allowed the Portuguese to control trade in *Indian Ocean.*

Afonso de Albuquerque *(1509)*

- He was the *second Portuguese Governor of India.*
- He captured Goa in *1510* and abolished *Sati.*

Nuno da Cunha

- He was a Portuguese Governor who moved capital from *Cochin* to *Goa* in *1530.*

> ***Bahadur Shah, ruler of Gujarat surrendered Diu to Portuguese in 1535.***

DUTCH

Arrival of Dutch

- Dutch refers to *"people from Netherlands".*
- Dutch East India Company was formed in *1602.*
- They set up their first factory in *Masulipatnam* (Machilipatnam) in Andhra Pradesh in *1605.*

ENGLISH

Arrival of English

- *1599:* East India Company came into existence.
- *1600:* East India Company received a *Royal Charter* from *Queen Elizabeth I* to trade in India.
- *1608: William Hawkins* arrived in the court of *Jahangir.*

EXPANSION OF BRITISHERS

- *Battle of Chinsurah/Bedara/Hooghly* in *1759* that took place on the banks of *Hooghly* river in which Britishers defeated the Dutch.
- *Battle of Swally/Suvali* in *Surat* in *1612* in which the Britishers defeated the Portuguese.

> ***Battle of Colachel in 1741 between Marthanda Varma (King of Travancore) and Dutch East India Company.***

CARNATIC WARS

- The series of Carnatic Wars started between British and French East India Companies.
- A total of 3 Carnatic Wars were fought between *1744* and *1763.*
- *Dupleix* led the French forces in the first two Carnatic Wars.

1st Carnatic War *(1744-1748)*

- It ended with *Treaty of Aix-la-Chapelle.*
- ***Won by:*** *French East India Company.*

2nd Carnatic War *(1749-1754)*

- It started with Battle of Ambur (won by British) and ended with *Treaty of Pondicherry.*

3rd Carnatic War *(1756-1763)*

- *Battle of Wandiwash (1760)* was a part of 3rd Carnatic War.
- This war was an extension of Anglo-French *War of 7 years* which were caused by *Austrian War of Succession.*
- It ended with *Treaty of Paris.*
- British forces led by *Sir Eyre Coote* defeated the French forces led by *Comte de Lally.*

IN BENGAL

- *1717-1727: Murshid Quli Khan* served as the *first Nawab of Bengal.*
- In 1717, Mughal Emperor *Farrukhsiyar* issued a *Golden Farman* (Magna Carta of Trade) that allowed the British East India Company to trade freely in *Bengal* for a yearly payment of 3,000 Rupees. The farman also granted the company the right to issue *Dastaks,* or trade permits, to move goods.

> ***Nawabs of Bengal***
>
> ***Murshid Quli Khan → Shuja-ud-Din Muhammad Khan → Alivardi Khan (died in: 1756) → Siraj-ud-Daulah***

TsuNamî

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Siraj-ud-Daulah

- He became the *Nawab* at the age of 23 years after the death of *Alivardi Khan* in *1756*.
- He was the *last self-governing* Nawab of Bengal.
- He was not happy with the Trade privileges enjoyed by Britishers in Bengal.
- Siraj-ud-Daulah, captured the *Fort William* after the British refused to stop fortifying it. The *Black Hole Tragedy* was a night of captivity for British soldiers and other prisoners in a small, airless room in Fort William, Calcutta in *1756*. This incident instigated *Robert Clive*, who decided to take revenge, which led to the Battle of Plassey.

> ***Treaty of Alinagar (1757)***
> ***It was signed between Siraj-ud-Daulah and the Britishers which became the cause of Battle of Plassey.***

Battle of Plassey *(1757)*

- It was fought between the East India Company force led by *Robert Clive* and *Siraj-ud-Daulah* (Nawab of Bengal).
- *Mir Jafar*, the military commander of Siraj-ud-Daulah joined hands with the Britishers.
- This battle confirmed the formal beginning of British Empire in India.

Outcomes of Battle of Plassey

- Siraj-Ud-Daulah was killed (forces led by Mir Madan).
- Mir Jafar was made the new puppet Nawab of Bengal.
- ***Then Mughal Emperor: Alamgir II.***
- Subsequently, Mir Qasim (son-in-law of Mir Jafar) came to the throne. He shifted the capital from *Murshidabad* to *Munger* (he also ended Dastak issued by Farrukhsiyar).
- Combined forces of ***Shuja-ud-Daula*** (Nawab of Awadh), ***Mir Qasim*** and *Shah Alam II* (Mughal Emperor) led to ***Battle of Buxar (1764)*** against the Britishers.

> - ***1st Nawab of Awadh: Saadat Khan Burhan-ul-Mulk.***
> - ***The fourth Nawab of Awadh → Nawab Asaf-ud-Daula,*** built ***Bara Imambara*** in ***Lucknow.***

Battle of Buxar *(1764)*

- Britishers won this battle led by *Hector Munro*.
- *Treaty of Allahabad* was signed in *1765* between *Shuja-ud-Daulah* (Nawab of Awadh), Mughal Emperor *Shah Alam II* and *Robert Clive* (then Governor). Under this, two separate treaty were signed.

First Treaty with Nawab of Awadh:

- *Allahabad* and *Kara* were handed over to Mughal Emperor Shah Alam II.
- Nawab paid Rs 50 lakh to the British as war indemnity.

Second Treaty with Shah Alam II:

- Emperor Shah Alam II was placed under British protection at Allahabad.
- Diwani (revenue rights) of *Bengal, Bihar,* and *Orissa* were given to the East India Company, in return of an annual payment of Rs 26 lakh.
- The Company was to receive Rs 53 lakh from the Emperor for performing nizamat (military and judicial) functions in these provinces.

This control over *Diwani* and *Nizamat* Functions by East India Company is called as *Dual Government* in *Bengal.*

- Mir Jafar was made the Nawab again.
- Allahabad Treaty ran for *7 years* and was ended by *Warren Hastings* in *1772*.

IN MYSORE

- In Mysore, *Wodeyar Dynasty* was ruling. *Hyder Ali* who was a soldier under Wodeyar Dynasty and ultimately sat on the throne of Mysore.

Anglo-Mysore Wars

1st Anglo-Mysore War *(1767-1769)*

- It ended with the *Treaty of Madras.*
- ***Won by: Mysore.***

2nd Anglo-Mysore War *(1780-1784)*

- Hyder Ali was defeated in the *Battle of Porto Novo (1781)* by the British forces led by Sir Eyre Coote.
- Tipu Sultan sat on throne after the death of his father Hyder Ali due to cancer in the middle of the war.
- It ended with *Treaty of Mangalore.*

3rd Anglo-Mysore War *(1790-1792)*

- It ended with *Treaty of Seringapatnam.*
- 3rd Mysore War led to defeat of *Tipu Sultan* (Capital: Seringapatnam). with heavy fine imposed on him and his two sons were captured as hostages.

4th Anglo-Mysore War *(1798-1799)*

- Due to growing proximity of Tipu Sultan with French, Britishers waged another war with him.
- *Tipu Sultan* was killed in the Battle.

Subsidiary Alliance

- Subsidiary alliance was introduced by *Lord Wellesley* in *1798*, though it was a brain-child of French Governor General *Lord Dupleix.*
- Under the subsidiary alliance, Indian rulers had to pay subsidy for the British Garrison and British Army deployed in their territory. They had to seek permission from British EIC to partner with any other European for any service, and also for the negotiations with other Indian rulers.
- ***Adopted by: Hyderabad (first State to sign in 1798); Mysore (in 1799); Tanjore (in 1799); Awadh (in 1801) and Peshwa (in 1802).***

IN PUNJAB

- *Maharaja Ranjit Singh* from *Sukerchakia Misl* (one of the 12 Sikh Misls) signed *Treaty of Amritsar* in *1809* with *British* and declared *Sutlej river* as boundary between the Sikh Kingdom and the British Empire.
- He died in *1839*.

> **Battle of Aliwal *(1846)***
> - It was a part of 1st Anglo-Sikh War.

Anglo-Sikh Wars

1st Anglo-Sikh War *(1845)*

- It resulted in the defeat and partial subjugation of the Sikh Empire and cession of Jammu & Kashmir as a separate princely state under British suzerainty.

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• *Treaty of Lahore* (Lahore was the capital) and *Treaty of Bhairowal* were signed between *Maharaja Dulcep Singh* and *British*.

2nd Anglo-Sikh War *(1848)*

• *Maharaja Dulcep Singh* was captured and *Kohinoor* diamond was stolen. *Lord Dalhousie* was then *Governor-General of India*.

AFGHANS

1st Anglo-Afghan War *(1839-1842)*

• *Dost Muhammad Khan*, the Afghan ruler was dethroned and *Shah Shuja* was placed on the throne.

• 1st Anglo-Afghan War took place during the tenure of *Lord Auckland* (Governor-General of India).

• *John Lawrence* (Governor-General) implemented *Policy of Masterly Inactivity* towards Afghan Empire during his tenure.

2nd Anglo-Afghan War *(1878-1880)*

• *Treaty of Gandamak* signed (*Lord Lytton* was the *Viceroy*)

3rd Anglo-Afghan War *(1919)*

BURMA (Myanmar)

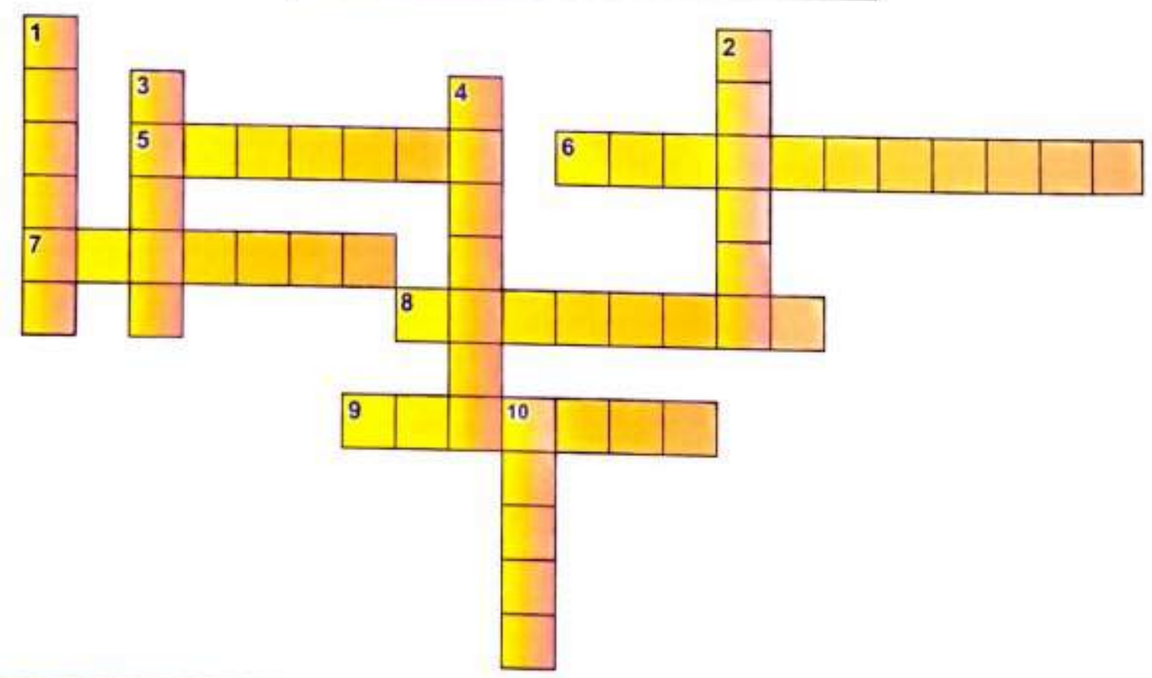
1st Anglo Burma War *(1824-1826)*

• It ended with the Treaty of Yandaboo (1826).

2nd Anglo Burma War *(1852-1853)*

PARMAR'S CROSSWORD

ADVENT OF EUROPEANS



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7. Battle where Ahmadullah Shah defeated British.
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9. First major British victory in Bengal.

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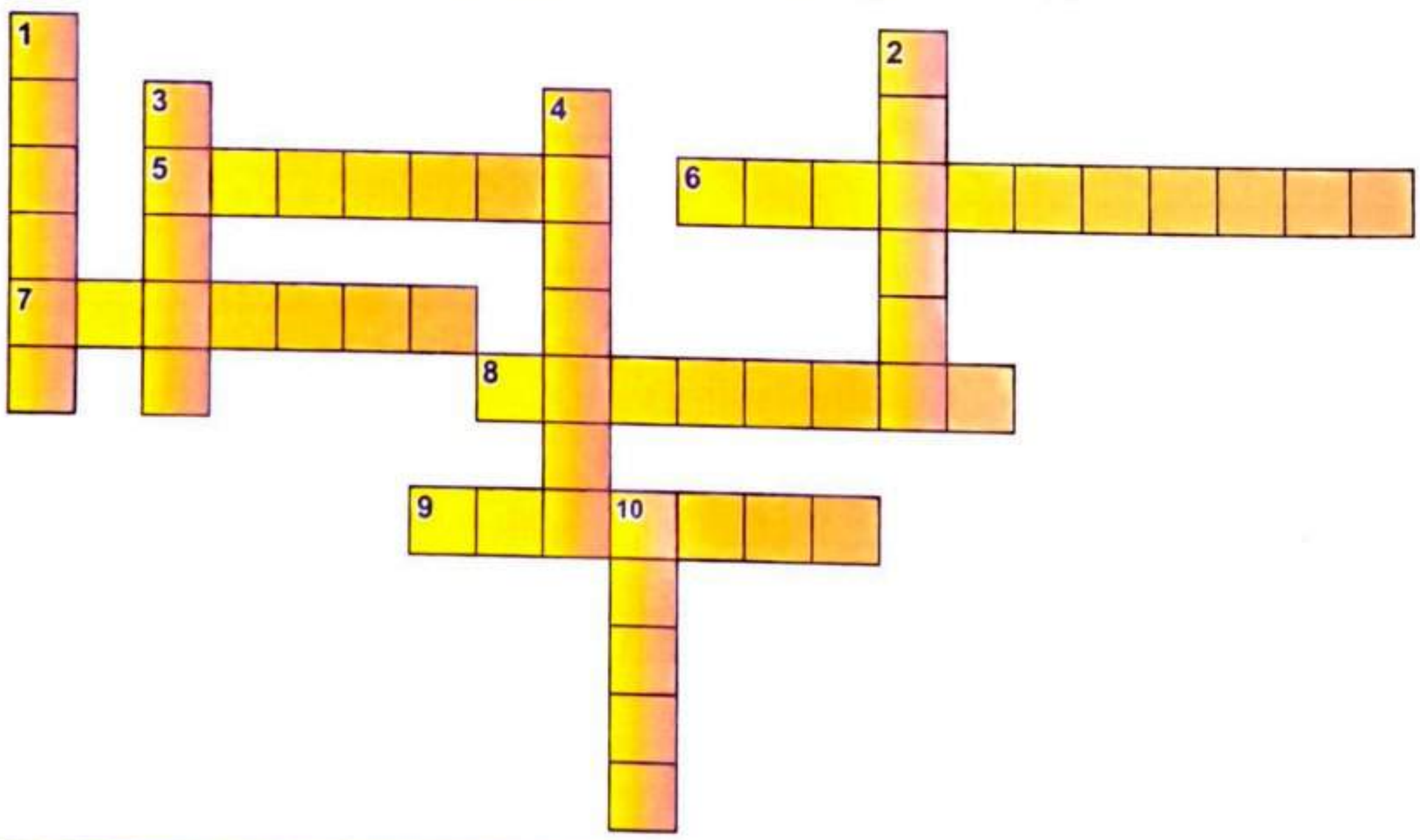

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REFORM MOVEMENTS IN INDIA

Reformist Movements started in India due to:

1. Social evils in society that existed in forms of untouchability, superstition, polygamy (multiple marriages), purdah system, polytheism (worship of more than one God), etc.
2. Position of women deteriorated in society due to polygamy, Sati system and also because widow remarriage was not allowed.

Steps taken to Ameliorate Women's Position

1. *Abolition of Sati*

- *1829:* An Act passed to abolish *Sati System* with the efforts of *Raja Ram Mohan Roy* (*Lord William Bentinck* was the then *Governor-General of India*).

2. *Widow Remarriage*

- *1856: Widow Remarriage Act* passed with efforts of *Ishwar Chandra Vidyasagar* [Got this title from his college (Principal in Sanskrit College)]
- Ishwar Chandra Vidyasagar was against child marriage.

Widow Remarriage Association by:

- *1853: Vishnu Shastri Pandit* formed *Vidhava Vivaha Uttejaka Mandal.*
- *1861: M. G. Ranade* formed a *Widow Remarriage Association.*
- *Satyaprakash* was a *Gujarati* language weekly founded by social reformer and journalist *Karsondas Mulji* with an intention of social reform.

3. *Child Marriage*

- *1891: Age of Consent Act* passed due to the efforts of B. M. Malabari (child marriage less than 12 years was not allowed)
- *Sarda Act of 1929:* It is also known as *Child Marriage Restraint Act* through which minimum age for marriage at *14 years* for *girls* and *18 years* for *boys* was set.

4. *Education*

- *1835: Thomas Babington Macaulay* presented *Macaulay's Minute* to promote English education in India.
  - He gave *Downward Filtration Theory.*
  - Only rich Indians were to be given education in English medium. *Lord William Bentinck* (Father of English Education in India) was the Governor-General of India during this time.
- ***1854: Wood's Dispatch***
  - It *abrogated* the Downward Filtration Theory.
  - It is also known as *Magna Carta of Indian Education.*
  - According to Wood's Dispatch Primary level education should be given in Vernacular; Secondary level education in Anglo-Vernacular; Higher level education in English.

5. *Certain Women's Organisation Formed*

- ***Bharat Stree Mahamandal (1910) → Founder:*** *Sarla Devi Chaudhurani.*
- ***Ladies Social Conference (1904) → Founder:*** *Ramabai Ranade.*
- ***All India Women's Conference (1927) → Founder:*** *Margaret Cousins.*
- ***Arya Mahila Samaj (1882) → Founder:*** *Pandita Ramabai Saraswati.*

> ***1st university for Indian Women (SNDT) by Dr Dhondo Keshav Karve (1916).***

Struggle against Caste based Exploitation (against Chaturvarna System)

- *Bahishkrit Hitakarini Sabha (1924):* It was established by *B. R. Ambedkar* at *Bombay.*
- *Self Respect Movement (1925):* It was started by *E. V. Ramaswamy Naicker* in *Tamil Nadu.*
  - ***Same movement started by:***
    - Narayan Guru in Kerala.
    - Jyotiba Phule in Maharashtra.
- *Mahad Satyagraha (1927):* It was led by *B. R. Ambedkar* (he also burnt *Manusmriti*).

Raja Ram Mohan Roy and Brahmo Samaj

- He is known as *"Father of Indian Renaissance".*
- He was given the title of *"Raja"* by *Akbar II.*
- *1814:* He established *Atmiya Sabha* in *Calcutta* (Forerunner of Brahmo Samaj).
- *1817:* He founded *Hindu College* in *Calcutta* with the help of *David Hare.*
- *1825:* He established *Vedanta College.*
- *1828:* Raja Ram Mohan Roy founded *Brahmo Sabha,* which later became the *Brahmo Samaj.*
- He also translated *Vedas* in *Bengali.*
- He was against idol worship, polytheism, child marriage.

Writings of Raja Ram Mohan Roy

- ***Gift to Monotheism***
- ***The Percepts of Jesus***
- ***Sambad Kaumudi***
- ***Mirat-ul-Akhbar*** (in Persian language)

> ***1791: First Hindu College (Banaras) was founded by Jonathan Duncan.***

Debendranath Tagore

- *1839:* He started *Tattvabodhini Sabha* along with its organ *Tattvabodhini Patrika* in *Bengali* in *Calcutta.*
- *1858:* He invited *Keshab Chandra Sen* to join the *Brahmo Samaj.*
- Due to difference in philosophical thinking, Brahmo Samaj split into two in *1866,* namely *Brahmo Samaj of India* (led by *Keshab Chandra Sen*) and *Adi Brahmo Samaj* (led by *Debendranath Tagore*).
- Later Adi Brahmo Samaj also got divided and Sadharan Brahmo Samaj was founded by Ananda Mohan Bose in 1878.

Veda Samaj

- *1864:* Veda Samaj was formed in *Madras* by *Keshab Chandra Sen* and *K. Sridharalu Naidu.*
- It is also known as *Brahmo Samaj of South India.*

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Young Bengal Movement *(Late 1820s and Early 1830s)*

- ***Started by:*** *Henry Vivian Derozia.*
- He was a teacher at the Hindu College.

Dharma Sabha → *Revivalist Movement (1830)*

- It was started by *Radhakanta Deb* → He was against the idea of Brahmo Samaj.

Paramhansa Mandali *(1849)* → *(**SSC considers this year as 1840)*

- It was formed by *Dadoba Pandurang* and *Durgaram Mehtaji* in *Maharashtra.*

Prarthana Samaj *(1867)*

- It was formed by *Atmaram Pandurang* in *Maharashtra.*
- *M.G. Ranade* joined it in *1870, R G Bhandarkar* was also a member.

Deoband Movement *(1866)*

- ***Started by:*** *Muhammad Qasim Nanautavi and Rashid Ahmad Gangohi.*
- ***Launched in:*** Saharanpur district in Uttar Pradesh.

Singh Sabha Movement *(1870)*

- It started in *Amritsar.*
- It aimed to revive Sikh faith by bringing back the converts.

Satyasodhak Samaj *(1873)*

- It was formed by *Jyotiba Phule* (he was from Mali/Gardener community) in *Maharashtra* against caste discrimination.
- In *1848,* Jyotiba Phule along with his wife *Savitri Phule* (first female teacher of India) started the first school for girls in *Pune.*
- Books written by Jyotiba Phule: *Gulamgiri, Sarvajanik Satyadharma (both in Marathi).*

Arya Samaj *(1875)*

- It was founded by *Swami Dayanand Saraswati* (original name: *Mool Shankar*).
- First unit of Arya Samaj was opened at *Bombay* and later shifted to *Lahore.*
- He advocated for *Caste less* and *Class less society.*
- He gave slogans *"Go Back to Vedas"* and *"India for Indians".*
- He considered Vedas as infallible but criticised Puranas.
- He believed in Karma and Reincarnation.
- He subscribed (support) the Chaturvarna system on the basis of work not by birth.
- He was against the Idol Worship.
- ***Book written by him:*** *Satyarth Prakash.*
- *1886:* Dayanand Anglo-Vedic (DAV) College in Lahore was established in memory of Swami Dayanand by Mahatma Hansraj.
- *1893:* The Arya Samaj members in Punjab were divided on the question of vegetarianism and modern education. The group that refrained from eating meat were called the *"Mahatma"* group and the other group, the *"Cultured Party".*

Aligarh Movement *(1875)*

- ***Started by:*** *Sir Syed Ahmed Khan.*
- He established a *Mohammaden Anglo Oriental College* in *1875* which was later called *Aligarh Muslim University* in *1920.*
- He also founded Indian Patriotic Association in 1888.

Dev Samaj *(1887)*

- ***Founder:*** *Shiv Narayan Agnihotri* at *Lahore.*

Shuddhi Movement

- It was a purification movement started by *Arya Samaj* for Christian converters to bring back to Hinduism.

Swami Vivekananda

- He started the *Ramkrishna Movement.*
- ***Original Name:*** *Narendranath Dutta.*
- ***His birth:*** *12 Jan 1863* is celebrated as *"National Youth Day".*
- ***Died on:*** *4 July 1902.*
- He believed in idol worship.
- ***Books written:*** *Raja Yoga, Karma Yoga.*
- *1893:* Swami Vivekananda gave a speech in *Chicago (USA)* in a conference.
- He advocated on how to make balance between Materialism and Spiritualism.
- *Swami Vivekananda Rock Memorial* is in *Tamil Nadu* (Kanyakumari).

Ramkrishna Mission/Ramkrishna Movement *(1897)*

- It was started by *Swami Vivekananda* in the memory of his *Guru Ramkrishna Paramhansa* (Priest of Kali Mandir in Calcutta) → Original name: *Gadadhar Chattopadhyay.*
- ***HQ:*** *Belur Math; Howrah (West Bengal).*
- According to him *"Service to man is service to God".*

Balshashtri Jambhekar

- ***He started two newspapers:*** *Darpan and Digdarshan.*
- He is remembered as the *"Father of Marathi Journalism".*

Gopal Hari Deshmukh

- ***Pen name:*** *Lokhitwadi.*
- ***He started weekly newspapers:*** *Prabhakar and Hitechhu.*

Gopal Ganesh Agarkar

- ***He started a weekly:*** *Sudharak.*

Servants of India Society *(1905)*

- ***Founder:*** *Gopal Krishna Gokhale.*
- He was political Guru of *Gandhi* and *Jinnah.*

Seva Sadan *(1908)*

- ***Founder:*** *B. M. Malabari.*
- He worked against child marriage and for widow remarriage.

Social Service League *(1911)*

- ***Founder:*** *Narayana Malhar Joshi* at *Bombay.*

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• He also started *All India Trade Union Congress* in *1920*.

Faraizi Movement *(1818)*
• ***Started by:*** *Haji Shariatullah.*

Wahabi Movement
• ***Started by:*** *Sayyid Ahmad Barelvi* of Rae Bareli.

SOCIO RELIGIOUS REFORM MOVEMENTS IN SOUTH INDIA

Satnami Movement
• It started in 1820s in *Chhatisgarh* region by *Guru Ghasidas* who belonged to Satnami sect.
• He worked with the leatherworkers in 1870.

Theosophical Society *(1875)*
• It was started in *New York (USA)* by *HP Blavatsky* and *HS Olcott*.
• The society's HQ was shifted to *Adyar Madras* from *New York* in *1882*.
• Later *Annie Besant* took its membership.
• This society was highly influenced by Hindu belief system.

Indian National Social Conference *(1887)*
• ***Founders:*** *M. G. Ranade* and *Raghunath Rao*.
• *Pledge Movement* was started by them against child marriage.

Shree Narayana Guru Dharam Paripalana (SNDP) Movement
• ***Started by:*** *Shree Narayan Guru Swami* for the upliftment of *Ezhavas Community* of *Kerala*.
• ***Important slogan:*** *"Oru Jathi, Oru Matham, Oru Daivam"* (One Caste, One Religion, One God for All).

Stri Purush Tulna was written by: Tarabai Shinde.

Justice Movement *(1917)*
• ***Started by:*** *C. N. Mudaliar, T. M. Nair and P. Tyagaraja.*

Self Respect Movement *(1925)*
• ***Founder:*** *E. V Ramaswamy Naicker* (also known as *Periyar*).

Temple Entry Movement *(for the entry of Dalits in temple)*
• In *North India (1930)*, it was started by *B. R. Ambedkar*.
• In *South India (1924)*, it was started by *T. K. Madhavan*.
• *Vaikom Satyagraha (1924)*, it was started by *K. P. Keshava*.

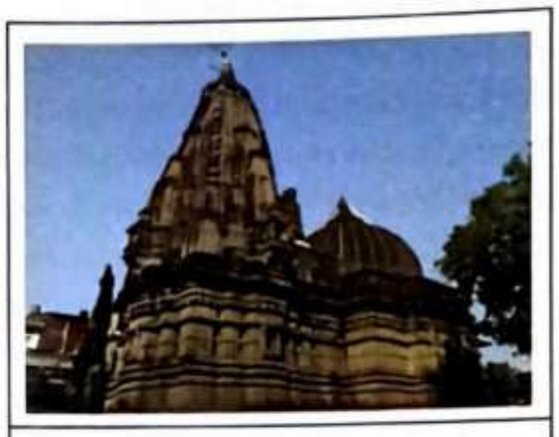


Fig 1: Kalaram Temple, Nashik
• B. R. Ambedkar started Temple Entry Movement in 1930 here for the entry of Dalits in this temple.

PARMAR'S CROSSWORD

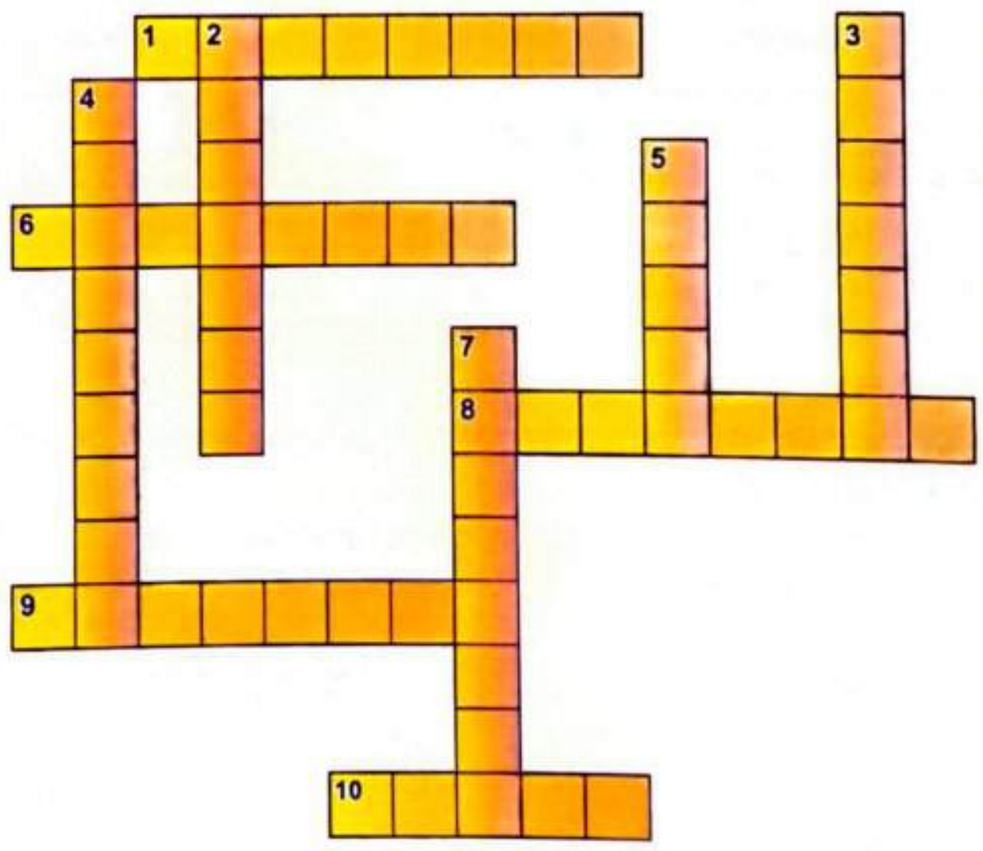
SOCIO RELIGIOUS REFORMS

Across

1. Established Brahmo Samaj in Calcutta.
6. Founded Arya Samaj in 1875.
8. Led temple entry movement in 1927.
9. Promoted widow remarriage in Maharashtra.
10. Led Singh Sabha Movement in 1873.

Down

2. Founder of Prarthana Samaj in Bombay.
3. Author of Gulamgiri.
4. Founded Theosophical Society in New York.
5. Founded Satyashodhak Samaj.
7. Started Atmiya Sabha in 1814.



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PRE-1857 REVOLTS

Reasons for Land Revolts in India

• Before Independence, there were three major land reforms prevailing in the country:

1. *Permanent Settlement*
2. *Ryotwari System*
3. *Mahalwari System*

> *Lord Cornwallis introduced Daroga System replacing Zamindari Thanedars.*

Permanent Settlement *(1793)*

• ***Introduced by:*** *Lord Cornwallis.*

• It is also known as *"Zamindari System"*.

• Under the Zamindari system, the land revenue was collected from the farmers by the intermediaries known as Zamindars (the middle man).

• ***It was introduced in:*** *Bengal, Bihar, Orissa, Uttar Pradesh, and Madhya Pradesh.*

> A *sunset clause* was introduced in the Zamindari system that required zamindars to pay a fixed amount of revenue by a specific date, before sunset. If the zamindars failed to pay the revenue on time, the government would confiscate and auction off their *zamindari*, which was ***hereditary***.

Ryotwari System *(1820)*

• ***Introduced by:*** *Munro and Reed.*

• It was based on *Ricardian Theory of Rent*.

• Under the Ryotwari system *(Ryot: Peasant)*, the land revenue was paid by the farmers directly to the state.

• ***It was introduced in:*** *South India* (Madras region of Tamil Nadu).

Mahalwari System *(1822)*

• ***Introduced by:*** *Holt Mackenzie* in *Punjab* and *Northwestern province.*

• Under the Mahalwari system, the land revenue was collected from the farmers *by the village headmen on behalf of the whole village* (and not the zamindar).

• The village or group of villages was termed a *"Mahal"* and treated as a single revenue unit.

REVOLTS

Sanyasi Revolt *(1763)*

• It started in *Bihar* and *Bengal*.

• ***Leaders:*** *Majnu Shah, Bhawani Pathak,* and *Debi Chaudhurani* (female participant).

• Governor-General *Warren Hastings* faced the persistent Sanyasi and Faqir disturbances in Bengal and Bihar.

• *Bankim Chandra Chatterjee's* novel *"Anand Math"* mentions about *Sanyasi Rebellion* of 1763.

Paika Revolt *(1817)*

• It started in *Odisha*.

• ***Leaders:*** *Bakshi Jagbandhu Bidyadhar* (Military Commander of Khurda kingdom).

Pagal Panthis *(1825)*

• It started in *Bengal* region.

• ***Leaders:*** *Karam Shah* and *Tipu Shah.*

Ahom Revolt (1828)

• It started in *Assam*.

• ***Leaders:*** *Gomdhar Konwar.*

> ***Battle of Saraighat*** **(1671)**
>
> • ***It was fought between:*** *Mughals and Ahom Kingdom.*
>
> • ***The Ahom forces was led by*** *Lachit Borphukan and the Mughal forces were led by Ram Singh.*
>
> • ***Mughals were defeated.***

Kol Mutiny *(1831)*

• ***Leaders:*** *Budho Bhagat.*

Birsa Munda

Moplah Uprising *(1836)*

• It started in *Malabar* region.

Ho and Munda Uprising *(1820 and 1837)*

• It is also known as *Ulgulan Uprising.*

• It started in *Ranchi* and *Singhbhum.*

• This revolt was fuelled by resentment against *"Dikus"* (outsiders).

• The arrival of Dikus and the introduction of colonial land revenue system posed a direct threat to the *Khuntkatti System* (collective ownership).

• ***Leader:*** *Birsa Munda.*

• ***Birth:*** *15 Nov 1875* (celebrated as *Janjatiya Gaurav Diwas* and *Jharkhand Foundation Day*).

• ***Death:*** *1900.*

Gadkari Uprising *(1844)*

• It started in *Kolhapur*.

Santhal Rebellion *(1855)*

• It started in *Damini-e-Koh*, a large tract of forested hilly land in the Jharkhand region particularly around the *Rajmahal Hills* demarcated in 1832.

• This large area of land was demarcated and declared to be the land of the *Santhals* (Santhal is the *3rd largest tribe* in India).

• ***Leaders:*** *Sidhu and Kanhu Murmu.*

Indigo Revolt *(1859)*

• It started in *Nadia* (District) of *Bengal*.

• ***Leaders:*** *Digambar Biswas* and *Bishnucharan Biswas.*

• It was against the exploitative practices of British planters who forced Indian farmers to cultivate *indigo* instead of food crops on their land.

• It was a successful revolt.

• *Dinbandhu Mitra* wrote *"Nil Darpan"* (a play about Indigo Revolt).

1857 REVOLT

Causes of 1857 Revolt

British Policies

1. ***General Service Establishment Act***

• *Lord Canning* brought this Act that mandated Indian soldiers of the Bengal Army to be sent overseas for duty.

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2. Doctrine of Lapse

• It was introduced by *Lord Dalhousie* in *1848*.

• If an Indian ruler died without a male heir, his kingdom would *"lapse"* and automatically become part of the East India Company's territories.

Acquired places under Doctrine of Lapse:

1. *Satara: 1848*
2. *Sambalpur, Jaitpur: 1849*
3. *Udaipur: 1852*
4. *Jhansi: 1853*
5. *Nagpur: 1854*

> • ***Dalhousie stated that "Awadh is like that cherry that will drop into our mouth one day".***
> • ***Awadh was captured on the grounds of Misgovernance.***
> • ***Mirza Wajid Ali Shah was the last Nawab of Awadh.***

Sepoy Mutiny

• Introduction of *"Enfield"* rifle: It was said that the cartridge of the rifle was wrapped in the *fat of cow* and *pig*. The cartridge had to be bitten off before loading it into the gun, thus Hindu and Muslim soldiers were reluctant to use it.

• Mangal Pandey was a sepoy in the ***34th Bengal Native Infantry*** at *Barrackpore*.

• On *29th March 1857*, he attacked British officers in Barrackpore.

• He was hanged on *8th April 1857*.

• On *9th May 1857*, 85 sepoys in Meerut were dismissed and sentenced to 10 years in jail for refusing to use the Enfield cartridges.

• The Revolt of 1857 began in Meerut on *10th May, 1857* with the march towards Delhi.

Hotspots of the 1857 Revolt

• *In Delhi: Bahadur Shah Zafar II* (the last Mughal ruler of India and was exiled to *Rangoon, Burma* (now Myanmar) after the war).

• ***Actual prominent leader:*** *General Bhakt Khan.*

> • ***Ishtahars: They glorified the co-existence of different communities under the Mughal Empire.***

Leaders of 1857 Revolt

• ***Delhi:*** *General Bhakt Khan and Bahadur Shah II.*

• ***Lucknow:*** *Begum Hazrat Mahal.*

• ***Kanpur:*** *Nana Saheb* (adopted son of Baji Rao II)/*Tantia Tope.*

• ***Bihar:*** *Kunwar Singh (landlord).*

• ***Bareilly:*** *Bahadur Khan Rohilla.*

• ***Jhansi:*** *Rani Lakshmibai* → Original name: *Manikarnika Tambe* (Manu).

• ***Faizabad:*** *Maulvi Ahmadullah* (also known as Danka Shah).

• ***Uttar Pradesh:*** *Shah Mal.*

> ***Tomb of Rani Lakshmibai is situated in Gwalior.***

Suppressors of Revolt

• ***Delhi:*** *John Nicholson.*

• ***Lucknow:*** *Henry Lawrence.*

• ***Kanpur:*** *Colin Campbell.*

• ***Jhansi:*** *Hugh Rose.*

• On *20th June 1858* in *Gwalior* → The revolt was fully suppressed.

Aftermath of Revolt

Government Of India Act 1858

• East India Company was abolished.

• *Queen's Proclamation* → *Crown Rule* (transfer of power from East India Company to the British Crown). *Queen Victoria* was the then Queen.

• The British significantly restructured the Indian Army, and the proportion of Indian soldiers was *reduced* (on the recommendation of the *Peel Commission*).

• Governor-General became *Viceroy* → ***1st Viceroy: Lord Canning.***

Reasons for Faliure of 1857 Revolt

• Due to limited territorial and social base, the revolt was primarily concentrated in North India.

• Due to lack of coordination and leadership.

• Due to lack of political perspective.

Comments

• *V D Savarkar* stated it as *"First war of Independence"*.

• *RC Majumdar:* It is neither "First", nor "National" nor a "War of Independence".

Deccan Revolt (1875)

Pabna Revolt *(1873-1876)*

• ***Started by:*** *Ishan Chandra Roy* also known as *"Bidrohi Raja"* or *"Rebel King"*.

Ramosi Peasant Force *(1879)*

• ***Founded by:*** *Vasudev Balwant Phadke* in *Maharashtra*.

For an interactive recap of this topic, see the crossword on Page Number 131.

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ASSOCIATIONS FORMED BEFORE CONGRESS

• Few regional level associations were formed before Congress.

1. **Bangabhasha Prakasika Sabha**

• *1836:* It was started by associates of *Raja Ram Mohan Roy*

2. **East India Association**

• *1866:* It was founded by *Dadabhai Naoroji* in *London.*

3. **Poona Sarvajanik Sabha**

• *1870:* It was started by *M G Ranade* (in Maharashtra)

4. **Indian League**

• *1875:* It was founded by *Sisir Kumar Ghosh*

• He founded Bengali newspaper: *Amrita Bazar Patrika*

5. **Indian National Association**

• *1876:* It was founded by *Surendranath Banerjee and Anand Mohan Bose*

6. **Madras Mahajan Sabha**

• *1884:* It was founded by *M. Viraraghavachari , G. Subramanian Iyer and P. Ananda Charlu*

7. **Bombay Presidency Association**

• *1885:* It was founded by *Pherozeshah Mehta, K. T. Telang, and Badruddin Tyabji*

DADABHAI NAOROJI

• ***He was the first Indian British*** member ***of Parliament.***

• ***He presided three sessions of Congress (1886, 1893, 1906).***

• ***He prepared the first estimate of the National Income of India in 1876 (he is also known as "Father of National Income*** in India"***).***

• ***He used the term "Swaraj" for the first time.***

• ***He is also known as "Grand Old Man of India".***

• ***Rast Goftar (a weekly newspaper by him for Parsi community) and Voice of India.***

• ***Book written: "Poverty and Un-British Rule in India" (explains the Drain of Wealth Theory).***

• ***He also started a movement called "Rahnumai Mazdayasnan Sabha" in 1851 along with Naoroji Furdonji and S.S. Bengalee.***

FORMATION OF CONGRESS

• ***Founder:*** It was formed by *Allan Octavian Hume in 1885* known as *Father of Indian Ornithology*

• ***1885:*** First meeting was called upon in *Poona* however due to plague the venue was changed to *Bombay*

• First Session was held at *Gokuldas Tejpal Sanskrit College, Bombay* (*72 delegates attended* this first Session, where only *two Muslim members and no women participated*).

• ***Immediate cause for the formation of INC was:***

Ilbert Bill, 1883

• It was a measure that allowed senior Indian magistrates to preside over cases involving British Subjects in India → But this received a huge backlash from Britishers. Due to which it had to be taken back and this exposed the Real face of Britishers to Indians.

DIFFERENT THEORIES

• ***Saftey Valve Theory:*** *Lala Lajpat Rai* (monthly magazine by him: *Young India*)

• ***Conspiracy Theory:*** *R. P. Dutt*

• ***Lightning Conductor Theory:*** *Gopal Krishna Gokhale*

Dufferin was the Viceroy at the time of formation of Congress and called Congress a "Factory of Sedition".

IMPORTANT SESSIONS OF CONGRESS

• **First Session:** 1885 → Headed by W. C. Banerjee in Bombay, where 72 Delegates attended it.

• **Second Session:** 1886 → Headed by Dadabhai Naoroji in Calcutta, where *434* Delegates attended it.

• **Third Session:** 1887 → Headed by Badruddin Tyabji in Calcutta. He was the *first Muslim President* of Congress.

• **Fourth Session:** 1888 → Headed by George Yule in Allahabad. He was the *first British President* of Congress

• **1896:** Held in Calcutta. Our National Song, *Vande Mataram* was sung for the first time by *Rabindranath Tagore* (***written by:*** *Bankim Chandra Chatterjee*).

• **1901:** Held in Calcutta. Mahatma Gandhi participated in this INC Session for the first time.

• **1905:** Headed by Gopal Krishna Gokhale in Benaras. *Swadeshi Movement* was formally adopted here.

• **1906:** Headed by Dadabhai Naoroji in Calcutta. Four resolutions: *Swaraj, Swadeshi, Boycott, and National Education* were adopted.

• **1907:** Headed by Rash Behari Ghosh in Surat. In this Session the *Congress split into Extremists and Moderates.*

• **1911:** Held in Calcutta. Our National Anthem, *Jana Gana Mana* written by *Rabindranath Tagore* was first sung in this Session.

• **1916:** Headed by Ambika Charan Mazumdar in Lucknow leading to merger of Congress. A *Joint Pact* also known as *Lucknow Pact* was signed between the *Muslim League and Indian National Congress.*

• **1917:** Headed by Annie Besant in Calcutta (*first Women President of Congress*).

• **1924:** Headed by Mahatma Gandhi (*only Session presided by him*) in Belgaum (Karnataka).

• **1925:** Headed by Sarojini Naidu (*first Indian women President of Congress* and *first women Governor of India state (Uttar Pradesh)*) in Kanpur.

• **1929:** Headed by Jawaharlal Nehru in Lahore. The INC passed the resolution for complete independence or *Purna Swaraj* (*January 26, 1930* was officially declared to be celebrated as *first Independence Day*).

• **1931:** Headed by Sardar Patel in Karachi.

• **1937:** Headed by J L Nehru in Faizpur (*first Session to be held in a village*)

1938-1939: Mahatma Gandhi Vs Subhash Chandra Bose

• In *1938* Session, held at *Haripura (Gujarat)* and S C Bose was *elected as President of INC.*

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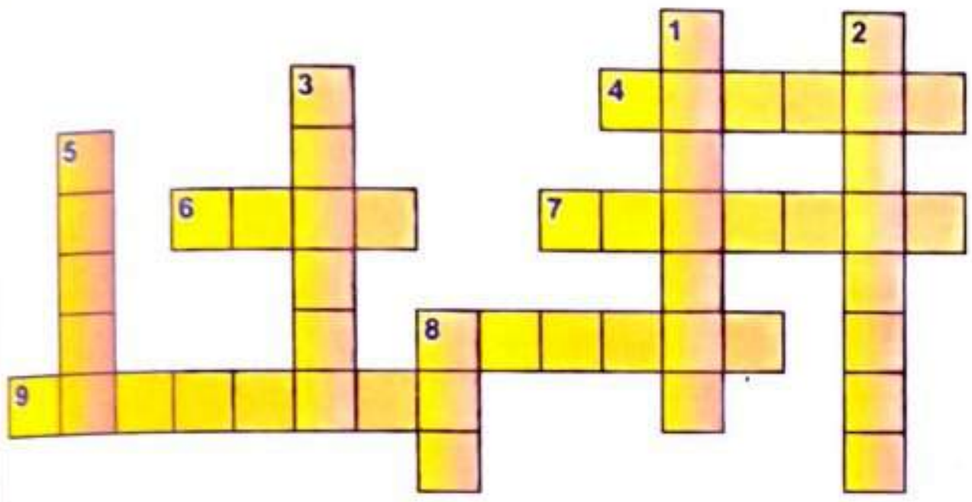
• In 1939 Session, held at *Tripuri* and S C Bose was *re-elected* by defeating Gandhi's candidate Pattabhi Sitaramayya, but later S C Bose resigned.

- ***Rajendra Prasad was elected as President in 1939.***
- ***Madan Mohan Malviya presided INC Session most number of times.***
- ***JB Kriplani: President during the time of Independence.***
- ***Youngest President of INC: Abul Kalam Azad***

Note: It is advisable to read about the Sessions after you have read the entire Modern History.

PARMAR'S CROSSWORD

REVOLT OF 1857



Across

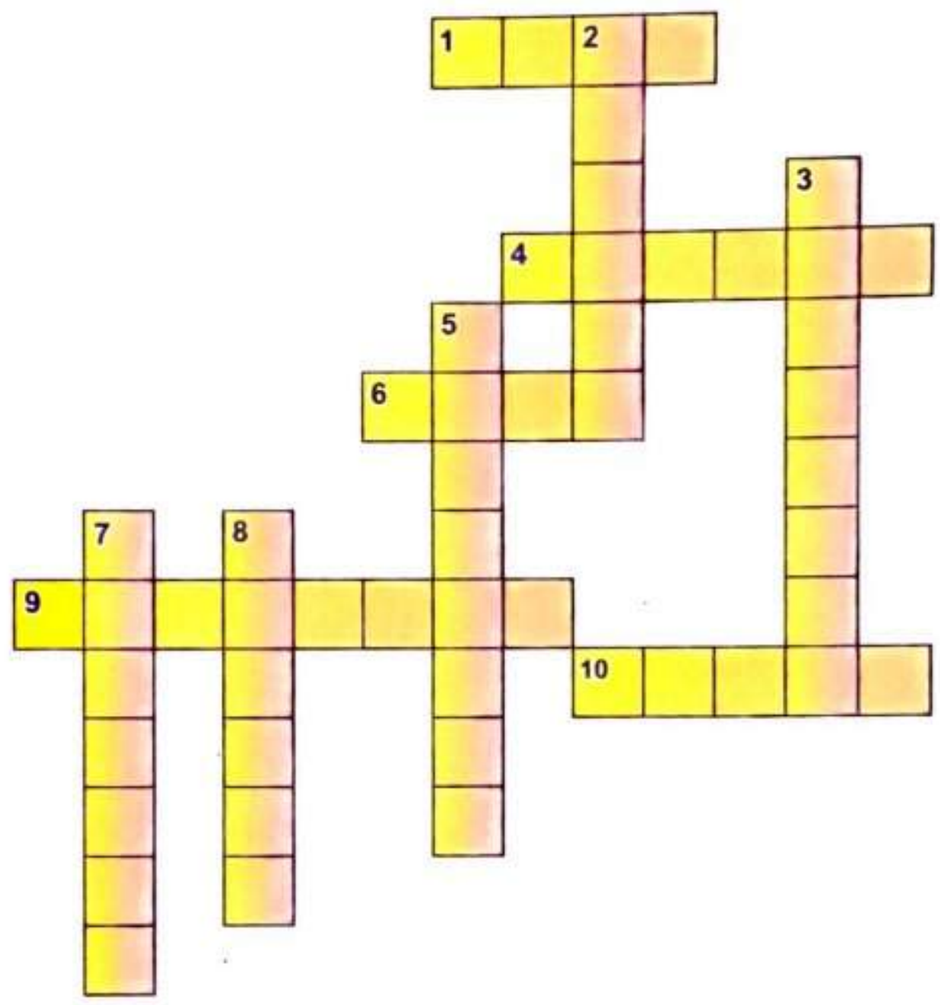
4. First martyr of 1857 revolt.
6. Rebel leader of Kanpur.
7. Battle linked with British supremacy before revolt.
8. City from where the revolt of 1857 started.
9. Issued the Queen's Proclamation in 1858.

Down

1. Mughal emperor declared leader of revolt.
2. Khan Bahadur led revolt from which region.
3. Leader of 1857 revolt in Bihar.
5. Sepoys reached Red Fort to meet Bahadur Shah.
8. Month when sepoys revolted in 1857.

PARMAR'S CROSSWORD

INDIAN NATIONAL CONGRESS



Across

1. First British President of Congress in 1888.
4. First session of Indian National Congress was held in which city.
6. Founder of Indian National Congress.
9. First session was presided by whom.
10. What happened in Surat session, 1907.

Down

2. Poorna Swaraj resolution passed in which session.
3. First Indian woman to become INC President.
5. Viceroy during the formation of Congress.
7. President of second session in Calcutta, 1886.
8. First woman President of Indian National Congress.

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BENGAL PARTITION: 1905

• *Lord Curzon (1899-1905)*, the then Viceroy of India, *proposed the partition in 1905.*

• The partition created a divide between *Hindus and Muslims*, leading to communal tensions that would echo throughout India's struggle for independence.

Bengal 1905-1911

	Bengal (Mid-1911)	Eastern Bengal & Assam (Mid-1911)
Area (Km²)	366,692	275,938
Population (Mn)	54	31
Muslims (Mn)	9	10
Muslims (%)	16.67	58.06

Bengal constituted 1/4th of the total British India population

Revolutionary Policies of Lord Curzon

1. ***Calcutta Corporation Act, 1899***
2. ***Official Secrets Act, 1904 (to curb the freedom of Press)***
3. ***Indian University Act, 1904***
4. ***Bengal Partition, 1905***

Bengal was divided into:

1. ***East Bengal (Muslim) → At present: Assam and Bangladesh***
2. ***West Bengal (Hindu) → At present: West Bengal, Odisha, and Bihar***

Reasons given by Britishers for Partition of Bengal

• The British justified the partition of Bengal in 1905 primarily on grounds of *administrative convenience* and the need to improve governance in a region with a large and diverse population.

• The actual reason was to *"Weaken the Bengal" (the nerve centre of Nationalist activities).*

• ***Partition announced on: July, 1905***

• ***Partition came into force on: October, 1905***

SESSIONS OF CONGRESS

1905 Session of Congress

• The Session happened in *Benaras* and was presided over by *G. K. Gokhale.*

• It approved *Anti Partition Movement/Swadeshi Movement.*

The formal proclamation of the Swadeshi Movement (foreign made goods and products were to be boycotted) was made on *7th August 1905 in Calcutta Townhall.*

1906 Calcutta Session of Congress

• It was presided over by *Dadabhai Naoroji.*

Four Important Resolutions were Taken in this Session:

• ***Swaraj as a goal adopted***

• ***Boycott of foreign goods***

• ***Swadeshi***

• ***National Education (formation of National Education Council)***

1907 Surat Session of Congress

• It was presided by *Rash Behari Ghosh.*

• In this Session, the Congress split into Moderates and Extremists.

Reasons for their Separation

• The *role of the INC in the manner of opposing the Partition of Bengal* was the main cause of the Split.

• The Extremists wanted the agitation to be a mass struggle all over the country. But the Moderates still had faith in the British administration and wanted to confine the boycott to Bengal and foreign goods only.

• Britishers adopted *"Carrot and Stick Model"* within Congress.

└ *Carrot:* Appeasement to Moderates; *Stick:* Suppressing Extremists.

MODERATES AND EXTREMISTS

• ***Methods adopted by Moderates were:*** Petitions, newspapers, pamphlets

Moderates

• ***SN Banerjee, KK Mitra, GK Gokhale, Pherozshah Mehta, etc.***

Extremists

• ***Lala Lajpat Rai, Bal Gangadhar Tilak, Bipin Chandra Pal, Aurobindo Ghosh***

Bande Matram journal was written by: Bipin Chandra Pal.

Methods Adopted by Extremists

According to Extremists:

• They had hatred for foreign rule; since no hope could be derived from it. *Swaraj to be goal* of national movement.

• Direct political action was required.

• Belief in capacity of masses to challenge the authority.

• Personal sacrifices required and a true nationalist to be always ready for it.

• Formation of ***Swadesh Bandabh Samiti by Ashwini Kumar Dutta at Barisal (in Bangladesh now).***

• National Educational Centres to be formed.

• ***Indigenous Enterprise: Swadeshi Steam Navigation Company by V.O. Chidambaram Pillai in Tamil Nadu***

Bal Gangadhar Tilak

• He organised Ganpati, Shivaji festivals to attract and mobilise the youth (in Maharashtra).

• He was titled as *"Father of Indian Unrest"* By *Valentine Chirol* in his book *"India Unrest"*.

• He is famously known as *"Lokmanya Tilak"*.

• Newspapers Published:

├ ***Mahratta (in English)***

└ ***Kesari (in Marathi)***

B.G. Tilak

Newspapers during Anti-partition Movements

• ***Hitabadi by: Dwijendranath Tagore***

• ***Sanjibani by: Krishna Kumar Mitra***

• ***Bengalee by: Surendranath Banerjee***

• ***B.G. Tilak said that:*** *Freedom is my Birth Right and I Shall have it.*

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Abanindranath Tagore

- He painted the image of *Bharat Mata* in *1905*. The painting was a symbol of nationalism during the Indian independence movement.
- He was the principal artist of *Indian School of Oriental Art (1907)*.

Actions to Show Unity

- People tied Rakhi to each other to show unity
- Rabindranath Tagore wrote a song: *Amar Sonar Bangla* (now it is National Anthem of *Bangladesh*).
- *Sudesa Geethangal*, a collection of poems was written by *Subramaniya Bharti*.
- People sang *Vande Matram* (National Song); however Government banned it.

The painting of Bharat Mata

Leaders

- ***Poona and Bombay: Bal Gangadhar Tilak***
- ***Delhi: Sayed Haider Raza***
- ***Madras: Chidambaram Pillai***
- ***Punjab: Lala Lajpat Rai***

Response of Muslims

- Muslims did not support Anti-Partition Movement.
- Formation of *All-India Muslim League* on *30th Dec 1906 in Dhaka* (now Bangladesh) by *Nawab Khwaja Salimullah and Aga Khan*.

INDIA COUNCIL ACT, 1909

- The Indian Council Act of 1909 is also known as *Morley-Minto Reform*. *Lord Morley was the then Secretary of State and Lord Minto was the then Viceroy of India*.
- The provision for separate electorate for Muslim was introduced by ***Lord Minto*** (he is also known as *"Father of Communal Electorate"*)
- Viceroy Executive Council will have one Indian → *First Indian* to be a part of it was *Satyendra Prasad Sinha*.

Annulment of Partition

- In *1911, Lord Hardinge II* organised *Delhi Durbar (3rd Delhi Durbar)* for the coronation of *King George V* (capital was shifted from Calcutta to Delhi in 1911) → Delhi Durbars have been organised three times in: *1877, 1903, 1911*.
- In 1911, King George V announced the reunification of Bengal during the Delhi Durbar.

REVOLUTIONARY ACTIVITIES

- 1902: Anushilan Samiti (Bengal) was formed by Satish Chandra Basu, Jatindranath Banerjee, Barindra Kumar Ghosh
  - In Patna, this Samiti was founded by Sachin Sanyal
- 1890: Shivaji and Ganpati festivals organised
- 1897: The Chapekar brothers *assassinated W. C. Rand (Plague Commissioner of Poona)*
- 1899: Mitra Mela was founded by Savarkar Brothers in Poona
- 1904: Mitra Mela was merged with Abhinav Bharat Society by V. D Savarkar
- 1905: Indian Home Rule and Indian House was formed by Shyamji Krishna Verma in London
  - ***Journal written:*** *The Indian Sociologist*
- 1907: Madam Bhikaji Cama became the *first Indian to hoist Indian Flag on foreign soil (in Stuttgart, Germany)*. She published *journal Vande Mataram*.
  - The flag hoisted by Madam Bhikaji was smuggled into British India by *Indulal Yagnik*
- 1908: Alipore Bomb Conspiracy / Manicktolla Bomb Conspiracy (this was an attempt to murder judge of Muzaffarpur) → Khudiram Bose and Prafulla Chaki were involved in this. Kanailal Dutta killed the witness of this incident.
  - Prafulla Chaki committed suicide and Khudiram Bose was hanged in *Muzaffarpur jail*.
- 1909: Madan Lal Dhingra killed Curzon Wyllie
- 1909: AMT Jackson was killed by Anant Lakshman
- 1910: United India House (in USA) was founded by Taraknath Das and G.D. Kumar
- 1913: Ghadar Party was formed in San Francisco *(HQ: USA)* by:
  - ***Lala Hardayal, Sohan Singh Bhakna (First President of Gadar), Barkatullah, Parmanand, Kartar Singh***
- 1915: Berlin Committee was formed by Virendranath Chattopadhyay

In 1911, V. D. Savarkar was sent to Cellular Jail in Andaman & Nicobar Islands

Komagata Maru Incident, 1914

- A *Japanese ship* taken on lease by Sikh businessman and sailed to Vancouver (Canada) from *Hong Kong*.
- This incident involved a ship carrying *376 Indian passengers, primarily Sikhs* who were denied entry to Canada due to discriminatory immigration laws. Forced to return to India, they faced further mistreatment, highlighting the struggle against racial discrimination and colonial operation.

Defence of India Act 1915

- This Act was enacted by the British government in India *to suppress the Ghadrites particularly in Punjab*, during World War I.
- This Act was later replaced by a *Permanent Act called Rowlatt Act*.

World War I

- In *1914, World War I began* → It was fought between the *Central Powers and the Allied Powers*.

Allies of World War I (they won the war)

- ***Belgium, France, Great Britain (and Commonwealth), Italy, Japan, Russia, and USA***

The Central Power

- ***Austria-Hungry, Bulgaria, Germany, and Ottoman Empire (Turkey)***

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Abanindranath Tagore

- He painted the image of *Bharat Mata* in 1905. The painting was a symbol of nationalism during the Indian independence movement.
- He was the principal artist of *Indian School of Oriental Art (1907)*.

Actions to Show Unity

- People tied Rakhi to each other to show unity
- Rabindranath Tagore wrote a song: *Amar Sonar Bangla* (now it is National Anthem of *Bangladesh*).
- *Sudesa Geethangal*, a collection of poems was written by *Subramaniya Bharti*.
- People sang *Vande Matram* (National Song); however Government banned it.

The painting of Bharat Mata

Leaders

- ***Poona and Bombay: Bal Gangadhar Tilak***
- ***Delhi: Sayed Haider Raza***
- ***Madras: Chidambaram Pillai***
- ***Punjab: Lala Lajpat Rai***

Response of Muslims

- Muslims did not support Anti-Partition Movement.
- Formation of *All-India Muslim League* on *30th Dec 1906 in Dhaka* (now Bangladesh) by *Nawab Khwaja Salimullah and Aga Khan*.

INDIA COUNCIL ACT, 1909

- The Indian Council Act of 1909 is also known as *Morley-Minto Reform*. *Lord Morley was the then Secretary of State and Lord Minto was the then Viceroy of India*.
- The provision for separate electorate for Muslim was introduced by *Lord Minto* (he is also known as *"Father of Communal Electorate"*)
- Viceroy Executive Council will have one Indian → *First Indian* to be a part of it was *Satyendra Prasad Sinha*.

Annulment of Partition

- In *1911, Lord Hardinge II* organised *Delhi Durbar (3rd Delhi Durbar)* for the coronation of *King George V* (capital was shifted from Calcutta to Delhi in 1911) → Delhi Durbars have been organised three times in: *1877, 1903, 1911*.
- In 1911, King George V announced the reunification of Bengal during the Delhi Durbar.

REVOLUTIONARY ACTIVITIES

- 1902: Anushilan Samiti (Bengal) was formed by Satish Chandra Basu, Jatindranath Banerjee, Barindra Kumar Ghosh
  - In Patna, this Samiti was founded by Sachin Sanyal
- 1890: Shivaji and Ganpati festivals organised
- 1897: The Chapekar brothers *assassinated W. C. Rand (Plague Commissioner of Poona)*
- 1899: Mitra Mela was founded by Savarkar Brothers in Poona
- 1904: Mitra Mela was merged with Abhinav Bharat Society by V. D Savarkar
- 1905: Indian Home Rule and Indian House was formed by Shyamji Krishna Verma in London
  - ***Journal written:*** *The Indian Sociologist*
- 1907: Madam Bhikaji Cama became the *first Indian to hoist Indian Flag on foreign soil (in Stuttgart, Germany)*. She published *journal Vande Mataram*.
  - The flag hoisted by Madam Bhikaji was smuggled into British India by *Indulal Yagnik*
- 1908: Alipore Bomb Conspiracy / Manicktolla Bomb Conspiracy (this was an attempt to murder judge of Muzaffarpur) → Khudiram Bose and Prafulla Chaki were involved in this. Kanailal Dutta killed the witness of this incident.
  - Prafulla Chaki committed suicide and Khudiram Bose was hanged in *Muzaffarpur jail*.
- 1909: Madan Lal Dhingra killed Curzon Wyllie
- 1909: AMT Jackson was killed by Anant Lakshman
- 1910: United India House (in USA) was founded by Taraknath Das and G.D. Kumar
- 1913: Ghadar Party was formed in San Francisco *(HQ: USA)* by:
  - ***Lala Hardayal, Sohan Singh Bhakna (First President of Gadar), Barkatullah, Parmanand, Kartar Singh***
- 1915: Berlin Committee was formed by Virendranath Chattopadhyay

> ***In 1911, V. D. Savarkar was sent to Cellular Jail in Andaman & Nicobar Islands***

Komagata Maru Incident, 1914

- A *Japanese ship* taken on lease by Sikh businessman and sailed to Vancouver (Canada) from *Hong Kong*.
- This incident involved a ship carrying *376 Indian passengers, primarily Sikhs* who were denied entry to Canada due to discriminatory immigration laws. Forced to return to India, they faced further mistreatment, highlighting the struggle against racial discrimination and colonial operation.

Defence of India Act 1915

- This Act was enacted by the British government in India *to suppress the Ghadrites particularly in Punjab*, during World War I.
- This Act was later replaced by a *Permanent Act called Rowlatt Act*.

World War I

- In *1914, World War I began* → It was fought between the *Central Powers and the Allied Powers*.

Allies of World War I (they won the war)

- ***Belgium, France, Great Britain (and Commonwealth), Italy, Japan, Russia, and USA***

The Central Power

- ***Austria-Hungry, Bulgaria, Germany, and Ottoman Empire (Turkey)***

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During the World War I, in the context of the Indian nationalist:

- The Moderates supported the war as a *matter of duty*.
- The Extremists supported the war, hoping for future *self-governance* in return.
- While the Revolutionaries, saw the war as an *opportunity to actively fight against* British rule and seek immediate Independence through forceful means.

HOME RULE LEAGUE (HRL), 1916

- ***Two Home Rule Leagues were formed by:*** Bal Gangadhar Tilak and Annie Besant, both in *1916*.
- After B G Tilak's death in *1920*, his Home Rule League was re-named as *Swarajya Sabha by M K Gandhi*.

Bal Gangadhar Tilak's HRL	Annie Besant's HRL
• *HQ:* Poona • It was founded first. • *Centre:* Maharashtra *(excluding Bombay City)*, Karnataka, Central Province, Berar	• *HQ:* Madras • It had more branches of HRL. • *Centre:* Madras and Bombay City

LUCKNOW SESSION, 1916

- This session was presided over by *Ambika Charan Mazumdar*.
- In this session:
  1. Reunion of Extremists and Moderates
  2. *Lucknow Pact* (a Joint Pact) was signed between *INC* and *Muslim League*.

Writings

- ***New India and Common Weal by: Annie Besant***
- ***Al Hilal (a weekly Urdu-language newspaper) by: Maulana Abul Kalam Azad (he also wrote a book: India Wins Freedom)***
- ***Comrade (a weekly English-language newspaper): Maulana Md. Ali***

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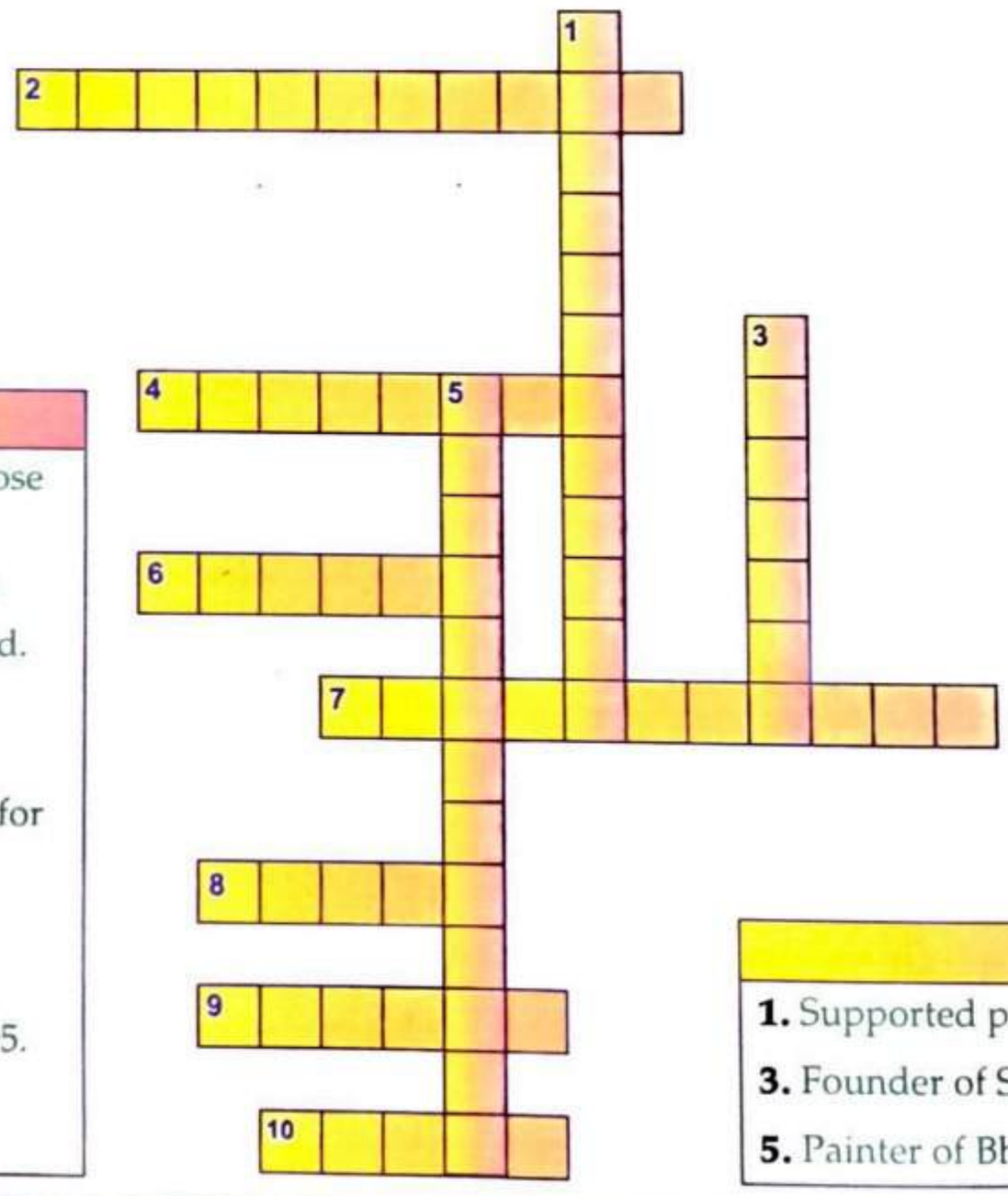
BENGAL PARTITION



Across

2. Jail where Khudiram Bose was hanged.
4. Venue where Swadeshi Movement was declared.
6. Viceroy during Bengal Partition.
7. Reason cited by British for partition.
8. Founder of Swadeshi Bandhab Samiti.
9. Province divided in 1905.
10. New capital of India after 1911.

Down

1. Supported partition of Bengal.
3. Founder of Servants of India Society.
5. Painter of Bharat Mata.

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MAHATMA GANDHI

- *Full name:* Mohan Das Karamchand Gandhi
- *Birth:* 2nd October 1869 in Porbandar, Gujarat
- *Mother:* Putlibai Gandhi
- *Father:* Karamchand Gandhi

Gandhi's Work in South Africa

- He setup *Natal Indian Congress* (1894) in *South Africa* against the racial discrimination carried out towards the Indians and South Africans.
- He started *Indian Opinion Newspaper (1903).*
- He also setup *Phoenix Farm (1904)* and *Tolstoy Farm (1910).*
- Gandhi was involved in Satyagraha *against Registration of Marriage Act.*
- He also led a campaign against the restriction of *Indian migration* and recognition of *Hindu marriages that were not recognised* in South Africa.

Gandhi in India

- Gandhi returned to India on *9 Jan 1915* which is celebrated as *Pravasiya Bhartiya Diwas for Non-Resident Indians (NRI).*
- *Political Guru:* Gopal Krishna Gokhale
- His first public appearance was at *Banaras Hindu University (BHU)* inauguration in *1916.*

> *BHU was founded by Madan Mohan Malaviya. He also founded Hindu Mahasabha (1915)*

- *Book written by Gandhi: Hind Swaraj* (also known as Indian Home Rule, where he wrote that "the British rule in India was a result of cooperation extended by Indians")

> *Autobiography of Mahatma Gandhi: The Story of My Experiments with Truth*

Movements Led by Gandhiji

1. Champaran Satyagrah *(1917)* → First Civil Disobedience Movement

- *Raj Kumar Shukla* invited Gandhi to *Champaran, Bihar* to complain about injustice of the landlord system where the *farmers were forced to cultivate Indigo in 3/20th part of their land, also known as Tinkathia System.*
- *Other people involved in Champaran Satyagraha: Rajendra Prasad, Mazhar-ul-Haq, J. B. Kriplani*

Champaran Agrarian Act *(1918)*

- This act was a direct result of Champaran Satyagraha. It abolished Tinkathia system and suspended *Abwab tax (an illegal collection imposed by landlords on peasants).*

2. Ahmedabad Mill Strike *(1918)* → First Hunger Strike

- *Anusuya Sarabhai* invited Gandhi to *Ahmedabad* where textile workers of mill in Ahmedabad fought for economic injustice when the mill owners discontinued their *Plague Bonus.*
- Workers *demanded a 50% wage hike* to compensate for rising costs of living. *The mill owners offered only a 20% raise* which led to the strike. Finally wage hike was settled at 35%.

3. Kheda Satyagrah (1918) → First Non-Cooperation

- This Satyagraha movement was carried out at *Kheda district of Gujarat* in support of the peasants who were not able to pay the land tax due to the failure of crops.

GOVERNMENT OF INDIA ACT *(1919)*

- It is also known as *Montagu-Chelmsford Reforms.*
- *Montagu was the Secretary and Chelmsford was the Viceroy.*

Provisions made:

1. It extended *separate electorate* to Anglo Indians, Christians.
2. It introduced *dyarchy at provinces* → Provincial subjects were divided into two parts.

↓

Reserved	*Transferred*
It was administrated by the Governor through his Executive Council.	It was administrated by Ministers from Legislative Council.
Eg: Land revenue, Police, Finance	***Eg: Agriculture, Health, Education***

3. It introduced *Bicameral Legislature at Centre.*

ROWLATT SATYAGRAHA *(1919)*

- The Rowlatt Satyagraha was a non-violent protest movement *led by Mahatma Gandhi against the Rowlatt Act (1919),* which was passed by the British government to curb revolutionary activities in India. He called this Act the *"Black Act"*, the act sought to suspend the law of *Habeas Corpus,* which protects a person's right against unlawful detention.

Background of Rowlatt Act

- It was suggested by *Sydney Rowlatt (a British Judge).*
- It was officially called the *Anarchical and Revolutionary Crimes Act, 1919.*
- It allowed the British government to *detain people without trial and imprison them for 2 years without trial.*
- It is an extension of the *Defence of India Act, 1915,* a World War I time law, even though the World War I had already ended.

Jallianwala Bagh Massacre 1919

Jallianwala Bagh Massacre

- It took place on *13 April 1919 (on Baisakhi).*
- In *Jallianwala Bagh, Amritsar* people gathered in mass for two reasons: *To celebrate Baisakhi* and *to protest against the arrest of Saifuddin Kitchlew and Dr. Satyapal.*
- Without warning, *Brigadier General Reginald Dyer,* accompanied by his armed troops, closed the only exit gate and open fired at the crowd.

Aftermath of Jallianwala Bagh Massacre

- *Rabindranath Tagore* returned his *"Knighthood"*.
- Mahatma Gandhi returned his title of "Kaisar-i-Hind" that he received for his work during Boer Wars in South Africa.
- Hunter Commission was setup to investigate the actions of *Reginald Dyer* but it did not impose any penal action → *Indemnity Act* was passed by the

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British Parliament to protect him.

• The British Elites started *"Morning Post"* (a fund collection) in support of Dyer. (*Rudyard Kipling* also funded in this).

• *Arur Singh* (clergy in Golden Temple) titled Reginald Dyer as *"Sikh"* due to which *Gurudwara Reform Movement* was launched later in *1920* to free the Gurudwaras from corrupt Mahants.

• *Udham Singh* killed *Michael O' Dyer* (Lieutenant Governor of Punjab during Jallianwala Bagh Massacre who supported "Reginald Dyer") using name *"Ram Mohammed Singh Azad"* in *1940*.

KHILAFAT MOVEMENT *(1919)*

• It was launched after World War I.

• When World War I ended, Britishers removed Khalifa in Turkey from power. This instigated Muslims all over the world, and Khilafat movement was its response in India.

• An *All India Khilafat Committee* was setup in *Bombay* on *March 1919*, under the leadership of *Ali Brothers (Maulana Ali and Shaukat Ali), Maulana Abul Kalam Azad, Hasrat Mohani, Ajmal Khan.*

• All India Khilafat Conference was held in *Delhi on Nov 1919* that was headed by *Mahatma Gandhi (the first President of the Conference)* → This Conference was opposed by Congress and B G Tilak.

Indian National Liberation Federation formed by: Surendranath Banerjee

NON-COOPERATION MOVEMENT *(1920)*

• It was launched in *1920*.

• Non Cooperation Movement was approved in a special session of Congress held at Calcutta in 1920 and later endorsed in Nagpur in the annual session. It also led to the formation of *15-membered* Congress Working Committee. Congress committed itself to extra-constitution mass struggle from now onwards. *Jinnah, Annie Besant, B C Pal* left the Congress due to ideological differences.

• Gandhi merged Khilafat Movement with it to ensure Hindu-Muslim unity.

• *1921: Tilak Swaraj Fund* in remembrance of B G Tilak was setup.

• ***Local struggles:*** *Eka Movement (1921 in Uttar Pradesh, led by Madari Pasi).*

• *Mappila/Malabar/Moplah Revolt (1921):* The Uprising was mainly led by Muslim peasants against Hindu feudal lords in the Malabar region of Kerala.

• Sikh agitation for removal of corrupt Mahants.

• *Awadh Kisan Movement:* A peasant movement also started to oppose British rule. Awadh Kisan Sabha was organised by *Baba Ramchandra* in *1920*.

Steps Taken to Support the Merger of Khilafat Movement and Non-Cooperation Movement

• On National-level, educational institutions were established as part of boycott of British-run schools and colleges, institutions such as *Jamia Millia Islam, Kashi Vidhyapith, Bihar Vidhyapith.*

• ***Fundraising for the Movement:*** A significant amount of Rs1 Crore was raised, which was utilised to:

• Promote national education.

• Organise protest and strikes.

• Support the boycott movement.

Chauri Chaura Incident *(1922)*

• On *4th Feb 1922*, the crowd of non-cooperation movement burnt a police station in Chauri Chaura a village in Gorakhpur, in which 22 policemen died.

• As a result, Gandhi called off the non-cooperation movement *due to violence* and was later jailed in *March 1922*.

Suspension of the Movement and Political Vaccum

• In Bardoli, Congress working committee suspended the non-cooperation movement due to violence and focused on *constructive work* from now onwards.

• This led to a political vacuum within the Congress party, as leaders were divided on what to do next.

The division created two groups:

• ***No Changers:*** This group, led by *Rajendra Prasad, Vallabhbhai Patel, and M.A. Ansari*, believed in continuing Gandhi's principles. They *boycotted the British councils and instead focused on constructive work like setting up ashrams, schools, and promoting Khadi (hand-spun cloth)*.

• ***Pro Changers:*** It was led by *C.R. Das, Motilal Nehru, and Ajmal Khan*, this group argued that entering the legislative councils would allow them to challenge British rule from within by opposing unfair laws and policies. However, Gandhi initially opposed this idea, as he felt cooperating with the British in any form would weaken the freedom struggle.

FORMATION OF SWARAJ PARTY, 1923

• In the *Gaya Session of Congress (Dec 1922)*, the Pro Changers decided to form their own political party the *'Congress Khilafat Swaraj Party'* or *'Swaraj Party'*.

• ***Leadership:*** *C.R. Das* → President; *Motilal Nehru* → Secretary.

• ***Goal:*** *"To end or mend the Council"*.

• ***Achievement:*** Successfully defeated the *"Public Safety Bill"* in *1928*.

Chittaranjan Das (C. R. Das) is also known by the name of "Deshbandhu".

Belgaum Session of Congress, 1924

• It was presided by *Gandhi (it is the only session presided by him)*.

• This session *accepted the Swaraj party* within the Congress.

For an interactive recap of this topic, see the crossword on Page Number 139.

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Socialism

- Theory of Socialism was given by *Karl Marx*, he stated that *"Only option to remove the rich classes from society is mass struggle"*.
- **Reason for Socialism:** Russian Revolution in 1917.

> - ***In 1920, All India Trade Union Congress was formed by Lala Lajpat Rai, Joseph Baptista, N. M. Joshi.***
> - ***N M lokhande is known as the "Father of Trade Union Movement". He founded Bombay Mill Association.***

Spread of Socialism and Communalism

- *Communist Party of India (CPI)* was formed by *M. N. Roy in Tashkent, Uzbekistan in 1920.*
- In *1924*, the party was involved in *Kanpur Bolshevik Conspiracy Case* → ***People involved:*** *S A Dange, Muzaffar Ahmed, Shaukat Usmani, etc.*
- In *1925*, CPI was formalised in *Kanpur*.
- In *1929*, *Meerut Conspiracy Case* occurred.

Novels and Books

- ***Bandi Jeevan by: Sachin Sanyal.***
- ***Pather Dabi by: Sharat Chandra Chattopadhyay.***
- ***Philosophy of Bomb by: B. C. Vohra.***

EVENTS AROUND INDIA

In Punjab-UP-Bihar

- In *1924*, *Hindustan Republican Association* was formed in Kanpur by *Ram Prasad Bismil, J. C. Chatterjee, Sachin Sanyal.*
- In *1925*, *Kakori Incident/Kakori Train Robbery* took place in Kakori, a village near *Lucknow*.
- ***Participants who were hanged to death:*** *Ashfaqullah Khan, Roshan Singh, Ram Prasad Bismil, and Rajendra Lahiri.*

- In *1926*, *Punjab Naujawan Bharat Sabha* was formed by *Bhagat Singh*.
- Bhagat Singh fully accepted Marxism.
- Hindustan Republican Association (HRA) which was later transformed to *Hindustan Socialist Republican Association (HSRA)* in *1928* at *Feroz Shah Kotla* by *Chandra Shekhar Azad, Bhagat Singh, Sukhdev*.
- In *1928*, *Lala Lajpat Rai* protested against Simon Commission and recited slogan *"Simon go back"*. He was hit by Scott during lathi charge due to which he died afterwards.
- In *1928*, *Bhagat Singh, Sukhdev, Raj Guru killed Saunders instead of Scott* mistakenly in Lahore to avenge the death of Lala Lajpat Rai.
- In *1929*, *Bhagat Singh and Batukeshwer Dutt* bombed Central Legislative Assembly.
  - ***Reason:*** To protest against *"Public Safety Bill" (1928)* as it was Anti-National (as said by Swaraj Party) and *Trade Disputes Bill (1929)*.
  - ***Purpose:*** No to kill anyone but *To Make Deaf Hear.*
- In *1929*, *Chandra Shekar Azad* was involved in the conspiracy to *blow up Lord Irwin's train*, unfortunately the plan failed.
- *Bhagat Singh, Sukhdev* and *Rajguru* were tried in *Lahore Conspiracy Case* and were hanged on *23rd March 1931* (now celebrated as *"Shaheed Diwas"*).

> ***Note:*** ***30 Jan, the day Gandhiji died is also celebrated as "Shaheed Diwas".***

> ***Book written by Bhagat Singh:***
> ***"Why I Am an Atheist"***

Fig 1: Statue of Chandrasekhar Azad at Alfred Park

- It is now known as Chandrashekhar Azad Park where he shot himself on 27 February 1931 in Allahabad

In Bengal

- In *1930*, *Chittagong Armoury Raid* was led by *Surya Sen* (also known as Master Da).
- ***Women participants involved were:*** *Pritilata Waddedar, Kalpana Dutta, Suniti Chanderi, Bina Das.*

SIMON COMMISSION

- *Government of India Act 1919* was set to be reviewed by a Commission in *10 years but it announced the appointment of a Commission in just 8 years after the Act* under the chairmanship *of John Simon*.

> ****Note:*** ***Clement Attlee (who later became PM of Britain) was the member of Simon Commission.***

- In *1928*, this *Commission arrived in India* which was a *7-membered Commission (all white and no Indians)* → Revolt against it was set in motion with slogans *"Simon Go Back"* (term coined by *"Yusuf Meherally"*).

Recommendations of Simon Commission

- Abolition of dyarchy.
- Federal system of government should be introduced in India.
- Extended voting rights.
- Separate Muslim electorate.
- It rejected the separation of Sindh from Bombay.
- The demand of frontier for equal status was also neglected.
- It rejected 1/3rd Muslim seats in Central Assembly.

Madras. Session of Congress of 1928

- ***President:*** *M. A. Ansari.*
- It was a special Session which passed a resolution, calling for boycott of Simon Commission.

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Response to Simon Commission

• The then Secretary, Birkenhead challenged the Indian leaders to draft their own Constitution.

• Congress set up a committee under the chairmanship of *Motilal Nehru* which presented *Nehru Report*.

Demands in Nehru Report

1. Rejected Separate Electorate.
2. Demand for Dominion status.
3. Linguistic provinces, 19 Fundamental Rights, and a Responsible Government.

• *Delhi Proposals* were given by *Muslim League (1927)*.

• *Jinnah* presented his *14 points (1929)*. Ignore Jinnah's points in the same manner she ignores you 😉.

> • ***S C Bose, J L Nehru and Srinivasa Iyengar*** formed ***Indian Independence League in 1928***. The league was formed in opposition to the Nehru Report.
> • ***Those in support of Simon Commission:*** ***B R Ambedkar and Hindu Mahasabha (founded in 1915 by Madan Mohan Malaviya).***

FACTORS THAT LED TO CIVIL DISOBEDIENCE MOVEMENT

• Calcutta Session, 1928: In this Session, Nehru Report was accepted.

• Irwin's Declaration, 1929: This is also known as *"Deepavali Declaration"*. *Viceroy Lord Irwin* promised Dominion status in the future and a Round Table Conference post-Simon Commission's Report.

• Delhi Manifesto, 1929: It outlined several key conditions by Indian leaders' for participating in the Round Table Conference.

• Lahore Session, 1929: It was presided by J L Nehru

Decisions taken:

- 1st Round Conference Table to be boycotted.
- ***Goal:*** *"Purna Swaraj"* (Complete Independence).
- ***31 Dec 1929:*** *Flag was hoisted* by J L Nehru on the banks of *Ravi river* with slogans of *"Inquilab Zindabad"*.
- ***26 Jan 1930*** was fixed as the *First Independence Day*.
- Congress authorised to launch CDM.
- Gandhi presented his *11 demands* as an ultimatum before launching CDM.

> • ***Dominion Status was first demanded by Tej Bahadur Sapru and M R Jaykar***
> • ***"Inquilab Zindabad" slogan was given by Hasrat Mohani***

CIVIL DISOBEDIENCE MOVEMENT

Dandi March

• *Dandi March was the beginning of Civil Disobedience Movement.*

• ***Time period:*** 12 March-6 April 1930.

• Gandhi marched *241 miles* along with *78 delegates* from *Sabarmati Ashram (Ahmedabad) to Dandi (Navsari) to violate Salt Law* due to which it is also known as *Salt Satyagraha*.

• Gandhi decided to raid *Dharshana, Gujarat* but *Abbas Tyabji* led the raid in Darashana Salt Works after the Gandhi was arrested on *4 May*.

• Salt was choosen as the theme because of the govt. tax on salt and its monopoly over its production which revealed govt.'s oppressive face.

Campaign across India

• ***In Ryotwari Areas:*** Non-payment of revenue.

• ***In Zamindari Areas:*** No chowkidar tax.

• ***In Central Province:*** Violation of forest laws.

Participation of Leaders in Different States

• ***Tamil Nadu:*** C Rajagopalachari (led Salt March from Trichinopoly to Vedaranniyam).

• ***Malabar:*** K Kelappan.

• ***Orissa:*** Gopalbandhu Choudhary.

• ***Bihar:*** Ambika Kant Sinha (*Nakhas Pond* was chosen as a site to violate Salt Law).

• ***Peshawar:*** Khan Abdul Ghaffar Khan or Badshah Khan or *Frontier Gandhi*.

- He launched *"Red Shirt Movement"*.
- ***Established:*** *Khudai Khidmatgar* (Servants of God).

• ***Dharsana:*** *Sarojini Naidu, Imam Saheb* and *Manilal* took up the unfinished task of Gandhi in Dharsana. Sarojini Naidu also persuaded Gandhi to seek women participation.

• *Kamala Devi Chattopadhyay* famously said to Gandhi, *"Do not restrict this movement to men alone"*.

• ***Manipur and Nagaland:*** Rani Gaidinliu.

Forms of Mobilization

• Prabhat Pheri, Vanar Sena, Manjari Sena were organised for mobilising the masses.

Gandhi-Irwin Pact 1931

• It was signed on *14 February between Gandhi and Irwin*.

Irwin's demands to Gandhi:

• Suspend CDM.

• Participate in 2nd Round Table Conference.

Gandhi's demands *(which were accepted by Irwin)*:

1. Release political prisoners, not convicted of violence.
2. Give the confiscated properties back to Indians which are not yet sold to third-parties.
3. Right to produce salt for personal consumption.
4. Right to make salt in coastal villages for personal consumption.

Gandhi's demands *(which were not accepted by Irwin)*:

1. Public inquiry into police excesses.
2. Commutation of death sentence to Bhagat Singh, Sukhdev, and Rajguru.

Karachi Session

• It was held on 29 March 1931 → Presided by Sardar Patel.

- Gandhi-Irwin Pact (or Delhi Pact) was accepted.
- Congress agreed to participate in 2nd Round Table Conference *CDM was suspended*.
- *The goal of Purna Swaraj was reiterated* (for the first time meaning of Purna Swaraj was stated).
- Two resolutions were adopted: *Fundamental Rights and National Economic Policy*.

Round Table Conference *(RTC)*

• RTCs were held in London to discuss about Simon Commission Report and future reforms for the country.

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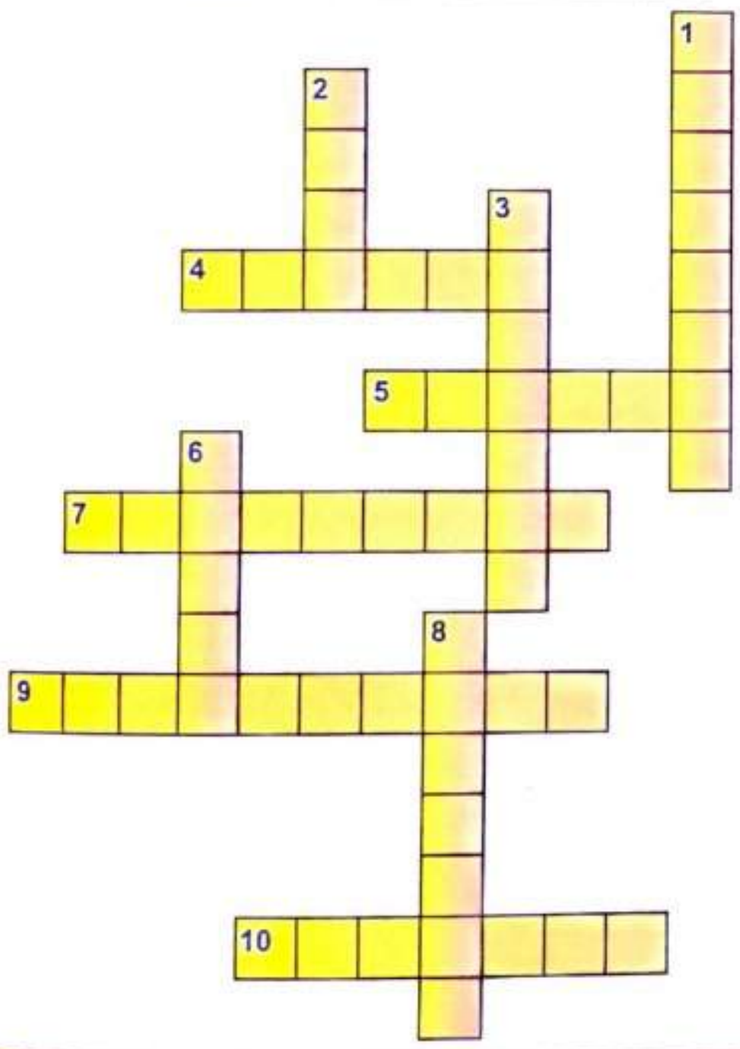
3 RTCs were held:

- *1st: Nov 1930-Jan 1931.*
- *2nd: Sep 1931-Dec 1931 (it is the only RTC where Gandhi and Congress participated)*
- *3rd: Nov 1932-Dec 1932.*
- *B.R. Ambedkar attended all 3 RTCs.*
- 2nd RTC failed due to non-acceptance of demands of Congress by British Government. Due to which Congress decided on *29th Dec 1931* to resume the CDM. The then Viceroy *Willingdon* also refused a meeting with Gandhi. On 4th Jan 1932, Gandhi was arrested, finally on *April 1934* Gandhi withdrew the CDM.

PARMAR'S CROSSWORD

GANDHIAN ERA



Across

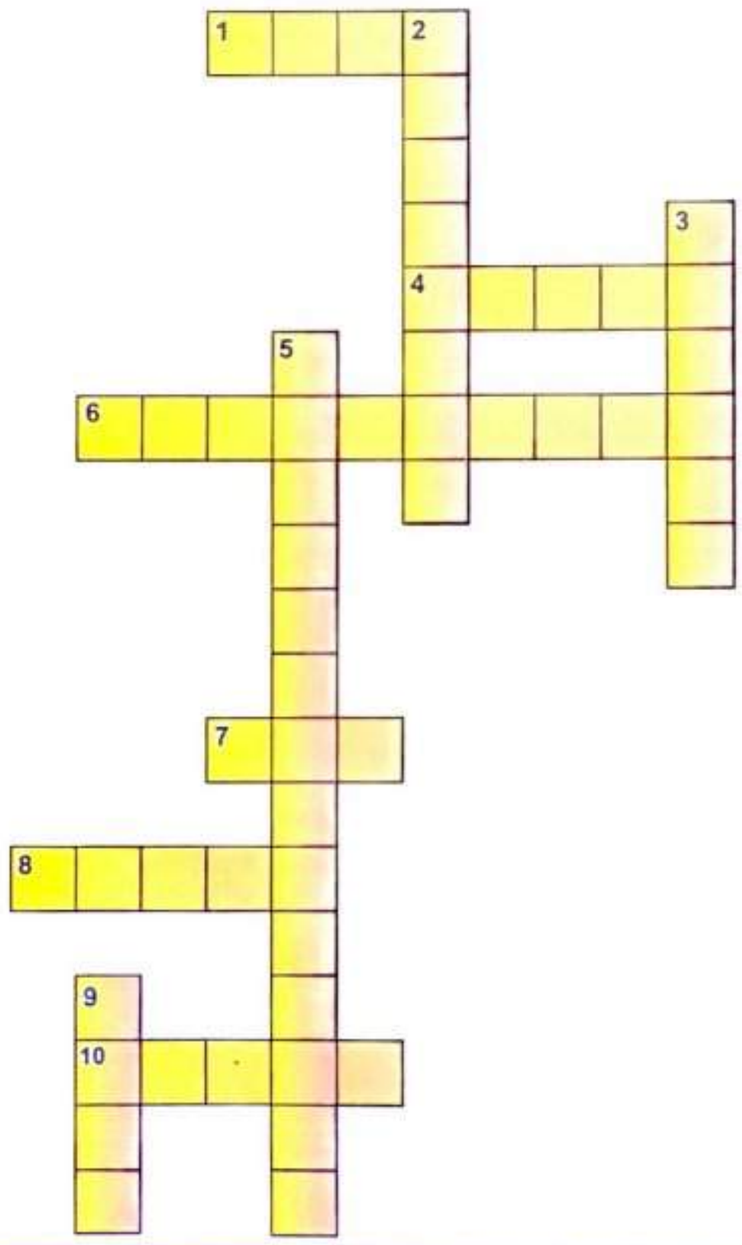
4. Viceroy during Partition of Bengal.
5. Persuaded Gandhi to visit Champaran.
7. Site of Gandhi's first successful Satyagraha.
9. Viceroy during Rowlatt Act and Jallianwala Bagh incident.
10. Act allowing arrest without trial in 1919.

Down

1. Movement to support the Ottoman Caliphate.
2. British officer responsible for Jallianwala Bagh massacre.
3. Leader who helped Gandhi in Kheda Satyagraha.
6. Congress founded by Gandhi in South Africa.
8. Gandhi's political mentor who advised him to tourIndia.

PARMAR'S CROSSWORD

CDM AND SIMON COMMISSION



Across

1. Organisation formed after Kakori case.
4. Salt Satyagraha led by Gandhi ended at which place.
6. Destination of Tamil Nadu Salt March.
7. Died after 63-day hunger strike in Lahore Jail.
8. Founder of Congress Socialist Party.
10. Assassin of Michael O'Dwyer.

Down

2. Signed Poona Pact with Gandhi.
3. Revolutionary involved in Kakori Train Incident.
5. Led Salt March in Tamil Nadu.
9. Accompanied Bhagat Singh in Central Assembly bomb case.

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COMMUNAL AWARDS

• The Communal Award was announced by *British Prime Minister Ramsay MacDonald* on *16th August 1932*. It is also known as *MacDonald Award*.

• It recognised the *"Depressed Classes" as minorities and provided them a separate electorate* along with some other communities like Muslims, Sikhs, Christians, Europeans, and Marathas as well.

• *Mahatma Gandhi strongly opposed* the separate electorate for Depressed Classes, viewing it as a threat to Hindu unity however *B. R. Ambedkar supported* the Award, as it ensured political representation and safeguarded the rights of the Depressed Classes.

> *Congress neither accepted nor rejected the Communal Award.*

Poona Pact 1932

• The Poona Pact was an agreement between *Mahatma Gandhi and B. R. Ambedkar*, signed on *24th September 1932*, at *Yerwada Central Jail in Pune*.

• While in prison, Gandhi announced a *fast unto death* till the time separate electorates were removed from the Award, which led to an agreement between Gandhi and Ambedkar that discarded the separate electorate.

> *Note: Madan Mohan Malviya signed Poona Pact on behalf of Gandhi*

Key Provisions for Poona Pact

• ***No separate electorates for Depressed Classes.***

• ***Number of seats reserved for Depressed Classes would be increased.***

Gandhi's Efforts against Untouchability

• ***All India Anti-Untouchability League (1932):*** This League, founded by *Mahatma Gandhi* was later re-named as the *Harijan Sevak Sangh*.

• ***Harijan (Weekly newspaper).***

GOVERNMENT OF INDIA ACT 1935

1937 Elections

• Provincial elections were held in British India according to GOI Act 1935. Elections were held in *11 provinces*. Congress got majority in all except → *Punjab, Bengal, and Sindh*.

For provisions of GOI Act 1935 refer to chapter: "Important Acts" in Polity section.

CONGRESS SESSIONS

• **1934:** Congress Socialist Party was formed by J P Narayan, Ram Manohar Lohia, A N Dev, Minoo Masani.

• **1936:** Held in Lucknow; All Indian Kisan Sabha (AIKS) was formed by Swami Sahajanand Saraswati.

• **1937:** Faizpur → 1st session to be held in a village (Jalgaon, Maharashtra). This session was presided over by J L Nehru.

• **1938:** Haripura, Gujarat led by *S C Bose (elected as President of INC)* marked the beginning of growing ideological differences between Bose and Mahatma Gandhi, though the full rift developed in 1939 during the Tripuri Session.

• *National Planning Committee (NPC)* was established in *1938* by *S C Bose*, during the *Haripura Session*. The *first chairman* of this Committee was *J L Nehru*.

• **1939:** Tripuri Session in Jabalpur (Madhya Pradesh) → *S C Bose was re-elected as President* of INC by defeating Gandhi's candidate *Pattabhi Sitaramayya*, but later *S C Bose resigned* from Congress and he formed *All India Forward Bloc, 1939, Unnao, Uttar Pradesh*

World War II

• In *1939*, World War II began → *It was fought between the Allied Powers* (Britain, France, USA, USSR) *and the Axis Powers* (German, Italy, Japan).

• In *October 1939*, the INC resigned from all provincial ministries to show protest against Britain's decision to *involve India in World War II without consulting Indian leaders*.

• After resigning, the INC made offers to *Viceroy Lord Linlithgow* regarding India's involvement in World War II. The demands were:

1. ***Demand for establishment of Constituent Assembly to draft a Constitution for the Indian people***
2. ***Demand for establishment of fully responsible Government at both Provincial and Central level***

> *Autobiography of Hitler: Mein Kampf*

AUGUST OFFER 1940

• In *1940, August Offer* was sent by Lord Linlithgow under the direction of *British Prime Minister Winston Churchill* to secure India's cooperation in World War II. The key Provisions were:

1. ***The British Government promised to grant Dominion Status for India.***
2. ***Indians could create their own Constituent Assembly themselves with inclusion of more Indian representatives than whites.***
3. ***An advisory war council was to be established.***

→ However these provisions were rejected by Congress as Congress had declared *"Purna Swaraj"* as their goal.

> *Revolutionary Socialist Party was established in 1940.*

Individual Satyagraha 1940

• The INC decided to launch the *"Individual Satyagraha"* after the failure of August Offer under the leadership of *Mahatma Gandhi* in *1940* with *Vinoba Bhave* nominated as *first Satyagrahi, J L Nehru* as *second and Brahma Dutt* as *the third*.

CRIPPS MISSION 1942

• In *1942, Stafford Cripps* was sent to India with a constitutional reforms. The key proposals were:

1. ***A Constituent Assembly would be formed to frame a new constitution for the country. This Assembly would have members elected by the provincial assemblies and also nominated by Princely States.***
2. ***India would be granted Dominion Status, allowing self-governance while remaining part of the British Commonwealth.***
3. ***Any province unwilling to join the Indian dominion could form a separate union and have a separate constitution.***
4. ***The transfer of power and the rights of minorities would be safeguarded.***

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The proposals were rejected by INC. Gandhi famously referred Cripps offer of Dominion Status as *"post-dated cheque drawn on a failing bank"*.

QUIT INDIA MOVEMENT 1942

• July 1942: The *Congress Working Committee* met at *Wardha, Maharashtra* where *Quit India Resolution* was adopted. It was ratified at *Gowalika Tank, Bombay*.

Quit India Movement

• On *8th August 1942, Mahatma Gandhi launched Quit India Movement* (also known as *August Kranti*) in response to the failure of Cripps Mission, which was initially not supported by J L Nehru and Hindu Mahasabha.

• The *"Do or Die"* slogan was given *during a speech by Mahatma Gandhi* at the *Gowalia Tank Maidan or August Kranti Maidan in Mumbai. The slogan was a call to action for Indians to fight for independence from British rule.*

• The very first day all leaders got arrested and that is why this movement was a *leaderless movement*.

• *Aruna Asaf Ali* presided over Congress Working Committee, she also hoisted the Indian Flag at the *Gowalika Tank* in *Mumbai*.

Specific Appeals made by Gandhi (during the Quit India Movement):

• To *government servants* Gandhi advised not to resign from their posts but instead urged them to remain loyal to the cause of the INC and work against British policies subtly.

• *Soldiers* were instructed not to resign from their duties but were urged to refuse orders to fire on fellow compatriots.

• Gandhi appealed to *peasants* to withhold rent payments if the landlords or Zamindars were loyal to the British government.

• He encouraged the *people living in princely states* to support their ruler if the ruler was anti-British. If the ruler was pro-British, Gandhi advised them to peacefully oppose the government.

Martyrs

• *Kushal Konwar* was the only martyr of the Quit India phase of the freedom movement who was hanged.

• *Kanaklata Barua* was shot dead by the British forces while leading a procession during QIM.

Underground Activities Carried Out:

• *Usha Mehta:* Launched *underground radio in Bombay* and appealed Indians to join Quit India Movement

• *Parallel government* were setup:

- *In Ballia by: Chittu Pandey*
- *In Tamluk by: Jatiya Sarkar*
- *In Satara by: Prati Sarkar (Y B Chauhan, Nana Patil)*

• 23 March 1943: *Pakistan Day was observed by Muslim League*

> *• The term PAKISTAN was coined in 1933 by Rahmat Ali*

> *• Lahore Resolution: It is also called as Pakistan Resolution was a formal political statement adopted by the All-India Muslim League on the occasion of its three-day general session in Lahore, Punjab, from 22 to 24 March 1940, calling for a separate homeland for the Muslims of British India.*

Mediation between Congress and Muslim League

• 1944: C. Rajagopalachari gave *C R Formula* (Clement-Read Formula) in response to the growing tensions between the INC and the Muslim League.

• Desai Liaquat Pact 1945: It was an unsuccessful agreement between *Bhalubhai Desai* (from Congress) and *Liaquat Ali Khan* (from Muslim League)

• 1945: *Wavell Plan* was proposed by then *Viceroy Lord Archibald Wavell* as an attempt to resolve the political *deadlock between the INC and the Muslim League*. This plan was discussed in Shimla Conference; however it failed.

> In September 1945, World War II completely ended with the US bombings. *In August 1945, US bombed in Hiroshima and Nagasaki (two cities of Japan) on 6 August and 9 August respectively. The bomb dropped on Hiroshima was known as "Little Boy". While the bomb dropped on Nagasaki was known as "Fat Man" which was more powerful than the "Little Boy" and that is from where we came up with the idea of naming this book and our GK MCQ Book (Little Boy).*

INDIAN NATIONAL ARMY (INA)

• The *Indian National Army (INA)* was founded during World War II to fight against British rule in India.

• It was initially formed in *1942* by *Mohan Singh with Indian Prisoners of Wars in Singapore* (it was later handed to *Rash Behari Bose* who again transferred the leadership to *S C Bose*).

> *Birth anniversary of S.C. Bose is celebrated every year as "Parakram Divas".*

Subash Chandra Bose

• He was born in *Cuttack in 23rd Jan 1897*.

• In *1942*, he met *Hitler* in Germany using a pseudo name *"Orlando Mazzotta"*.

• The Indian National Army (Azad Hind Fauj) was reorganised by Bose in *Singapore* in *1943*.

• He founded *"Free India Legion/Tiger Legion"* in *1941* in *Berlin, Germany*.

• He formed a women regiment named after *Rani Lakshmibai* led by Captain Lakshmi Swaminathan.

• On 15th August, Japan surrendered to Allied powers, marking the end of World War II.

• *He died on: 18th August* in a plane crash.

• S C Bose was called as *"Patriot of Patriots" by Gandhi*.

• In *1944*, he was the person to give *"Father of Nation" title to Gandhi* through Singapore Radio.

> *The Indian struggle 1920-1942 was authored by S C Bose.*

Famous Slogans by S C Bose

• *"Delhi Chalo"*

• *"Give me blood, and I shall give you freedom"*

• *"Jai Hind"*

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INA trials

• The Indian National Army trials (also known as the INA trials and the Red Fort trials) was the British Indian trial by court-martial of a number of officers of the Indian National Army (INA) between *November 1945* and *May 1946*.

• First INA trial was held against: *Prem Kumar Sehgal, Shah Nawaz Khan* and *Gurbaksh Singh Dhillon* in *Red Fort* in *1945*.

• Congress came in defence of these INA soldiers and formed a committee which included Jawaharlal Nehru, Bhulabhai Desai, Asaf Ali, Tej Bahadur Sapru, Kailash Nath Katju, and others.

• **14th February 1946:** The *ratings* (sailors in lowest rank) of *Royal Indian Navy (RIN)* revolted against British due to the discrimination and poor conditions and this led to a historic *Royal Indian Navy Mutiny*. This event began at the *HMIS Talwar* (a shore establishment in Bombay) against the *poor working conditions* (low pay, poor food quality, etc.).

CABINET MISSION PLAN

• In *1945*, elections were held in Britain where *Labour Party* under the leadership of *Clement Atlee* formed the government.

• In *March 1946, Clement Attlee (then PM of Britain)* sent a delegation called the Cabinet Mission consisting of:

• *Lord Pethick-Lawrence (Chairman), Sir Stafford Cripps and A. V. Alexander.*

• It proposed a *3-tiered Federal Plan*.

Provisions in Cabinet Mission Plan

• The plan proposed a united India, rejecting the demand for a separate Pakistan.

• The Cabinet Mission Plan, proposed a three-tier administrative structure for British India, with the Federal Union at the top tier, individual provinces at the bottom tier and Groups of provinces as a middle tier.

• Provincial were divided into three groups:

- ***Group A:*** Hindu-majority provinces (Madras, Bombay, UP, Bihar, Odisha, Central Provinces)
- ***Group B:*** Muslim-majority provinces (Punjab, NWFP, Sindh, Balochistan)
- ***Group C:*** Bengal and Assam

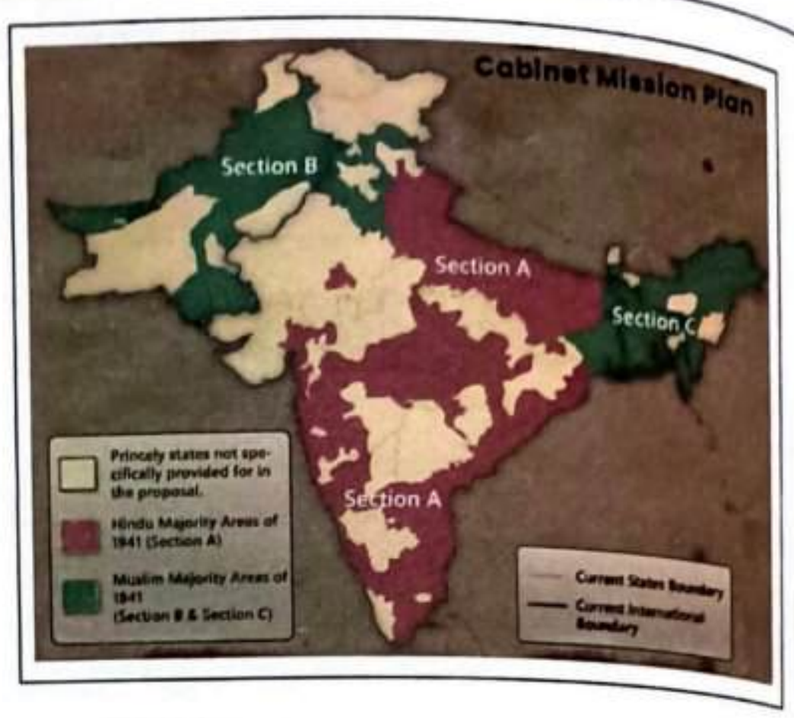
• Central Government to have power over defense, foreign affairs, and communications.

• Provinces to have full autonomy and residual powers.

• Princely States were free to negotiate their status, either to join with Britishers or Successor Governments.

• Constituent Assembly to draft a new constitution; members would be elected by provincial assemblies.

• Interim Government to function till the new constitution and government were formed.



Response to the Cabinet Mission Plan

• ***Indian National Congress:*** It accepted the plan partially but opposed the idea of grouping, fearing it was a step toward partition.

• ***Muslim League:*** It initially accepted the plan though it did not have a separate provision for Pakistan, thinking that the provision for grouping will provide it a separate Nation but when Jinnah sensed that this grouping is not mandatory then he called for *"Direct Action Day"*.

> *The Muslim League Observed "Day of Deliverance" on 22 December 1939.*

MOUNTBATTEN PLAN

• The Mountbatten Plan which formed the basis for Indian Independence Act proposed for the Partition of India into two Dominions namely India and Pakistan. That's why it is also known as *Partition Plan*.

• Under this Plan, the Princely States were given the option to *join either India or Pakistan or remain Independent*.

- ***Out of 565 Princely States, 563 joined either India or Pakistan and 3 did not join initially. They were: J & K, Hyderabad and Junagarh.***

> ***Note:*** *To see Provisions of Indian Independence act 1947 refer to chapter "Important Acts" in Polity section.*

• ***Louis Mountbatten:*** Last Governor-General of India.

• ***C. Rajagopalachari:*** Only Governor-General of independent India (because later this post was removed).

> • ***Bangladesh Liberation War in 1971 led to the separation of East Pakistan (now Bangladesh) from West Pakistan (now Pakistan). This war took place during the tenure of Indira Gandhi.***
>
> • ***In 1972, the Shimla Agreement was signed by Indira Gandhi (then Prime Minister of India) and Zulfikar Ali Bhutto (then President of Pakistan) to restore peace between two countries. It has been suspended by Pakistan as a move of retaliation after India suspended Indus Water Treaty.***

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• Mahatma Gandhi was in Noakhali (present day Bangladesh) on *August 15, 1947*, the day India gained independence.

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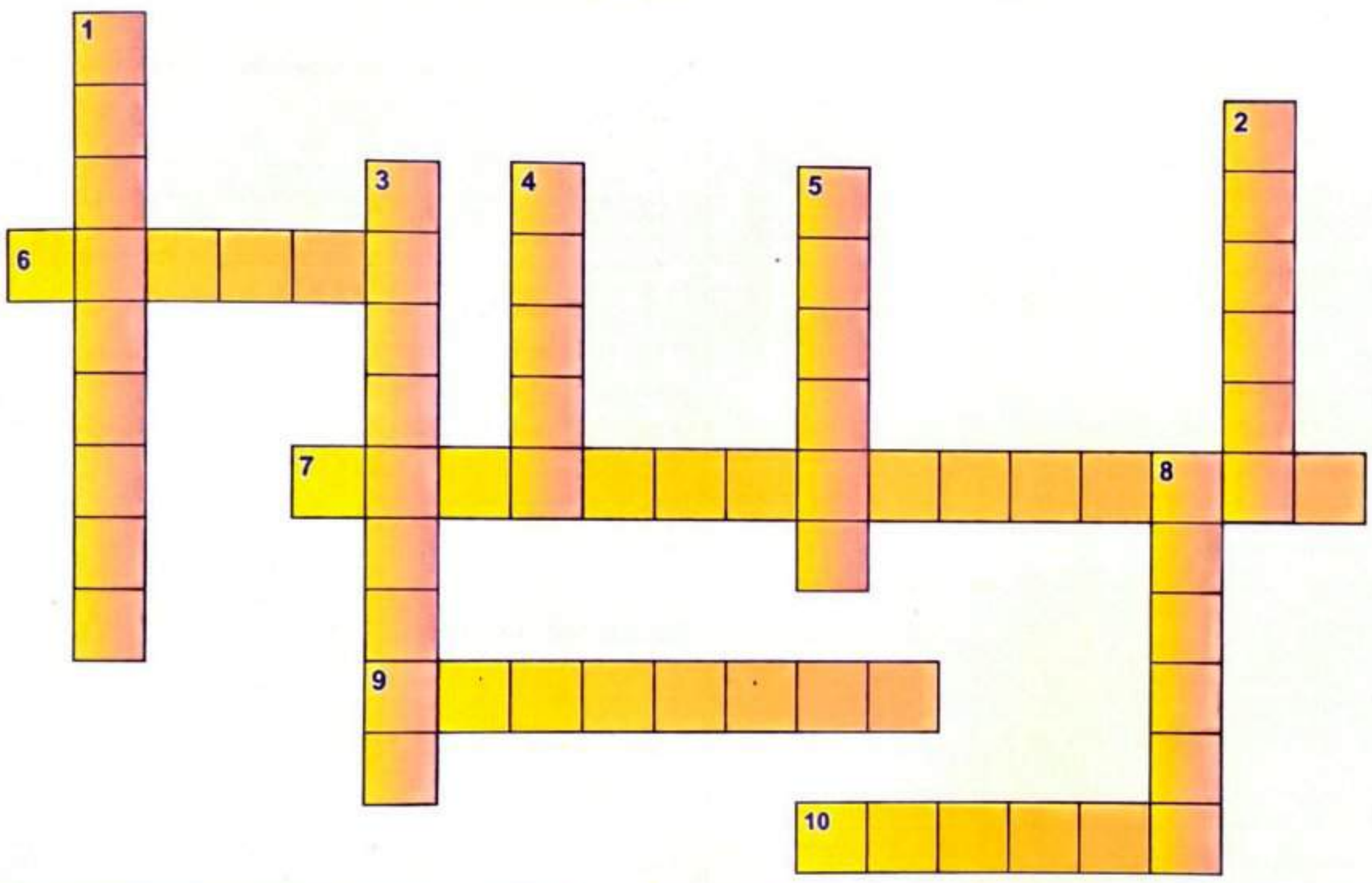
QUIT INDIA MOVEMENT



Across

6. Gave the slogan "Do or Die".
7. Gave C-R Formula in 1944.
9. Demarcated India-Pakistan border.
10. District where 1947 referendum joined Pakistan.

Down

1. Martyred in Quit India Movement in Assam.
2. Only martyr of Quit India Movement who was hanged.
3. INA was formed officially in which city.
4. Hoisted flag during Quit India Movement.
5. Quit India Resolution was passed in which city.
8. Muslim League observed which month's day as Direct Action Day

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GOVERNOR-GENERALS OF INDIA

Lord Warren Hastings *(1773–1785)*

- Regulating Act (1773) → 1st Governor General of Bengal.
- Pitt's India Act (1784).
- 1st Anglo-Maratha War (1775-1782) → Treaty of Salbai signed (1782)
- 2nd Anglo-Mysore War (1780-1784).
- Asiatic Society of Bengal (1784) formed.

Lord Cornwallis *(1786–1793)*

- 3rd Anglo-Mysore War (1790-1792) → Treaty of Seringpatnam.
- Permanent Settlement (1793)
- ***Death:*** India (tomb in Ghazipur, Uttar Pradesh).
- He is known as Father of Indian Civil Services.

Lord Wellesley *(1798–1805)*

- 2nd Anglo-Maratha War (1803-1805).
- 4th Anglo-Mysore War (1799).
- Treaty of Bassein (1802).

Lord Minto *(1807–1813)*

- Treaty of Amritsar (1809) signed between Maharaja Ranjit Singh and Britishers.

Lord Hastings *(1813–1823)*

- 3rd Anglo-Maratha War (1817-1819).
- Anglo-Nepal War (1814-1816) → Treaty of Sagauli signed.
- Ryotwari System introduced by Munro and Reed.

Lord William Bentinck *(1828–1835)*

- First Governor-General of India.
- Abolition of Sati (1829).
- Suppression of Thugs.
- He abolished Circuit Courts.
- He is known as Father of Modern Education in India → Macaulay's Minute (1835) during his tenure.

Lord Metcalfe *(1835–1836)*

- He is known as the Liberator of Indian Press.

Lord Auckland *(1836–1842)*

- 1st Anglo-Afghan War (1838-1842).

Lord Hardinge I *(1844–1848)*

- 1st Anglo-Sikh War → Treaty of Lahore signed.

Lord Dalhousie *(1848–1856)*

- Doctrine of Lapse (1848).
- 1st railway line laid down (1853) → from Bombay to Thane (34 km).
- Widow Remarriage Act (1856).
- Postal Act. Telegraph lines spread across.
- Wood's Dispatch (1854) → Magna Carta of Indian Education.
- He founded Public Works Department (PWD).
- 2nd Anglo-Sikh War (1848-1849).

VICEROYS

Lord Canning *(1856-1857)*

- He became the 1st Viceroy of India.
- 1857 Revolt.
- Government of India Act (1858) was passed.

Lord Mayo *(1860-1872)*

- 1st Unsynchronised (not complete) Census was held during his tenure (1872).
- He established Statistical Survey of India.
- Sher Ali Afridi killed him in Andaman Jail.

Lord Lytton *(1876-1880)*

- Arms Act (1878).
- He brought Vernacular Press Act (1878) to ban local newspapers.
- First Delhi Durbar (1877) to proclaim Queen Victoria as Empress of India.
- 2nd Afghan War (1878-1880).
- He lowered the maximum age of eligibility for Civil Services (reduced the age from 21 to 19 years).

> ***"Bengal Gazette" by James Augustus Hickey was the 1st Newspaper in India (1780).***

Lord Ripon *(1880-1884)*

- Ilbert bill was introduced in 1883.
- He repealed Vernacular Press Act.
- 1st Synchronised (complete) Census held during his tenure (1881).
- He is known as Father of Local Self-Government.
- Hunter Commission (1882) was setup which was related to Education.
- 1st Factory Act (1881).

Lord Dufferin *(1884-1888)*

- Formation of INC (1885).

Lord Curzon *(1899-1905)*

- Partition of Bengal (1905).
- Indian Universities Act.
- Calcutta Corporation Act.
- Curzon-Kitchner controversy.
- Young Husband Mission (to Tibet).

Lord Minto II *(1905-1910)*

- Muslim League formation (1906) by Aga Khan.
- Surat Split.

Lord Hardinge II *(1910-1916)*

- 3rd Delhi Durbar for King George (1911).
- During his tenure, capital shifted from Calcutta to Delhi.

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- Royal Commission on Civil Services was appointed in 1912.

Lord Chelmsford *(1916-1921)*
- Government of India Act, also known as Montagu-Chelmsford Reforms (1919).
- Rowlatt Act (1919).
- Jallianwala Bagh Massacre (1919).

Lord Reading *(1921-1926)*
- Chauri Chaura Incident (1922).
- Kakori Train Incident (1925).
- Establishment of Swaraj Part (1923).
- epeal of Press Act (1910) and Rowlatt Act (1919).

Lord Irwin *(1926-1931)*
- Visit of Simon Commission (1928).
- Lahore Session of Congress (1929).
- Dandi March (1930).
- 1st Round Table Conference.

Lord Willingdon *(1931-1936)*
- 2nd Round Table Conference.
- 3rd Round Table Conference.
- Government of India Act (1935).

Lord Linlithgow *(1936-1944)*
- World War II.
- August Offer (1940).
- Individual Satyagrah (1940).
- Quit India Movement (1942).
- Cripps Mission (1942).

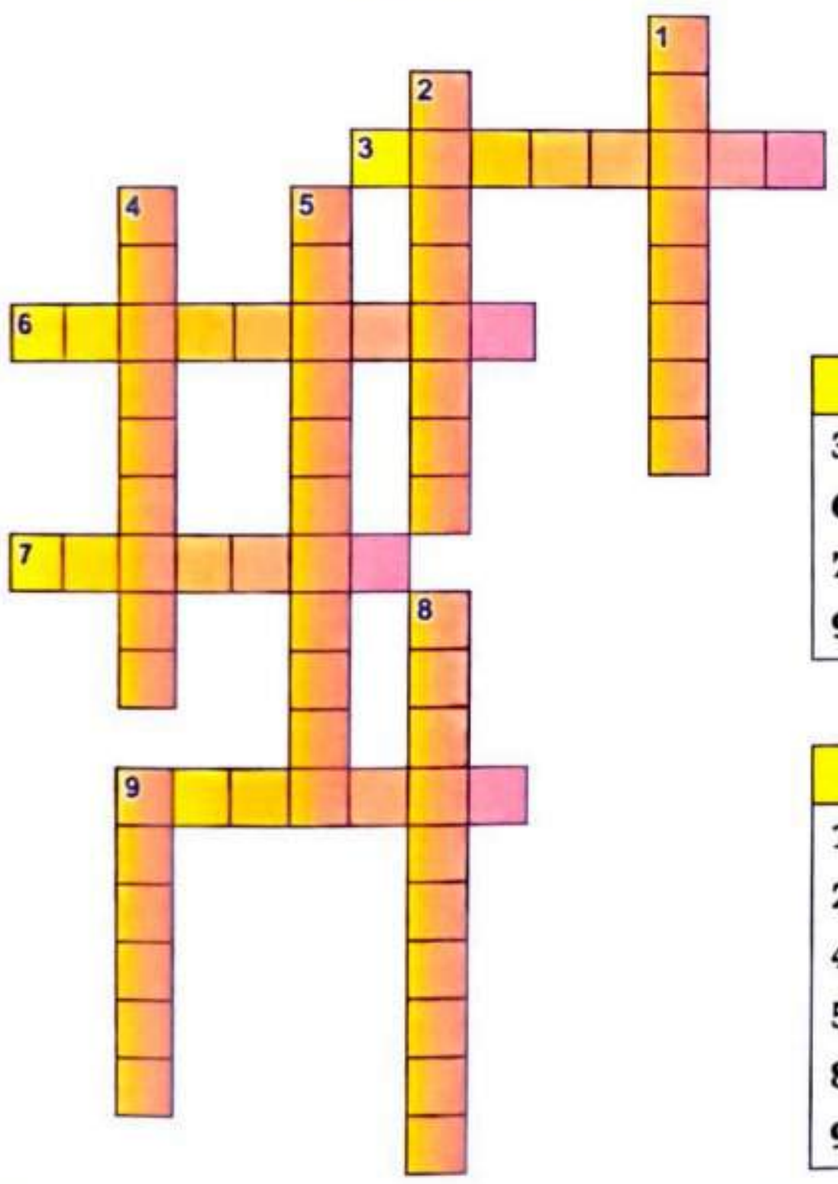
Lord Wavell *(1944-1947)*
- CR Formula (1944).
- Wavell Plan (1945).
- Caninet Mission Proposals (1946).
- Observance of Direct Action Day (16 August 1948).

- **Lord Mountbatten** *(1957-48)* → Last British Governor General of India.

- Only Indian Governor General of India: *C. Rajagopalachari*.

PARMAR'S CROSSWORD

GOVERNOR-GENERAL AND VICEROY



Across

3. First Governor General of India.
6. Introduced Doctrine of Lapse.
7. Abolished Sati system.
9. Last Governor General of India and first Viceroy.

Down

1. Made English the official language.
2. Capital shifted from Calcutta to Delhi in his tenure.
4. Introduced Subsidiary Alliance.
5. Oversaw India's independence and partition.
8. Implemented Permanent Settlement in Bengal.
9. Responsible for 1905 Partition of Bengal.

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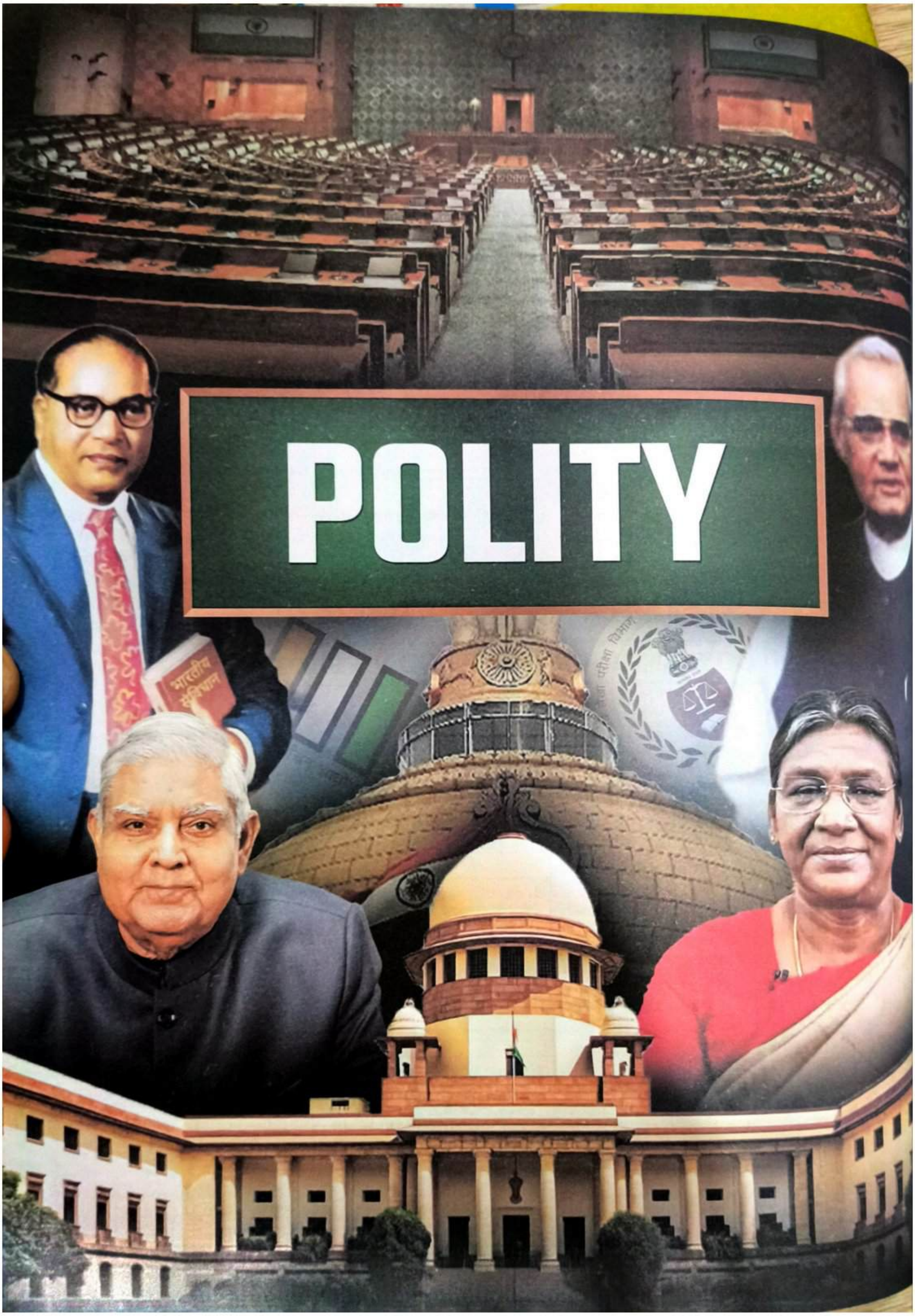

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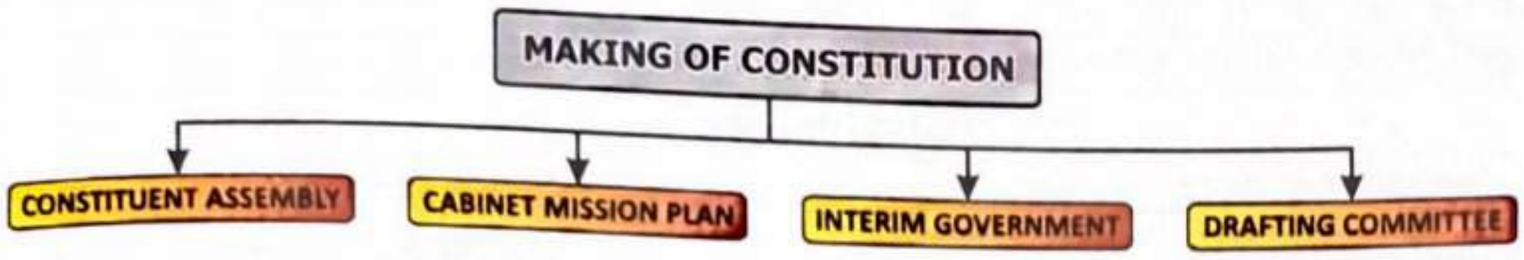

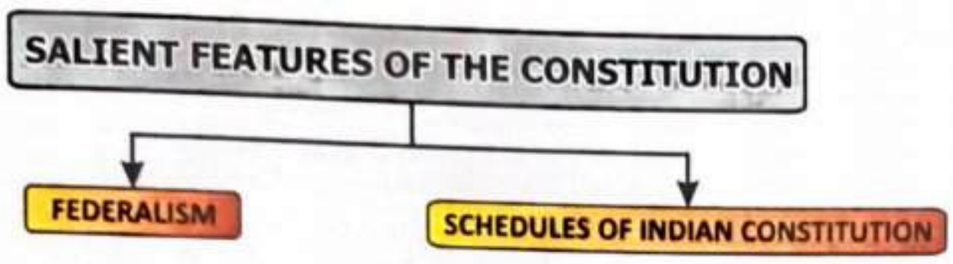

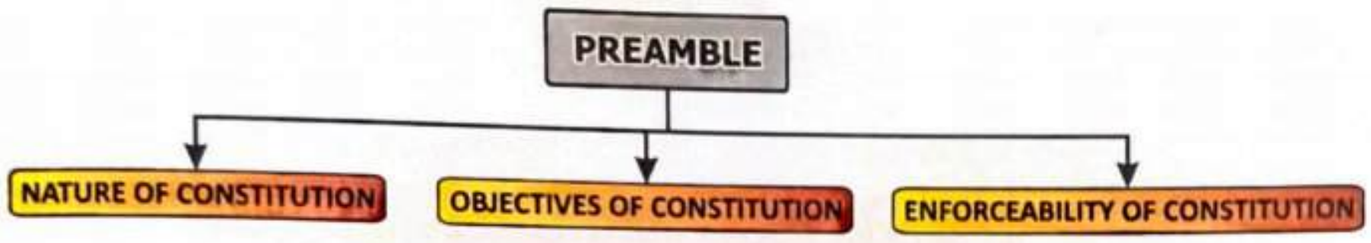

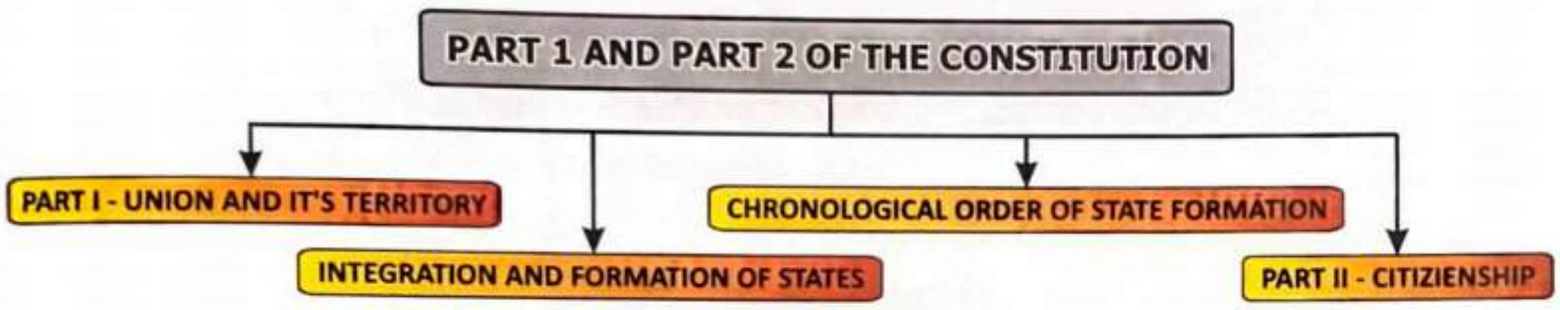

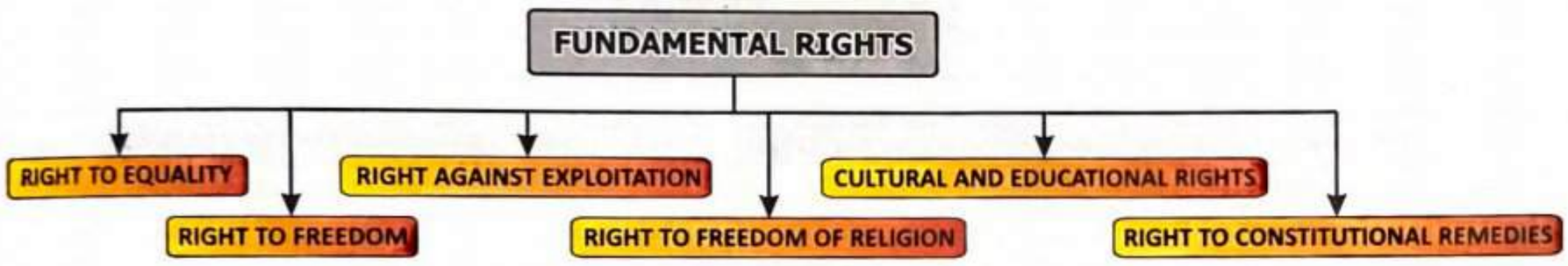

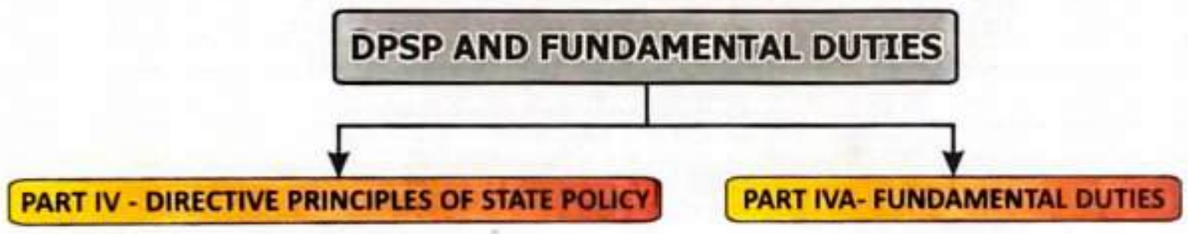

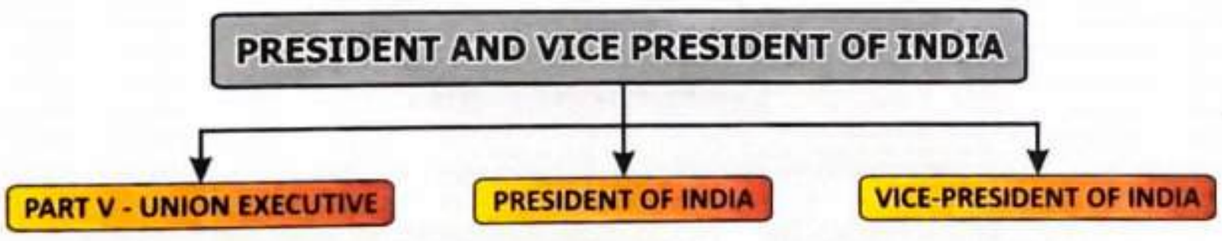

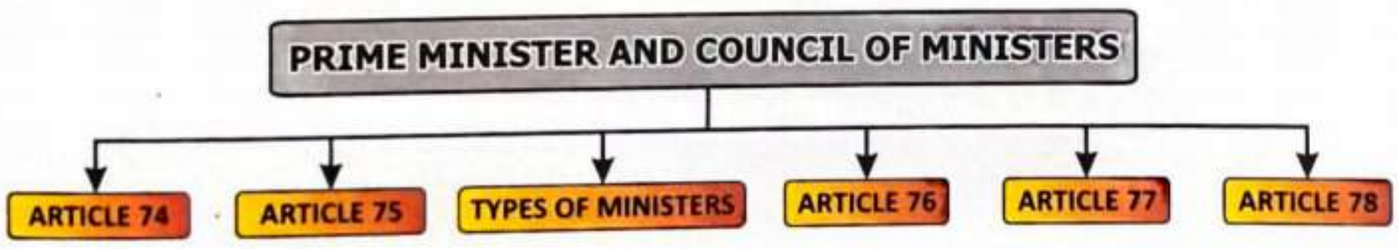

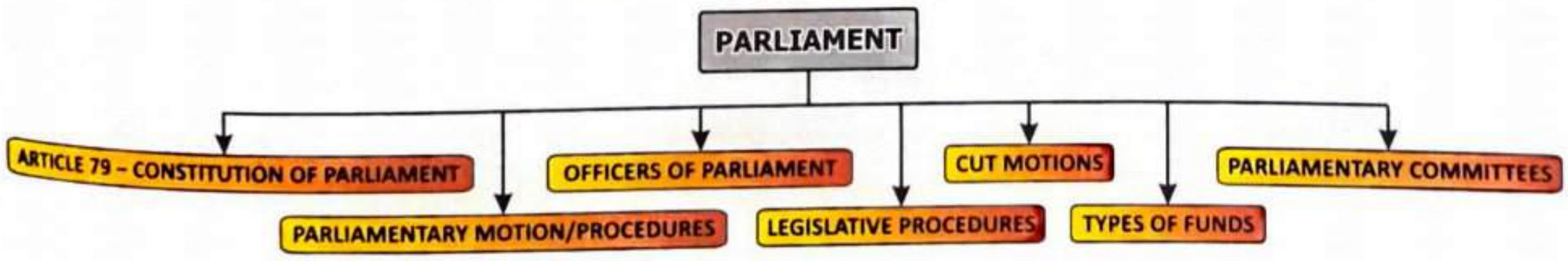

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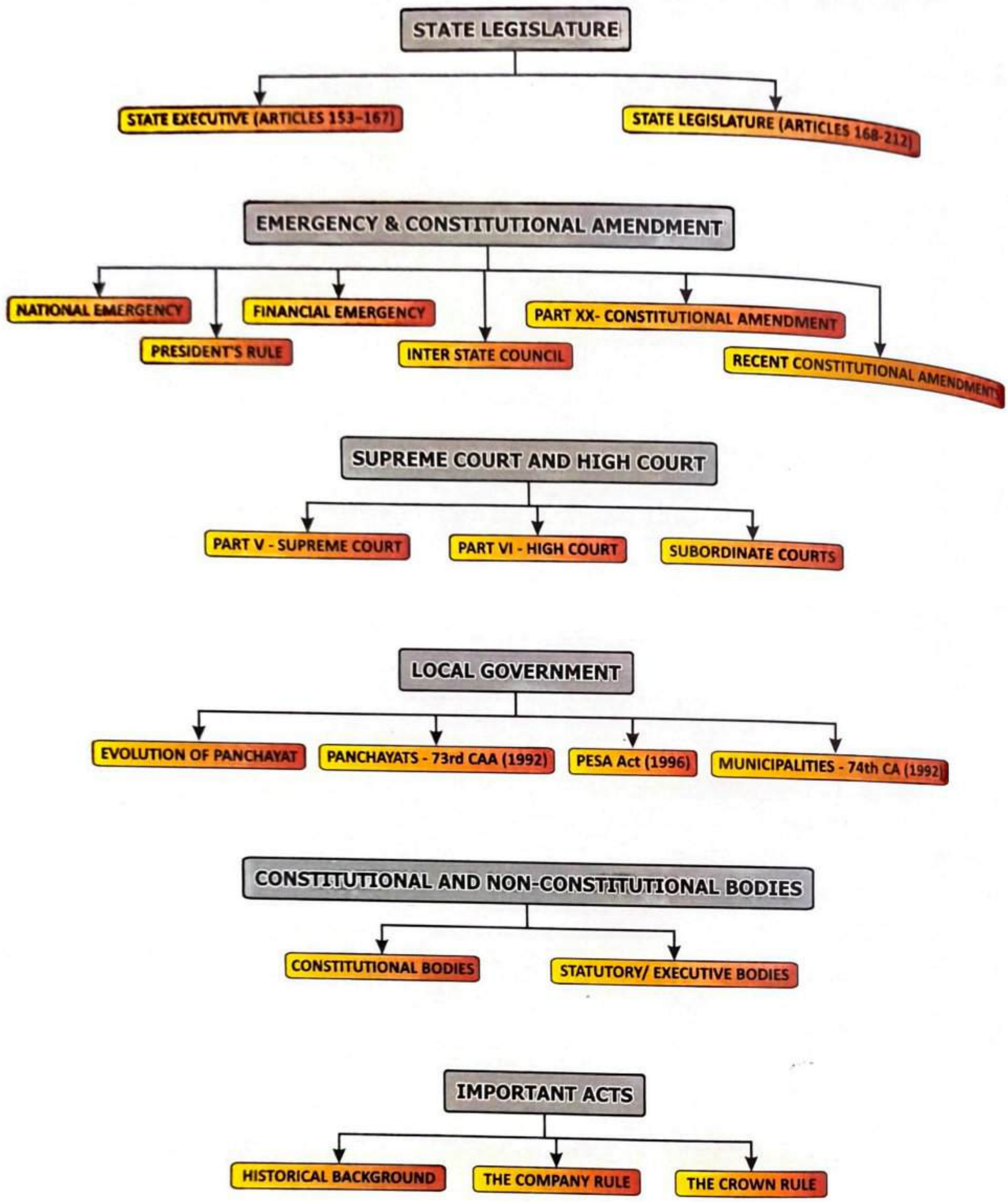

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• A Constitution lays out certain ideals that forms the basis of the kind of country a nation aspires to be.

India's Constitution is partly rigid; partly flexible.

• While all democratic countries are likely to have a Constitution, it is not necessary that all countries that have a Constitution are democratic

• *Tradition of Constitution began in: USA (in 1787).*

• Independence of USA: 4th July 1776.

Other forms of Government:

• *Communist:* Source or means of production controlled by government, *e.g. China.*

• *Oligarchic:* A government a few . *e.g. China, Russia.*

• *Monarchic:* A government by a single person → specifically King or a monarch. *E.g. North Korea.*

• *Totalitarian:* It refers to total control over lives of citizens by whoever is ruling.

CONSTITUENT ASSEMBLY

Timeline

• 1928: The early draft of the Indian Constitution (Nehru Report) was submitted by the All Parties Conference at Lucknow → chaired by *Motilal Nehru.*

• 1934: M. N. Roy first proposed the idea of a Constituent Assembly for India.

• 1935: The Indian National Congress officially demanded a Constitutional Assembly.

Offers from Britain

• *Reason:* Ongoing World War II (1939-1945)

1. *August Offer: 1940*
2. *Cripps Proposal: 1942*
3. *Wavell Plan: 1945*
4. *Cabinet Mission Plan: 1946* → with 3 British Cabinet members: *Pethick-Lawrence (chairman), Stafford Cripps, and A. V. Alexander.* Only Cabinet Mission Plan was accepted by both the Congress and the Muslim League, hence Constituent Assembly was formed according to it.

Reasons for Rejection of Former ones

• Congress demanded **Purna Swaraj**, but Britisher's offered **Dominion Status.**

Dominion Status: It is a status given to certain countries that allowed them to be self-governing while remaining part of the British empire. The term "Dominion" means "that which is mastered or ruled".

Tryst with Destiny

In his famous speech "Tryst with Destiny" delivered on 14th Aug 1947 before Constituent Assembly, Nehru referred to Gandhiji, as "The ambition of the greatest man of our generation has been to wipe every tear from every eye".

CABINET MISSION PLAN

Provisions of Cabinet Mission Plan

• *Total seats: 389*

1. *Elected Members: 296* → represented British India.

Out of 296:

• *292 members* came from Governor's Provinces **(11 provinces in total).**

• *4 members* came from Chief Commissioner's Provinces.**(4 provinces)**

2. *Nominated Members: 93* → represented Princely States (they didn't conduct elections; rulers nominated members).

Seats Allocation

• Seats allocated to each British province, were to be divided among three principal communities: *Muslim, Sikh and General.*

• One seat was to be allotted per 1 million population.

• It was partly elected and partly nominated.

• Method of election (Indirect Elections): *Proportional Representation + Single Transferable Vote.*

• Elections held in: **July-August 1946.**

Results:

- *Majority:* Congress (INC): *208 seats*
- Muslim League: *73 seats*
- Independent: *15 seats*

After boycott of Muslim League, Remaining seats: 299 (after partition).

INTERIM GOVERNMENT

• *2nd September 1946:* The Interim Government of India was formed. It lasted until India's independence on *15th August 1947,* and the partition of the country into India and Pakistan.

→ *President of the Executive Council* (Viceroy and Governor-General of India): *Viscount Wavell* (till Feb 1947); *Lord Mountbatten* (from Feb 1947)

→ *Commander-in-Chief: Sir Claude Auchinleck*

→ *Vice President,* also in charge of External Affairs and Commonwealth Relations: *Jawaharlal Nehru (INC)*

→ *Home Affairs, Information and Broadcasting: Sardar Vallabhbhai Patel (INC)*

→ *Agriculture and Food: Rajendra Prasad (INC)*

→ **Commerce**: *Ibrahim Ismail Chundrigar (ML)*

→ *Defence: Baldev Singh (INC)*

→ *Finance: Liaquat Ali Khan (ML)*

→ *Health: Ghazanfar Ali Khan (ML)*

→ *Labour: Jagjivan Ram (INC)*

→ *Law: Jogendra Nath Mandal (ML)*

→ *Education and Arts: C. Rajagopalachari (INC)*

→ *Railways and Communication, Post and Air: Abdur Rab Nishtar (ML)*

→ *Industries and Supplies : John Mathai (INC)*

Objective Resolution

• *13th December 1946:* Objective Resolution was presented by *Jawaharlal Nehru* before the Constituent Assembly.

• *22nd January 1947:* Objective Resolution was accepted by the Constituent Assembly.

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Committees of the Constituent Assembly

• The Constituent Assembly of India formed *8 Major* and *13 Minor* committees.

Major Committee of Constituent Assembly

Committee	Head
Union Powers Committee	J. L. Nehru
Union Constitution Committee	J. L. Nehru
States Committee	J. L. Nehru
Provincial Constitution Committee	Sardar Patel
Advisory Committee on Fundamental Rights, Minorities, and Tribal and Excluded Areas	Sardar Patel
Drafting Committee	Dr. B. R. Ambedkar
Rules of Procedure Committee	Dr. Rajendra Prasad
Steering Committee	Dr. Rajendra Prasad

Minor Committee of Constituent Assembly

Committee	Head
Finance and Staff Committee	Dr. Rajendra Prasad
Ad-hoc Committee on the National Flag	Dr. Rajendra Prasad
Credentials Committee	Alladi Krishnaswami Ayyar
House Committee	B. Pattabhi Sitaramayya
Committee on Chief Commissioners Provinces	B. Pattabhi Sitaramayya
Order of Business Committee	Dr. K. M. Munshi
Committee on the Functions of the Constituent Assembly	G. V. Mavalankar
Ad-hoc Committee on the Supreme Court	S. Varadachariar
Ad-hoc Committee Citizenship	S. Varadachariar
Expert Committee on the Financial Provisions of the Union Constitution	Nalini Ranjan Sarkar
Linguistic Provinces Commission	S. K. Dhar
Special Committee to Examine the Draft Constitution	J. L. Nehru
Press Gallery Committee	Usha Nath Sen

DRAFTING COMMITTEE

• Set up on: *29th August 1947*

• ***Total members of Drafting Committee***: 7

→ ***Chairman***: *Dr. B. R. Ambedkar* (also known as **"Modern Manuh"** or **"Modern Man"**)

→ *Alladi Krishnaswami Ayyar*

→ *N. Gopalaswami Ayyangar*

→ *Muhammad Saddullah*

→ *B. L. Mitter* (replaced by **N. Madhav Rau**)

→ *D. P. Khaitan* (replaced by **T. T. Krishnamachari**)

→ *K. M. Munshi*

Drafts of Constituent Assembly

• *21 Feb 1948*: First draft was published. It took 8 months for people of India to discuss.

• *4 Nov 1948*: B. R. Ambedkar introduced the final draft before Constituent Assembly.

> ***B.R. Ambedkar was elected to the Consituent Assembly from Bengal in July 1946 (before Partition) but after Partition he was elected from Bombay Presidency.***

• ***1st reading:*** 5 days (4th Nov 1948-9th Nov 1948).

• ***2nd reading:*** 10 months and 3 days (15 Nov 1948-17 Oct 1949)

• ***3rd reading:*** Completed on 26 Nov 1949.

Important Sessions

• ***Total sessions held:*** *11 sessions for 165 days.*

• Total time taken for drafting the Constitution: *2 years 11 months 18 days.*

• ***Budget***: *64 lakhs* **(to frame the Constitution).**

• ***1st Session***: *9-23rd December 1946*

• ***10th Session***: *6-17th October 1949*

> ***211 members were present on the 1st day of the constituent assembly.***

• ***11th Session***: *14-26th November 1949* (also the last session).

• ***Final Draft***: Presented by Dr. B. R. Ambedkar before the public on 4th November 1948.

• *26th November 1949*: Constitution was *adopted* (this day is also celebrated as the *"Constitution Day"*)

• *26th November 1949:* Some provisions were imposed.

- Citizenship (Article 5-9)
- Elections (Article 324-329)
- Provisional Parliament

• *26th January 1950*: Constitution was *enforced / commenced* on this day, Hence, this day is celebrated as ***THE REPUBLIC DAY OF INDIA***.

• The reason for chosing this date is because on the same day in 1930 **Purna Swaraj** day was celebrated following the Lahore session (1929)

> ***Originally, our Constitution consisted of 395 Articles, 8 Schedules, 22 Parts and a Preamble.***

Functions of the Constituent Assembly

• It acted as a law-making body (to legislate) → *G. V. Mavalankar (first speaker of Lok Sabha)*

• It acted as a Constitution making body.

→ Temporary President (before elections): *Sachchidananda Sinha*

→ President (after elections): *Rajendra Prasad*

→ Vice President: *V. T. Krishnamachari and H. C. Mukherjee*

• It functioned as the ***'First Parliament of India.'***

• It adopted National Flag on **22 *July*, 1947**

• It adopted National Anthem *("Jana Gana Mana"→ by Rabindranath Tagore) and National Song ("Vande Matram"→ by Bankim Chandra Chatterjee)* on **24 *January*, 1950.**

• It ***ratified*** India's membership of the Commonwealth in *May 1949.*

• *Elected Dr. Rajendra Prasad as the 1st President of India on 26 Jan 1950.*

Some more Significant facts to know:

→ Legal/ Constitutional advisor : *B. N. Ray*

→ Chief Draftsman : *S. N. Mukherjee*

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→ No. of members who signed constitution: *284 (including 15 female members)*

Signed on the last sitting of the Consituent Assembly on 24 Jan 1950.

- Constitution Calligraphers:—***English*** : *Prem Bihari Naraian Raizada*
  —***Hindi*** : *Vasant Krishan Vaidya*
- Constitution decorator : *Nand Lal Bose and Beohar Rammanohar Sinha*
- Secretary of Constituent Assembly: *H.V. Iyengar*

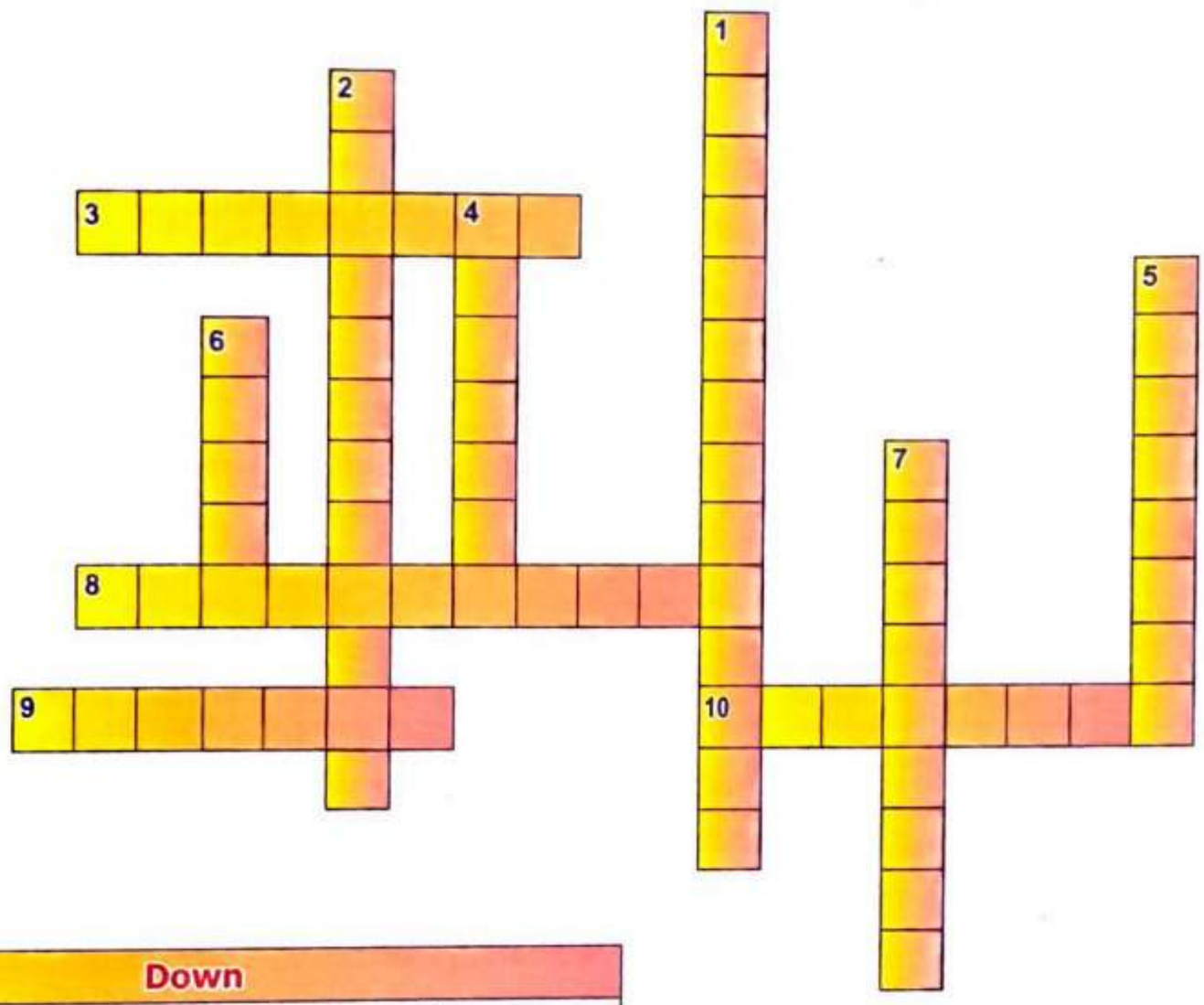
- India's constitution is the largest written constitution, its symbol is an *Elephant.*
- Language of the Constitution: *English*

Important Female members of The Constituent Assembly

- *Rajkumari Amrit Kaur* → 1st Health minister
- ***Sucheta Kriplani*** → 1st female Chief Minister of Uttar Pradesh
- ***Sarojini Naidu*** → 1st Governor of Uttar Pradesh

PARMAR'S CROSSWORD

MAKING OF CONSTITUTION



Down

1. Interim president of Constituent Assembly.
2. Fundamental law defining structure of government.
4. Handwritten version of Indian Constitution author.
5. Known as father of Indian Constitution.
6. Headed Union Powers and States Committee.
7. Chief draftsman of the Constitution.

Across

3. President of the Constituent Assembly.
8. Last British Viceroy of India.
9. BN Rau's official role in Constitution making.
10. Constitution Day is celebrated in which month.

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- Indian Constitution is the *lengthiest written Constitution* in the world.
- Originally Constitution contained: *395 Articles, 22 Parts, 8 Schedules*
- Presently it contains: *448 Articles, 25 Parts, 12 Schedules*
- Part 7 has been deleted and new Parts: IV-A, IX-A, IX-B, and XIV-A have been added.

Written Constitution	Unwritten Constitution
• Compiled and structured in a systematic form.	• Not structured
• Formally constituted	• Not formally constituted
• Not easy to amend	• Easy to amend
• Ex: India	• Ex: UK

FEDERALISM

- This refers to the existence of more than one level of government in the country.
- *Three tier* government exists in India: — Union/Centre, States, Local Bodies
- Under federalism, the states are not merely agents of federal government, they drive their authority from Constitution itself.

> • India has a : ***Federation with a unitary bias.***
> ***Federation with a strong Centre.***

Federal features vs Unitary features

Federal Features	Unitary Features
Written Constitution	Single Constitution
Supremacy of the Constitution	Single Citizenship
Rigidity of Constitution	Integrated Judiciary
Independence of Judiciary	All India Services
Bicameralism	Emergency provisions
Dual Government	Appointment of governors by centre

Comments on Indian Federalism

→ ***Quasi Federal : By K.C. Wheare***
→ ***Cooperative Federalism : By Granville Austin***
→ ***Bargaining Federalism : By Morris Jones***
→ ***Federalism with centralising tendency : By Ivor Jennings***

- ***India has a Parliamentary form of Government, having-***

3 organs of government — *LEGISLATIVE - makes laws*, *EXECUTIVE - carries out laws*, *JUDICIAL - evaluates laws*

SCHEDULES OF INDIAN CONSTITUTION

Schedule 1: Names of States and UTs and their territorial jurisdiction

Schedule 2: Provisions relating to emoluments and allowances.
President, VP, Governor, Speaker + Deputy Speaker (LS+LA), Chairman + Deputy Chairman (RS + LC), Judges (SC+ HC), CAG

Schedule 3: Oaths and affirmations (Union + State)
Ministers, MPs, MLAs, Judges, CAG

Schedule 4: Allocation of seats in Rajya Sabha.

Schedule 5: Provisions relating to administration of scheduled areas and scheduled tribes.
Andhra Pradesh, Chhattisgarh, Maharashtra, Jharkhand, Madhya Pradesh, Gujarat, Himachal Pradesh, Odisha, Rajasthan, Telangana

Schedule 6: Provisions related to administration of tribal areas.
Assam, Tripura, Meghalaya, Mizoram

> ***TRICK: ATM without Money (Manipur is not included)***

Schedule 7: 3 lists containing subject in which Union and States can make laws. (Federal Provisions)
Union list, State list, Concurrent list

Union List Subjects: ***Initially 97, presently 100 subjects***(Defence, arms and ammunition, atomic energy, citizenship, airways, inter-state trade and commerce, banking, foreign affairs, labour and mines, census, etc.)

State List Subjects: ***Initially 66, presently 61 subjects.*** (Public order, local government, health, pilgrimage, liquor, agriculture, fisheries, betting and gambling, etc.)

Concurrent List Subjects: ***Initially 47, presently 52 subjects. Both State and Centre can make laws about subjects given in this list.*** (Marriage and divorce, insolvency and bankruptcy, trade and labour disputes, electricity, education, weights and measure, etc.)

> ***Residuary List :***
> ***• These subjects are not included in Union/State/Concurrent list***
> ***• Parliament has the power to legislate on residuary subjects.***

Subjects Transferred through 42nd Amendment (State list to Concurrent list)

→ Education
→ Forests
→ Weights and Measures
→ Protection of wild animals and birds
→ Administration of justice

> ***Amendment***: a formal change to law, contract, constitution, or other legal document.

Schedule 8: Official languages
- Originally there were *14 languages.*
- Presently there are *22 languages.*

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• Here's a list of constitutional amendments that added following languages to the list :

21st CAA, 1967 → *Sindhi* was added.
71st CAA, 1992 → *Konkani, Manipuri, Nepali* (**Trick : KMN**)
92nd CAA, 2003 → *Bodo, Dogri, Maithili, Santhali* (**Trick : BDSM**)
96th CAA, 2011 → It changed the name *'Oriya' to 'Odia'*

Classical languages of India

TRICK		Classical languages +	Newly added in 2024
Tu	→	Tamil	Marathi
Shuru	→	Sanskrit	Pali
Toh	→	Telugu	Prakrit
Kar	→	Kannada	Assamese
Mai	→	Malayalam	Bengali
Aariya	→	Odia	

Schedule 9: Provisions related to land reforms and Zamindari system. *(Added through 1st CA: 1951)*

Schedule 10: Provisions relating to disqualification of MPs and MLAs on grounds of defection. *(52nd CA: 1985)*

Schedule 11: Provisions relating to Panchayat. *73rd CA: 1992*, 29 functional matters

Schedule 12: Provisions relating to Municipalities. *74th CA: 1992*, 18 functional matters

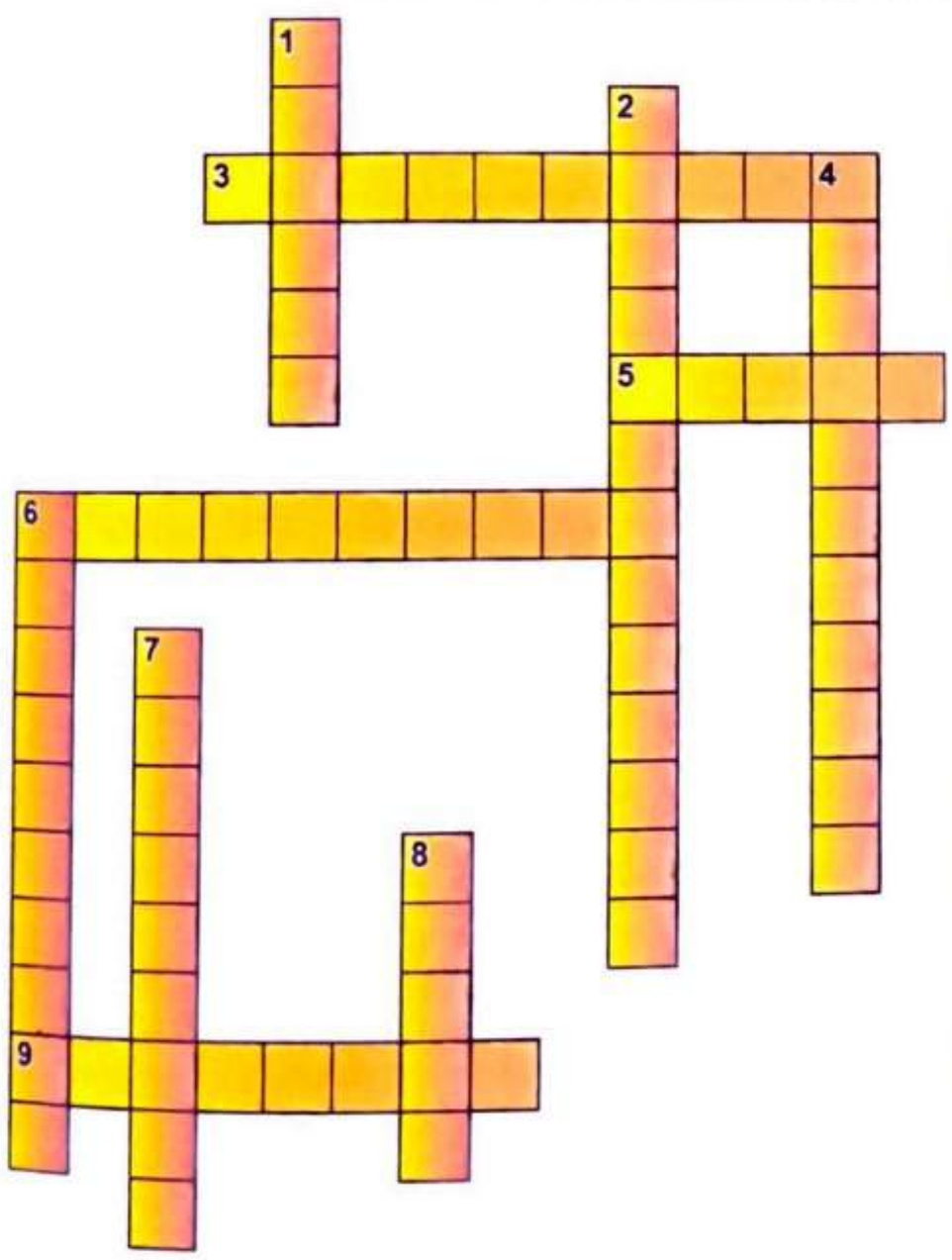
•CA, here, refers to Constitutional Amendment

TRICK to learn Schedules → *TEARS OF OLD PM*

T: Territory
E: Emoluments
A: Affirmation and oath
R: Rajya Sabha
S: Scheduled areas
O: Other scheduled areas
F: Federal provisions
O: Official languages
L: Land provision
D: Defection
P: Panchayat
M: Municipality

PARMAR'S CROSSWORD

SALIENT FEATURES OF CONSTITUTION



Across

3. Government limited by law and rights.
5. Country with longest written constitution
6. Establishment of UPSC falls under which feature.
9. All India Services is not a federal feature.

Down

1. Described Indian Constitution as quasi-federal.
2. System of government in Indian Constitution.
4. Not a feature in Indian Constitution due to dual type.
6. Existence of more than one level of government.
7. Not a unitary feature of Indian Constitution.
8. Described Indian federalism as bargaining federalism.

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PREAMBLE

- It is an introductory statement in a Constitution, which states the reasons and guiding values of the Constitution.
- It contains the summary or the essence of the Constitution
- Tells us about the philosophy of the Constitution.
- It was made **after** the entire Constitution was compiled.
- It is a modified version of the **Objective Resolution presented by J.L. Nehru** before the Consituent Assembly.
  - *Presented on : Dec 13, 1946*
  - *Adopted on : Jan 22, 1947*

Comments on Preamble

ID Card of Constitution: N. A. Palkhivala

Political Horoscope of Constitution: K. M. Munshi

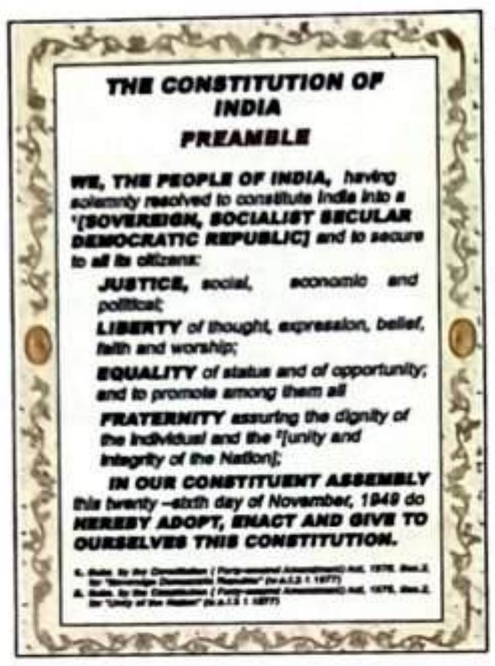
Jewel set : Pt. Thakur Das

Understanding the Preamble

- **Source of power of Constitution**

→ *"WE, THE PEOPLE OF INDIA....."*

- This shows that the constitution has been drawn up and enacted by the people **through their representatives,** and not handed down to them by a king or any outside powers.



THE CONSTITUTION OF INDIA

PREAMBLE

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a [SOVEREIGN, SOCIALIST SECULAR DEMOCRATIC REPUBLIC] and to secure to all its citizens:

JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity; and to promote among them all

FRATERNITY assuring the dignity of the individual and the [unity and integrity of the Nation];

IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949 do HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.

- **Nature of the Constitution**

SOVEREIGN

- People have supreme right to make decisions on internal as well as external matters. ***No external power can dictate*** the government of India.

SOCIALIST

- Wealth is generated socially and should be ***shared equally*** by society.
- Government should regulate the ownership of land and industry to ***reduce socio-economic inequalities.***

Example: Russia

→ ***Capitalistic: USA***

→ ***Mixed: India***

SECULAR

- Citizens have complete ***freedom to follow any religion or no religion at all.*** There is no official state religion. Government treats all religious beliefs and practices equally and impartially
- In India, secularism follows a positive concept. (Involvement of state in religious matters)

DEMOCRATIC

- The government functions according to a set of constitutional rules and principles.
- ***A Government Of the People, By the People, For the People***

REPUBLIC

> ***UK is not a Republic State.***

- A system of government in which the ***head of the state is elected by the people*** and not based on a hereditary succession.

- **Objectives of the Constitution**

JUSTICE

- Citizens cannot be discriminated on the grounds of caste, religion, and gender. Social inequalities have to be reduced.
- ***Three types of justice are given in Preamble:*** *Social, Economic and Political*

LIBERTY

- There are no unreasonable restrictions on a citizen in what they think, how they wish to express their thoughts and the way they wish to follow up their thoughts in action.
- ***Five forms of liberty are given in Preamble:*** *Thought, Expression, Belief, Faith, and Worship*

EQUALITY

- ***All are equal before the law.*** The traditional social inequalities must end. The government should ensure equal opportunities for all.
- ***Two types of equality are given in Preamble:*** *Status and Opportunity*

FRATERNITY

- All of us should behave as if we are members of the same family. No one should treat a fellow citizen as inferior.

> The terms ***"Liberty, Equality, Fraternity and Republic"*** are taken from ***France*** and the ***Ideals of Justice*** are taken from ***Russia.***

Is Preamble a Part of Constitution and is it Amendable?

Berubari Union Case: 1960

- Supreme Court held that—

i) The Preamble is ***not a part*** of the Constitution & hence cannot be amended.

ii) It is just a key to understanding the Constitution.

iii) ***is not legally enforceable.***

Kesavananda Bharati Case: 1973

- In this case, Supreme Court Overruled the Berubari view and held that

i) The ***Preamble is a part of the Constitution.***

ii) It reflects the ***basic structure of the Constitution***

LIC of India Case : 1995

i) Reaffirmed the Kesavananda Bharati case ruling.

> ***Preamble has been amended only once in 1976 through 42nd Constitutional Amendment.***
>
> It added the terms : ***Integrity, Socialist, Secular*** (TRICK: ISS/SIS)

Enforceability of Preamble

- It is ***not enforceable in the Court of Law.***
- It is neither a source of Power nor Restriction to the legislature, but it can be considered as an aid to the legal interpretation of the Constitution.

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PART I - UNION AND IT'S TERRITORY
[Article 1-4]

• *Article 1: Name and Territory of the Union*

(1) **India, that is Bharat, shall be a Union of States.**

(2) The States and the territories, thereof, shall be as specified in the First Schedule.

(3) The territory of India shall comprise of-

(a) The territories of the States;

(b) The Union territories specified in the First Schedule; and

(c) Such other territories as may be acquired

> *Type of Polity*
>
> • *India is not a Federation but a Union of States.*
>
> → *Federation of State:* A new state that is formed through a treaty or an agreement between various federating units.
>
> → *Union of States:* No agreement between the Federating units. They do not have a right to secede from the Union.
>
> • *India is an Indestructible Union of Destructible states.*
>
> • US is an indestructible union of indestructible states.

• *Article 2: Admission or Establishment of new States*

• Parliament may by law admit into the Union, or establish, new states on such terms and conditions as it thinks fit.

• *Article 3: Formation of new States and alteration of areas, boundaries, or names of existing States.*

• Parliament may by law—

(a) form a new State by separation of territory from any State or by uniting two or more States or parts of States or by uniting any territory to a part of any State;

(b) increase the area of any State;

(c) diminish the area of any State;

(d) alter the boundaries of any State;

(e) alter the name of any State

> NOTE: Bill related to subject matters given in Article 3 shall be introduced with the prior recommendation of the President, who shall refer this bill to the legislature of the state concerned.
>
> • *5th Constitutional amendment empowered the President to set a time limit for state legislature to express it's views.*

> *Difference between Article 2 and 3: Article 2 talks about incorporating foreign territory into India while Article 3 talks about the changes in the existing State.*

• *Article 4: Laws made under Article 2 and 3 to provide for the amendment of first and fourth Schedules*

Clause (2) Any law made under Article 2 or Article 3 that amends the First or Fourth Schedule of the Constitution shall not be considered a constitutional amendment under Article 368. Therefore, *such a law can be passed by a simple majority in Parliament.*

• If Indian territory is to be ceded, then amendment is needed under Article 368. *(Berubari Union case, 1960)*

• ***100th CA (2014):*** India-Bangladesh boundary agreement

• India transferred 111 enclaves to Bangladesh while Bangladesh transferred 51 enclaves to India.

INTEGRATION AND FORMATION OF STATES

Integration of the Princely States

• In 1947, *562 out of 565* princely states agreed to accede to the Indian Union by signing the Instrument of Accession. The following 3 Major princely states initially refused to join India, but later—

• *Jammu & Kashmir* acceded to India through an *Instrument of Accession.*

• *Junagarh* became part of India after conducting a *referendum.*

• *Hyderabad* was integrated into India through a *military operation called Operation POLO* in September 1948.

• In 1950, a four fold Classification of states was done: Part A, Part B, Part C, Part D.

Committees on Linguistic Reorganisation of States

Dhar Committee (1948)

• *Chairman: S. K. Dhar*

• Recommended that states should be reorganized based on administrative convenience, not linguistic factors.

JVP Committee (1948)

• *Members: Jawaharlal Nehru, Vallabhbhai Patel, and Pattabhi Sitaramayya*

• It rejected the idea of forming states on a linguistic basis as well.

> 1952: Death of **Potti Sriramulu** after a hunger strike for a separate Telugu speaking state led to the **formation of Andhra Pradesh** ***(became the 1st linguistic state of India, 1953)***

Fazl Ali Commission / State Reorganisation Commission (1953)

• *Members: Justice Fazl Ali, K. M. Panikkar, and H. N. Kunzru*

• Rejected the theory of "*One language, One state*" but supported reorganising states on a linguistic basis.

State Reorganisation Act, 1956

• The State Reorganisation Act of 1956 was passed based on the recommendations of the Fazl Ali Commission.

• ***It removed the fourfold classification of states*** **and** ***created 14 States + 6 Union Territories, on 1st Nov, 1956***

CHRONOLOGICAL ORDER OF STATE FORMATION

> *TRICK: AAM GUNAH HAI MAIM TUSSI GAO AUR MOJ LO*

Aa → Andhra Pradesh *(Full fledged state on 1st Nov, 1956)*

M → Maharashtra, 1960

Gu → Gujarat, 1960

Na → Nagaland, 1963

H → Haryana, 1966

> ***Bombay Reorganisation Act, 1960 bifurcated Bombay in two new states - Maharashtra and Gujarat.***

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Hai → Himachal Pradesh, 1971
Mai → Meghalaya, 1972
M → Manipur, 1972
Tu → Tripura, 1972
Ssi → Sikkim, 1975
Gao → Goa, 1987 (became 25th state of India by 56th CA after being a UT since 1961)
Aur → Arunachal Pradesh, 1987
Moj lo → Mizoram, 1987

Gujarat and Maharashtra commemorate their statehood on 1st May.

Karnataka, Kerala, Andhra Pradesh, Chhattisgarh, Haryana and Madhya Pradesh celebrate their statehood on 1st November.

Additional Points to Remember

- *12th CA, 1962* : ***Goa(UT) + Daman+Diu (Still an UT)***

Operation Vijay,1961: launched by Indian Government to ***liberate Goa, Daman & Diu from Portuguese rule.***

- *10th CA, 1961* : Dadra & Nagar Haveli(UT) → Now merged with Daman and Diu.
- *22nd CA, 1969* : Meghalaya was created within Assam.
- Mizoram and Arunachal: Created as a UT → once part of **NEFA** (North-East Frontier Agency)
- ***Chhattisgarh, Uttarakhand, Jharkhand***: gained statehood in *2000*. Thay were created out of Madhya Pradesh, Uttar Pradesh and Bihar, respectively.
- ***Telangana***: became *29th state of India on June 2, 2014*
- ***Sikkim(Special Case):***

→ was Earlier ruled by ***Chogyal Dynasty,***
→ Became an ***associate state under Article 2A*** (35th Amendment, 1974)
→ Gained *complete statehood in 1975, by 36th Amendment.*
→ Became *22nd* state of India.

Articles Related to Special Provisions for Some States at a Glance

TRICK : NAM AASMA GK

Article No.	Subject Matter
371	Special provision with respect to the states of ***Maharashtra and Gujarat.***
371-A	Special provision with respect to the state of ***Nagaland.***
371-B	Special provision with respect to the state of ***Assam.***
371-C	Special provision with respect to the state of ***Manipur.***
371-D	Special provisions with respect to the state of ***Andhra Pradesh*** or the state of Telangana.
371-E	Establishment of ***Central University in Andhra Pradesh.***
371-F	Special provisions with respect to the state of ***Sikkim.***
371-G	Special provision with respect to the state of ***Mizoram.***
371-H	Special provision with respect to the state of ***Arunachal Pradesh.***
371-I	Special provision with respect to the state of ***Goa.***
371-J	Special provisions with respect to the state of ***Karnataka.***

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PART II - CITIZIENSHIP
[Article 5-11]

Article 5- Citizenship at the commencement of the Constitution

- A person shall be deemed to be a citizen of India on 26 January 1950, if they fulfill any of the following condition—

(a) Born in India
(b) Either of the parents was born in India or;
(c) Has been an ordinary resident of India for at least 5 years immediately before 26 January, 1950.

Single citizenship: Taken from UK (Britain)

- *Article 6 :* It provided rights of citizenship of certain persons who have migrated to India from Pakistan.
- *Article 7 :* Rights of citizenship of certain migrants to Pakistan (India to Pakistan then back to India).
- *Article 8 :* Rights of citizenship of certain persons of Indian origin residing outside India.
- *Article 9 :* Provided that if any person voluntarily acquired the citizenship of a foreign State will no longer be a citizen of India.
- *Article 10 :* Continuance of rights of citizenship.
- *Article 11 :* Parliament to regulate the right of citizenship by law.

Citizenship Act 1955 :

Deals with the provisions of Citizenship *after 26 Jan, 1950.*

Aquisition of Citizenship —

1. By ***Birth***
2. By ***Decent***: Indian origin, but currently living in other country
3. By ***registration***: granted to Indian-origin individuals, spouses of Indian citizens, or minor children who have resided in India for 7 years.
4. By ***Naturalisation***: granted to foreign nationals who have been —

- Residing in India for 12 years (11 years in the preceding 14 years + 1 year immediately before application)
- They must know one Indian Language mentioned in the 8th schedule.

→By ***incorporating a territory***

Can lose Citizenship through :

1. ***Renunciation*** (voluntarily gives up Indian citizenship)
2. ***Termination*** (voluntarily acquired citizenship of other country without informing)
3. ***Deprivation*** (if acquired citizenship by fraud, false documents, or during war helped an enemy country)

Citizenship

- Before the commencement of the Constitution (26 Jan 1950)
- Article(5-8)

- After 26 Jan 1950
- Citizenship Act, 1955

Recent Amendment in Citizenship Act, 1955

Citizenship Amendment Act, 2019 : People from 6 communities → ***Hindu, Sikh, Parsi, Jain, Christian, Buddhist*** of 3 countries ***Bangladesh, Afghanistan, Pakistan*** can acquire citizenship through *Naturalization* i.e. —

- Entered India on or before 31st December 2014,
- Must have lived in India for at least 6 years (instead of 12 years earlier)

For an interactive recap of this topic, see the crossword on Page Number 157.

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PART III : FUNDAMENTAL RIGHTS
[Article 12-35]

Fundamental rights are a set of legally enforceable rights.

Salient Features of Fundamental Rights

Fundamental Rights —

- are not absolute. (but have limits)
- are not 'Sacrosanct' or Permanent.
- can be curtailed during emergency. (but *Article 20 and 21 can never be suspended)*
- are justiciable in nature.

Basic Pointers

- They are borrowed from the Constitution of *USA*. (Bill of Rights).
- They are contained in *Part III* of the Constitution → *Article (12-35)*
- They are termed as *"Conscience of Constitution"*
- They seek to implement ***political democracy.***
- They are referred to as the *"Magna Carta of India"*
- Originally there were 7 fundamental rights, currently there are 6 Fundamental Rights (Right to property was ***removed*** from *Part III in 1978 by 44th CA, It is now a legal right under Article 300-A, part XII.)*

- Six Fundamental Rights given in the constitution are:
  → *Right to Equality*: *Article 14-18*
  → *Right to Freedom*: *Article 19-22*
  → *Right against Exploitation*: *Article 23-24*
  → *Right to Freedom of Religion*: *Article 25-28*
  → *Cultural and Educational Rights*: *Article 29-30*
  → *Right to Constitutional Remedies*: *Article 32*

Fundamental Rights in detail:

Article 12: Definition of State

- It defines the term "State" which includes the Government, Union executive, the Parliament of India, the Legislature of each of the sates, and all local or other authorities within the territory of India.

Article 13: Laws Inconsistent with or in Derogation of the Fundamental Rights

- Any law made before the commencement of constitution shall be declared null and void by judiciary if it violates Fundamental Rights.
- Law includes any ordinance, order, by-law, rule, regulation, notification, in the territory of India.
- This article shall not apply to any amendment made under Article 368.

Article 14-18: Right to Equality

Article 14 : Equality before Law and Equal Protection of laws

Exception: President, MLAs/MPs, governor, foreigner dignitaries cannot be arrested in civil/criminal matters.

Equality before law	*Equal protection of laws*

→*A. V. Dicey* considered equality before the law to be a fundamental principle of Rule of Law.

Equality Before Law	Equal Protection of Law
This is a negative concept taken from the UK.	This is a positive concept taken from USA.
States that everyone should be treated equally in the eyes of the law.	Like should be treated alike under the law.

Article 15: Prohibition of Discrimination on Grounds of Religion, Race, Caste, Sex or Place of Birth

15 (1) The State shall **not discriminate** against any citizen on grounds only of religion, race, caste, sex, place of birth.

15 (2) No citizen shall, on these grounds, be subject to any disability, liability, restriction or condition with regard to-

(a) Access to shops, public restaurants, hotels and places of public entertainment; or

(b) The use of wells, tanks, bathing ghats, roads and places of public resort maintained wholly or partly out of State funds.

15 (3) the State can make special provisions for **women and children,** e.g. few Metro seats are reserved for women.

15 (4) the State can make special provision for the **advancement of Scheduled Castes and the Scheduled Tribes.**

Article 16: Equality of Opportunity in Matters of Public Employment

(1) Equality of opportunity for all citizens in matters relating to ***employment or appointment*** to any office under the state.

(2) No citizen shall, on grounds only of religion, race, caste, sex, descent, place of birth, residence, be ineligible for, or discriminated against in respect of, ***any employment or office under the state.***

(3) State can set rule that gives ***preference to people who are residents of the area*** when it comes to local employment or appointments.

(4) State can make rules to reserve jobs or positions for ***"backward classes"*** who are underrepresented in the state services.

Cases/Commission subjective to article 16(4):

- ***Kalelkar Commission (1953)***

→ 1st Backward Class commission *(Chairman: Kaka Kalelkar)*

- ***Mandal Commission (1979)***

→ 2nd Backward Class commission *(Chairman : B P Mandal)*
→ Recommended 27% reservation to OBCs
→ Implemented by Prime Minister *V.P. Singh in 1990.*

- ***Indra Sawhney Case (1992) - also known as Mandal case.***

→ Public Interest Litigation by advocate Indira Sawhney.
→ The Supreme Court upheld the **27%** reservation for OBCs in government job, but also set a **50%** cap on total reservations.
→ Creamy-layer is to be identified in OBC are ***not entitled*** to reservation.

Public Interest Litigation(PIL) is taken from USA's constitution.

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Article 17: Abolition of Untouchability

→ The state and any private individual are prohibited from practicing untouchability.

• The term 'Untouchability' has nowhere been defined in the constitution.

Article 18: Abolition of Titles

→ No title, other than being a military or academic distinction, shall be conferred by the State.

→ No citizen of India shall accept any title from any foreign state.

→ No person, holding any office of profit shall receive "Title" from any foreign state without the consent of the President.

Eg:- Maharaja, Rai Bahadur, etc.

Article 19-22: Right to Freedom

Article 19 : Protection of certain rights regarding freedom of speech, etc.

TRICK - SAAMRO

(1): All citizens shall have the right-

S → (a) to freedom of **speech and expression** — *"Hallmark of Democracy"*

A → (b) to assemble peacefully and without **arms;**

A → (c) to form **associations or unions** or cooperative societies;

M → (d) to **move freely** throughout the territory of India

R → (e) to **reside and settle** in any part of the territory of India;

O → (g) to practise any profession, or to carry on any **occupation, trade or business.**

(2): ***Reasonable restriction*** can be imposed in interest of Public order, decency, morality, sovereignty, integrity,defamation, contempt of court etc.

Hidden Rights under Article 19:

- ***Right to Internet (Anuradha Bhasin vs Union of India case,2020)***
- ***Right to Information (Raj Narayan vs State of UP, 1975)***

> • *97th Amendment added Right to form Cooperative societies under Article 19(1)(c).*
> • *Article 19(f),Right to Property, has been omitted by 44th CA, 1978.*

Article 20: Protection in respect of conviction for Offences

(1) ***No ex-post-facto law*** : No person shall be subject to a penalty greater than that prescribed by law in force when the crime was committed.

(2) ***No double jeopardy*** : A person must not be punished twice for the same offence.

(3) ***No self-incrimination*** : A person cannot be compelled to provide information or testify against oneself. But have to submit blood specimen or thumb impressions, if asked.

Article 21: Protection of Life and Personal Liberty

→ No person shall be deprived of his life except according to the procedure established by law. ***(Borrowed from the Japanese constitution)***

→ The **foremost right** among right to freedom is Right to life and Personal Liberty.

> *Article 20 and 21 can never be suspended.*

Landmark Cases & Interpretations—

A. K. Gopalan Case : 1950

• The Supreme Court of India took a ***narrow view*** of Article 21 and ruled that it does not guarantees "Due process of law."

Maneka Gandhi Case: 1967

• The Supreme Court overturned the Gopalan case ruling.

• Took a wide stance on Article 21 and introduced the "Due Process of Law."

• It expanded the interpretation of Article 21 and ***made Right to Travel abroad- a Fundamental Right to personal liberty.***

• Included some rights under Article 21 namely Right to Health, Shelter, Speedy trial, Information, Sleep, Electricity, Privacy

> ***KS Puttaswamy case affirmed that the Right to Privacy is an intrinsic part of right to life and personal liberty.***

> ***'Due Process of Law': ensures fair and just legal proceedings. It is not mentioned in Constitution and is an American concept.***

Article 21(A): Right to Education

→Added by ***86th Constitutional Amendment Act, 2002***

→It guarantees the right to free and compulsory education for children between the ages of 6 and 14.

Article 22: Protection against Arrest & Detention in certain cases

→ A person being arrested under ordinary law has:

- Right to be informed.
- Right to be defended by a legal practitioner.
- Right to be produced before a magistrate within 24 hrs.
- Right to be released after 24 hours unless the magistrate authorises for their detention.

> ***Punitive Detention : Occurs after a crime has been committed.***
> ***Preventive detention: To prevent a possible future offence.***
> ***This detention cannot exceed 3 months, unless an Advisory Board of High Court judges approves an extension.***

Article 23-24: Right against Exploitation

Article 23: Prohibition of trafficking in Human Beings and Forced Labour (Beggar)

→ Exception: State can force people to do compulsory services, for e.g. during War.

Article 24: Prohibition of Employment of Children in Hazardous Places

→ No child below the age of 14 years shall be employed in Factories, Mines or any other hazardous occupations.

→ They can however work at safe places during non- school hours.

Article 25-28 : Right to freedom of Religion

Article 25: Freedom of Conscience and Free Profession,Practice and Propagation of Religion

Article 26: Freedom to Manage Religious Affairs

→ Every religious institution or section shall have the right to:

(a) Establish and maintain religious institutions.

(b) Manage their own religious affairs.

(c) Own and acquire movable and immovable property.

(d) Administer property in accordance with law.

→ Article 26 also guarantees collective freedom of religion.

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Article 27: Freedom as to Payment of Taxes for Promotion of Any Particular Religion

→ This provision prohibits only the levy of taxes and not fee.

Article 28: Freedom from attending Religious Instruction

→ No religious instruction shall be provided in any educational institution wholly funded by the State.

Article 29-30: Cultural and Educational Rights

Article 29: Protection of Interest of Minorities

→ ***Any section of citizens*** with a distinct language, script, or culture has the right to conserve it.

Article 30: Rights of Minorities to establish and administer educational Institutions

→ The state cannot discriminate based on religion or language while providing aid.

> ***•Article 29 is not solely specific to minorities whereas Article 30 is specifically for minorities. Term ' Minority' is nowhere defined in constitution.***

Article 32-35: Right to Constitutional Remedies

Article 32 : Remedies for enforcement of rights conferred by this part

1. Right to approach the Supreme Court for the enforcement of Fundamental Rights.
2. Supreme Court's powers: The Supreme Court can issue orders, directions, or writs to enforce fundamental rights. These writs include Habeas corpus, Mandamus, Prohibition, Certiorari, and Quo-warranto.

Writ Jurisdiction SC vs HC:

Supreme Court (Article 32)	High Court (Article 226)
The SC cannot refuse to issue writ.	The HC can refuse to issue writ.
It can only issue writs when there is violation of Fundamental Rights only.	It can issue writs when there is violation of Fundamental Rights + Legal Rights **(hence, writ jurisdiction of HC is wider)**.
Jurisdiction: Throughout the territory of India.	Jurisdiction: Throughout the state

> ***• Parliament can authorise any other court other than SC & HC to issue writs.***

Five writs issued by the Supreme Court (and High Courts) under Article 32 and Article 226 of the Indian Constitution are:

Habeas Corpus – *"to have the body of"*

It ensures individual liberty against unlawful detention.

> ***ADM Jabalpur case is also known as Habeas Corpus case, it is related to 'Personal Liberty.'***

Mandamus – *"We command"*

• Orders a public official or authority to perform a duty they failed to do.

• It cannot be issued against : a private individual, President, Governor, or when the duty is not mandatory.

Prohibition – *"To forbid"*

• Issued by a superior court to a lower court to prevent the latter from exceeding its jurisdiction.

Certiorari – *"To be certified"*

• Issued by a higher court to transfer a case pending in the lower court to itself or nullifies the lower court's order if it acted beyond jurisdiction.

Quo Warranto – *"By what authority"*

• Challenges a person's right to hold a public office.

> ***• Dr. B. R. Ambedkar mentioned Article 32 as "Heart and Soul" of Indian Constitution.***

Article 33

→ It empowers the parliament to restrict the Fundamental Rights for the members of Armed Forces, Police and Intelligence Agencies to ensure proper discipline and duty. ***(50th amendment, 1984)***

Article 34

→ It provides for the restrictions on Fundamental Rights while Martial Law is enforced in an area.

> ***Martial Law borrowed from: UK***

Article 35

→ It vests exclusive powers in parliament to make laws relating to enforcement of certain fundamental rights.

> ***Rights that are available only to the citizen of India and not to Foreigners - Article 15, 16, 19, 29, 30***

For an interactive recap of this topic, see the crossword on Page Number 157.

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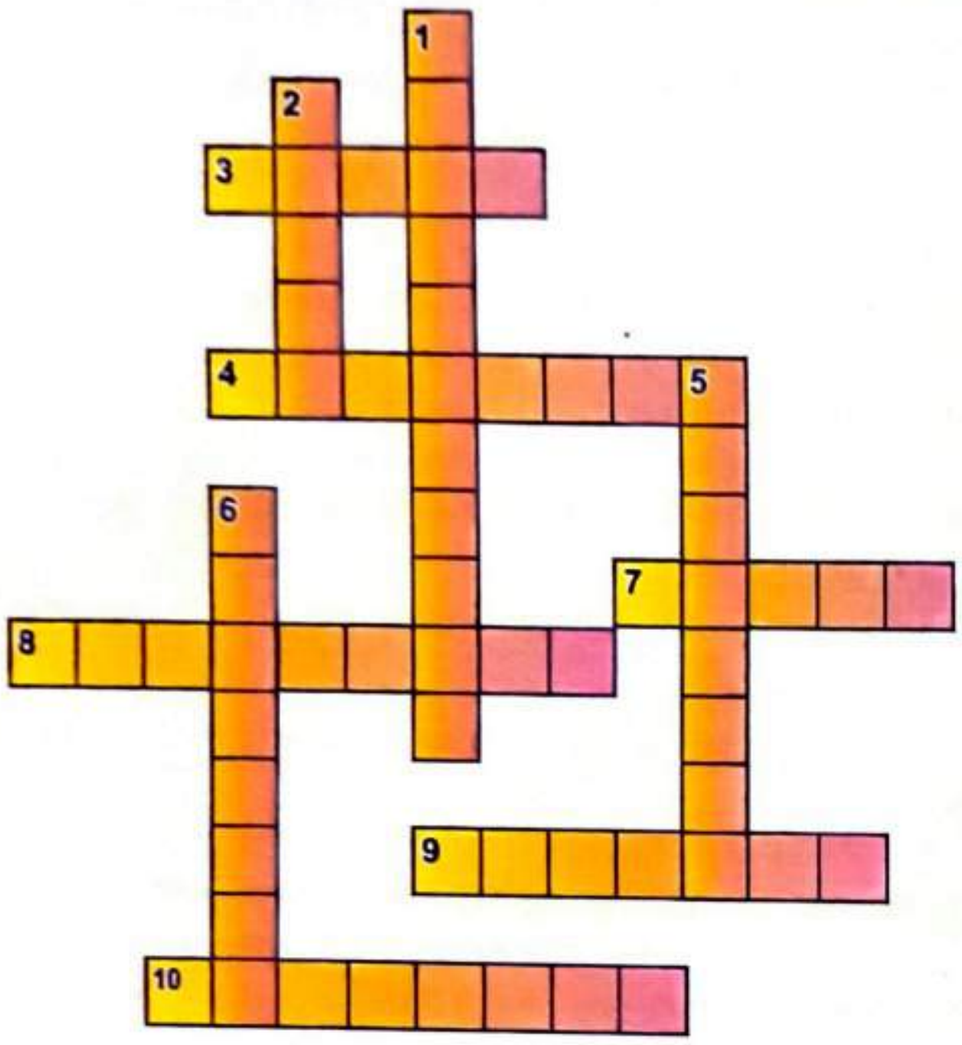
PARMAR'S CROSSWORD

PREAMBLE + PART–1 AND PART–2 OF THE CONSTITUTION



Across

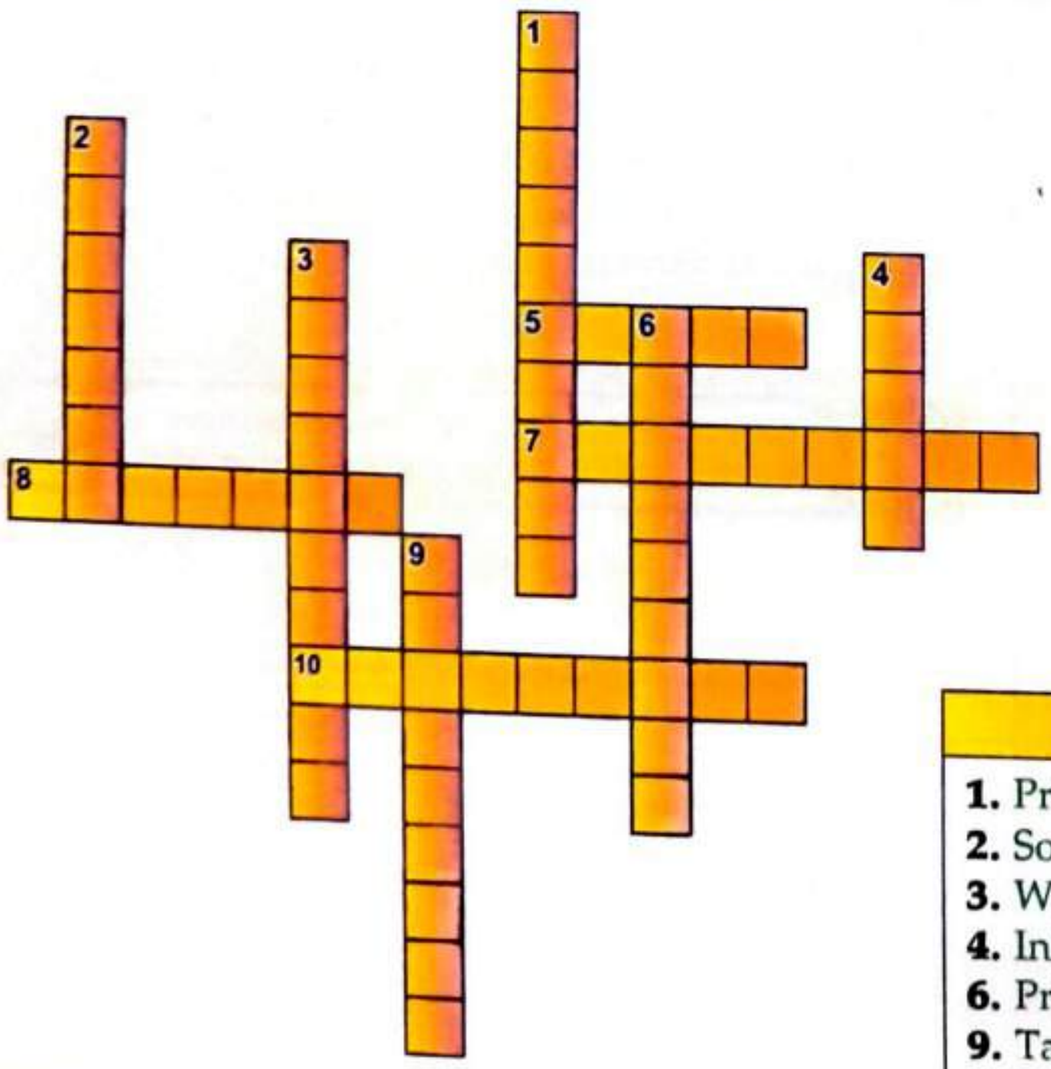
3. Ensured through fraternity in the Preamble.
4. First President of Constituent Assembly.
7. Moved the Objective Resolution.
8. Term in Preamble signifying no external control.
9. Principle in Preamble taken from France.
10. Indicates elected head of state.

Down

1. Subject of Articles 5 to 11.
2. Country with longest written constitution.
5. Father of Indian Constitution.
6. Described as political horoscope of the Constitution.

PARMAR'S CROSSWORD

FUNDAMENTAL RIGHTS



Across

5. Defined in Article 12 of the Constitution.
7. Provides right to freedom of speech.
8. Mentioned part of Constitution for Fundamental Rights.
10. Abolition of titles mentioned under this.

Down

1. Privacy case petitioner under Article 21.
2. Source of Fundamental Rights in Indian Constitution.
3. Writ to quash lower court decision.
4. Initially provided number of Fundamental Rights.
6. Prohibits human trafficking and forced labour.
9. Talks about right to equality.

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PART IV - DIRECTIVE PRINCIPLES OF STATE POLICY [Article 36-51]

Salient Features of DPSP

- DPSP, are non-justiciable, means that they are not legally enforceable by courts.
- The concept is borrowed from the Irish Constitution.
- They place ***positive obligations*** on the State to promote social and economic justice.
- Their objective is to help establish ***social and economic democracy.***
- DPSPs reflect the vision of a ***Welfare State*** as outlined in the Constitution.
- They serve as a measure to assess laws based on their alignment with constitutional ideals.
- ***Novel Features/Resemble the Instrument of Instructions as contained in GoI Act 1935:*** *B. R. Ambedkar*
- DPSP have ***Moral and Political*** sanctions.

Comments on DPSP :

- Conscience of Constitution: *Granville Austin*
- Manifesto of aims and aspirations: *K. C. Wheare*
- Cheque payable by the bank at its own convenience: *K. T. Shah*
- Moral Percepts for the authorities of state: *B. N. Rau*

Article 36: ***Definition of State.***

→ Defines the term "State" as it is used in Part III.

→ The meaning of "State" here is the same as in Article 12 under Fundamental Rights.

Article 37: ***Application of the Principles contained in this part.***

→ They are non- justiciable in nature.

→ They are fundamental to governance.

→ It is the duty of the state to apply these principles when making laws and policies

Article 38 : ***State to secure a social order for the promotion of welfare of the people***

(a) The State must promote people's welfare by ensuring justice—social, economic, and political.

(b) It should also reduce inequalities in income, status, facilities, and opportunities. ***(44th Amendment, 1978)***

Article 39: ***Certain principles of policy to be followed by the State***

TRICK : LDC goes to PHC

The State should work to ensure:

L- (a) **Livelihood** for all citizens

D- (b) Fair **distribution** of resources for the common good.

C- (c) Avoiding **concentration of wealth** and production.

P- (d) Equal **pay** for equal work for men and women.

H- (e) Protection of worker's **Health** and children from exploitation.

C- (f) Proper development opportunities for **Children** ***(42nd Amendment, 1976)***

Article 39A: ***Equal Justice and Free Legal Aid***

→ Directs the State to ensure equal justice and provide free legal aid to the poor and weaker sections. ***(42nd Amendment Act, 1976)***

Article 40: ***Organisation of Village Panchayats***

Article 41: ***Right to Work, Education, and Public Assistance in certain cases***

Article 42: ***Just and Humane Working Conditions & Maternity Relief***

Article 43: ***Living Wages and Decent Working Conditions***

Article 43A: ***Workers' Participation in Management of Industries***

→ The State shall ensure workers' participation in industry management ***(42nd Amendment, 1976).***

Article 43B: ***Promotion of Cooperative Societies***

→ The State shall promote the formation and democratic management of cooperative societies ***(97th Amendment, 2011).***

Article 44: ***Uniform Civil Code***

Article 45: ***Provision for Early Childhood Care and Education***

→ ***86th Amendment Act, 2002*** changed the subject matter of this article and shifted focus to early childhood care and education for children below the age of six years.

Article 46: ***Promotion of Educational and Economic Interests of SCs, STs, and Weaker Sections***

Article 47: ***Duty to Raise Nutrition, Living Standards, and Public Health***

Article 48: ***Organisation of Agriculture and Animal Husbandry***

→ prohibit slaughter of cows, calves, and useful cattle.

Article 48A: ***Protection of Environment, Forests, and Wildlife***

→ The State shall protect and improve the environment and safeguard forests and wildlife ***(42nd Amendment, 1976).***

Article 49: ***Protection of Monuments and National Heritage***

Article 50: ***Separation of Judiciary from Executive***

Article 51: ***Promotion of International Peace and Security***

Classification of DPSP:

Socialist	Gandhian	Liberal
Article 38, 39, 41, 42, 43, 43A, 47	Article 40, 43, 46, 47, 48	Article 44, 45, 48A, 49, 50, 51

*****This classification of DPSP into Socialist, Gandhian and Liberal is not mentioned in the constitution.***

- ***Socialistic principles:*** aim for social and economic welfare, focusing on equality and a welfare state.
- ***Gandhian principles :*** emphasize on decentralized governance, self-sufficiency, and equitable resource distribution.
- ***Liberal-Intellectual principles :*** prioritize individual freedoms and rights, along with promoting a strong, rational state.

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DPSPs added through Amendment

- ***42nd CA (1976)***
  - 39(f): Childrens' healthy development
  - 39A: Poor (equal justice & free legal aid)
  - 43A: Participate of workers in management of industries
  - 48A: To protect environment , safeguard wildlife
- ***44th CA (1978)*** : Article 38; To reduce inequality
- ***86th CA (2002)*** : Article 45; Early childhood care
- ***97th CA (2011)*** : Article 43B; Cooperative Societies

Cases related to DPSPs vs Fundamental Rights (FRs)

Champakam Dorairajan Case (1951): Supreme Court ruled that—

- FRs would prevail over DPSP.
- FRs are amendable.

Golaknath Case (1967): Parliament cannot revoke/amend FRs.

Aftermath of The Golaknath case:

- In response to the Golaknath case, the Parliament enacted 24th amendment which empowered Parliament to amend FRs.
- 25th Amendment: Inserted Article 31(c)

(i) Laws implementing DPSP under Articles 39(b) and 39(c) cannot be declared null and void on the grounds of contravention of Article 14 & 19.
(ii) No such law can be questioned in the court.

Keshavananda Bharti Case (1973): A 13 judges bench ruled that —

- Parliament can amend FRs but cannot disturb the Basic Structure of the Constitution.
- The 2nd provision of the 25th amendment which restricted judicial reviews of laws was declared unconstitutional.

Minerva Mill Case (1980): Indian Constitution is found on the bedrock of balance between FRs and DPSP.

Difference between FRs and DPSPs

Fundamental Rights	DPSPs
Negative obligations	Positive obligations
Justiciable rights	Non-justiciable
Focused on political democracy	Promotes social/economic welfare
Protected by legal sanctions	Backed by moral/political sanctions
Oriented towards individual welfare	Focused on societal welfare
Automatically enforceable	Require legislative enactment
Court can invalidate laws violating FRs.	Courts cannot invalidate laws violating DPSP

PART IVA- FUNDAMENTAL DUTIES
[Article 51 A]

- FDs are borrowed from the *USSR*.
- Statutory and non-enforceable.
- Not originally part of the Constitution.
- Applicable only to Indian citizens, not foreigners.
- Introduced through the 42nd Constitutional Amendment Act (1976).
- Intially 10 Fundamental Duties were added to the Constitution.
- Currently, there are *11 Fundamental Duties*.
- The last Fundamental Duty ***[Article 51A(k)] was added later via 86th Constitutional Amendment Act, 2002.***

Committee that suggested addition of Fundamental Duties:

- *Swaran Singh Committee* proposed Fundamental Duties in 1976:

→ Recommended 8 duties. ***(Prime Minister - Indira Gandhi)***
→ 5 duties accepted, 3 duties rejected.

→**Rejected duties:**
- Imposing penalties for not observing duties.
- Prohibition against challenging penalty laws in courts.
- Duty to pay taxes.

- On the recommendations of Swaran Singh Committee the 42nd CA of 1976 was made to ***add 10 FDs in Part IVA.***
- ***Article 51A*** which added 11th duty was added later through ***86th CA, 2002.***

ARTICLE 51(A)

(a) to abide by the Constitution and **respect** its ideals and institutions, the **National Flag and the National Anthem;**
(b) to cherish and **follow the noble ideals** that inspired the national struggle for freedom;
(c) to uphold and protect the **sovereignty, unity and integrity** of India;
(d) to **defend** the country and render national service when called upon to do so;
(e) to promote harmony and the spirit of **common brotherhood** among all the people of India, transcending religious, linguistic and regional or sectional diversities; to renounce practices derogatory to the **dignity of women;**
(f) to value and preserve the rich **heritage** of our composite culture;
(g) to protect and improve the natural **environment** including **forests,** lakes, rivers and wildlife, and to have compassion for living creatures;
(h) to develop the **scientific temper, humanism** and the spirit of inquiry and reform;
(i) to safeguard public property and to **abjure violence;**
(j) to **strive towards excellence** in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievement;
(k) duty of a parent or guardian : to provide opportunities for education to his child or ward between the age of six and fourteen years. *(Added through 86th CA, 2002)*

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• *Justice Verma Committee:*

→ It identified the existence of legal provisions for implementation of Fundamental Duties and teaching school kids about their duties.

Laws Reflecting and Enforcing Fundamental Duties

• ***The Unlawful Activities (Prevention) Act (1967)***

→ Prevents activities that threaten the sovereignty and integrity of India — *Duty (c)*

• ***Prevention of Insults to National Honour Act (1971)***

→ Prohibits disrespect to the Constitution, National Flag, and National Anthem.— *Duty (a)*

• ***Wildlife Protection Act (1972)***

→ Provides legal protection to wild animals and birds. — *Duty (g)*

• ***Forest Conservation Act (1980)***

→ Restricts deforestation and conserves forests. — *Duty (g)*

• ***Representation of the People Act (1951)***

→ Regulates elections and upholds democratic processes.— *Duties (a)*

• ***Indian Penal Code (IPC)***

→ Defines crimes and prescribes punishments, protecting public order and morality. — *Duties (i) and (e) (to renounce derogatory practices against women)*

• ***Protection of Civil Rights Act (1955)***

→ Eliminates untouchability and promotes equality. — *Duty (e)*

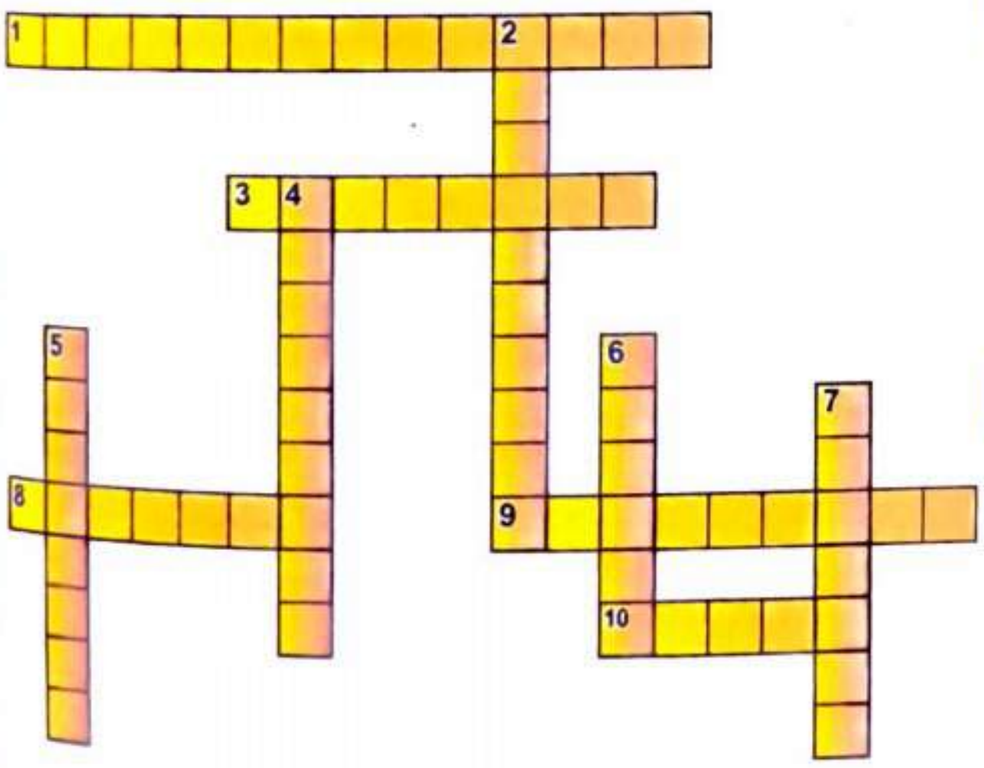
Fundamental duties are provided for Indian citizens only and not for Foreigners.

TRICK TO LEARN ALL FDs:

a- Anthem aur flag ki respect
b- Bhagat Singh/ Bapu ke ideals ko follow
c- Means 3. (Sovereignty,unity, integrity)
d- Defend the country
e- Means 5 & E for equality, brotherhood, No derogatory practices to women's dignity
f- Fort matlab heritage ki value & care karna
g- Greenery- environment ka protection
h- Humanism
i - Eye (eye for an eye makes whole world blind), matlab Violence Nahi karna chahiye.
j- Jadeja ki tarah excellent performer in all spheres bano aur achievements karo.
k- K-12 (School education)

PARMAR'S CROSSWORD

DPSP AND FUNDAMENTAL DUTIES



Across

1. Nature of DPSP compared to Fundamental Rights.
3. Village panchayat principle is of which type.
8. Type of state DPSPs aim to establish.
9. Mentions organization of village panchayats.
10. Committee for implementation of Fundamental Duties.

Down

2. Part of Constitution containing Fundamental Duties.
4. Related to early childhood care.
5. Called DPSP a novel feature of Constitution.
6. Constitution part containing Articles 36–51.
7. Country from which DPSP was borrowed.

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PART V - UNION EXECUTIVE
(Article 52-78)

Part V of the Constitution is divided into 5 chapters:

Chapter I: Union Executive (P+VP+PM+COMs+ *Attorney General)*

Chapter II: Parliament (Art 79-122)

Chapter III: Legislative powers of the President (Art 123)

Chapter IV: Union Judiciary (Art 124-147)

Chapter V: Comptroller and Auditor General of India (Art 148-151)

PRESIDENT OF INDIA
(Article 52-62)

Article 52: ***There shall be a President of India, who shall be the Head of the Union Executive***

Article 53: ***Executive power of Union shall vest in President***

- He is the Supreme Commander of all the defence forces (Army, Navy, Airforce)

Article 54: ***Election of President***

- President is elected by **an electoral college**; i.e. Elected members of both Houses of Parliament (Lok Sabha + Rajya Sabha) + Elected members of the Legislative Assemblies of the States + Elected members of the Legislative Assemblies of the UTs of Delhi and Puducherry.

Note: *Nominated members of Parliament and Members of Legislative Council do not participate in the election of the President.*

- The President is:
  - **Head of the country.**
  - **First citizen of India.**
  - **Nominal head / Titular head / De jure head of the country.**

Article 55: ***Manner of election***

- Indirect election (not directly by the people)
- **Proportional representation + Single Transferable Vote (STV)**
- Voting done by Secret ballot.

Vote Value Calculations:

- President Elections— **50 proposers + 50 seconders**
- Value of vote of all MLAs = **(Total population of the state / Total number of elected MLAs) × 1/1000**
- Value of vote of an MP = **Total value of votes of all MLAs / Total number of elected MPs.**
- Electoral quota = **(Total number of valid votes polled / Vacancies +1) + 1**

Article 56: ***Term of office of President → 5 years***

Dr. Rajendra Prasad – longest serving and the 1st President of India. (1950-62)
Dr. Sarvepalli Radhakrishnan – served twice as Vice President

- He can resign by addressing the resignation letter to Vice-President.

Article 57: ***Eligibility for Re-election of President***

- Eligible for re-election any number of times.
- Naturalised citizen can become President.

USA: President can serve maximum of 2 terms.

Article 58: ***Qualification for election as President***

Must be:

- A citizen of India.
- Minimum **35 years** of age.
- Qualified for election as a member of Lok Sabha.
- Must not hold any office of profit. (Office of profit is not defined in the Constitution)

Office of Profit : ***Offices in which people are appointed and removed by the government, however offices of President, Vice President, PM, Governor are not considered as office of profit.***

Do you know?
President is immune from any criminal proceedings during his term of office. After giving 2 months notice civil proceedings can be carried against him.

Article 59: ***Conditions of office of President.***

1. Shall not be a member of either House of Parliament or State Legislature — If he is a member, he/she should vacate the seat before appointment.
2. Entitled to emoluments and allowances as maybe determined by the Parliament.

Emoluments and allowances shall not be diminished during his term.

Article 60: ***Oath or affirmation by the President***

- In the presence of Chief Justice of India.

If unavailable → Senior-most judge of the Supreme Court.

Article 61: ***Procedure for impeachment of the President***

- Grounds of removal : violation of the Constitution.(Not defined in Constitution)
- *All Members of Parliament (elected + nominated) take part in the Impeachment process.*

Impeachment is a removal process borrowed from USA.

Impeachment procedure:

- Impeachment charges can be initiated by **either** house of Parliament.
- Charges should be **signed by 1/4 members of that House.**
- A **14 days notice** should be given to the President.
- After this the Resolution should be passed by **Special Majority by both the Houses** (Majority of two-thirds of the Total Membership of that House).
- President has right to appear & to be represented at such investigation.

- ***Impeachment is a Quasi-judicial process.***
- ***No President has been impeached till date.***
- ***MLAs participate in President's election , but not in impeachment.***

Article 62: ***Time of holding election to fill vacancy***

- If term ends normally → Election should be held before the expiration of President's term.
- If vacancy is created due to death, resignation, removal, then :

— Election must be held within 6 months, till then:

- The Vice President acts as **Acting President.**
- If Vice President is not available, then Chief Justice of India (CJI) acts as Acting President.
- If CJI is also unavailable, then Senior-most Judge of the Supreme Court acts.

Ex: Zakir Hussain—— V.V. Giri(Acting President)—— M.Hidayatullah

- ***President has the power to declare any area as Scheduled Area.***

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TRICK: PrEEM TReQing pe chalna hai, so COme In Time

Pr	→	President
E	→	Executive
E	→	Election
M	→	Manner of Election
T	→	Term
Re	→	Re-election
Q	→	Qualifications
C	→	Conditions of office
O	→	Oath
In	→	Impeachment
Time	→	Time to fill vacancy

VICE-PRESIDENT(VP) OF INDIA
(Article 63-71)

Article 63: There shall be a Vice-President of India.

Article 64: Vice President shall be the ex-officio Chairman of the Council of States (Rajya Sabha).

VP holds second highest constitutional post.

Article 65: Vice-President to act as President.

In the absence of the President:

- Vice President performs functions as an Acting President.

VP can act as President only for a maximum period of 6 months.

Article 66: Election of Vice-President.

1) Elected by Electoral College:

– All members of both Houses of Parliament (Lok Sabha + Rajya Sabha)

– Includes nominated members also.

2) Method of Election:

–Proportional Representation + Single Transferable Vote (STV)

– 20 proposers + 20 electors as seconders

– Secret ballot voting

- Required Security deposit: ₹15,000/-
- Each voter has multiple preferences of voting.

3) Eligibility criteria:

- must be a citizen of India
- Must be of 35years or more
- Qualified for election as a member of the Rajya Sabha.

4) He shall not be a member of either house of the parliament and /or State Legislature (Same as President)

Article 67: Term of Office of Vice-President.

- Can hold office upto 5 years.
- Can resign to the President (and vice-versa)

Removal if :

–Resolution initiated (only in Rajya Sabha)

–Passed by effective majority in RS and simple majority in LS.

–14 days prior notice required.

- Will continue in office until successor takes charge.

Article 68: Time of holding election to fill vacancy.

- Vacancy caused due to expiration of the term of office of VP shall be completed before the expiration of the term.
- If vacancy arises due to resignation, removal by Parliament, or death, then — Election must be held as soon as possible.

Article 69: Oath or affirmation by Vice-President.

- Administered by the President or any person appointed on behalf of him.

Article 70: Discharge of President's functions in other contingencies.

Parliament may make provisions for the discharge of the President's functions in any contingency.

Article 71: Matters relating to election of President and Vice-President.

1) All doubts and disputes related to elections are handled by the Supreme Court, whose decision is final

2) If election is declared void by the SC, then the acts done by VP/President before the date of declaration are considered valid.

3) Parliament may regulate matters related to election of P/VP.

4) Election cannot be challenged on the ground that electoral college electing that person was incomplete.

Longest serving VP: M.Hamid Ansari (2007-2017)
He is the only VP to serve under 3 Presidents.

Article 72: Pardoning power of the President

Types of Pardoning Power of President:

1) *Pardon* – Completely removes punishment and conviction.

2) *Commutation* – changes the form of punishment.

3) *Remission* – Reduce the punishment period.

4) *Respite* – Lessen the punishment due to special conditions. (e.g., pregnancy)

5) *Reprieve* – Stay on execution for a temporary duration.

Q. What is the difference between the pardoning power of President and Governor?

Ans: The President can pardon death sentences and court-martial punishments while the Governor cannot. *(Pardoning power of Governor is given in Article 161)*

Kehar Singh vs Union of India Case (1988):

Pardoning power of the President is not subject to judicial review, unless the decision is arbitrary, mala fide, irrational, or discriminatory.

Judicial Powers of the President

- Appoints Chief Justice and judges of the Supreme Court and High Courts.
- Can seek advice from Supreme Court on any law or fact. However, the advice tendered by the SC is not binding on him.
- Exercises pardoning powers as mentioned above.

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	Presidents of India	Term
1.	Dr. Rajendra Prasad (Longest serving President)	1950–1962
2.	Dr. Sarvepalli Radhakrishna	1962–1967
3.	Dr. Zakir Husain (First Muslim President, Died in office)	1967–1969
4.	V. V. Giri (First Acting President to be later elected)	1969–1974
5.	Fakhruddin Ali Ahmed (Died in office)	1974–1977
6.	B. D. Jatti (Acting President after Fakhruddin's death)	1977
7.	Neelam Sanjiva Reddy (Only President elected unopposed)	1977–1982
8.	Giani Zail Singh (First Sikh President)	1982–1987
9.	R. Venkataraman (Served during coalition era)	1987–1992
10.	Dr. Shankar Dayal Sharma	1992–1997
11.	K. R. Narayanan (First Dalit President)	1997–2002
12.	Dr. A. P. J. Abdul Kalam (Missile Man, People's President)	2002–2007
13.	Pratibha Patil (First woman President of India)	2007–2012
14.	Pranab Mukherjee (ex-Finance Minister)	2012–2017
15.	Ram Nath Kovind (Second Dalit President)	2017–2022
16.	Droupadi Murmu (First Tribal and Second Woman President)	2022–Present

Droupadi Murmu

	Vice Presidents of India	Term
1.	Dr. Sarvepalli Radhakrishnan (First Vice President)	1952–1962
2.	Dr. Zakir Husain (First Muslim Vice President)	1962–1967
3.	V.V. Giri	1967–1969
4.	Gopal Swarup Pathak	1969–1974
5.	B. D. Jatti	1974–1979
6.	Mohammad Hidayatullah	1979–1984
7.	R. Venkataraman	1984–1987
8.	Shankar Dayal Sharma	1987–1992
9.	K.R. Narayanan	1992–1997
10.	Krishan Kant (Died while in office)	1997–2002
11.	Bhairon Singh Shekhawat	2002–2007
12.	Mohammad Hamid Ansari	2007–2017
13.	M. Venkaiah Naidu	2017–2022
14.	Jagdeep Dhankhar (Current Vice President)	2022–Present

Jagdeep Dhankhar

For an interactive recap of this topic, see the crossword on Page Number 166.

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PRIME MINISTER AND COUNCIL OF MINISTERS
(Article 74-78)

• The Prime Minister(PM) is considered as the *Head of the Council* who assists the Council of Ministers.
• The Prime Minister of India is the Chairman of the:
– NITI AAYOG
– Interstate Council
– National Disaster Management Authority
• The PM is known as *the Real / De facto* head of the government. (President is known as *De jure/Nominal* head.)

Article 74: Council of Ministers to aid and advise President

74(1) There shall be a Council of Ministers with the Prime Minister as the head to aid and advise the President who shall act in accordance with the advice of the Council of Ministers.

• **42nd Constituional Amendment** made the advise binding on President.
• **44th Constitutional Amendment**: President may request the Council of Ministers to reconsider advice however after reconsideration, the President must ultimately act according to the advice tendered.

74(2) The question, whether any, and if so what advice was tendered by ministers to the President **shall not be inquired into by any court.**

• *44th CA, 1978 introduced the term "Cabinet" for the first time formally (into the Constitution.)*
• *Specifically, in Article 352(3), which states that Emergency must be based on a written recommendation of the "Cabinet."*

Article 75: Other provisions as to Ministers

75(1) The Prime Minister shall be appointed by the President and other ministers shall be appointed by the President on the advice of the Prime Minister.

91st Amendment, 2003 added -
• (1A) The total number of Ministers, including the Prime Minister, **shall not exceed 15%** of the total strength of the Lok Sabha.
• (1B) If any member is disqualified on the grounds of defection, they cannot become minister.

75(2) Ministers hold office till the pleasure of the President.

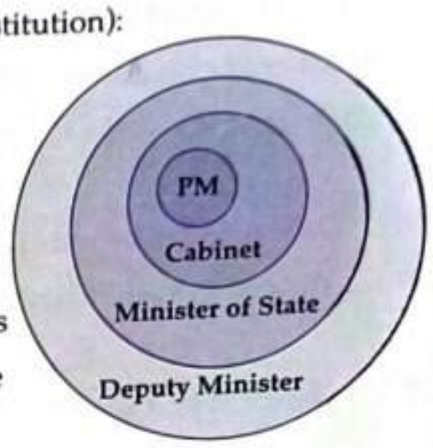
75(3) Council of Ministers is **collectively responsible** to the House of the People (Lok Sabha).

75(4) Before entering office, the Prime Minister and Ministers must take oaths of office and secrecy administered by the President.

75(5) A Minister who is not a member of either Houses of the Parliament for **six consecutive months** shall cease to be a Minister at the end of that period.

75(6) Salaries and allowances of Ministers are determined by Parliament and until Parliament fixes that, it shall be as specified in the 2nd Schedule.

Types of Ministers (not specified by the Constitution):



• ***Cabinet Ministers***: Important portfolios like Defence, Home, Finance, Education, Health. Participate in Cabinet meetings.

• ***Minister of State:*** Handle smaller ministries or assist Cabinet Ministers. Do not participate in Cabinet meetings.

• ***Deputy Ministers:*** Assist Cabinet Ministers and Ministers of State.

Article 76: Attorney General of India

76(1) President shall appoint a person who is qualified to be a judge of the Supreme Court to be Attorney General of India.

76(2) Duty: To give advice to the Government of India upon legal matters.

76(3) Attorney General has the right to audience in all courts within the territory of India.

76(4) Attorney General holds office till the pleasure of the President and receives remuneration as determined by the President.

POINTS TO REMEMBER :

• He is not a full-time counsel of the government.
• He is not debarred from the private legal practice, after ceasing to hold office.
• ***1st Attorney General: M. C. Setalvad*** (longest serving)
• ***Current Attorney General: R. Venkataramani***
• ***He is the highest law officer of the country.***

Solicitor General of India:

• Assists Attorney General but is not a constitutional post.
• ***Current Solicitor General of India : Tushar Mehta***

Advocate General of State *(Article 165)*

• Appointed by Governor.
• Must be qualified to be a judge of a High Court.
• Duty: Advise State Government on legal matters.
• Holds office during the pleasure of the Governor.
• He is the highest law officer of the state.

Dissolution of Council of Ministers (CoM)

• If any member of Council of Ministers Resigns/Dies/Removed then vacancy is created.
• If the Prime Minister dies or resigns then entire **CoMs is dissolved**, in that case **entire CoMs has to resign**, the President invites the leader with majority's support in the LS to become the new PM.

First Indian PM to resign - Morarji Desai

Rajya Sabha Members who became PM :

• Indira Gandhi
• Manmohan Singh
• H.D. Deve Gowda (He became the PM of India without becoming a Union Cabinet Minister)

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Article 77: Conduct of Business of the Government of India

77(1) All executive actions of Government of India shall be expressed to be taken in the name of the President.

77(2) Orders and instruments made in the name of the President shall be authenticated in such manner as specified in rules made by the President.

77(3) The President shall make rules for more convenient transaction of the business of Government of India and allocate responsibilities among Ministers.

Article 78: Duties of Prime Minister

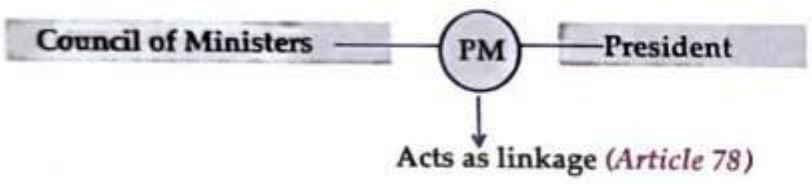
(a) To communicate to the President all decisions of the Council of Ministers relating to administration of the Union and proposals for legislation.

(b) To furnish such information relating to the administration of the Union and proposals for legislation as the President may call for.

(c) If the President so requires, to submit for the consideration of the Council of Ministers any matter on which a decision has been taken by a Minister but which has not been considered by the Council.

Comments on the post of PM

- "Collective responsibility can be achieved only through the instrumentality of the Prime Minister." — *Dr. B. R. Ambedkar.*
- *Pt. J.L. Nehru* described PM as *"The Linchpin of Government"* ; as the PM acts as a link between the Council of Ministers and the President.



Summarising the Powers and Functions of the PM:

- Advises President regarding summoning and proroguing of the sessions of the Parliament.
- Recommends dissolution of Lok Sabha to President any time.
- Announces government policies on the floor of the House.
- Recommends names for ministerial appointments.
- Allocates and reshuffles portfolios among ministers.
- Can ask a Minister to resign or recommend dismissal.
- Presides over Council of Ministers meetings.
- Guides, directs, controls and coordinates activities of Ministers.
- Can cause collapse of the Council of Ministers by resigning.

Few PMs of India and their term of office:

- **Jawaharlal Nehru:** *Longest serving Prime Minister* (16 years, 286 days).
- Atal Bihari Vajpayee: Served an initial 13-day term as Prime Minister.
- Chaudhary Charan Singh: 170 days.
- **Chandra Shekhar**: 7 months. (Shortest serving amongst all full term PMs)
- V. P. Singh: 11 months.
- H. D. Deve Gowda: 10 months.
- Inder Kumar Gujral: 11 months.

For an interactive recap of this topic, see the crossword on Page Number 166.

TsuNamî

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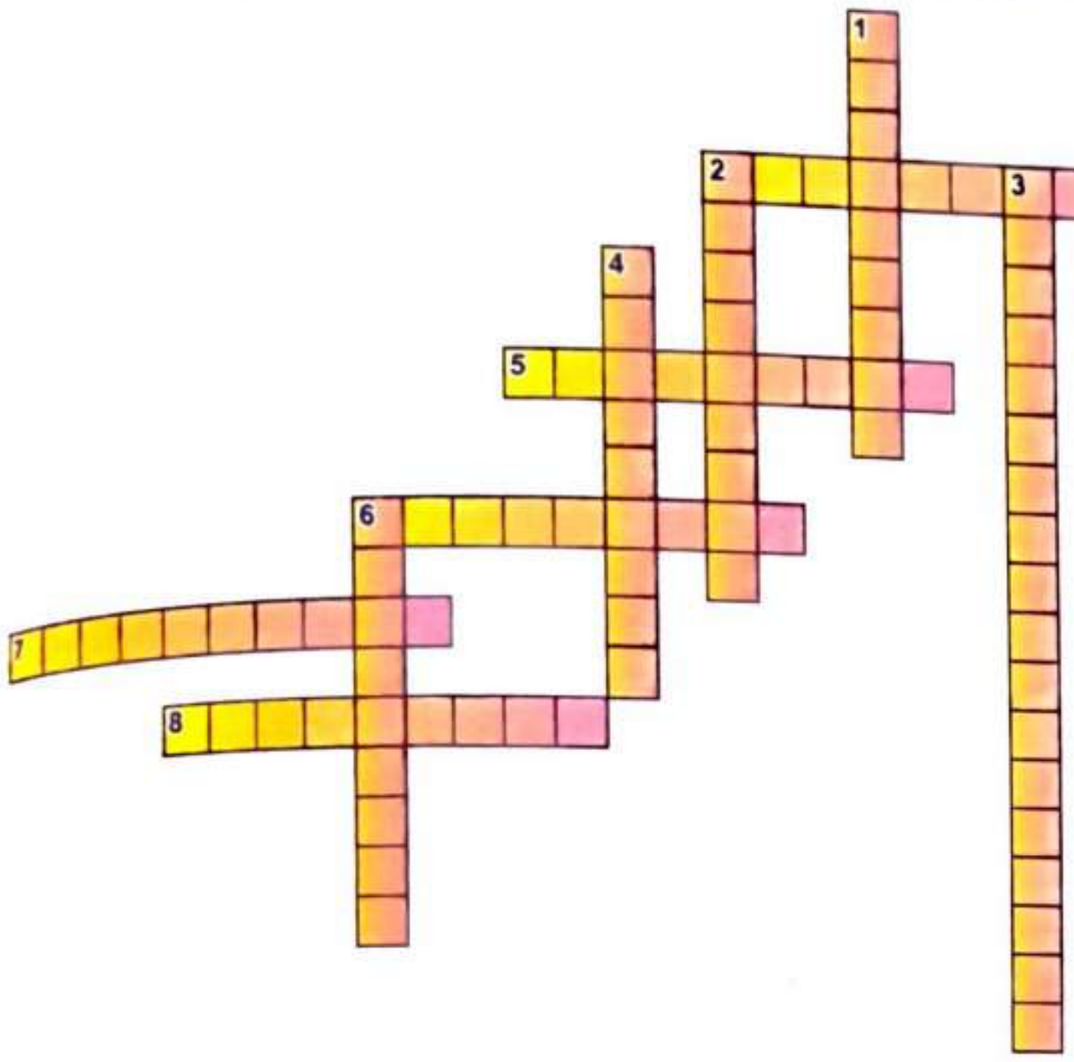
PARMAR'S CROSSWORD

PRESIDENT AND VICE PRESIDENT OF INDIA



Across

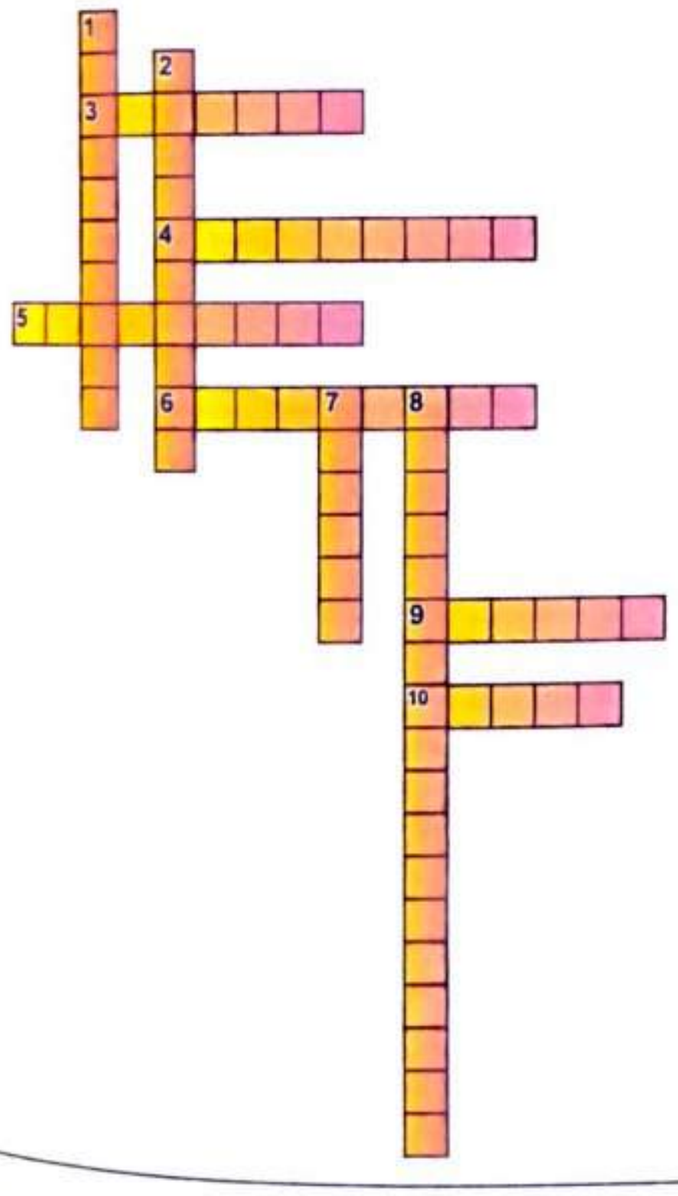
2. Allows President's re-election.
5. Sets qualifications for President.
6. Election before term expiry.
7. Power to keep bill pending indefinitely.
8. Deals with oath of the President.

Down

1. Mentions President's term continuation.
2. Impeachment of President.
3. Advises President on MP disqualification.
4. Executive power of the Union vests in President.
6. Concerns election of the President.

PARMAR'S CROSSWORD

PRIME MINISTER AND COUNCIL OF MINISTERS



Across

3. Group that aids and advises the President.
4. Deals with collective responsibility to Lok Sabha.
5. Nominal head advised by Council of Ministers.
6. Relates to advice of Council to President.
9. Prime Minister when Fundamental Duties were added.
10. First Prime Minister of India.

Down

1. Power to keep bill pending without decision.
2. Shortest-serving Prime Minister of India.
7. Replaced Morarji Desai as Prime Minister in 1979.
8. Advises President on MP disqualification.

TsuNamî

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PART V- PARLIAMENT
[Article 79-122]

Parliamentary system borrowed from UK (Westminster Model).

Article 79 – Constitution of Parliament

- There shall be a Parliament of India that consists of:

—**The President** and ;

—Two Houses:

Council of States (Rajya Sabha) – Upper House

House of the People (Lok Sabha) – Lower House

Lok Sabha (LS):

- First sitting: *13 May 1952*
- Constituted on : *17 April, 1952*
- is also known as the *'House of the People'* (Hindi name adopted in 1954)
- Members elected directly by the people.

> ***Themes of New Parliament buildings:***
> ***Lok Sabha : Peacock***
> ***Rajya Sabha : Lotus***

Rajya Sabha (RS):

- First sitting: *13 May 1952*
- Constituted on : *3 April, 1952*
- is also known as the *'Council of States'/ 'Permanent House'*(Hindi name adopted in 1954)
- Represents States.
- Also known as the *'House of Elders'*

President is an integral part of Parliament. No Bill becomes law without his assent.

Article 80 – Composition of Council of States (Rajya Sabha)

Total Members:

Maximum 250 — **238 elected members**; **12 nominated by the President:** From the fields of— Literature, Science, Arts, Social Service **(LiSAS)**

Present strength of RS : 245

(233 elected, 12 nominated)

5 seats are vacant for PoK, Aksai Chin, etc.

President to Nominated Members

Representation in RS:

- Members are indirectly elected by means of Proportional Representation and Single Transferable Vote (STV)

Note: ***Unequal representation in RS*** (based on population) (e.g., UP – 31 seats, small States like Sikkim/Goa etc.– 1 seat each).

> ***• Election of RS members is borrowed from South Africa.***
> ***• Nomination of RS members is taken from Ireland***

Article 81 – Composition of House of the People (Lok Sabha)

Total Members:

Maximum 550 — 530 from States; 20 from Union Territories

Present strength: *543 elected members.*

> ***2 Anglo Indians were nominated by President, this provision was removed later through 104 CA,2019.***

Representation in LS:

- Direct election by citizens.
- Parity maintained among Inter and Intra States.

> ***Q. Do you know why Lok Sabha has green carpet and Rajya Sabha has red Carpet?***
>
>
>
>
> ***Ans: Green colour represents that India is an agricultural land and people here elected from grassroots level.***
> ***Red colour represents royalty and symbolises the sacrifices done by the freedom fighters and the blood they shed to gain independence for India.***

Article 82 – Readjustment after Each Census

Delimitation Commission established after every Census (10 years) to: Divide constituencies based on population.

Important Delimitation Acts:

1st in 1952, then 1962, 1972, 2002.

Key Amendments:

42th CA (1976) : Seats were fixed based on 1971 Census until 2000.

84th CA (2001) : Freeze on Delimitation Commission extended till 2026.

87th CA (2003) : Minor adjustments, Delimitation according to 2001 Census.

> ***"Delimitation" means the act or process of fixing limits or boundaries of territorial constituencies.***

Article 83 – Duration of Houses

Rajya Sabha:

- Permanent body; *not subject to dissolution*
- 1/3rd members retire every 2 years;
- Term of members of RS is 6 years.

Lok Sabha:

- Tenure: 5 years.
- Can be extended during national emergency (one year at a time).
- Elections must be held within 6 months after the end of emergency.

> ***Requirement for a candidate contesting election to RS from a particular state should be an elector in that particular state was dispensed with in 2003.***

Article 84 – Qualifications for Membership of Parliament

- Must be a citizen of India.
- Minimum required age:

30 years (Rajya Sabha), 25 years (Lok Sabha)

- Other qualifications as prescribed by Parliament.

Article 85 – Sessions of Parliament, Prorogation, and Dissolution on the advice of Council of Ministers.

Parliamentary Sessions: (summoned by the President)

- ***Budget Session***: February to April
- ***Monsoon Session***: July–August
- ***Winter Session***: December

> ***Note: Maximum gap between sessions cannot exceed 6 months.***

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Prorogation: Ends a session **(by President)**.

Dissolution: Formal termination of the current Lok Sabha session (**by President).**

Adjournment: Temporary break within a session where a sitting is terminated **(by Presiding Officer).**

Adjournment Sine die: **by Presiding Officer**

Ends the session meeting without fixing a date for next session, happens just before prorogation.

• The *adjournment motion* is introduced in the Parliament to draw the attention of the house to a definite matter of urgent public importance and needs the support of 50 members to be admitted.

Some other Parliamentary motion/Procedures:

• **Closure Motion :** A motion moved by a member to cut short the debate on a matter before the house.

• **Call Attention Motion :** It is introduced in Parliament by a member to call the attention of a minister on a matter of public importance.

• **Point of Order :** It is raised when the proceedings of the house do not follow the normal rules of procedure. No debate is allowed on Point of Order.

Censure Motion	No-Confidence Motion
Reason must be stated	No reason required
Can be moved against an individual, group, or entire council	Can be moved against entire council only.
To target for some specific policies/actions	To tests majority support (confidence) of LS in CoM.
If passed – no resignation required	If passed – resignation is mandatory

Types of Questions:

Starred: Oral question-answers, can have supplementary questions.

Unstarred: Required written answers, No Supplementary questions could follow.

Short Notice: 10 days prior notice should be given.

Routine of a session :

11 AM: Start

11 AM–12 PM: Question Hour

12–1 PM: Zero Hour (Agenda of the day is decided)

• ***Question could also be asked to private members.***

(A private member is the one who is not a minister.)

Article 86 – Right of President to Address and Send Messages

• President can address either House or both Houses jointly.

• President can send messages regarding pending Bills or other matters.

Article 87 – Special Address by the President

• President addresses both Houses: At the first session after each general elections and the first session of each fiscal year.

• *Motion of Thanks* follows the address.

Article 88 – Rights of Ministers and Attorney General

• Right to speak in either House but can vote only in that house of which they are a member.

• Attorney General is not a member of either house but has the right to speak in LS/RS, without having Right to Vote.

Officers of Parliament:

Article 89 – Chairman and Deputy Chairman of Rajya Sabha

• ***Chairman***: Vice President of India (Ex-officio).

He is not a member of RS.

• ***Deputy Chairman***: Elected by Rajya Sabha.

• Fulfills duties as the Acting Chairman in absence of the Chairman.

He is a member of RS.

• While the Chairman is presiding the house, he is like any other member of the house.

Article 90 – Vacation, Resignation, Removal of Deputy Chairman

• ***Resignation***: by writing to the *Chairman*.

• Removal by Effective majority of the total membership of the Rajya Sabha.

(Effective Majority = Majority of the total membership of house - Vacancies)

Article 91 – Power/Duty of Deputy Chairman

• Presides in absence of Chairman.

• When Seats of C and Dep. C are vacant: then President can choose any member from the house to discharge duties of RS.

• If the Chairman and DC, both are absent, then :

one member of the Panel of Vice-Chairpersons , appointed by the Chairman, presides. (This is not explicitly mentioned in Constitution).

Article 92 – Chairman and Deputy Chairman Not to Preside During their removal

• They can participate in proceedings but cannot preside during their own removal resolution.

P.T. Usha: first woman to be appointed in the RS panel of Vice-Chairpersons.

• Can vote in first instance but not in the case of tie (casting vote exercised by Presiding Officer).

• Chairman does not have the casting vote rights in this case , as he is not a member of RS.

Article 93 – Speaker and Deputy Speaker of Lok Sabha

• Elected by Lok Sabha members **by Simple Majority**

• **First Speaker**: *Ganesh Vasudev Mavalankar.*

• **First Deputy Speaker**: *M. A. Ayyangar.*

• **Note**: No Deputy Speaker appointed since 2019.

Article 94 – Vacation, Resignation, Removal of Speaker and Deputy Speaker

• Resignation: *Speaker resigns to Deputy Speaker and vice-versa.*

• Removal: by *Effective majority.*

• Speaker continues till a new Speaker is elected,

• He does not immediately resign after the dissolution of LS and continue till the newly elected LS meets.

Date of election of Speaker is fixed by the President, and that of deputy speaker is fixed by speaker.

Article 95 – Powers to Perform Duties

Deputy Speaker presides when Speaker is absent.

• If the Seat is vacant: then President can choose any member to discharge the duties.

If the speaker and Deputy speaker, both are ***absent,*** then : one member of the Panel of Chairpersons , appointed by the Speaker presides.

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Article 96 – Speaker and Deputy Speaker Not to Preside During Their Removal.

They can participate but cannot preside while a motion for their removal is under discussion. (The Speaker's right to vote in the first instance is retained, but has no right to casting their vote in the case of tie.)

Note : Deputy speaker is not subordinate to the Speaker.

Article 97 —Salaries and Allowances

Salaries of Chairman and Deputy Chairman of Rajya Sabha and Speaker and Deputy Speaker of Lok Sabha—are decided by Parliament.

Article 98 — Secretariat of Parliament

- Each House has its separate secretarial staff.
- Secretariat appointed by President on advice of the Speaker of the LS and Chairman of RS.

Article 99 — Oath or Affirmations by Members

Every member of either House must take oath before taking his seat as administered by the President or a person appointed by him.

Protem Speaker:

Senior-most member appointed temporarily by President to administer oath to members.

Article 100 — Voting in Houses and Quorum

100(1) The Chairman or Speaker shall not vote in the 1st instance but shall exercise a *casting vote* in case of a tie.

100(3) Quorum:Minimum 1/10th of total strength of House is required to carry on the proceedings.

100(4) If quorum is not met, *house is adjourned* by the presiding officer.

Article 101 — Vacation of Seats

101(1) No person shall be a member of both Houses of Parliament.

101(2) No person can be a member of State Legislature and a member of Parliament.

101(3) Members can be disqualified as mentioned in Article 102

- (3A) A member can resign his seat to the Chairman or Speaker.

101(4) If a member of either of the Houses of Parliament is absent without permission for a period of 60 days, the house may declare the seat vacant.

> ***RPA: Representation of People Act, 1951***
> ***Jail for more than two years lead to disqualification.***

Article 102 — Disqualifications for Membership

102(1):

A person shall be disqualified for membership if:

(a) He holds any office of profit under the Union or State Government.

(b) He is of unsound mind, as declared by a competent court.

(c) He is an undischarged insolvent.

(d) He is not a citizen of India.

(e) He voluntarily acquired citizenship of another country or allegiance to a foreign State.

102(2):

Disqualification under 10th Schedule— Defection

On the grounds of:

- Independent members join any political party.
- Nominated members join the political party after 6 months from the date of his nomination.
- If he votes contrary to the direction of his party.
- If the member voluntarily gives up the membership of the party on whose ticket he has been elected.

—*Exception* : Merger when 2/3rd members leave and join other political party (91st CA, 2003)

> ***Decision of the Speaker is final with regard to disqualification under defection.***
>
> ***Kihoto Hollohan vs Zachilhu Case : Judiciary can review the final decision of the Speaker in case of disqualification under Defection.***

Article 103 — Decision on Questions of Disqualification

103(1) Decision of the President shall be deemed final if question arises over disqualification of any member of the either house.

103(2) President must obtain the opinion of the Election Commission before giving his final decision.

Article 104 — Penalty for Sitting and Voting When Disqualified or before making an oath or affirmation under Article 99

- If any person sits or votes knowing they are disqualified, a penalty of Rs. 500 per day is charged for the period he/she sat or voted.

Article 105 — Powers, Privileges, and Immunities of Parliament Members

105 (1) Freedom of speech in Parliament.

105(2) No proceedings in Parliament can be questioned in any court of law. No MP liable for anything said or any vote given in Parliament.

105(3) MPs enjoy protection from civil arrest during a session and 40 days before and after the session (by parliamentary convention).

- This protection does not apply to criminal arrest or preventive detention.

(Note: Protection of the President from criminal proceedings is under Article 361, not Article 105)

Article 106 — Salaries and Allowances of Members

- Parliament may by law fix salaries and allowances of members of both the Houses.

LEGISLATIVE PROCEDURES

Article 107 — Introduction and Passing of Bills

107(1) A Bill can originate in either House (LS or RS) except the Money bill

107(2) A Bill passes if both Houses agree, with or without amendments.

107(3) Bill pending in Parliament does not lapses due to adjournment or prorogation of the session.

107(4) Bills lapsing after dissolution:

- A Bill pending in Lok Sabha and not passed at the time of its dissolution lapses.
- A Bill pending in the RS, which has not been passed by the LS shall not lapse on the dissolution of the LS.

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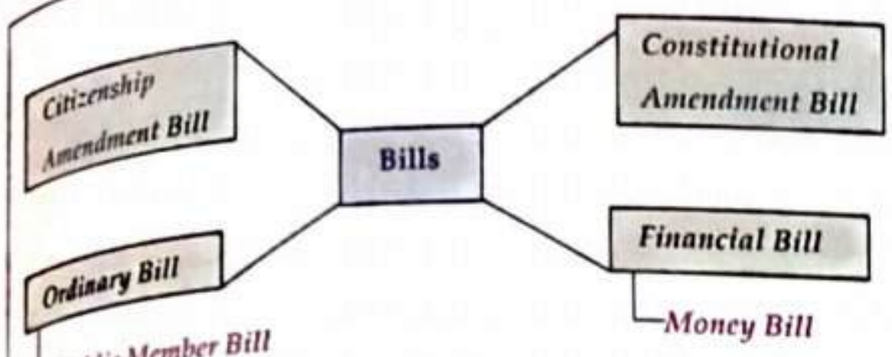

Public Member Bill
- 1 week prior notice should be given.

Private Bill (brought by a MP who is not a minister)
- 1 month prior notice should be given

Passage of Ordinary Bill : can originate in either house,
- If both the houses pass the bill, it goes to President for his Assent.

When Deadlock created → President calls Joint Sitting → Bill passed by Simple Majority.

Deadlock is created in 3 cases.

- But a deadlock is created when :-

(a) the bill is rejected by the other house; or

(b) the houses have finally disagreed as to the amendments to be made in the bill; or

(c) more than six months, elapse from the date of the reception of the bill by the other house without the bill being passed by it .

- to resolve the deadlock, the ***President may summon a joint sitting.***

Article 108 — Joint Sitting of Both Houses

108(1) In case of a deadlock (disagreement between both Houses), the President may summon a Joint Sitting.

Provision of Joint sitting is taken from Australia.

108(2) Speaker of Lok Sabha presides over the Joint Sitting.
- In his absence Deputy Speaker of Lok Sabha presides.
- In absence of both → Deputy Chairman of Rajya Sabha. (Chairman cannot preside the Joint sitting as he is not the member of either house.)

Exceptions:

Money Bill and Constitutional Amendment Bill — ***No Joint Sitting allowed.***

- Simple majority is needed to pass the Bill (majority of members present and voting).
- Joint Sitting follows the Rules of Lok Sabha.

Joints Sittings has happened 3 times till now:
- Dowry Prohibition Bill, 1960
- Banking Services Commission Bill, 1977
- Prevention of Terrorism Bill, 2002

Lok Sabha in case of Money Bill

Article 109 — Special Procedure for Money Bills

109(1) A Money Bill can only be introduced in Lok Sabha, on the recommendation of the President.

109(2) After a bill is passed to RS, it can: approve, suggest amendments or take no action on the bill but it must give its response within 14 days.

109(3) Lok Sabha may accept or reject Rajya Sabha's suggestions.

If RS does not pass the bill within 14 days → It shall be deemed passed by both Houses.

Article 110 — Definition of Money Bill

A Bill is a Money Bill if it contains only provisions related to:

(a) Imposition, abolition, remission, alteration, regulation of any tax.

(b) Regulation of borrowings.

(c) Custody and audit of Consolidated Fund or Contingency Fund.

(d) Appropriation of money out of Consolidated Fund.

(e) Declaring any expenditure as charged on Consolidated Fund.

(f) The receipt of money into the Consolidated Fund of India or the Public Account of India, or the custody or issue of such money.

(g) Any matter incidental to any of the above matters.

The Speaker of Lok Sabha certifies whether a Bill is a Money Bill.

- The Speaker's decision is final, and normally cannot be challenged in any court. However, Judicial review is allowed.

A Bill is not considered as a money bill if it provides:
- For the imposition of fine/imposition or abolition of any tax by local Authority.

Article 111 — Assent to Bills

- After a bill is passed by both the Houses the bill is then presented to the President.
- President may:

(a) Give assent — Bill becomes a law.

(b) Use its Veto power.

Veto powers of the President (Negative Powers)

- ***Absolute Veto*** : President rejects the Bill completely.
- ***Suspensive Veto*** : President returns the Bill for reconsideration. If Parliament passes it again, assent is mandatory.

— ***Not available in case of Money bill*** because it is already brought into the Parliament after the prior recommendation of the President.

- ***Pocket Veto*** : No action taken by President. (No time limit to act.)

— This veto was first used by ***Gyani Zail Singh for Indian Post Office (amendment) bill 1986.***

No Veto can be used in case of a Constitutional Bill: 24th CA(Article 368)
Pocket of Indian President is deeper than the USA's president because no time limit is mentioned in constitution for Indian president to act on the bill.

Article 112 — Annual Financial Statement (Budget)

President shall cause to be laid before both the Houses , a statement of estimated receipts and expenditures.

The term 'Budget' is not mentioned in the Constitution.

Article 113 — Procedure in Parliament with Respect to Estimates

No expenditure from Consolidated Fund of India be done except with the authorization by Parliament.

- Estimates of Expenditure are divided into two parts:

— **Charged on the Consolidated Fund of India** (not votable due to salaries of President, SC judges , etc)

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— **Made from the Consolidated Fund of India** (subject to vote in Lok Sabha through Demands for Grants).

• Only Lok Sabha has the right to vote on Demands for Grants. RS can only discuss it.

• Demands for Grants are presented on behalf of the President.

Article 114 — Appropriation Bills

• The Appropriation Bill is introduced to authorize the withdrawl of money from the Consolidated Fund of India.

• No amendments or voting on the Appropriation Bill amounts — it is passed as a formality after Demands for Grants are voted.

• ***Cut motions*** are moved during the voting on Demands for Grants:

1. ***Policy Cut***: Reduce the amount to Rs. 1 to criticize government policy.
2. ***Economy Cut***: Reduce by a specified amount to suggest savings.
3. ***Token Cut***: Reduce by Rs. 100 to raise a specific grievance.

Article 115 : Supplementary, Additional, Excess grants

• ***Supplementary grant:*** granted when the amount authorised by Parliament is found insufficient.

• ***Additional grant :*** granted for additional expenditure upon some new service.

• ***Excess grant*** : It is granted when money has been spent on any service in excess of the amount granted to that service in the budget.

Article 116: Vote on Account, Votes of Credit, and Exceptional Grants

Vote on Credit:

• Financial grant given to the Executive from India's resources to meet urgent financial needs.

• Details cannot be shared ordinarily in a budget.

• It acts like a blank cheque given to the Executive by the Lok Sabha (LS).

Exceptional Grants:

• Special provisions made by Parliament.

• Used to meet specific expenses not covered under the regular budgetary allocation.

Stages in enactment of budget

Presentation
↓
Discussion
↓
Scrutiny by departmental committees
↓
Voting on demands for grants
↓
Passing of Appropriation bill
↓
Passing of Finance bill

Different Types of Funds

1. *Consolidated Fund of India* (Article 266)

Consists of: Tax & Revenue

2. *Public Account of India* (Article 266)

Consists of: Remittance (public fund deposits) and Judicial deposits

Managed by: Executive (not under Parliament's direct control)

3. *Contingency Fund of India* (Article 267)

In hands of President but run by President and Finance Secretary.

Article 117: Special Provisions for Financial Bills

• All Money Bills are Financial Bills, but vice versa is not true.

• Procedure of financial bill is same as ordinary bill, except that financial bill can be introduced only in Lok Sabha and with prior recommendation of President.

Article 118: Rules of Procedure

• Each House of Parliament may make rules for regulating its procedure and conduct of business.

Article 119: Regulation of Procedure for Financial Business

• Parliament can regulate laws related to financial procedures.

Article 120: Language to be Used in Parliament

• Business of Parliament shall be transacted in Hindi or in English.

• Unless Parliament by law provides, Use of 'English' to be removed after 15 years.

• ***Presiding officer may allow any member to express themselves in their mother tongue.***

Article 121: Restriction on Discussion in Parliament

• No discussions shall take place in Parliament with respect to the conduct of any judge of the Supreme Court or of a High Court.

Article 122: Court not to Inquire into Proceedings of Parliament

• No court shall inquire into Parliament proceedings.

• Conduct of MPs or officers not subject to court jurisdiction.

Article 123: Power of President to Promulgate Ordinances during Recess

President can issue ordinances when both Houses are or even one House is not in session.

• Ordinance has same force as an Act of Parliament.

(a) Must be laid before both Houses shall cease to operate after 6 weeks from reassembly unless approved.

(b) Can be withdrawn anytime by the President.

• Ordinance should not contain provisions beyond Parliament's legislative competence (i.e. on the subjects of union list.)

• ***Legislative power of President*** (Centre) under *Article 123;*

• ***Legislative power of Governor*** (State) under *Article 213.*

Max Life of an Ordinance:

Approved → Continues as law.

Disapproved → Ordinance lapses.

In case, Parliament takes no action : max life- 6 months and 6 weeks, How?

• Max gap between sessions: 6 months,

• When no action is taken: 6 weeks post reassembly.

DC Wadhwa Case vs State of Bihar, 1986: Relates to misuse and repeated re-promulgation of ordinances.

Special Powers of Rajya Sabha

1. Can authorise Parliament to create a *new All India Service* (Article 312)
2. Can *authorise the Parliament to make a law on a Subject of State List.* (Article 249)

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PARLIAMENTARY COMMITTEES

- Constitution mentions these committees at different places but without any specific provision regarding their tenure,functions,etc.
- All these matters are dealt by rules of two houses.
- A Parliamentary committee is appointed by Speaker / Chairman and works on his directions.

Classification of Parliamentary Committees

Permanent Committee
- *Standing Committee*

Temporary Committee
- *Ad Hoc Committee*

- *Financial Committees*
  - *Public Accounts Committee*
  - *Estimates Committee*
  - *Committee on Public Undertakings*

Public Accounts Committee :

- Established in *1921* through GOI Act 1919.
- **Total members**: *22 members* (15 from LS + 7 from RS).
- **Guide and Philosopher**: CAG (submits reports which are analysed by PAC).
- **Function**: To examine the audit reports of CAG.

Estimates Committee :

- Established in *1921*.
- Re-established post Independence: *1950* on recommendation of *John Mathai Committee.*
- **Total members**: *30* (all from LS) , (increased from 25 to 30 in 1956).
- **Function** : To examine estimates included in budget

Committee on Public Undertakings :

- Established in: *1964* on recommendation of *Krishna Menon Committee.*
- **Total members**: *22 Members* (15 from LS + 7 from RS) (Increased from 15 to 22 in 1974)
- Chairman is from Lok Sabha.
- **Function** : To examine reports and accounts of Public Undertakings.

Similar features of all the Financial Committees:

- **Election** : *Proportional representation + STV (Single transferable vote)*
- **Appointed/elected** by the House or nominated by *Speaker/ Chairman.*
- **Term of members**: *1 year*
- **No Minister can be a member.** *(Only private member)*

Departmental Standing Committees

- **Total**: *24 (16 from LS + 8 from RS)*
- **Strength**: *31 members (21 from LS + 10 from RS)*

Speaker of Lok Sabha is the Chairman of :

- Business Advisory Committee
- Rules Committee
- General Purpose Committee

> ***Deputy Speaker is a member of Committee on Private Members Bill (He automatically becomes the Chairman of any Committee he/she is appointed as a member of.***

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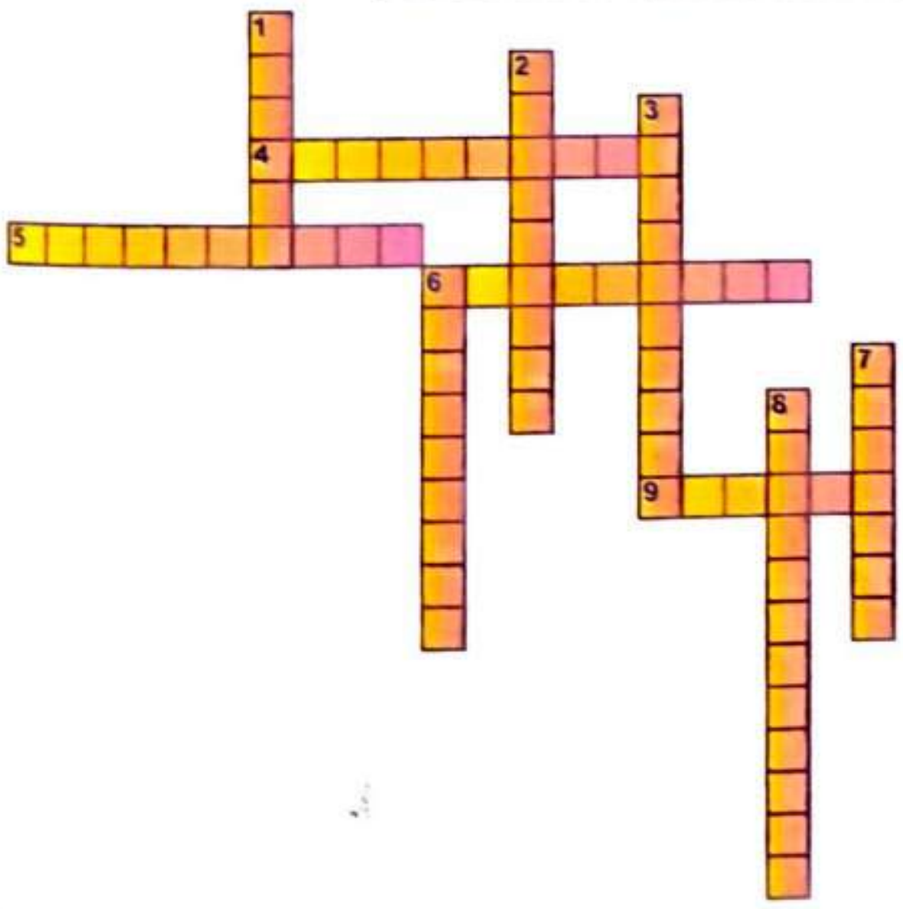
PARLIAMENTARY COMMITTEES



Across

4. Permanent House of Indian Parliament.
5. Includes President, Lok Sabha, and Rajya Sabha.
6. Bicameral Parliament is mentioned under.
9. Gap between prorogation and next session.

Down

1. Minimum members required to conduct business.
2. Alliance formed when no party gets majority.
3. First Speaker of Lok Sabha.
6. Composition of Rajya Sabha is defined under.
7. Motion to cut short debate in Parliament.
8. First hour of parliamentary sitting is known as.

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PART VI : THE STATES
[Article 152-237]

Article Mapping from Union to State level:

Articles 73–111 (Parliament) → Add 89 → gives corresponding articles of State Legislature.
Articles 112–213 → Add 90 → Corresponding articles for State Legislature.

Key Replacements:

- President → Governor
- Parliament → State Legislature
- Prime Minister → Chief Minister
- Council of Ministers (Union) → Council of Ministers (State)
- Attorney General of India → Advocate General of State
- Consolidated Fund of India → Consolidated Fund of State

Chapter II: State Executive (Articles 153–167)

- Consists of (*Governor+CM+CoM+Advocate General*)

Article 153: Governor of States

- There shall be a Governor for each State.

> ***7th Constitutional Amendment allowed for the appointment of same person as the Governor of two or more states.***

Article 154: Executive Power of State

- Executive power of State vests in the Governor.
- Can be exercised directly or through subordinate officers.

Article 155: Appointment of Governor

- Governor is appointed by the President by warrant under his hand and seal.

Article 156: Term of Office of Governor

(1) Governor holds office during the pleasure of the President.
(2) Governor may, address his resignation to the President
(3) Term: 5 years from the date of assuming office, subject to earlier removal or resignation.

Article 157: Qualifications for Appointment as Governor

- Must be a Citizen of India and should have completed 35 years of age.

Article 158: Conditions of Governor's Office

(1) Governor cannot be a member of Parliament or State Legislature; must vacate seat before entering office.
(2) Governor cannot hold any office of profit.
(3) Governor is entitled to use official residence without rent; emoluments and privileges as determined by the Parliament.
(3A) If serving multiple states, emoluments are shared as per Presidential order.
(4) Emoluments and allowances cannot be reduced during his tenure.

Article 159: Oath or Affirmation by Governor

- Oath administered by Chief Justice of High Court, or in absence, senior-most judge.

Article 160: Discharge of Governor's functions in contingencies

- President can appoint a person to discharge functions of Governor during contingencies.

Article 161: Power of Governor to Grant Pardons

- Governor can grant pardons, reprieves, respites, remissions, or commute sentences.
- But he cannot:
  — Pardon death sentence (only President can).
  — Use pardoning power against Martial Court sentences.

Article 162: Extent of Executive Power of State

- State's executive power extends to matters on which the State Legislature can make laws.

Article 163: Council of Ministers to Aid and Advise Governor

- Council of Ministers, headed by Chief Minister, aids and advises the Governor.
- Advice of Council of Ministers is not binding on the Governor'

Article 164: Other Provisions as to Ministers

(1) Chief Minister is appointed by the Governor; other Ministers appointed on CM's advice.
(2) Council of Ministers is collectively responsible to the Legislative Assembly of the state.
(3) Ministers must take oaths of office and secrecy as administered by the Governor.
(4) A Minister who is not elected as MLA/MLC within 6 consecutive months ceases to be a Minister.
(5) Salaries and allowances determined by State Legislature.

Article 165: Advocate General for the State

(1) Appointed by Governor; must be qualified to be a High Court judge.
(2) Advises State Government on legal matters.
(3) Holds office till the Governor's pleasure.

Article 166: Conduct of Business of State Government

All executive actions must be expressed in the name of Governor.

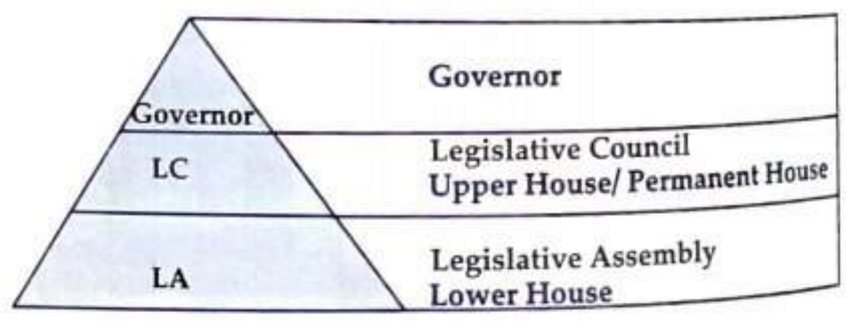
Article 167: Duties of Chief Minister

Communicate decisions of Council of Ministers to Governor.

Chapter III: State Legislature (Articles 168–212)

Article 168: Constitution of Legislatures in States

(1) Every State shall have a Legislature, consisting of the Governor.



- All states have a Legislative Assembly. *(Unicameral legislature)*
- ***6 States have a Legislative Council as well. (Bicameral legislature)*** they are :

Andhra Pradesh	*Maharashtra*
Bihar	*Karnataka*
Telangana,	*Uttar Pradesh*

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States with (Legislative Assembly + Legislative Council) :

TRICK - KABUTM
K - Karnataka
A - Andhra Pradesh
B - Bihar
U - Uttar Pradesh
T - Telangana
M - Maharashtra

3 UTs out of 8 have LA, i.e. Delhi, Puducherry, J&K.

Article 169: Abolition or Creation of Legislative Councils

• Parliament can **create or abolish Legislative Councils just by Simple** Majority, based on a resolution passed by the State Legislative Assembly by Simple Majority.

• Such a law is not considered an amendment under Article 368.

Article 170: Composition of Legislative Assemblies

(1) Legislative Assembly: **not less than 60 and not more than 500** members should be elected **by direct election.**

(2) Constituencies should have roughly equal population-seat ratio.

Special case:

Goa, Arunachal Pradesh, Sikkim → Minimum 30 members.

Mizoram → 40 members; Nagaland → 46 members

Article 171: Composition of Legislative Councils

(1) Total members **shall not exceed 1/3rd of Legislative Assembly, minimum 40 members.** (Indirectly Elected)

(3) Of the total no. members of the LC of a state:

(a) 1/3rd elected by members of local authorities (municipalities, district boards, etc.).

(b) 1/12th elected by Graduates of 3 years or more.

(c) 1/12th elected by Teachers with at least 3 years experience

(d) 1/3rd elected by Legislative Assembly members.

(e) 1/6th nominated by Governor (experts in literature, science, art, cooperative movement, social service) — ***Li SAS+ Cooperative movement***

Article 172: Duration of State Legislatures

(1) Legislative Assembly term = 5 years from first meeting, unless dissolved earlier.

(2) Legislative Council: **Permanent body**; 1/3rd members retire every 2 years. (Hence, term of a member = 6 years)

Article 173: Qualifications for Membership

(a) Must be a citizen of India.

(b) Minimum 25 years for Legislative Assembly, 30 years for Legislative Council.

(c) Must possess other qualifications prescribed by Parliament.

Article 174: Sessions, Prorogation, Dissolution

(1) Governor summons house of the Legislature; maximum gap between two sessions is 6 months.

(2) Governor can :

(a) prorogue Houses or

(b) dissolve Legislative Assembly.

Article 175: Governor's Address and Messages

Governor may address and send message to Legislative Assembly or Council or both houses assembled together.

Article 176: Special Address by the Governor

(1) At the commencement of first session of after general elections and the first session of each year, Governor addresses Legislature.

Article 177: Rights of Ministers and Advocate General

• Ministers and Advocate General can participate in debates and proceedings but cannot vote if they are not a member of the House.

Article 178: Speaker and Deputy Speaker of Legislative Assembly

• Legislative Assembly elects a Speaker and a Deputy Speaker.

Article 179: Vacation and Resignation or Removal of Speaker/Deputy Speaker

• to be done by resolution passed by majority of the Assembly members.

Article 180: Duties of Deputy Speaker

Deputy Speaker acts as the Speaker when office is vacant or Speaker is absent.

Article 181: Speaker/Deputy Speaker not to preside during consideration of resolution for their own removal

Article 182: Chairman and Deputy Chairman of Legislative Council.

Article 183: Vacation, Resignation, Removal of Chairman/Deputy Chairman

• Similar to provisions for Speaker and Deputy Speaker.

Article 184: Duties of Deputy Chairman

• Deputy Chairman acts as Chairman when office is vacant or chairman is absent.

Article 185: Chairman or Deputy Chairman shall not preside when his removal resolution is being considered.

Article 186: Salaries and Allowances of Speaker, Deputy Speaker, Chairman, Deputy Chairman

• Salaries and allowances are determined by State Legislature.

Article 187: Secretariat of State Legislature

• Appointed and regulated by State Legislature.

Article 188: Oath or Affirmation by Members

Article 189: Voting in Houses, Vacancies, and Quorum

(1) All questions in Legislature decided by majority of members present and voting.

(2) Presiding officer can vote in the first instance and also have a casting vote.

(3) Legislature can act despite vacancies.

(4) Quorum for a meeting = 10% of total membership.

Article 190: Vacation of Seats

Seat vacated if:

• a person is member of both the houses,

• member resigns,

• a member becomes subject to disqualification

Article 191: Disqualifications of Membership

Disqualification if:

• Holds office of profit.

• Unsound mind.

• Undischarged insolvent.

• Disqualified under anti-defection laws or other Parliament-made laws.

Article 192: Decision on Disqualification

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Article 193: Penalty for Sitting and Voting before taking Oath or when disqualified: fine decided by Legislature.

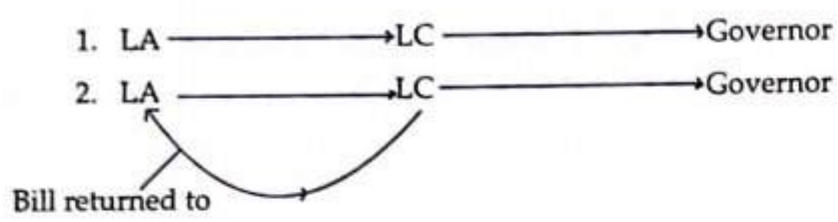
Article 194: Powers, Privileges, and Immunities of State Legislatures and Their Members

Article 195: Salaries and Allowances of Members

Article 196: Introduction and Passing of Bills

- Bills can originate in either House (if bicameral).
- Bill must be passed by both Houses and assented by Governor to become a law.
- In case of an Ordinary bill, Legislative Assembly has upper hand over Legislative Council.
- When a bill originates in the LC, and if LA disagrees, then the bill lapses, and there is no provision for joint sitting in Part VI.

What happens when a bill originates in LA—two cases:



- **In 2nd case, LC can only delay an Ordinary Bill by maximum 4 months i.e. 3 months in first instance and for 1 month in 2nd instance.**

Article 197: Restriction on Powers of Legislative Council as to bills other than Money bill

Article 198: Special Procedure for Money Bills

- Money Bill can be introduced ***only in Legislative Assembly.***
- then sent to Legislative Council for recommendations, LC cannot reject the bill, it must return the bill within 14 days, with or without recommendations, if the council fails to do so, the money bill is deemed passed in its original form.

Article 199: Definition of Money Bill

Article 200: Assent to Bills by the Governor

Article 201: Bills Reserved for President's Consideration

Article 202: Annual Financial Statement (Budget)

Article 203: Procedure in Legislature with Respect to Estimates

- Demands for grants made only on the recommendation of the Governor.

Article 204: Appropriation Bills

Article 205: Supplementary, Additional, and Excess Grants

Article 206: Votes on Account, Votes of Credit, and Exceptional Grants.

Article 207: Special Provisions for Financial Bills

Money Bills require prior recommendation of the Governor for introduction.

Article 208: Rules of Procedure

Article 209: Regulation of Procedure Relating to Financial Business

Article 210: Language to be used in the Legislature

Article 211: Restriction on Discussion in the legislature

Article 212: Courts not to Inquire into Legislature Proceedings

Article 213: Power of Governor to Promulgate Ordinances during Recess of the legislature

Article 214-231: High Courts

Article 233-237 : Subordinate Courts

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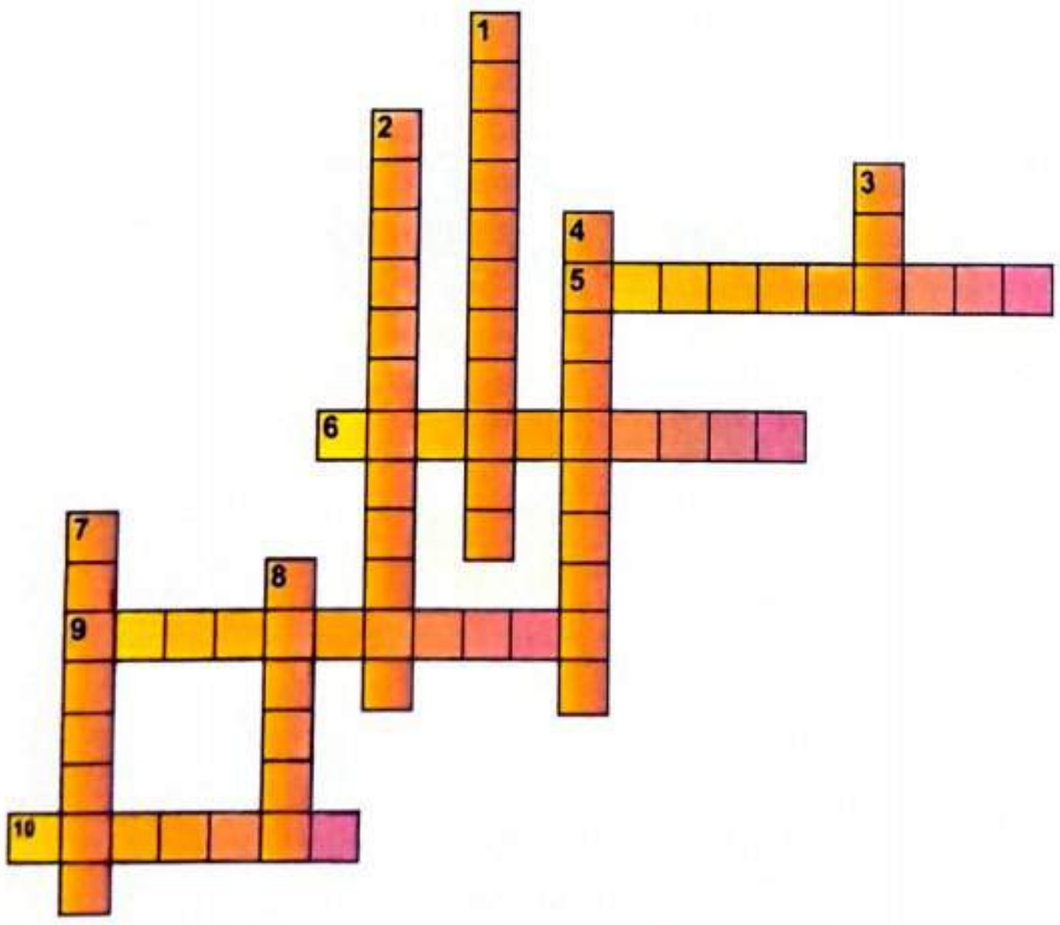
STATE LEGISLATURE



Across

5. Qualification for State Legislature membership.
6. Abolition or creation of State Legislative Council.
9. Speaker elected by which House.
10. Upper House in a State Legislature.

Down

1. Governor submits it to the President.
2. State with highest number of Assembly seats.
3. Third of Vidhan Parishad retires every two years.
4. First Speaker of a Legislative Assembly.
7. Can introduce Money Bill in Assembly.
8. Constitutional part dealing with State Legislature.

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EMERGENCY

- Emergency Provisons are mentioned under *Part XVIII* of the Constitution in *Article: 352-360*
- They are borrowed from the Weimar Constitution of Germany.
- There are three types of Emergency :

1) National Emergency
2) State Emergency (President's rule)
3) Financial Emergency

Article 352: National Emergency

Proclamation:

- Proclamation of Emergency is made by the President after receiving a decision from Cabinet. (44th amendment)
- Proclamation **must be approved within 1 month** from the date of its issue by both the Houses of the Parliament with a **Special Majority.**
- If approved it continues for 6 Months & **can be extended to an indefinite time period** after the approval of Parliament after every 6 Months.

Minerva Mills Case vs Union of India, 1980:

- Proclamation of emergency is subject to *Judicial Review.*

Grounds of Proclamation :

– War
– External Aggression
– Armed Rebellion : This term was inserted by the 44th Amendment,1978. Before that it was known as Internal Disturbance.

Revocation:

- Emergency can be revoked any time by the President without any requirement for Parliamentary approval.

But, if Lok Sabha passes a resolution just **by Simple Majority** approving the discontinuation of Emergency then in that case President must revoke the Emergency.

The term "Cabinet" was inserted in Art 352 of Constitution in 1978 by the 44th Constitutional Amendment Act

Effects of National Emergency

1) Effects on Centre State Relations

- ***Federal system becomes Unitary in nature***

During Non- emergency times centre can give directions to state on some specified matters but during Emergency it can give **directions on any matter.**

- During Emergency **Parliament is empowered to make laws on any subject mentioned in the state list.** (These laws become inoperative 6 months after Emergency ceases to operate.)

2) Effects on the Life of Lok Sabha and Legislative Assembly

- It may be extended for 1 year at a time, but this extension cannot continue beyond a period of 6 months after the emergency has ceased to operate.

3) Effect on Fundamental Rights

Article 358	Article 359
It deals with suspension of FRs guaranteed by Article 19.	It deals with suspension of other FRs.
Article 19 can only be suspended on the grounds of war and external aggression and not in case of armed rebellion.	It empowers the President to suspend "Right to move any court" for enforcement of FRs except Article 20 and 21. **(Can never be suspended.)**

National Emergencies Declaration Till Now

1962: Indo-China War (Oct 1962-1968) (Then PM: J L Nehru)
1971: India and Pakistan War (Then PM: Indira Gandhi)
1975: Internal Disturbances (1975-1977) (Then PM: Indira Gandhi) (President: Fakhruddin Ali Ahmed)

25th June: Samvidhan Hatya Diwas

Article 355: Duty of Centre to protect every state against external aggression.

Article 355 act as the foundation for the centre to intervene in a state under Article 356 when necessary, creating a clear correlation between two provisions.

Article 356 : President's Rule (State Emergency/ Constitutional Emergency)

Grounds:
- If a situation has arisen in which the government of the state cannot be carried on, in accordance with the provisions of the Constitution.
- Whenever a state fails to comply with or to give effect to any direction from the centre.

Approval:
- Must be approved by both the Houses of Parliament with a simple majority **within 2 months** from the date of its issue.
- If approved it continues for 6 months and can be extended for a **maximum period of 3 Years.**

Proclamation
- By the President of India which can be done only after cabinet approval. (44th CAA, 1978)

Revocation
- Any time by the President, no need of Parliamentary approval or
- If LS passes a resolution through Simple Majority.

Consequences
- President can take up the functions of Governor
- Parliament can take up the functions of State Legislature

Executive is dismissed and Legislature is either suspended or dissolved.

Use of Article 356

There is no effect on FRs during president's rule.

- For the *1st time* President Rule was imposed in *Punjab in 1951.*
- *Manipur* has undergone the President's Rule the most number of times(11).
- In *Uttar Pradesh*, President Rule was imposed *10 times.*

B. R. Ambedkar about Article 356 : "It should be used as a last resort and as a means of final recourse."

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S. R. Bommai Case (1994) : Significantly curtailed the misuse of Article 356 and held that President's rule is subject to Judicial Review.

Article 360 : Financial Emergency

Proclamation :

- Article 360 empowers President to proclaim a Financial Emergency if he is satisfied that financial stability of India or any of its part has been threatened.
- It is approved by the Parliament within 2 months by a Simple Majority (same as President's Rule)
- ***No Financial Emergency has been imposed till now.***
- During the Financial Emergency, the President can ask the States to reduce the salaries and allowances of all or any class of person in government services.

Committees that deal with Centre-State Relations

- Sarkaria Commission: 1983
- Punchhi Commission: 2007
- Rajmannar Commission: 1969 (setup by Tamil Nadu government)

Inter-State Council (ISC)

Article 263 of the Indian Constitution establishes the ***Inter-State Council*** (ISC) to address inter-State issues and foster harmonious relations between the States and the Union.

Composition of the Inter-State Council :

- Chairman: Prime Minister

Members:

- Chief Ministers of all States
- Chief Ministers of Union Territories with Legislative Assemblies
- Administrators of Union Territories without Legislative Assemblies
- Six Cabinet Ministers nominated by the Prime Minister of India.

Zonal Councils

Zonal Councils are the statutory (and not the constitutional) bodies. They are established by an Act of the Parliament, *States Reorganisation Act of 1956.*

The act divided the country into *five zones*- Northern, Central, Eastern, Western and Southern and provided a zonal council for each zone.

Composition of the Zonal Council :

- Chairman: Union Home Minister
- Vice Chairman: Chief Ministers of the States included in each zone act as Vice-Chairman for that zone by rotation, each holding office for a period of one year at a time.

The North Eastern Council was constituted in 1971 by an Act of Parliament.

PART XX- CONSTITUTIONAL AMENDMENT

Basic Pointers:

- Borrowed from the Constitution of **South Africa.**
- Article 368: Deals with the procedure of Amendment.
- Parliament cannot amend those provision which form **the Basic structure of the Constitution** (Kesavananda Bharti Case, 1973)

Basic Structure of Constitution is not Mentioned in the Constitution but was Born in Kesavananda Bharti Case (1973) & has evolved in further cases.

It Consists of :

Judicial Review,Independent Judiciary,Separation of Powers,Federal Structure,Secularism,Supremacy of Constitution.

Procedure :

- Constitutional Amendment Bill can be introduced in either house of Parliament (LS/RS) but not in State Legislature
- Can be introduced by any minister or a private member.
- It does not require the prior recommendation of President for introduction.
- President must give his/her assent & no veto is allowed in case of a Constitutional Amendment Bill under Article 368. **(24th CA, 1971)**
- There is no provision of joint sitting in the case of a Constitutional Amendment Bill.

Types of Amendments

1. By simple majority of Parliament:

- It is outside the purview of Article 368.
- It is amended in the same way as normal legislations are passed.

2. By special majority of Parliament:

- For amending provisions, not within the first category.
- This requires both a Majority of total membership of each House and, a Majority of not less than 2/3rd of the members present and voting of each House. (As per article 368)

3. Special Majority + Ratification of atleast 1/2 of the State Legislatures:

- It is related to the federal structure of polity.
- Amendment- Special Majority of Parliament + State Ratification by Simple Majority.

Provisions Amended by Simple Majority :

- Admission/establishment of new state
- Formation of new states , alteration of boundaries, areas, names of states.
- 2nd Schedule
- 5th/6th Schedule
- Quorum in Parliament
- Delimitation of Constituencies
- To create/abolish Legislative Council
- Use of official language
- Election to Parliament and state legislatures
- Union territories
- Salaries and allowances of members of Parliament.

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Provisions Amended by Special Majority :

- Fundamental Rights
- DPSP
- Fundamental Duties

Provisions Amended by Special Majority + Ratification of at least 1/2 of the States :

- Election of President and its manner
- Supreme Court/High Court
- Article 368, itself.
- Any list in 7th Schedule
- Distribution of Legislative powers between centre and states.
- Representation of states in Parliament.

Comments on Amending Procedure:

1) *This variety of amending process is wise, but rarely found: K. C. Wheare*
2) *Strikes a good balance between rigidity and flexibility: K.C. Wheare*
3) *The amending process has proved itself one of the most ably conceived aspects of the Constitution, Although it appears complicated, it is merely diverse: Granville Austin*

Recent Constitutional Amendments (CA):

100 CA, 2015 : India-Bangladesh land boundary agreement

101 CA, 2016 : GST

102 CA, 2018 : National Commission for Backward Classes (NCBC) ***(Gave Constitutional status)***

103 CA, 2019 : Economically Weaker Section (EWS) ***(10% reservation given)***

104 CA, 2020 : Removal of Anglo Indians nomination from Lok Sabha and state assemblies

105 CA, 2021 : It restored the power of state government to identify the Socially and Educationally Backward Classes (SEBCs)

106 CA, 2023 : 1/3rd seats in LS/LA reserved for women

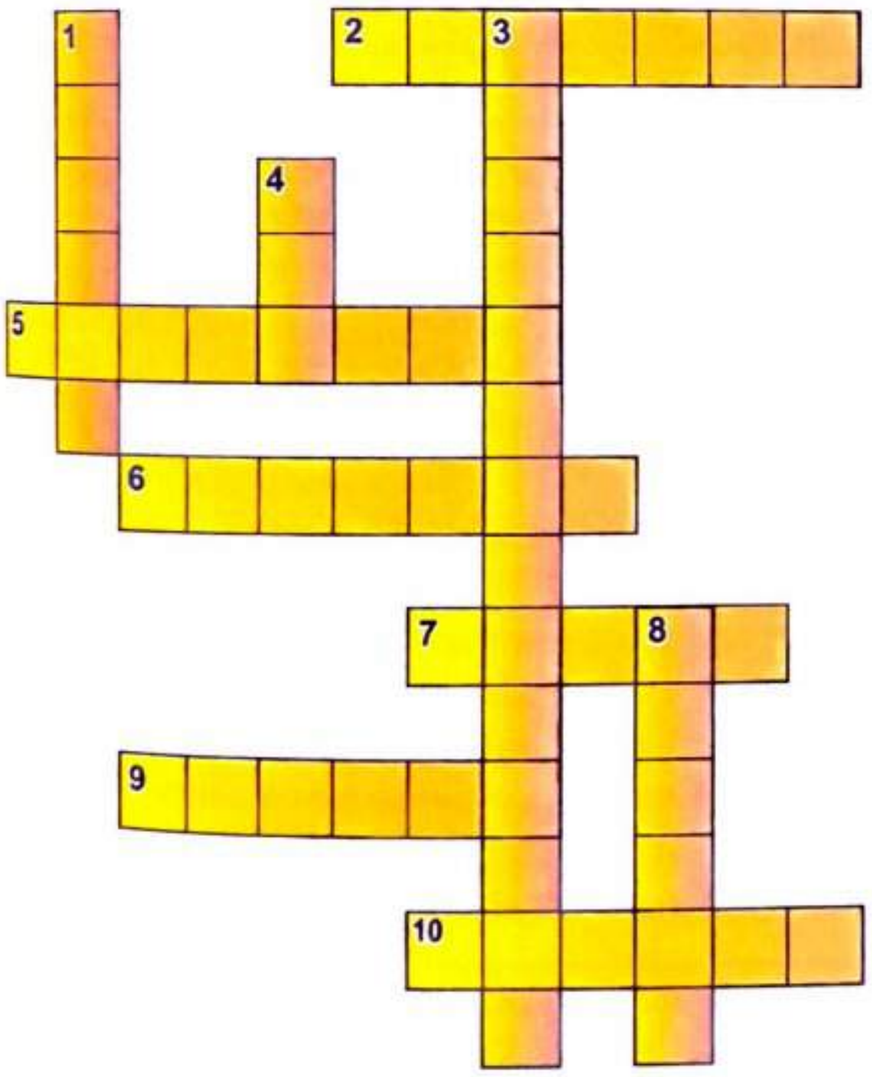
(Important Amendments have been separately dealt in each chapter.)

Do you know?

42nd Amendment is also known as Mini Constitution due to extensive changes it brought to our constitution.

PARMAR'S CROSSWORD

EMERGENCY & CONSTITUTIONAL AMENDMENT



Across

2. Extended High Court jurisdiction to UTs.
5. Governor should be non-partisan.
6. Word added by 42nd Amendment.
7. Types of constitutional amendments.
9. Recommended 27% OBC reservation.
10. Deals with constitutional amendments.

Down

1. Judicial review of President's Rule.
3. Fundamental duties review committee.
4. Gained statehood via 56th Amendment.
8. Konkani, Manipuri, Nepali added to Schedule.

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Basic Pointers:

- Judiciary in India is Integrated (borrowed from GoI act of 1935) and Independent.
- The Supreme Court replaced the Federal Court and the Judicial Committee of Privy Council after India gained Independence.
- **1st sitting :** *28 Jan, 1950*
- Federal Court was established in 1937 under the provisions of GoI Act 1935.
- SC is also known as *'the Guardian of the Constitution.'*

PART V - SUPREME COURT

Chapter IV: [Article 124-147]

Article 124 — ***Establishment and Constitution of Supreme Court***

1. Strength of Judges
- Originally, strength: *1 Chief Justice + 7 Judges* = 8 Judges
- Present, strength: *1 Chief Justice + 33 Judges* = 34 Judges

(Maximum sanctioned strength: 34)

2. Every judge of SC shall be appointed by the President after consultation with CJI.
- **Tenure**: Serves till the age of **65 years**, provided that—
  (a) a Judge may resign his office by writing to the President.
  (b) a Judge to be removed in the manner provided in clause (4).

2(A) The age of a SC Judge to be determined in such manner as Parliament may by law provide. (15th CAA, 1963)

3. **Qualification for SC Judges:**

— a Citizen of India.
— (a) At least 5 years as a Judge of a High Court, or
— (b) At least 10 years as an Advocate of a High Court, or
— (c) Distinguished jurist in the opinion of the President.

4. **Removal**: A Judge can be removed by President after Parliament passes an address by Special Majority (i.e. majority of total membership + 2/3rd of members present and voting) on **grounds of:**
- Proved misbehaviour or Incapacity

> ***Procedure of Removal for Supreme Court/High Court Judges is mentioned in Judges Enquiry Act,1968***
> ***Motion to remove judges should be signed by 50 members of Rajya Sabha or 100 members of Lok Sabha.***

5. Parliament may by law establish procedure for investigating judge's misconduct as mentioned in clause (4).
6. A Judge of SC to subscribe an Oath or affirmation before the President.
7. Restrictions: After retirement, a SC judge **cannot practice law** in any court within the territory of India.

Collegium System

(Not mentioned in Constitution.)

It is a system under which appointments and transfers of judges are decided by a forum of the **CJI and the 4 senior most judges** of the Supreme Court. It has no place in the Indian constitution. Its origin can be traced from the following judges cases :

First Judges Case (1982 - S.P. Gupta Case):
- Recommendation of CJI not binding on the President ;
- Gave primacy to the executive in judicial appointments.

Second Judges Case (1993):
- Introduced the Collegium system, holding that *"Consultation" means Concurrence.*
- Recommendation made by CJI + 2 senior-most judges,
- Recommendation given by CJI will be binding on President.

Third Judges Case (1998):
- Collegium expanded to a 5 member body,
- CJI + 4 senior-most judges, decision binding on the President.

> ***The Parliament replaced the collegium system by National Judicial Appointments Commission (NJAC) through 99th CA, 2014 to provide recommendations to the President.***

Fourth Judges Case (2015):
- 99th CA was declared unconstitutional and NJAC Act was struck down.
- **Collegium System was restored.**

Article 125 — ***Salaries, etc., of Judges***
- Salaries & allowances are determined by Parliament.

Article 126 — ***Appointment of Acting Chief Justice***

President appoints Acting Chief Justice when:
- Chief Justice's seat is vacant, or
- Chief Justice is unable to perform duties.

> ***First Female Judge of SC: Justice Fathima Beevi (1989)***
> ***No Female Chief Justice of SC till date.***

Article 127 — ***Appointment of Ad Hoc Judges***

CJI, with prior consent of the President and in consultation with the Chief Justice of the concerned High Court, may request a High Court judge (qualified for SC) to sit as an ad hoc judge (temporary judge) in the Supreme Court.

Such ad hoc judge enjoys powers, jurisdiction, and privileges of SC judges during the time.

Article 128 — ***Attendance of Retired Judges***
- Retired SC Judges can be invited to sit and act as Judge of SC.

Article 129 — ***Supreme Court as a Court of Record***

SC is a Court of Record:
- Its decisions are preserved as legal precedents.
- Has power to punish for 'Contempt of court.'

Article 130 — ***Seat of Supreme Court***
- The seat of the Supreme Court is at Delhi.
- SC can sit elsewhere if CJI recommends and President approves.

Article 131 — ***Original Jurisdiction of Supreme Court***
- SC has Exclusive Original Jurisdiction in disputes:

—Between Government of India and one or more States.
— Between GoI and any state or states on one side and one or more states on the other side.
—Between two or more States.

> ***Article 131 (A) : introduced by 42nd CA, 1976. It granted SC exclusive authority to determine the validity of central laws, it was further repealed by 43rd CA, 1977.***

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Article 132 — Appellate Jurisdiction of SC (Constitutional Matters)

• By way of appeal from High Court in Constitutional matters.

Article 133 — Appellate Jurisdiction of SC (Civil Matters)

• Appeal to SC from HC on judgments in civil cases like: Property, Marriage, Divorce, etc.

Article 134 — Appellate Jurisdiction (Criminal Matters)

Article 135 — Federal Court's Powers

• SC can exercise powers of the Federal Court under pre-Constitution laws.

Article 136 — Special Leave to Appeal

• SC can grant Special Leave to appeal from any court/tribunal judgment (except those related to Armed forces courts or Military Tribunals/ Courts-martial.)

Judicial review borrowed from the U.S. Constitution.

Article 137 — Review of Judgments

• SC can review its own judgments or orders.

Article 138 — Enlargement of SC Jurisdiction

• Parliament may expand SC's jurisdiction by law.

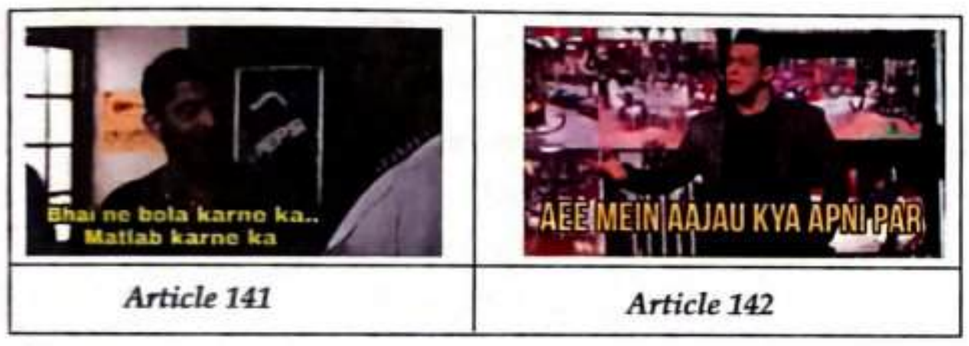
Article 139 — Power to Issue Certain Writs

• SC can issue writs for enforcement of Fundamental Rights given under ***Article 32.***

• For other purposes, it requires Parliamentary permission.

Article 140 — Ancillary Powers of Supreme Court

Article 141 — Law Declared by SC to be binding on all Courts



Article 141	Article 142

Article 142 — Enforcement of Decrees and Orders

• SC may pass any decree/order for complete justice.

Article 143 — Advisory Jurisdiction

• President may refer 2 kinds of matters to SC for advice.

1) Pre-constitutional matters

2) Matters of General importance

In pre-constitutional matters, SC must give its advice to President, and in both the cases, the advice is not binding on him.

Article 144 — Civil and Judicial Authorities to Act in Aid of SC

Article 145 — Rules of Court, etc.

• SC can make its own procedural rules with President's approval as long as it does not conflict with the laws made by the Parliament.

Article 146 — Officers and Servants of the Supreme Court.

Appointments : CJI of SC appoints the Court's officers and Staff.

Service Conditions: CJI sets the rules for the staff employment and salaries.

Expenses : The SC operating cost, like staff salaries, pensions are paid from Consolidated Fund of India.

Article 147 — Interpretation

Constitution clarifies that when interpreting the constitution, any significant legal question should also be considered: GOI Act, 1935, Indian Independence Act, 1947 and related orders and amendments to both of these Acts.

TRICK - SC ne SAARC countries ko SLAT OFFER Karl

SC -	Art. 124	— SC
S -	Art 125	— Salaries
A -	Art 126	— Acting Chief Justice
A -	Art 127	— Ad Hoc judges
R -	Art 128	— Retired judges
C -	Art 129	— Court of record
Seat-	Art 130	— Delhi as a seat
Offer -	Art 131	— Original jurisdiction

PART VI - HIGH COURT

[Article 214-231]

Article 214 — Establishment of High Courts

• Each State shall have a High Court.

Article 215 — High Court to be Court of Record

Article 216 — Constitution of High Courts

• One Chief Justice and other Judges as Parliament may decide.

Article 217 — Appointment and Conditions of Judges

(1) **Appointment** of HC Judges is done by the President after consultation with: Chief Justice of India, Governor of State, Chief Justice of the High Court. (Collegium)

• Maximum age for HC Judge: ***62 years***

• HC judge shall hand his resignation to the President.

• His Removal process is same as that of SC Judge.

(2) **Qualifications**:

• 10 years advocate of HC, or

• 10 years holding judicial office.

No provision for "Distinguished Jurist" in HC.

Article 218 — Application of Certain Provisions

• Applies SC Judges' removal procedure to HC Judges, Judges Inquiry Act, 1968.

Article 219 — Oath or Affirmation

• HC Judges take oath before the Governor.

Article 220 — Restriction on Practice After Retirement

• Former HC judges cannot practice law before any court except: SC & other HCs.

Article 221 — Salaries and Allowances

• Salaries and allowances are drawn from Consolidated Fund of State while Pensions are drawn from Consolidated Fund of India.

• Salaries , allowances, leaves and pension rights are determined by the Parliament.

Article 222 — Transfer of Judges

• President can transfer HC judges after consultation with CJI.

Article 223 — Appointment of Acting Chief Justice

The President can appoint an Acting Chief Justice when:

The office of the Chief Justice of the High Court is vacant, or

The Chief Justice is unable to perform duties due to absence or any other reason

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Article 224 — Appointment of Additional and Acting Judges

(1) **Additional Judges**: If the workload of High Court increases (e.g. due to arrears), the President may appoint additional judges for a temporary period not exceeding 2 years.

(2) **Acting Judges**: If a judge is absent, unable to perform duties, or seat is vacant, the President may appoint an acting judge.

•These appointments to be done in consultation with CJI.

Article 224A — Appointment of Retired Judges at Sittings of High Courts

The Chief Justice of a HC can request the attendance of a retired judge of that HC or any other HC

Article 225 — Jurisdiction of HC:

• **Original jurisdiction** - revenue matters, election disputes of MPs and MLAs.

• **Appellate jurisdiction** - hear appeals about decisions made by lower courts.

• Writ jurisdiction.

Article 226 — Power of HC to Issue Writs

• HC has **wider writ jurisdiction than SC**

• It can issue writs on Legal + Fundamental Rights.

• HC may **refuse** to issue writ, SC cannot.

Article 227 — Superintendence over Subordinate Courts

Article 228 — Transfer of Certain Cases to HC

Article 229 — Officers and Servants of HC - by Chief Justice of HC.

Article 230 — Extension of Jurisdiction to Union Territories : Power of Parliament —

• Andaman & Nicobar → Calcutta HC

• Lakshadweep → Kerala HC

• Puducherry → Madras HC

• Dadra and Nagar Haveli & Daman and Diu→ Maharashtra HC.

• Chandigarh → Punjab and Haryana HC

Article 231

• Establishment of **Common High Court for two or more States.** *(7th CA, 1956)* for example:

a. Maharashtra and Goa have a *common HC at Mumbai*, Maharashtra.

b. Arunachal Pradesh, Nagaland, Mizoram and Assam have a *common HC at Guwahati, Assam.*

Article 232 — Transfer of Cases to Federal Court (Repealed)

By the 7th Constitutional Amendment Act, 1956.

1st HC (1862) : Calcutta High Court.

1st Female HC Judge: Justice Anna Chandy (Kerala).

1st Female Chief Justice of HC: Justice Leila Seth (Himachal Pradesh)

Total High Courts in India : 25

TRICK - NHRC AAO ReST karo(for Article 214-222)

N - No article	220 ⟶ R - Restrictions
214 ⟶ H - High Court	e
215 ⟶ R - Court of Record	221 ⟶ S - Salary
216 ⟶ C - Constitution	222 ⟶ T - Transfer
217 ⟶ A - Appointment	
218 ⟶ A - Application of certain provisions	
219 ⟶ O - Oath	

SUBORDINATE COURTS

Article 233 — Appointment of District Judges

(1) : Distric Judge to be appointed by the Governor in consultation with the High Court.

(2) : A person not already in the service of the Union or of the State shall only be eligible to be appointed a district judge if he has been for not less than seven years an advocate or a pleader and is recommended by the High Court for appointment.

Article 233A — Validation of Appointments of District Judges.

Article 234 — Recruitment of Persons Other than District Judges to the Judicial Services shall be made by the Governor of the state.

Article 235 — Control Over Subordinate Courts.

For an interactive recap of this topic, see the crossword on Page Number 190.

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PANCHAYAT

EVOLUTION OF PANCHAYAT

Balwant Rai Mehta Committee, 1957

- Recommendation: 3-tier Panchayati Raj System

1) Gram Panchayat- Village level
2) Panchayat Samiti- Block level
3) Zila Parishad- District level

- ***Rajasthan*** - 1st state to implement Panchayati Raj at Nagaur, on 2nd October 1959 followed by Andhra Pradesh on October 11, 1959.

Ashok Mehta Committee, 1977

- Proposed: 2-tier Panchayati Raj System

1) Zila Parishad (main unit)
2) Mandal Panchayat

G.V.K Rao Committee, 1985

- Reviewed the working of Constitution in relation to the working of the Panchayats and Municipalities.
- Proposed ***Zila Parishad to act as the Nodal agency for development.***

L. M. Singhvi Committee, 1986

- 1st to recommend ***constitutional status for PRIs*** that they should constitutionally recognised, protected, and preserved.
- Advocated for financial autonomy of Panchayats.
- It also emphasised the importance of the Gram Sabha and called it the embodiment of direct democracy.
- Nyaya Panchayats should be established for a cluster of villages.

Thungon Committee, 1988

Gadgil Committee, 1988

- To examine the role of Panchayati Raj Instiutions in rural development.
- Members at all three levels should be directly elected.
- Term should be fixed at 5 years.
- Reservation for SC,ST and Women

73rd Constitutional Amendment Act, 1992

- Made it mandatory to establish Panchayati Raj institutions by inserting—
- *Part IX, Article: 243-243O*
- **Added Schedule 11 that contains 29 functional items.**
- Enforced on 24th April, 1993 (that's why this day is celebrated as *Panchayati Raj Day)*
- Then PM: ***P. V. Narasimha Rao.***

Articles related to Panchayat

Article 243: Definition

- "Gram Sabha" means a body consisting of persons registered in electoral rolls relating to a village comprised within the area of Panchayat at the village level.

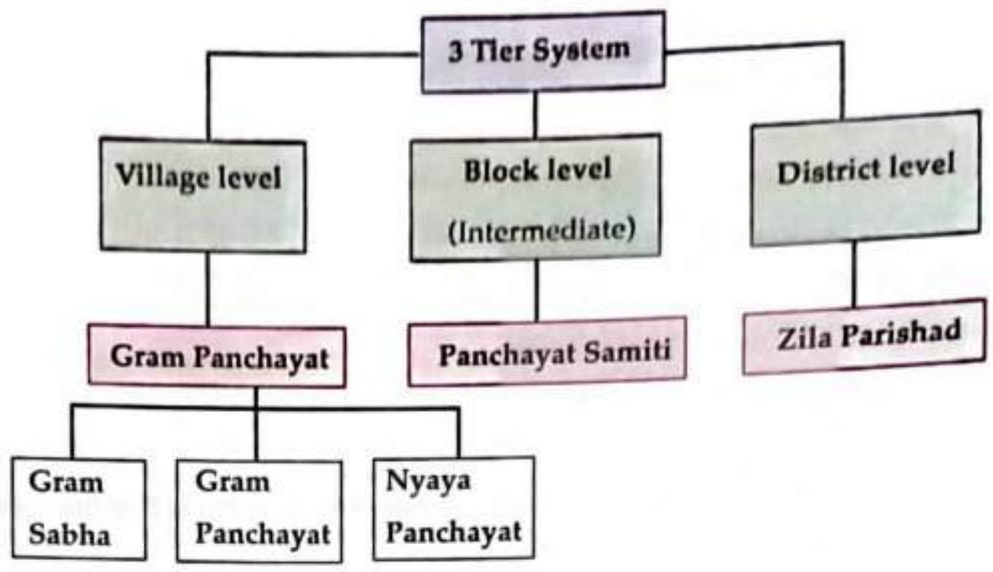
Article 243A: Gram Sabha

- A Gram Sabha may exercise such powers and perform such functions at village level as the **Legislature of State** may, by law, provide.

Article 243B: Constitution of Panchayats

- There shall be constituted in every state, Panchayat at village, intermediate, and district level i.e.,

(1) Constitution of 3-tier Panchayati Raj System
(2) Panchayat at intermediate level, not to be constituted in a state having a population, **not exceeding 20 lakhs**



Article 243C: Composition of Panchayats

(1) All seats in Panchayat shall be filled by persons **chosen by direct election.**

(2) The Chairperson of a Panchayat at village level shall be elected in such manner as the Legislature of a state may, by law, provide and at intermediate and district level through **an indirect election.**

Article 243D: Reservation of Seats

(1) Seats are **reserved for SC/ST in** proportion of their population

(2) **1/3rd seats are reserved for women.**

Article 243E: Duration of Panchayats, etc.

(1) Duration of Panchayats: **A 5-year term**, unless dissolved earlier by applicable laws.

(3) **Election Time**

(a) Before the end of its 5 year term.

(b) Dissolution: If Panchayat is dissolved before its term ends, **election must be held within 6 months** of dissolution date. (If remaining term is less than 6 months, election is not mandatory).

(4) Term of Reconstitution: Panchayat formed after early dissolution will serve only for the remainder of original term.

Example:

1 Jan 2020 ———— 1 Jan 2025

20 Nov 2024: (Dissolution) **Less than 6 months** → **(Election not mandatory)**

1 Jan 2024: (Dissolution) **More than 6 months** → **(Election Mandatory)** ↓

Dissolving power: **Zila Parishad**

New Panchayat formed will serve remainder of the term. (1year in this case)

Article 243F: Disqualifications of Membership

(1) Law made by State legislature can cause disqualification.

(a) A person convicted of a certain offense or declared insolvent may be disqualified from being a Panchayat member if they are disqualified by law related to state elections.

- He cannot be disqualified if he is less than 25 years (minimum required age 21 years)

(b) Disqualification is decided by such authority as determined by State Legislature.

High Court deals with the election disputes of MP/MLAs

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Article 243G: Power, Authority, and Responsibilities of Panchayats

• State legislature, by law, endow, the Panchayat with such powers an authority that may be necessary to enable them to function as institutions of self-government.

Article 243H : Power to Impose Taxes

• State legislature can authorise the Panchayat:-

To levy, collect and appropriate taxes, duties, tolls, and fees, grant-in-aids, ensuring proper financial management.

Article 243I: Constitution of Finance Commission by Governor to review financial position

• Government shall lay the recommendation of Commission before the State Legislature.

Article 243J: Audit of Accounts of Panchayats

Article 243K: Election to the Panchayats

(1) All elections of Panchayat shall be conducted by **State Election Commission**.

The State Election Commissioner is appointed by the Governor.

(2) The conditions of service and tenure of office of State Election Commissioner are determined by the Governor. He can be removed from his office in the same manner as the judge of a High Court.

Article 243L: Application to Union Territories

• Provisions of Part IX, of Constitution, which deals with Panchayats, shall apply to UTs with certain modification and exceptions.

Article 243M: Part not to Apply to Certain Areas

(1) Exclusion of certain areas like tribal regions and some North-Eastern states from the Panchayat system to respect their unique governance traditions, and local customs. However, provisions can be extended to these areas with necessary modification through specific laws.

The PESA Act, 1996,

The Panchayats (Extension to the Scheduled Areas) Act, 1996," extends these provisions of Part IX of the Indian Constitution, to the Scheduled Areas (Fifth Schedule Areas) of India.

(2) Nothing in this part shall apply to:-

(a) Nagaland, Meghalaya, Mizoram (Panchayati Raj system do not exist here)

(b) Hill areas of Manipur (District Council exist here)

Delhi is the only UT where provisions of the Panchayats are not applicable.

Article 243N: Continuance of Existing laws and Panchayats

Article 243N ensures a smooth transition to the new Panchayati Raj System by allowing all law to remain temporarily valid, while the State makes necessary changes to comply with updated constitutional framework.

Article 243O: Bar to Interference by Courts in Electoral Matters

(a) Courts cannot interfere in the process of defining Panchayat constituencies, or assigning seats.

TRICK for Articles related to Panchayat and Municipalities:

Art 243:	*Definition*
Art 243	*A: Assembly*
Art 243	*B: Banana (Constitute karna)*
Art 243	*C: Composition*
Art 243	*D: Dalit (reservation)*
Art 243	*E: Duration 5 years (Letter E: 5)*
Art 243	*F: Fail (Disqualify)*
Art 243	*G: Goli khake power aa gyi*
Art 243	*H: House-tax*
Art 243	*I: Income (Finance)*
Art 243	*J: Jaanch (Audit)*
Art 243	*K: Kiske elections (Panchayat)*
Art 243	*L: Lieutenant Governor in UTs*
Art 243	*M: Modifications*
Art 243	*N: Continuance of existing laws and Panchayat*
Art 243	*O: Bar to interference by courts in electoral matters*

MUNICIPALITIES

• Introduced through: *74th CA, 1992*

→ *Part IXA, Art 243P-243ZG*

→ ***Added 12th Schedule that contains 18 functional items***

• ***First Municipal Corporation was set up in Madras in 1687-1688***

• 1870: Lord Mayo presented resolution of Financial Decentralisation

• Ripon's resolution of 1882 is known as ***"Magna Carta of Local Self-Government"***.

• ***Municipal Corporation in Calcutta & Bombay were set up in : 1726***

Ripon is also known as "Father of Local Self-Government"

There are 8 types of Urban Local Government

→ Municipal Corporation

→ Municipality

→ Notified Area Committee

→ Cantonment Board (Military)

→ Township

→ Town Area Committee

→ Port Trust

→ Special Purpose Agency

3 Types of Municipalities

Nagar Panchayat: For a Transitional Area

Municipal Council: For a small urban Area

Municipal Corporation: For a larger urban Area

All seats are filled through direct elections.

Elections conducted by: State Election Commission

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Articles related to Municipalities

Article 243P: Definitions
Article 243Q: Constitution of Municipalities
Article 243R: Composition of Municipalities
Article 243S: Constitution and composition of Wards Committees, etc.
Article 243T: Reservation of seats
Article 243U: Duration of Municipalities, etc.
Article 243V: Disqualifications for membership
Article 243W: Powers, authority and responsibilities of Municipalities
Article 243X: Power to impose taxes by, and Funds of, the Municipalities
Article 243Y: Finance Commission
Article 243Z: Audit of accounts of Municipalities
Article 243ZA: Elections to the Municipalities
Article 243ZB: Application to Union territories
Article 243ZC: Part not to apply to certain areas
Article 243ZD: Committee for district planning
Article 243ZE: Committee for Metropolitan planning
Article 243ZF: Continuance of existing laws and Municipalities
Article 243ZG: Bar to interference by courts in electoral matters
Article 243ZH: Interpretation

Part IXB – The Co-operative Societies - (Articles 243ZH to 243ZT)

- *Inserted by: 97th Constitutional Amendment Act, 2011.*
- Grants constitutional status and protection to co-operative societies.
- Provisions relating to the formation, regulation, and functioning of Co-operative societies.

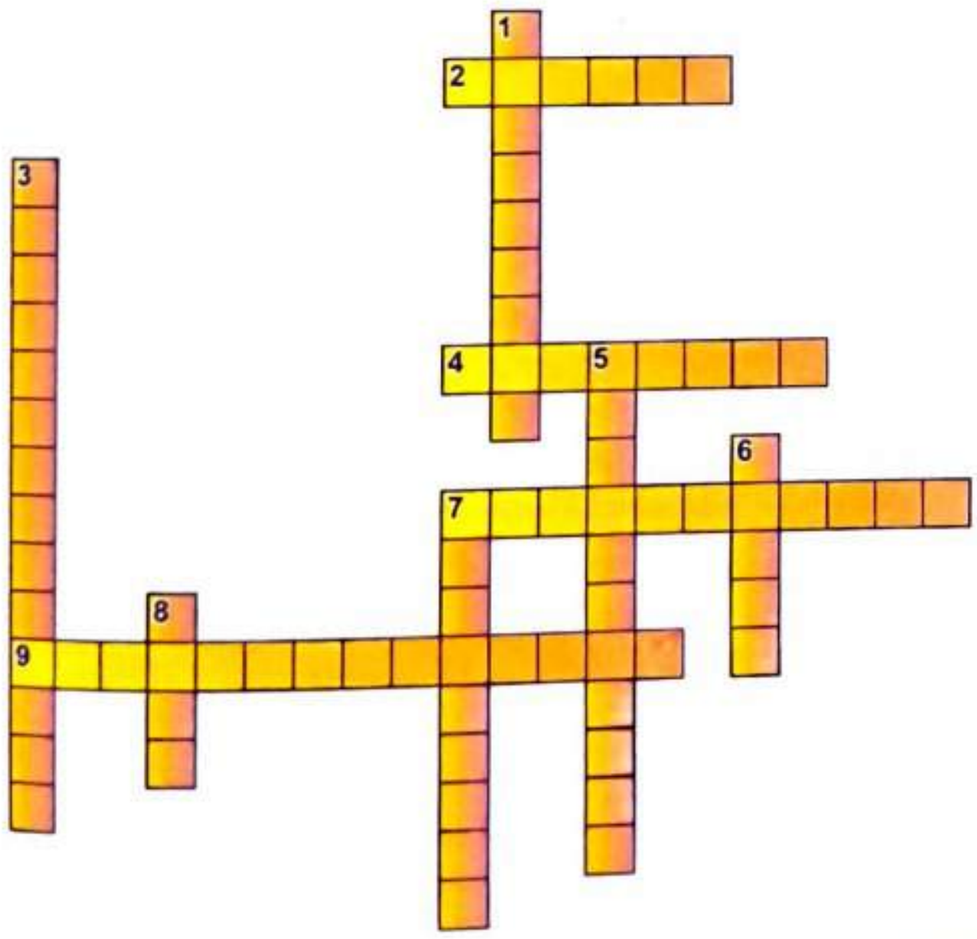
Remaining Parts of Indian Constitution:

Parts	Subject	Article No.
Part VIII	The Union Territories	Articles 239 to 242
Part X	The Scheduled and Tribal Areas	Articles 244 to 244A
Part XI	Relations Between the Union and the States	Articles 245 to 263
Part XII	Finance, Property, Contracts and Suits	Articles 264 to 300A
Part XIII	Trade, Commerce and Intercourse within the Territory of India	Articles 301 to 307
Part XVI	Special Provisions Relating to Certain Classes	Articles 330 to 342A
Part XVII	Official Language	Articles 343 to 351A
Part XVIII	Emergency Provisions	Articles 352 to 360
Part XIX	Miscellaneous	Articles 361 to 367
Part XX	Amendment of the Constitution	Article 368

**Parts that are not mentioned in this table have been covered in detail throughout the Polity section.

PARMAR'S CROSSWORD

LOCAL GOVERNMENT



Across

2. Constitutional part related to Panchayats.
4. State with no Panchayati Raj Institution.
7. Relates to women's reservation in Panchayats.
9. Added to Constitution by 74th Amendment.

Down

1. Gram Sabha consists of adults in which local body.
3. Panchayati Raj institutions are form of what governance.
5. Deals with elections to Panchayats.
6. Committee that proposed two-tier Panchayati Raj system.
7. Mentions Village Panchayats in DPSP.
8. Tenure in years of a Panchayat.

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BODIES

Constitutional Bodies	Statutory	Non - Statutory/ Executives
Mentioned in Constitution under any article.	Created by a law.	Created by any Executive resolution/ Resolution of Government.

CONSTITUTIONAL BODIES

Election Commission of India (ECI)

- Articles *324-329 (Part XV)*
- Permanent & Independent body
- Adminiters the election to the LS, RS, LA, LC , President, VP, but not for Panchayat & Municipality elections.
- Composition: *Chief Election Commissioner (CEC) + 2 Election Commissioners* (as determined by the President)
- Appointment: By President, Serves till the pleasure of the President.
- ***Tenure:*** *6 years or until 65 years of age*
- Removal: By President, Similar to the removal procedure of a Supreme Court Judge(CEC) , other ECs are removed by President on the advice of CEC.
- Salary: Same as a Supreme Court Judge
- Nature of functions: Administrative, Advisory, Quasi-judicial.
- *1st CEC: Sukumar Sen*
- Originally it was a single- membered body.
- It became a Multi-membered Commission since: 1989
- *61st Amendment of 1988* reduced the voting age from *21 years to 18 years.*

Important Articles:

- ***Article 324***: Superintendence, direction and control of elections
- ***Article 325***: No person to be ineligible for inclusion in, or to claim to be included in a special, electoral roll on grounds of religion, race, caste or sex.
- ***Article 326***: Elections on the basis of adult suffrage, Representation of People Act.
- ***Article 327 :*** Powers of Parliament to make provisions with respect to elections to legislature.
- ***Article 328 :*** Power of Legislature of a State to make provisions with respect to elections to such legislature.
- ***Article 329 :*** Prohibits interference by courts in electoral matters.

Union Public Service Commission (UPSC)

- Articles *315–323 (Part XIV)*
- Independent Constitutional body; known as ***"Watchdog of Merit System"***
- Composition: in discretion of the President
- Qualification: ½ of members must have held Government office for 10 years
- Term: 6 years or until 65 years of age
- Recruitment: All India Services and Central Services

Removal by President if:

→ found insolvent.
→ found holding any office of profit.
→ having an infirmity of mind or body.
→ Misbehaviour (as recommended by SC through an enquiry board).

Related Articles

- ***Article 315:*** Public Service Commission for the Union and for the States.
- ***Article 316:*** Appointment and term of office of members.
- ***Article 317:*** Removal and suspension of a member of PSC.
- ***Article 318:*** To make regulations as to conditions of service of members and staff of the Commission.
- ***Article 319:*** Prohibition as to the holding of office by members of commission on ceasing to be such members.
- ***Article 320:*** Function of PSCs.
- ***Article 321:*** Power to extend functions of PSCs.
- ***Article 322:*** Expenses of PSCs.
- ***Article 323:*** Reports of PSCs.

State Public Service Commission (SPSC)

- Articles *315–323 (Part XIV)*
- Same structure as UPSC
- Term: ***6 years or until 62 years of age.***
- Qualification : ½ of members must have held Government office for 10 years
- Recruitment: State Services
- Appointed by : Governor of the State.
- Removal : same as UPSC

> ***Though UPSC and SPSC are constitutional bodies but Joint Public Service Commission is Statutory in nature.***

Finance Commission (FC)

- *Article 280* - a Quasi-judicial body
- Composition: Chairman + 4 Members (Constituted by President in every 5 years
- Constitution has authorised Parliament to determine the Qualifications of member of Financial Commission.

Qualifications:

- Chairman – must be experienced in Public affairs.
- Members – a judge of HC or Qualified to be appointed as a HC judge.
  - Special knowledge of finance and Accounts of government and Economics.
  - Experienced in Financial Matter and Administrations.
  - Members are eligible for reappointment.
- 1st FC (1951): *K. C. Neogy*
- 14th FC: *Y.V. Reddy*
- 15th FC: *N. K. Singh*
- 16th FC: *Arvind Panagariya*
- Members: *Ajay Narayan Jha, Annie George Mathew, Manoj Panda, Soumya Kanti Ghosh* (Part-time)

Related Article:

Article 280: Defines Finance Commission.

Article 281: Submission of recommendations of FC.

> ***It makes recommendation to the President on the Net Proceeds of taxes to be shared between Centre & State. (Not binding)***

GST Council

- Inserted via *101st CAA, 2016*
- *Article 279A*
- Composition: Joint forum of Centre & State.
- Chairperson : Union Finance Minister.

> ***Union Revenue Secretary acts as the ex-officio Secretary to the Council.***

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National Commission for SCs & STs

- SCs – *Article 338*
- STs – *Article 338A*
- Composition: Chairperson + Vice-Chairperson + 3 members
- All members appointed by President.
- Originally, Article 338 provided for a Special Officer for SCs and STs.
- Later, *the 65th CAA*, 1990 replaced the Special Officer with a multi-member National Commission for SCs and STs under Article 338.

  Finally, *the 89th CAA, 2003* bifurcated it into 2 separate commissions:

  National Commission for Scheduled Castes (NCSC) – *Article 338*

  National Commission for Scheduled Tribes (NCST) – *Article 338A*

National Commission for Backward Classes (NCBC)

- Established in : 1993
- Article: *338B*
- Originally it was a statutory body.
- ***Mandal Case, 1992***: SC directed Central government to constitute a permanent statutory body for Backward Class.

> ***102nd Amendment Act of 2018 conferred the constitutional status and added a new article 338B to the constitution.***

Special Officer for Linguistic Minorities

- *Part XVII*
- Article *350B* - Inserted via *7th Amendment Act, 1956*
- Appointed by: President
- *Article 350A*: providing adequate facilities at primary level education in Mother tongue to children belonging to linguistic minority groups.

Comptroller and Auditor General of India (CAG)

- *Part V, Chapter V, Article 148–151*
- Head of the Indian Audit & Accounts Department.
- Appointed by: President
- Term: 6 years or till 65 years of age
- A Single-membered body,
- Removal: Done in the same manner as that of SC Judge.
- Known as: ***"Guardian of Public Purse"***
- B.R. Ambedkar's mentioned CAG as the ***"Most important officer under the Constitution"***
- He acts as a ***Guide and Philosopher to Public Accounts Committee.***
- He compiles and maintains the accounts of State government, not central government.
- **CAG related Articles:**
  - *Article 148:* Office of Comptroller and Auditor General of India (CAG), appointment, removal, salary and other conditions of service.
  - *Article 149:* Duties and powers of CAG.
  - *Article 150:* Form of accounts of the Union and of the States.
  - *Article 151:* Audit reports must be submitted to President.

Attorney General of India

- *Article 76*
- ***Highest Law Officer of India***
- Appointed by: President
- Qualification: should be eligible to become a SC Judge.
- Assisted by: Solicitor General (Not a constitutional body)

Advocate General of India

- *Article 165*
- Appointed by : Governor
- Qualification: must be eligible for a HC Judge
- Advices State Government in legal matters referred to him by the Governor.

STATUTORY/ EXECUTIVE BODIES

National Human Rights Commission (NHRC)

- Established ***under Protection of Human Rights Act, 1993***

Composition:

- Chairperson (Retired CJI or SC Judge) + 5 full-time members
- Appointed by: President (based on 6-membered committee recommendation)
- Tenure: 3 years or 70 years of age.
- Members are eligible for re-appointment after completing their current term
- Also known as the *"Watchdog of Human Rights"*
- Current Chairperson: *Justice V. Ramasubramanian*

State Human Rights Commission

- Established under *Protection of Hunan rights Act, 1993*

Composition:

- Chairperson (Retired Chief Justice or HC Judge) + 5 full-time members
- Appointed by: Governor (based on 6-membered committee recommendation)
- Removal by: President
- Tenure: 3 years or 70 years of age.
- Members are eligible for re-appointment after completing their current term

Chief Information Commission (CIC)

- Established in *2005 under Right to Information Act, 2005*
- Tenure: 5 years or 65 years of age
- Not eligible for Re- appointment under Central/State Government

Central Vigilance Commission (CVC)

- Established: *1964 by Executive Resolution*
- Initial Status: Neither constitutional nor statutory.
- ***Statutory Status granted in 2003***
- Recommended by: Santhanam Committee
- Appointed & Removed by: President

Central Bureau of Investigation (CBI)

- Established: *1963 by Executive Resolution*
- Derive its power from Delhi Special Police Establishment Act, 1946.
- It is an Executive body.
- Recommended by: Santhanam Committee

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4. Recognition to the '*portfolio*' system, introduced by *Lord Canning in 1859.*
5. It empowered the Viceroy to issue ordinances, without the concurrence of the legislative council, during an emergency. The life of such an ordinance was 6 months.

Indian Councils Act, 1892

1. It introduced *indirect elections.*
2. It permitted discussions on financial matters, and allowed members to question the executive, enhancing accountability.

Indian Councils Act, 1909

• Also known as ***Morley-Minto Reforms*** (Lord Morley- Secretary of State and Lord Minto - Viceroy of India)

1. Increased the size of the legislative councils, both Central and Provincial. The no. of members in the central legislative council was raised from 16 to 60.
2. Members : Official majority in central legislative council and non-official majority in Provincial legislative council.
3. It provided for the association of Indians with Executive Councils of the Viceroys and Governor (*Satyendra Prasad Sinha* was the *1st* Indian to join, later appointed as the Law member)
4. It *introduced Separate Electorate for Muslims* (System of Communal Representation) i.e. Muslim members were elected by muslim voters ***(Lord Minto: Father of Communal Electorate)***

Government of India Act, 1919

• Also known as *Montagu-Chelmsford Reforms* (Montagu - Secretary of State for India and Lord Chelmsford - Viceroy of India)

1. *Dyarchy introduced in provinces.*
2. Classified all the subjects of administration into the central subjects and the provincial subjects

Provincial Subjects were further divided into two parts: Transferred and Reserved subjects.

> ***Transferred subjects :*** (Governor General not responsible) - ***Public health, Education, Local Self government , Agriculture, etc***
> ***Reserved subjects :*** (Governor General responsible) - ***Police, Administration of justice, Prison, Land revenue, Finance , etc***

3. It introduced Bicameralism and direct elections in the country for the 1st time consisting of an Upper House (Council of State) and a Lower House (Legislative Assembly).
4. It required that the 3 of the 6 members of the Viceroy's executive council (other than the Commander-in-Chief) were to be Indian.
5. It created a new office of the High Commissioner for India in London and transferred to him some of the functions.
6. Public Service Commission was established and a Central Public Service Commission was set up in 1926 for recruiting civil servants.
7. It separated Provincial budget from central budget.
8. It extended the system of *Separate Electorate for : Sikhs, Indian Christians, Anglo-Indians and Europeans.*

Government of India Act, 1935

(Enforced on: 1st April 1937)

1. It *abolished dyarchy in the provinces and introduced dyarchy at the Centre,* provided Autonomy to the Centre.
2. It provided for the establishment of an All India Federation consisting of provinces and princely states as units.
3. It *introduced bicameralism in 6 out of 11 provinces.* (Bengal, Bombay, Madras, Bihar, Assam and the United Provinces)
4. It reserved certain no. of seats for Scheduled Castes, women and labours.
5. It *extended adult franchise* - Only 14% of total population had the right to vote.
6. *Reserve Bank of India was established.*
7. Federal Public Service Commission, Provincial Public Service Commission and Joint Public Service Commission were established.
8. *Federal Court was setup in 1937.*
9. *Burma (now Myanmar) was separated from India.*
10. The Act divided the powers between the Centre and units in three lists- Federal List (for Centre, with 59 items), Provincial List (for provinces, with 54 items) and the Concurrent List (for both, with 36 items)
11. Residuary powers were given to the Viceroy (Governor-General)
12. It abolished the council of 15 members.

Indian Independence Act, 1947

1. It *ended the British rule in India* and declared India as an independent and sovereign state from August 15, 1947.
2. Partition of India and creation of two independent dominions of India and Pakistan with the right to secede from the British Commonwealth was done.
3. It *abolished the office of Viceroy* and provided a Governor General, who was to be appointed by the British King on the advice of the dominion cabinet.
4. It abolished the office of the Secretary of State for India and transferred his functions to the Secretary of State for Commonwealth Affairs.
5. It *proclaimed the lapse of British paramountcy* over the Indian princely states and treaty relations with tribal areas from August 15, 1947.
6. It granted freedom to the Indian princely states either to join the Dominion of India or Dominion of Pakistan or to remain independent.
7. The Governor-General would have full power to assent to any bill in the name of His Majesty.
8. It designated the Governor-General of India and the provincial governors as constitutional (nominal) heads of the states.
9. It dropped the title of Emperor of India from the royal titles of the King of England.
10. It discontinued the appointment to civil services and reservation of posts by the secretary of state for India.
11. It is also known as *the Partition plan/Mountbatten plan/June 3rd plan.*

At the stroke of midnight of 14-15 August, 1947, the British rule came to an end.

> ***• 1st Governor General of Independent India : Mountbatten***
> ***• 1st and last Indian Governor General: C Rajagopalachari***

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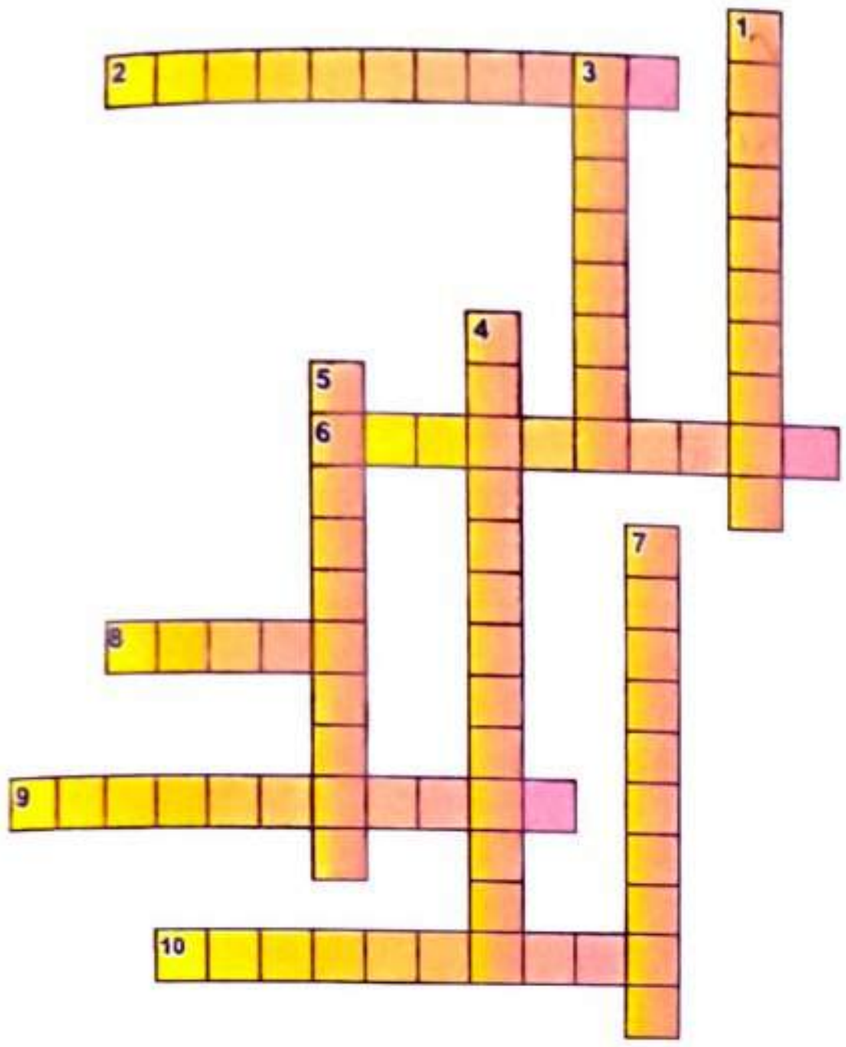
PARMAR'S CROSSWORD

SUPREME COURT AND HIGH COURT



Across

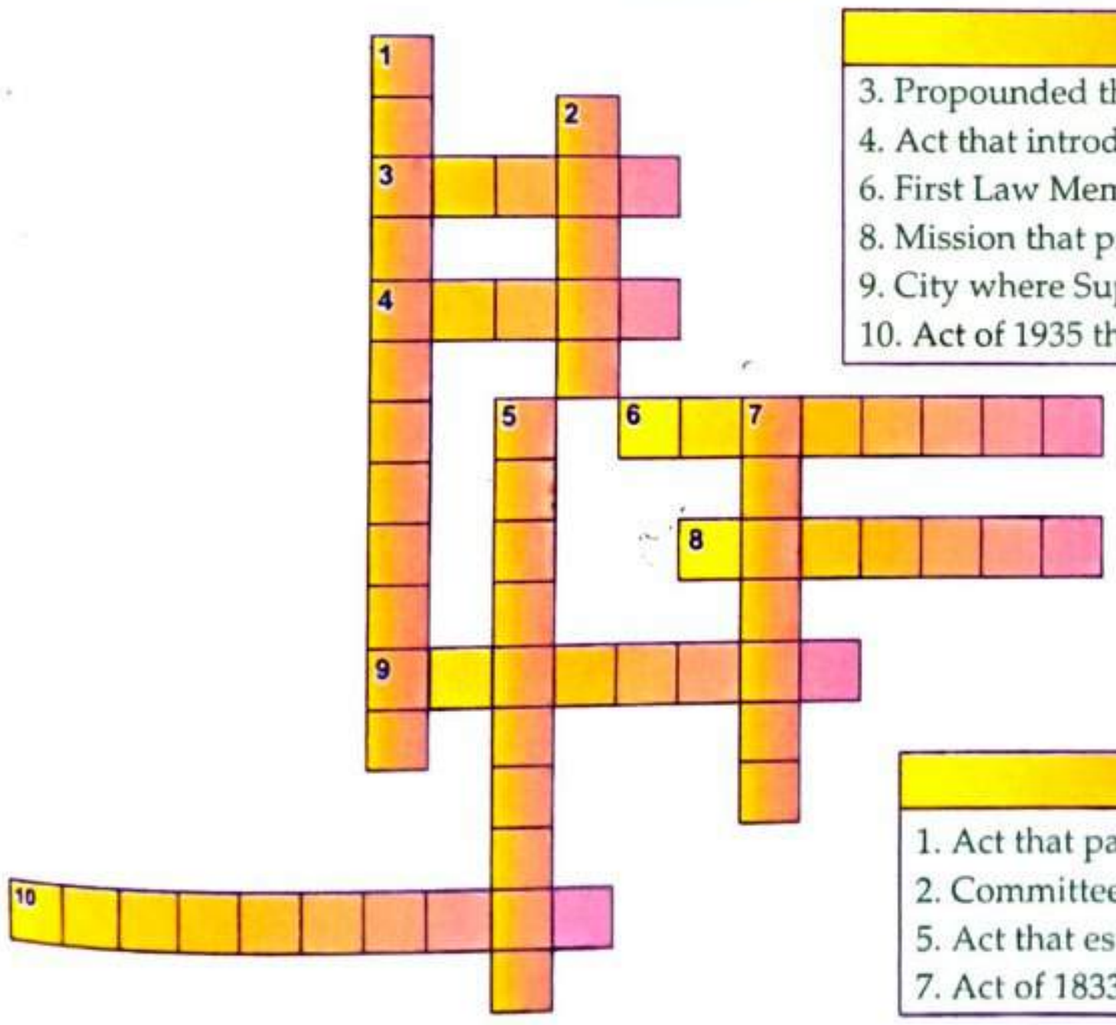
2. Writ to stop a court acting beyond jurisdiction.
6. Declares SC as Court of Record.
8. First Chief Justice of India.
9. Case defining 'Basic Structure Doctrine'.
10. Grants advisory jurisdiction to Supreme Court.

Down

1. Establishment of Supreme Court mentioned under.
3. Jurisdiction for inter-state disputes.
4. Oath for Supreme Court judges is in which Schedule.
5. Decides salaries of Supreme Court judges.
7. Jurisdiction enlargement provision for SC.

PARMAR'S CROSSWORD

IMPORTANT ACTS



Across

3. Propounded the concept of Rule of Law.
4. Act that introduced dual system of control in 1784.
6. First Law Member in Governor-General's Council.
8. Mission that proposed three-tier power transfer in 1946.
9. City where Supreme Court was established in 1774.
10. Act of 1935 that introduced provincial autonomy.

Down

1. Act that partitioned India and Pakistan.
2. Committee behind two-tier Panchayati Raj proposal.
5. Act that established Supreme Court at Calcutta.
7. Act of 1833 established Law Commission.

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So now we have seen that our Indian Constitution is a unique and comprehensive document, drawing upon the best practices from a variety of foreign constitutions to suit India's diverse needs. Here is a summarised culmination of all the sources of our constitution:

British Constitution (United Kingdom)

- Parliamentary system of government
- Bicameral legislature (Lok Sabha and Rajya Sabha)
- Rule of Law
- Legislative procedure
- Single citizenship
- Cabinet system
- Concept of the Speaker and his role
- Parliamentary privileges
- Prerogative writs (like habeas corpus, mandamus, etc.)

United States Constitution (USA)

- Fundamental Rights
- Independence of the judiciary
- Judicial review
- Written Constitution
- Preamble
- Office of President and Vice President
- Impeachment procedure
- Removal of Supreme Court and High Court Judges
- Separation of powers among the three organs

Canadian Constitution

- Federal structure with a strong Centre
- Residuary powers vested in the Centre
- Appointment of Governors by the Centre
- Advisory jurisdiction of the Supreme Court
- Quasi-federal nature of Constitution

Constitution of the Soviet Union (now Russia)

- Fundamental Duties
- Ideals of *justice (social, economic, and political)* in the Preamble.

Australian Constitution

- Concurrent List
- Freedom of trade, commerce, and intercourse within the country
- Joint sitting of the two Houses of Parliament to resolve deadlock

Weimar Constitution of Germany

- Emergency powers (suspension of Fundamental Rights)
- Provisions regarding proclamation and effects of Emergency

Irish Constitution

- Directive Principles of State Policy (DPSP)
- Nomination of members to the Rajya Sabha by the President
- Method of election of the President

French Constitution

- Republican form of government
- Ideals of *Liberty, Equality, and Fraternity* (included in the Preamble)

Japanese Constitution

- Concept of Procedure established by law (as opposed to "due process of law" in the U.S.)

South African Constitution

- Procedure for amendment of the Constitution
- Election of Rajya Sabha members using proportional representation by single transferable vote

Government of India Act, 1935

- Federal structure of government
- Office of Governor
- Public Service Commissions
- Emergency provisions
- Administrative details (civil services, police, etc.)
- Judiciary system
- Provincial autonomy
- Integrated Judiciary

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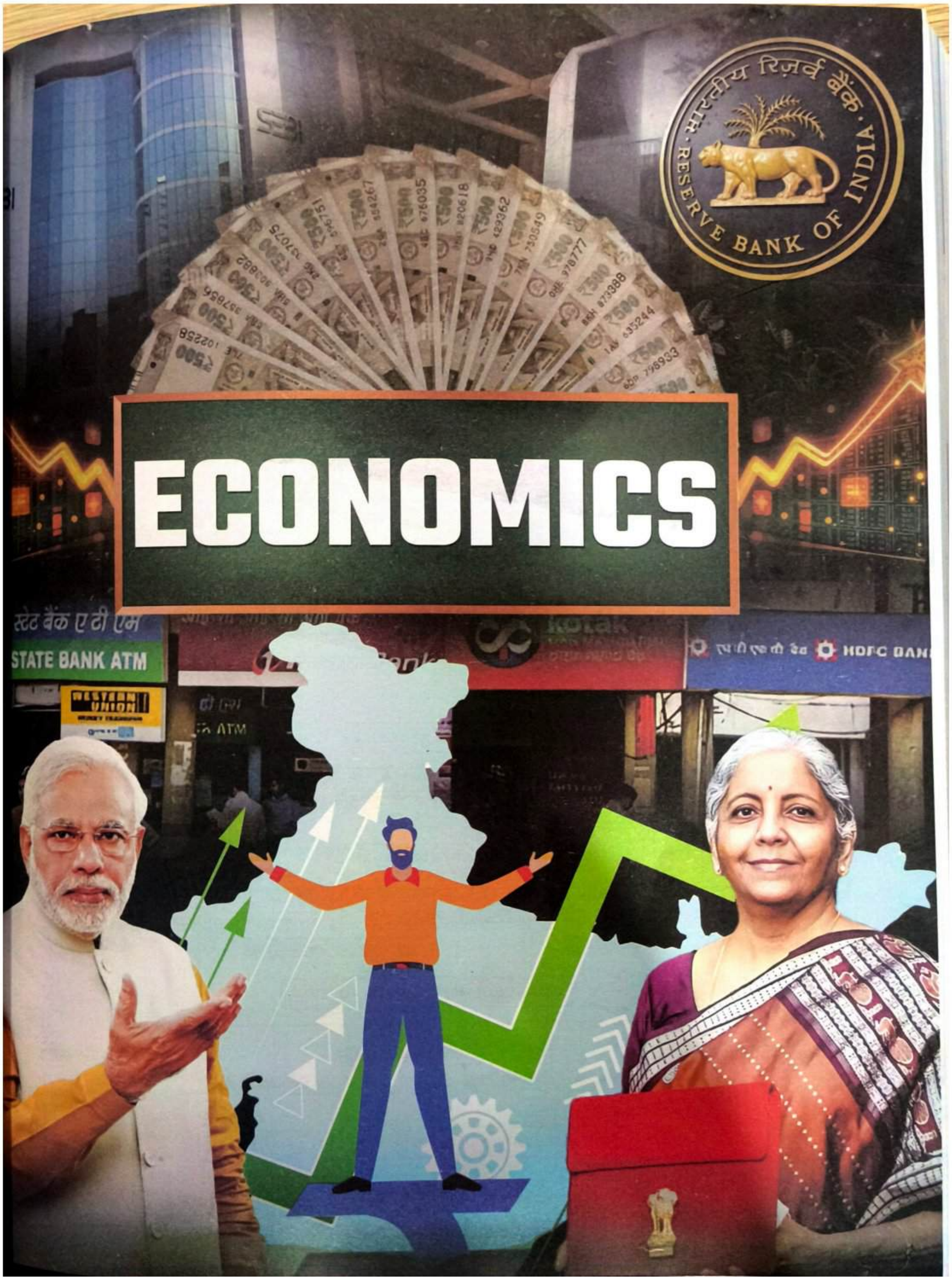

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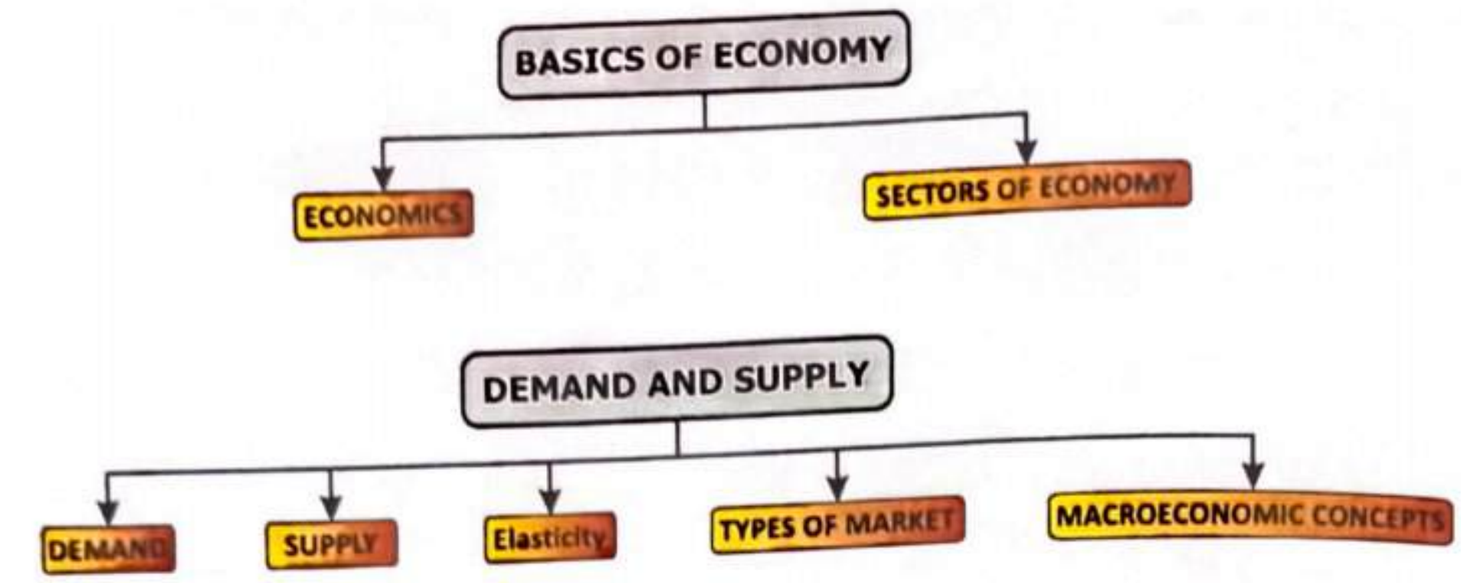

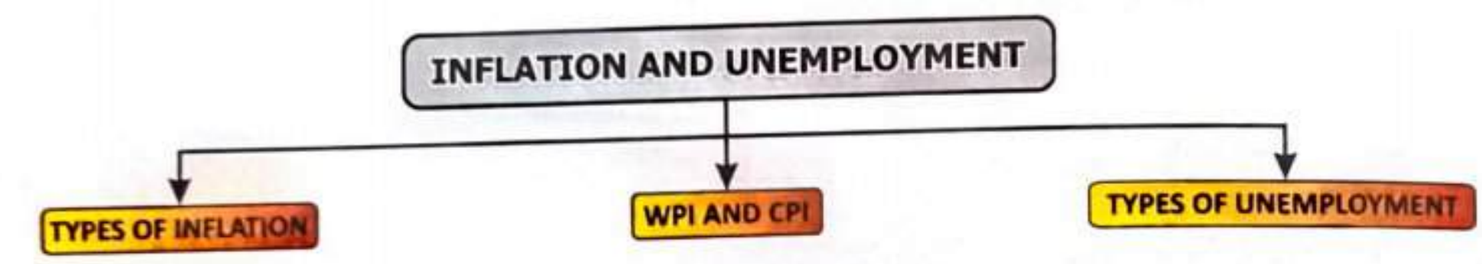

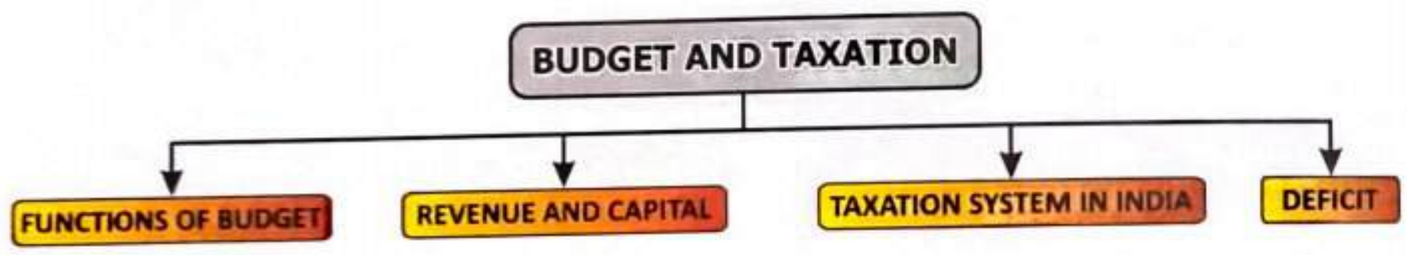

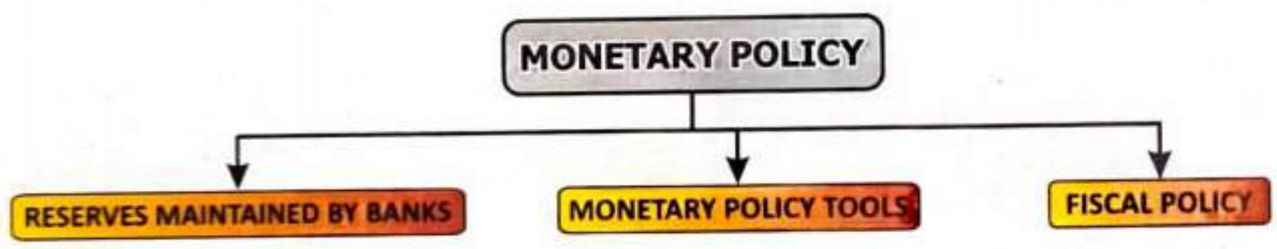

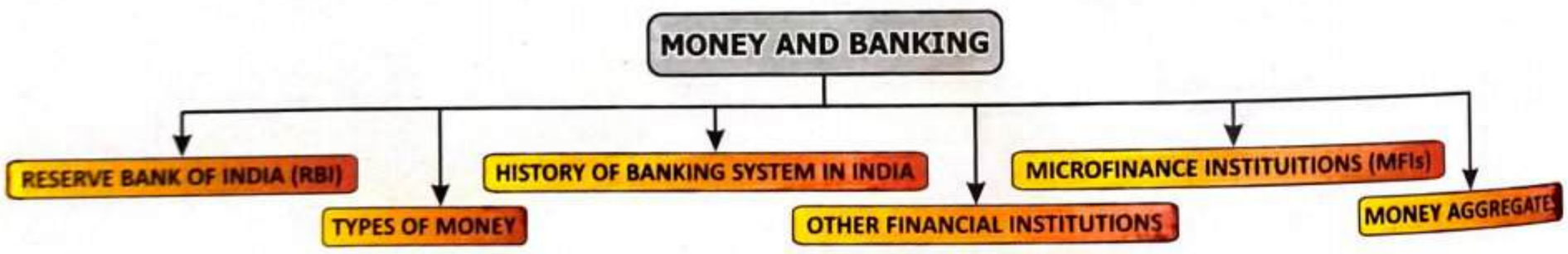

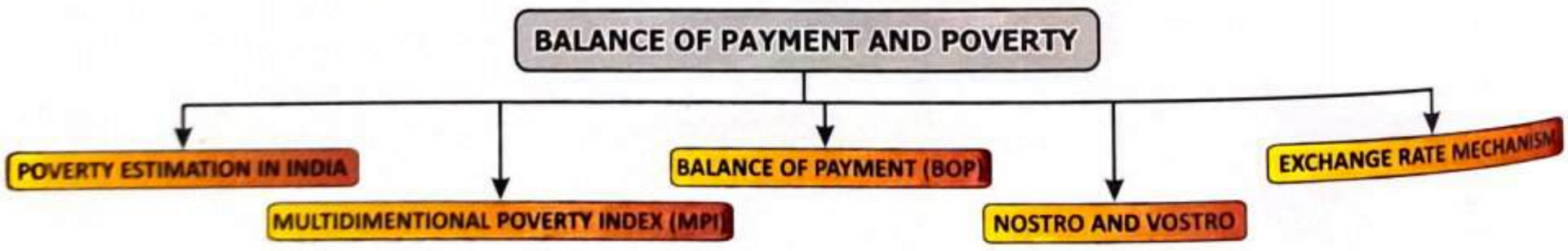

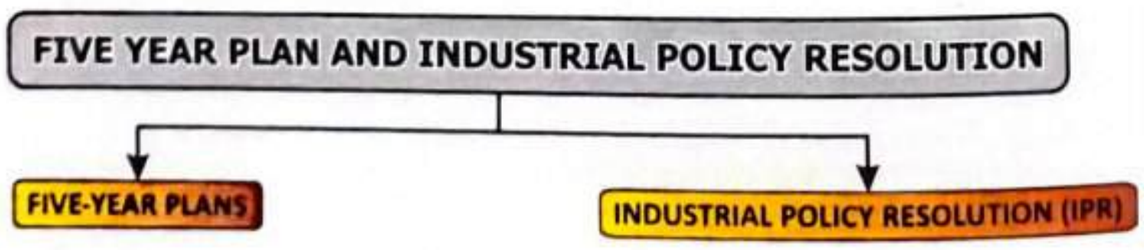

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ECONOMICS

- Economics is the study of how people, businesses, and governments use limited resources to produce, distribute, and consume goods and services.
- Economics broadly divided into: Macroeconomics and Microeconomics.

Aspects	Macroeconomics	Microeconomics
Definition	It studies the economy as a whole	It studies individual consumers, firms, and markets
Focus Area	It is focused on the action of government and countries that take to influence broader economics like supply, demand, prices, etc.	It is focused with the action of individual or businesses
Scope	Large-scale, specific sector	Small-scale, entire economy
Father	J. M. Keynes (from England) wrote the "General Theory of Employment, Interest and money"	Adam Smith (Founding Father of Modern Economy) wrote the book "The wealth of Nations"
Examples	GDP, inflation rates, fiscal policies, national income, unemployment rates	Pricing of a product, consumer behavior, competition in a market

The economic system can be classified into three types:

1. Capitalist Economy
2. Socialist Economy
3. Mixed Economy

	Capatalist	Socialist	Mixed
Ownership	Private ownership	Public ownership	Public + Private ownership
Economic motive	Profit	Social welfare	Both
Government role	No role	Complete involvement	Limited role
Income distribution	Unequal	Equal	Less unequal
Economic freedom	Complete	Lack of freedom	Limited freedom
Example	USA	USSR, North Korea	India

License Raj and LPG Reforms 1991

- Licence Raj, also called *"Permit Raj"*, was a system in India *before 1991* where businesses had to get many government approvals to start or run.
- During this time, the government controlled industries, imports, and trade, which slowed down the country's growth and caused economic crisis. India faced a *Balance of Payment (BoP) crisis* with very little foreign exchange reserve left.
- To solve this, *LPG reforms 1991 (Liberalization, Privatization, Globalization)* was introduced, it was was led by *Prime Minister P.V. Narasimha Rao and Finance Minister Dr. Manmohan Singh*, this reform made doing business easier and opened up the Indian economy to the world.

Rivalrous Goods

A good is said to be rivalrous if its consumption by one consumer prevents simultaneous consumption by other consumers.

Difference between Public Goods and Private Goods

Private Goods	Public Goods
They are rivalrous (provide satisfaction to only limited persons)	They are non-rivalrous (provide satisfaction to all)
They are excludable (E.g. A person can exclude someone from sitting in the car)	They are non-excludable (E.g. Any person can use the public bridge)
They are generally provided by Private Sector (made by a private car company)	They are generally provided by the Government (public provisions made by Government)
They have a positive marginal costs.	They have zero marginal costs.

Public goods involve the problem of Free Ridership (Bole to: Muft ka Chandan Ghis Mere Nandan).

SECTORS OF ECONOMY

There are three sectors of economy

1. *Primary Sector*
2. *Secondary Sector*
3. *Tertiary Sector*

Primary Sector

- This sector is directly dependent on the environment.
- In India Primary Sector is mostly seen in *agricultural activities. E.g. Agriculture, Fishing, Hunting, Forestry, Mining*
- The types of activities under this sector is also known as *Red Collar Jobs.*

Agriculture Sector is considered "the backbone of Indian Economy"

Secondary Sector

- It is also called as *Manufacturing Sector.*
- They add value to natural resources by transforming raw materials into valuable products. *E.g. Manufacturing, processing, building/construction, electricity etc.*

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• Secondary Sector is considered *backbone of a country, as it helps in industrialisation of a country. E.g. China.*

• Secondary Sector is also known as *Blue Collar Jobs* and is yet not developed in India properly. We have directly leaped to Tertiary Sector.

> ***Blue-collar jobs involve physical work and use practical skills. These jobs are often in fields like construction, manufacturing, and maintenance.***

Tertiary Sector

• It is also known as *Service Sector.*

• It is a part of economy where business produce services. *E.g. Teaching, Transport, Advertising, Retail, Hospitality and Healthcare.*

• It is always *intangible* (something which cannot be touched) in nature.

• It is also known as *White Collar Jobs.*

Quaternary Sector

• The Quaternary Sector focuses on knowledge-based activities and intellectual services.

• This sector is also known as the *"Knowledge Sector". E.g. Senior Business Executive, Teaching, Manager, Banking, Chartered Accountant, Lawyer, Scientists*

Quinary Sector

• The Quinary Sector involves high-level, *knowledge-based activities that require expertise and advanced skills → All the decision making activities are involved here.*

• The activities in this sector are also known as *Gold Collar Jobs. E.g. Media, Financial Services, Education, Research Scientists, Information Technology, Activity of Politicians.*

According to 2011 Census

	Primary Sector	*Secondary Sector*	*Tertiary Sector*
LFPR	*54.6%*	*24.3%*	*21.1%*
% in GDP	*14.39%*	*31.46%*	*54.15%*

**LFPR: Labour Force Participation Rate*

• *Percentage of women engaged in Primary Sector: 62.8%*

Aids or Auxiliaries to Trade

• Auxiliaries to trade refers to the factors that are essential for bringing the *goods from the place of their production to the place of their consumption.* In other words, these are essential services and functions that *assist the business. E.g. Transportation, communication, banking, insurance, warehousing, and advertising.*

Normative Vs Positive Economics

Normative Economics	*Positive Economics*
It is based on opinion and value of the interpreter	It is based on actual data, facts, and numbers
Verification is not possible	Results can be verified
No way to test feasibility and applicability in various field	Safe and beyond doubt and can be proved scientifically
It deals with idealistic situation	It deals with actual and realistic situations
E.g. The level of unemployment must be 5% maximum.	*E.g. The current unemployment rate is 20%.*

Parallel Economy

• Parallel Economy refers to all the forms of activities through which black income is generated and those which are usually not accounted.

• It renders Policies by Government Ineffective.

For an interactive recap of this topic, see the crossword on Page Number 209.

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• Problem of Central Economy is *limitation of resources*. Since resources like money, raw materials, labor, and time are finite, an economy cannot produce everything it desires.

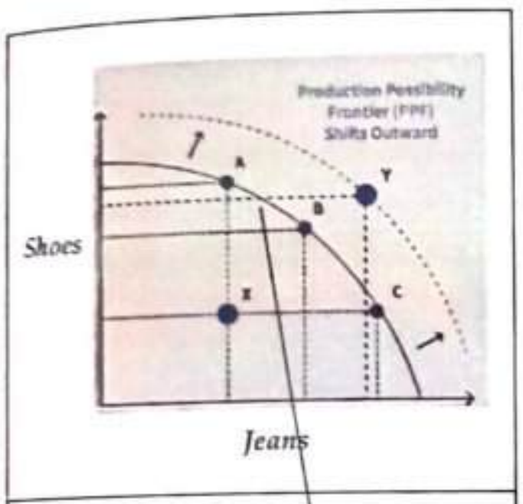
• When resources in an economy are limited, they can be used in different ways to produce various goods and services. Depending on how these resources are used, different combinations of goods and services can be created.

• The *production possibility of the economy* refers to all the possible combinations of goods and services that an economy can produce using the available resources and current technology.

Production Possibility Curve

• It is a graph that shows the different combinations of two goods or services that an economy can produce *when all resources are used efficiently*.

E.g. If a person has ₹6000, and they have two buying options: 6 pairs of shoes for ₹6000 and 6 pairs of jeans for ₹6000. Spending the entire amount on one product means buying 6 pairs of shoes with no money left for jeans, or buying 6 pairs of jeans with no money left for shoes.



Graph 1: Negative sloping/Downward sloping curve (concave at origin)

• It is seen in case of inverse relationship

• If they want more shoes, they must give up some jeans and vice versa. This also illustrates *inverse relationship* means that as we spend more *money on one product we have less money available for the other product due to limitation on budget*.

At any point

• *On the curve: Full utilisation of resources*

• *Down/under the curve: Under utilisation of resources*

• *Up/Over the curve: Not achievable (due to limited resources)*

Opportunity Cost

• Opportunity cost means the value of *what you give up when you choose one thing over another*.

E.g. If a person has ₹6000 and can buy either a pair of jeans or a pair of shoes, choosing the jeans means they miss out on getting the shoes. The shoes are the opportunity cost.

Free Goods

• They are the type of goods that have *no opportunity cost*, as they are *readily available in nature and not scarce*, meaning there is no need to sacrifice the production of another good to obtain them; *examples include air and sunlight.*

Utility

• Utility refers to the *satisfaction or benefit a person gets from consuming a good or service.*

E.g. If you eat a meal when you're hungry, the enjoyment and relief you feel is the utility you receive from that meal.

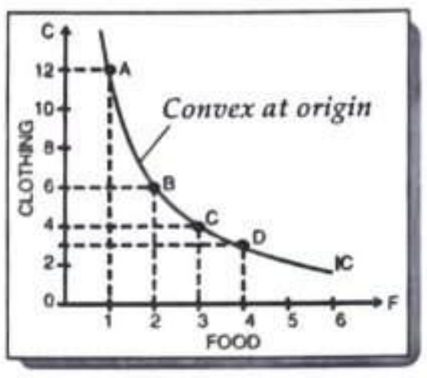
Types of Utility

Cardinal Utility	Ordinal Utility
Benefit gained from consumption of certain resources is measured in numerical value	Benefit gained from consumption of certain resources that are not measurable in numerical value
It is a quantitative approach	It is a qualitative approach
It is less realistic	It is more realistic

Consumer's Indifference Curve

• A consumer's indifference curve is a graph that shows different *combinations of two goods that provide the consumer with the same level of satisfaction or happiness.*

E.g. At point A, we have 1 units of food and 12 units of clothing and point B, we have 2 units of food and 6 units of clothing. Both points make one equally happy, so they lie on the same indifference curve.



Graph 2: A consumer's indifference curve

Marginal Utility

• The *additional satisfaction or benefit* that a consumer derived from buying an additional unit of a commodity/service.

Utility Law of Diminishing Marginal Utility

• The Law of Diminishing Marginal Utility states that as a person consumes more units of a good, the *additional satisfaction (utility) derived from each extra unit gradually decreases, assuming all other factors remain constant*.

E.g. Jab tum pahla golgappa khate ho toh jo anand ki prapti hoti hai woh dusre golgappe main nahi hoti kyunki dhire dhire additional satisfaction (utility) kam hota jata hai.

DEMAND

• The quantity of a good or service that consumers are willing and able to buy at a particular price during a specific period of time *(willingness + ability)*.

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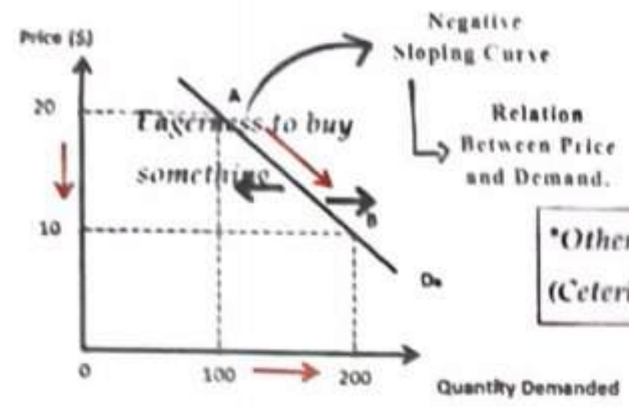


Graph 3: Demand curve

• There is an *inverse relationship between price and demand*. When the price of a product increases, people tend to buy less of it and when the price decreases, people usually buy more of it. *However, this is not always true, this is true only under given conditions:*

1. ***When income is constant.***
2. ***When price of other goods is constant.***
3. ***When there is no change in preferences.***

Movement and Shift in Demand Curve

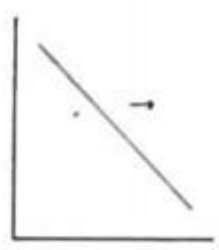
• Movement in demand curve happens when there is a *change in price of the product*.

• Shift in demand curve occurs *when factors other than price change*, such as income, consumer preferences, or the price of related goods changes.

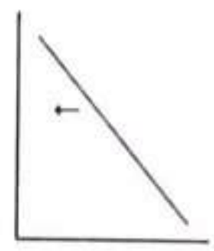
Complimentary Goods vs Substitute Goods

Substitute Goods	*Complimentary Goods*
They refer to those goods which can be used in place of one another to satisfy a particular want	They refer to those goods which are used together to satisfy a particular want
They have a competitive demand	They have a joint demand
Price of one substitute good, has positive relationship with quantity demanded of another substitute good	Price of one complementary good has a negative relationship with the quantity demanded of another complimentary good
E.g. Tea and Coffee, Coke and Pepsi	***E.g. Tea and Sugar, Car and Petrol***

• Shift on the curve can occurs in *rightward or leftward position*.



Curve shift to the rightward occurs when demand increases



Curve shift to the leftward occurs when demand decreases

• **Law of Demand:** It is a fundamental principle which states that there is an inverse relationship between price and quantity demanded.

Exceptions to Law of Demand

• **Giffen Goods:** It is a type of *inferior goods/non-luxurious goods* where *demand may increase when prices rise*, due to the *absence of better alternatives or limited purchasing power*.

E.g. Increase in price of wheat

• **Veblen Goods:** Veblen goods are *luxury goods* that have a *direct relationship between price and demand*. This means that the demand for Veblen goods *increases as their price increases*, which is the opposite of the law of demand.

E.g. iPhone, Mercedes

Effect of Income on Inferior Products

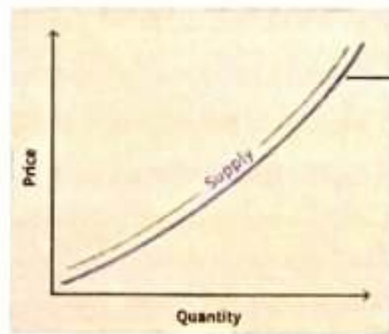
• Inferior goods are products whose *demand decreases when consumer income rises*, and *demand increases when income falls*, as people switch to better alternatives.

SUPPLY

• Supply is the amount of a product or service that is *available for purchase or use*.

Supply Curve

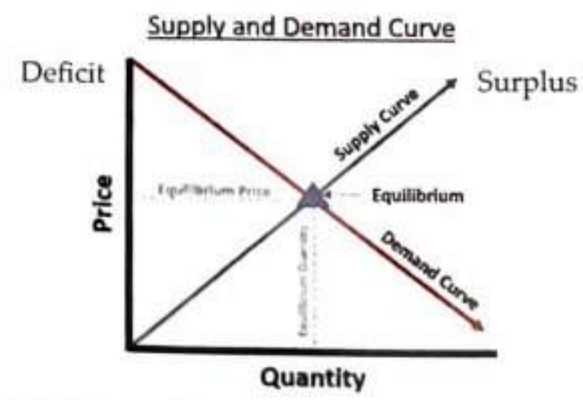
• A supply curve is a graphical representation of the *relationship between the price of a good or service* and the quantity that producers are willing and able to supply in a given period of time.



Positive sloping curve is seen when there is a direct relation between price and quantity supplied. Producers produce more when they get better price for their product.

Graph 4: Supply curve

When things exists in Equilibrium



• *Equilibrium shifts, if any of the factors shift.*

• *If demand decreases, the curve shifts to the left while if the demand increases, the curve shifts to the right.*

Graph 5: Supply-Demand curve at Equilibrium

Price Elasticity

• Price elasticity of demand measures how much the quantity demanded of a good or service changes in response to a change in its price.

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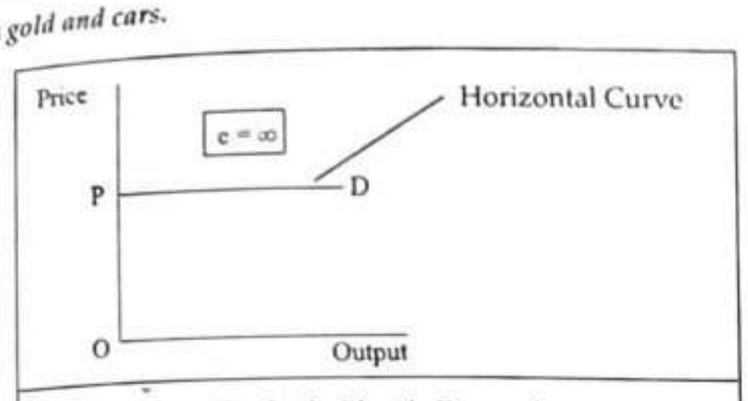
$$e_d = \frac{\%\ \text{change in demand}}{\%\ \text{change in price}}$$

Perfectly Elastic Demand

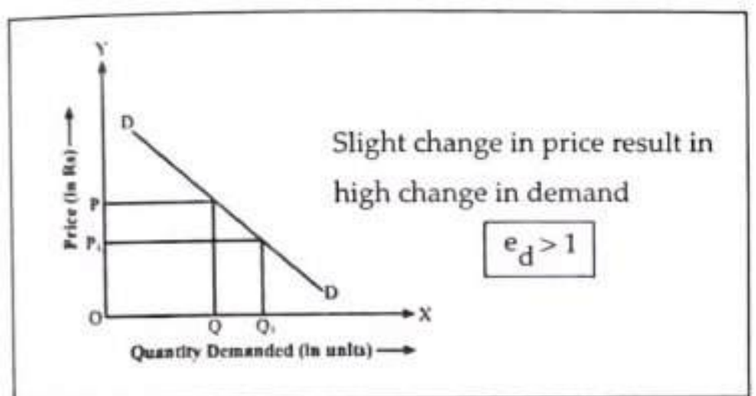
• In perfectly elastic demand, a *small rise in price results in a fall in demand to zero, while a small fall in price causes an increase in demand to infinity.* In such a case, the demand is perfectly elastic or $e = \infty$. *E.g. Luxury products such as gold and cars.*



Graph 6: Perfectly Elastic Demand curve

Relatively Elastic Demand

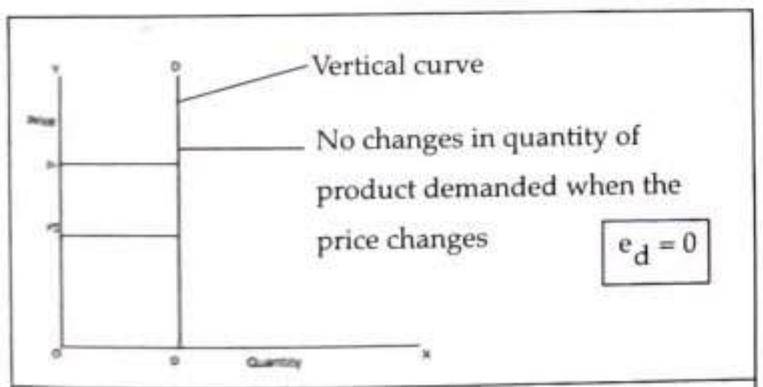
• Relatively elastic demand is when a *small change in price leads to a large change in the quantity demanded of a product or service*. This means that consumers are sensitive to price changes.



Graph 7: Relatively Elastic Demand curve

Perfectly Inelastic Demand

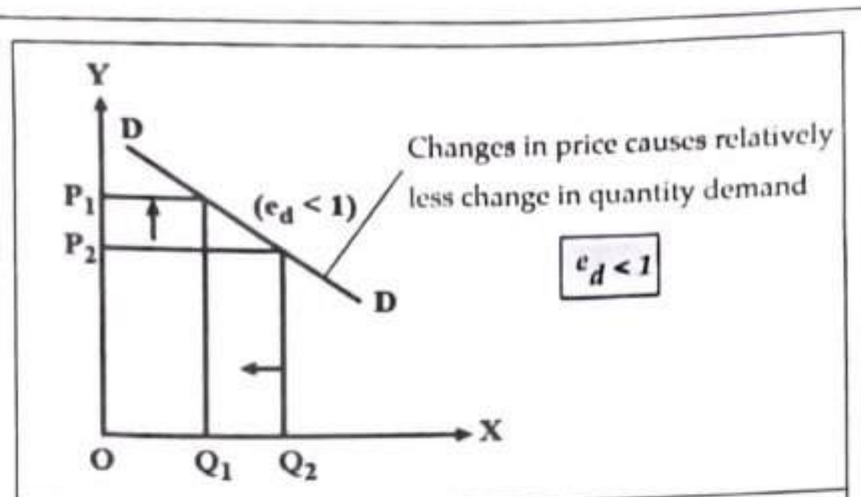
• Perfectly inelastic demand is *when the demand for a product remains the same regardless of price changes*. This means that the quantity demanded is fixed and does not change. *E.g. Necessary goods (water, wheat and rice).*



Graph 8: Perfectly Inelastic Demand curve

Relatively Inelastic Demand

• Relatively inelastic demand is *when the demand for a product changes in response to price, but the change is not proportional to the price change*. This means that the price of a product changes more than the demand for that product.



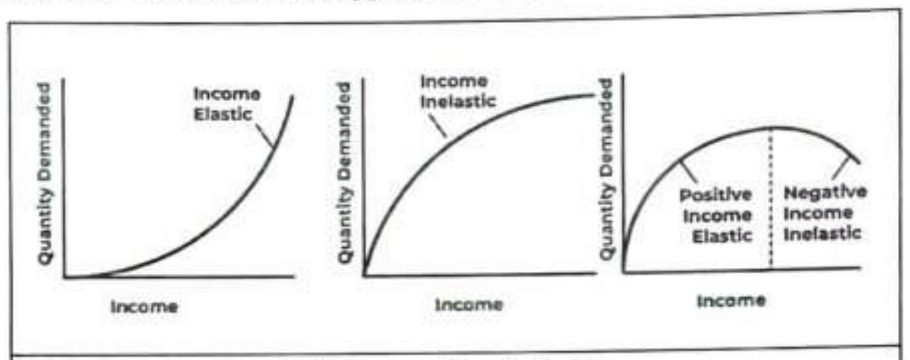
Graph 9: Relatively Inelastic Demand curve

Income Elasticity

• Income elasticity of demand measures the relationship between a *change in the quantity demanded for a particular good and a change in real income.*

• For most goods, when income goes up, demand goes up. The demand curve shifts to the right, showing a positive relationship.

• For inferior goods (like cheaper options), when income rises, demand goes down. When income drops, demand for these goods goes up. The demand curve moves in the opposite direction.

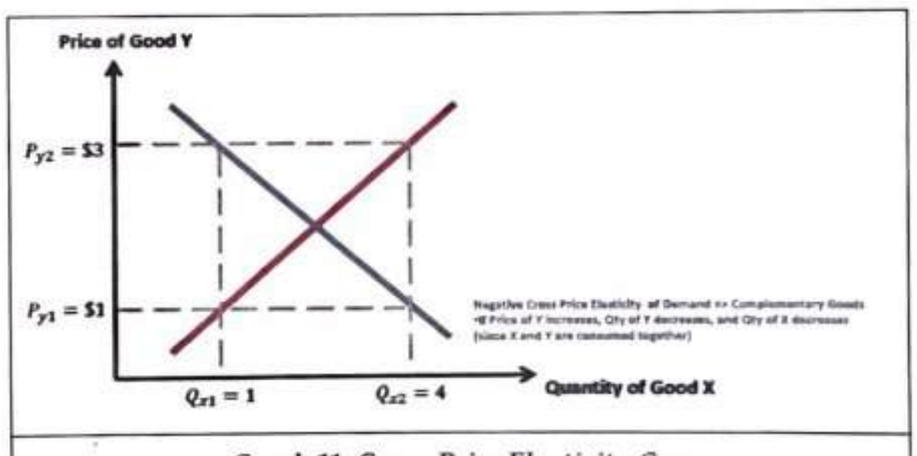


Graph 10: Income Elasticity Curve

Cross-Price Elasticity

• Cross-price elasticity is an economic measure of how a *change in the price of one good affects the demand for another good.*

E.g. If the price of Pepsi rises by 10% and Coke's demand increases by 5%



Graph 11: Cross-Price Elasticity Curve

TYPES OF MARKET

Monopoly

• One seller controls the entire market.

• No close substitutes for the product.

• High barriers to entry.

E.g. Indian railways

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Oligopoly

- A few large firms dominate the market.
- Products may be similar or differentiated.
- Many buyers for one product.
- No easy entry.

E.g. Telecom sector, laptop market

Monopolistic Competition

- Many sellers and many buyers for a product.
- Products are similar but not identical (differentiated).
- Some control over price.
- Easy entry and exit.

E.g. Toothpaste

Perfect Competition

- Many buyers and sellers.
- Products are identical (homogeneous).
- No barriers to entry.
- Price is determined by supply and demand.

E.g. Agriculture products

MACROECONOMIC CONCEPTS

Marginal Propensity to Consume

- Marginal Propensity to Consume (MPC) refers to the *portion of additional income that a person spends on consumption rather than saving*. It measures how much consumption increases when income rises by one unit.
- MPC is *dependent on the income level* as it may vary with the income levels *(MPC is lower at higher income levels)*.

$$MPC = \frac{\text{Change in Consumption } (\Delta C)}{\text{Change in Income } (\Delta Y)}$$

- *MPC value: 0-1*
- *E.g. If income rises by Rs. 10,000 and spending increases by Rs. 1,000, then:*

$$MPC = \frac{1000}{10000} = 0.1$$

- ***A MPC indicates that people are more likely to spend a larger portion of their additional income, leading to a greater increase in overall expenditure in the economy.***

Autonomous Expenditure

- It is the spending that occurs *regardless of the level of income* in an economy. It is *independent of income*.

$$C = A + cY$$

A: Income-independent consumption

cY: Income-dependent consumption

- c: Marginal propensity to consume
- Y: Level of income

C: Total consumption

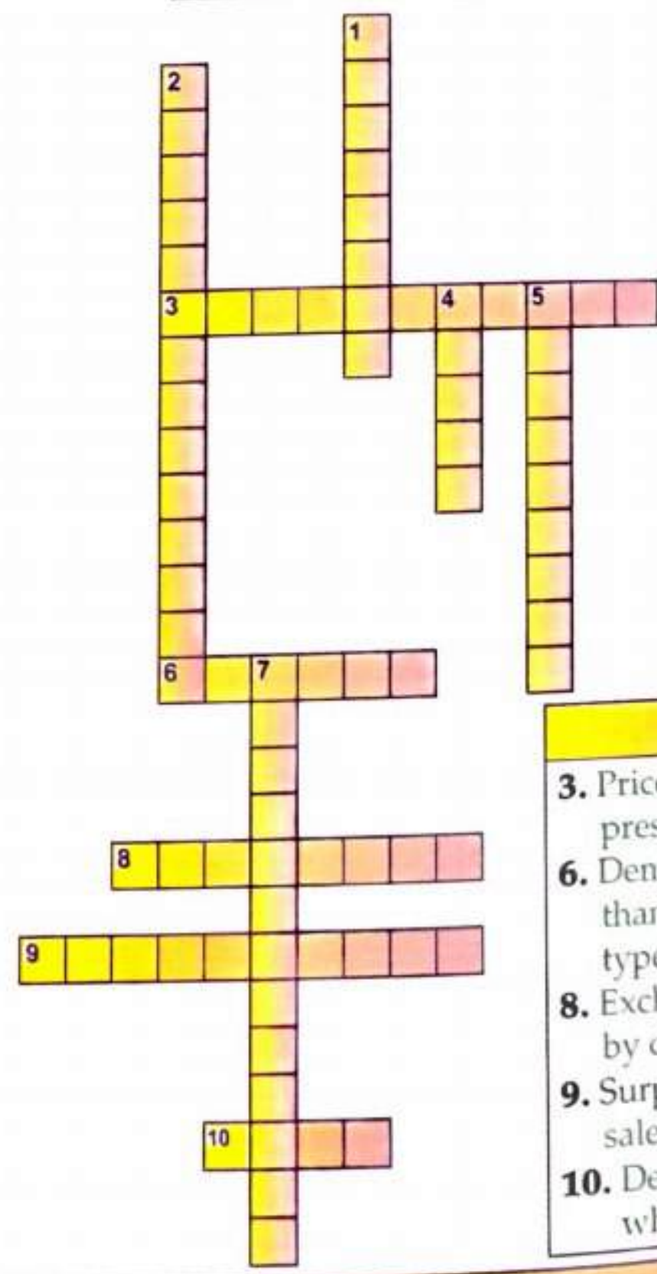
$$\text{Savings} = 1 - c$$

$$\text{Expenditure} = \frac{1}{1 - c}$$

- ***There is an inverse relationship between expenditure and savings.***

PARMAR'S CROSSWORD

DEMAND AND SUPPLY



Across

3. Price of bond equals present value.
6. Demand elasticity less than one means what type of demand.
8. Exchange rate decided by demand-supply.
9. Surplus from agricultural sale.
10. Demand for money when interest rate rises.

Down

1. Less elastic demand than monopolistic competition.
2. Studies national income and employment.
4. Medium of exchange before money.
5. Law of demand relates price and demand.
7. Demand for money due to future uncertainty.

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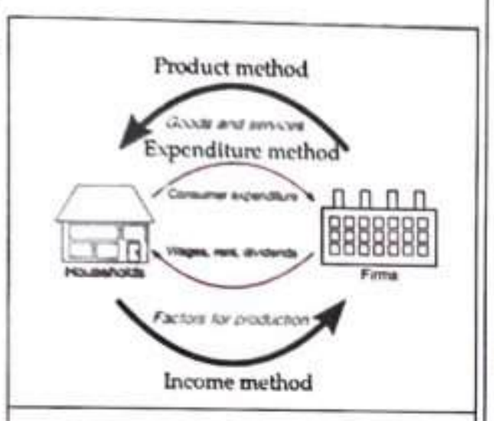
NATIONAL INCOME

- National income is the total value of all goods and services produced by a country's residents in a given year. It is a *"Macroeconomic"* concept.
- For the first time, the concept of *National Income* was given by *Dadabhai Naoroji*.
- *PC Mahalanobis* headed the *National Income Committee (1949)*.

Circular Flow of Income

- The Circular Flow of Income is a model/concept often used to describe the *continuous movement of goods, services, resources, and money in an economy*.
- Households own land, labor, and capital. They provide these to firms in return for income (wages, rent, profits).
- Firms use these resources to produce goods and services and sell them to households.
- Households spend money to buy goods and services from firms (expenditure).
- Firms pay money to households for the resources they use (income).

This cycle keeps the economy moving by maintaining a continuous flow.



Flow Chart 1: Circular flow of income

Injection (Money Entering the Economy)

- Injections are additional *funds that enter the economy*, increasing the total spending and income. They help expand economic activity.

Types

- **Investment:** When businesses spend money on capital goods like machinery or buildings to expand production.
- **Government Spending:** Public sector expenditure on goods and services like infrastructure, education, or defense.
- **Exports:** Sales of domestic goods and services to foreign buyers, bringing money into the domestic economy.

More injections → Economic growth increases

Leakage (Money Leaving the Economy)

- Leakages are *funds that exit the circular flow*, reducing total spending and slowing economic growth.

Types

- **Savings:** When households save instead of spending their income.
- **Taxes:** When people pay taxes to the government.
- **Imports:** When people spend money on foreign-produced goods and services.

More leakages → Slower economic growth

**In two sector economy, there is no leakage and no infection.*

Factors of Production	*Factors of Payment*
Land	Rent
Labour	Wages
Capital	Interest
Entrepreneurs	Profit

Three Methods to Calculate National Income

1. Value Added Method/Production Method/Output Method

- It is a way to calculate the *value of a product or service at each stage of production*. It is also known as production method.

Value added method = Output - Input

Example

	Cotton	*Yarn*	*Cloth*	*Shirt*
	Rs 100	Rs 200	Rs 400	Rs 800
Value added in every stage	Rs 100	Rs 100	Rs 200	Rs 400

- **Gross Value Added (GVA):** The value that producers add to goods and services they buy and sell.

$$GVA = GVA_1 + GVA_2 + GVA_3 + \ldots\ldots GVA_{12}$$

Central Statistics Office (CSO) adopted the GVA in 2015

2. Income Method

- This method includes *all the income generated by the factors of production* which are inputs in the process of producing final goods or services, in the entire economy.

Components of Income Method

1. **Compensation to Employees:** It refers to the *total wages or salaries paid to workers for their product services*.
2. **Operating Surplus:** It refers to the *profit earned by businesses* (profit, rent and interest) *after deducting employees compensation* (wages).
3. **Mixed Income:** It is the income earned by *self-employed individuals* and *unincorporated businesses*. It arises when *elements of factor income (labour and capital) cannot be distinctly separated*. *E.g. A doctor running their own clinic.*

3. Expenditure Method

It is way to calculate a country's GDP by *adding up all spending on goods and services in the economy*. It's the most common method for calculating GDP.

Expenditure Method = C + G + I + (X-M)

C = Consumption
G = Government Expenditure
I = Investment
X = Export
M = Import

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Final Goods vs Intermediate Goods

Final Goods	*Intermediate Goods*
These goods will now not undergo any economic process	These are semi-finished products that will undergo various economic process and transformation to be converted to final products
Goods used by the consumer for personal consumption or investment	Goods used as inputs for producing other goods and services and will get customised in the process
Direct consumption or capital investment	Further processing or resale
E.g. When you buy tea from a shop for personal consumption, it is a final good	*E.g. When a tea shop or hotel buys tea to prepare and sell tea to customers, it becomes an intermediate good*

Types of Final Goods

• **Consumer goods:** Finished products used by individuals for *personal consumption* rather than for *producing other goods.*

• **Capital goods:** They are *physical goods* used by *businesses to produce other goods and services,* but they *do not get consumed in the process.*
E.g. Machine to produce T-shirts.

Inventory

• It refers to the *items a business keeps in stock for sale or production purposes*. It can include raw materials, work-in-progress items, and finished goods, depending on the type of business.

• *If the sale of goods increases the inventory decumulates and if the sale of goods decreases the inventory accumulates. It can be either planned or unplanned.*

Stock vs Flow

Stock	*Flow*
It is a quantity measured at a point of time ***Ex: Wealth, loan, inventory, capital, Money Supply***	It is a quantity measured over a period of time ***Ex: Income, expenditure, change in inventory, depreciation***

AGGREGATES OF NATIONAL INCOME

Gross Domestic Product (GDP)

• GDP measures *total value of all final goods and services* produced within the territory of a country *within a financial year (Financial Year: 1st April-31 March).*

In GDP second hand goods are never counted.

• While calculating GDP, value of *only final goods is considered* and not intermediate goods to avoid *Double Counting.*

Work done by women at home is outside the purview of GDP.

Gross National Product (GNP)

• *Total value of all final goods and services produced by the nationals of the country.*

Net Domestic Product (NDP)

• It is the measure of a *country's economic output* after adjusting for the *depreciation (or consumption) of fixed capital.*

GDP = GDP - Factor Income to Abroad + FI from Abroad
OR
GNP = GDP + Net Factor Income from Abroad (NFIA)

• Monetary Value of an Asset *decreases over time due to various factors* and is called as *Depriciation*. It is seen in Capital Goods.

NDP = GDP - Depreciation

Net National Product (NNP)

• It is the *monetary value* of *finished goods and services* produced by a *country's citizens in a given period.*

NNP = GNP - Depriciation

GDP was developed by Russian-American Economist "Simon Kuznets" in 1934.

Market Price vs Factor Cost

Market Price (MP)	*Factor Cost (FC)*
The market price is the final value of the product being sold, which includes indirect taxes	Factor cost is the cost of factors of production, or total value of inputs, where indirect tax is not included

FC = MP - Indirect tax + Subsidy
FC = MP - (Indirect tax - Subsidy)
FC = MP - Net Indirect Tax

Basic Price = FC + Net production tax
**Net production tax = (Production tax - Subsidy)*

To Summarise

1. Gross से Net मे जाना हो तो Depreciation subtract करदो.
2. Domestic से National मे जाना हो तो NFIA add करदो.
3. MP से FC मे जाना हो तो Net Indirect Tax को substract करदो.

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Real GDP vs Nominal GDP

Real GDP	Nominal GDP
In this, a base year is taken as reference	It is more than Real GDP due to inflation
It is calculated on constant prices	It is calculated on current prices
It is inflation adjusted	Inflation is not adjusted here

$$\text{GDP Deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$$

Current Base Year is 2011-2012, but the govt. has setup a committee to revise the Base Year to 2022-2023.

- GDP Deflator is also called as *"Implicit Price Deflation"* and *"Price Index"*.
- *GDP of India is calculated by: Central Statistical Officer (CSO) under Ministry of Statistics and Programme Implementation (MoSPI).*
- *The Base Year is considered as: 2011-2012.*

Per Capita Income

- It is the average amount of money earned by each person in a specific area over a period of time.

$$\text{Per Capital Income} = \frac{\text{National Income}}{\text{Population}}$$

Purchasing Power Parity

- Purchasing power is the amount of goods and services that can be bought with a specific amount of money. It can also be referred to as *"a common basket of goods"*.
- As of 2024, *India's GDP* ranked *5th in the world* and *India's economy* ranks at *3rd position in the world* in terms of *Purchasing Power Parity* after *USA* and *China (their economy is inflated)*.

Personal Income

- Total income of an individual earned from all the sources before taxes.

Ranking of GDP (around the world)

1. *USA*
2. *China*
3. *Germany*
4. *Japan*
5. *India*

PI = National Income (NI) + Income received but not earned - Income earned but not received

OR

PI = NI + Govt. transfers + Net interest paid by Govt. - Corporate tax - payment for social security

PI = NI + Transfer Payment - Undistributed corporate profit

**Transfer payment example: Government subsidies/Scholarship/Person*

Personal Disposable Income

- It is the amount of money a *person has after paying taxes* and other mandatory withholding.

Disposable Income = Personal Income - Tax

Green GDP = GDP - Environmental Damage

Potential GDP - Real GDP = Recessionary Gap

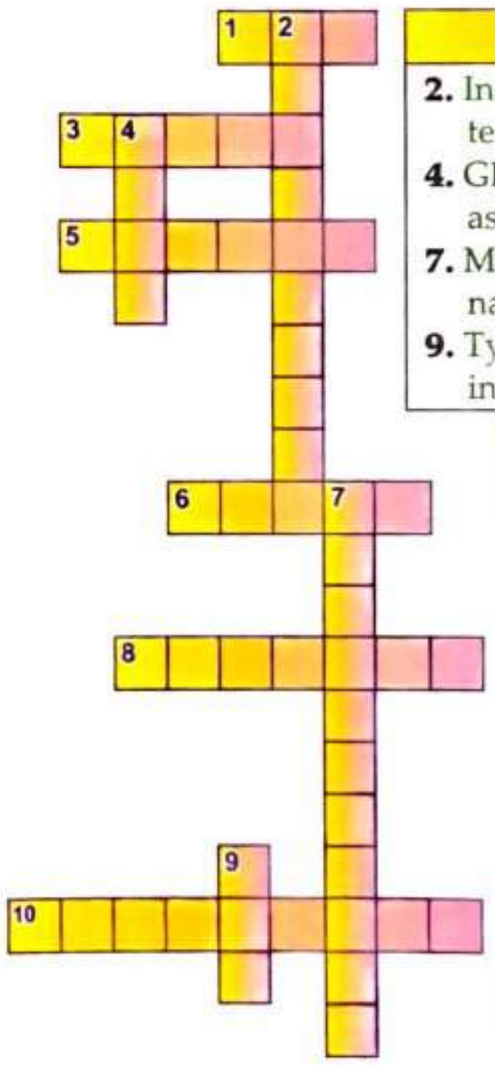
Potential GDP

- It is the total output an economy would produce if its resources are fully utilised.

V.K.R.V. Rao used a scientific approach to calculate National Income. He also gave two-sector economy classification.

PARMAR'S CROSSWORD

NATIONAL INCOME



Down

2. Income after tax deduction is termed as.
4. GDP at constant prices is known as.
7. Method that includes exports in national income.
9. Type of income calculated per individual.

Across

1. Indicator of country's economic growth.
3. Income before tax is called what.
5. Cost concept used in India's national income.
6. GDP including environmental costs.
8. Income from ownerless property.
10. Government's consolidated fund is called.

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INFLATION

- *Inflation is increase in the general level of prices of Goods and Services.*
- Purchasing power *decreases* in case of inflation.
- During inflation the *debtor/borrower benefits more than the lender.*

Ex: If you borrow ₹10,000, from a lender at a fixed interest during inflation, the money you repay is worth less than when you borrowed it. As when inflation occurs, the general price goods and services increases, meaning the value of money decreases. When you repay the ₹10,000 + Interest, the money you return has less purchasing power than when you borrowed it.

Fisher's Quantity Theory

- Irving Fisher gave the *"Money Illusion"* concept.
- Fisher's Quantity Theory explains the relationship between money supply, velocity of money, price level, and transaction.

$$MV = PT$$

M = Money Supply
V = Velocity of Money
P = Price Level
T = Transaction

- The equation suggests that an *increase in the money supply (M) will lead to an increase in the price level (P), assuming that the velocity of money (V) and the level of transactions (T) are constant.*
- The theory also implies that changes in the money supply have a *direct impact on inflation*, as an increase in the money supply leads to an *increase in the price level*, which in turn *reduces the purchasing power of money.*

Types of Inflation

1. *Creeping: 3-4%*
2. *Walking: 4-10%*
3. *Running: 10-20%*
4. *Galloping: 20-100%*
5. *Hyper: >100%*

Causes of Inflation

Demand Pull Inflation	*Cost Push Inflation*
It is caused by an increase in demand (demand side inflation)	It is caused by an increase in production costs (supply side inflation)
It can be caused by strong economic growth, increased government spending or increased exports	It can be caused by increased wages, raw material prices, or indirect taxes
It can be short-term	It can be long-term
"Too much money chasing too few goods", an expression that describes demand-pull inflation	Increase in cost of any factors of Production and Input Cost

Measurement of Inflation

- Wholesale Price Index (WPI) and Consumer Price Index (CPI) is used to measure inflation.

Wholesale Price Index (WPI)

- It measures the average change in prices of goods at the *wholesale level.*
- It also reflects the change in prices of goods before they reach consumers.
- *Published by: Office of Economic Adviser (OEA) under Ministry of Commerce and Industry*
- *Base Year of All India WPI: 2011-12*

Weightage Distribution in WPI:

- *Manufactured goods (64.2%)*
- *Primary articles (22.6%)*
- *Fuel and power (13.5%)*

$$WPI = 100 \times \frac{\text{Cost of a fixed basket of goods in the current year}}{\text{Cost of fixed basket of goods in base year}}$$

Consumer Price Index (CPI)

- It measures the average change in prices of goods and services at the *consumer/retail level.*
- It reflects the cost of living for consumers.
- *Released by: National Statistical Office (NSO) under Ministry of Statistics and Programme Implementation (MoSPI).*
- *Base Year of All India CPI: 2011-12.*

Weightage Distribution in CPI:

- *Food and Beverages (highest)*
- *Housing (10%)*
- *Fuel and power (6.8%)*

Four types of CPI are as follows

- *CPI for Industrial Workers (IW) → Industrial Worker Base year: 2016*
- *CPI for Agricultural Labourer (AL)*
- *CPI for Rural Labourer (RL)*
- *CPI (Rural/Urban/Combined) →*

Base Year: 2012, published by *National Statistical Office (NSO)* under *MoSPI*

CPI is used by RBI for its monetary policies.

- Base Year for CPI-AL and CPI-RL is: *1986-87*
- CPI-AL and CPI-RL published by *Ministry of Labour and Employment*

$$CPI = 100 \times \frac{\text{Cost of a fixed basket of goods and services in the current year}}{\text{Cost of a fixed basket of goods and services in base year}}$$

Core Inflation

- Core inflation is a measure of inflation that *excludes food and energy prices*. It's calculated using the consumer price index (CPI) *(excluding: Crude oil and food items).*

$$\text{Core Inflation} = \text{Headline Inflation} - \text{Volatile Inflation}$$

Index of Industrial Production (IIP)

- It is a statistical indicator that measures the *growth of industrial production in a country over time.*
- *Base Year: 2011-2012.*

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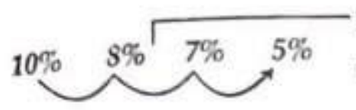
- Published by: Central Statistical Organisation (CSO) under MoSPI.
- Eight core industries have 40% contributions in IIP: Coal, Crude Oil, Natural Gas, Refinery Products, Fertilizers, Steel, Cement, and Electricity.

DISINFLATION, DEFLATION AND STAGFLATION

Disinflation

- The decrease in the rate of inflation, while prices may still be rising.
- It is measured by the change in the inflation rate from one year to the next.
- Cause: A slowdown in the economy's money supply through a tighter monetary policy.



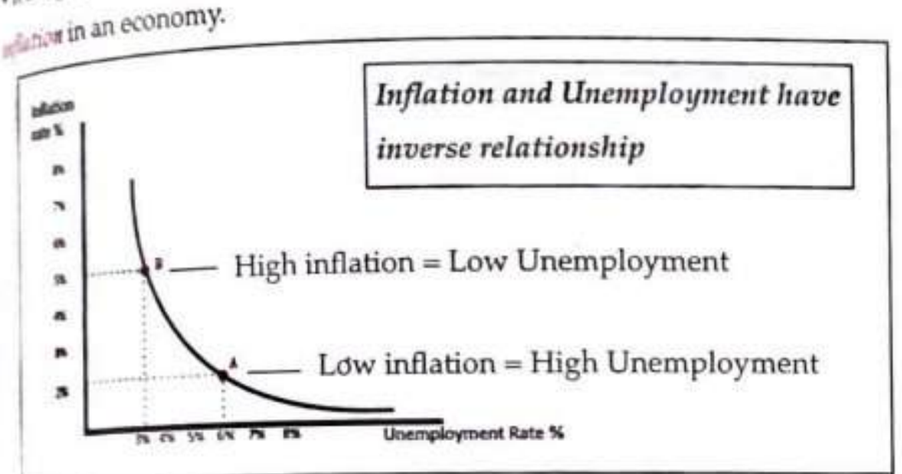
Decrease in inflation rate over the years

Deflation

- It is a general decrease in price of goods and services. In deflation purchasing power increases.
- Cause: Reduced money supply, reduced investment, or lower production.

Phillips Curve

- It is a graph that shows the relationship between unemployment and inflation in an economy.



Graph 1: Philips Curve

Stagflation

- It is a period of high inflation and low economic growth. It's a combination of the words "stagnation" and "inflation" (Stagflation = Stagnantion + Inflation).
- When stagflation increases, high unemployment is a direct consequence.
- Cause: When the production of goods and services in an economy slows down or declines.

Great Depression

- The Great Depression was a severe global economic downturn from 1929 to 1939 in the history of USA. The period was characterized by high rates of unemployment and poverty; drastic reductions in liquidity, industrial production, and trade; and widespread bank and business failures around the world.

Great Recession

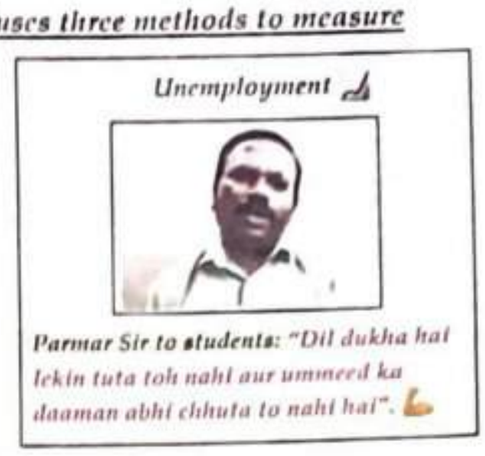
- The Great Recession was a period of market decline in economies around the world that occurred from late 2007 to mid-2009.

UNEMPLOYMENT

- Unemployment refers to a situation when a person actively searches for the job but unable to find work.

National Sample Survey Office (NSSO) uses three methods to measure Unemployment

1. Usual status approach
2. Current weekly status approach
3. Daily status approach



Types of Unemployment

Structured Unemployment

- A type of unemployment that occurs when there is a mismatch between the skills of the workforce and the skills required for available jobs.

E.g. An advancement in technology like advanced machinery can replace farmer labour.

Educated Unemployment

- Educated unemployment is when people with academic degrees are unable to find employment. It can also be called graduate unemployment.
- It is seen in urban part of India.

E.g. An engineering graduate, who is unable to find a job in their field because they lack practical skills.

Frictional Unemployment

- A short-term type of unemployment that occurs when people search for better job that's why it is also called Search/Voluntary unemployment.

Ex: An employee leaving a current job to move to a better one as frequently seen in urban cities.

Disguised Unemployment

- A type of unemployment where more people are working than actually needed, meaning their removal would not affect productivity.

E.g. A family of five works on a farm in rural area that could be run by three people.

Cyclical Unemployment

- A type of unemployment that occurs when the labor force is reduced due to business cycles or economic fluctuations. When economy revives, there is an opportunity to employment (mostly seen in urban areas).

E.g. Great Recession.

Sub-type

Seasonal Unemployment

- A type of unemployment that occurs during specific times of the year. The employment is based on seasonal basis and is mostly seen in rural part of India.

Ex: Lights or firework sellers during Diwali.

Classical Unemployment

- It is also known as real wage unemployment, it occurs when the real wage for a job is too high, which leads to more job seekers than job openings.

E.g. When workers negotiate for a minimum salary that's more than what a company can afford.

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Natural Unemployment

- Natural unemployment refers to the *lowest unemployment level* a healthy economy can *sustain without causing inflation.*

Marginal Worker vs Main Worker

Marginal Worker	*Main Worker*
Marginal worker is someone who is employed for less than 6 months or 183 days	Main worker is someone who is employed for more than 6 months or 183 days
E.g. Landless agricultural laborers and people who work in low-wage industries	*E.g. Construction workers, seasonal employees, independent contractors*

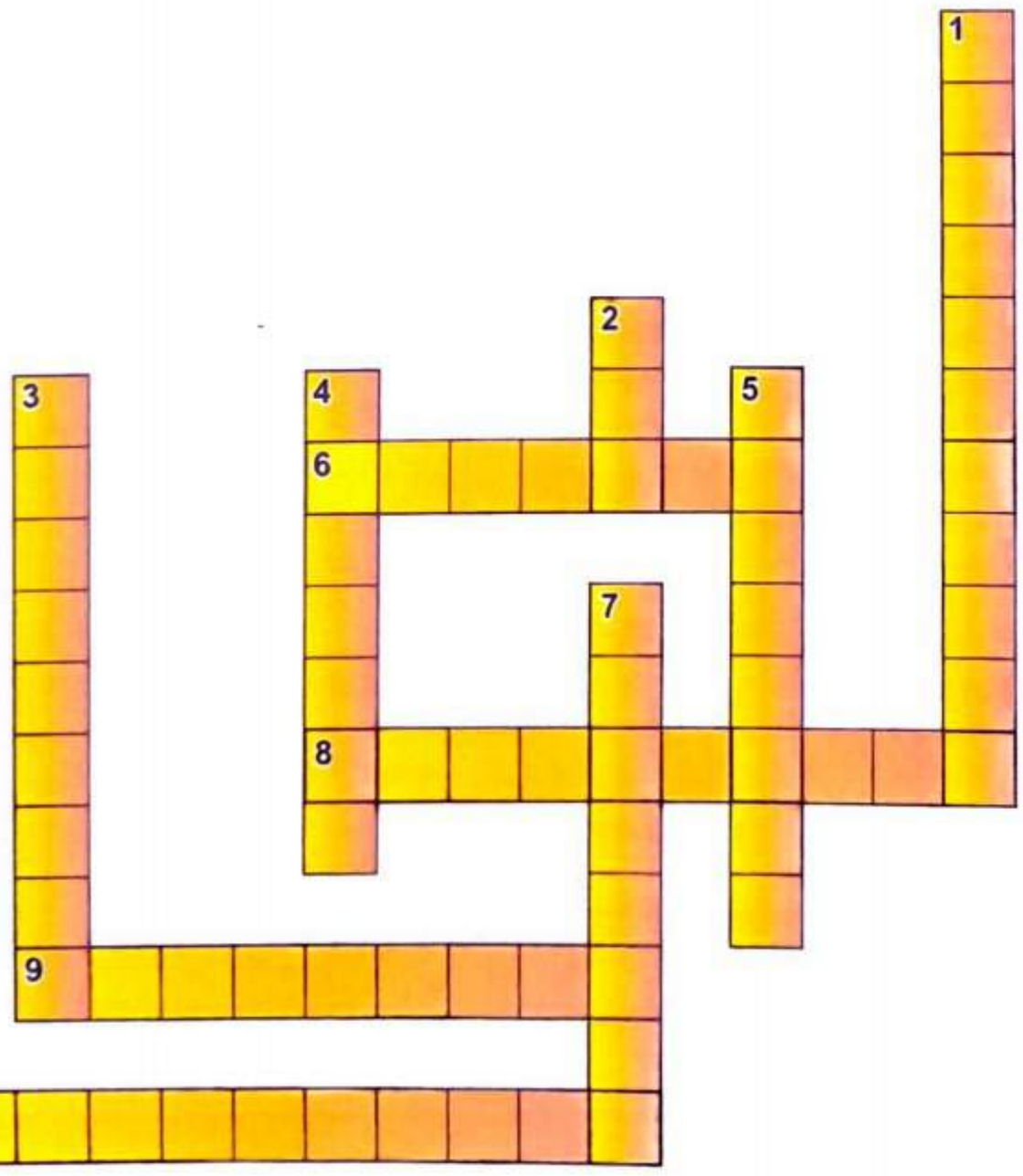
Organised Sector vs Unorganised Sector

Organised Sector	*Unorganised Sector*
This sector is registered under government. In such way, working hours, working conditions, social security, etc. is all regulated by the government.	This sector is outside the control of government.
The terms of employment is regular	The terms of employment is not regular
There is security of employment *E.g. Fixed working hours, leaves, etc.*	There is no security of employment

More than 90% of Indian workforce is indulged in an unorganised sector.

PARMAR'S CROSSWORD

INFLATION AND UNEMPLOYMENT



Across

6. Monetary stance to combat inflation.
8. Price control and rationing are measures to check what.
9. Continuous fall in price level is known as.
10. Unemployment caused by skill-job mismatch.

Down

1. High inflation with low growth and unemployment.
2. Inflation is measured in India by which index.
3. Extra people working without productivity.
4. Unemployment lasting for a long period.
5. Curve that links wage and unemployment.
7. Type of unemployment in tourism and agriculture

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BUDGET

Budget

- It is an approximation of revenue and expenses over a specified period of time.
- *Article 112* of the Constitution of India requires the government to present an *Annual Financial Statement (a statement of Receipt and Expenditure)* to the Parliament.
- The *President of India* is responsible for presenting the Annual Financial Statement to both houses of Parliament.
- ***Prepared by:*** *Department of Economic Affairs (Ministry of Finance)*
- ***Presented by:*** *Finance Minister*
- The *first Budget* was presented by *R K Shanmukham Chetty* and the *second budget* was presented by *John Mathai.*

Most Number of Budget

1. *Morarji Desai (10 times) → 6 times in a row*
2. *P. Chidambaram (9 times)*
3. *Pranab Mukherjee (8 times)*
4. *Nirmala Sitharaman (8 times) → Achievement: Presented consecutive Budget for the maximum number of times.*

> *Gender Sensitive Budget: 2005-06*
> *Indira Gandhi is the 1st female Finance Minister of India (temporary)*

Railway and General Budget

- In *1921*, the *Acworth Committee* recommended *separating the Railway Budget from the General Budget*. In *2016*, based on the recommendations of the *Bibek Debroy Committee*, the Indian government decided to *merge* the *Railway Budget with the General Budget*. This merger was implemented from the *2017-18 financial year*.

Functions of Budget

1. **Allocation Functions**

- It refers to the process of *dividing resources between public goods and private goods*, essentially deciding which social services and infrastructure projects to fund.

2. **Redistribution Functions**

- It aims to *reduce income inequality* by using *progressive taxation* (higher tax rates for higher earners) and providing social welfare programs like unemployment benefits.

3. **Stabilisation Functions**

- It is aimed at maintaining economic stability by adjusting government spending and taxation to counter recession (by increasing spending) or inflation (by decreasing spending).

> **Asset**
> - An asset is a *resource with economic value* that an individual, a company, or a country owns or controls with the expectation that it will provide a future benefit. *E.g. Gold, Property.*

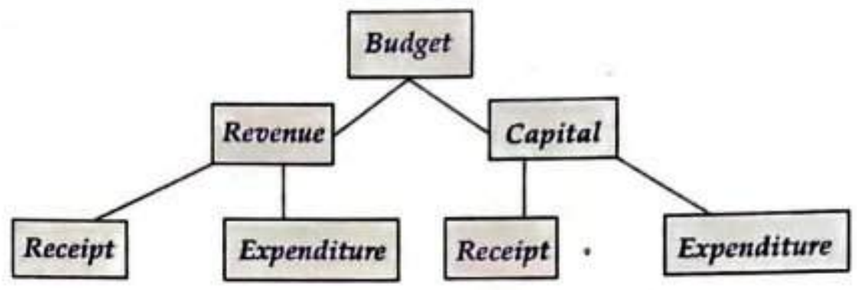
> **Liability**
> - A liability represents the obligation or responsibility to fulfill a debt or duty to another party. *E.g. Payment of loan.*

REVENUE AND CAPITAL

- Budget is divided into two heads: *Revenue* and *Capital.*

Revenue

- Revenue refers to the funds that a government collects to *finance its activities and public services*. This primarily comes from taxes, as well as other sources like fees, fines, and duties.



- ***It is of two types: Revenue Receipts and Revenue Expenditure***

Revenue Receipts

- These are earnings that *do not create liabilities or reduce assets.*
- Revenue Receipts *do not lead to claim on government* and are of *non-redeemable in nature.*

Sub-types

1. ***Tax Revenue:*** The income that is collected by governments through *taxation. E.g. Wealth tax.*
2. ***Non-Tax Revenue:*** It is the recurring income that is earned from sources other than *taxes by the government. E.g. Interest on loans, PSU earnings, railway tickets.*

Revenue Expenditure

- It is the amount of money spent that *does not lead to increase in assets nor decrease in liabilities.*

Sub-Types

1. ***Plan Revenue Expenditure:*** It is a government expenditure that is part of the *plan budget and does not create assets or liabilities.*
   E.g. Government grants/financial assistance.
2. ***Non-Plan Revenue Expenditure:*** It is the money a *government spends on its day-to-day operations, excluding capital expenditures. E.g. Salary/ pension, interest payment (largest component of non-plan expenditure), maintenance of infrastructure.*

Capital

- It is the physical or financial resources that is used to produce value in an economy.
- ***It is of two types: Capital Receipts and Capital Expenditures.***

Sub-Types

1. ***Capital Receipt:*** They are those receipts which *either create liabilities or reduce the asset value* of the government. It creates new liabilities and reduces an existing asset. *E.g. Loan, disinvestment.*

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MONETARY POLICY

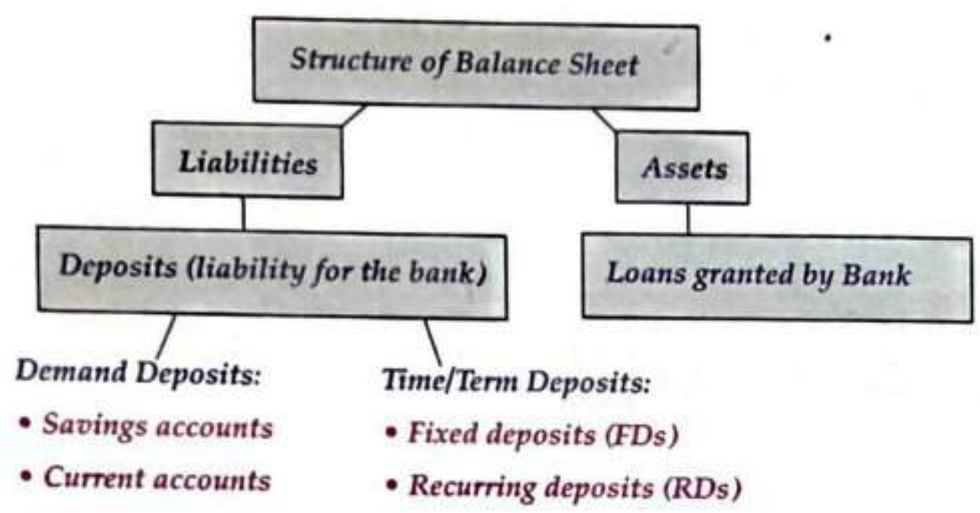
• Monetary policy refers to the regulation of the money supply and interest rates by the RBI to maintain price stability, control inflation, and ensure economic growth.

• RBI uses various monetary policy tools to achieve these objectives, which are categorized into *quantitative* and *qualitative instruments*.

• For the better understanding of Monetary Policy, we first need to learn about Assets and Liabilities of a Bank.

Balance Sheet

• A bank's balance sheet is a *financial statement that shows its Assets* (what the bank owns) and *Liabilities* (what the bank owes to others, including depositors).



Net Demand and Time Liability (NDTL)

• NDTL refers to the *total deposits held by a bank*, which determines the money available for lending.

• It is an important factor in determining reserve requirements set by RBI

NDTL consist of

1. **Demand Liabilities:** Deposits that can be withdrawn at any time ***(E.g. Savings and current accounts).***
2. **Time Liabilities:** Deposits with a fixed tenure ***(E.g. Fixed deposits and recurring deposits).***

Reserves Maintained by Banks

• RBI keeps a part of *NDTL as a reserve*. This is done through two mechanisms: *CRR (Cash Reserve Ratio) and SLR (Statutory Liquidity Ratio).* This is done to ensure that Banks have sufficient vault cash to cater any emergency situation.

Cash Reserve Ratio	*Statutory Liquid Ratio*
Banks must keep this reserve in cash with the RBI	Banks must keep this reserve in liquid assets like cash, gold, or approved securities
Banks don't earn interest on money kept as CRR	Banks earn interest on money kept as SLR

Monetary Policy Committee (MPC)

• The Monetary Policy Committee (MPC) was established based on the *Urjit Patel Committee's recommendations.*

A total of 6 members suggested

• 3 members from RBI, that includes → RBI Governor, Deputy Governor, and an Executive. The RBI Governor is the chairman.

• 3 members from the Government of India.

The MPC meets bimonthly to decide monetary policy actions, such as changes in repo rate and CRR.

MONETARY POLICY TOOLS

Monetary Policy Tools used by RBI

Quantitative Tools

• These tools influence the overall money supply and credit in the economy.

1. **Cash Reserve Ratio (CRR)**

2. **Statutory Liquidity Ratio (SLR)**

3. **Bank Rate (BR)**

• It is an interest rate at which *RBI provides loan to commercial banks for a long-term without keeping any securities/collateral.*

• Higher bank rates make borrowing costlier, reducing money supply and lower bank rates make loans cheaper, increasing liquidity.

4. **Open Market Operations (OMO)**

• It is also called as *sterilization.*

OMO are of two types:

1. ***Outright Purchase:*** *RBI directly sells government securities* without any kind of repurchase agreement.
2. ***Repurchase Obligation (Repo):*** When *banks borrow money from RBI,* using government securities as collateral and with a promise of repurchases them later, it is called as *Repo*. Similarly, when RBI invites bank to deposit their extra funds in RBI in exchange of government securities, it is called as *Reverse Repo*.

****Repo and Reverse Repo are collectively known as Liquidity Adjustment Facility (LAF).***

> **Collateral** (गिरवी)
> • ***Collateral is something valuable that a borrower gives as a guarantee for a loan. If the borrower fails to repay, the lender can take the collateral to recover the money.***

5. **Marginal Standing Facility (MSF)**

• MSF is a way for banks to borrow money from the RBI in emergencies when they don't have enough funds. It allows banks to get *"overnight loans" but at a higher interest rate than the repo rate.*

• If the bank fails to maintain the required *CRR* and *SLR*, it must pay a penalty of *3% above the Bank Rate for each day of default.*

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• Under MSF, banks can use *G-Secs within their SLR quota to borrow funds from RBI. Only scheduled commercial banks can access MSF.*

> ***Minimum rate below which banks are not allowed to lend money is called as Base Rate.***

• If banks are unable to maintain the required CRR and SLR, they may borrow funds from the other banks in the *Interbank Lending Market*. This borrowing occurs at *Call Money Rate* (it is decided on basis of *RRR* and *MSF*), which is the interest rate charged for *short-term, overnight loans* between banks and other financial institutions.

• *Limit: 2% of NDTL.*

Money Multiplier (MM)

• The Money Multiplier (MM) is the highest possible extent to which the money supply can increase due to changes in bank deposits.

$$\text{Money Multiplier} = \frac{1}{\text{CRR}}$$

> ***NBFC and NBFC-MFI need not maintain CRR and SLR.***

• When *CRR increases*, banks keep more money as reserves. They have less money to lend. Fewer loans mean less money creation. This *reduces the money multiplier and vice versa.*

Monetary Policy and Inflation/Deflation Control

Situation	*RBI Action*	*Effects*	*Policy*
During inflation	Increase in CRR, SLR, BR, RRR, RR	Decrease in money supply	Contractionary/ Tight/Dear/Hawkish Monetary Policy
During deflation	Decrease in CRR, SLR, BR, RRR, RR	Increase in money supply	Expansionary/Easy/ Dovish Monetary Policy

Qualitative Monetary Policy Tools

• These are selective tools used by RBI to control the use and direction of credit in specific sectors of the economy.

• *The central bank limits the amount of loans and advances that commercial banks can give.*

1. **Changing Margin Requirements**
   • The RBI *increases the margin (the amount borrowers must pay upfront) for non-essential sectors to limit excessive borrowing* and reducing it for important sectors like *agriculture* to encourage lending.

2. **Consumer Credit Regulation**
   • RBI *sets rules on loan installments, down payments, and repayment periods in advance*. This helps manage inflation by controlling how much people can borrow.

3. **Moral Suasion**
   • It is a technique used by RBI to influence economic activity through *persuasion* and *implicit threats*. RBI advises or persuades banks to follow its monetary policy.

4. **Credit rationing**
   • Credit rationing is when RBI *limits the total amount of loans* and *credit banks can issue to certain sectors*. It fixes the credit supply for each bank, preventing excessive lending. It also *sets credit limits for different sectors to ensure balanced lending*.

FISCAL POLICY

• Fiscal policy is the government's strategy to manage the economy by adjusting taxes, government spending, and borrowing. *It is used to control inflation or deflation, unemployment, and economic growth.*

When the government wants to control inflation, it can take the following steps

• **Increased Taxes:** *Higher taxes reduce people's disposable income*, leading to lower spending and demand.

• **Lower Subsidies:** *Reducing subsidies makes goods and services more expensive*, discouraging excessive consumption.

• **Lower MSP (Minimum Support Price):** A lower MSP *discourages excessive crop production* and *controls the rise in food prices* by keeping supply in check.

> ***• MSP stands for Minimum Support Price, a price set by the government for certain agricultural products.***
> ***• Monetary Policy is used by RBI and Fiscal Policy is used by Government.***

For an interactive recap of this topic, see the crossword on Page Number 209.

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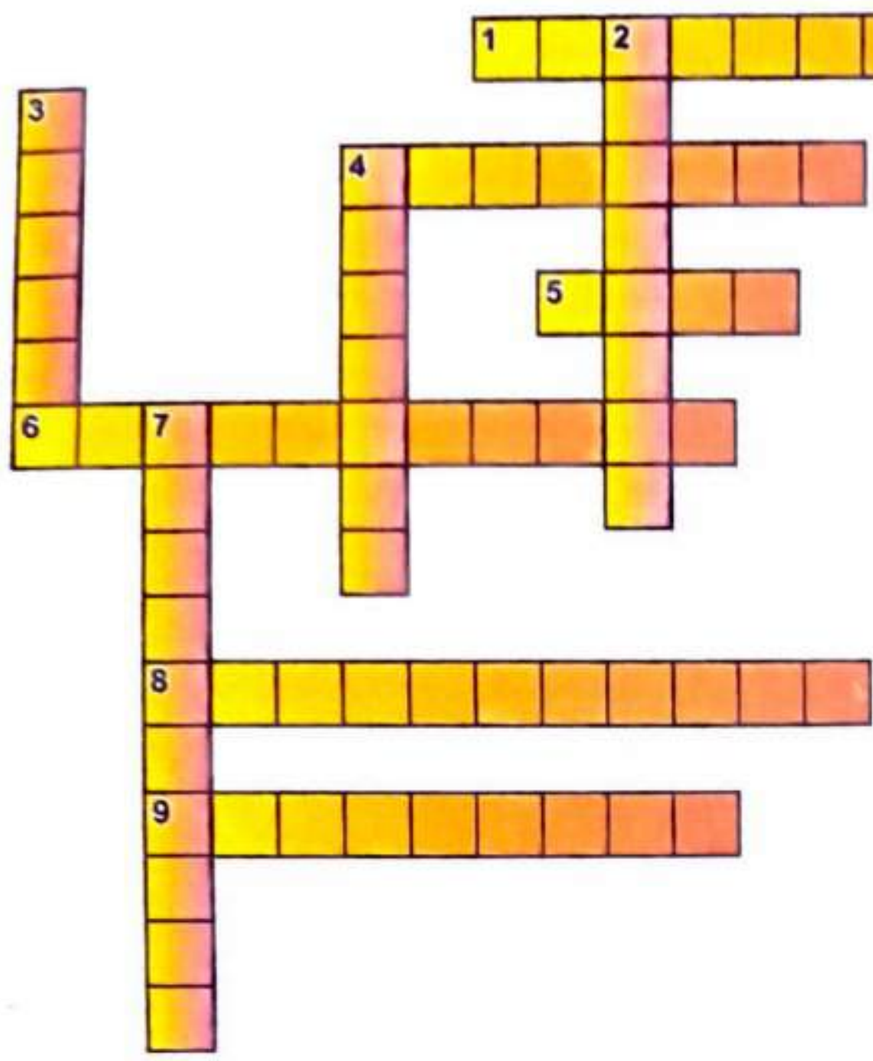
BASICS OF ECONOMY



Across

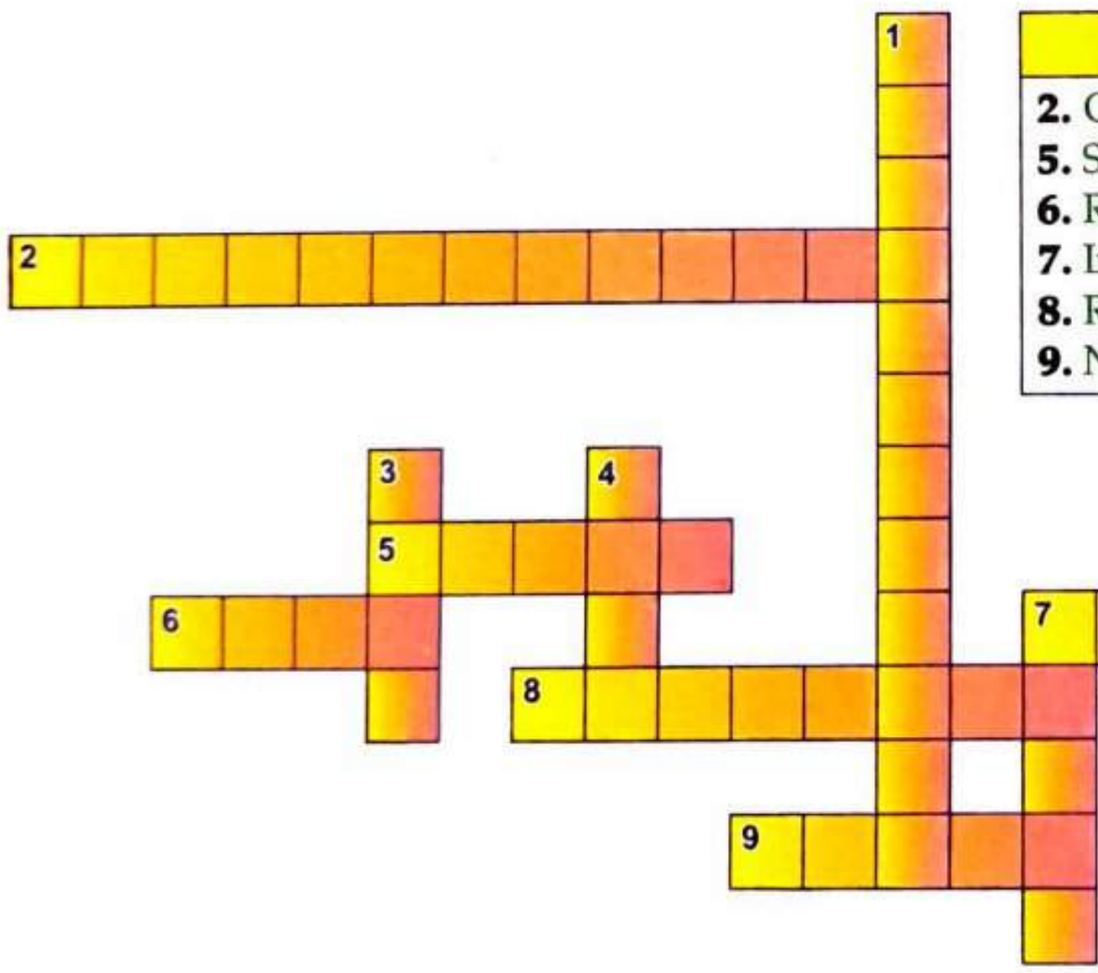
1. Branch studying income and employment theory.
4. Category of people moving in and out of poverty.
5. Factors causing people to migrate.
6. Transfers sent by migrants to home country.
8. Not a part of the infrastructure sector.
9. Related to public goods.

Down

2. Final goods are not last to be what.
3. Goods used as medium of exchange in this system.
4. Machines and buildings are what type of goods.
7. Not an example of manufacturing activity.

PARMAR'S CROSSWORD

MONETARY POLICY



Across

2. Operation to maintain money supply during shocks.
5. Suasion is a persuasive method by RBI.
6. Raised to control inflation by RBI.
7. Institution that fixes statutory liquidity ratio.
8. Relationship between reserve ratio and money supply.
9. Nominal interest excludes adjustment for inflation.

Down

1. CRR is which type of monetary tool.
3. RBI operation involving buying or selling of bonds.
4. Minimum lending rate allowed by RBI.
7. Proposed NM2 monetary aggregate in 1998.

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Banking

• Banking is a financial activity that involves managing money and providing financial services to individuals, businesses, and governments. Banks accept deposits, lend money, and facilitate transactions.

RESERVE BANK OF INDIA (RBI)

• Reserve Bank of India (RBI) was established as an independent body based on the recommendations of the *Hilton Young Commission in 1926.*

• The RBI was officially established under the *Reserve Bank of India Act* in *1934* and started operations on *1st April 1935* in *Calcutta.*

• RBI was nationalised on *1st January 1949.*

• The headquarter was moved to *Mumbai* in *1937.*

• ***First Governor of RBI:*** *Sir Osborne Smith*

• ***First Indian Governor of RBI:*** *Sir C D Deshmukh*

Logo of RBI features a tiger and a palm tree.

Functions of RBI

1. *Regulator of Banks:* RBI under the *Banking Regulation Act of 1949,* holds extensive authority to regulate the country's banking system and hence called as *"Bank of Banks"*. ***E.g. It grants licenses to banking companies, ensuring they meet specific criteria before commencing operations, regulation of Cash Reserve Ratio (CRR) and Statutory Liquidity Ratio (SLR), the RBI also influences interest rates through monetary policy instruments like the repo rate (the rate at which banks borrow from the RBI).***
2. *Monetary Authority:* The RBI formulates and implements monetary policy to *control inflation, manage money supply, and ensure adequate credit flow to various sectors of the economy.*
3. *Currency Printing:* The RBI prints and manages currency in India, including banknotes *(except for ₹1 note and coins → issued under Ministry of Finance, GOI).*
4. The RBI is often referred to as the *"lender of last resort"* (it acts as the final source of funding for commercial banks when they are unable to secure loans from other sources during financial crises).

In India, currency is printed in *Nasik, Dewas, Mysore, Salboni* and the coins are minted in *Mumbai, Hyderabad, Calcutta, Noida.*

Types of Money

1. FIAT Money

• It is a type of currency that a government declares as *legal tender, meaning it is authorised by government to be used as a medium of exchange.* It is issued by a central bank and is *not backed* by a physical commodity like *gold or silver.*

2. Fiduciary Money

Fiduciary money is money that is accepted as a medium of exchange due to the *trust that exists between the payer and the payee.* ***Ex: Cheques, tokens/ bitcoins.***

3. Plastic Money

• Plastic money, also known as electronic money, is a payment method that uses electronic fund transfers instead of cash.

• It includes debit cards, credit cards, and prepaid cards.

4. Hot Money

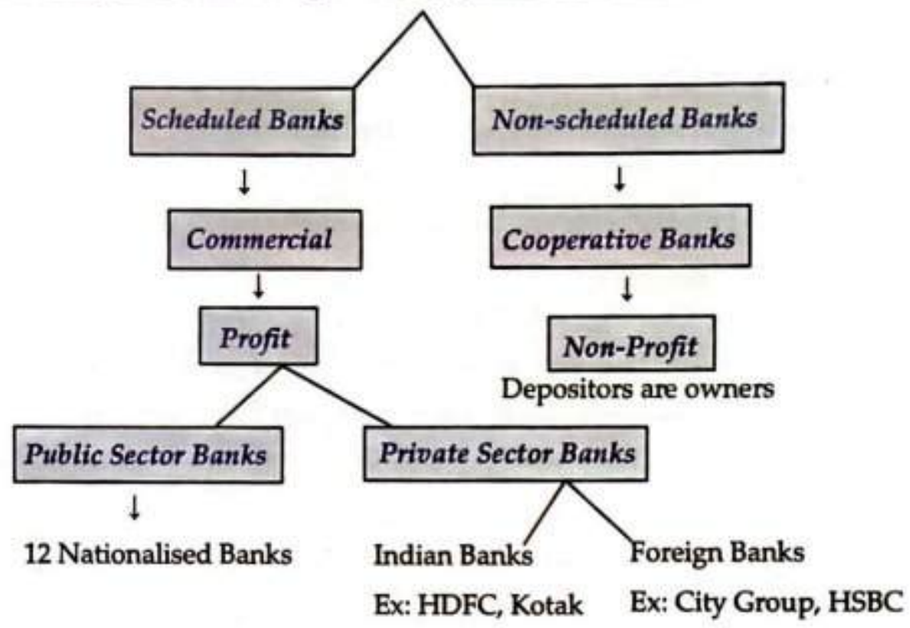
• Hot money refers to funds that investors *quickly move between countries or financial markets* to take advantage of short-term opportunities such as *stocks, deposits, bonds, etc.*

Clean Money Policy

• RBI introduced *Clean Note Policy in 1999,* asking the banks to not pass on the *soiled, torn, and scribbled notes to the customer and deposit the same to the RBI.*

• This was introduced under *Section 35A* of the *Banking regulation Act, 1949.*

According to RBI Act 1934, banking system can be classified as



• The nationalisation of *14 major commercial banks* in India took place on *1969* and later on *6 other banks* were nationalised on *1980.*

HISTORY OF BANKING SYSTEM IN INDIA

• *Bank of Hindustan* was the first bank to be established in *1770* in *Calcutta.*

• During the British Rule in India, three Presidential Banks: *Bank of Calcutta (1806), Bank of Bombay (1840),* and *Bank of Madras (1843)* were eventually *merged into a single bank → Imperial Bank of India in 1921.*

• The Imperial Bank of India was later *nationalised* and renamed as *State Bank of India* in *1955.*

• First Indian owned bank is *Allahabad Bank,* established in *1865.*

• *Regional Rural Banks (RRB)* was established as a *statutory body* under *RRB Act 1976* to enhance financial activities in rural areas. ***E.g. Grameen Banks.***

• *Pratham Grameen Bank* was set up on *2nd October 1975* in *Moradabad, Uttar Pradesh* (First one).

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In Regional Rural Banks (RRB)

- The *Central Government* holds *50%* ownership in RRBs, making it the largest stakeholder.
- *Commercial banks* that sponsor RRBs hold *35%* ownership and provide financial and operational support.
- The respective *State Government* where the RRB operates holds *15%* ownership.
- They are supervised by *NABARD* and regulated by *RBI*.

> ***RRBs were set up on the recommendations of the Narsimham Committee on Rural Credit***

OTHER FINANCIAL INSTITUTIONS

National Bank of Agriculture and Rural Development (NABARD)

- NABARD was established on *12 July 1982*, on the recommendation of *B. Sivaramman Committee (1979)* through → *NABARD Act 1981*.
- ***Headquarter:*** *Mumbai*

Functions of NABARD

- It offers loans and financial assistance to promote *agriculture growth and rural development*.
- It oversees and regulates the working of *cooperative banks* and *RRBs* to ensure their financial stability.
- Unlike commercial banks, *NABARD does not provide loans or banking services to individuals* (meaning: It does not deal directly with public).
- It provides various rural financing schemes through *PMAY (Pradhan Mantri Grameen Awas Yojana), KCC (Kisan Credit Cards), RuPay Kisan Cards*.

> ***In 2015, NABARD had launched initiatives 'E-Shakti' and 'LEDP' (Livelihood and Enterprise Development Program).***

National Housing Bank

- It was established in *1988* through → *Act of 1987*.

Small Industries Development Bank of India (SIDBI)

- It was established on *2nd April 1990*.
- ***Headquarter:*** *Lucknow*

Securities and Exchange Board of India (SEBI)

- It was established as statutory body on *12th April 1988* through *SEBI Act of 1992*.
- ***Headquarter:*** *Mumbai*
- ***Chairman:*** *Tuhin Kanta Pandey*

Functions of SEBI

- It safeguard the interests of investors in the securities market.

Insurance Regulatory and Development Authority (IRDAI)

- It was established as a statutory body on *April 2000* through *IRDAI Act of 1999*.

National Agricultural Co-Operative Marketing Federation Of India Limited (NAFED)

- It was established on *2 October 1958*.
- It is an apex organisation of agricultural produce marketing cooperatives.

Industrial Development Bank of India Limited (IDBI)

- It was established by *GOI in 1964* as a *subsidiary* of the *RBI*. *LIC (Life Insurance Corporation of India)* later acquired *51%* stake in the bank.

MICROFINANCE INSTITUITIONS (MFIs)

- MFIs provide *micro-credit* and other financial services like loan, savings, insurance, and remittances to *low income population*.
- MFIs provide a collateral-free microfinance loan to households having income upto *3 lakh/annum*.
- ***Father of Microfinance system:*** *Muhammad Yunus (in 2006, he won Nobel Peace Prize for creating Bangladesh Grameen Bank)*.
- ***First Micro Finance institution in India:*** *Self Employed Women Association (SEWA) Bank*, which was established in *Ahmedabad* in *1974*.

Business Model of Micro Finance Banks

- The business model of Microfinance Banks revolves around providing small loans and financial services to low-income individuals, primarily in rural area through various schemes and groups.

Self Help Groups (SHG)

- It is a group of *10-20 people Below Poverty Line (BPL)* who come together to find ways to improve their living conditions in rural areas.
- SHGs provide *collateral-free loans* to members at *lower interest rates* than the informal sector.
- SHGs also help *women* and *other marginalized groups* become more self-reliant.

Joint Liability Groups (JLG)

- It comprises a group of *4-10 people* who come together to apply for a bank loan.
- By forming a JLG, individuals can avail of *collateral-free loans* and expand their businesses without worrying about security or margin.
- This loan is offered to *individuals, tenant farmers, sharecroppers, and small and marginal farmers*.

Pradhan Mantri Mudra Yojana (PMMY) Scheme

- This is a government scheme that promotes financial inclusion by providing *micro-credit or loans to small businesses*.

The loans are categorised into

- ***Shishu:*** *Covering loans upto ₹50,000*
- ***Kishor:*** *Covering loans above ₹50,000-₹5 lakh.*
- ***Tarun:*** *Covering loans above ₹5 lakh-₹10 lakh.*
- ***Tarun Plus:*** *Covering loans above ₹10 lakh-₹20 lakh.*

> - ***MUDRA stands for Micro Units Development & Refinance Agency Ltd.***
> - ***Launch year: 8 April 2015***
> - ***It receives 100% funding from SIDBI.***

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Non-Banking Financial Companies (NBFCs)

- NBFCs are also known as *Nonbank Financial Institutions (NBFIs)*, that offer various banking services but do not have a banking license.
- They are registered under *Companies Act of 1956* and are regulated by RBI under *RBI Act 1934*.
- They *cannot accept Demand Deposits* (like savings/current accounts) and *cannot issue cheques*.
- NBFCs provide *loans against Gold* and these are called *Gold Loans*.
- *Deposits are not guaranteed in NBFCs*. If an NBFC fails, depositors may lose their money, as there is no government protection.
- They are *not required* to maintain *CRR* and *SLR* like banks.

Non-Banking Financial Company-Micro Finance Institution (NBFC-MFI)

- They are registered under RBI and regulated by RBI.
- They provide micro loans/micro financial services to *low-income individuals, especially in rural areas*, who lack access to formal banking services.
- NBFC-MFIs were established based on the recommendations of the *Malegam Committee (2010)* → also looked after the issues of MFIs.
- As per RBI guidelines, for entities other than NBFC-MFIs, the maximum limit on microfinance loans is *25% of their total assets*.
- To qualify for NBFC-MFI licence they are required to have *75% of their total assets* in the form of microfinance loans *(earlier this was 85%, however the guidelines were revised in 2022)*.

LIQUIDITY

- Liquidity means how easily an asset can be converted into cash without losing its value. Money has the highest liquidity because it can be used immediately for transactions.

Liquidity Order

Cash > Gold > Cheque > Bond

Demand Deposit is more liquid than Term Deposit

Functions of Money

- ***Medium of Exchange:*** It can be used for buying and selling goods and services.
- ***Unit of Account:*** It helps to measure the value of goods and services.
- ***Valuable in Nature:*** It retains value over time, unlike perishable goods (no intrinsic value, unlike commodities such as gold). Modern paper has value because of government backing.
- ***Highly Portable and Durable:*** Money is easy to carry around and does not degrade over time.

There are Two Reasons Why People Hold Money

Transaction Motive

- This is the most basic reason for holding money. Money is held to facilitate smooth spending on goods and services. ***E.g. people keep cash on hand to pay for regular purchases like groceries, transportation, or bills, etc.***

Speculative Motive

- People hold money to take advantage of investment opportunities or avoid potential losses. ***E.g. buying stocks when the market dips, by being ready to invest when prices are considered favorable.***

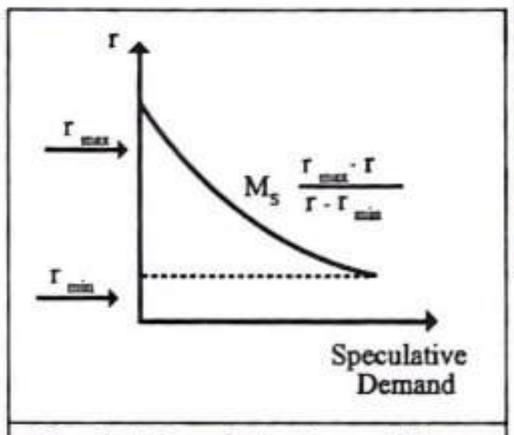
****John Maynard Keynes's theory of money demand includes a speculative motive, which is the desire to hold money for investment opportunities.***

Speculative Demand for Money

- Speculative demand for money is the ***desire to hold cash or other liquid assets*** for investment purposes, rather than for daily needs.

$$\textit{Speculative Demand for Money} \propto \frac{1}{\textit{Rate of Interest}}$$

- Speculative demand for money and interest rates share an inverse relationship. As interest rates rise, speculative demand for money falls, and vice versa.
- ***When interest rates rise → People prefer to invest in bonds and financial assets instead of holding cash → Speculative demand for money decreases.***
- ***When interest rates fall → Returns on investments are low, so people hold more cash instead of investing → Speculative demand for money increases.***



Graph 1: Speculative Demand Curve

r_{max} = maximum interest rate

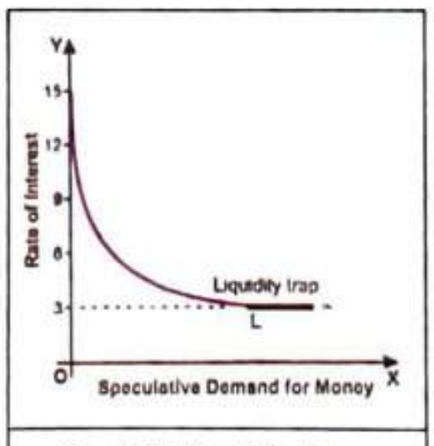
r_{min} = minimum interest rate

M_s = Speculative Demand for money

****Interest rates are an opportunity cost or 'price' of holding money balance in an economy.***

Liquidity Trap

- A liquidity trap is an economic situation *where interest rates are low and people prefer to hold cash instead of spending or investing*, which can lead any Monetary Policy ineffective.



Graph 2: Liquidity Trap

- The *horizontal portion* of the liquidity preference curve is referred to as the liquidity trap.
- In this portion of the curve, the demand for money is *infinitely elastic* and the liquidity preference curve becomes *perfectly elastic*.

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Types of Money in our Economy

1. **Currency in Circulation**

- ***Currency with Banks:*** Money held by banks for daily operations.
- ***Currency with Public:*** Money available for spending by people.

$$CDR = \frac{\text{Money held by public in currency}}{\text{Money held by public in deposits}}$$

During a festival, does the Currency Deposit Ratio (CDR) increases or decreases?

2. **Deposits with Banks**

Banks hold two types of deposits from customers:

- ***Demand Deposits:*** Deposits that are withdrawable anytime ***(Ex: Savings and Current Accounts).***
- ***Term Deposits:*** They are fixed deposits for a set period ***(Ex: Fixed Deposits, Recurring Deposits).***

3. **Deposits with RBI**

- ***Bank Deposits with RBI:*** It includes the CRR, which is the mandatory percentage of a bank's *Net Demand and Time Liabilities (NDTL)* that *must be kept with the RBI.* This helps in controlling inflation and liquidity in the economy.
- ***Other Deposits with RBI:*** It includes deposits from government institutions, foreign central banks, international financial organisations and some private entities.

4. **Postal Deposits**

- They are similar to bank deposits (Term Deposits and Demand Deposits), but managed by the *Post Office Savings Bank (POSB).*

MONEY AGGREGATES

- Monetary aggregates *(or Money Supply)* refers to the amount of money in circulation in the economy at a given time. The Reserve Bank of India (RBI) measures it using different monetary aggregates *(M1, M2, M3, M4).*

Types of Money Supply

Money Aggregates	*Components*
M0	Currency in circulation + Banker's deposit with RBI
M1	Currency with public + Other deposits with RBI + Demand Deposits
M2	M1 + Saving deposits with Post Office savings bank
M3	M1 + Net time deposits of commercial banks
M4	M3 + Total deposits with Post Office

Points To Note

1. *M0* is called as *High Powered Money/Base Money/Reserve Money.*
2. *M1* is called as *Narrow Money.*
3. *M3* is called as *Broad Money* and *Aggregate Monetary Resource.*

Interbank Offer Rate

- The rate at which banks lend to each other to meet *short-term needs (such as fulfilling CRR requirement by RBI)* is called the Interbank Offer Rate, also known as the *Offer Rate.*

London Interbank Offer Rate (LIBOR)

- LIBOR served as a base rate for loans and financial products worldwide, including loans, mortgages, etc.
- It was no longer published after *31st December 2021* and was officially replaced with *SOFR (Secured Overnight Financing Rate)* for the *US dollar.*
- The *MIBOR (Mumbai Interbank Offer Rate)* was the Indian version of LIBOR. MIBOR was replaced by the *FBIL-Overnight MIBOR* in *2015.*

Asia's oldest stock exchange is "Bombay Stock Exchange" established in 1875.

Money Market

Short-term Loans

- ***Call Money:*** Loans are to be repaid within *1 day.*
- ***Notice Money:*** Loans are to be repaid in *2-14 days.*

Capital Market (Long-Term Loans)

- They are used for long-term investments, including stocks and bonds.

Treasury Bills (Issued by RBI)

- They are short-term debt instruments issued by the *GOI through the Reserve Bank of India (RBI).*
- ***T-Bills are issued in three tenors:*** *91 day, 182 day, and 364 day*
- T-Bills are categorised as money market instruments because they have a *maturity of less than one year.*
- They are always listed at a discount, *no interest is paid.*

Assets

- Assets are resources owned by an individual or entity that hold economic value (reserve + loan).

Types of Assets.

1. ***Regular Assets:*** Regular Assets are financial assets that generate consistent returns over the long term. They typically include loans where both interest and principal are repaid on time.
2. ***Stressed Assets:*** Stressed assets are loans that are not performing, or are in danger of not performing (when principal + interest rate is *overdue for less than 90 days*).
3. ***Non-performing Assets (NPAs):*** It is a loan or advance where the interest or principal payment is *overdue for more than 90 days.*

Classified as:

- ***Substandard Assets:*** Loans that are overdue for more than *90 days but less than 12 months.*
- ***Doubtful Assets:*** Loans that are overdue for *more than 12 months.*
- ***Loss Assets:*** Loans that are considered uncollectible and have *no chance of recovery.*

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Bad Banks

• A bad bank is a financial entity which specialises in *handling bad loans or NPAs*. It buys the NPAs of commercial banks and tries to recover at least a part of the value of such NPAs.

2021 Budget announced two bad banks to help resolve NPAs:

• ***National Asset Reconstruction Company Limited (NARCL)***

• ***India Debt Resolution Company Limited (IDRCL)***

Banking Regulations and Security Laws

SARFAESI Act, 2002

• ***Full Form:*** *Securitisation and Reconstruction of Financial Assets and Enforcement of Securities Interest Act*

• ***Purpose:*** It allows banks to seize properties of borrowers who fail to repay loans.

Insolvency and Bankruptcy Code (IBC), 2016

• It helps in the quick resolution of financial insolvency ensuring that the defaulting companies pay back lenders on time.

• Under IBC, 2016, a moratorium period (calm period) of 180 days is granted when a company undergoes insolvency proceedings (in some cases, it can be extended to 270 days if needed).

> ***Collateral*** (गिरवी)
>
> • ***Collateral is something valuable that a borrower gives as a guarantee for a loan. If the borrower fails to repay, the lender can take the collateral to recover the money.***

International Banking Regulations

Basel Norms

• The Basel Norms, also known as the *Basel Accords*, are a set of international banking regulations that aim to strengthen the banking system and manage risk.

• ***Established by:*** *Central Bank Governors (a group of 10 countries) in 1974*

• ***Headquarter:*** *BIS (Bureau of International Settlement) offices in Basel, Switzerland*

• The *Basel Committee on Bank Supervision (BCBS)* has issued three sets of regulations which are known as *Basel-I, II, and III.*

Basel-I

• ***Introduced in:*** *1988*

• It focused almost entirely on credit risk.

• The minimum capital requirement was fixed at *8% of risk weighted assets (RWA).*

• India adopted Basel-I guidelines in *1999.*

Basel-II

• ***Introduced in:*** *2004*

> ***RWA means assets with different risk profiles.***

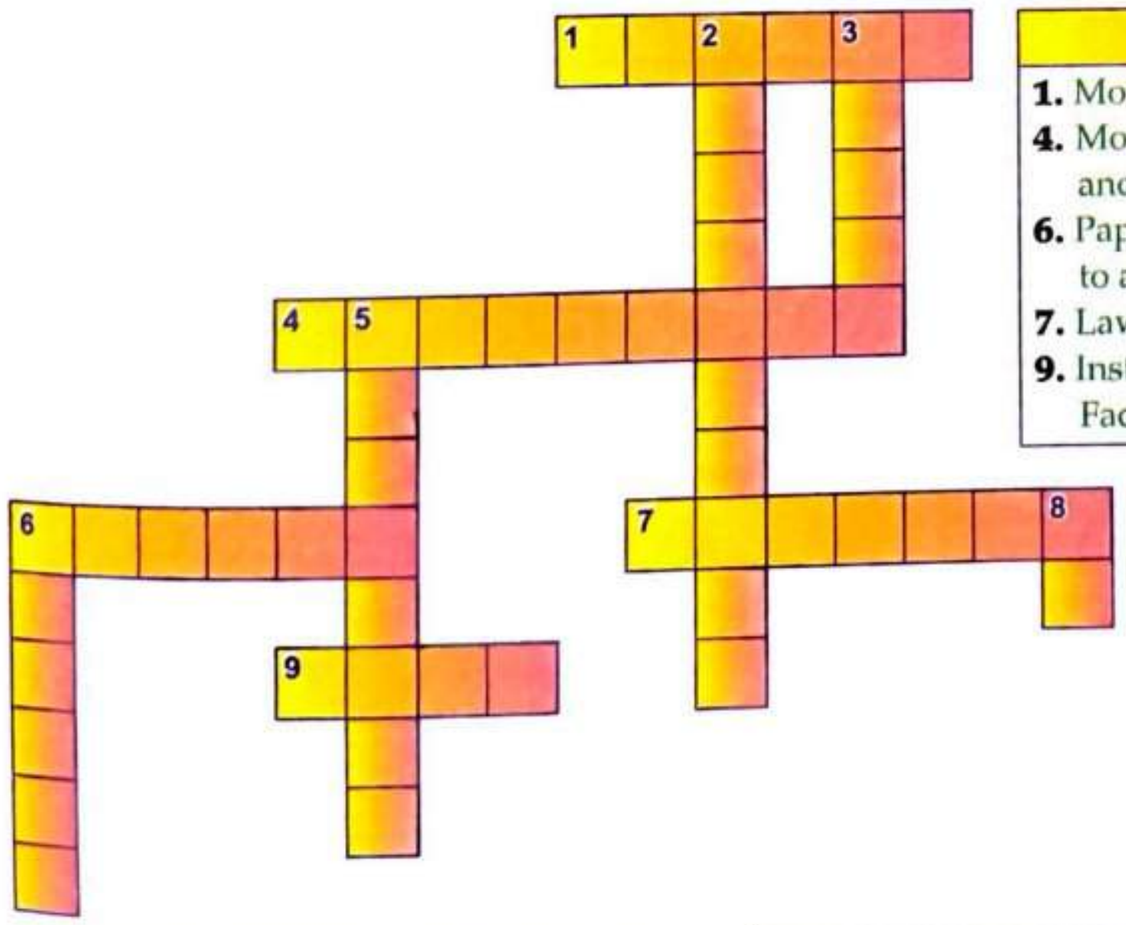
Basel-III

• ***Introduced in:*** *2010*

• A bank needs to maintain the *capital adequacy ratio (CAR)* is to be maintained at *12.9%*. The minimum Tier 1 capital ratio and the minimum Tier 2 capital ratio have to be maintained at 10.5% and 2% of risk-weighted assets respectively.

PARMAR'S CROSSWORD

MONEY AND BANKING



Across

1. Monetary return over time.
4. Money accepted due to trust between payer and payee.
6. Paper instructing payment from one account to another.
7. Law that says bad money drives out good.
9. Instrument under Liquidity Adjustment Facility.

Down

2. Asset pledged as loan security.
3. Medium of exchange in economy.
5. Extra amount earned on loan or deposit.
6. Money accepted based on trust.
8. Most used money supply measure in India.

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Poverty

• Poverty is a state or condition in which an individual lacks the financial resources and essentials for a basic standard of living. It can have diverse environmental, legal, social, economic, and political causes and effects.

Types of Poverty

1. *Absolute Poverty:* A condition where indiviaduals lack basic necessities like food, clean water, shelter, clothing, and healthcare, and education.
2. *Relative Poverty:* A condition where individuals have significantly lower income or resources compared to the average income level of their society.
3. *Subjective Poverty:* A condition based on personal perceptions of economic well-being, where individuals feel poor, despite their income level, influenced by societal comparisons, personal expectations, and psychological factors.

POVERTY ESTIMATION IN INDIA

• In India, poverty is measured by checking a person's income or consumption level. If their income or spending is less than a set minimum amount, they are considered *Below the Poverty Line (BPL).*

• Poverty estimation in India is carried out by *NITI Aayog's* task force through the calculation of the poverty line based on data captured by the *National Sample Survey Office* (NSSO) under the *Ministry of Statistics and Programme Implementation* (MoSPI).

Pre-Independence Estimation

• *Dadabhai Naoroji* through his book, *"Poverty and Unbritish Rule in India"* made the earliest estimation of poverty line *(₹16 to ₹35 per capita per year).*

• He was the *first person* to give estimation of *National Income of India.*

1. **National Planning Committee** *(1938)*

• It was set up by *Subash Chandra Bose* under the *chairmanship of J L Nehru.*

• The National Planning Committee (NPC) of *1938* estimated the poverty line at *₹15 to ₹20 per capita per month.*

• This estimate was based on a minimum standard of living which implicitly included nutritional requirements.

2. **The Bombay Plan** *(1944)*

• It was a set of proposals by influential business leaders in Bombay for the development of India.

• ***Poverty line was suggested as:*** *₹75 per capita per year.*

Post-Independence Estimation

1. **VM Dandekar and N Rath** *(1971)*

• It was the first systematic assessment of poverty in India, based on *National Sample Survey Office (NSSO)* data.

• It was an *Expenditure based Poverty line estimation.*

• It is adequate to provide *2250 calories per day* in rural and urban areas.

2. **Alagh Committee** *(1979)*

• The Planning Committee constituted Alagh Committee under the chairmanship of YK Alagh.

• He constructed a poverty line for rural and urban areas on the basis of *nutritional requirements* and *related consumption expenditure.*

• ***Rural:*** *2400 calories → Rs 49.09 per month*

• ***Urban:*** *2100 calories → Rs 56.64 per month*

3. **Lakdawala Committee** *(1993)*

• This committee defined the poverty line on the *basis of household per capita consumption expenditure.*

• The committee used *Consumer Price Index-Industrial Workers* (CPI-IW) and *CPI- AL (Consumer Price Index for Agricultural Laborers)* for estimation of the poverty line.

It made few suggestions:

• Consumption expenditure should be calculated based on calorie consumption as earlier.

• State specific poverty lines should be constructed.

4. **Tendulkar Committee** *(2005)*

• Tendulkar Committee was *set up in 2005* to address the shortcomings of previous methods and *submitted its report in 2009.*

• It computed poverty line based on *Purchasing Power Parity* in terms to *₹33 per day.*

Recommendations:

• It recommended to shift away from calorie based model and made poverty line broader.

• Incorporation of private expenditure on health and education.

• It replaced the uniform reference period (URP) with the *mixed reference period (MRP)* to estimate poverty in India.

According to Tendulkar Committee, the poverty line for 2011-12 was set to:

• ***Rural:*** *₹816 per capita per month.*

• ***Urban:*** *₹1,000 per capita per month.*

According to Planning Commission, the % of people below poverty line is:

• ***Rural:*** *25.7%* } Overall 29% (2011-2012)

• ***Urban:*** *13.7%* }

5. **Rangaranjan Committee** *(2012)*

• Rangarajan committee include three components in poverty baskets: *food items, essential non-food items, and behaviorally determined non-food items.*

• In addition to calories intake it also include other nutrients like protein and fat.

• It introduced *Mixed Modified Reference period* (consumption and expenditure was computed on *weekly, monthly, and yearly* basis).

The poverty line was recommended (reports submitted in 2014) as:

• ***Rural:*** *₹972 per capita per month.*

• ***Urban:*** *₹1407 per capita per month.*

Trends in Poverty Reduction

• ***2004-2005:*** *407 million* people were poor *(37.2% in BPL → Rural (41.8%) and Urban (25.7%)*

• ***2011-2012:*** *270 million* people were poor.

• ***1993-94 to 2004-2005:*** Poverty declined by *0.74%* per year.

• ***2004-2005 to 2011-2012:*** Poverty declined by *2.4%* per year.

State-wise Poverty *(2011-2012)*

• ***Highest Poverty Rate:*** *Chhattisgarh (39.9%), Jharkhand (37%), Bihar (33.7%).*

• ***Lowest Poverty Rate:*** *Goa (5.09%), Kerala (7.1%).*

Types of Poor

1. ***Usually Poor:*** *They are normally below Poverty line.*
2. ***Churning Poor:*** *They move in and out of poverty line.*
3. ***Occasionally Poor:*** *They are normally above poverty line.*

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MULTIDIMENTIONAL POVERTY INDEX (MPI)

- The MPI concept was introduced in *2010* by *United Nations Development Programme (UNDP)* and *Oxford Poverty and Human Development Initiative (OPHI).*
- It uses *10 Health indicators* over *3 key dimensions*, Education and Standard of living to determine the incidence and intensity of poverty experienced by a population.

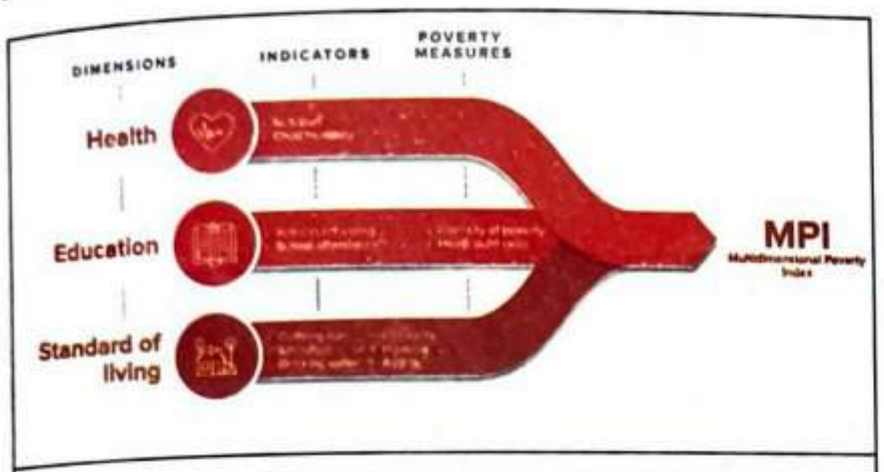


Fig 1: Structure of the Global Multidimensional Poverty Index

- *NITI AAYOG* launched a report in *November 2021* → *National Multidimensional Poverty Index (MPI)*, that measures poverty in India using *12 indicators.*

In recent scenario:

- Multidimensional poverty in India has declined since *2005-2006* as measured by National MPI.
- According to the NITI Aayog, *24.82 crore* people have escaped multidimensional poverty in India in the last *9 years.*
- *Uttar Pradesh:* Largest number of people lifted out of poverty since 2005-2006.

→ ***Highest MPI (Most Poverty):*** *Bihar.*

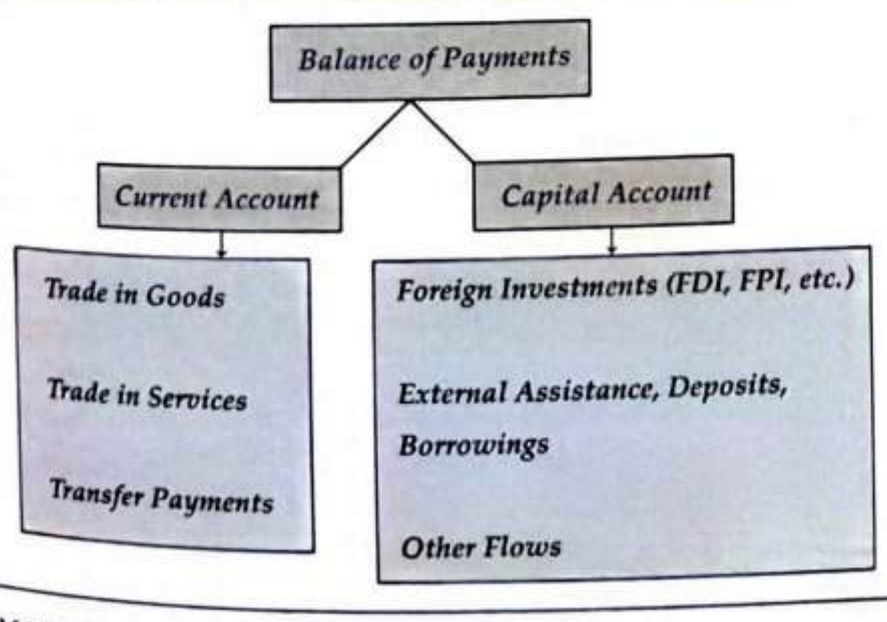
→ ***Lowest MPI (Least Poverty):*** *Kerala.*

Head Count Ratio (HCR)

- The head count ratio (HCR) is the *percentage of a population that lives BPL.* It's also known as the poverty headcount index.

$$\text{Head Count Ratio} = \frac{\text{No. of multidimensionally poor people}}{\text{Total population}}$$

BALANCE OF PAYMENT (BOP)



- The Balance of Payment (BoP) is a record of all financial transactions (imports, exports, investments) between a *country and the rest of the world over a specific period.*
- ***Types:*** *Current Account and Capital Account.*
- **Current Account:** This account scans all the *incoming and outgoing* of goods and services between countries. It is divided into:
  - ***Visible items:*** Exports and Imports of all ***physical goods*** such as tea and coffee. These are ***tangible*** in nature.
  - ***Invisible items:*** Exports and Imports of *services* such as shipping, banking, etc. They are *intangible* in nature.
  - ***Transfer Payments:*** These include *unilateral transfers* such as remittances, foreign aids, etc.

    → ***Top receiver of remittances globally:*** *India.*

    → ***2nd:*** *Mexico.*

- **Capital Account:** Capital transactions like purchase and sale of assets (non-financial) like lands and properties are monitored under this account.

  Types of investment included
  - **Foreign Direct Investment (FDI):** It is a *long-term investment* in a *foreign country's physical asset.* ***E.g. Walmart acquiring Flipkart.***
  - **Foreign Institutional Investment/Foreign Portfolio Investment (FPI):** It is a *short-term investment* in a foreign country's *financial assets.* ***E.g. Stocks, bonds, mutual funds, NRI deposits.***

  FDI limit in defence sector was enhanced in 2020:

  → ***74% through the Automatic.***

  → ***Up to 100% through the Government Route.***

Current Account Deficit

- A current account deficit is when a *country imports more than it exports.*
- It includes the balance of trade, net income from abroad, foreign aid, and net current transfers.

Twin Deficit

- A twin deficit occurs when a country has ***both a current account deficit*** and a *fiscal deficit.*

Balance of Payment Crisis (1991)

- Balance of Payment (BoP) Crisis is also called *currency crisis.* It occurs when a nation is unable to pay for essential imports or repay its foreign debts.
- India faced BOP in *1991* (then *PM: P V Narasimha Rao* and then *Finance Minister: Manmohan Singh*). In response to this, the government introduced broad range of reforms under *LPG model.*

L: *Liberalisation* → Abolition of industrial License Permit Raj, reduction in import tariffs, etc.

P: *Privatisation* → The transfer of ownership or management of government-owned enterprises to private entities. It aims to improve efficiency, reduce the financial burden on the government, and increase competition in various sectors.

G: *Globalisation* → The process of increased economic, social, and cultural integration among countries through trade, investment, technology, and communication. It leads to the free flow of goods, services, capital, and labor across borders.

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FOREX Exchange Reserves

- Forex Exchange Reserves are *assets held by nation's central banks or monetary authority* holds to provide import cover and protect against external shocks.

The four main components of foreign exchange reserves are:

- ***Foreign Currency Assets (FCA).***
- ***Gold reserves.***
- ***Special Drawing Rights (SDRs)*** → also termed as *Paper gold.*
- ***Reserve Tranche Position in the IMF*** (required quota to be maintained within the IMF → *Higher the quota in IMF, higher is the voting power*).

SDR Basket of Currency includes:

- ***USA***
- ***Euro***
- ***Yen (Japan)***
- ***Yuan (China)***
- ***Pound (Britain)***

International Monetary Fund (IMF) and World Bank

- ***Headquarter:*** *Washington D.C.*
- The *Bretton Woods Conference in 1944* (officially known as *United Nations Monetary and Financial Conference*) was a gathering of *44 nations with 730 delegates* which resulted in the x of IMF and World Bank (Twin Organisations).
- It also resulted in creation of *International Bank for Reconstruction and Development (IBRD)* which is now a part of World Bank.

- ***1929-30: Great Depression in USA***

Top Borrowers of IMF

- ***1st: Argentina.***
- ***2nd: Egypt.***
- ***3rd: Ukraine.***
- ***4th: Pakistan.***
- ***5th: Ecuador.***

Le Pakistan: Bhai apna toh IMF ke saath roj का uthna baithna hai 😜 😜 .

NOSTRO and VOSTRO

NOSTRO

- A Nostro *("our")* account refers to a bank account that a domestic bank holds in a foreign bank in foreign currency → *"Our account/money in your bank"*. It is used for international transactions and trade. ***E.g. Bank X has an account with Bank Y in Bank Y's home currency.***

VOSTRO

- A VOSTRO *("your")* account refers to a bank account that a foreign bank holds in a domestic bank in the domestic currency → *"Your account/money in our bank"*. It allows foreign banks to conduct transactions in the domestic market. ***E.g. City Banks partners with HDFC Bank based in India and opens an account with the denoted currency INR.***

Exchange Rate Mechanisms

FERA (Foreign Exchange Regulation Act 1973)

- It was introduced with the intent to facilitate and simplify the foreign exchange system in India. *This act was later abolished and replaced by FEMA* since its rigid regulations were hindering India's economic growth.

FEMA (Foreign Exchange Management Act 1999)

- FEMA focuses on enhancing India's foreign exchange reserves and emphasises the promotion of foreign trade and payments.

Certain Terms to Understand

- **Depreciation:** A *decrease in the value of the domestic currency* due to market forces (supply and demand in the forex market). Exporters will benefit in case of depreciation.

- **Appreciation:** An *increase in the value of the domestic currency* due to market forces. This happens when the demand for the domestic currency rises.

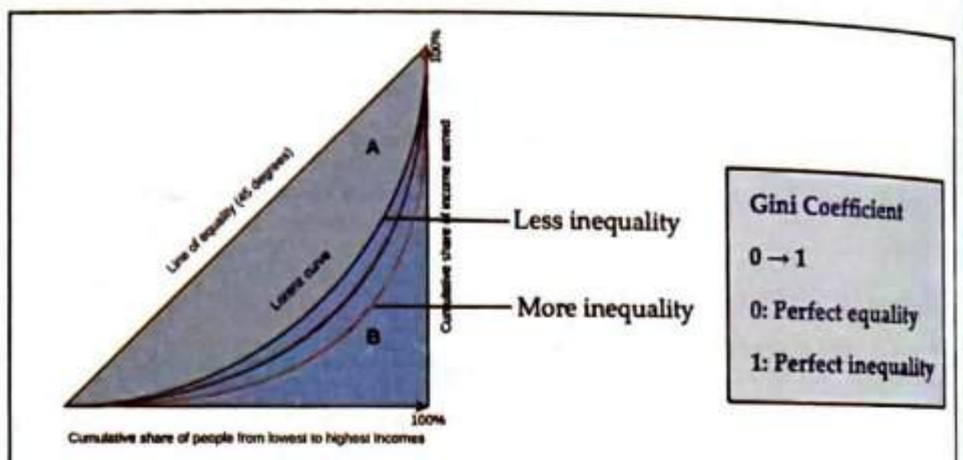
Both Depreciation and Appreciation occurs due to Floating Exchange Rate system (price of country's currency is determined by the market based on supply and demand).

- **Devaluation:** A *government-induced depreciation* of the domestic currency under a fixed exchange rate system. Devaluation of currency will be more beneficial if prices of exports rise proportionately.

- **Revaluation:** A *government-induced appreciation* of the domestic currency under a fixed exchange rate system.

Lorenz Curve

- A Lorenz curve is a graph that shows how *income or wealth is distributed within a population*. It is used to measure inequality and to compare the distribution of income and wealth across different age groups.



Gini Coefficient or Gini Ratio can be associated with measurement of income inequality in an economy.

Graph 1: Lorenz Curve

A fixed currency rate is often called pegged currency rate.

For an interactive recap of this topic, see the crossword on Page Number 221.

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FIVE-YEAR PLANS

Pre-Independence

National Planning Committee *(1938)*

- It was formed by *S.C. Bose.*
- *1st Chairman: J.L. Nehru.*
- It was the first attempt to develop a National Plan for India.

Bombay Plan *(1944)*

- *"A Plan of Economic Development for India"* → popularly known as Bombay Plan. It was prepared by India's leading capitalists like J.R.D Tata.
- It was published in two parts: First part *(released in 1944)* and Second part *(released in 1945)*.

Gandhian Plan *(1944)*

- The plan emphasized on *"decentralised economic structure"* for India with *"self-contained villages"*.

Peoples Plan *(1945)*

- It was formulated by M.N. Roy, Chairman of the *Post-War Reconstruction Committee of Indian Trade Union.*

Sarvodaya Plan *(1950)*

- It was formulated by *Jaiprakash Narayan* (formed Congress Socialist Party in 1934). It was a sort of the *first blueprint* of the planned development of Independent India.

Post-Independence *(1947)*

- The concept of five-year plans was borrowed from the *USSR* (The Union of Soviet Socialist Republics) → *Joseph Stalin* introduced it in *1928* to industrialize the Soviet Union.

Introduction in India

- The Planning Commission of India was set up in *1950* that prepared the Five-Year Plan.

> *Pranab Mukherjee served as the Vice Chairman of Planning Commission.*

The goals of the five year plans were:

1. *Growth:* Growth in terms of GDP.
2. *Modernisation:* Integration of new technology in the economy.
3. *Self-reliance:* Inward-looking trade strategy (domestic production instead of importing goods).
4. *Equity:* Development of all.

- The Five-Year Plans not only specify the objectives to be attained in the 5 years of a plan but also what is to be achieved over a period of *20 years.* This long-term plan is called *"perspective plan"*.

First Five-Year Plan *(1st April 1951)*

- *Duration: 1951-1956.*
- *Based on: Harrod-Domar Model.*
- *Key Focus:* Agriculture and Rural Development (Primary Sector).
- It was presented by *India's first PM* → *J L Nehru.*
- Commentary Development Programme *(1952)* was launched.

> - *Target Growth Rate:* 2.1%
> - *Achieved:* 3.6% (Successful)

> *During Independence, about 75% of the country's population was dependent on agriculture.*

Major Irrigation Projects

- ***Bhakra Nangal Dam (Sutlej River).***
- ***Hirakud Dam (Mahanadi River).***
- ***5 IITs were also established.***
- ***Nagarjuna Sagar Dam (Krishna River).***

Reforms Introduced in Agriculture

- ***Policy of "land of tiller":*** It was a land reform that gave land ownership to farmers who actually worked on it, instead of landlords. It aimed to end the zamindari system, reduce rural inequality, and empower farmers.
- ***Land Ceiling Act (1976):*** It was a land reform law in India that set a maximum limit on land ownership to prevent concentration of land in the hands of a few and distribute surplus land to landless farmers.
- *High yielding variety (HYV) seeds.*

Second Five-Year Plan *(Then PM: J L Nehru)*

- ***Duration:*** *1956-1961.*
- ***Based on:*** *P.C. Mahalanobis Model.*
- ***Key Focus:*** Development of basic and heavy industries → It stressed more on *Rapid industrialisation.*
- The *Industrial Policy Resolution of 1956 (2nd IPR) served as the foundational policy* for India's Second Five Year Plan.

Three Steel Plants were setup:

- *Rourkela Steel Plant (RSP):* ***Odisha (with German collaboration).***
- *Durgapur Steel Plant (DSP):* ***West Bengal (with British collaboration).***
- *Bhilai Steel Plant (BSP):* ***Chhattisgarh (with USSR collaboration).***

> - *Target Growth Rate:* 4.5%
> - *Achieved:* 4.3% (Moderately Successful)

> **About P.C. Mahalanobis**
>
> - ***He is considered as Chief Architect of Indian Planning.***
> - ***On his Birth Anniversary → 29 June, Statistics Day is celebrated.***
> - ***Founded: Indian Statistical Institute, Kolkata***
> - ***He started a journal name Sankhya.***

> - *1st steel plant of India: TISCO (Jamshedpur, Jharkhand)*

Third Five-Year Plan

- ***Duration:*** *1961-1966.*
- ***Based on:*** *Gadgil Formula.*
- ***Key Focus:*** Self-reliant and self-generating economy.
- ***Reasons for its failure:*** *Sino-Indian War (1962),* followed by the *Indo-Pakistan War (1965)* → diverted the focus towards defense spending, alongside *severe droughts* during the plan period.
- *PL 480 Scheme:* India imported wheat from the USA under this scheme to alleviate hunger and poverty.

> - *Target Growth Rate:* 5.6%
> - *Achieved:* 2.8% (Failure)

> ***Lal Bahadur Shastri was the PM of India during Indo-Pak War. He raised the slogan "Jai Jawan Jai Kisan" when India went to war with Pakistan.***

Establishment of Various Institutes

- ***Food Corporation of India (FCI):*** *14th January 1965.*
- ***Commission for Agricultural Costs & Prices (CACP):*** *1st January 1965.*
- ***Industrial Development Bank of India (IDBI):*** *1st July 1964.*
- ***Unit Trust of India (UTI):*** *1963* (by an Act of Parliament) → Established in *1st February 1964.*

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Plan Holiday

- ***A break in Five-Year:*** *1966-1969* → due to economic strain caused by the war and other factors like severe drought.
- India focused on *"New Agriculture Strategy"* or *"Green Revolution"* → widespread distribution and *adoption of HYV seeds.*
  - ***1st phase*** **(Mid 1960s-1970s)**
  - ***2nd phase*** **(Mid 1970s)**

> ***1971: Bangladesh Liberation War***

Fourth Five-Year Plan *(Then PM: Indira Gandhi)*

- ***Duration:*** *1969-1974.*
- ***Based on:*** *Gadgil Formula/Rudra-Allen Model.*
- ***Key Focus:*** Growth with stability and the move toward self-reliance.

> - ***Target Growth Rate:*** 5.6%
> - ***Achieved:*** 3.3% (Failure)

Key Initiatives

- Family Planning Programme was introduced.
- 14 major banks were nationalised *(1969).*
- First Underground Nuclear Test conducted → *"Smiling Buddha" (1974).*
  - ***PM: Indira Gandhi***
  - ***President: V. V. Giri***
- Drought Prone Area Programme *(1973-1974).*

Fifth Five-Year Plan *(Then PM: Indira Gandhi)*

- ***Duration:*** *1974-1978.*
- ***Based on:*** *D. P. Dhar Model.*

> - ***Target Growth Rate:*** 4.4%
> - ***Achieved:*** 4.8% (Moderately successful)

Key Focus

- Employment and Poverty alleviation *("Garibi Hatao" slogan given by Indira Gandhi).*
- Attainment of self-reliance.
- *Minimum Needs Programme (1974)* was introduced which aimed to provide basic needs to poor and unreserved.
- *20 points programme (1975)* was launched that aimed to reduce poverty and improve quality of life.
- Regional Rural Banks (RRBs) were set up *(1975).*
- *Hill Area Development Programme* was initiated.

Rolling Plan

- It was introduced by *Janata Party/Morarji Desai* government.
- ***Duration:*** *1978-1980.*

Key Focus

- Increase in the country's GDP, employment, and agricultural production.

Sixth Five-Year Plan *(Then PM: Indira Gandhi)*

- ***Duration:*** *1980-1985.*

> - ***Target Growth Rate:*** 5.2%
> - ***Achieved:*** 5.7% (Successful)

Key Focus

- Increase in National Income.
- Modernisation of technology.
- Decrease in poverty and unemployment (schemes for transferring skills *(TRYSEM → Training Rural Youth for Self-Employment)* and seets *(IRDP → Integrated Rural Development Programme)* and providing slack season employment *(NREP → National Rural Employment Program)*).
- Establishment of *NABARD* (National Bank for Agriculture and Rural Development) in *1982.*
- *Rural Landless Labour Employment Guarantee Programme (RLEGP)* was launched on *15 August 1983.*

Hindu Rate of Growth *(1978)* → signifying low economic growth.

- ***Concept given by:*** *Prof. Raj Krishna.*
- From 1960-1980, India has experienced a slow economic growth rate.

Seventh Five-Year Plan *(Then PM: Rajiv Gandhi)*

- ***Duration:*** *1985-1990.*

> - ***Target Growth Rate:*** 5%
> - ***Achieved:*** 6% (Successful)

Key Focus (FWP)

- Accelerating food grain production → *Food.*
- Generating employment opportunities → *Work.*
- Increasing economic productivity through "Social Justice" → *Productivity.*
- *Jawahar Rozgar Yojana* was introduced in *1989* by merging *NREP* (National Rural Employment Programme) and *RLEGP* (Rural Landless Employment Guarantee Programme).

> ***Department of Biotechnology was set up by GOI in Seventh FYP.***

Annual Plans *(1990-1992)*

- *No Five-Year Plan* due to Political Uncertainty.
- *Balance of Payments (BoP) Crisis (1991)* that led to beginning of ***L*** (Liberalisation), ***P*** (Privatisation) and ***G*** (Globalisation) reforms.

Eight Five-Year Plan *(Then PM: P V Narasimha Rao)*

- ***Duration:*** *1992-1997.*

> - ***Target Growth Rate:*** 5.6%
> - ***Achieved:*** 6.8% (Highly successful)

Key Focus

- New Indicative Policy.
- Economic and Fiscal reforms were seen.
- Share of Public sector declined (License Raj ended).
- It focused on Human Development.

> - ***The Eighth FYP could not take off in 1990 due to the fast changing political situation at the Centre and the years 1990-91 and 1991-92 were treated as Annual Plans. The Eighth Plan was finally launched in 1992 after the initiation of structural adjustment policies.***
> - ***Some 65% of the country's population continued to be employed in agriculture even as late as 1990. Between 1950 and 1990, GDP contributed by agriculture declined significantly but not the population depending on it (67.5% 1950 to 64.9% by 1990).***

Ninth Five-Year Plan *(Then PM: Atal Bihari Vajpayee)*

- ***Duration:*** *1997-2002.*

> - ***Target Growth Rate:*** 6.5%
> - ***Achieved:*** 5.4% (Failure)

Key Focus

- Growth with social justice and equality.
- After 9th Five-Year Plan, there was not much focus on public sector.

Tenth Five-Year Plan *(by Atal Bihari Vajpayee and Manmohan Singh)*

- ***Duration:*** *2002-2007.*

> - ***Target Growth Rate:*** 8%
> - ***Achieved:*** 7.6% (Failure)

- *National Horticulture Mission (NHM)* was promoted by government.
- *Jute Technology Mission* was introduced.
- Introduction of *Micro Irrigation Programme.*

Eleventh Five-Year Plan

- ***Duration:*** 2007-2012.

> - ***Target Growth Rate:*** 9%
> - ***Achieved:*** 8% (Failure)

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Key Focus

- Towards rapid and more inclusive growth.
- Global financial crisis overlapped with the Five-Year Plans.

Twelfth Five-Year Plan *(Then PM: Manmohan Singh)*

- *Duration: 2012-2017.*
- *Key Focus:* Towards faster, more inclusive and sustainable growth.

- ***Target growth: 8%***

NITI AAYOG chairman: Prime Minister of India.

NITI AAYOG

- In *2014*, the Planning Commission was replaced with NITI AAYOG and Five-Year Plans were discontinued.
- NITI AAYOG (non-constitutional body) was set up on: ***1st Jan 2015***
- It is a *policy think tank for the GOI.*
- It designs and recommends policies and programs for India's development.
- It publishes reports on a variety of topics, including fiscal health, education quality, and water management.

INDUSTRIAL POLICY RESOLUTION (IPR)

- Industrial Policy Resolutions (IPRs) are policy frameworks set by the Indian government to regulate industrial growth, define the role of the public and private sectors, and promote economic development.

1st IPR, 1948

- *First official industrial policy of independent India.*
- *Led by: Dr. Shyama Prasad Mukherjee* (Industry & Commerce Minister).
- It declared the Indian economy as *Mixed Economy.*

Industries were divided industries into 4 categories:

1. ***Strategic Industries (Public Sector):*** *Railways, defense, atomic energy.*
2. ***Basic/Key Industries (Public-Cum-Private Sector):*** Coal, steel, aircraft, telecommunications.
3. ***Industries Requiring Regulation and Control (Controlled Private Sector):*** Sugar, cement, textiles.
4. ***Other Industries (Private and Cooperative Sector):*** Consumer goods and small-scale industries.

- The *start of License Raj* → Government control over industries through licensing.
- It laid the foundation for public sector dominance in key industries.

In 1955, the Village and Small-Scale Industries Committee, also called the Karve Committee, it noted the possibility of using small-scale industries for promoting rural development.

2nd IPR, 1956

- It also known as the *"Economic Constitution of India".*
- It is a framework for socialist industrial growth in India.

Divided industries into three schedules

- *Schedule A (17 Industries – Public Sector Monopoly)* → Aviation, Atomic energy, railways, atomic energy, arms and ammunition, steel and iron, etc.
- *Schedule B (12 Industries – Public & Private Sectors)* → Aluminium, machine tools, chemicals, etc.
- *Schedule C (All Other Industries – Private Sector)* → Consumer goods, textiles, automobiles, etc.

3rd IPR, 1977 ***(extension of 1956 Policy)***

- Introduced by *Morarji Desai* Government (Janata Party).

Key Features

- It emphasised growth of *Small-Scale Industries (SSI).*
- Introduced the *"Tiny Unit"* concept → Small enterprises with investments below *₹1 lakh.*
- Restrictions on *Multinational Corporations (MNCs)* → Focus on self-reliance.

4th IPR, 1980

- It was introduced by *Indira Gandhi* Government.

Key Features

- Shifted focus back to heavy industries.
- Encouraged foreign technology transfer and investment → *FERA Act of 1973.*
- *Monopolistic and Restrictive Trade Practices (MRTP) Act, 1969* was amended to remove the threshold limits of assets in respect to MRTP companies.
- Investment limit for tiny unit increased to *₹ 2 lakhs.*

5th IPR ***(New Industrial Policy, 1991 → Economic Liberalisation)***

- It was announced by *P.V. Narasimha Rao* government, led by Dr. Manmohan Singh.

Key Features

- *End of License Raj* → Most industries freed from licensing requirements.
- *Privatization* → Disinvestment in Public Sector Undertakings (PSUs).
- *Foreign Direct Investment (FDI) opened* → Allowed foreign investment in key industries.
- *Liberalization, Privatization, Globalization (LPG Reforms)* → end of License Raj.

Joint Sector

- Joint Sector refers to a form of partnership between the public sector (government) and the private sector
- *Dutta Committee (1973)* recommended the establishment of *Joint Venture Sector* in Indian Industry.

For an interactive recap of this topic, see the crossword on Page Number 221.

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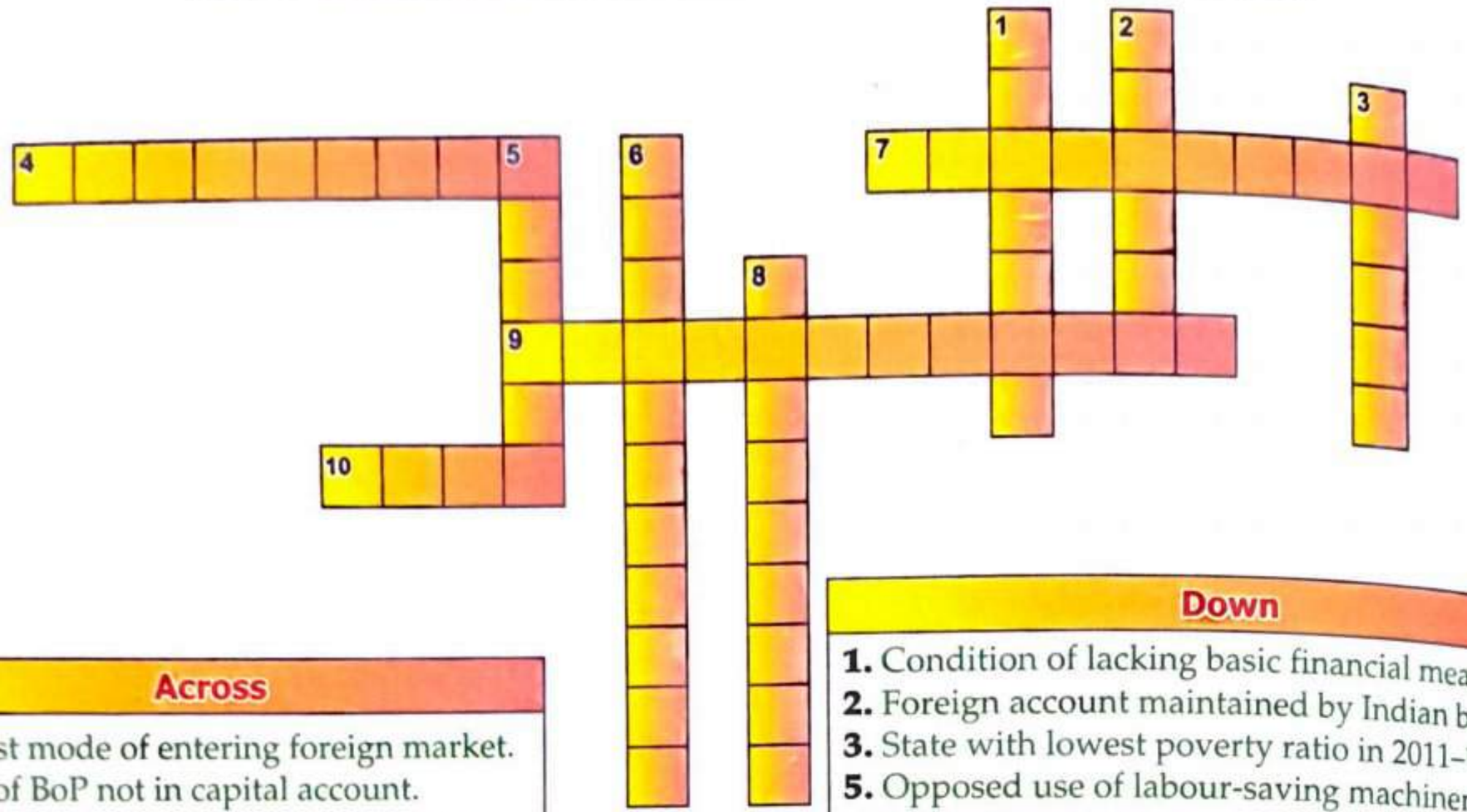
PARMAR'S CROSSWORD

BALANCE OF PAYMENT AND POVERTY



Across

4. Oldest mode of entering foreign market.
7. Part of BoP not in capital account.
9. Fixed capital consumption is known as.
10. Index to measure income inequality.

Down

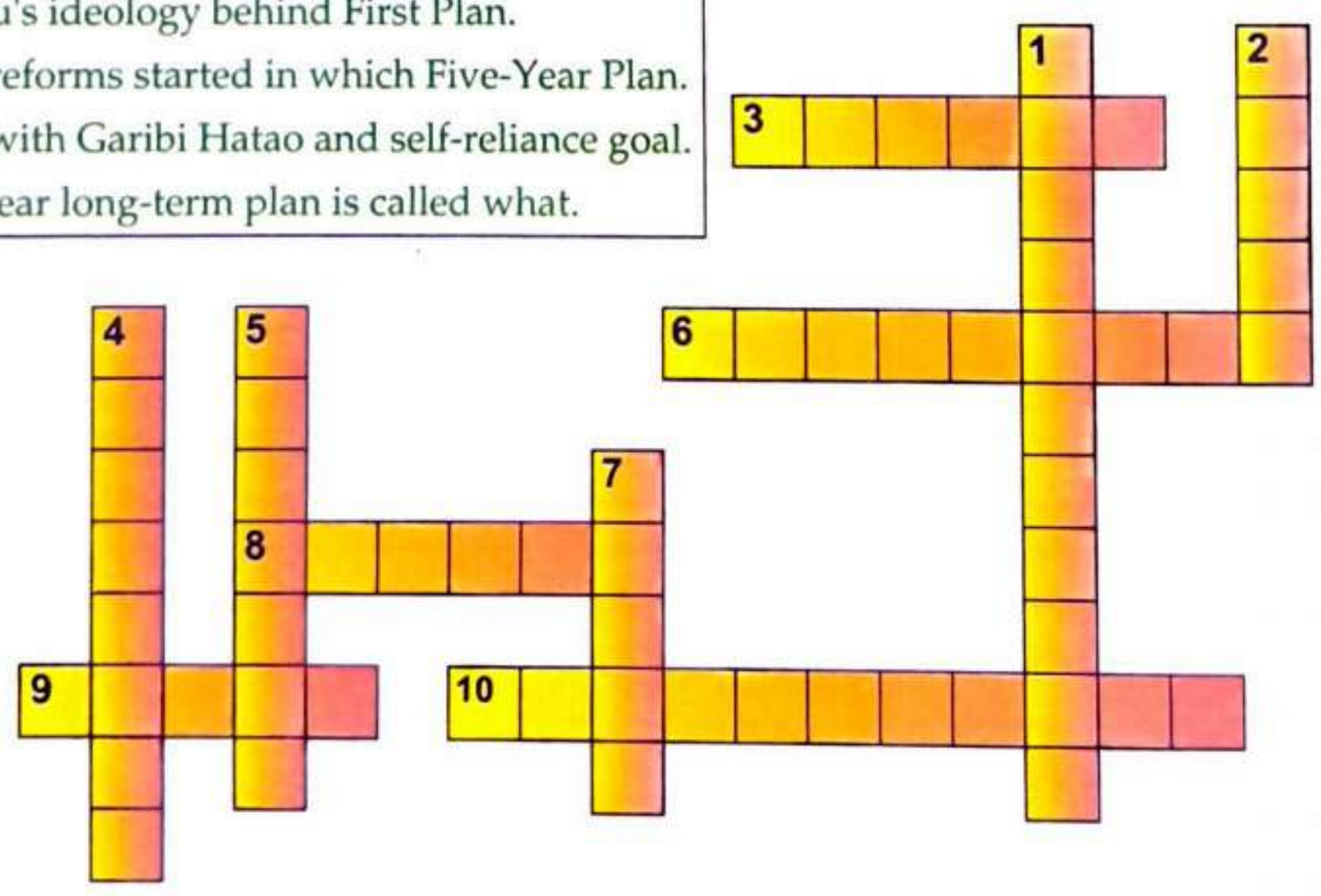
1. Condition of lacking basic financial means.
2. Foreign account maintained by Indian bank.
3. State with lowest poverty ratio in 2011–12.
5. Opposed use of labour-saving machinery.
6. Trade liberalisation improves which advantage.
8. Committee that estimated poverty in India.

PARMAR'S CROSSWORD

FIVE YEAR PLAN AND INDUSTRIAL POLICY RESOLUTION

Across

3. 1944 industrialist proposal for planning.
6. Nehru's ideology behind First Plan.
8. LPG reforms started in which Five-Year Plan.
9. Plan with Garibi Hatao and self-reliance goal.
10. 20-year long-term plan is called what.



Down

1. Architect of Indian economic planning.
2. Plan based on Harrod-Domar model.
4. Commission responsible for Five-Year Plans.
5. Plan focused on food, work and productivity.
7. Plan that failed completely.

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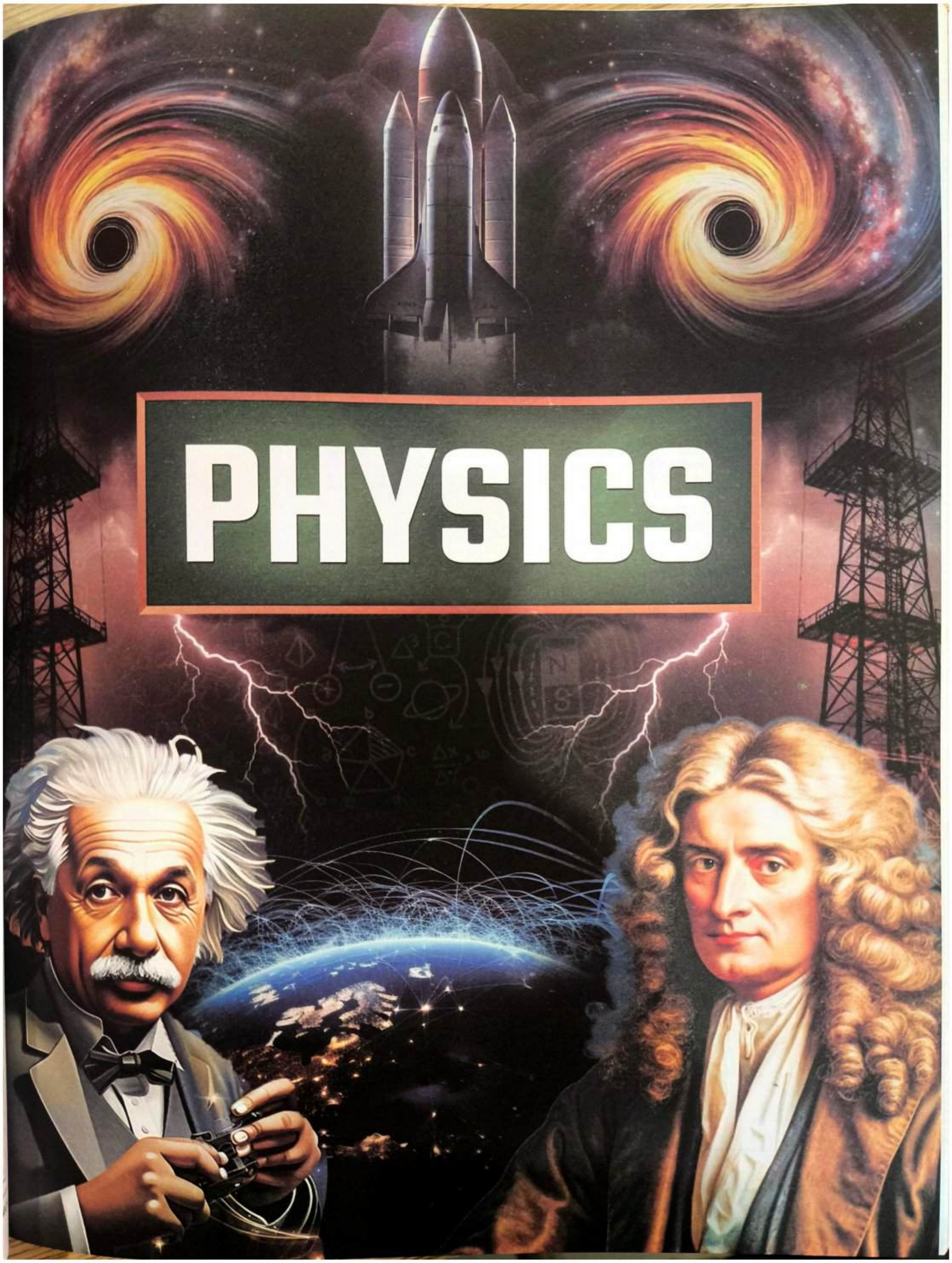

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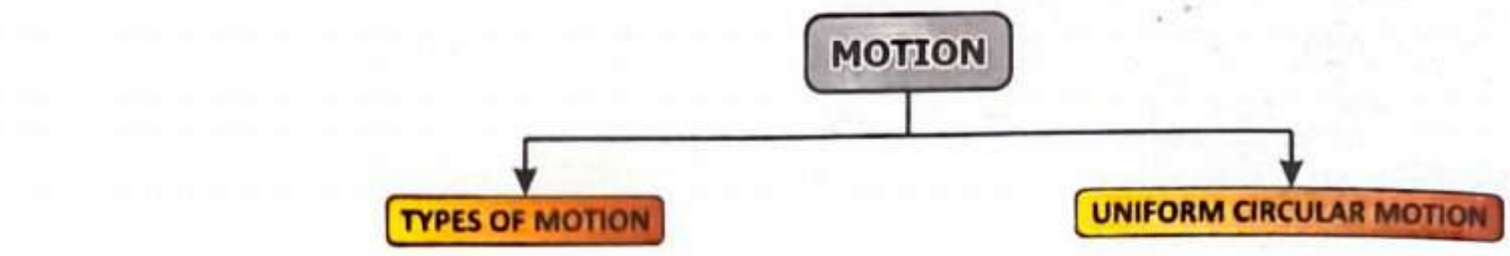

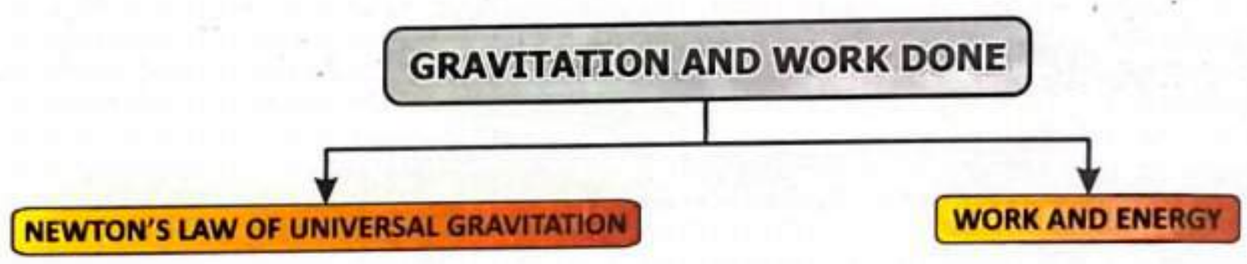

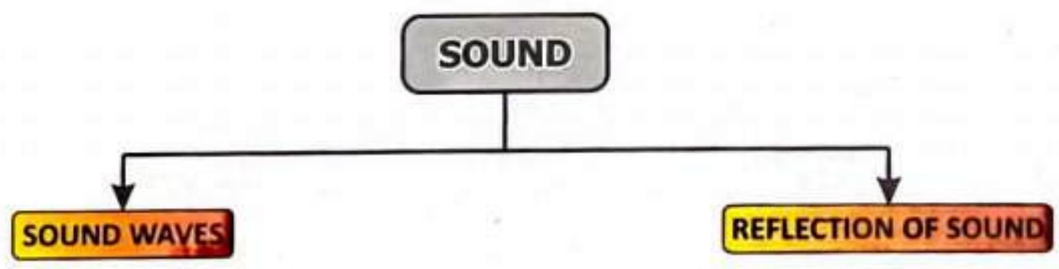

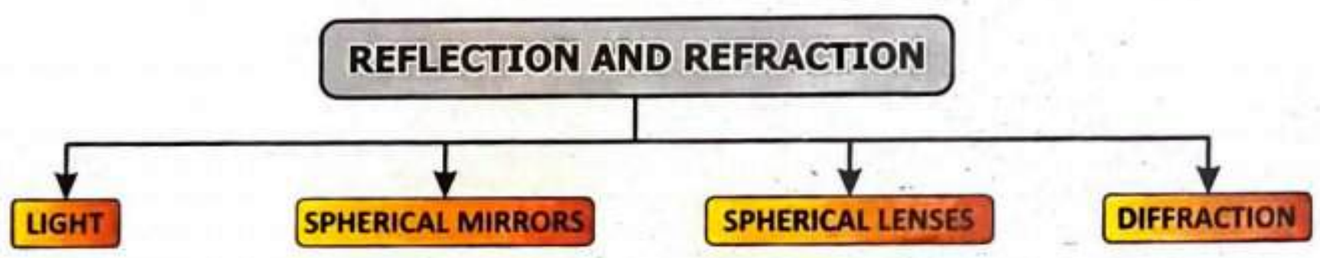

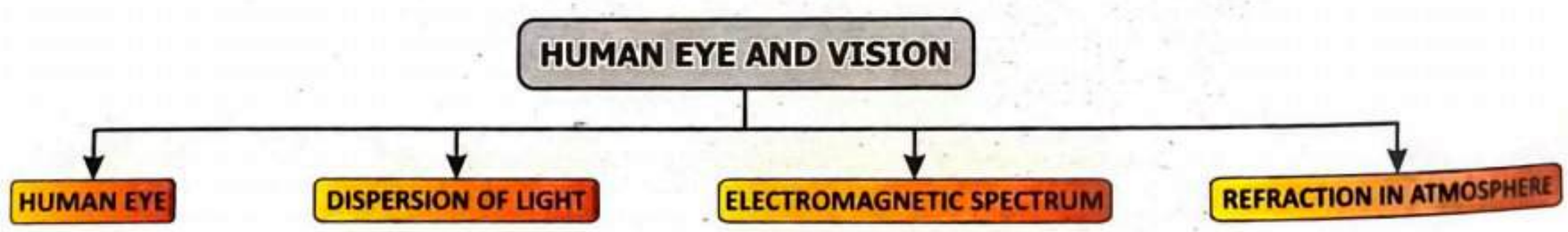

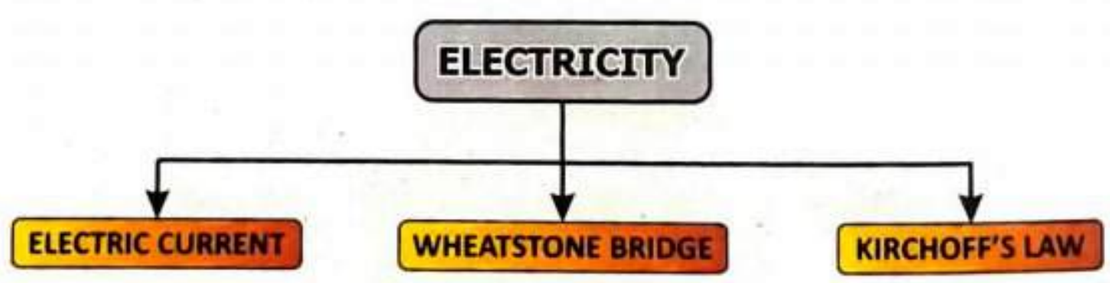

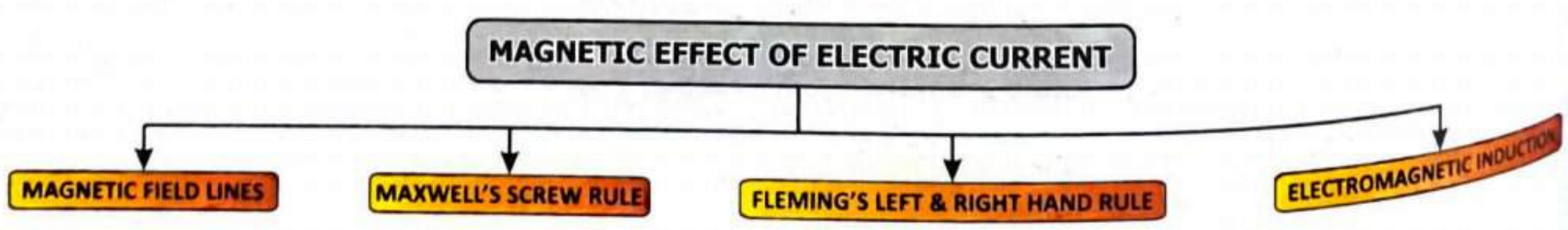

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MOTION

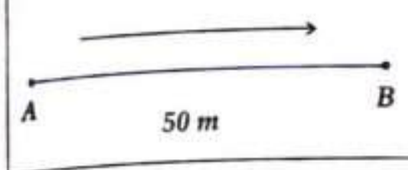
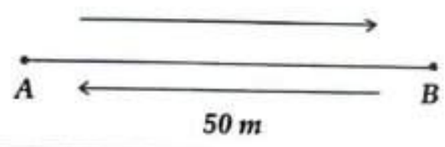
• A relative change in the position of an object with respect to a reference point is called motion.

• *Opposite of Motion:* *Rest* (when the body is still and not moving).

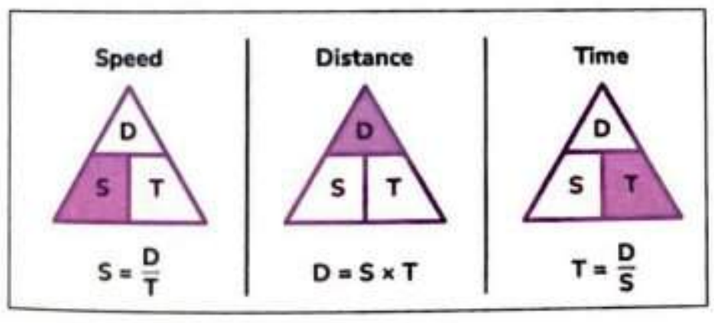
• ***Motion is mainly described in terms of the following terms:***

→ *Distance:* It refers to the total length of the path an object travels, regardless of direction and is a *scalar quantity.*

→ *Displacement:* It is the shortest path between the initial and final positions (not the total distance) and is a *vector quantity.*

Case 1	*Case 2*
	
A person walks directly from point A to point B. Distance covered = 50 m. Displacement = 50 m. The person walks in a straight line.	A person walks directly from point A to point B and returns back to point A. Distance covered = 100 m (50 m to B + 50 m back to A). Displacement = 0 m. The displacement is only from initial to final position.

Scalar Quantity	*Vector Quantity*
It only represents numerical value (magnitude)	It represents both numerical value (magnitude) and direction
E.g. Distance, Speed, Time.	***E.g. Displacement, Velocity.***



Point To Remember

$km/hr \times \frac{5}{18} = m/s$

$m/s \times \frac{18}{5} = km/hr$

Internationl system of units (S.I.) was established in 1960.

→ *Speed:* It is the rate at which an object's position changes with time, regardless of the direction of motion. Its S.I. unit is meters per second → (m/s) and is a *scalar quantity.*

Average Speed

• The average speed is the ratio of total distance traveled by the object to the total time taken to cover that distance. It is a *scalar quantity.*

$$\textit{Average Speed} = \frac{\textit{Total Distance Covered}}{\textit{Total Time Taken}}$$

Questionnaire

An object travels 16 m in 4 sec and then another 16 m in 2 sec. What is the average speed of the object?

Sol:

$$\textit{Average Speed} = \frac{\textit{Total Distance Covered}}{\textit{Total Time Taken}}$$

$$= \frac{16+16}{4+2} = \frac{32}{6} = 5.33\ m/s$$

Types of Motion

• There are two types of motion: Uniform and Non-Uniform motion.

1. *Uniform Motion:* Uniform motion is characterized by an object moving in a *straight line with a constant velocity,* which means that it covers *equal distances* in *equal intervals of time,* resulting in *zero acceleration.* ***E.g. If the speed of a car is 10 m/s, it means that the car covers 10 meters in one second. The speed is constant every second.***
   - *Linear (Rectilinear) Motion:* An object moving in a straight line at a constant speed (constant velocity).
   - *Circular Motion:* An object moving along a circular path at a constant speed (constant angular velocity).
   - *Rotational Motion:* An object rotating around a fixed axis at a constant angular speed.
2. *Non-Uniform Motion:* Non-uniform motion is when an object's *speed* or *direction changes over time,* so it doesn't cover equal distances in equal time intervals. ***E.g. If a car covers 10 meters in the first two seconds and 15 meters in the next two seconds.***
   - *Linear (Rectilinear) Motion:* An object moving in a straight line with changing speed (acceleration).
   - *Circular Motion:* An object moving along a circular path with changing speed (acceleration).
   - *Rotational Motion:* An object rotating around a fixed axis with changing angular speed (angular acceleration).

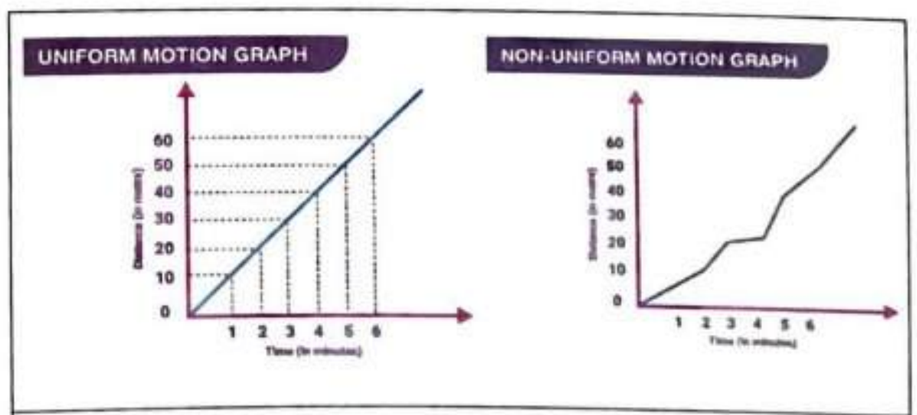


Fig 1: Graphical Representation of Uniform and Non-Uniform

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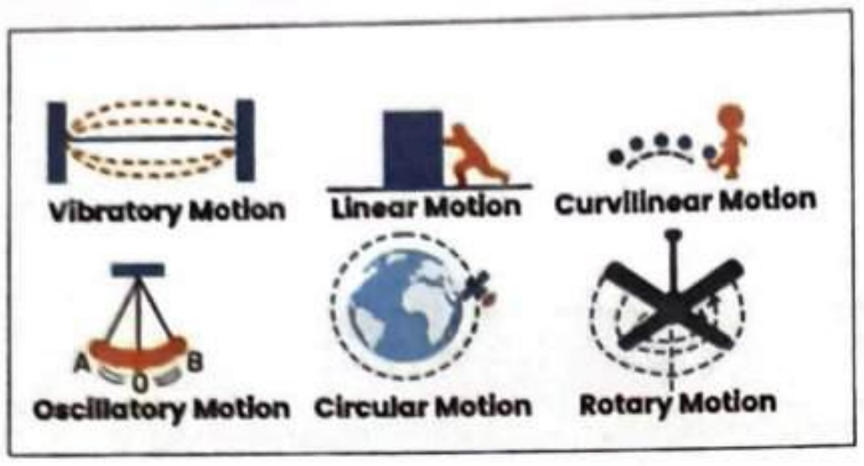


Velocity

• Velocity is the rate at which an object changes its position in a specific direction. Unlike speed, velocity is a vector quantity, which means it has both *magnitude* and *direction*. The S.I. unit of velocity is *m/s*.

Speed + Direction = Velocity

$$Velocity = \frac{Displacement}{Time}$$

$$v = \frac{d}{t} \qquad t = \frac{d}{v} \qquad d = v \times t$$

Odometer: It is used to measure the distance travelled by a vehicle.

Questionnaire

Usha swims in a 90 m long pool. She covers 180 m in one minute by swimming from one end to the other and back along the same straight path. The average speed and average velocity of Usha respectively is?

→ *Since, she covers 180 m in one minute by swimming from one end to the other and back along the same straight path, therefore, displacement of Usha in 1 min = 0 m.*

$$Average\ Speed = \frac{180\ m}{1 \times 60\ s} = 3\ m/s$$

$$Average\ Velocity = \frac{0}{1 \times 60\ s} = 0\ m/s$$

Acceleration

• Acceleration is defined as the *rate of change of velocity with respect to time*. It essentially describes how quickly an object's speed or direction (or both) is changing. The S.I. unit of acceleration is m/s^2.

$$Acceleration = a_c$$

$$a_c = \frac{Change\ in\ Velocity}{Time\ (\Delta t)}$$

$$\frac{Final\ Velocity - Initial\ Velocity}{Time\ (\Delta t)}$$

$$\frac{v - u}{\Delta t}$$

Questionnaire

Starting from a stationary position, Rahul paddles his bicycle to attain a velocity of 6 m/s in 30 s. Then he applies brakes such that the velocity of bicycle comes down to 4 m/s in the next 5 s. Calculate the acceleration of the bicycle in both the cases.

Sol:

Case 1: He starts from a stationary position and attains speed of 6 m/s in 30 s.

Initial velocity (u) = 0 m/s
Final velocity (v) = 6 m/s
Time taken (Δt) = 30 s

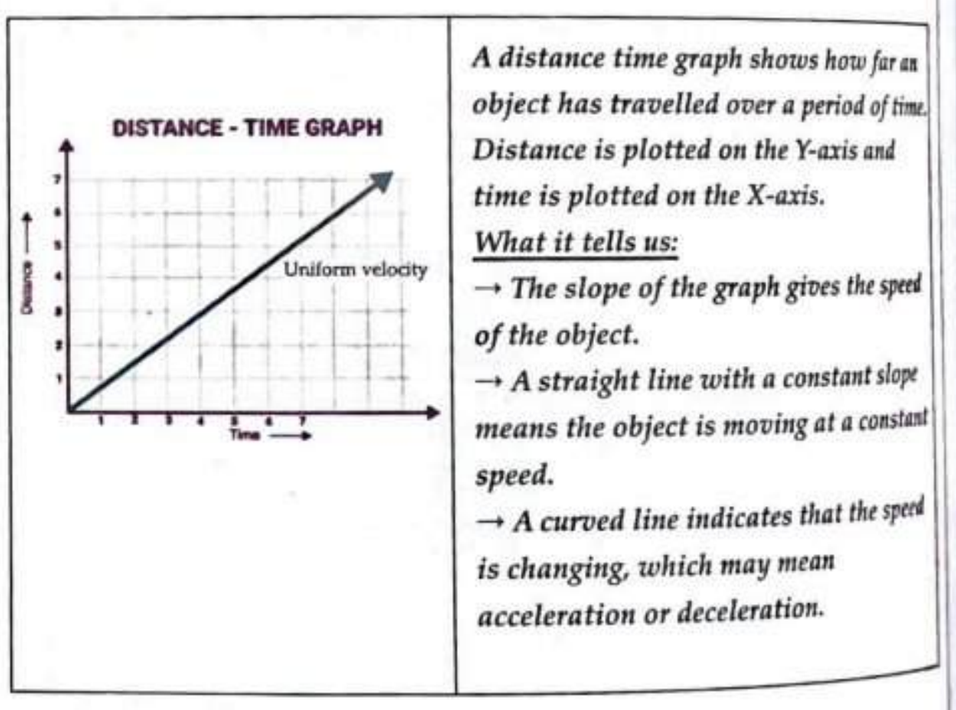
$$a_c = \frac{6 - 0}{30} = \frac{1}{5} = 0.2\ m/s^2$$

Case 2: He applies brakes such that the velocity of the bicycle comes down to 4 m/s in next 5 s. Final velocity in Case 1 becomes the initial velocity in Case 2.

Initial velocity (u) = 6 m/s
Final velocity (v) = 4 m/s
Time taken (Δt) = 5 s

$$a_c = \frac{4 - 6}{5} = \frac{-2}{5} = -0.4\ m/s^2$$

Graph Representation



A distance time graph shows how far an object has travelled over a period of time. Distance is plotted on the Y-axis and time is plotted on the X-axis.

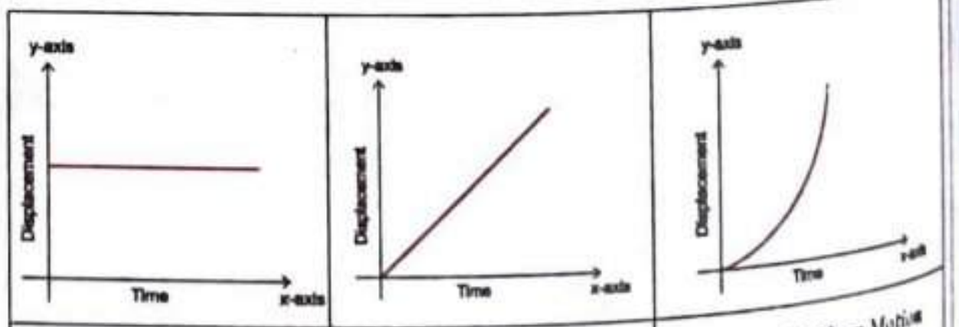
What it tells us:

→ *The slope of the graph gives the speed of the object.*

→ *A straight line with a constant slope means the object is moving at a constant speed.*

→ *A curved line indicates that the speed is changing, which may mean acceleration or deceleration.*

Displacement-Time Graph



For Stationary Body (Body at rest)	For Uniform Motion	For Non-Uniform Motion (speed increases)

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Numerical of Motion in a straight line: The "UTSAV" Concept

• In case of uniform acceleration, there are three equations of motion that describe the motion of an object with constant acceleration.

1. $v = u + at$
2. $s = ut + \frac{1}{2}at^2$
3. $v^2 - u^2 = 2as$

u: Initial velocity
t: Time
s: Distance
a: Acceleration
v: Final velocity

When an object starts from a stationary position or starts to free fall, its initial velocity (u) is 0 m/s.

Deceleration, also known as negative acceleration or retardation, refers to a decrease in an object's speed or velocity, which is the opposite of acceleration (increasing speed or velocity).

Motion Under Gravity

• Motion under gravity (also known as ***free-fall motion***) refers to the movement of an object solely influenced by the ***force of gravity***, resulting in a ***constant downward acceleration*** (approximately ***9.8 m/s²***).

1. $v = u + gt$
2. $s = ut + \frac{1}{2}gt^2$
3. $v^2 - u^2 = 2gh$

$a = g \rightarrow$ Acceleration due to gravity
Free fall $\rightarrow u = 0$ (initial speed)

Upward Motion *(against the gravity)*

1. $v = u - gt$
2. $s = ut - \frac{1}{2}gt^2$
3. $v^2 - u^2 = -2gh$

$a = -g$, final velocity at highest point = 0

Questionnaire

A train starting from rest attains a velocity of 72 km/h in 5 minutes. Assuming that the acceleration is uniform. The distance travelled by train for the above velocity is?

Sol:

Initial velocity (u) = 0 km/h, Final velocity (v) = 72 km/h = 20 m/s and Time (t) = 5 min.

As per the first law of motion

$v = u + at$

$20 = 0 + (a_c \times 5 \times 60)$

$a_c = \frac{20}{5 \times 60} = \frac{1}{15}\ m/s^2$

Distance travelled by train

$S = ut + \frac{1}{2}at^2$

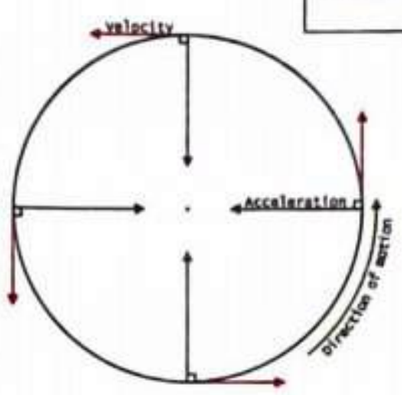
$S = 0 \times 300 + (\frac{1}{2} \times \frac{1}{15} \times 300^2) = 3000\ m = 3\ Km$

UNIFORM CIRCULAR MOTION

• The motion of a body moving with a ***constant speed along a circular path*** is called Uniform Circular Motion.

$a_c = \frac{v^2}{r}$

a_c: Centripetal acceleration (acceleration towards the centre in circular path)



Centripetal force is the force acting on a body in a circular path. It points towards the center around which the body is moving.

• For a body moving in uniform circular motion the speed attained by the object will ***remain constant not the velocity*** as velocity depends on the direction of motion, and in circular motion the ***direction of the object changes at every point***. This continuous change in velocity results in an acceleration, even though the speed is constant.

Questionnaire

An athlete completes one round of a circular track of diameter 100 m in 20 s. What will be the displacement after 1 min and 10 s, respectively?

Sol:

Diameter of the track = 100 m

One complete round takes, t = 20 s

Total Time = 1 min and 10 s = 70 s

No. of rounds = $\frac{70}{20}$ = 3.5 rounds

After 3 full rounds, the athlete comes back to the starting point, so displacement = 0

After 0.5 round, the athlete reaches the diametrically opposite point of the circle.

Displacement after 3.5 rounds = Diameter of the circle

Displacement = 100 m

*(*because as you know, displacement is the shortest distance between the initial and final point).*

For an interactive recap of this topic, see the crossword on Page Number 231.

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FORCE

• Force is an external agent capable of changing a body's state of rest or motion. The SI unit of force is *Newton (N)*. A newton is defined as *1 kg m/s²*.

The Force has different effects, and here are some of them:

→ Force can make a body that is at rest to move.
→ It can stop a moving body or slow it down.
→ It can accelerate the speed of a moving body.
→ It can also change the direction of a moving body along with its shape and size.

Force produces the change in velocity.

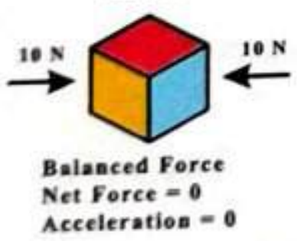
Balanced and Unbalanced Force

Balanced Force

• Balanced forces are forces that *cancel each other* out because they are equal in strength and act in opposite directions. The net force acting on an object when forces are balanced is *zero* ($F_{Net} = 0$).

Unbalanced Force

• Unbalanced forces are forces that are *not equal in magnitude* and/or act in the *same direction*. The net force acting on an object when forces are unbalanced is not zero ($F_{Net} \neq 0$).

Balanced Force	*Unbalanced Force*
When the man pushes against the wall, the forces at play balance each other, and as a result, the wall does not move.	*One person significantly heavier than the other creates a condition of unbalanced forces in a seesaw.*
	

Types of Force

1. **Contact Forces:** A contact force is a force that acts on a body either directly or through a medium are called contact forces.

Types:

a) ***Frictional Force:*** Frictional Force refers to the force generated by two surfaces that contact and slide against each other.

b) ***Spring Force:*** The spring force is a restoring forced exerted by a spring when it is stretched or compressed.

Hooke's Law

• It states that the force needed to extend or compress a spring (or any elastic material) by a certain distance is directly proportional to that distance.

2. **Non-Contact Forces:** A non-contact force is a force applied to an object by another body that is not in direct contact with it.

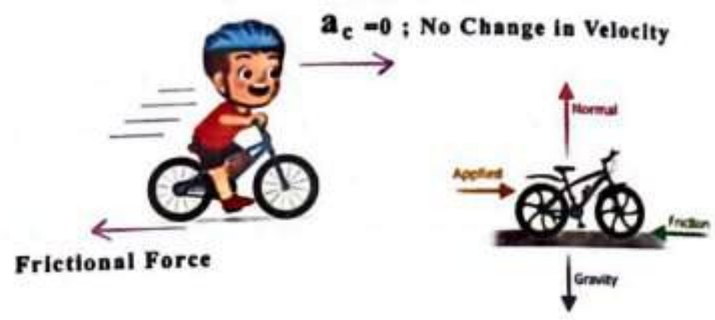
Types:

a) ***Gravitational Force:*** A gravitational force is an attractive force *between two masses.*

b) ***Magnetic Force:*** Magnetic force is the force experienced by a moving electric charge/magnetic material in a magnetic field. It can also refer to the attractive or repulsive interaction *between magnetic materials or magnets.*

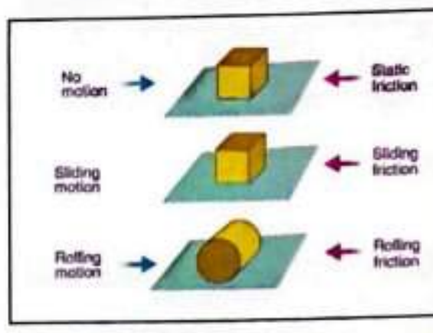
c) ***Electrostatic Force:*** The electrostatic force, also known as the Coulomb force, is the attractive or repulsive force *between two electrically charged objects.*

TRICK to Remember non-contact forces: GEM



Conservative Forces	*Non-Conservative Forces*
Work done is independent of the path (depends on final and initial point).	Work done depends upon the path
Work done is zero in case of a closed path	Work done is not zero in case of a closed path
Work done by it is completely recoverable	Work done is not completely recoverable; some energy is lost (usually as heat)
E.g. Gravitational force, electrostatic, magnetic, spring force.	*E.g. Frictional force, Drag.*

Friction drag is a force that resists the motion of an object moving through a fluid (air/liquid).

	***Order of Force: Static Friction > Sliding Friction > Rolling Friction***

LAWS OF MOTION

• *Galileo Galilei* first proposed the concept of *inertia*. By observing the motion of objects on an inclined plane Galileo deduced that *objects move with a constant speed when no force acts on them.*

• Galileo published a series of essays named: *De Motu* (Meaning: "On Motion")

• Galileo's first book: *La Bilancetta* ("The Little Balance") published in *1586.*

• *Newton* formulated the three laws of motion.

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1st Law of Motion → *Law of Inertia*

• The Law of Inertia states that ***"An object at rest remains at rest and an object in motion remains in motion at constant velocity unless acted upon by an external force"***.

Types of Inertia

1. ***Inertia of Rest:*** This is the tendency of an object to remain at rest unless acted upon by an external force. ***E.g. The dry leaves and fruits falls when we shake a tree.***
2. ***Inertia of Motion:*** This is the tendency of an object to continue moving in a straight line at a constant speed unless acted upon by an external force. ***E.g. A person sitting in a moving car may be pushed forward when the car stops abruptly as our legs are in contact with the surface.***
3. ***Inertia of Direction:*** This is the tendency of an object to continue moving in the same direction unless acted upon by an external force. ***E.g. When a car makes a sharp turn, your body tends to move in the direction it was previously moving, rather than following the car's new direction.***

> ***Inertia: The tendency of an object to resist changes in its state of motion. It depends on the mass of the object.***

$$\text{Inertia} \propto \text{Mass}$$

2nd Law of Motion

• The 2nd Law of Motion states that ***force equals mass times acceleration, or $F = ma$***. This law describes how the acceleration of an object depends on the force applied to it and the object's mass. ***E.g. A cricketer pulling back his hand while catching the ball to avoid injury.***

> *Force = Rate of change of momentum*
>
> $F = ma$
>
> $F = Kg\ m/s^2$

Derivation:

Change in momentum $= mV - mu$

Rate of change in momentum with time $= \dfrac{mV - mu}{t}$

We know $\dfrac{(V - u)}{t} = a$ (acceleration); $\quad = \dfrac{m(V - u)}{t} = ma$

3rd Law of Motion

• The 3rd Law of Motion states that ***"For every action, there is an equal and opposite reaction"*** meaning if one object exerts a force on another, the second object will exert an equal and opposite force back on the first. ***E.g. When a gun fires, the bullet experiences a forward force, and the gun experiences an equal and opposite force, causing it to recoil backward.***

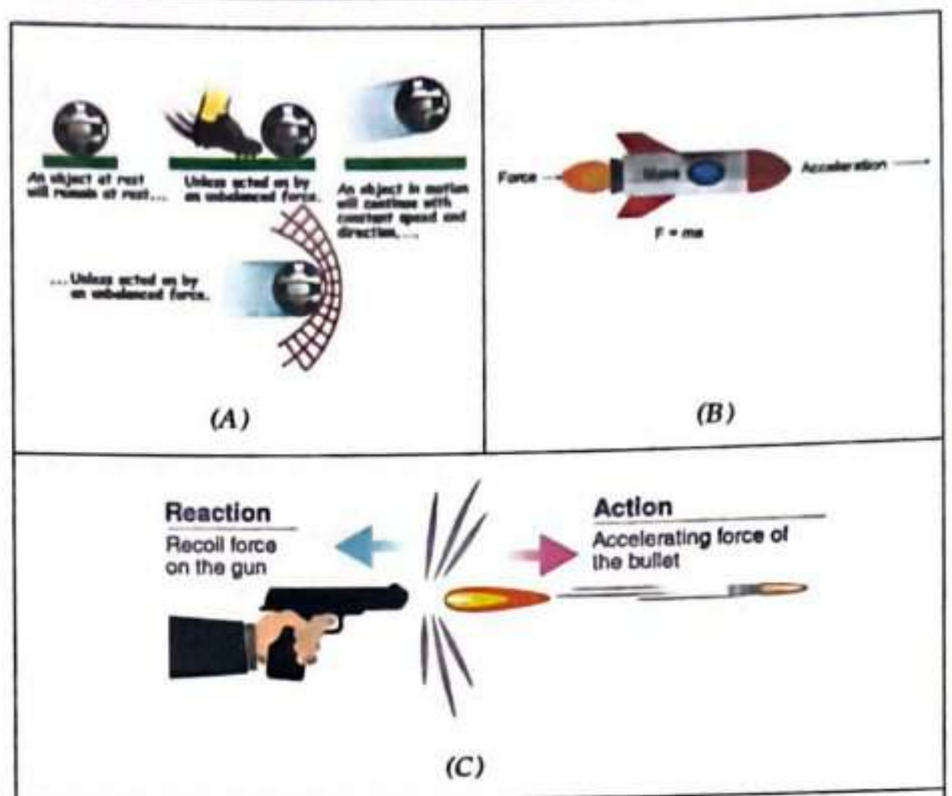

Fig 1: (A) 1st Law of Motion; (B) 2nd Law of Motion; (C) 3rd Law of Motion

Questionnaire

> *A constant force acts on an object of mass 5 kg for a duration of 2s. It increases the object's velocity from 3 m/s to 7 m/s. Find the magnitude of the applied force. Now if the force were applied for a duration of 5 s. What would be the final velocity of object?*

Sol:

$F = m \times a$

$F = m \times \dfrac{(V - u)}{t}$

$F = 5 \times \dfrac{(7 - 3)}{2}$

$F = 5 \times \dfrac{4}{2} = 10\ N$

$10 = 5 \times \dfrac{(V - 3)}{5}$

$10 = V - 3$

$V = 13\ m/s$

Impulse and Momentum

• Momentum measures the ***"quantity of motion"*** of an object, defined as the product of its mass and velocity. The S.I. unit of Momentum is ***Kg m/s***.

$$p = m \times v$$

> ***p = vector quantity***
>
> ***m = scalar quantity***
>
> ***v = vector quantity***

• Impulse is the change in momentum of an object caused by a force acting over a short period of time.

> ***Impulse-Momentum Theorem:*** $F \Delta t = m \Delta V$

Conservation of Momentum

• The conservation of momentum principle states that ***"In a closed system, the total momentum remains constant"***, meaning momentum is neither created nor destroyed, but only transferred.

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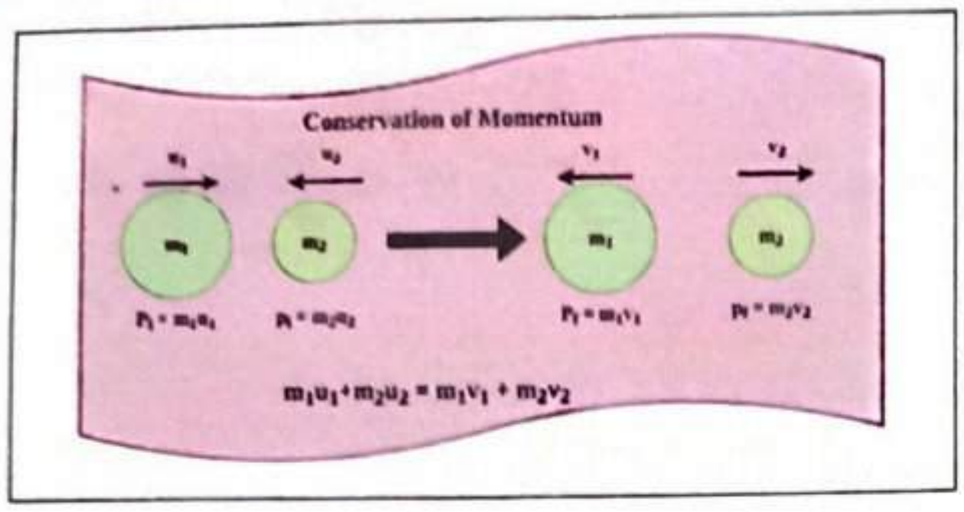


• In the equation, m_1 and m_2 are *masses* of the bodies, u_1 and u_2 are the *initial velocities* of the body and v_1 and v_2 are the *final velocities* of the bodies (change in velocity not mass).

Questionnaire

A girl of mass 40 kg jumps with a horizontal velocity of 5 ms^{-1} onto a stationary cart with frictionless wheels. The mass of the cart is 3 kg. What is her velocity as the cart starts moving?

Sol:

Mass of girl $(m_1) = 40$ *kg*

Velocity of girl before jump $(u_1) = 5$ *m/s*

Mass of cart $(m_2) = 3$ *kg*

Velocity of cart before jump $(u_2) = 0$ *m/s*

Final velocity of girl + cart system $= v$

$$m_1 u_1 + m_2 u_2 = m_1 v_1 + m_2 v_2$$

(In this case, $v_1 = v_2 = v$)

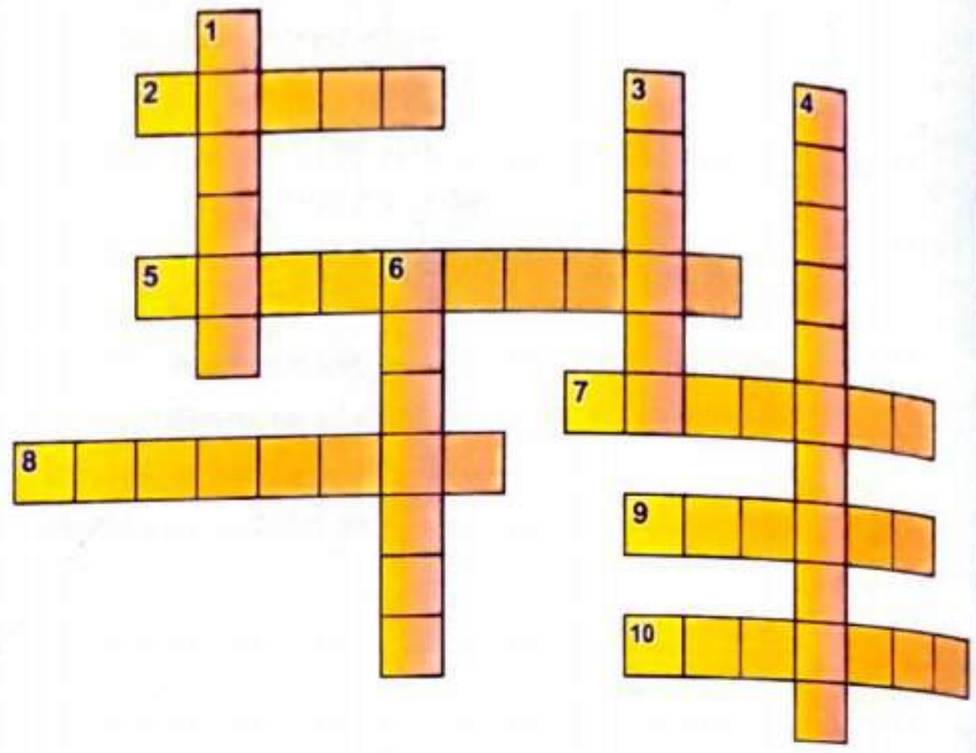
$$40 \times 5 + 3 \times 0 = (40 + 3) \times v$$

$$200 = 43v$$

$$v = 4.65 \text{ m/s}$$

PARMAR'S CROSSWORD

FORCE AND LAWS OF MOTION



Across

2. External agency changing rest or motion.
5. Substances used to reduce friction.
7. Newton's first law is also known as.
8. Quantity conserved in rocket propulsion.
9. Self-adjusting type of friction.
10. Nature of frictional force on motion.

Down

1. Rotational effect of a force.
3. SI unit of force.
4. Action-at-a-distance type of force.
6. Force acting for a short time.

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UNIVERSAL LAW OF GRAVITATION

• *Newton* put forward the universal law of gravitation in *1687* and used it to explain the observed motions of the planets and moons.

Newton's Law of Universal Gravitation

• It states that "Every particle attracts every other particle in the universe with force directly proportional to the product of their masses and inversely proportional to the square of the distance between them".

The Universal Gravitation Equation

$$F \propto \frac{m_1 m_2}{r^2}$$

$$F = G\frac{m_1 m_2}{r^2}$$

→ F is the gravitational force between bodies, m_1 and m_2 are the masses of the bodies, r is the distance between the centres of two bodies, G is the universal gravitational constant.
→ The value of G is found to be $G = 6.673 \times 10^{-11}\ N\ m^2/kg^2$ (Discovered experimentally by Henry Cavendish in 1798).

• The gravitational force is both a *non-contact force* (acting at a distance) and a *conservative force* (work done is independent of path and work done in a closed path is zero).

• *Mercury nearest to Sun: 88 days revolution.*
• *Neptune farthest to Sun: 165 yrs revolution.*

Kepler's Planetary Laws (1609)

First Law: Law of Orbit

• It states that *"Planets move in elliptical orbits with the Sun as a focus"*.

Second Law: Law of Area

• It states that *"The line joining the planet and the Sun sweep out equal areas in equal interval of time"*.

Third Law: Law of Time Period

• It states that *"The square of the time period of revolution of a planet around the Sun is directly proportional to the cube of its mean distance from the Sun"*.

$$T^2 \propto r^3$$

Mass Vs Weight

Mass	*Weight*
The mass of a body is the amount of matter present in it	The weight of a body is the force with which the earth attracts it
It has magnitude but not direction (scalar quantity)	It has both magnitude and direction (vector quantity)
It does not change from place to place	It changes from place to place (W = m x g)
It can never be zero	It is zero at the center of earth
Its S.I. Unit is kilogram	Its S.I. Unit is Newton

Variation in the gravity

1. *The gravity is more at the poles than at the equator.*
2. *The gravity decreases with altitude.*
3. *The gravity on the moon is 1/6th of Earth's gravity.*

$$F = \frac{GMm}{R^2}$$

$$m \times g = \frac{GMm}{R^2}$$

$$g = \frac{GM}{R^2}$$

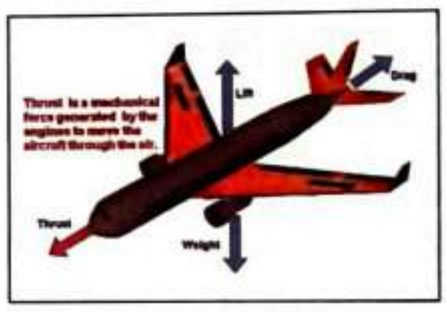
$$g = 9.8\ m/s^2$$

M = Mass of the Earth
R = Radius of the Earth
G = Universal Gravitational Constant
g = Acceleration due to gravity

"g" represents the acceleration that an object experiences due to the Earth's gravity (or the gravity of any celestial body).

• Gravity gets weaker as you move farther from Earth's center. This is because gravity is inversely proportional to the square of the distance between the centers of two objects.
• When we go *higher*, the distance *increases* → gravity *decreases*.
• As we move deeper into the Earth, only the Earth's mass beneath us contributes to the *gravitational pull*. The mass above us has *no effect* → gravity also *decreases*.
• So, gravity is strongest at the surface and weaker both above and below it.

Thrust



• Thrust is a force, or push, that acts on a surface in a direction perpendicular (normal) to that surface. It is measured in *Newtons (N)*. ***E.g. Thrust is generated by the engines of the aircraft through some kind of propulsion system.***

Pressure

• Pressure is the force (or thrust) acting per unit area. S.I. unit is ***pascal (Pa)***.

$$Pressure = \frac{Thrust/\ Force}{Area}$$

$$P = \frac{Kgm}{s^2 m^2} \quad Or \quad 1\ Pa = \frac{N}{m^2}$$

Pascal's Law

• Pascal's law (also Pascal's principle or the principle of transmission of fluid-pressure) is a principle given by *Blaise Pascal* that states that *"A pressure change at any point in a confined incompressible fluid is transmitted throughout the fluid such that the same change occurs everywhere"*.
• It was given in *1653* and published in *1663*.

$$1\ atm = 1.013 \times 10^5\ Pa$$
$$1\ atm \approx 1.01325\ bar$$
$$1\ N = 10^5\ Dyne$$

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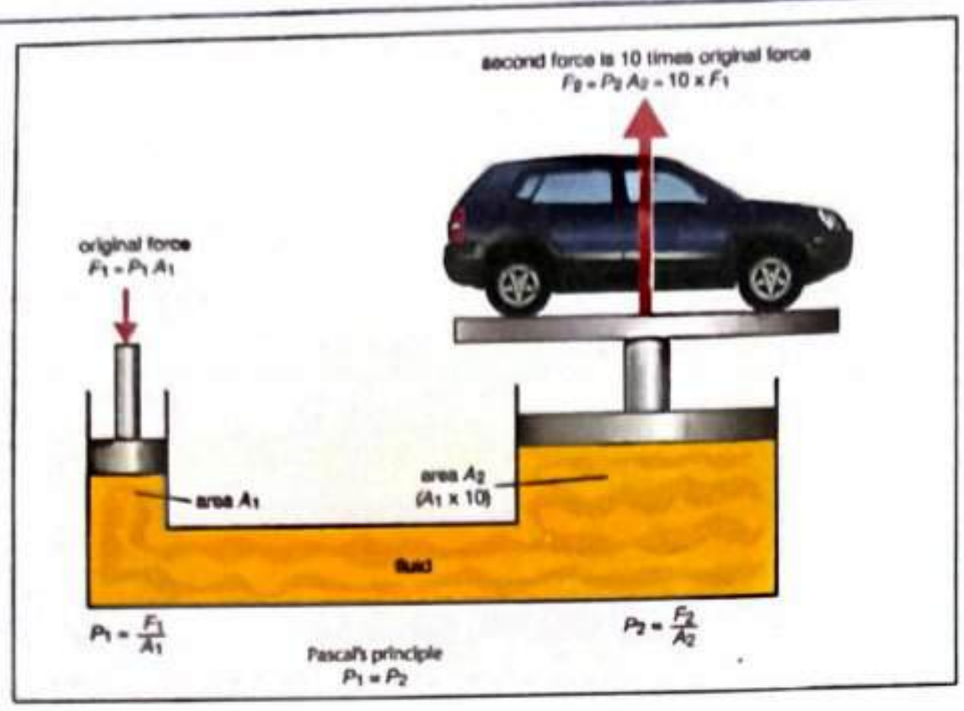


$$P_1 = \frac{F_1}{A_1} \qquad P_2 = \frac{F_2}{A_2}$$

$$P_1 = P_2$$

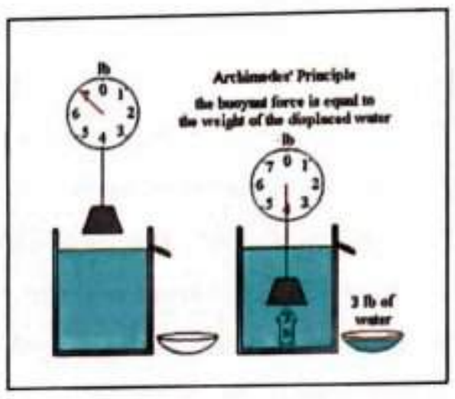
$$\frac{F_1}{A_1} = \frac{F_2}{A_2}$$

Archimedes' Principle

• Archimedes' principle states that *"The upward buoyant force that is exerted on a body immersed in a fluid whether fully or partially is equal to the weight of the fluid that the body displaces"*.

$$F_b = \rho g V$$

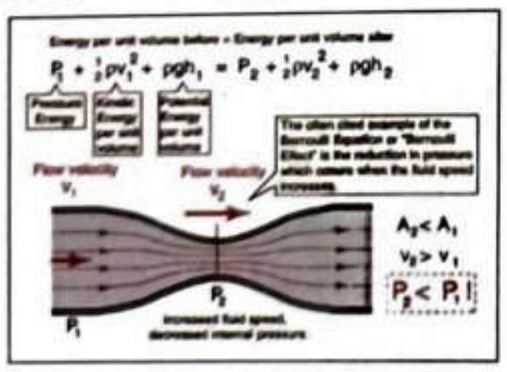
F_b = *Buoyant force*
ρ = *Fluid density*
g = *Acceleration due to gravity*
V = *Fluid volume*



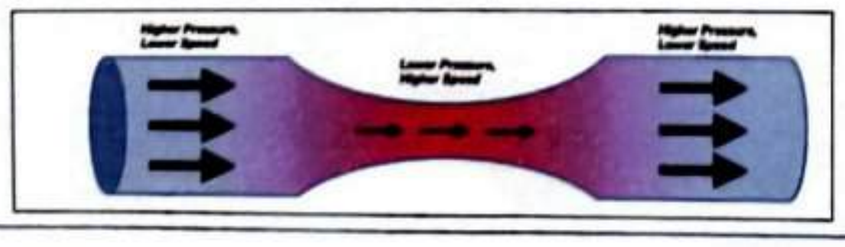
E.g. A ship will float higher in saltwater than in freshwater because the denser saltwater exerts a greater buoyant force, requiring the ship to displace less volume of water to remain afloat. The same principle applies to a person swimming, who will feel lighter and easier to float in saltwater.

Bernoullis Principle

• Bernoulli's principle is a key concept in fluid dynamics. It states that *"In a streamlined flow of incompressible, non-viscous fluid, the sum of pressure energy, kinetic energy, and potential energy per unit volume remains constant"*.



Pressure energy + Kinetic energy + Potential energy = Constant



Relative Density

• Relative density is the ratio of the density of a substance to the density of a reference substance (usually water for liquids and solids).

$$\text{Relative Density} = \frac{\text{Density of a Substance}}{\text{Density of Water}}$$

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

• *S.I. unit of density is Kg/m^3.*
• *Relative Density has no S.I. unit.*

Substance	Density, g/mL
Hydrogen (gas)	0.000089
Carbon dioxide (gas)	0.0019
Cork	0.21
Oak wood	0.71
Ethyl alcohol	0.79
Water	1.00
Magnesium	1.74
Table salt	2.16
Sand	2.32
Aluminum	2.70
Iron	7.86
Copper	8.92
Lead	11.34
Mercury	13.59
Gold	19.3

Table 1: Common densities of few substances

WORK AND ENERGY

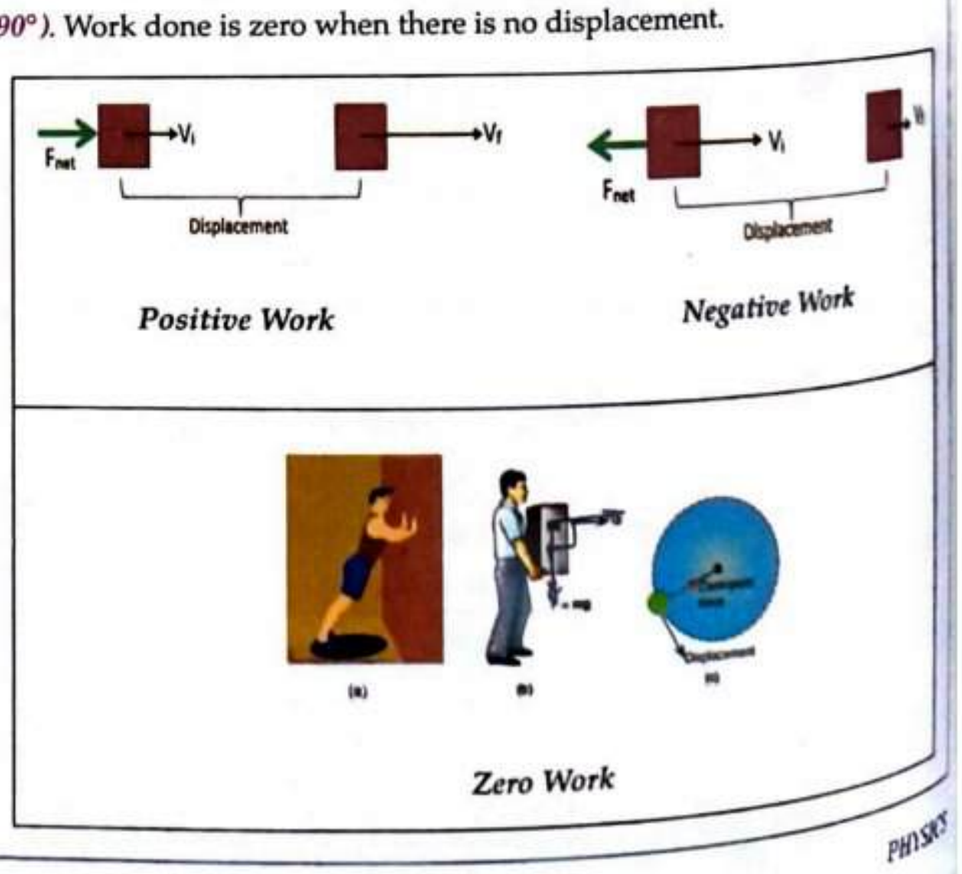
Work

• "Work" is defined as the energy transferred by a force that causes an object to move a certain distance in the direction of the force. The S.I. unit is *Joule (J)* which is equivalent to *Newton-meter (Nm)*.

Work Done = Force × Displacement
Work Done = FS cos θ

• *Work done is a scalar quantity.*
• *The S.I. unit of energy is Joule. It is named after English physicist James Prescott Joule.*

• Work done is *positive* when force and displacement have *same direction* (are parallel to each other).
• Work done is *negative* when force and displacement are in *opposite directions (anti-parallel, angle 180°)*.
• Work done is *zero*, when force and displacement are *perpendicular (angle = 90°)*. Work done is zero when there is no displacement.



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Energy

• Energy is defined as the *capacity to do work*, or the ability to cause change. It may exist in potential, kinetic, thermal, electrical, chemical, nuclear, or other various forms.

• S.I. unit of energy is *Joule (J)*. Biggest source of energy is the Sun.

Forms of Energy

Kinetic Energy

• Kinetic energy refers to the energy possessed by an object due to its *motion*.

$$K.E. = \frac{1}{2} mV^2$$

m = Mass
V = Velocity

Relationship between K.E. and Linear Momentum (p)

$$K.E. = \frac{1}{2} mV^2 \times \frac{m}{m}$$

$$= \frac{(mV)^2}{2m}$$

$$K.E = \frac{p^2}{2m}$$

$$p = mV$$

When Momentum is Doubled

• *If momentum (p) doubles, the kinetic energy (K. E.) becomes 4 times.*

$$K.E. = \frac{(2p)^2}{2m} = \frac{4p^2}{2m}$$

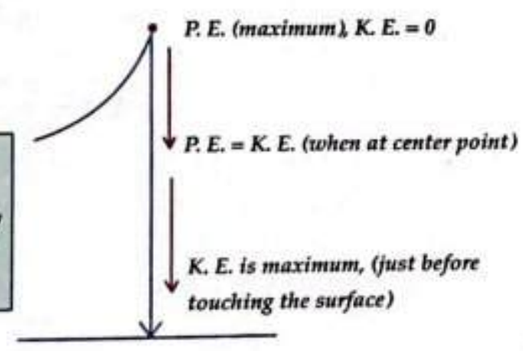
Potential Energy

• Potential energy (P. E.) is stored energy that an object has because of its position or state, ready to be released and do work. ***E.g. Gravitational P. E.***

• The concept of a dam is fundamentally based on potential energy (P.E.), where the stored water at a height possesses potential energy that can be converted into kinetic energy (motion) and used in *turbines* to generate *electricity* or for other purposes.

$$P.E. = mgh$$

m = Mass of the body
g = Acceleration due to gravity
h = Height



Escape Velocity

• The velocity needed for a body to escape from a gravitational centre of attraction without undergoing any further acceleration. ***E.g. Imagine throwing a ball upwards, if you throw it lightly, it comes back down due to gravity; however, if you throw it with a high enough velocity, it will escape Earth's gravity and never return.***

• Escape velocity is approx. *11.2 km/s*.

Law of Conservation

• The law of conservation of energy states that *"Energy can neither be created nor be destroyed. Although, it may be transformed from one form to another"*.

• The *1st Law of Thermodynamics* is based on this concept.

1. ***Dynamo:*** It converts *mechanical energy* into *electrical energy*.
2. ***Generator:*** It converts *mechanical energy* into *electrical energy*.
3. ***Motor:*** It converts *electrical energy* into *mechanical energy*.
4. ***Microphone:*** It converts *sound energy* into *electrical energy*.
5. ***Loudspeaker:*** It converts *electrical energy* into *sound energy*.
6. ***Photosynthesis:*** Process by which plants, algae, and some bacteria convert *light energy* (primarily from sunlight) into *chemical energy* in the form of sugars, using carbon dioxide and water, and releasing oxygen as a byproduct.
7. ***Battery:*** It converts *chemical energy* into *electrical energy*.
8. ***Bulb:*** It converts *electrical energy* primarily into *light energy* and *heat energy*. Bulb filament is made of *Tungsten (W)*.

Mechanical energy is defined as the total amount of potential energy (P.E) and kinetic energy (K.E) an object possesses.

Melting Point : 3422°C

Laws of Thermodynamics

Zeroth Law of Thermodynamics

• It states that *"If body A in thermal equilibrium with B, and B is in thermal equilibrium with C, then A is also in thermal equilibrium with C"*.

First Law of Thermodynamics

• It states that *"Energy can neither be created nor be destroyed only converted from one form to another"*.

• It is the law of conservation of energy applied to heat.

Formula: $Q = \Delta U + W$

Zeroth law was given by Ralph H. Fowler in 1931.

Q = Heat added to the system
ΔU = Change in internal energy
W = Work done by the system

Second Law of Thermodynamics

• Heat cannot flow from a colder body to a hotter body on its own.

• It introduces the concept of *entropy* (disorder).

E.g. Heat engine can't be 100% percent efficient, refrigerator requires external work to transfer heat from cold to hot.

Third Law of Thermodynamics

• As temperature approaches absolute zero (0 K), the entropy of a perfect crystal becomes *zero*.

Entropy, the measure of a system's thermal energy per unit temperature that is unavailable for doing useful work.

Power

• Power is the *rate at which work is done* or the rate at which energy is transferred from one place to another or transformed from one type to another. The S.I. unit of power is *Watt (W)*.

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$$Power = \frac{Work}{Time}$$

$$Power = Force \times Velocity$$

$$P = FV$$

A watt (W) is a unit of power, specifically defined as one joule of energy transferred or converted per second (1 J/s).

Horse Power

- Horsepower *(hp)* is a unit of *measurement of power*, or the rate at which work is done, often used to describe the output of engines or motors.

$1\ hp = 746\ W$

$1\ hp = 0.746\ kW$

$1\ kW = 1000\ W$

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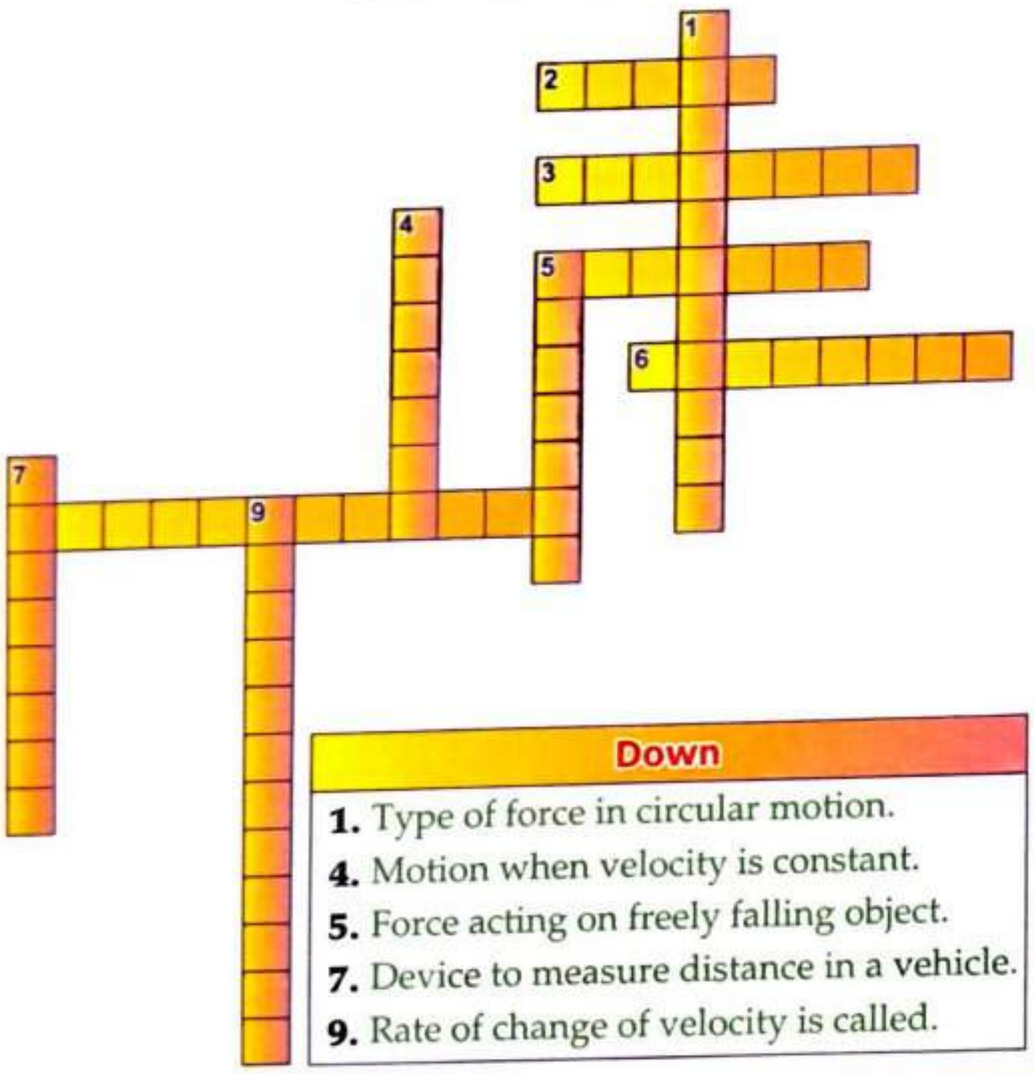
MOTION



Down

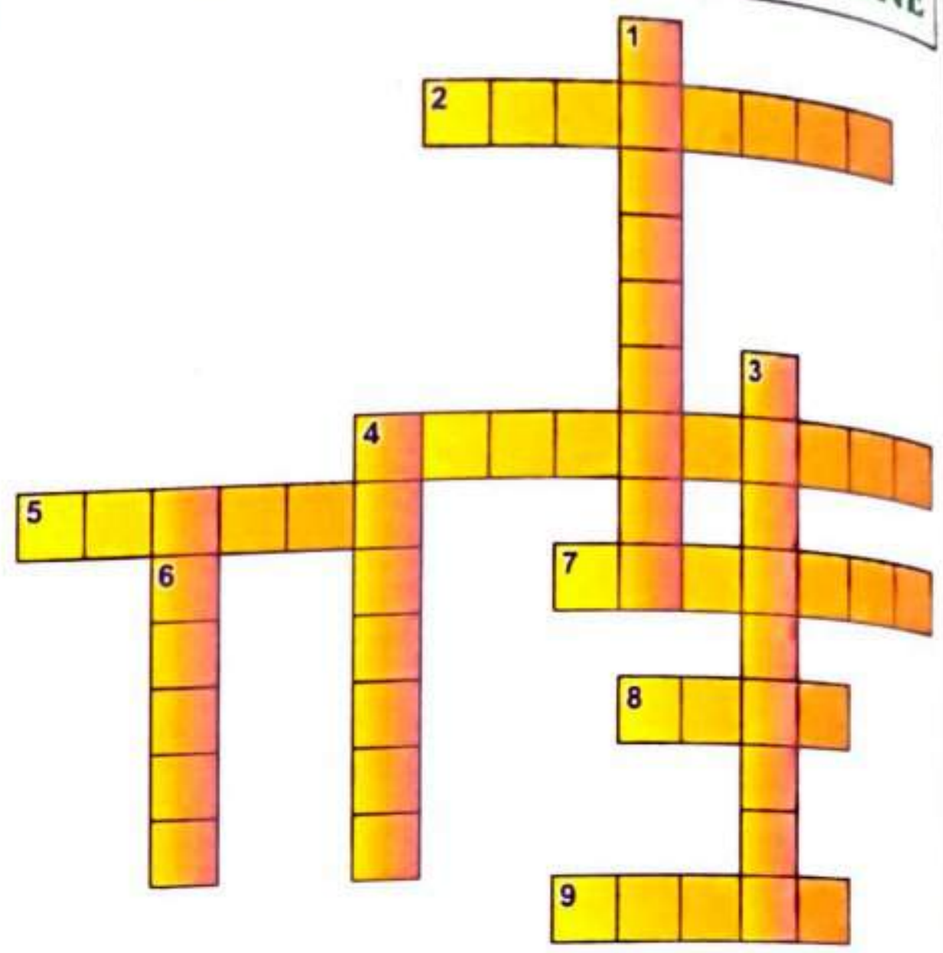
1. Type of force in circular motion.
4. Motion when velocity is constant.
5. Force acting on freely falling object.
7. Device to measure distance in a vehicle.
9. Rate of change of velocity is called.

Across

2. 'v' in centripetal acceleration equation stands for what.
3. Time graph that shows speed.
5. Discovered motion on inclined plane.
6. Quantity whose rate of change gives acceleration.
8. Area under velocity-time graph gives what.

PARMAR'S CROSSWORD

GRAVITATION AND WORK DONE



Across

2. Quantity conserved during propulsion.
4. First proved uniform fall of objects in vacuum.
5. Gave three laws of planetary motion.
7. Energy of falling coconuts and flying aircraft.
8. Introduced term 'horsepower'.
9. SI unit named after energy scientist.

Down

1. Principle involving fluid energy conservation.
3. Energy of water stored behind a dam.
4. Force responsible for free fall.
6. Law related to pressure in confined fluid.

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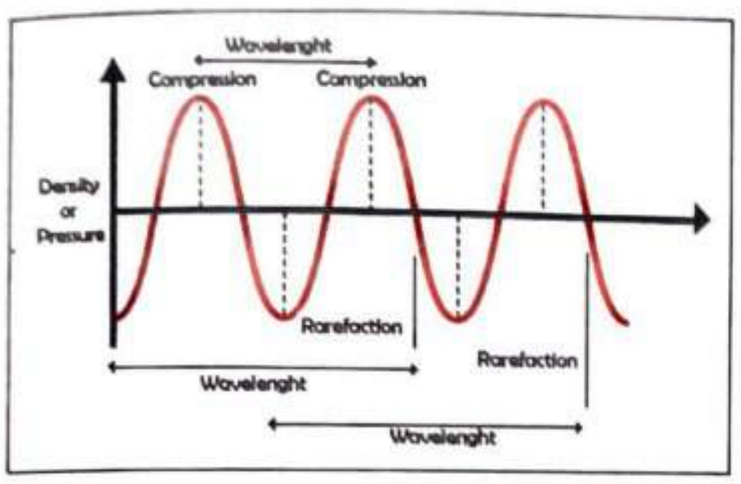
SOUND

• Sound is a form of energy, a vibration that travels through a medium (like air, water, or solids) as a *mechanical wave*, and is perceived by the human ear as an audible sensation.

• Sound is produced when an object vibrates, creating a *pressure wave*. This pressure wave causes particles in the surrounding medium (air, water, or solid) to have vibrational motion.

• As the object vibrates back and forth, it creates areas of *high pressure* (compressions) and *low pressure* (rarefactions) in the medium.



Sound in Different Media

• *Air:* Sound travels as *longitudinal waves* in air, where the vibrations are parallel to the direction of wave propagation.

• *Water:* Sound also travels as *longitudinal waves* in water.

• *Solids:* Sound can travel as *both longitudinal* and *transverse waves* in solids.

Speed of Sound

• Sound travels fastest in solids, slower in liquids, and slowest in gases.

Solid > Liquid > Gas

The particles in solids are tightly packed and can transfer energy (sound) quickly, leading to faster propagation.

Speed of Light = 3×10^8 m/s
Speed of light is more than speed of sound (343 m/s)

State	Substance	Speed in m/s
Solids	Aluminium	6420
	Nickel	6040
	Steel	5960
	Iron	5950
	Brass	4700
	Glass (flint)	3980
Liquids	Water (sea)	1531
	Water (distilled)	1498
	Ethanol	1207
	Methanol	1103
Liquids	Hydrogen	1284
	Helium	965
	Air	346
	Oxygen	316
	Sulphur dioxide	213

Table 1: Speed of Sound in Different Medium

Sound wave cannot be polarised, but light wave can.

Sound Waves

• Sound waves are disturbances that travel through a medium (like air, water, or solids) as a result of vibrations.

• ***Types of Waves:*** *Mechanical Waves* and *Non-Mechanical Waves.*

Mechanical Waves	*Non-Mechanical Waves*
Medium is required to propagate	No medium is required to propagate
E.g. Sounds waves	*E.g. Light waves*

Types of Mechanical Waves

1. ***Transverse Waves:*** Transverse waves are waves that moves *perpendicularly to the direction of its propagation.* This means that the wave forms a right angle with the direction it travels. e.g. ***Light.***
2. ***Longitudinal Waves:*** Longitudinal waves are waves where the particles of the medium vibrate *parallel to the direction of its propagation*, e.g. ***sound waves or pressure waves.***

λ = Wavelength

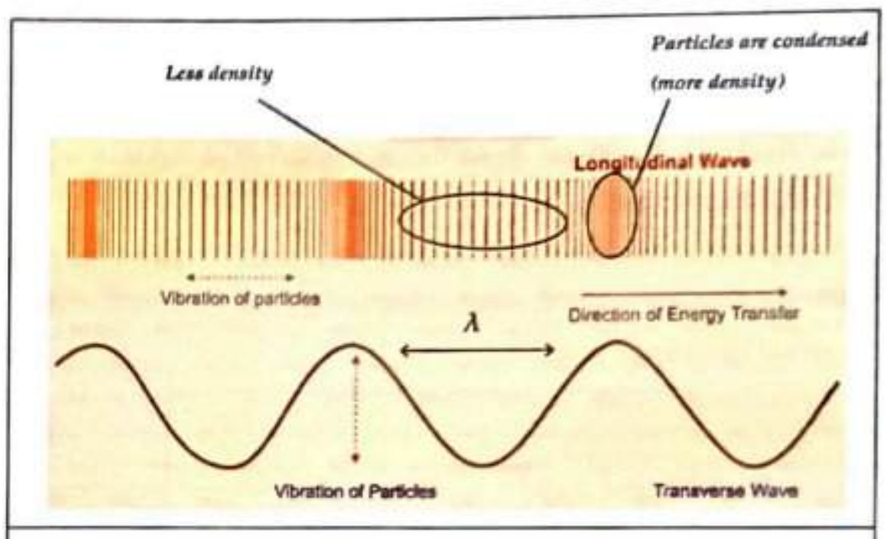


Fig 1: Longitudinal and Transverse Waves

Compression in a longitudinal wave is a region where the particles are the closest together while rarefaction in a longitudinal wave is a region where the particles are spread out.

Characteristics of Sound Waves

Sound waves have several characteristics, including:

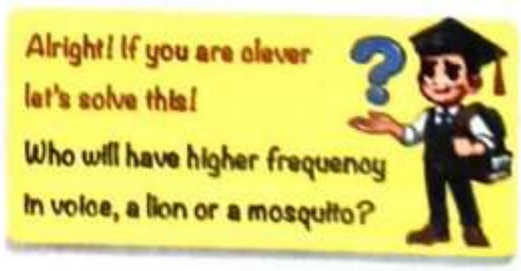
Frequency

• The number of times a sound wave cycles per second, which determines its pitch of the sound.

• Girls have high pitched voice, high shrillness (their vocal cords, vibrate quickly).

• The S.I. unit of frequency is s^{-1} or *Hertz*.

$$\text{Frequency } (\nu) = \frac{1}{\text{Time}}$$



• A high pitch sound has *faster vibrations* and *higher wave frequency*. A low pitch has *slower vibrations* and a *lower wave frequency* of the sound.

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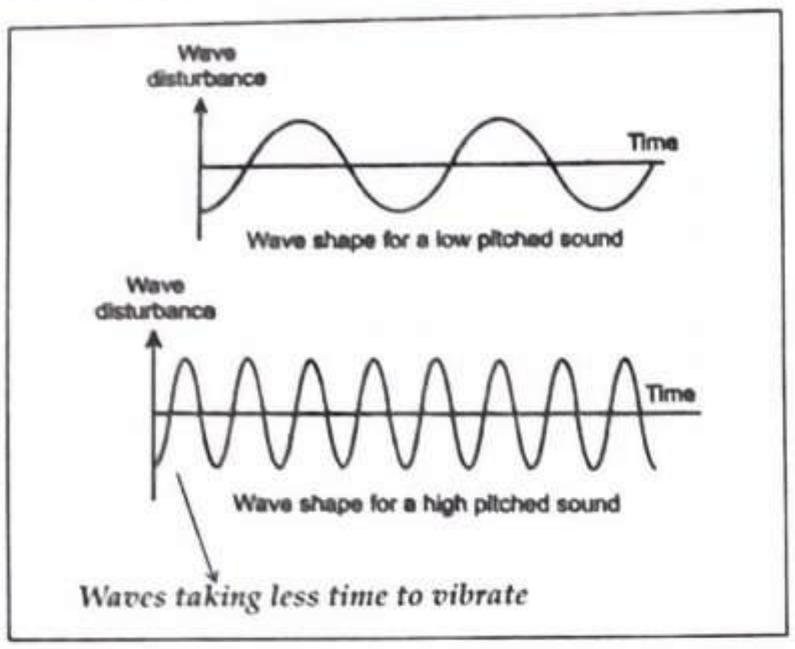


Amplitude

• Amplitude is the maximum displacement of vibrating particles from their mean (equilibrium) position. It represents the loudness (intensity) of a sound wave.

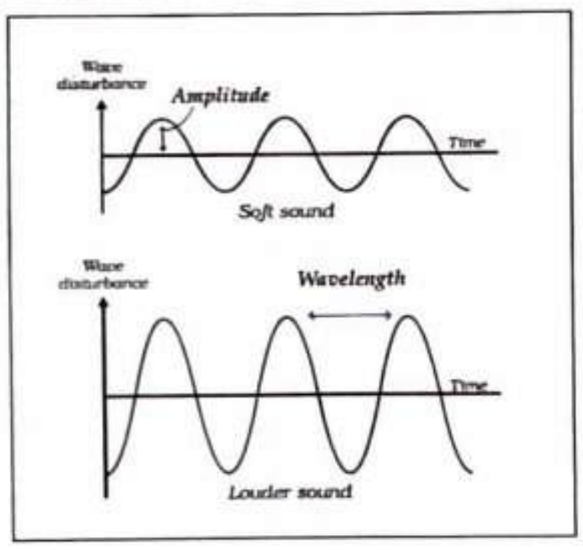
• ***Greater amplitude = louder sound.***

• Unit: *Metre (m)* in the S.I. system

• *Decibel (dB)*: Unit of sound intensity level.

• The range of sound intensities a human ear can generally perceive is from 0 to 130 decibels (dB). Sound above this is considered as noise.

• The amplitude of the sound wave depends upon the force with which an object is made to vibrate. If we strike a table lightly, we hear a soft sound because we produce a sound wave of less energy (amplitude). Conversly, a loud sound has a large amplitude.



Timbre *(Tone Quality/Tone Color)*

• Timbre is the quality of a sound that distinguishes it from other sounds having the *same pitch* and *loudness.*

Note

• Note is produced due to a mixture of *several frequencies* (fundamental + overtones), not just a single frequency.

Audible Range

• The audible range is the range of sound frequencies that humans can hear, which is from *20 Hz to 20,000 Hz (20 kHz)*.

→ ***Infrasonic:*** Sounds *below 20 Hz* that humans can't hear. Many animals can hear infrasonic sounds. E.g. sounds produced by earthquakes.

→ ***Ultrasonic:*** Sounds *above 20,000 Hz* that humans can't hear.

Applications of Ultrasonic Sounds:

• It is produced by bats and dolphins.

• Ultrasound is banned in gender determination.

• It is used to monitor growth and development of foetus.

• It is used to identify kidney stones and to break kidney stones.

• It is used to identify the conditions of our internal organs.

Mach Number

• Mach number is the ratio of the speed of an object to the speed of sound in the surrounding medium.

$$\textit{Mach No.} = \frac{\textit{Speed of a Body}}{\textit{Speed of Sound in that Medium}}$$

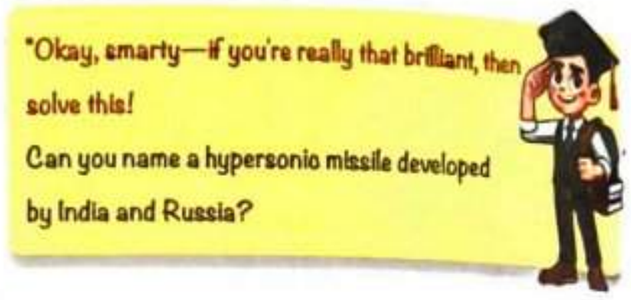
Speed of Objects Based on Mach Number

• *Subsonic: <1*

• *Supersonic: 1 to 5*

• *Hypersonic: >5*

• *Transonic: ≈1*

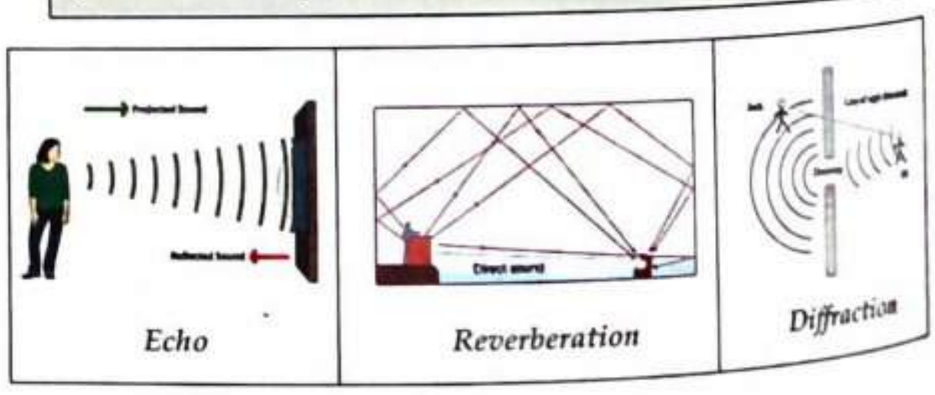


Reflection of Sound

• Reflection of sound can be defined as the *bouncing back of sound waves after striking the surface* and within the same media. This medium can be either solid or liquid. Similar to light, sound also follows the same laws of reflection. It gives rise to phenomena like Echo, Reverberations, and Diffraction.

- *Echo:* An echo is the reflected repetition of a sound that occurs when *sound waves bounce off a surface and return to the listener,* allowing the sound to be heard again after the original has faded.
- *Reverberation:* It is the *continued presence of sound in an enclosed space* even after the original sound source has stopped. This occurs due to repeated reflections of sound waves from surfaces like walls, ceilings, and furniture, causing the sound to linger before gradually fading away as it gets absorbed.
- *Diffraction:* Diffraction is the *bending of sound waves* as they move around obstacles or through small openings. This allows us to hear sounds even when the source is hidden from view.

For hearing distinct echoes, the minimum distance of the obstacle from the source of sound must be at least 17.2 m.



SONAR (Sound Navigation and Ranging)

• It is a a technology that uses *sound waves to detect and locate objects underwater.* It's used for a variety of purposes, including navigation communication, and mapping.

• It emits sound waves and *analyses the echoes* that bounces back.

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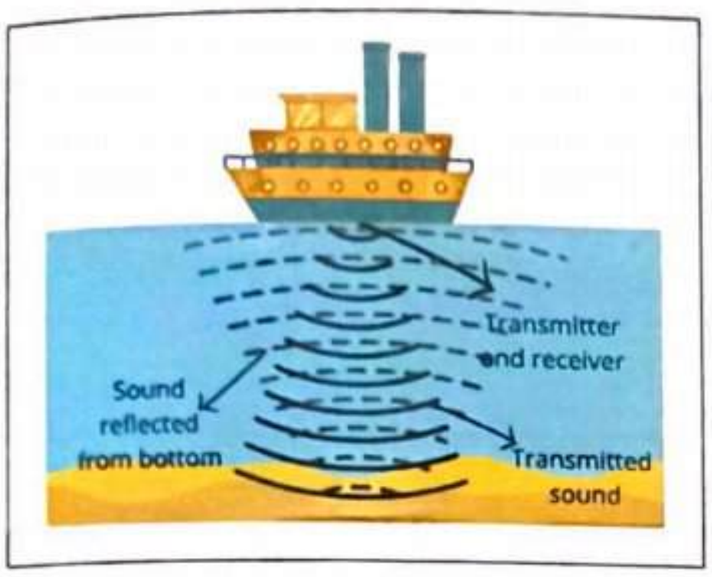


- *Velocity of Sound in moist air is greater than the velocity of sound in dry air.*
- *Sound cannot travel through a vacuum because it requires a medium, like air, water, or solids, to propogate.*

Doppler Effect

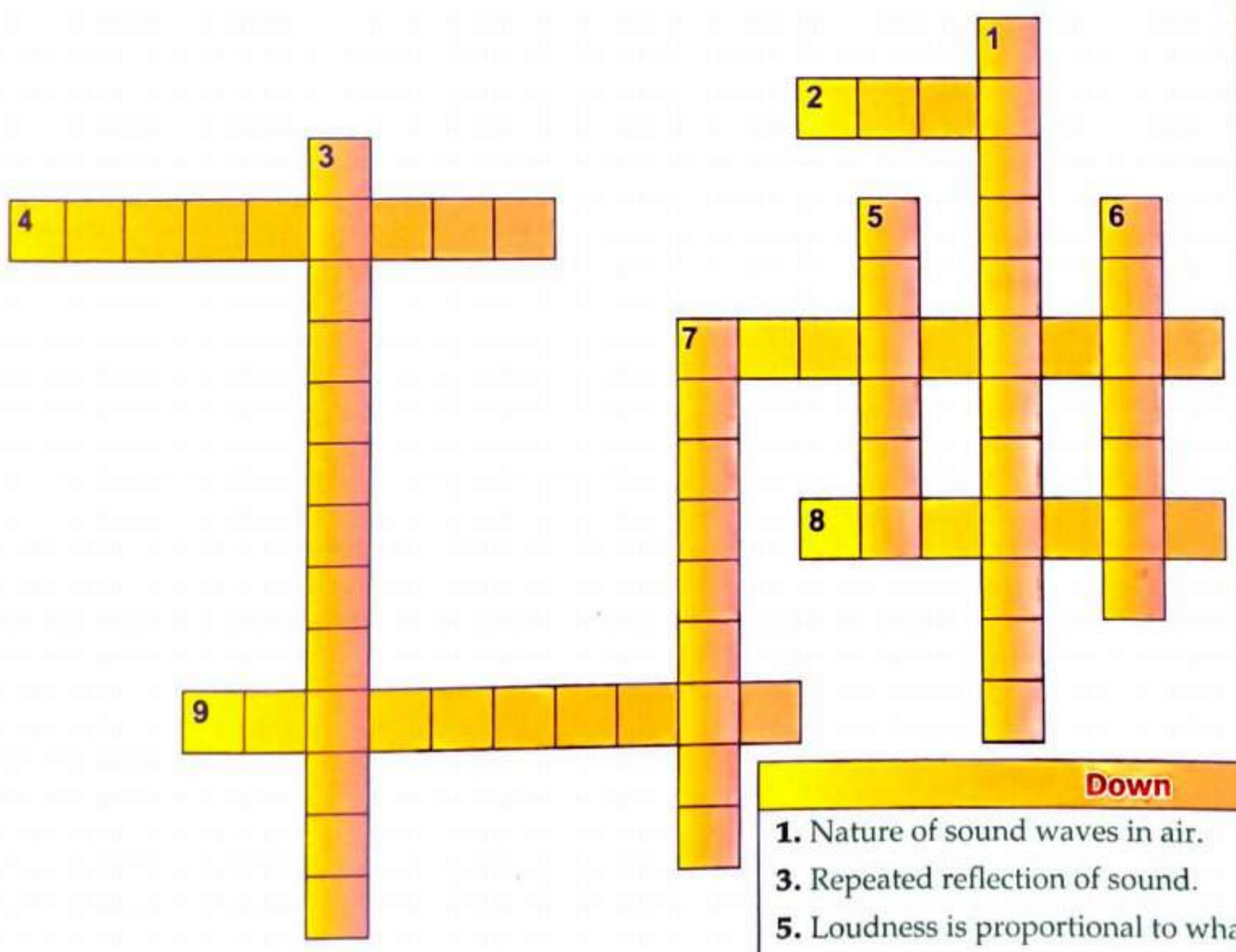
- The Doppler effect is the change in frequency or wavelength of a wave as perceived by an observer who is moving relative to the source of the wave.

$$f_o = \frac{v + v_o}{v + v_s} f_s$$

f_o = *Observer frequency of sound*
v = *Speed of sound wave*
v_o = *Observer velocity*
v_s = *Source velocity*
f_s = *Actual frequency of sound wave*

PARMAR'S CROSSWORD

SOUND



Across

2. Caused by reflected sound.
4. Number of oscillations per second.
7. Study of sound and its propagation.
8. Unit of sound loudness.
9. Type of wave used by bats.

Down

1. Nature of sound waves in air.
3. Repeated reflection of sound.
5. Loudness is proportional to what of amplitude.
6. Converts pressure variations to electrical signals.
7. Medium where sound speed is highest.

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LIGHT

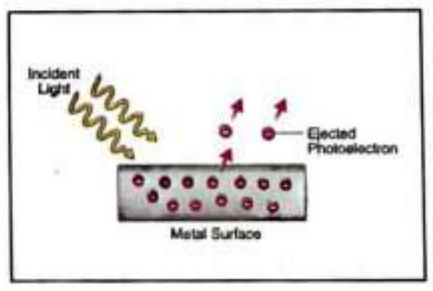
- Light is defined as a form of electromagnetic radiation, specifically the part of the electromagnetic spectrum that is visible to the human eye.
- Light has *dual nature* (Light exhibits both wave-like and particle-like characteristics).
- Light can also be described as a stream of particles called *photons*, which carry energy.
- Light travels at a constant speed in a vacuum, *approx.* 3×10^8 *m/s*.
- Light is a *form of transverse wave* that travels in vacuum.
- Light can be *polarized*.

Young's Double-Slit Experiment

- It was performed in *1801* by *Thomas Young, demonstrates the wave-like nature of light*, showing that light can interfere with itself, creating an interference pattern of bright and dark fringes.

Photoelectric Effect

- The photoelectric effect is a phenomenon where electrons are emitted from the metal surface when light of sufficient frequency is incident upon it.
- This effect led to the conclusion that light is made up of *packets or quantum of energy*.
- *Heinrich Rudolf Hertz* was the first to observe the photoelectric effect in *1887*.
- In *1905, Albert Einstein* proposed the existence of photons, *discrete packets of energy*, to explain the photoelectric effect and other light-related phenomena (received Nobel Prize in *1921*).

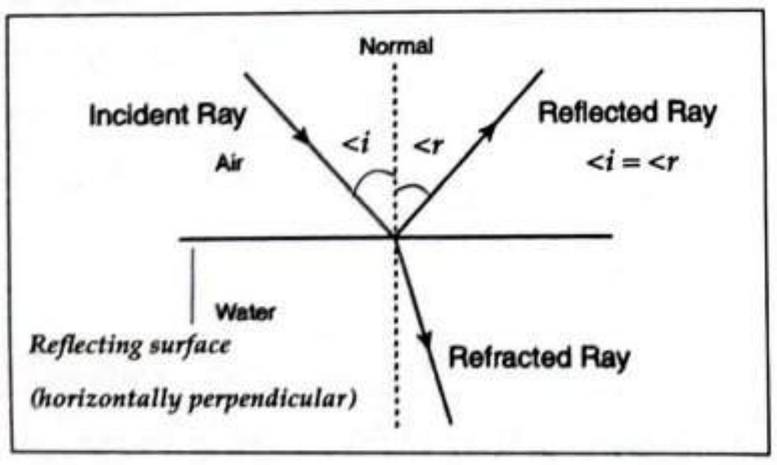


Reflection of Light

- Reflection occurs when light rays strike a surface and change direction, returning to the same medium instead of passing through or being absorbed.

Laws of Reflection

1. The *angle of incidence (i)* is equal to the *angle of reflection (r)*.
2. The incident ray, reflected ray, and the normal *all lie in the same plane*.



SPHERICAL MIRRORS

There are different types of mirrors and they are broadly classified as:

→ *Plane Mirrors, Concave Mirrors, Convex Mirror.*

Type	*Description*	*Image Nature*
Plane Mirror	Flat mirror	Virtual, erect, laterally inverted
Concave Mirror	Reflecting surface curves inward	Real/Inverted or Virtual/Erect depending on object position
Convex Mirror	Reflecting surface curves outward	Always Virtual, erect, and diminished

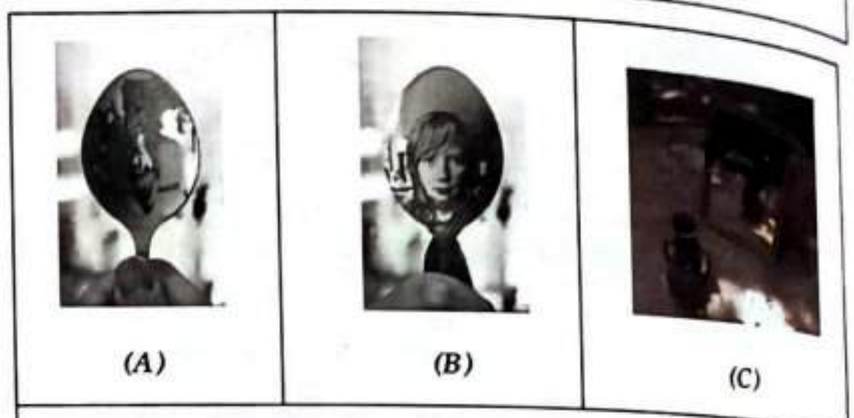
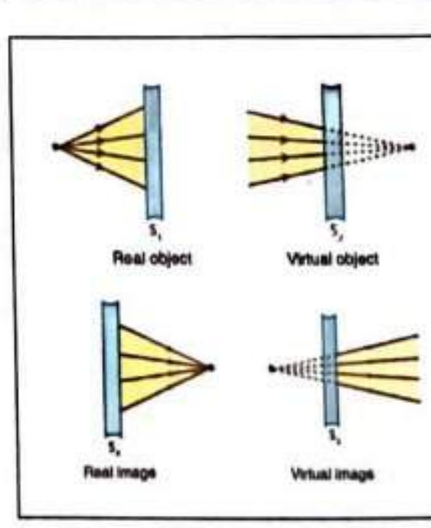


Fig 1: Image Formation in (A) Concave Mirror; (B) Convex Mirror; (C) Plane Mirror

- Images are classified as *either real or virtual*, based on whether light rays actually converge to form the image, or only appear to diverge from a point.

Types of Image:

Real Image	*Virtual Image*
Can be projected on a screen	Cannot be projected on a screen
Formed when light rays actually converge and intersect after reflection or refraction	Formed when light rays appear to diverge from a point, but do not actually intersect
Always inverted (upside down)	Always upright (right side up).
Formed by concave mirrors and convex lenses	Formed by convex mirrors, concave lenses, and plane mirrors



Real objects are points from which light diverges. Virtual objects are points towards which light converges.

Image Formation in Plane Mirror

- ***Virtual Image:*** The image *cannot be projected onto a screen* and is formed *behind the mirror*.
- ***Erect Image:*** The image is *upright* (not inverted), i.e., it has the *same orientation as the object*.
- ***Lateral Inversion:*** The left and right sides of the object appear *interchanged in the image*.

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• ***Same Size:*** The image and object have the *same size*.

• ***Equal Distances:*** The distance between the *object* and the *mirror* is equal to the distance between the *image* and the *mirror*.

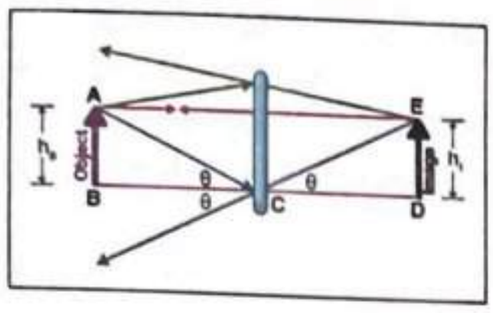


Image Formation by Concave Mirror

• A concave mirror can form both real and virtual images.

Object Position	*Image Position*	*Nature*	*Image Size*
At infinity	At focus	Real, inverted	Highly diminished
Beyond C	Between C & F	Real, inverted	Diminished
At C	At C	Real, inverted	Same size
Between C & F	Beyond C	Real, inverted	Enlarged
At F	At infinity	Real, inverted	Highly enlarged
Between F & P	Behind mirror	Virtual, erect	Enlarged

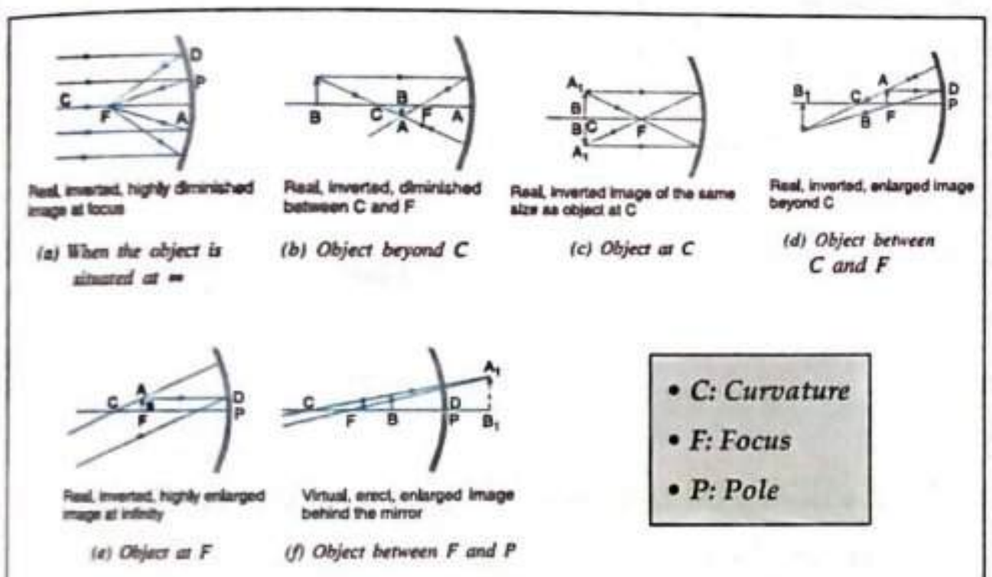


Fig 2: Image Formed by a Concave Mirror

Image Formation by Convex Mirror *(Diverging in Nature)*

• A convex mirror forms an image that is always *virtual, erect,* and *diminished* (regardless of the object's position) and appears behind the mirror.

Object Position	*Image Position*	*Nature*	*Image Size*
At infinity	At F, behind the mirror	Virtual, erect	Highly diminished, point-sized
Between infinity and P of the mirror	Between P and F behind the mirror	Virtual, erect	Diminished

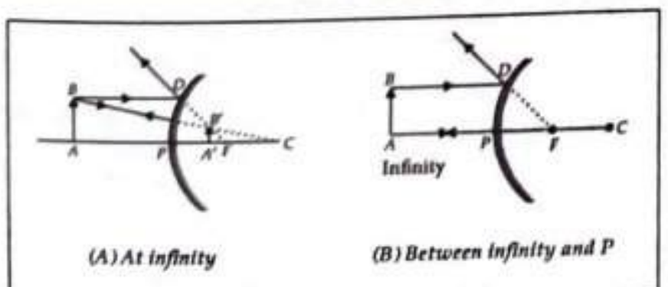


Fig 3: Image Formed by a Convex Mirror

Sign Convention in Spherical Mirror

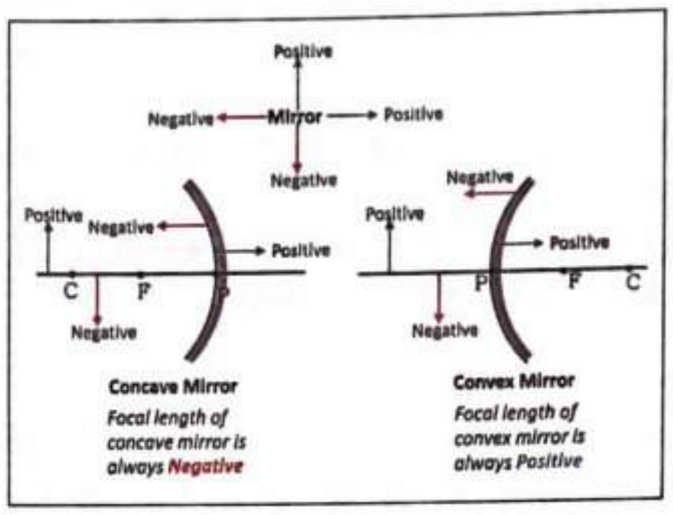
• All distances are *measured from the pole* of the mirror.

• Distances to the right of the pole are considered *positive*.

• Distances to the left of the pole are considered *negative*.

• Distances above the principal axis are considered *positive*.

• Distances below the principal axis are considered *negative*.



In Spherical Mirrors

• ***Object Distance (u):*** Always *negative* (since the object is placed in front of the mirror).

• ***Image Distance (v):***

→ **Concave mirror:** Real image (v is *negative*) and virtual image (v is *positive*).

→ **Convex mirror:** Image is always virtual and v is *positive*.

• ***Focal Length (f):*** Concave mirror (f is *negative*) and convex mirror (f is *positive*).

• ***Radius of Curvature (R):*** Same sign as focal length *(R = 2f)*.

Mirror Formula

$$\frac{1}{v}+\frac{1}{u}=\frac{1}{f}$$

$$\text{Magnification of Mirrors} = \frac{h_i}{h_o} = \frac{-v}{u}$$

Let's see what it means! →

M = 2 (image size is twice the size of an object)
M = -2 (image is real and inverted)
M = 0.2 (image size is smaller than the object)

Questionnaire

An object 4.0 cm in size, is placed 25.0 cm in front of a concave mirror of focal length 15.0 cm. At what distance from the mirror should a screen be placed in order to obtain a sharp image ? Find the nature and the size of the image.

Sol: ***Given***

Object height (h_o) = 4.0 cm

Object distance (u) = –25.0 cm (object is in front → negative)

Focal length (f) = –15.0 cm (concave mirror → negative)

$$\frac{1}{v}+\frac{1}{u}=\frac{1}{f} \qquad \frac{1}{v}=\frac{1}{-15}+\frac{1}{25}$$

$$\frac{1}{v}+\frac{1}{-25}=\frac{1}{-15} \qquad \frac{1}{v}=\frac{-5+3}{75}=\frac{-2}{75}$$

$$v = -37.5\ cm$$

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$M = \frac{v}{u} = \frac{-37.5}{-25} = 1.5$ *Image Height* $(h_i) = M \times h_o = 1.5 \times 4 = 6$ *cm*

Conclusion:

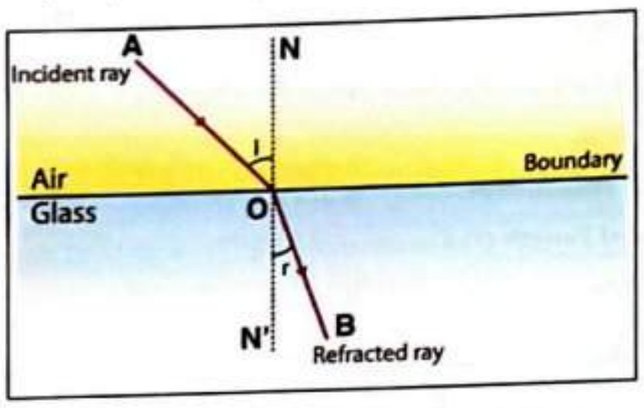
- ***The image is real (since image is formed on the same side as the object) and inverted (magnification is positive but real images in concave mirrors are inverted).***

Uses of Spherical Mirrors

- ***Concave Mirror:*** Shaving and dentist mirrors, car headlights, telescopes, solar furnace, etc.
- ***Convex Mirror:*** Rear view mirrors in vehicles, security monitors in ATMs and stores, surveillance mirrors, sunglasses, etc.

Refraction of Light

- The refraction of light is the bending of light rays as they pass from one medium to another, thereby causing a change in its speed and direction. Refraction occurs *due to a change in the speed of the light ray or wave.*
- While the speed and wavelength of light changes as it moves into a different medium, the frequency, which is determined by the light source, remains constant.



- This bending by refraction makes it possible for us to have lenses, magnifying glasses, prisms and rainbows.

Laws of Refraction

1. The incident ray, the refracted ray and the normal at the point of incidence: *All lie in the same plane.*
2. The ratio of the sine of the angle of incidence (i) and sine of the angle of refraction (r) is *constant* (also known as *Snell's Law*).

$$\frac{\text{Sin } i \text{ (Angle of Incidence)}}{\text{Sin } r \text{ (Angle of Refraction)}} = \text{Constant} = \mu$$

**where μ (mu) is the refractive index of the second medium with respect to the first.*

Light has rectilinear motion (moves in a straight line).

Refractive Index (μ)

$$\mu = \frac{\text{Speed of light in vacuum}}{\text{Speed of light in medium}}$$

Types of Medium

1. ***Rare Medium:*** Light bends *away from the normal* when moving from a denser to a rarer medium.
2. ***Denser Medium:*** Light *bends toward the normal* when moving from a rarer to a denser medium.

Let's Take a Look At Three Cases

→ ***Case A: Same Medium (No Refraction)***

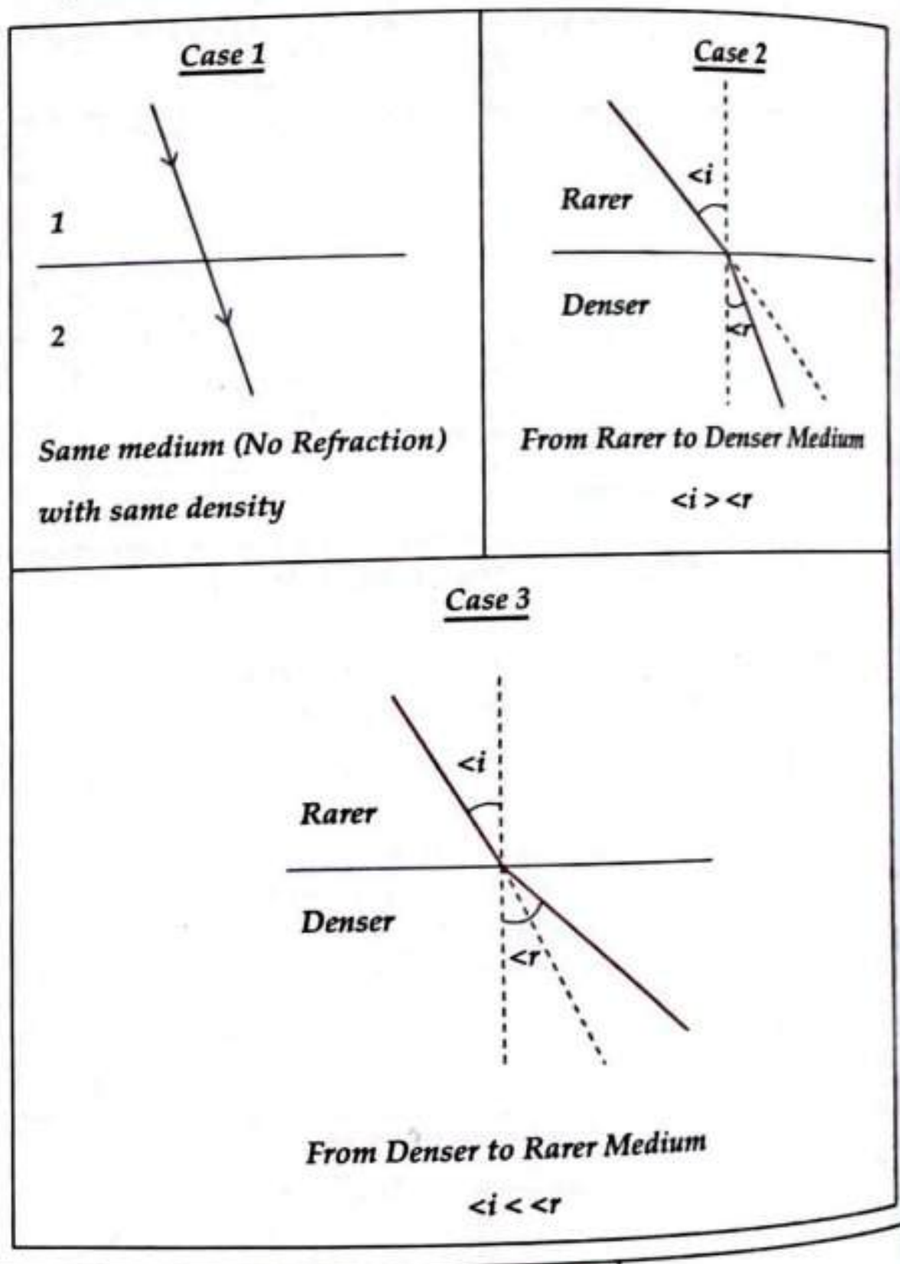
- When light travels through two mediums with the same optical density (E.g., air to air or water to water), it continues in a *straight line without bending.*
- This is because the *speed of light remains constant*, and there's no change in the direction of the light ray.

→ ***Case B: From Rarer to Denser Medium***

- When light travels from a rarer medium to a denser medium (E.g., air to glass or water), it *bends towards the normal* (the line perpendicular to the surface at the point of incidence).
- *<i is greater than <r.*
- The *speed of light decreases* in the denser medium.

→ ***Case C: From Denser to Rarer Medium***

- When light travels from a denser medium to a rarer medium (e.g., glass to air), it *bends away from the normal.*
- *<i is less than <r.*
- The *speed of light increases* in the rarer medium.



Material medium	Refractive index	Material medium	Refractive index
Air	1.0003	Canada Balsam	1.53
Ice	1.31		
Water	1.33	Rock salt	1.54
Alcohol	1.36		
Kerosene	1.44	Carbon disulphide	1.63
Fused quartz	1.46	Dense flint glass	1.65
Turpentine oil	1.47	Ruby	1.71
Benzene	1.50	Sapphire	1.77
Crown glass	1.52	Diamond	2.42

Table 1: Material Medium and their Refractive Index

**Speed of light in air/vacuum = 3×10^8 m/s.*

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Refraction Through Glass Slab

When light passes through a glass slab:

- It *bends towards the normal* on entering (air → glass, denser medium).
- It *bends away from the normal* on exiting (glass → air, rarer medium).
- The *emergent ray is parallel to the incident ray* but slightly shifted sideways → this is called *lateral displacement*.

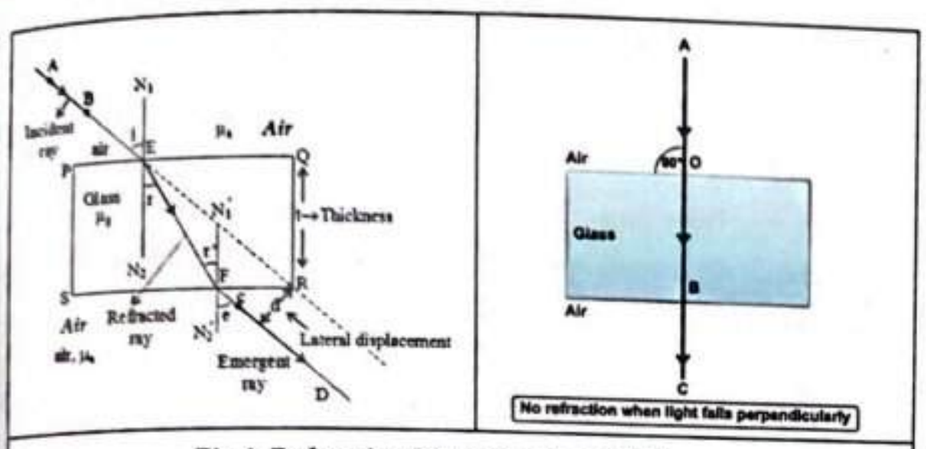
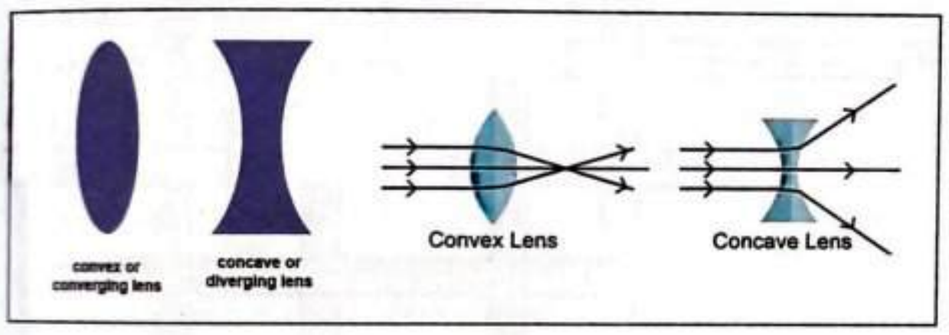


Fig 4: Refraction Through Glass Slab

SPHERICAL LENSES

Spherical Lenses

- Spherical lenses are optical devices with curved, spherical surfaces that refract (bend) light, either converging or diverging it. They are classified into two main types: *Convex (converging) and Concave (diverging) lens.*



→ *Convex Lens: Centre bulged, ends narrow*
→ *Concave Lens: Centre narrow, ends wider*
→ *Convex Lens = Concave Mirror*
→ *Concave Lens = Convex Mirror*

Image Formation by Convex Lens

- A convex lens (also called a converging lens) can form *real or virtual images* depending on the object's position.

Object Position	Image Position	Nature	Image Size
At infinity	At focus (F)	Real, inverted	Highly diminished
Beyond 2F	Between F and 2F	Real, inverted	Diminished
At 2F	At 2F	Real, inverted	Same size
Between F and 2F	Beyond 2F	Real, inverted	Enlarged
At focus (F)	At infinity	Real, inverted	Highly enlarged
Between F and O	On same side of the lens	Virtual, erect	Enlarged

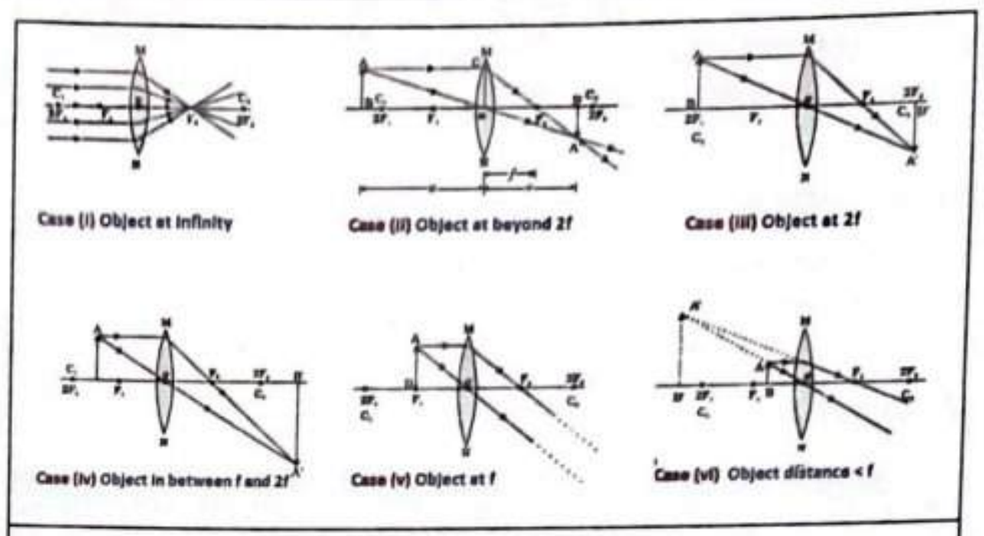


Fig 5: Image Formed by Convex Lens

Image Formation by Concave Lens

- A concave lens always forms a *virtual, erect, and diminished image,* regardless of the object's position.

Object Position	Image Position	Nature	Image Size
At infinity	At F	Virtual, erect	Highly diminished
Between infinity and O (center)	Between F and O	Virtual, erect	Diminished

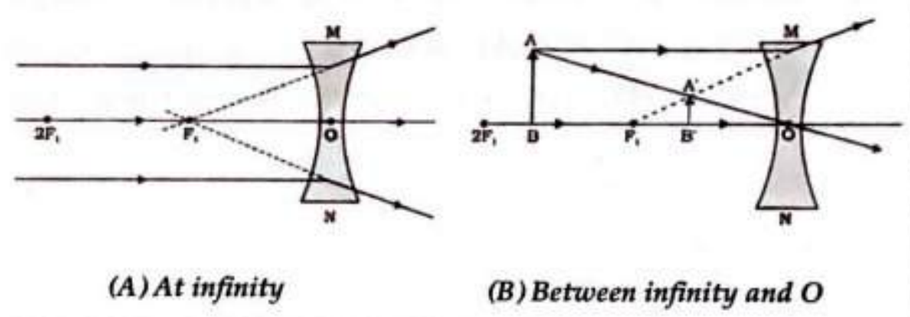


Fig 6: Image Formed by Concave Lens

Lens Formula = $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

f = Focal length of lens
v = Image distance from the lens
u = Object distance from the lens

Magnification (M) = $\frac{-v}{u}$

M = 1 (Image size = Object size)
M > 1 (Image is larger than object)
M < 1 (Image is smaller than object)

Uses of Lenses

- ***Convex lens:*** Used in eyeglasses to correct hypermetropia (farsightedness), magnifying glasses, microscopes, cameras, telescopes.
- ***Concave lens:*** Used in eyeglasses to correct myopia (nearsightedness)

Power of Lens

- Power of a lens is the *reciprocal of its focal length* (in meters).

$$Power\ (P) = \frac{100}{f_{(cm)}} = \frac{1}{f_{(m)}}$$

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S.I. Unit of Power

- The SI unit of power is the *dioptre (D)* → $1\ D = 1\ m^{-1}$.

Sign Convention

- Convex lens (converging) → *Positive power.*
- Concave lens (diverging) → *Negative power.*

Questionnaire

A concave lens has focal length of 15 cm. At what distance should the object from lens should be placed so that it forms an image at 10 cm from the lens? Also find the magnification of lens.

Sol:

Given

Focal length, $f = -15$ cm (concave lens → focal length is negative)

Image distance, $v = -10$ cm (virtual image formed on the same side as the object → also negative)

Object distance, $u = ?$

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{-10} - \frac{1}{u} = \frac{1}{-15}$$

$$\frac{1}{u} = \frac{1}{-10} - \frac{1}{-15}$$

$$\frac{1}{u} = -\frac{1}{10} + \frac{1}{15}$$

$$\frac{1}{u} = \frac{-3+2}{30}$$

$$\frac{1}{u} = -\frac{1}{30}$$

$$u = -30$$

$$\text{Magnification} = \frac{h_i}{h_o} = \frac{v}{u} = \frac{-10}{-30} = \frac{1}{3}$$

This means the image is virtual, erect, and 1/3 the size of the object (diminished).

Questionnaire

If the focal length of a convex lens is 5cm, concave lens is 10 cm, and convex lens is 2 cm respectively. What power do we get after adding all the focal length?

Sol:

Given

f of convex lens = +5 cm

f of concave lens = -10 cm

f of convex lens = +2 cm

$$P_1 = \frac{100}{5} = +20\ D$$

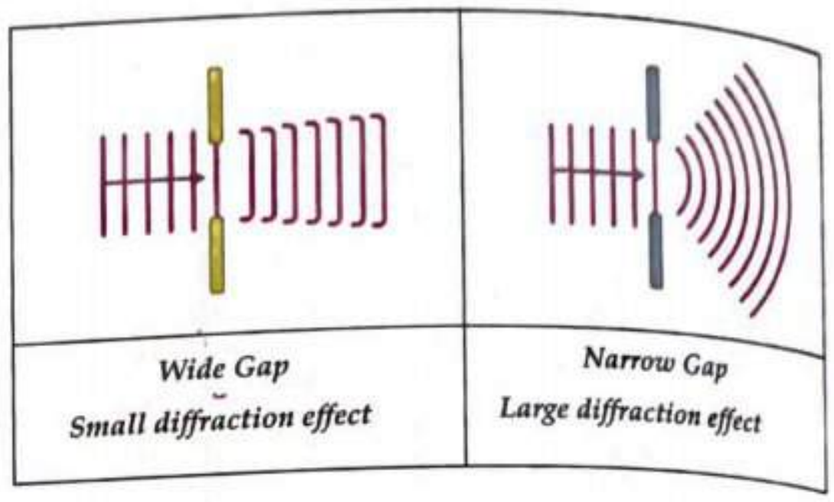
$$P_2 = \frac{100}{-10} = -10\ D$$

$$P_3 = \frac{100}{+2} = +50\ D$$

$$P_{total} = P_1 + P_2 + P_3 = 20 + (-10) + 50 = 60\ D$$

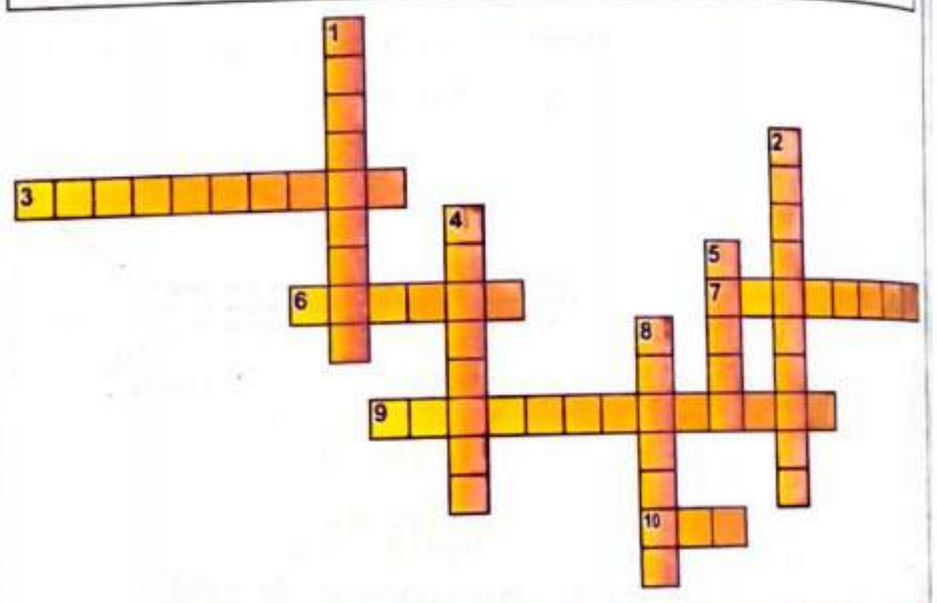
Diffraction

- Diffraction is the *bending or spreading of light* (or any wave) around the edges of an obstacle or through a small opening.



PARMAR'S CROSSWORD

REFLECTION AND REFRACTION



Across

3. Telescope invented by Newton.
6. Mirror used in rear-view of vehicles.
7. Diaphragm opening limiting light propagation.
9. Nature of white light.
10. Light with minimum energy in VIBGYOR.

Down

1. Phenomenon of rosy light on mountain tops.
2. Splitting of white light into colours.
4. Type of reflection on smooth surfaces.
5. Radiation with very short wavelength.
8. Unit of optical power.

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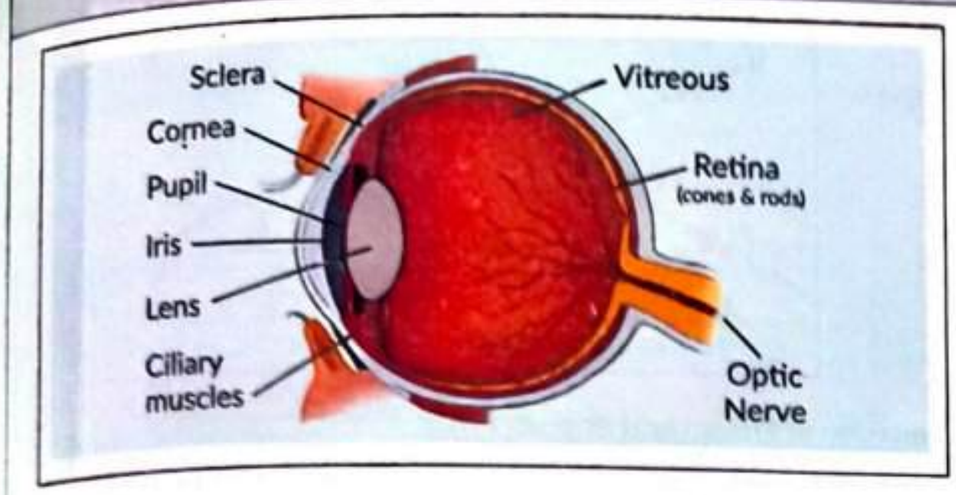
HUMAN EYE



Cornea

- It is the transparent and front part of human eye.
- It is responsible for the majority of the ***refraction*** (bending) of light as it enters the eye.
- In ***eye donation***, only cornea is used, not the entire eye.

Aqueous Humor

- It is the clear fluid between cornea and lens.
- It maintains pressure, nourishes the cornea and lens.

Iris ***(dark muscular diaphragm)***

- It is the coloured part of eye that surrounds the pupil.
- It controls the size of the ***pupil***.

Pupil

- It is a black circular opening in the center of the iris.
- It regulates the ***amount of light*** entering the eye.

Lens

- It is transparent and flexible structure.
- It focuses ***light ray onto the retina*** by changing shape ***(accommodation)***.

Vitreous Humour

- It is jelly-like substance filling the inside of the eye.
- It helps in maintaining the eye shape.

Retina

- It is a ***light-sensitive layer*** at the back.
- It is the spot where image is formed.
- In retina, optical energy is converted into electrical energy by ***photoreceptor cells***.

Two types of photoreceptor cells:

- ***Rods*** (black and white / night vision).
- ***Cones*** (color and daytime vision).

Blind Spot

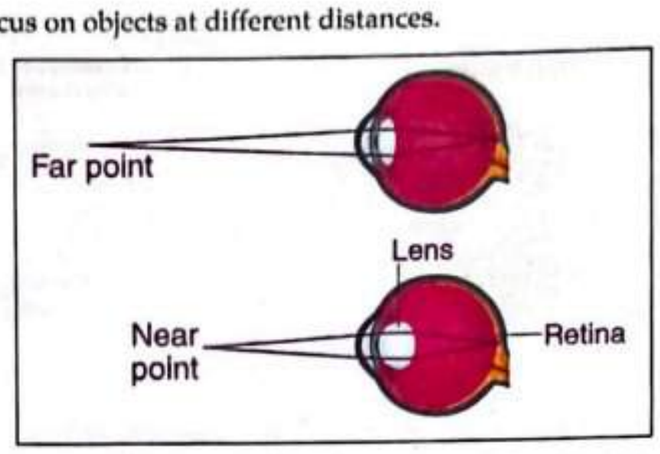
- The blind spot in your eye is the point in the retina where the optic nerve exits the eye.
- This area has ***no light-sensitive cells***, so it cannot detect light.

Optic Nerve

- The optic nerve is a bundle of nerve fibers that ***transmits visual information*** from the ***eye to the brain***.

Power of Accommodation

- The power of accommodation is the ***ability of the eye to adjust its focal length*** to focus on objects at different distances.

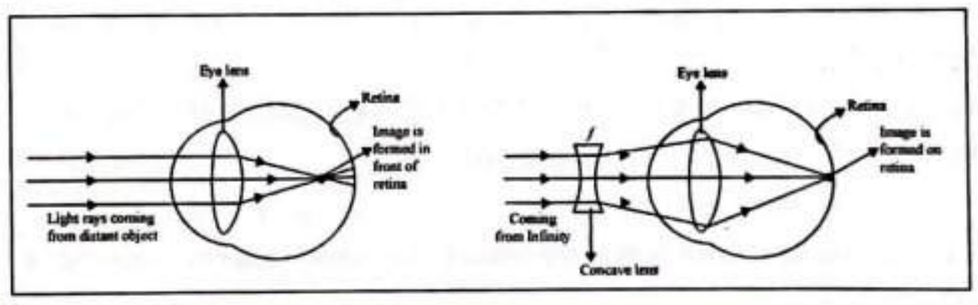


> - ***The ciliary muscles contract to thicken the lens, which increases its refractive power and allows the eye to focus on nearby objects.***
> - ***The ciliary muscles relax to flatten the lens, which decreases its refractive power and allows the eye to focus on distant objects. This is known as power of accommodation.***
> - ***The least distance of distinct vision is 25 cm.***

Defects of Eye

Myopia/Nearsightedness

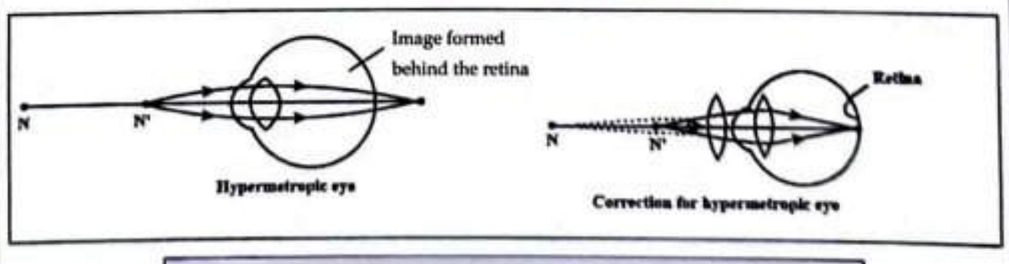
- Myopia also known as ***nearsightedness***, which means that you can see objects that are near clearly but have difficulty seeing objects that are farther away.
- To correct myopia, ***Concave lens (-ve power lens)*** is used.



> - ***Focal length decreases and power increases.***
> - ***Image is formed in front of the retina.***

Hypermetropia/Far Sightedness

- Hypermetropia means ***farsightedness*** which means that you can see objects that are far away but have difficulty seeing objects that are close.
- It usually occurs above the age of ***40 years***.
- To correct hypermetropia, ***Convex lens (+ve power lens)*** is used.



> - ***Image formed behind the retina.***
> - ***Light focuses behind the retina instead of focusing on the retina.***

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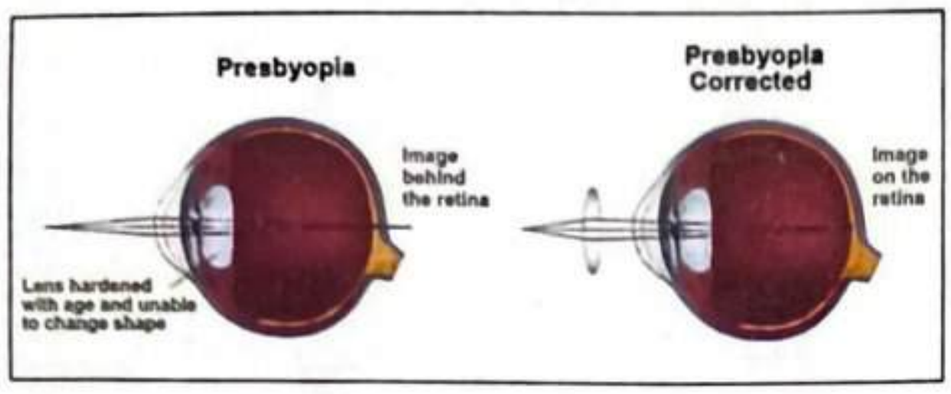
Presbyopia

- Presbyopia is the gradual loss of your eyes' ability to focus on *nearby objects.*
- In presbyopia, the lens of *eye hardens with age* (loses flexibility).
- It usually occurs above the age of *50 years.*
- ***Correction : Concave (upper part) + Convex lens or bifocal lens (lower part).***



Glaucoma

- Glaucoma is an eye condition that damages your eye's *optic nerve.*
- This causes the eye pressure to increase, leading to permanent vision loss.
- Glaucoma is generally *hereditary* (not curable).

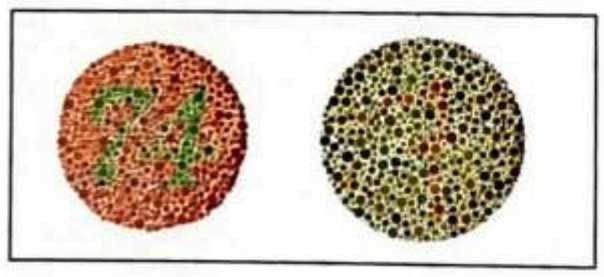
Trachoma

- Trachoma is a disease of the eye caused by infection with the bacterium *Chlamydia trachomatis.*
- Trachoma leads to corneal clouding or scarring which is responsible for *irreversible vision loss.* The disease itself is not curable in the later stages.

> ***Tonometry is an eye exam that measures the pressure inside your eyes, or intraocular pressure (IOP). It is used to screen for glaucoma and monitor how well glaucoma treatments are working.***

Colour Blindness

- Colour blindness (or color vision deficiency) is a condition where a person has difficulty seeing certain colors correctly.
- It is a *hereditary* condition.
- It happens when cone cells in the retina (which detect color) are missing or not working properly.



Cataract

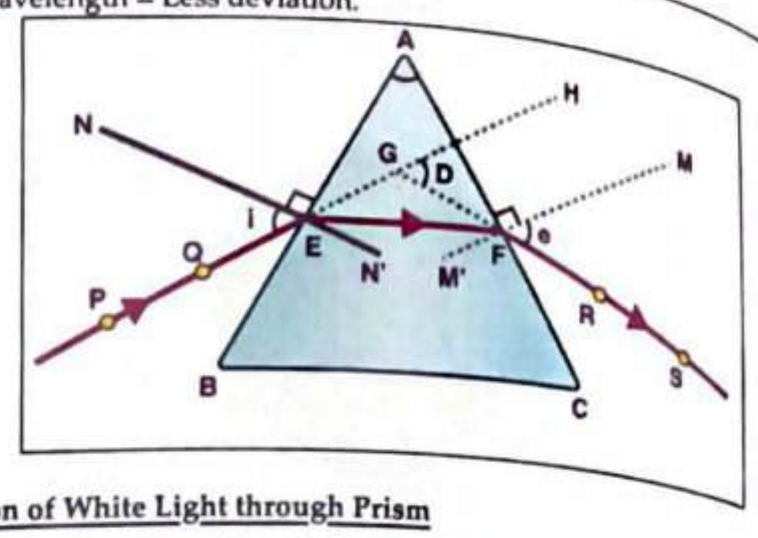
- The clear lens of the eye becomes *cloudy* and the vision becomes *blurry.* This clouding happens as the proteins in the lens break down and clump together.

LIGHT

Refraction of Light through a Prism

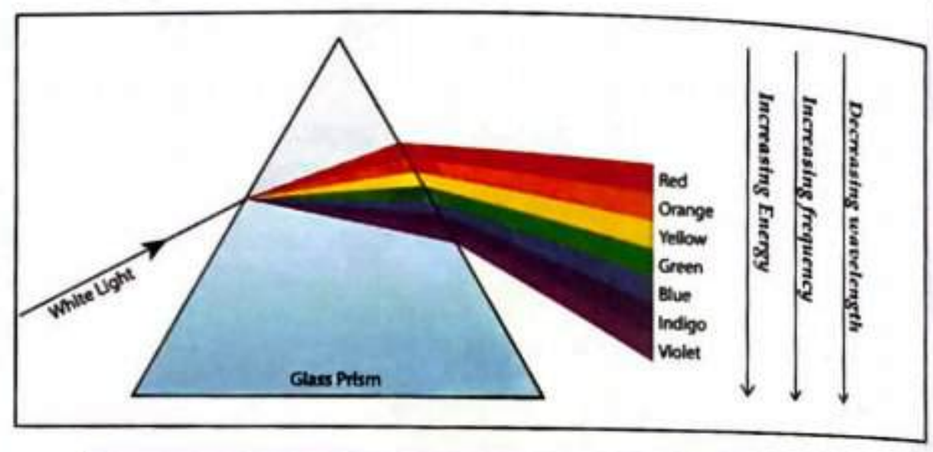
- When light passes through a prism, it undergoes refraction, which means it bends as it *changes speed moving from one medium* (like air) to another (glass). This bending occurs because light travels at different speeds in different media.

- More wavelength = Less deviation.



Dispersion of White Light through Prism

- Dispersion is the process by which *white light splits into its constituent colors* when it passes through a glass prism.
- White light is made up of seven colors: *Violet, Indigo, Blue, Green, Yellow, Orange, and Red (VIBGYOR).* When it passes through a glass prism, it slows down and bends due to *refraction,* as glass is denser than air.
- Each color has a different wavelength and bends at a different angle → *violet bends the most* and *red bends the least.*
- This difference in bending causes the light to spread out into a band of colors, forming a visible spectrum.

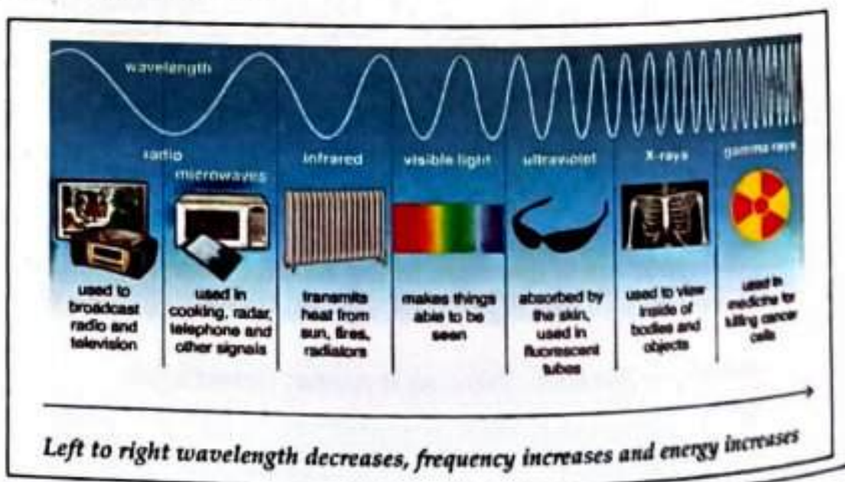


> ***Red light: More speed → less refractive index***
> ***Violet light: Less speed → more refractive index***
> ***Red light has maximum wavelength hence it deviates the least.***
> ***Violet light has minimum wavelength hence it deviates the most.***

$$\text{Refractive Index } (n) = \frac{\text{Speed of light in air}}{\text{Speed of light in prism}}$$

Electromagnetic Spectrum

- The electromagnetic spectrum is the complete range of electromagnetic waves arranged according to their wavelength or frequency. These waves all travel at the speed of light in a vacuum (3×10^8 m/s) but differ in their energy and applications.



Left to right wavelength decreases, frequency increases and energy increases

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TRICK TO REMEMBER

Decreasing wavelength order →

Rich	Man	In	Victoria	Uses	Xtra	Gold
Radio waves	Micro waves	Infrared	Visible light	UV rays	X-ray	Gamma rays

Radiation	Discovered By
Radio waves	Heinrich Hertz (late 1880s)
Microwaves	Percy Spencer (1945)
Infrared rays	William Herschel (1800)
Visible light	
UV rays	Johann Wilhelm Ritter (1801)
X-rays	Wilhelm Roentgen (1895)
Gamma rays	Paul Villard (1900)

Planck's Constant

• Planck's constant is a fundamental constant in quantum physics that relates the energy of a photon to its frequency.

$E = hf$

$E = \frac{hc}{\lambda}$

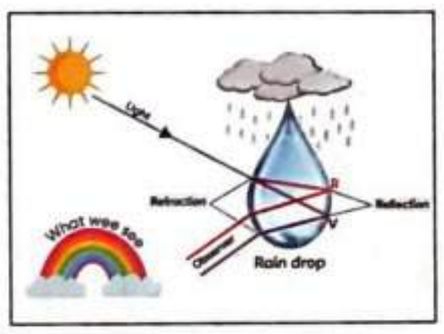
$h = 6.626 \times 10^{-34}$ J-sec

E = Energy of the photon (in joules, J)
h = Planck's constant
f = Frequency of the radiation (in hertz, Hz)
c = Speed of light
λ = Wavelength
Energy of a photon is directly proportional to its frequency and inversely proportional to its wavelength.

Rainbow Formation

• A rainbow is formed due to the *refraction (two), dispersion, and reflection of sunlight in water droplets* present in the atmosphere.

• Sunlight enters a raindrop and bends (refracts) because water is denser than air. Inside the drop, the *light splits into its 7 colors (VIBGYOR)* because each color bends at a slightly different angle. The light reflects off the inside surface of the raindrop. As it exits the drop, the light bends again, and the colors spread out more.



Refraction in Atmosphere

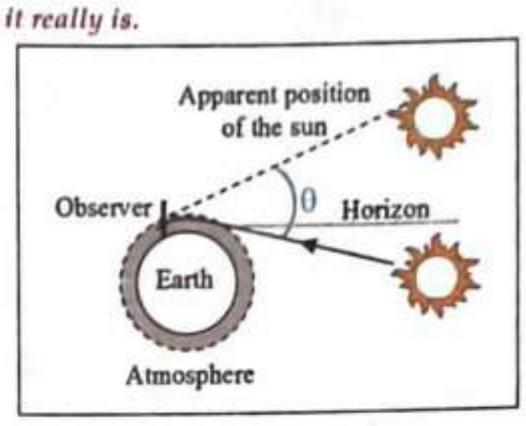
Twinkling of Stars

• The twinkling of stars is caused by the *refraction of light* as it passes through the Earth's atmosphere.

• Starlight passes through Earth's atmosphere before reaching our eyes. The atmosphere is made up of many layers of air with varying temperatures and densities. As the light passes through these layers, *it bends (refracts) continuously* and *slightly differently every moment*. Because of this bending, the position and brightness of the star seem to change → making it appear to "twinkle".

Advanced Sunrise and Delayed Sunset

Advanced sunrise and delayed sunset are both caused by the *refraction of sunlight in Earth's atmosphere*. Due to atmospheric refraction, we see the sun a little earlier before it actually rises (advanced sunrise), and a little longer after it sets (delayed sunset). This happens because the *Earth's atmosphere bends the sunlight, making the sun appear slightly higher than it really is.*



Alpenglow is a natural phenomenon where mountains appear to glow with a rosy or reddish hue, typically around sunrise or sunset.

Scattering of Light

• Scattering of light happens when *light hits small particles* (like dust, water droplets, or gas molecules) in the atmosphere and changes direction.

Rayleigh talked about the scattering of light in 1871.

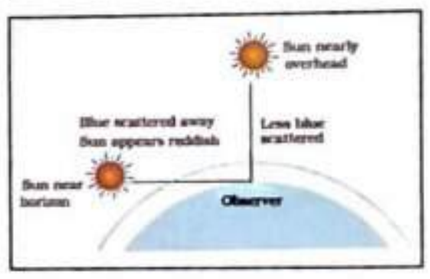
Blue Colour of Sky

• Shorter wavelengths (blue/violet) *scatter more* (travels as shorter or smaller waves) than longer wavelengths (red). That's why the sky looks blue during the day (blue light is scattered in all directions).

Our sky appears black without atmosphere.

Red Colour of Sun during Sunrise/Sunset

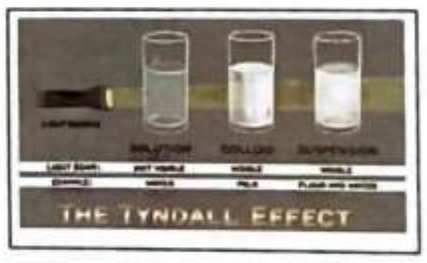
• During sunrise and sunset, the sun is *low on the horizon*, so its light has to *travel a longer distance* through the Earth's atmosphere. In this long path, shorter wavelengths like blue and violet are scattered away, while red light, which scatters the least, manages to reach our eyes. That's why the sky appears reddish-orange during these times.



Tyndall Effect

• The Tyndall effect is the scattering of light by particles in a *colloid* or *suspension*, which makes the light beam visible.

• Light rays hit the particles in a colloid, these particles scatter the light in all directions. The scattered light makes the path of the light beam visible.



Danger Signals in Red

• Danger signals are often in red because it has the *longest wavelength* and *scatters the least*, making it visible from a distance even in poor visibility conditions like fog or smoke. ***Additionally, red naturally catches attention and signals alert or warning, making it the ideal color for danger signals.***

Total Internal Reflection(TIR)

• Total internal reflection is a phenomenon where light, traveling from a

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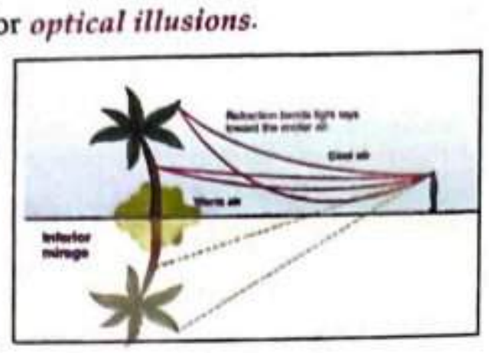
denser medium to a less dense medium, is reflected back into the denser medium instead of being refracted. *E.g. Mirage, optical fibres, etc.*

- This phenomenon is also responsible for *optical illusions.*



Conditions of Total Internal Reflection

- Light should travel from denser to rarer medium.
- Angle of incidence must be greater than the critical angle (The critical angle is the minimum angle of incidence at which light is totally reflected inside the denser medium.

> ***A mirage is an optical illusion caused by the refraction of light through layers of air at different temperatures. On a hot day, the layer above the ground gets warm. The light ray gets refracted when light moves through the cold air and into the hot layer.***

> ***Diamond sparkles due to TIR.***

Uses of Optical Fibres

- Optical fibers have a wide range of uses, primarily in telecommunications, computer networking, and medical applications.

PARMAR'S CROSSWORD

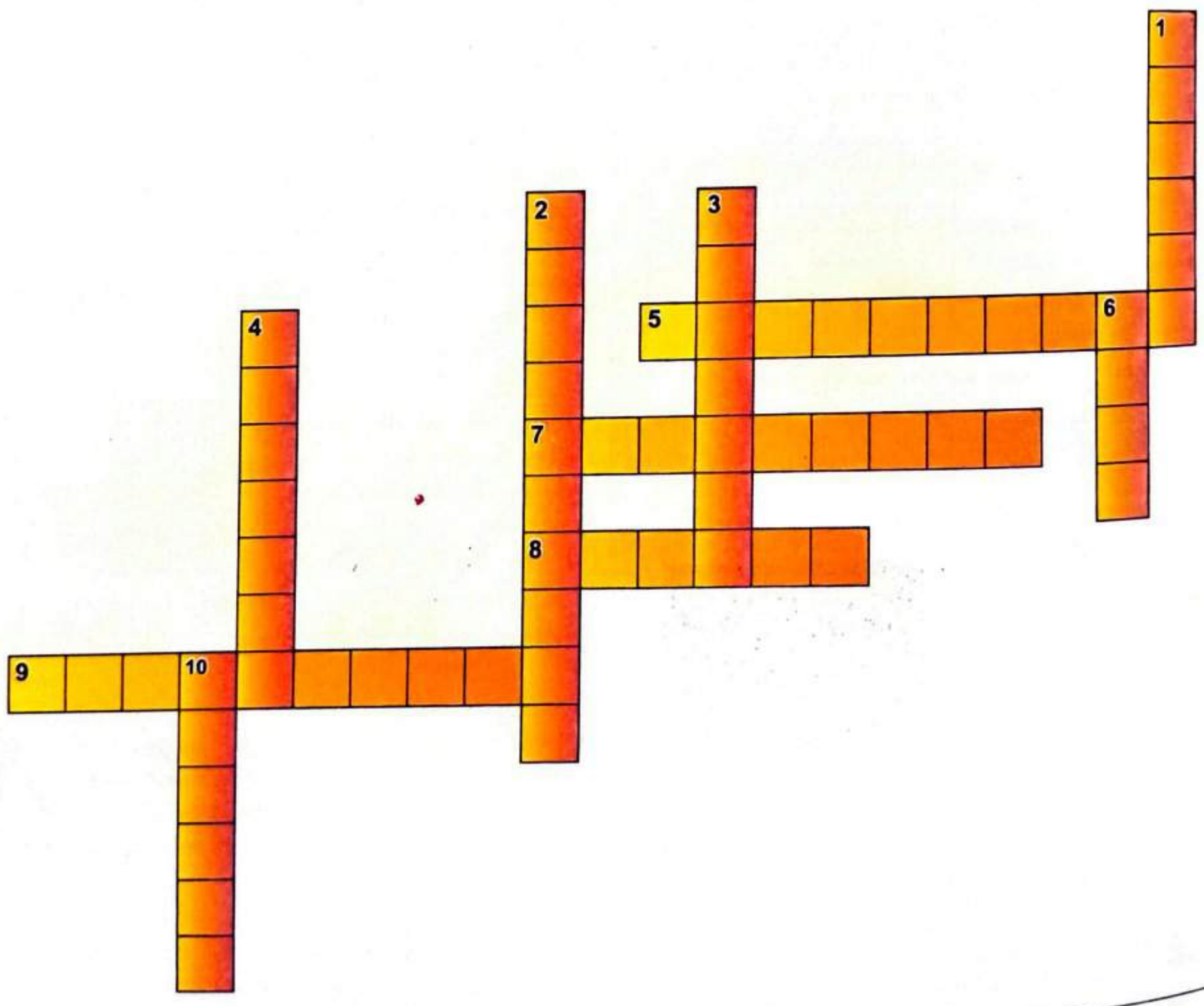
HUMAN EYE AND VISION

Across

5. Defect corrected using bifocal lens.
7. Device measuring eye pressure.
8. Converts image to nerve signals.
9. Splitting of white light into colours.

Down

1. Transparent front part of eye.
2. Reason why sky appears blue.
3. Invented radio communication system.
4. Mirror used by dentists.
6. Controls size of pupil.
10. Gave concept of energy quantum.



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ELECTRICITY

Electric Current *(represented by "I")*

- Electric current is the rate of flow of electrons in a conductor. The SI Unit of electric current is the *Ampere*.
- Electric current is also expressed as the *flow of charge per unit time* or *flow of electrons per unit time* ($1\ e^- = 1.6 \times 10^{-19}$ Coulomb).
- It is measured by *Ammeter*.

$$I\ (\text{Electric Current}) = \frac{q\ (\text{Charge})}{t\ (\text{Time})}$$

$$q = I \times t$$

An Ammeter

$q = n \times e^-$

$1\ C = n \times 1.6 \times 10^{-19}$

$n = \frac{1}{1.6 \times 10^{-19}}$

$= 6.25 \times 10^{18}\ e^-$

$n = 6 \times 10^{18}\ e^-$

Coulomb is the S.I. unit of Charge.

q = Total charge (in Coulombs)
n = No. of electrons
e- = Charge of a single e- (1.6×10^{-19} C)

Conductor

- A conductor is an object or type of material that allows the *flow of charge* (electric current) in *one or more directions*.

Potential Difference

- Potential difference is the amount of *work done in moving a unit positive charge* from one point to other in an electric field. The S.I. unit of potential difference is *Volt*.
- It is measured using a Voltmeter.

$$V = \frac{W}{q}$$

1 Volt: It is the amount of energy needed to move a unit charge from one point to another.

$$1\ V = \frac{1J}{1C}$$

Ohm Law

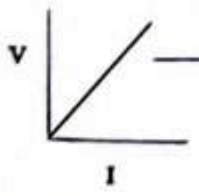
- The Ohm's Law states that "The current flowing in a conductor is directly proportional to the voltage across the conductor, provided all the physical condition and temperature remain constant".
- Ohm's Law is given by *George Simon Ohm* in *1827*.
- ***Ohm's law can be rewritten in three different forms:***

$V \propto I$

1. $V = IR$
2. $R = \frac{V}{I}$
3.
4. $I = \frac{V}{R}$

V = Voltage
I = Current
R = Resistance

When voltage increases, current generally also increases, assuming the resistance and temperature remain constant.

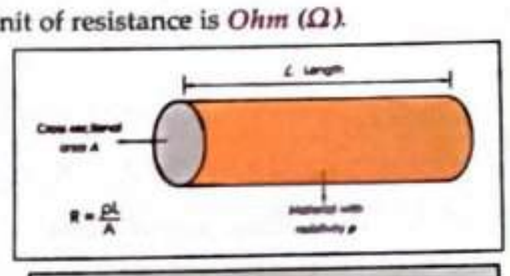


Higher the slope, higher the resistance

Resistance

- Resistance is defined as the property of an electrical component to *resist the flow of electric current*. The S.I. unit of resistance is *Ohm (Ω)*.

$$R = \rho \frac{L}{A}$$



R = Resistance
ρ = Resistivity of the material
L = Length of the conductor
A = Area of cross-section

Resistivity (ρ)/Specific Resistance

- *The resistivity of a material is a measure of how strongly a material opposes the flow of electrical current.*
- *Resistivity is constant.*

Factors Affecting Resistance

1. ***Length of the Conductor (L)***

- Resistance is directly *proportional to length.*

$$R \propto L$$

- A longer conductor *offers more resistance* due to *increased collisions* between electrons and ions.

E.g. A wire twice as long will have twice the resistance.

2. ***Area of Cross-Section (A)***

- Resistance is inversely proportional to the area of cross-section.

$$R \propto \frac{1}{A}$$

- A thicker conductor has a *lower resistance* because *electrons have more space to flow with fewer collisions.*

E.g. A wire with a larger diameter offers less resistance.

3. ***Temperature (T)***

- For metallic conductors, *resistance increases with temperature*. This happens because atoms vibrate more at higher temperatures, increasing collisions (increase movement of electrons and K.E.).
- For semiconductors, *resistance decreases with temperature.*

Note: The temperature-resistance relationship depends on the material.

4. ***Nature of the Material (Resistivity)***

- Different materials have different *intrinsic resistivities.*
- Lower resistivity → better conductor *(E.g., copper, silver)*.
- Higher resistivity → poorer conductor or insulator *(E.g., rubber, plastic)*.

$\Omega = \rho \frac{m}{m^2}$

$\Omega m = \rho$

S.I. unit of resistivity = Ωm

$R \propto L$

$R \propto \frac{1}{A}$

$R \propto \frac{L}{A}$

$R = \frac{\rho L}{A}$

Conductance (Symbol: G)

It measures how easily electricity flows through a component. The S.I. unit of conductance is Seimens (S).

Materials are classified into:

1. **Conductors:** Materials that readily allow the flow of electric current, exhibiting *high electrical conductivity* and *low resistivity*. *E.g. Copper, silver, gold, aluminum, steel.*

or ohm per meter or seimens.

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2. **Semiconductors:** Materials with *conductivity values between conductors and insulators*, offering the possibility to control their conductivity. ***E.g. Silicon, germanium, and various compounds like arsenide.***

3. **Insulators:** Materials that resist the flow of electric current, *having high electrical resistivity* and *low conductivity*. ***E.g. Rubber, glass, plastic, air, pure water.***

	Material	Resistivity (Ω m)
Conductors	Silver	1.60×10^{-8}
	Copper	1.62×10^{-8}
	Aluminium	2.63×10^{-8}
	Tungsten	5.20×10^{-8}
	Nickel	6.84×10^{-8}
	Iron	10.0×10^{-8}
	Chromium	12.9×10^{-8}
	Mercury	94.0×10^{-8}
	Manganese	1.84×10^{-6}
Alloys	Constantan (alloy of Cu and Ni)	49×10^{-6}
	Manganin (alloy of Cu, Mn and Ni)	44×10^{-6}
	Nichrome (alloy of Ni, Cr, Mn and Fe)	100×10^{-6}
Insulators	Glass	$10^{10} - 10^{14}$
	Hard rubber	$10^{13} - 10^{16}$
	Ebonite	$10^{15} - 10^{17}$
	Diamond	$10^{12} - 10^{13}$
	Paper (dry)	10^{12}

Table 1: Material and Resistivity

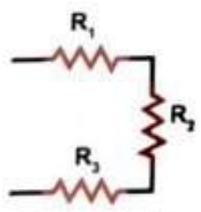
**Alloy has greater resistivity than its constituent metals*

Resistance Combination

- In electrical circuits, resistors can be connected in two primary ways: *Series and Parallel.*

Series Connection

- In a series circuit, resistors are connected *end-to-end, forming a single path* for current flow.
- Current (I) is the *same* through each resistor.
- Voltage (V) is *divided across each resistor* depending on its resistance.



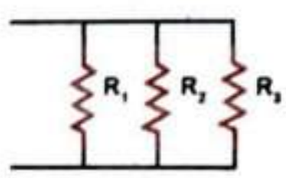
Series Circuits

$$R_{eq} = R_1 + R_2 + R_3 + \ldots + R_n$$

- *Where, $R_1, R_2, R_3 \ldots R_n$ are individual resister value.*
- *Same current, different potential difference.*

Parallel Connection

- In a parallel circuit, resistors are *connected across the same two points*, creating *multiple paths* for current flow.
- Voltage (V) is the *same* across each resistor.
- Current (I) is *divided* based on the resistance of each branch.



Parallel Circuit

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots + \frac{1}{R_n}$$

- *Same potential difference, different current.*

- Appliances in our home are connected in Parallel Connection.

Questionnaire:

Two resistors of 20Ω and 4Ω respectively are connected in series connection to a 6V battery, what is the current flow?

Sol:

Given

$R_1 = 20\Omega$

$R_2 = 4\Omega$

Voltage of the battery (V) = 6V

Connection = Series

In a series connection:

$$R_{total} = R_1 + R_2 = 20\Omega + 4\Omega = 24\Omega$$

$$I = \frac{V}{R}$$

$$I = \frac{6V}{24\Omega}$$

$$I = 0.25\ A$$

Questionnaire:

Three resistors of 5Ω, 10Ω, and 30Ω respectively are connected in parallel connection with a potential difference of 12V, what is the current flow?

Sol:

Given

$R_1 = 5\Omega$

$R_2 = 10\Omega$

$R_3 = 30\Omega$

Voltage across each resistor (V) = 12V

Connection = Parallel

In a parallel connection:

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$\frac{1}{R_{eq}} = \frac{1}{5} + \frac{1}{10} + \frac{1}{30}$$

$$\frac{1}{R_{eq}} = \frac{6+3+1}{30}$$

$$R_{eq} = 3\Omega$$

$$V = IR$$

$$12 = I \times 3$$

$$I = 4\ A$$

Heating Effect of Electric Current

- When an electric current flows through a conductor, it produces *heat due to the resistance of the conductor*. This phenomenon is called the heating effect of electric current.

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Joule's Law of Heating

• The heat produced in a resistor due to the flow of current is given by:

$$Heat\ (H) = I^2Rt$$

Where:
H = Heat energy (in joules)
I = Current (in amperes)
R = Resistance (in ohms)
t = Time (in seconds)

Alternate Forms:
Using Ohm's Law (V = IR), the formula can also be written as:

$$H = VIt \text{ or } H = \frac{V^2t}{R}$$

Applications of Heating Effect of Electric Current

Application	Details
Electric Heater	Nichrome wire used as heating element
Electric bulb	Tungsten filament (high melting point)
Electric iron	Uses the heating effect to iron clothes
Fuse	Thin wire with low melting point to protect appliances

Important Notes:

• Nichrome is commonly used in heating devices because it has *high resistance* and it *does not oxidize* easily at high temperatures.

• A fuse melts when *excessive current flows*, breaking the circuit and preventing damage. It is used to protect electrical appliances from excessive current and to prevent *short circuits* or *mismatched loads*.

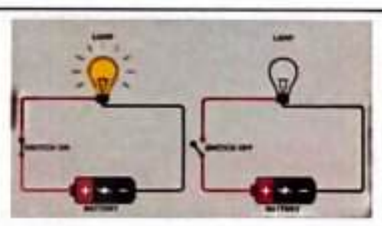


Fig 1: Open and Closed Circuit

Electric Power: Electric power is the rate at which electrical energy is consumed or produced.

$$P = VI$$
$$P = I^2R \rightarrow (\because V = IR)$$
$$P = \frac{V^2}{R}$$

V = Voltage
I = Current
R = Resistance

Commercial Unit of Energy → kWh

1 unit = 1kWh

1 kWh = 1 kW × 1 hour = 1000 watts × 3600 secs

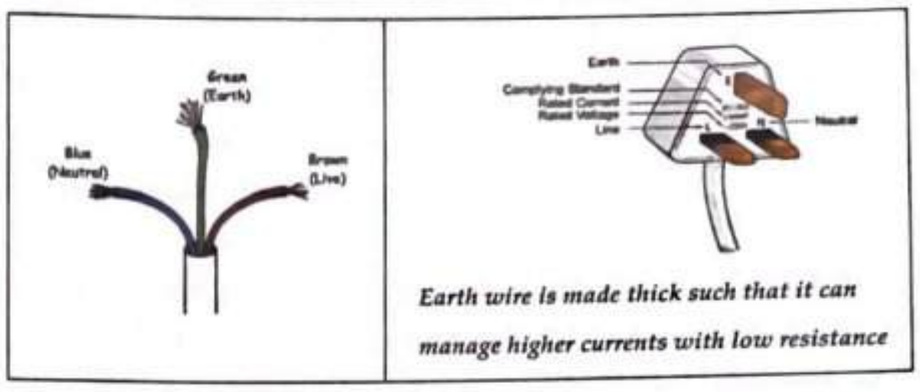
= 3,600,000 watt-seconds or joules

$= 36 \times 10^5$ Ws

$= 3.6 \times 10^6$ J

Colour Coding in Household Wiring

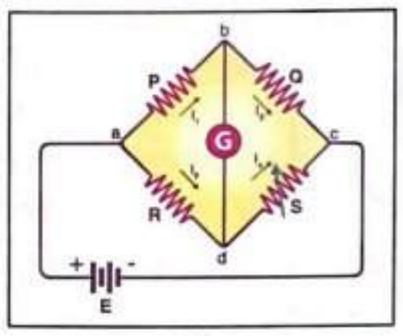
• Live wire: Red (high voltage)
• Neutral: Black (V = 0)
• Ground / Earth: Green / Yellow
• In electrical appliances: 220V; 50Hz



Earth wire is made thick such that it can manage higher currents with low resistance

Wheatstone Bridge

• A Wheatstone bridge is an electrical circuit used to accurately measure an *unknown resistance* by balancing two legs of a bridge circuit using 4 resisters.



$$\frac{P}{R} = \frac{Q}{S}$$

Questionnaire:

Calculate the electrical energy consumed by a 1200 W toaster in 30 mins. What will be the cost of using the same for 1 month if 1 unit of electricity cost Rs. 4?

Sol:

Given

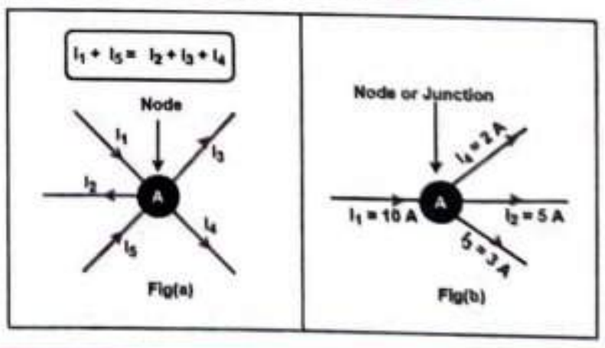
Power of toaster = 1200 W = 1.2 kW
Time used = 30 minutes = 0.5 hours
Cost of 1 unit (1 kWh) = Rs. 4
Usage = 1 time/day for 30 days
Energy = Power × Time = 1.2 kW × 0.5 hr
= 0.6 units (kWh)
Monthly Energy = 0.6 × 30 = 18 units
Cost = 18 × 4 = Rs. 72
Energy consumed per day = 0.6 units
Total energy for 30 days = 18 units
Cost for 1 month = Rs. 72

Kirchoff's Law

1. **Law of Current:** It states that the total current entering a node (junction) in a circuit is equal to the total current leaving that node.

$$\sum I_{In} = \sum I_{Out}$$

2. **Law of Voltage:** The sum of all voltages (EMFs and voltage drops) around any closed loop in a circuit is equal to zero ($\sum V = 0$).



For an interactive recap of this topic, see the crossword on Page Number 249.

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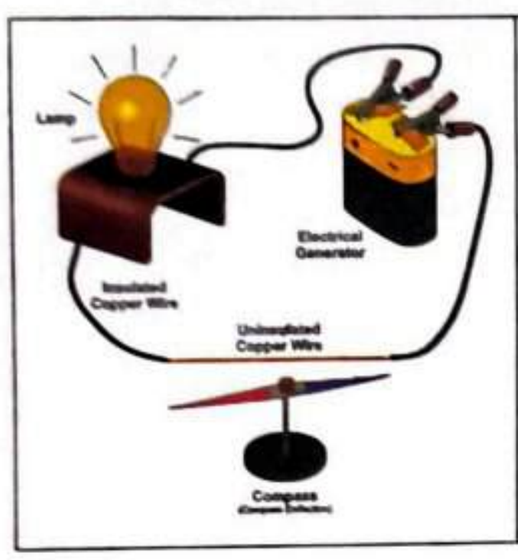
MAGNETIC EFFECT OF AN ELECTRIC CURRENT

• The magnetic effect of electric current is the phenomenon where an electric current flowing through a conductor produces a magnetic field around it. This field can exert force on other magnets or moving charges.

E.g. ***Deflection of a compass needle placed near a current-carrying wire.***

• ***The strength of the magnetic field increases with the amount of current flowing through the wire.***

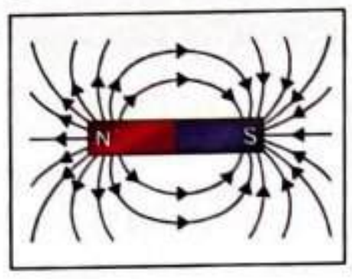


• The direction of magnetic field changes due to a change in direction of current in the wire.

• ***Hans Christian Oersted*** discovered the magnetic effect of electric current in ***1820***.

Magnetic Field Lines

• The magnetic field created by a current-carrying wire is a force field that influences other magnets and moving charges.



• When iron filings are scattered around a magnet, they become ***temporary magnets*** through magnetic induction and align end-to-end along the magnetic field lines. The filings clump more densely near the poles, showing that the magnetic field is the ***strongest near the poles***. This pattern of filings gives a clear visual impression of the magnetic field around the magnet.

• ***Like poles repel each other and Unlike poles attract each other.***

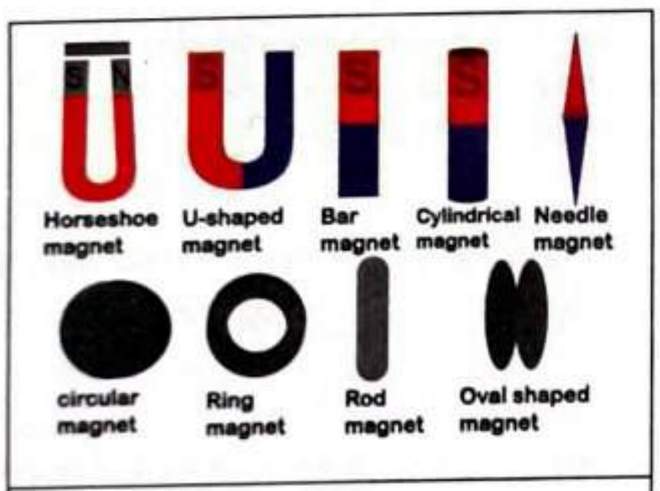


Fig 1: Types of Magnet

Properties of a Magnetic Field Lines

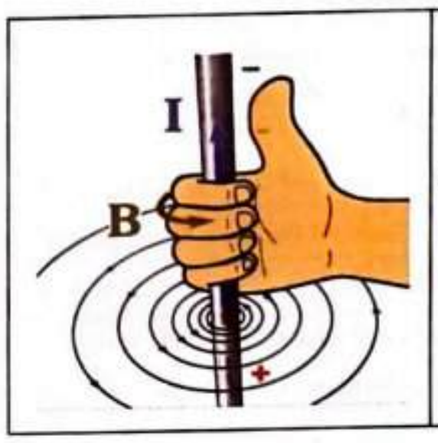
1. They always go from the ***north pole to the south pole*** outside the magnet.
2. Inside the magnet, they go from the south pole to the north pole, forming ***closed loops***.
3. The closer the lines are, the ***stronger*** the magnetic field.
4. Magnetic field lines ***never cross each other***. If they intersect, there will be two direction of magnetic field lines, which is not possible.
5. They show the ***direction*** and ***strength*** of the magnetic field.

Magnetic Field Due to Straight Current Carrying Conductor

• The magnetic field around a straight current-carrying conductor consists of concentric circles centered on the wire.

• These circular magnetic field lines form around the wire when electric current flows through it.

• The direction of the field can be found using the ***Right-Hand Thumb Rule*** → if you point your right thumb in the direction of the current, your fingers will curl in the ***direction of the magnetic field lines.***



Right-Hand Thumb Rule

• ***Magnetic Field*** $\propto \frac{1}{\text{Distance}}$

→ As you go ***farther*** from the wire, the magnetic field becomes ***weaker.***

• ***Magnetic Field ∝ Current***

→ A stronger current produces a stronger magnetic field.

• ***Change in Current Direction → Change in Magnetic Field Direction***

→ If current flows ***downward***, the magnetic field become ***clockwise.*** If the current flows ***upward***, the magnetic field lines become ***anti-clockwise.***

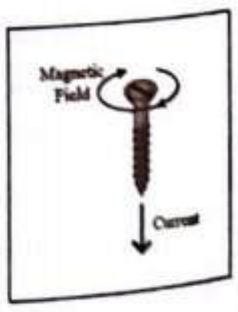
• ***Increasing the number of loops/turns in a current-carrying wire coil strengthens the magnetic field. E.g. On doubling the number of turns the magnetic field also doubles***

Maxwell's Screw Rule

• Maxwell's screw rule is a way to find the direction of the magnetic field around a current-carrying conductor.

Rule:

• Imagine turning a right-handed screw (or corkscrew) in the direction of the current. Then, the direction in which the screw rotates gives the direction of the magnetic field lines.



Ampere's Law

Ampere's Law essentially states that ***"The line integral of the magnetic field around a close loop is proportional to the total current passing through the loop"***. It is used to calculate the magnetic field in various configurations, such as around straight wires or solenoids.

$$\int B.dl = \mu_0 I$$

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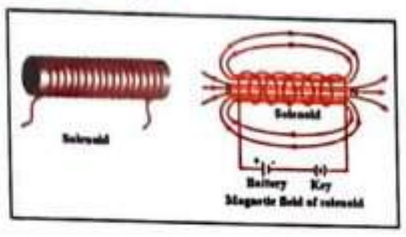
Magnetic Field Current Due to a Current Carrying Solenoid

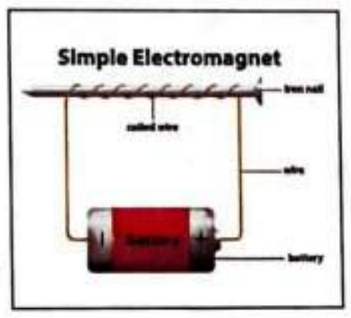
- The magnetic field ***inside*** a solenoid is ***uniform*** and ***strongest*** in the ***center***.
- For a long, ideal solenoid (where the length is much greater than the radius), the magnetic field ***outside*** is considered to be ***zero***.
- A solenoid behaves like a magnet when a current flows through it because it creates a magnetic field that resembles that of a ***bar magnet***.
- When current flows through the coils of a solenoid, each turn of the coil generates its own magnetic field. These fields combine to create a strong, relatively uniform magnetic field inside the solenoid.



- If the direction of ***current is reversed***, the direction of ***magnetic field is also reversed***.

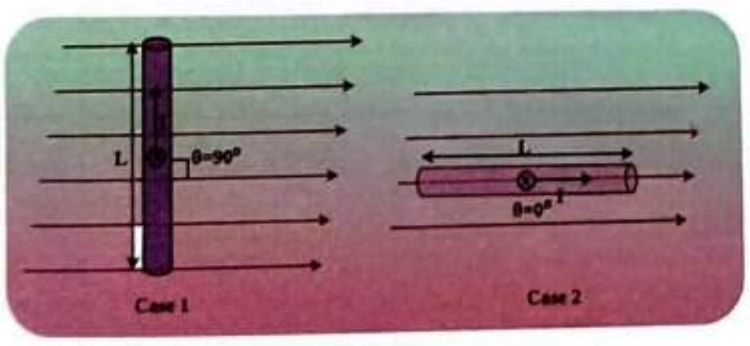
Electromagnet

- An electromagnet is a temporary magnet, meaning it only exhibits magnetic properties when an electric current is flowing through its coil, and ***loses its magnetism when the current is switched off***.
- If a soft iron core is placed inside this coil, the magnetic field from the coil will induce magnetism in the soft iron. The induced magnetism is ***temporary***. As long as the current flows, the soft iron remains magnetized. ***Once the current stops, the soft iron loses its magnetism.***



Force on a Current Carrying Conductor in a Magnetic Field

- A current-carrying conductor experiences a force when placed in a magnetic field. This force is caused by the interaction between the magnetic field generated by the current in the conductor and the external magnetic field.



$$\vec{F} = I(\vec{L} \times \vec{B})$$

$\vec{F}$: Magnetic force on the conductor.
I: Current in the conductor.
$\vec{L}$: Length of the conductor in the direction of current.
$\vec{B}$: Magnetic field.

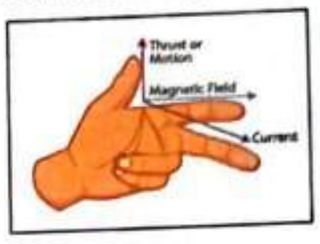
- If the angle between L and B is θ, then: ***$F = ILB \sin \theta$***.

Conditions:

- The maximum force is experienced when the angle is ***90°***, because the ***sinθ becomes 1***, which is the ***maximum value***.
- When the angle is ***0°***, the force experienced is ***zero*** because ***sinθ is zero***.
- When the angle is ***180°***, the force experienced is also ***zero*** because sinθ is again zero.

Fleming's Left Hand Rule

- Fleming's Left Hand Rule states that "If you extend your left thumb, index finger, and middle finger at right angles to each other, the thumb points in the direction of the force, the index finger points in the direction of the magnetic field, and the middle finger points in the direction of the current".

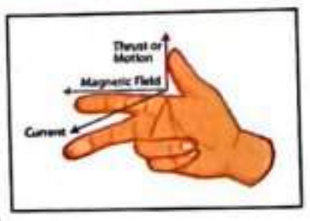


- It is used to determine the ***direction of force*** (motion) on a current carrying conductor placed in a magnetic field.

E.g. Motor (electrical energy is converted to mechanical energy) works on the principle of Fleming's Left Hand Rule.

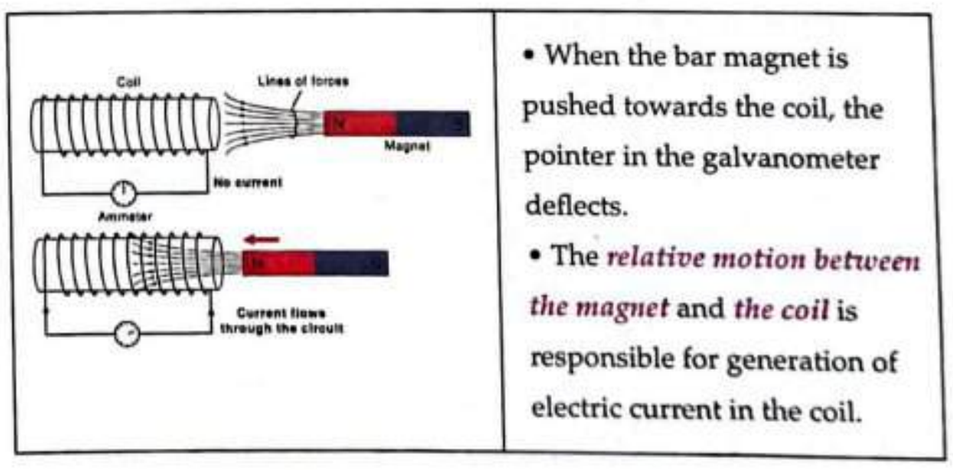
Fleming's Right Hand Rule

- Fleming's Right-Hand Rule helps determine the ***direction of induced current in a generator*** (mechanical energy is converted into electrical energy). It uses the right hand where the thumb indicates the direction of motion, the first finger (forefinger) indicates the magnetic field, and the second finger (middle finger) indicates the direction of induced current.



Electromagnetic Induction

- Electromagnetic Induction is a phenomenon in which current is produced because of ***voltage production*** (electromotive force) due to a changing magnetic field.
- This either happens when a conductor is placed in a moving magnetic field (when using an AC power source) or when a conductor is constantly moving in a stationary magnetic field.
- Electromagnetic induction was discovered by ***Michael Faraday*** in ***1831***.



- When the bar magnet is pushed towards the coil, the pointer in the galvanometer deflects.
- The ***relative motion between the magnet*** and ***the coil*** is responsible for generation of electric current in the coil.

Short Circuit

- Short Circuit is caused due to ***breaking of insulation of wires***, forming the contact between live wire and neutral wire.

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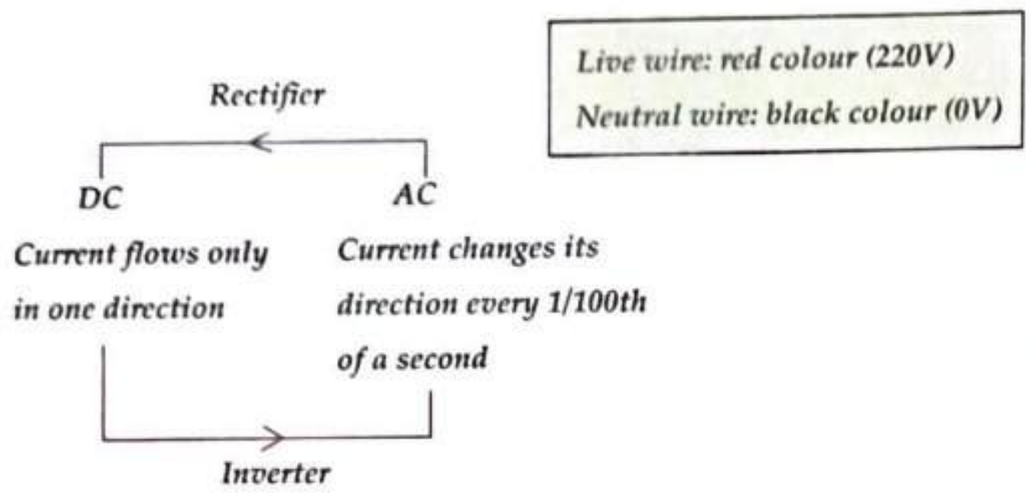
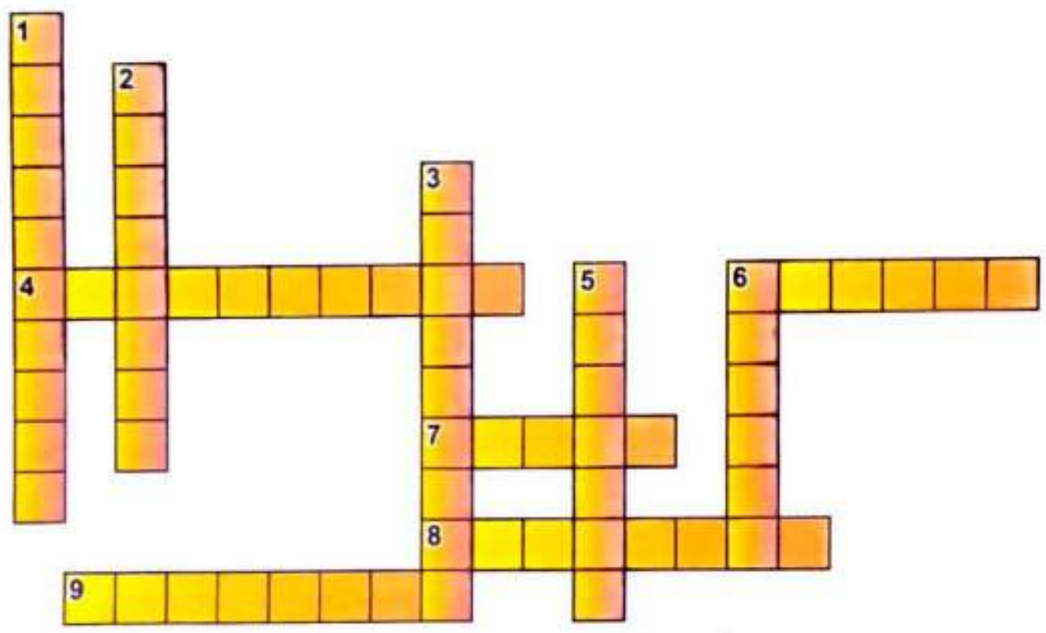
• During a short circuit, the current in a circuit increases abruptly and significantly. This is because a short circuit creates a very *low resistance path*, allowing a large amount of current to flow.



PARMAR'S CROSSWORD

ELECTRICITY



Across

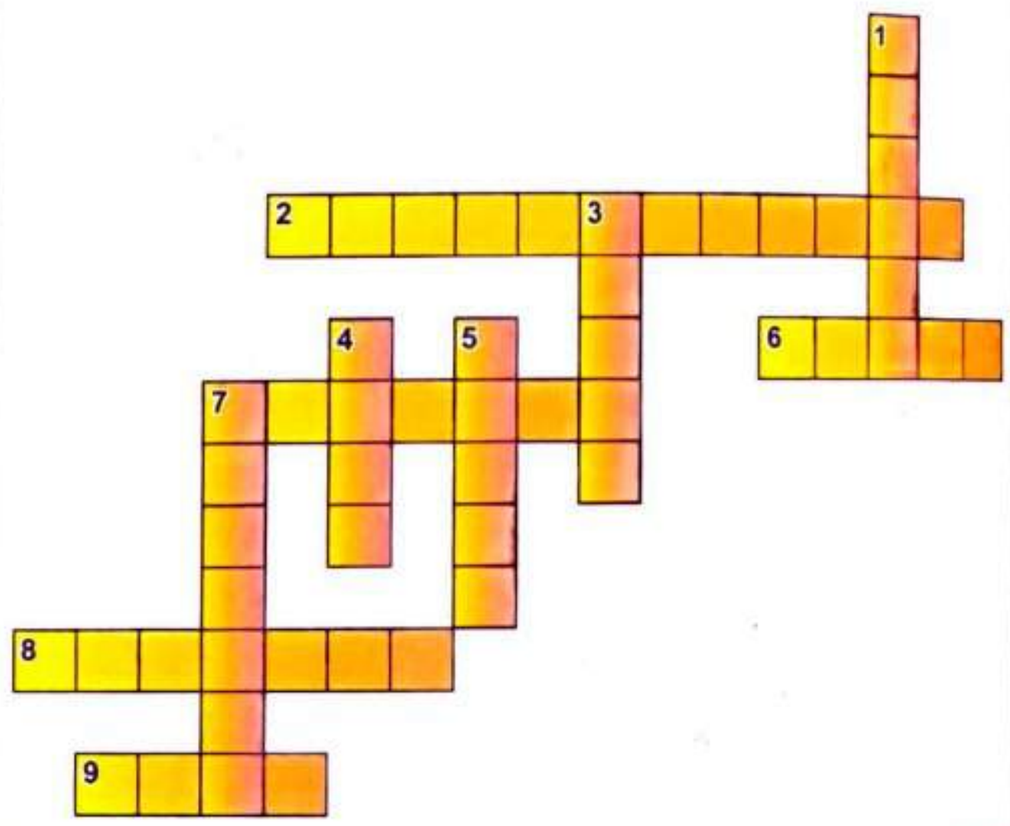
4. Physical quantity represented by omega.
6. Unit for measuring electric current.
7. SI unit of magnetic flux density.
8. Unit of specific resistance.
9. Gave relation $E = mc^2$.

Down

1. Scientist behind gold foil experiment.
2. Device used to vary circuit resistance.
3. Device to accelerate charged particles.
5. Law governing force between point charges.
6. SI unit of electric current.

PARMAR'S CROSSWORD

MAGNETIC EFFECT OF ELECTRIC CURRENT



Across

2. Device detecting current via magnetic needle deflection.
6. Common material used to make permanent magnets.
7. Right-Hand Thumb Rule indicates direction of what.
8. Discovered electromagnetic induction.
9. Direction of induced current using Fleming's right hand rule.

Down

1. Scientist who found current can attract or repel another.
3. Direction pointed by north pole of free bar magnet.
4. Strongly ferromagnetic element.
5. Confirmed electromagnetic waves experimentally.
7. Tool to find polarity of unmarked bar magnet.

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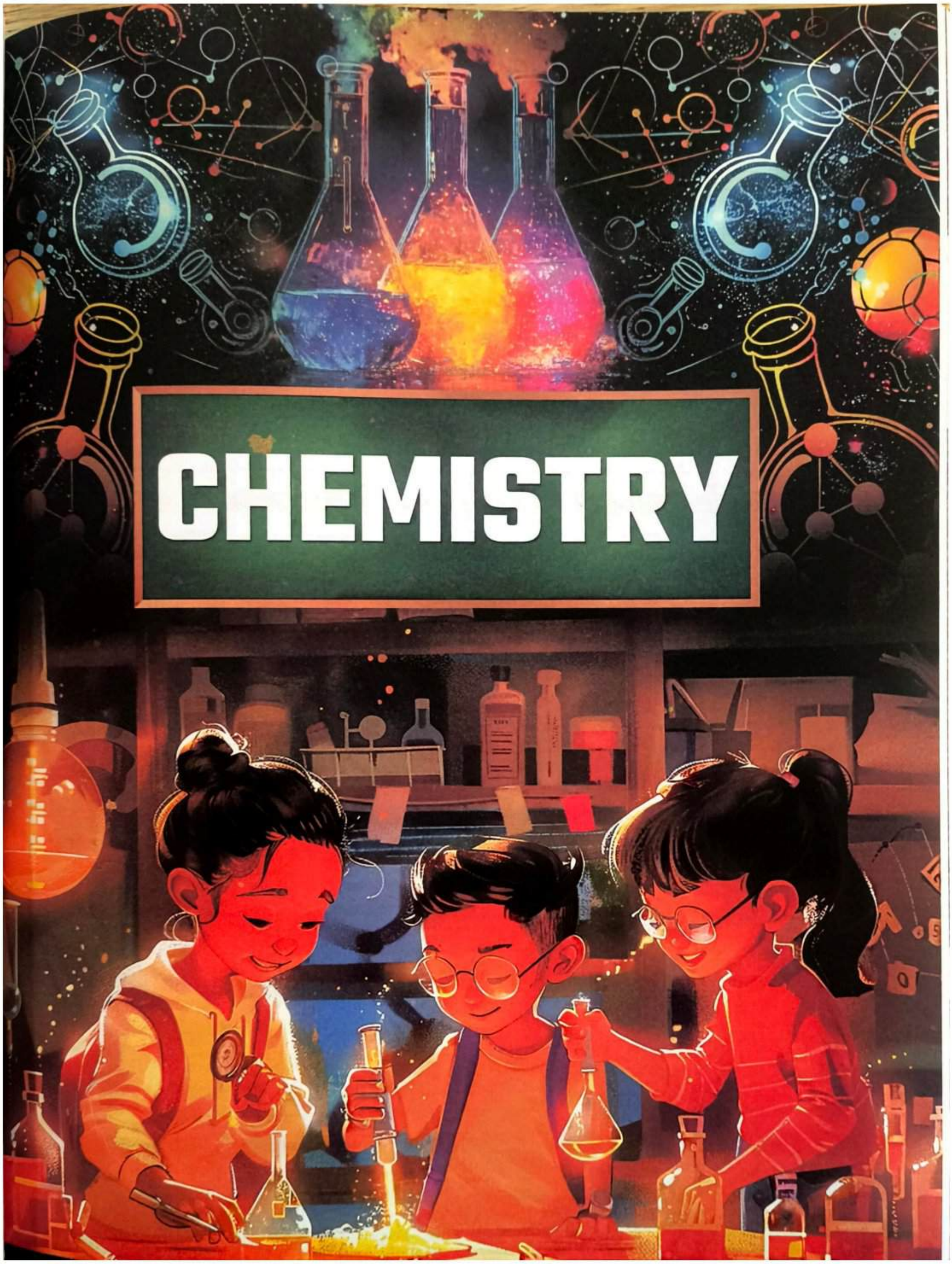

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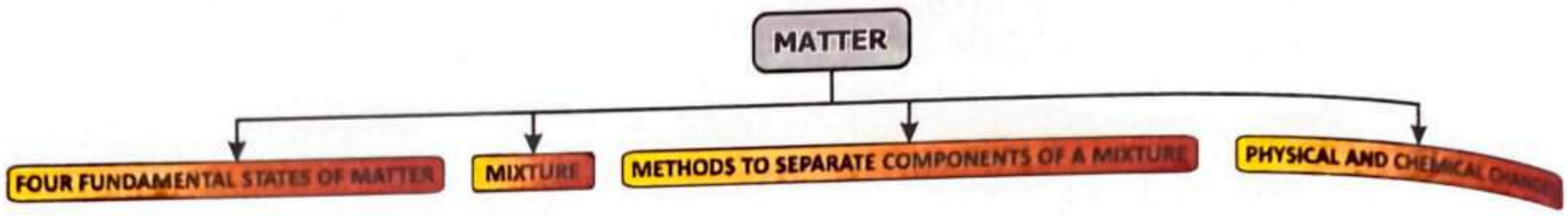

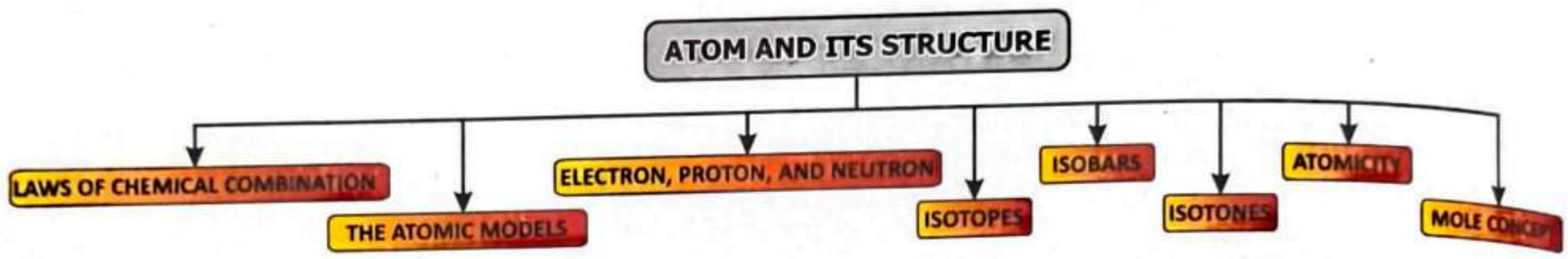

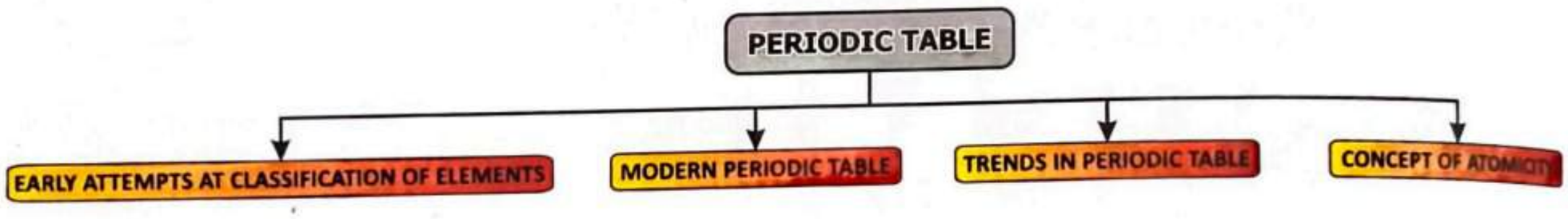

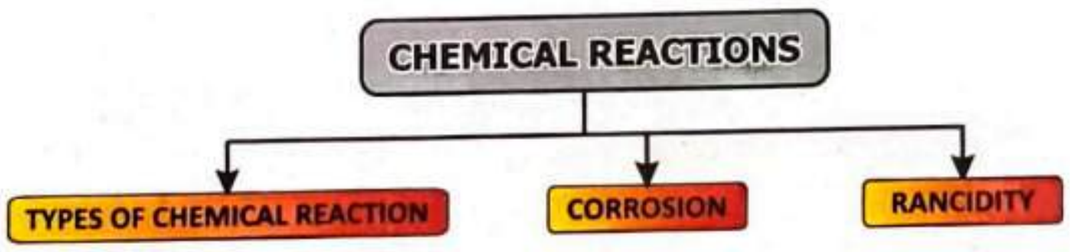

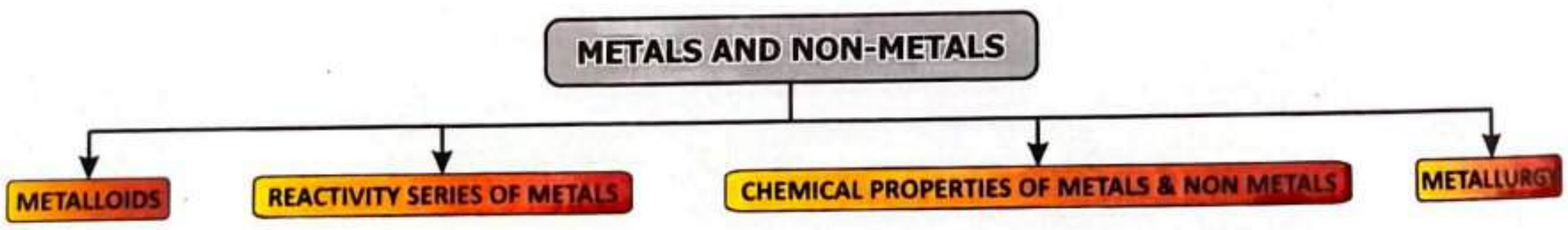

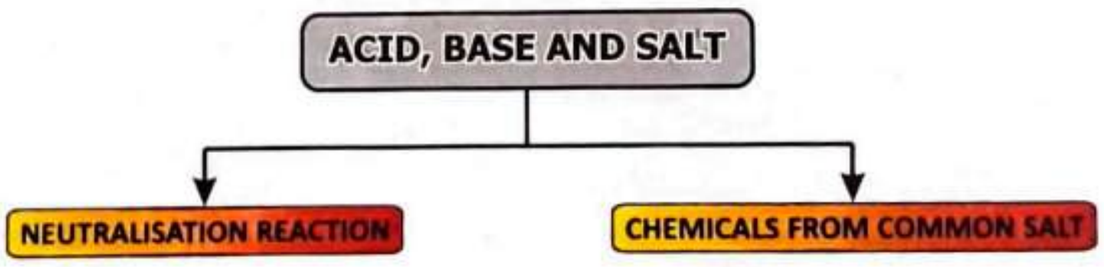

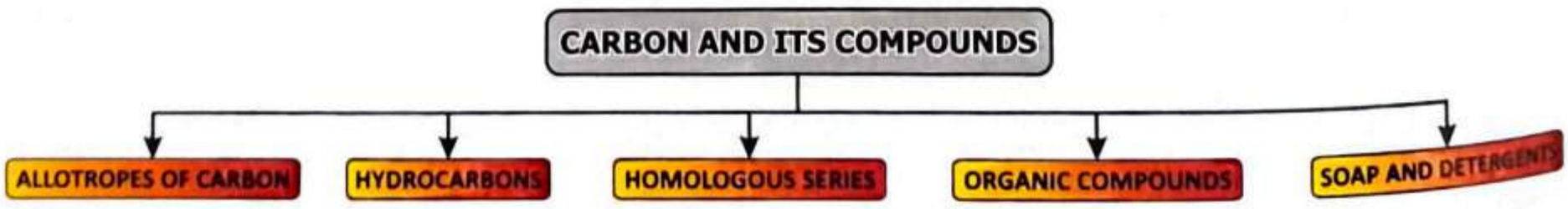

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MATTER

• Matter is anything that has mass and takes up space. It can be solids, liquids, or gases. Matter is made up of tiny particles called atoms and molecules.

Based on the composition, matter can be classified as:

1. *Pure Substances:* Pure substances are substances that are made up of only one kind of particle and have a *fixed or constant structure*. ***E.g. Diamond, sulphur, tin, etc.***
   1. *Element:* A pure substance made up of only *one type of atom* that *cannot* be broken down into *simpler substance* by chemical means. ***E.g. H (Hydrogen) and O (Oxygen).***
   2. *Compound:* A pure substance made up of *two or more different types of elements* that are *chemically bonded* together in a fixed ratio. ***E.g. H_2O (Water).***
2. *Impure Substances:* Impure substances, also known as mixtures, are made up of two or more different substances. ***E.g. Brass (Cu+Zn), Bronze (Cu+Sn).***

Four Fundamental States of Matter

Solids

• They have *distinct boundaries* and *fixed volumes*.

• They have a *definite shape*.

• They have a tendency to maintain the shape when subjected to outside force.

• *Types of solids:* *Amorphous solids* and *Crystalline solids*.

Amorphous Solids	*Crystalline Solids*
Isotropic in nature (same properties in all direction)	Anisotropic in nature (properties vary with direction)
They have irregular shape	They have a definite shape
They are pseudo solids	They are true solids
They have an irregular arrangement of constituent particles	They have a regular arrangement of constituent particles
They do not have sharp melting point	They have sharp melting point
E.g. Glass, rubber, plastic, etc.	*E.g. Copper, Silver, NaCl*

Liquid

• A liquid is a state of matter that can flow and take the *shape of its container*.

Crystalline solid changes abruptly from solid to liquid when heated.

Gas

• A gas is a substance that is in a *gaseous, or vaporous*, state of matter. It exhibits behaviour uniformity.

Plasma

• It is the *4th* state of matter.

• A plasma is an *ionised gas*, with roughly equal numbers of positively and negatively charged particles.

• It can be produced in laboratory by *heating a gas* to an *extremely high temperature*.

• *Stars* are made of plasma.

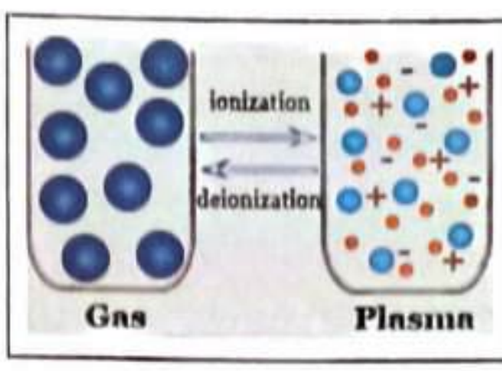

Fig 1: Transition between Gas and Plasma through Ionization and Deionization

States of Matter	*Intramolecular Space*	*Kinetic Energy*	*Movement*	*Force of Attraction*
Solid	Low	Low	Low	High
Liquid	Medium	Medium	Medium	Medium
Gas	High	High	High	Low

Bose-Einstein Condensate (BEC)

• The *fifth* state of matter is *Bose-Einstein condensate (BEC)*.

• It is typically formed when a *gas of bosons* at very *low densities is cooled to temperatures very close to absolute zero, i.e., 0 K (−273.15°C; −459.67°F).*

• ***Origin of Name:*** The term *"Boson"* comes from the name of *Dr. Satyendra Nath Bose*, an Indian physicist whose work on quantum mechanics was extended by *Albert Einstein* in *1925*.

• ***Discovery:*** Dr. Bose published a research paper in *1924* and sent it to Einstein, who further developed the concept and predicted the existence of BEC in *1925*.

First Production of Bose-Einstein Condensate (BEC)

• *1995: Eric Cornell* and *Carl Wieman* experimentally produced the first *BEC condensate* in a rare field *gas of rubidium atoms* at extremely low temperature.

• *1995: Wolfgang Ketterle* later created a BEC condensate with *sodium atoms. All three of them received Noble Prize in Physics in 2001.*

Change in State of Matter

• ***Sublimation:*** The process of changing a *solid directly into a gas* without passing through a liquid state. ***E.g. Naphthalene, dry ice, etc.***

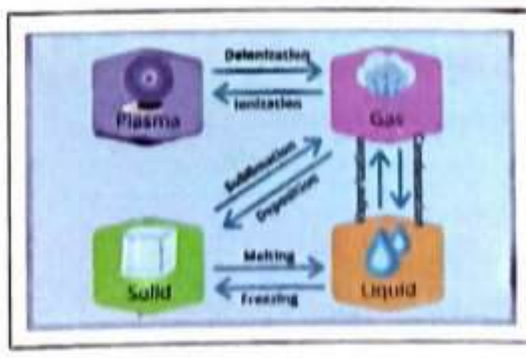

Fig 3: Phase Change of Matter

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• **Deposition:** The opposite of sublimation, where a *gas turns into a solid without passing through a liquid state*. ***E.g. The formation of frost or ice-crystals on surface.***

• **Evaporation:** The process of changing a *liquid into a vapour by heating*. This happens at boiling point of liquid. ***E.g. Evaporation of nail polish remover.***

• **Condensation:** The process by which *water vapour in air changes into liquid*. ***E.g. Dew, Fog.***

Favourable Conditions for Evaporation

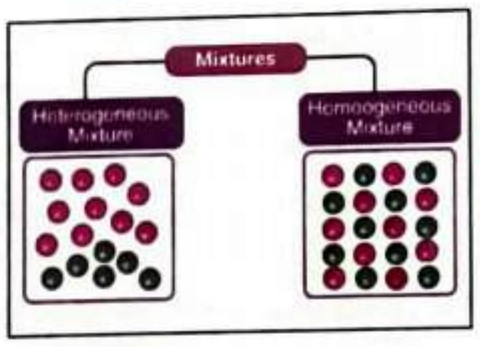
• When temperature *increases*, the rate of *evaporation increases*.
• When surface area *increases*, the rate of *evaporation increases*.
• When wind speed *increases*, the rate of *evaporation increases*.
• When humidity *increases*, the rate of evaporation *decreases*.

Mixture

• A mixture is a composition of *two or more pure substances*. Mixtures are considered to be *homogenous* or *heterogenous* in nature.

Homogeneous Mixture vs Heterogenous Mixture

Homogeneous Mixture	*Heterogeneous Mixture*
They have a uniform composition	They have a non-uniform composition
The components of mixture cannot be separated through physical process	The components can be separated through physical process
The component cannot be seen through naked eyes	The components can easily be seen through naked eyes
They exist in single-phase	They can exist in two or more phase
E.g. A mixture of water and milk	***E.g. A mixture of oil in water***



Solution

• A solution is a homogeneous mixture formed when one or more substances *(solute)* dissolve in another substance *(solvent)*. The composition is uniform throughout, meaning the solute is evenly distributed within the solvent. ***E.g.***

• ***Liquid into liquid: Water and Ink.***
• ***Solid into Solid: Alloys.***
• ***Gas into Gas: Air.***
• ***Solid into a liquid: Sugar and Water.***
• ***Gas into Solid: Hydrogen dissolved in palladium.***
• ***Gas into Liquid: Carbon Dioxide dissolved in water.***

Solute + Solvent = Solution

$1\ nm = 10^{-9} m$

Properties of Solution

1. It is *homogeneous* in nature.
2. The particles of solution are too *small (less than 1 nm)*.
3. It *does not* scatter light.
4. It cannot be separated by filtration.
5. It is *stable* in nature.

More Examples of Solution

• A solution of sugar in water is a solid in *liquid solution*. In this solution, sugar is the solute and water is the solvent.
• A solution of iodine in alcohol known as *"Tincture of Iodine"*, this solution has iodine (solid) as the solute and alcohol (liquid) as the solvent. This solution is also used as *Antiseptic*.
• Aerated drinks like soda water, etc., are gas in *liquid solutions*. These contain carbon dioxide (gas) as solute and water (liquid) as solvent.
• Air is a mixture of gas in gas. Air is a *homogeneous mixture* of a number of gases. Its two main constituents are: oxygen (21%) and nitrogen (78%). The other gases are present in very small quantities.

Types of Solution

1. **Unsaturated Solution:** It is a solution that contains *less solute than the maximum amount it can dissolve*.
2. **Saturated Solution:** It is a solution that contains the *maximum amount of solute that can dissolve* in a given amount of solvent at a specific temperature.
3. **Concentrated Solution:** It contains a *large amount of solute relative to the solvent*.

Calculation of Mass % of a Solution

$$\text{Mass \% of solute} = \frac{\text{Mass of Solute}}{\text{Mass of Solution}} \times 100$$

Alloy

• An alloy is a *mixture of different metals or non metals* that cannot be separated by physical method. ***E.g. Brass, Bronze, Nichrome, etc.***

E.g.
Q. A solution contains 40 g of common salt in 320 g of water. Calculate the concentration in terms of mass by mass % of the solution.

Solution: $\frac{40}{40 + 320} \times 100 = 11.11\% \rightarrow$ *Mass % of the solution*

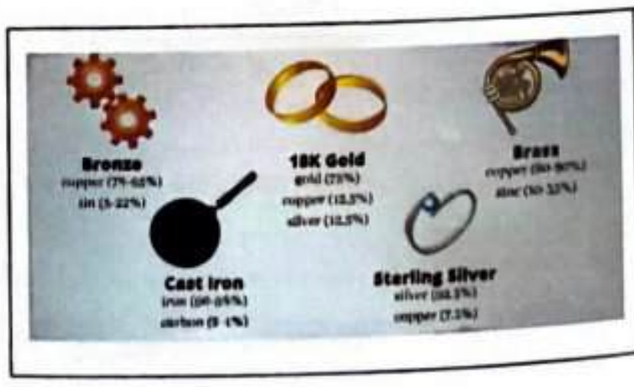


Fig 4: Types and Composition of Alloy

Suspension

• A suspension is a mixture in which two or more substances are combined in a *non-uniform* manner. In a suspension, the *solute does not dissolve*

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completely in the solvent, and its particles remain large enough to be seen with naked eye. ***E.g. Suspension may include muddy water, flour in water, and chalk powder in water.***

Properties of Suspension

- It is *heterogeneous* in nature.
- It *scatters light* (shows Tyndall Effect) because particle size is large *(greater than 1000 nm)*.
- It can be separated using *filtration method*.
- It is *unstable* because solute gets settled down in solvent.

Colloids

- A colloid is a mixture in which one substance is dispersed evenly throughout another. Although colloids appear uniform (homogeneous) to the naked eye, they are actually *heterogeneous* when viewed under a microscope.
- The particle size of colloid is intermediate *(1-1000 nm)* between that of a *solution* and *suspension*.

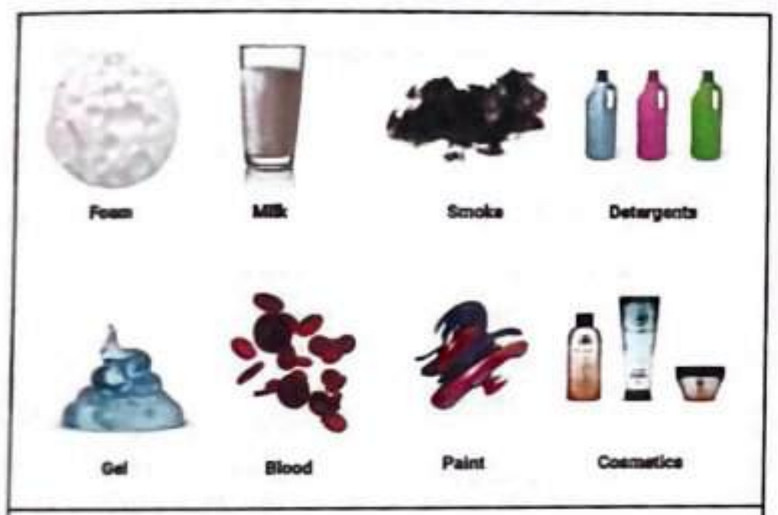

Fig 5: Examples of Colloidal Solution

Properties of Colloids

- Colloids are *heterogeneous* in nature.
- The particles *cannot* be seen through naked eyes *(particle size: Between 1 and 1000 nm)*.
- The particles of *colloid do not settle* down if left uninterrupted, hence they are stable.
- It cannot be separated through filtration method but can be separated through centrifugation.

> *Turbidity measures the haziness or cloudiness of water due to suspended particles.*

Tyndall Effect

- When a beam of light is passed through a colloidal solution, the particles of the *colloid scatters the beam of light* and we can see the path of light in the solution. This is called as Tyndall Effect which was discovered in *1859*.

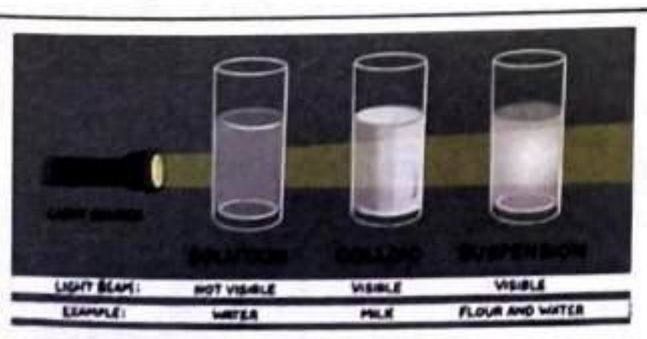

Fig 6: Tyndall Effect in Solution, Colloid, and Suspension

Types of Colloids

Dispersed Phase	*Dispersing Medium*	*Type*	*Example*
Liquid	Gas	Aerosol	Fog, clouds, mist
Solid	Gas	Aerosol	Smoke, automobile exhaust
Gas	Liquid	Foam	Shaving cream
Liquid	Liquid	Emulsion	Milk, face cream
Solid	Liquid	Sol	Milk of magnesia, mud
Gas	Solid	Foam	Foam, rubber, sponge
Liquid	Solid	Gel	Jelly, cheese, butter
Solid	Solid	Solid Sol	Coloured gemstone, milky glass

Different Methods to Separate Components of a Mixture

- We can separate the *heterogeneous mixtures* into their constituents by means of physical methods such as → *Filtration, Hand-picking, Sieving*.
- *Filtration:* It is a physical separation process that separates *solid matter* and *fluid from a mixture* using a filter medium.
- *Hand-picking:* It is a method of separating substances in a *mixture* by *hand* when the components are clearly visible enough to pick.
- *Sieving:* It is a method of using a *sieve* to distinguish small particles from bigger particles.

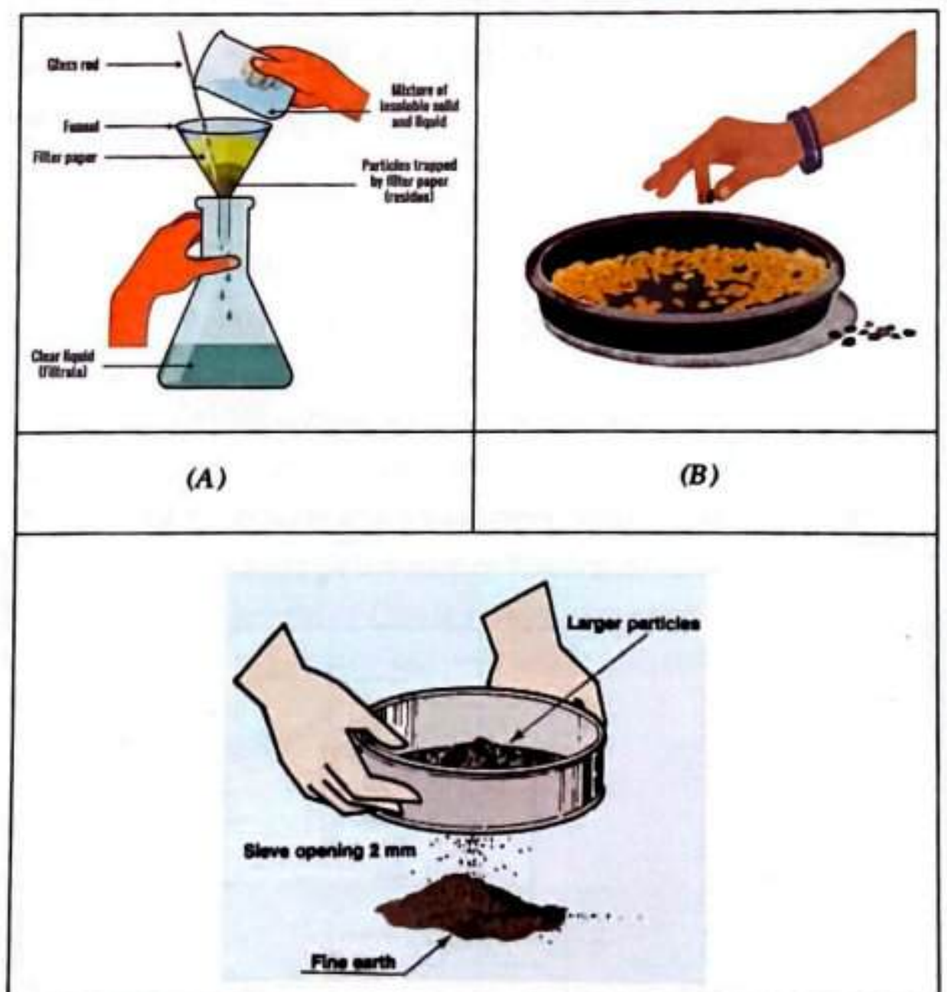

Fig 7: (A) Filtration Method; (B) Hand Picking; (C) Sieving

Other Methods of Separation of components of Mixture

1. *Evaporation:* It is a process that is used to separate a mixture of a *non-volatile* and a *volatile* substance.

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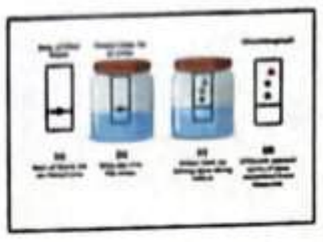
Applications

- It is used to separate coloured dye from the ink.
- It is used to separate salt from water.
- It is used to separate sugar from water.

2. **Chromatography:** It is a technique used to separate *different components* of mixture that are soluble in *same solvent*.



Applications

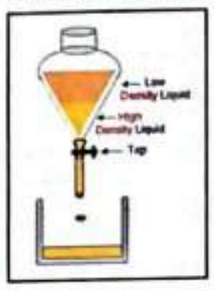
- It is used for separating different colors of a dye
- It is used to separate drugs from blood.

3. **Centrifugation:** It is a process that is used to separate *dense particles* from *lighter particles*.

Applications

- It is used to separate cream from milk.
- It is used to separate butter from cream.
- It is used to squeeze out water from wet clothes.

4. **Separating Funnel:** It is a process that is used to separate *two immiscible liquids*.



Applications

- It is used to separate oil from water.

5. **Distillation:** It is used to separate two *miscible liquids* (the *boiling point* of the liquids must be *sufficiently different*).

Application

- It is used to separate acetone and water.

Types of Distillation

1. **Simple Distillation:** It is used to separate miscible liquids with boiling point differences of *more than 25 Kelvin* (or 25°C).
2. **Fractional Distillation:** It is used to separate miscible liquids with boiling point differences of *less than 25 Kelvin* (or 25°C). It is also used to separate *components of air*, like nitrogen and oxygen, based on their boiling points.

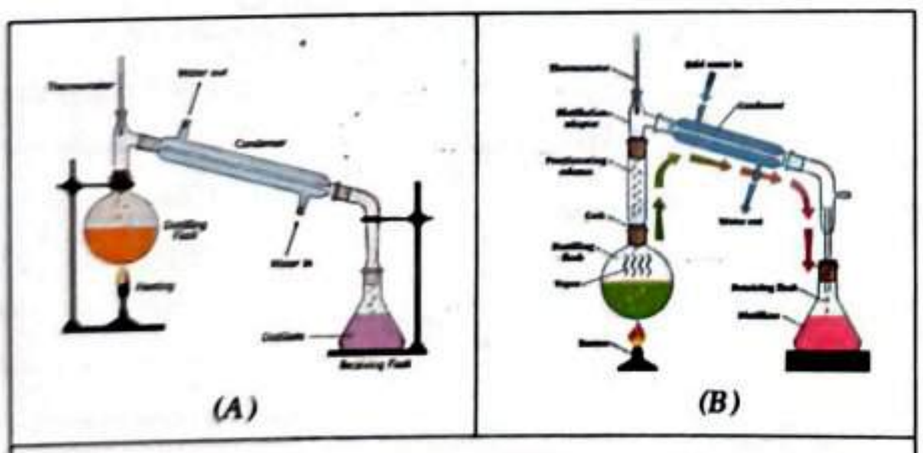
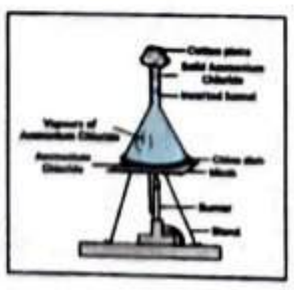


Fig 8: (A) Simple Distillation; (B) Fractional Distillation

6. **Sublimation:** It is a process that is used to separate a *sublimable component* from *non-sublimable* component.



Application

- It is used to separate ammonium chloride / camphor / naphthalene and salt.

Purifying Solids

Crystallisation

- It is a process of formation of *solid crystals from solution*, melt, or by deposition directly from *gas phase*.
- It is the most commonly used method for the process of *purification of solids*.
- In this method, impure substances are dissolved in a minimum amount of water and then filtered.

Fractional Crystillization: It is the method *of separating a mixture of soluble solids by dissolving them in a suitable hot solvent and then lowering the temperature slowly*

Application

- It is used to separate salt from seawater.
- It is used for purification of copper sulphate.

PHYSICAL AND CHEMICAL CHANGES

Physical Properties of a Substance

- The physical property of a substance is which we can observe, such as rigidity, colour, fluidity, boiling point, melting point, density, and hardness.

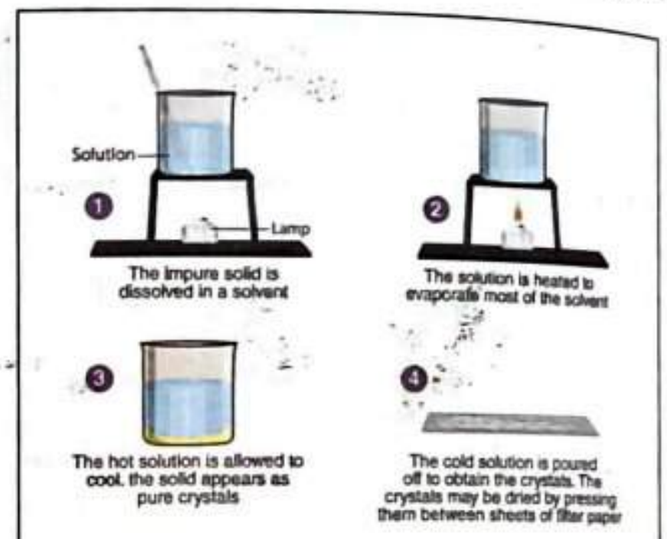


Fig 10: Crystallisation Process

Chemical Properties of a Substance

- The chemical nature of a substance is known as its chemical property such as its order or its chemical composition.

Physical Change vs Chemical Change

Physical Change	*Chemical Change*
It is a change that occurs without changing the chemical composition of a matter	It is a change of chemical composition of a matter
It is usually reversible	It is usually irreversible
New products are not formed	New products are formed
Some changes occur when heating or cooling it down	Changes always involve absorption or release of energy
Changes have no effect on the chemical bonds of molecule of a substance	They have a direct effect on chemical bonds of molecules in a substance

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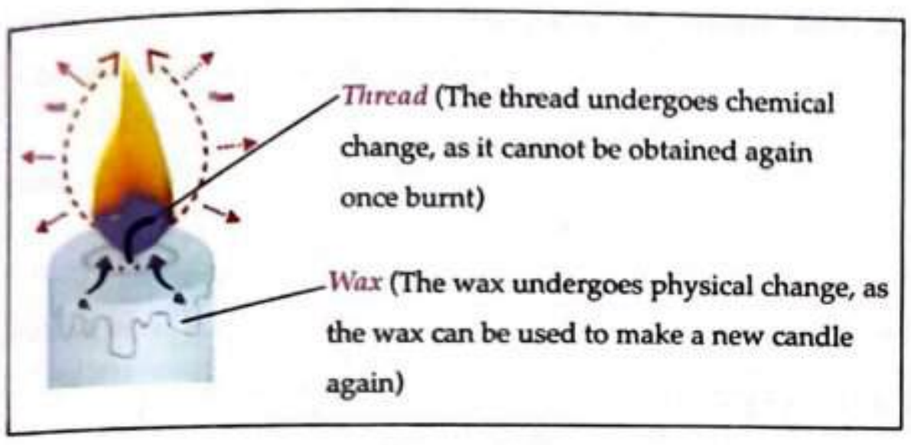
Fig 11: Few Examples of Physical and Chemical Changes

• *Burning of candle* is both *physical* and *chemical* change.



Brownian Movement

• It is a random *zig-zag movement* of particles suspended in a medium.

• This motion is a result of the *collisions of the particles* with other fast-moving particles in the fluid.

• It was named after *Robert Brown* after he discovered the phenomenon in *1827*.

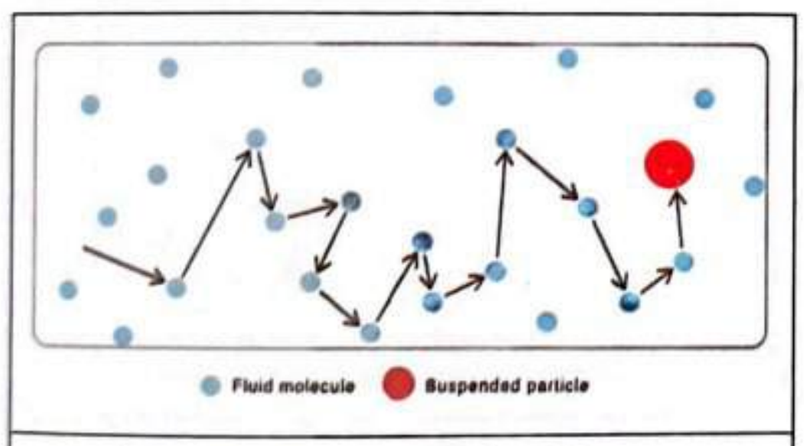


Fig 11: Brownian Movement of Particles

Types of Gases

Ideal Gas	*Real Gas*
The intermolecular force of attraction is zero It follows ideal gas equation → PV = nRT (P: Pressure; V: Volume; n: No. of moles; R = Universal gas constant; T = Temperature)	There is some intermolecular force of attraction

• A real gas behaves most like an ideal gas at *high temperatures* and *low pressures*, where intermolecular forces and the volume occupied by the gas molecules become *negligible*.

Gas Laws

Boyle's Law *(1662)*

• According to Boyle's Law, *pressure* and *volume* are *inversely proportional* to each other at *constant temperature*.

$$P \propto \frac{1}{V}$$

$$P_1 V_1 = P_2 V_2$$

At constant T, as pressure increases, volume decreases

Charles' Law *(1787)*

• According to Charles' Law, *temperature* and *volume* are *directly proportional* to each other at *constant pressure*.

$$V \propto T$$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

At constant P, as temperature increases, volume increases.

Gay-Lussac's Law *(1808)*

• According to Gay-Lussac's Law, *pressure* and *temperature* are *directly proportional* to each other at *constant volume*.

$$P \propto T$$

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

At constant V, as pressure increases, temperature increases.

Avogadro's Law *(1811)*

• Avogadro's law states that an *equal volumes of all gases* under the same *temperature* and *pressure* conditions contain an equal number of molecules. In other words, the *volume of a gas* is *directly proportional* to the *number of moles of gas*, when *temperature* and *pressure are constant*.

$$\frac{V_1}{n_1} = \frac{V_2}{n_2}$$

Solubility of gases in liquids increases with decrease in temperature.

For an interactive recap of this topic, see the crossword on Page Number 259.

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Atoms

• Atoms are the smallest component of an element and are building blocks of matter. An atom is composed of *protons (p)*, *neutrons (n)* and *electrons (e-)*.

LAWS OF CHEMICAL COMBINATION

Law of Conservation of Mass

• The law of Conservation of Mass states that in a closed system, the *total mass of a system remains constant* over time, meaning mass is neither created nor destroyed, but can only change form.

• This was given by *Antoine Lavoisier*.

Law of Constant Proportion

• The law states that a given chemical compound always contains its component elements in a *fixed ratio by mass*, regardless of its source or method of preparation.

• This was given by *Joseph Proust*.

Dalton's Atomic Theory (1808)

According to Dalton's Theory:

• All matter is made of indivisible particles called *atoms*, which cannot be created nor destroyed.

• Atoms of the *same element* have *identical mass* and *physical properties*.

• Compounds are *combinations of atoms* of two or more elements.

• All chemical reactions involve the rearrangement of atoms.

THE ATOMIC MODELS

J. J. Thomson and Discovery of Electron *(1898)*

1897: J. J. Thomson performed *Cathode-Ray Experiment* by observing streams of particles emitted by cathode of a vacuum tube, which led to the discovery the *electron*.

He proposed:

(i) An atom consists of a *positively charged sphere* and the *electrons are embedded* in it.

(ii) The negative and positive charges are *equal in magnitude*. So, the atom as a whole is electrically neutral.

• *1904:* J. J. Thomson proposed the first atomic model, often referred to as the *"Plum Pudding Model"*, *"Raisin Pudding Model"*, or *"Watermelon Model"*. In this model, the *positive charge* is spread throughout the atom (like the bulk of pudding or watermelon), while the *electrons* are embedded within it (like plums or seeds).

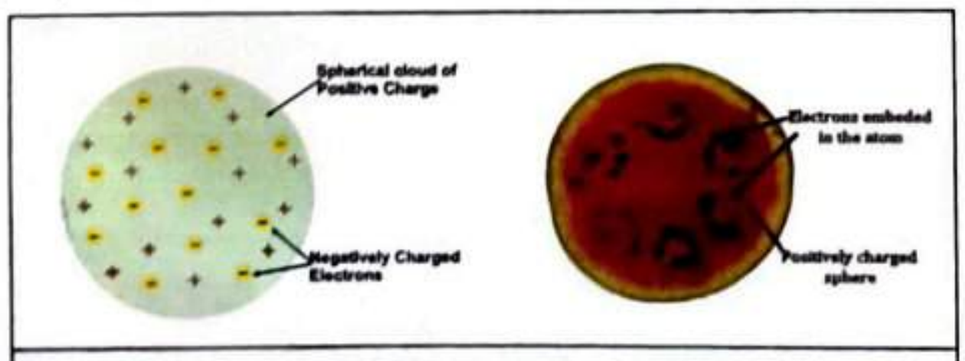

Fig 1: Thomson's Plum Pudding Model

Ernest Rutherford's Atomic Model (1911)

• In *1909*, Ernest Rutherford conducted the *Gold Foil Experiment* with the help of *Hans Geiger* and *Ernest Marsden*.

Gold Foil Experiment Findings

• A few *α-particle* were deflected at small and large angles, indicating the presence of a dense, positively charged nucleus.

• Rutherford used *gold foil* (about *1000* atoms thick) because gold is highly *malleable*, allowing it to be hammered into *ultra thin sheets*. A thicker foil would have prevented the *α-particles* from penetrating. The majority of alpha particles went through the gold foil without any deflection however a smaller number of alpha particles were slightly deflected from their original path. A very few *(1 in 8000)* were deflected backwards, at angles greater than 90°.

Key Observations and Conclusions:

From the α-particles scattering experiment, Rutherford proposed the following atomic model:

(i) An atom has a *positively charged* centre, called the *nucleus*, where nearly all the atom's mass is concentrated.

(ii) *Electrons* revolve around the nucleus in *circular paths* (orbit).

(iii) The nucleus is *extremely small* compared to the overall size of the atom.

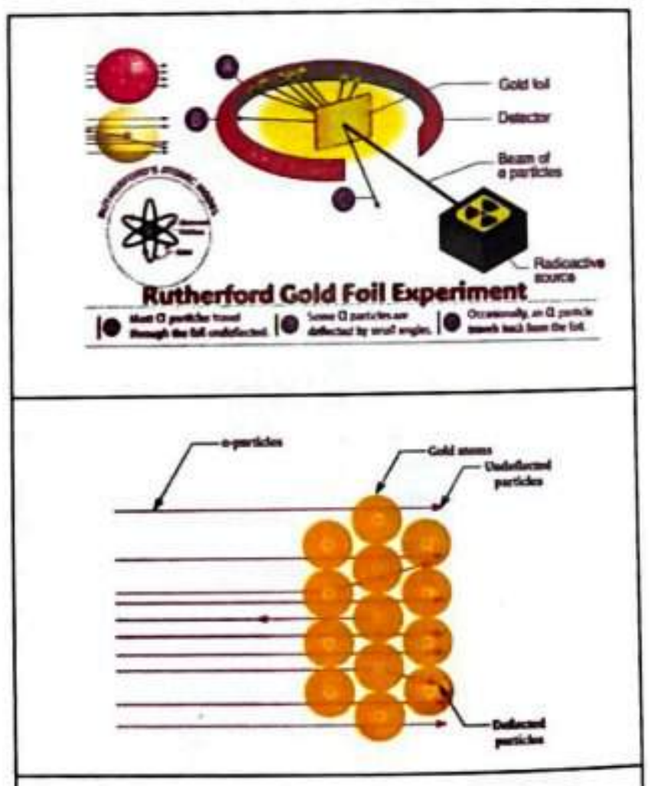

Fig 2: Rutherford's Gold Foil Experiment

Drawbacks of Rutherford's Model

• The atomic model failed to explain the distribution of electrons around the nucleus and the *stability of atoms*.

• It did not explain why *atoms emit specific colour* when they are heated.

• It failed to explain why different *elements react differently* or how *electrons are arranged*.

• The atomic model *did not include energy levels* which was later explained through *Bohr's Model (1913)*.

Artificial Nuclear Reaction (1917)

• In *1917*, Rutherford performed the *first artificially induced nuclear reaction*

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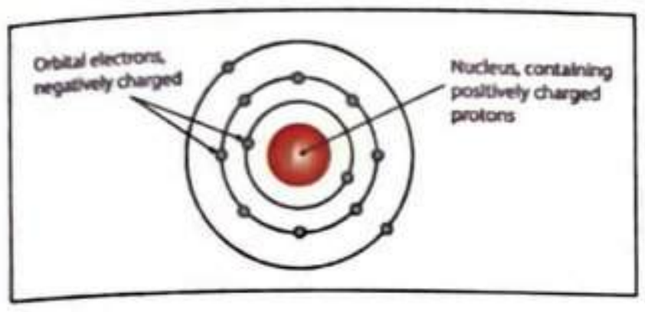
by conducting experiment in which nitrogen nuclei was bombarded with α-particles.

Key Observations:

- Rutherford concluded that the *hydrogen* nucleus is a fundamental particle present in all atoms.
- He named this positively charged particle the *proton (p)* in *1920*.



Bohr's Model of Atom (1913)

According to this model:

- Electrons revolve around the nucleus in *stable orbits* (energy levels or shells) without losing energy in the form of radiation.
- The orbits or energy levels are labeled *K, L, M, N,* with *K* being the *closest* to the nucleus and *N* being the *farthest*.
- The *ground state is the lowest energy level* that an electron can occupy, typically referring to the electron's position in the K-shell (the innermost shell).
- When an electron moves between different energy levels (or shells), it either *absorbs or emits energy*.
- When an electron falls from a higher energy level to a lower one, it emits energy, usually in the form of electromagnetic radiation.
- When an electron moves from a lower energy level to a higher one, it absorbs energy.

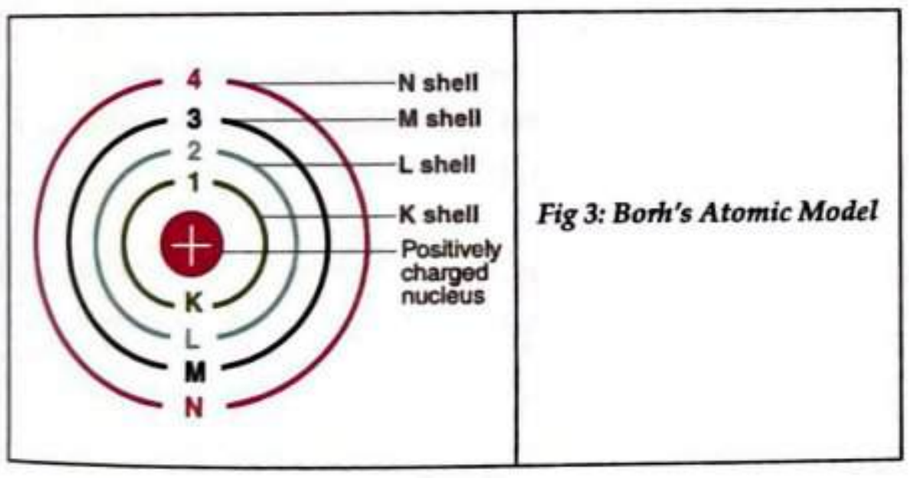


Fig 3: Bohr's Atomic Model

Distribution of Electrons (e-)

- The maximum number of e- that can be present in the nth shell is equal to $2n^2$. Thus, we have
- *Last shell/orbit → Valence shell → e- → Valence e-*

Shell	Maximum no. of e-
1st shell or K-shell (n = 1)	$2 \times 1^2 = 2$
2nd shell or L-shell (n = 2)	$2 \times 2^2 = 8$
3rd shell or M-shell (n = 3)	$2 \times 3^2 = 18$
4th shell or N-shell (n = 4)	$2 \times 4^2 = 32$

ELECTRON, PROTON, AND NEUTRON

Discovery of Electron, Proton and Neutron

- ***Electron discovered by:** J. J. Thomson.*
- ***Proton discovered by:** Rutherford or Goldstein.*
- ***Neutron discovered by:** Chadwick (1932).*

Comparison of Characteristics of Electron, Proton and Neutron

Particle	Charge on the particle	Mass of the particle	Symbol	Location in the atom
1. Electron	−1 unit (-1.602×10^{-19} coulomb)	9.11×10^{-31} kg $\left(\frac{1}{1836}u\right)$	${}^{0}_{-1}e$	Outside the nucleus (Extranuclear part)
2. Proton	+1 unit ($+1.602 \times 10^{-19}$ coulomb)	1.673×10^{-27} kg (1 u)	${}_{+1}p^{1}$	In the nucleus
3. Neutron	No charge	1.675×10^{-27} kg (1 u)	${}^{1}_{0}n$	In the nucleus

Table 1: Characteristics of Electron, Proton, and Neutron

***A neutron's mass is approx. 1836 times greater than that of electron.*

Neutrons

- Neutrons are sub-atomic particles that are found in the nucleus of every atom, except for hydrogen, which only has proton in its nucleus.
- Protons and neutrons are collectively known as *nucleons*.
- The mass of neutrons is *1 amu*.

Ions

- The charged species are called *Ions*.
- Negative charged ions are *Anion*.
- Positive charged ions are *Cation*.

E.g. Sodium Chloride (NaCl) constitutes positively charged Na^+ (sodium) and negatively charged Cl^- (chlorine).

Positron: Discovered in 1932 by Carl Anderson.

Symbols of Elements

- The symbols of elements were first given by *Jacob Berzelius (1813)* and were used by *Dalton* for the first time.
- He proposed that chemical symbols should be based on the *Latin* names of the elements.

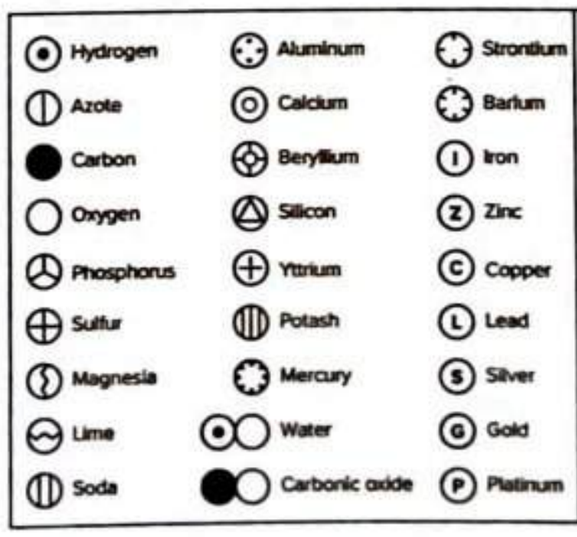


Table 2: Symbolsof Elements

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Atomic Number (Z)

Z = no. of proton (p) = no. of electrons (e-)

- Atomic number is always a *whole number*, because it represents the *total number of protons* in an atom.
- The atomic number of an element does not change during a chemical reaction, as chemical reactions involve only *rearrangement of electrons*, not changes in the nucleus.

Mass Number (A)

- ***Mass number of an element (A) = No. of protons (p) + No. of neutrons (n)*** (present in the atom of an element).
- Since protons and neutrons are present in the nucleus, these particles are collectively called *nucleons*. Thus,

Mass number of an element = Number of nucleons in the atom of that element.

Mass no. (No. of p + n) — a
Atomic no. (No. of protons) — Z
M

$A = p + n$
$A = Z + n$
$A - Z = n$

E.g. Magnesium (Mg)
Protons (p^+) = 12
Electrons (e-) = 12
Neutrons (n_0) = Mass no. — No. of protons = 12

Electronic Configuration of First 20 Elements

Name Element	Symbol	Atomic Number	Number of Protons	Number of Neutrons	Number of Electrons	Distribution of Electrons K	L	M	N	Valency
Hydrogen	H	1	1	-	1	1	-	-	-	1
Helium	He	2	2	2	2	2	-	-	-	0
Lithium	Li	3	3	4	3	2	1	-	-	1
Beryllium	Be	4	4	5	4	2	2	-	-	2
Boron	B	5	5	6	5	2	3	-	-	3
Carbon	C	6	6	6	6	2	4	-	-	4
Nitrogen	N	7	7	7	7	2	5	-	-	3
Oxygen	O	8	8	8	8	2	6	-	-	2
Fluorine	F	9	9	10	9	2	7	-	-	1
Neon	Ne	10	10	10	10	2	8	-	-	0
Sodium	Na	11	11	12	11	2	8	1	-	1
Magnesium	Mg	12	12	12	12	2	8	2	-	2
Aluminium	Al	13	13	14	13	2	8	3	-	3
Silicon	Si	14	14	14	14	2	8	4	-	4
Phosphorus	P	15	15	16	15	2	8	5	-	3,5
Sulphur	S	16	16	16	16	2	8	6	-	2
Chlorine	Cl	17	17	18	17	2	8	7	-	1
Argon	Ar	18	18	22	18	2	8	8	-	0

Table 3: Electronic Configuration of First 20 Elements

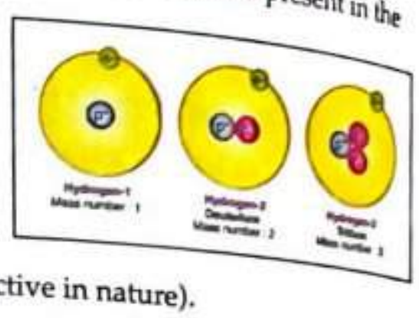
Q. An ion M^{3+} contains 10 electrons and 14 neutrons. What is the mass number and atomic number of element M?

Solution:

M^{3+} = 3 e- lost → So originally it had 13 e-
$A = p + n$ → 13 e- = 13 p^+ = atomic no. = 13
$= 13 + 14$ → Mass no. (A) = No. of protons (p) + No. of neutrons (n)
$A = 27$

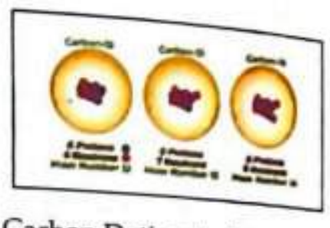
ISOTOPES

- Isotopes are atoms of same elements that have *same atomic number, but different mass number.*
- Isotope of an element differ only in *number of neutrons* present in the nucleus.



Isotopes of Hydrogen

$^{1}_{1}H$ (e- = p = 1, n = 0): *Protium.*
$^{2}_{1}H$ (e- = p = 1, n = 1): *Deuterium.*
$^{3}_{1}H$ (e- = p = 1, n = 2): *Tritium* (radioactive in nature).



Isotopes of Carbon

$_{6}C^{12}$ (e- = p = 6, n = 6): *Carbon-12.*
$_{6}C^{13}$ (e- = p = 6, n = 7): *Carbon-13.*
$_{6}C^{14}$ (e- = p = 6, n = 8): *Carbon-14* (used in Carbon Dating to determine age of fossils and rocks).

Characteristics of Isotopes

1. *Same Chemical Properties*

- Isotopes have same electronic configuration, hence *same number of valance e-*. Since chemical property depends upon the number of valance e-. Therefore, they have same chemical properties.

2. *Different Physical Properties*

- Since, the isotopes of an element have *different masses*, hence different physical properties, like melting point, boiling point, density, etc. exist.

Q. Atomic Mass of Chlorine is 35.5. How?

Solution:

$^{35}_{17}Cl$: $^{37}_{17}Cl$
3 : 1

$$\text{Atomic Mass} = \frac{35 \times 3 + 37 + 1}{3 + 1} = 35.5$$

→ *Chlorine has two isotopes Cl-35 and Cl-37 which exists in ratio 3: 1.*

Uses of Isotopes

1. In *nuclear reactors*, isotopes like *Uranium-235* are used as fuel to sustain a controlled nuclear chain reaction, generating heat that powers electricity production.
2. In *radiation therapy*, isotope *Cobalt-60* is used to destroy and prevent *cancer cells.*
3. In treatment of *goitre*, isotope *Iodine-131* is used.

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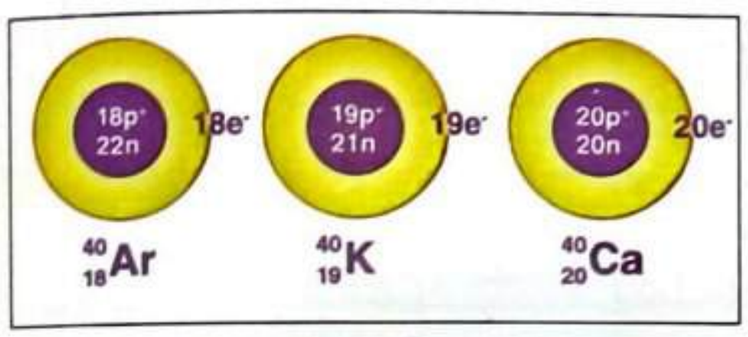
ISOBARS

• Isobars are atoms of different chemical elements that have *same mass number, but different atomic numbers.*

Isobars and Their Properties

• They are atoms of different elements.
• They have different atomic number.
• They have same mass number.
• They have similar physical properties and different chemical properties.
• They have different number of protons, electrons, neutrons.

E.g. Argon (Ar), Potassium (K), Calcium (Ca).



ISOTONES

• Isotones are atoms that have the *same neutron number but different proton number.*

Element	Protons	Electrons	Neutrons
$^{16}_{8}O$	8	8	8
$^{15}_{7}N$	7	7	8

ATOMICITY

• Atomicity is the *total number of atoms* present in a molecule of an element. *E.g. Each molecule of Oxygen is composed of two oxygen atoms. Therefore, the atomicity of Oxygen is 2.*

Element	Atomicity
Argon	Monoatomic (1)
Helium	Monoatomic
Oxygen	Diatomic (2)
Hydrogen	Diatomic
Nitrogen	Diatomic
Chlorine	Diatomic
Phosphorus	Tetra-atomic (4)
Sulphur	Poly-atomic

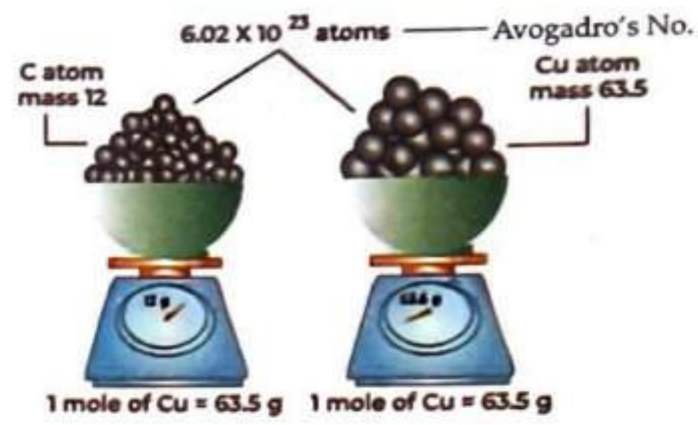
MOLE CONCEPT

Mole

• It is a unit of measurement that represents the amount of a substance.
• It is a *base unit* in the *International System of Units* (SI).
• *One mole* of a substance contains 6.022×10^{23} elementary entities *(Avogadro's Number)*, such as atoms, molecules, or ions.

$$\text{No. of Moles} = \frac{\text{Given Mass } (m)}{\text{Molecular Mass } (M)} = \frac{\text{Given no. of Particles } (N)}{\text{Avogadro No. } (N_0)} \rightarrow N = \frac{m}{M} = \frac{N}{N_0}$$

E.g. Copper



Q. What will be the number of moles in 2g of Helium (He)?

Solution: $n = \frac{2}{4} = \frac{1}{2} = 0.5$ *moles*

→ *The molecular mass of helium* = 2 + 2 = 4
2 → *protons*
2 → *neutrons*

Q. What will be the number of moles in 12.044×10^{24} particles of N atoms?

Solution: $n = \frac{12.044 \times 10^{24}}{6.022 \times 10^{23}} = 20$ *moles*

For an interactive recap of this topic, see the crossword on Page Number 259.

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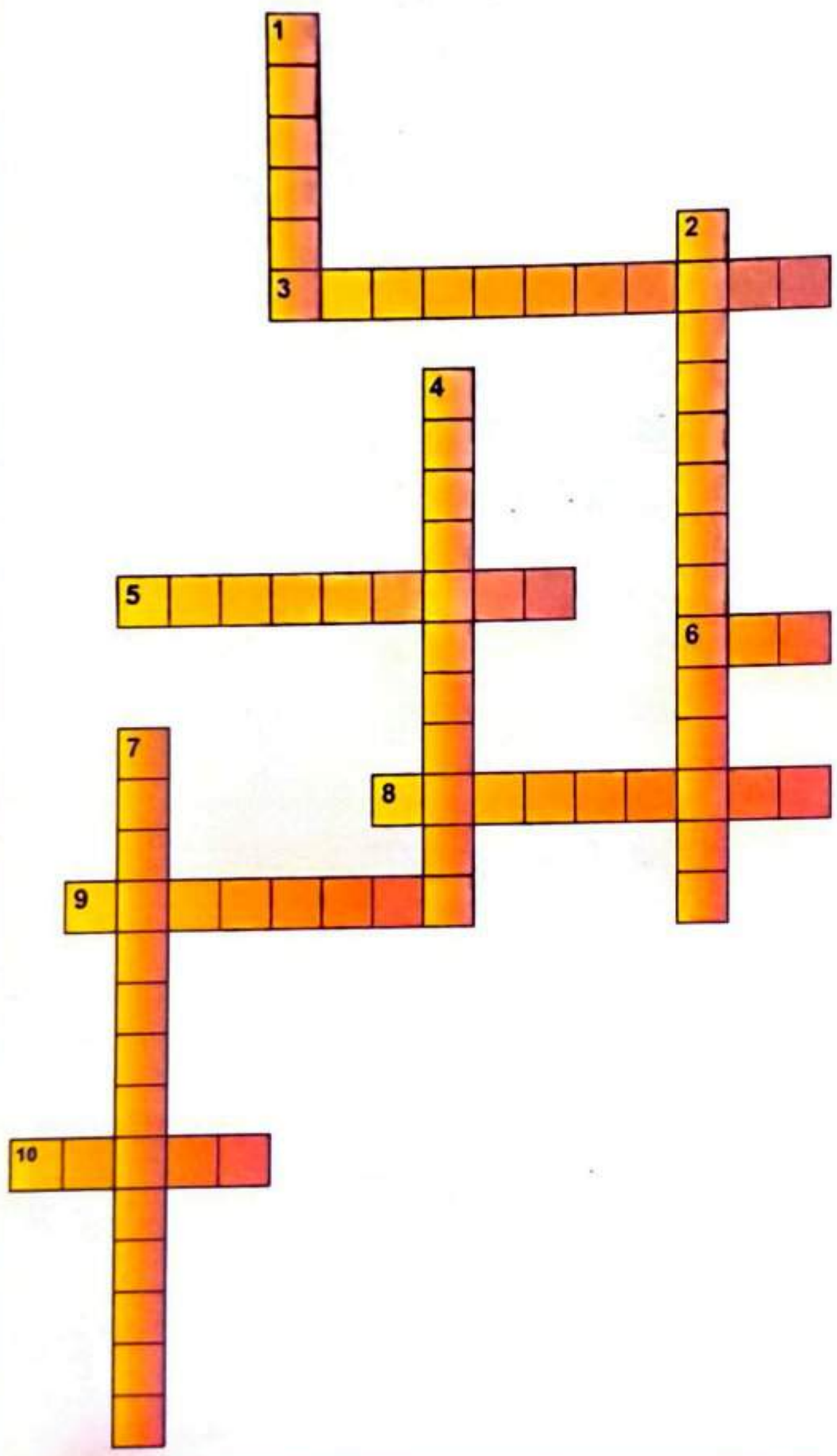
PARMAR'S CROSSWORD

MATTER



Across

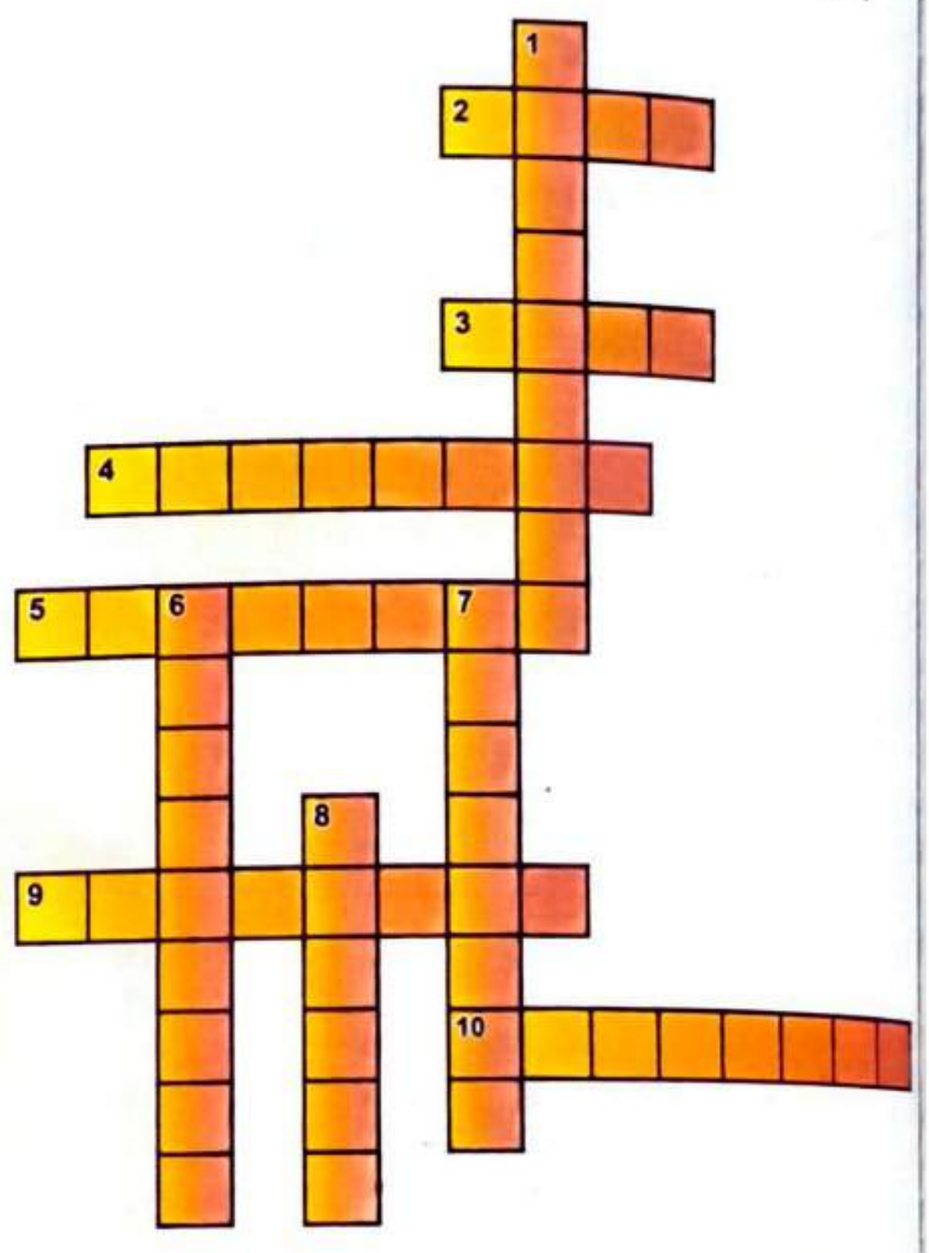
3. Sublimable substance changing directly to gas.
5. Measurement of haziness in water.
6. State of matter with highest kinetic energy.
8. Movement from high to low concentration.
9. Homogeneous mixture with solute and solvent.
10. Compound among given options.

Down

1. Phenomenon opposite to solidification.
2. Technique used for blood test separation.
4. Process when solid directly turns into gas.
7. Method to separate dyes in black ink.

PARMAR'S CROSSWORD

ATOM AND ITS STRUCTURE



Across

2. J.J. Thomson's atomic model name.
3. Dalton stated matter is made of tiny particles called what.
4. Particle discovered by Carl Anderson.
5. Main particles in atomic nucleus.
9. Constant used for number of atoms.
10. Nature of an atom as a whole.

Down

1. Move in fixed orbits around nucleus.
6. Small whole number ratio forms what.
7. Particle responsible for atomic mass with protons.
8. Disease treated using cobalt isotope.

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EARLY ATTEMPTS AT CLASSIFICATION OF ELEMENTS

Döbereiner's Law of Traids *(1817)*

• Döbereiner observed that when groups of three elements with similar properties (which he named *"triads"*) were arranged by increasing atomic mass, *the atomic mass of the middle element* was approximately the average of the atomic masses of the *1st and 3rd elements.*

Dobereiner's Triads

Elements	Atomic Mass	Average
Lithium (Li) Sodium (Na) Potassium (K)	6.9 23.0 39.0	$\frac{6.9 + 39.0}{2} = 22.95$
Calcium (Ca) Strontium (Sr) Barium (Ba)	40.1 87.6 137.3	$\frac{40.1 + 137.3}{2} = 88.65$
Chlorine (Cl) Bromine (Br) Iodine (I)	35.5 79.9 126.9	$\frac{35.5 + 126.9}{2} = 81.2$

Table 1: Döbereiner's Triads

Newland's Law of Octaves *(1865)*

• Newland discovered that when elements are arranged in increasing order of their atomic mass, the 1st and the 8th elements showed similar properties and characteristics.

• Newland arranged the elements in horizontal rows, with each row having 7 elements and compared this to the eight octaves of music (do, re, mi, fa, so, la, ti, do).

• He published his concept in *1864* and recognition was given in *1865.*

• Last element: Thorium

• Total number of elements: 56

Sa (do)	re (re)	ga (mi)	ma (fa)	pa (so)	da (la)	ni (ti)
H	Li	Be	B	C	N	O
F	Na	Mg	Al	Si	P	S
Cl	K	Ca	Cr	Ti	Mn	Fe
Co and Ni	Cu	Zn	Y	In	As	Se
Br	Rb	Sr	Ce and La	Zr	-	-

Table 2: Elements Arranged on the Basis of Musical Note

Limitations of Newland's Model

1. The law was not true for elements beyond *Calcium.* After calcium, every eighth element *did not share similar properties to the first one.*
2. Those elements that were discovered after Newlands' octaves did not follow the law of octave.
3. To fit elements into his table, Newland sometimes placed two elements in the same position, even when they had different chemical and physical properties. ***E.g. Cobalt and Nickel were placed in the same slot without considering their differences from Iron, which was placed far away, despite similarities.***
4. The periodic table did not include noble gases because they were not discovered then.

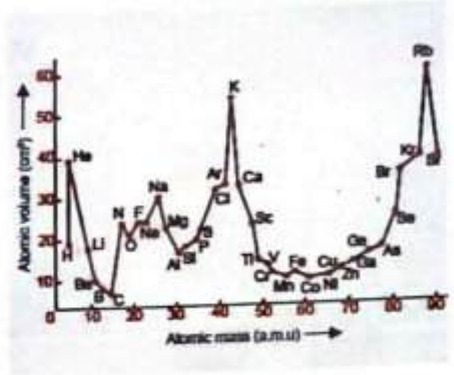
Lothar Meyer

• Meyer published his first periodic table in *1862,* which included *28* elements.

• He published an updated version in *1864,* which included *50* elements.

• He was the *first* to identify *periodic trends* in the properties of elements.

• He plotted the *atomic volume of an element against its atomic weight* to show this pattern.



Graph 1: Lothar Meyer Atomic Volume Curves

• ***Father of Periodic Table:*** *Dmitri Mendeleev.*

Mendeleev's Periodic Table *(1869)*

• The periodic table was created in *1869* by *Dmitri Mendeleev,* a Russian chemist and inventor.

• He arranged the *63* known elements at the time in order of their increasing relative atomic masses.

• He divided the table into *8 groups* and *7 periods.*

Mendeleev's Periodic Law

• Mendeleev's law states that the physical and chemical properties of elements are periodic functions of their atomic masses, meaning that when elements are arranged in order of increasing atomic mass, *elements with similar properties repeat themselves at regular intervals.*

Mendeleev's Given Name	*Modern Name*
Eka-aluminium	Gallium
Eka-boron	Scandium
Eka-silicon	Germanium
Eka-manganese	Technetium
Tri-manganese	Rhenium
Dvi-tellurium	Polonium
Dvi-caesium	Francium
Eka-tantalum	Protactinium

Element	*Atomic Mass*
Eka Boron	44 (Scandium) → 44.955912 u
Eka Silicon	72 (Germanium) → 72.64 u
Eka Aluminium	68 (Gallium) → 69.723 u

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Limitations of Mendeleev's Periodic Table

1. The position of *hydrogen is not fixed.*
2. The *increasing order of atomic weight* is not maintained.
3. Some elements in the same group differ in their properties.
4. Lanthanides and Actinides were not included in the table.

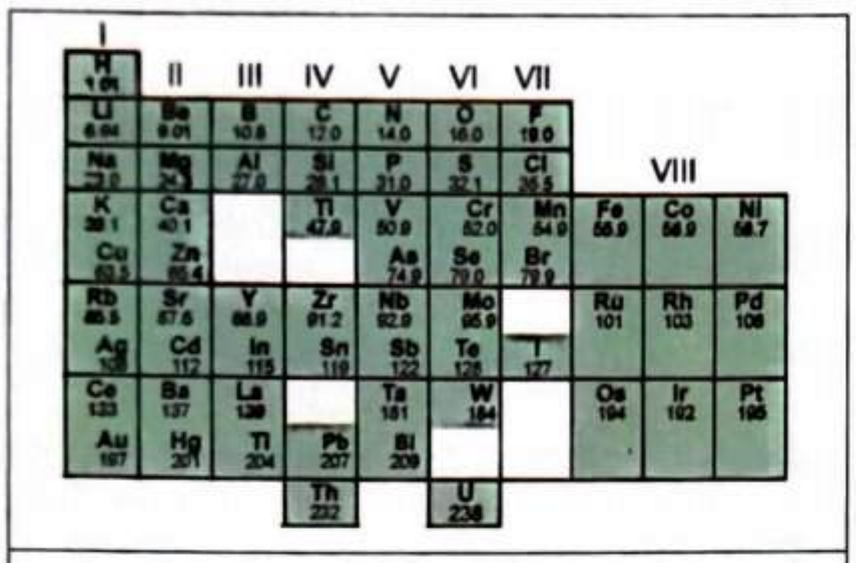


Fig 1: Mendeleev's Periodic Table

MODERN PERIODIC TABLE

- It was given by *Henry Moseley* in *1913.*
- Moseley discovered that elements are best characterized by their atomic number (the number of protons in the nucleus) and not by atomic weight.
- ***The modern periodic table contains:*** *18 Groups* and *7 Period.*

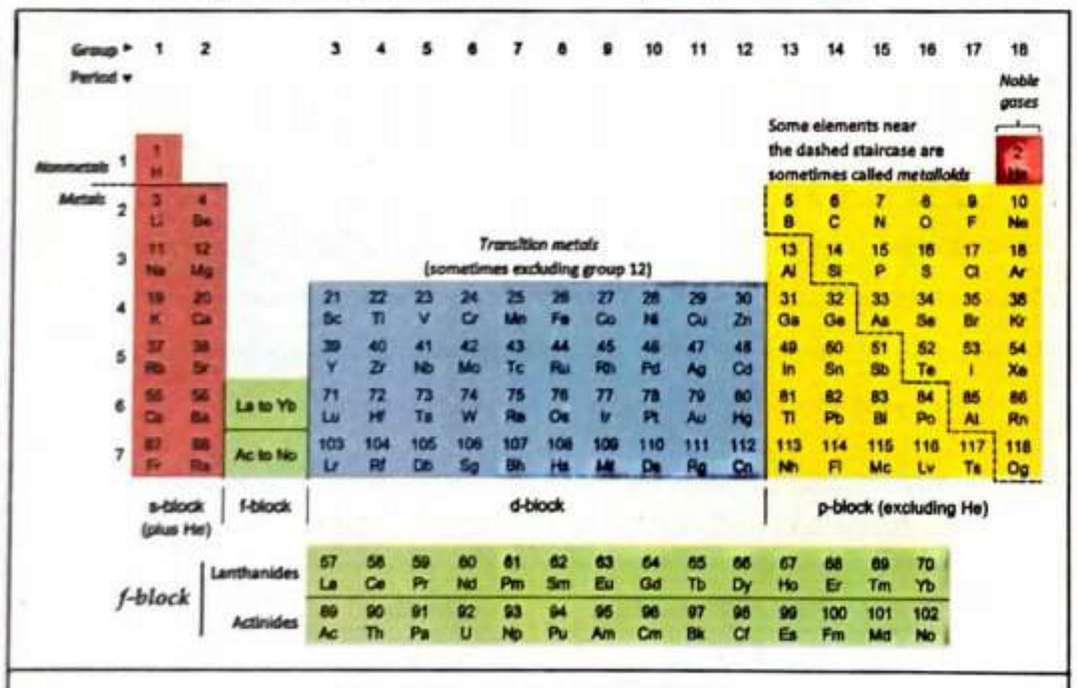


Fig 2: Modern Periodic Table

Groups (vertical lines) → 18

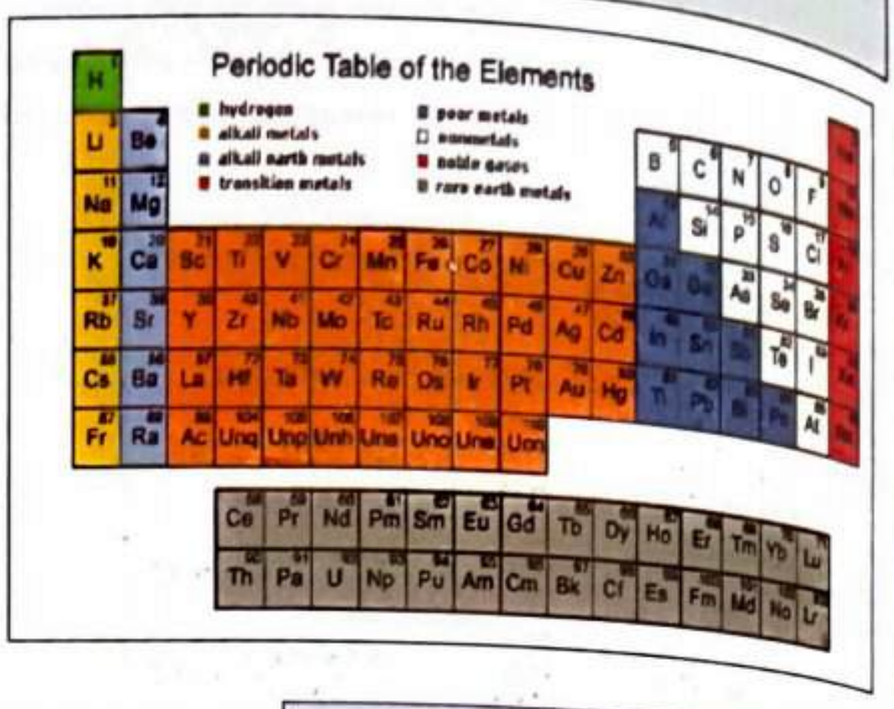
Periods (horizontal lines) → 7

Elements → 118

Naturally occuring elements → 94

- *s: Valence e- s subshell → Group 1 & 2.*
- *p: Valence e- p subshell → Group 13 to 18.*
- *d: Valence e- d subshell → Group 3 to 12 (Transition Metals).*
- *f: Valence e- f subshell → Inner Transition Metals.*
- *s* and *p-block* elements are collectively called as *Representative Elements.*
- *Metals: s, p, d, f.*
- *Non-metals: Only in p-block.*
- *Metalloids (7): Only in p-block (Germanium, Arsenic, Antimony, Tellurium, Boron, , Polonium, and Silicon).*

Metalloids are chemical elements that have both properties of metal and non-metals.



Hydrogen → Group 1A

1st Group → Alkali metal

2nd Group → Alkaline Earth metals

Group 15 → Pnictogens

Group 16 → Chalcogens

Group 17 → Halogens

Group 18 → Noble gas/Inert gas

Noble Gas/Inert Gas/Group 18	*Discovered By*
Helium (used in balloons)	Pierre Janssen and Norman Lockyer
Neon (used in light bulbs)	William Ramsay and Morris Travers
Argon (used in double pane window glasses)	William Ramsay and Lord Rayleigh
Krypton (used in nuclear fission)	William Ramsay and Morris Travers
Xenon	William Ramsay and Morris Travers
Radon	Friedrich Ernst Dorn

Some Special Elements

- ***Seaborgium → Z = 106.***
- ***Mendelevium → Z = 101.***
- ***Rutherfordium → Z = 104.***

- *There are a total of 94 naturally occurring elements.*
- *1st man-made element: Technetium (Z = 43).*
- *Heaviest naturally occurring elements: Uranium (Z = 92)*

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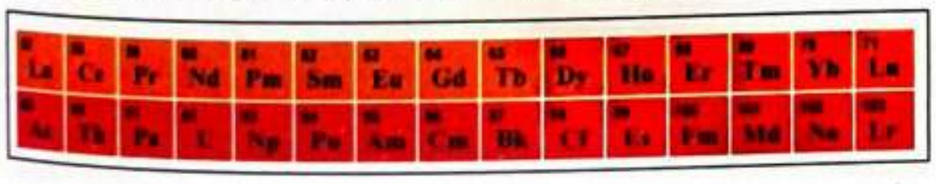
TRICK TO REMEMBER GROUPS

Groups	Elements With TRICK						
Group 1	Helium	Lithium	Sodium	Potassium	Rubidium	Caesium	Francium
	H	*Li*	*Na*	*K*	*Rb*	*Cs*	*Fr*
		Helina		Kabra		Se	Farar
Group 2	Beryllium	Magnesium	Calcium	Strontium	Barium	Radium	
	Be	*Mg*	*Ca*	*Sr*	*Ba*	*Ra*	
	Beta	Mange	Car	Sundarkanya	Baap	Raaji	
Group 13	Boron	Aluminium	Gallium	Indium	Thallium		
	B	*Al*	*Ga*	*In*	*Tl*		
	Baingan	Aalo	Gajar	In	Thaili		
Group 14	Carbon	Silicon	Germanium	Tin	Lead		
	C	*Si*	*Ge*	*Sn*	*Pb*		
	Kahe	Sita	Ji	Sune	Parbati		
Group 15	Nitrogen	Phosphorus	Arsenic	Antimony	Bismuth		
	N	*P*	*As*	*Sb*	*Bi*		
	Nepal	Pakistan	Australia	Sab	Bhikari		
Group 16	Oxygen	Sulphur	Selenium	Tellurium	Polonium		
	O	*S*	*Se*	*Te*	*Po*		
	Old	Style	Se	Topi			
Group 17	Fluorine	Chlorine	Bromine	Iodine	Astatine		
	F	*Cl*	*Br*	*I*	*At*		
	Fir	Kal	Bahar	Aayi	Aarti		
Group 18	Helium	Neon	Argon	Krypton	Xenon	Radon	
	He	*Ne*	*Ar*	*Kr*	*Xe*	*Rd*	
	Hema	Neha	Aur	Karina	Jeeti	Rehna	

Lanthanides and Actinides

- They are collectively called as *Inner Transition Metals* (f-block).



- *Lanthanides:* 57-71 → Period 6
- *Actinides:* 89-103 → Period 7

} *Group 3*

Diagonal Relationship

- This relationship is prominent among the lighter members of the *2nd* and *3rd* periods.
- A diagonal relationship in the periodic table is when two elements that are diagonally adjacent in the 2nd and 3rd periods have *similar properties*.

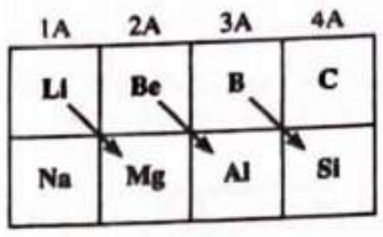
Some examples of diagonal relationships include:

→ *Boron and silicon (they are both semiconductors).*

→ *Li and Mg.*

→ *Be and Al.*

→ *C and P.*



TRENDS IN PERIODIC TABLE

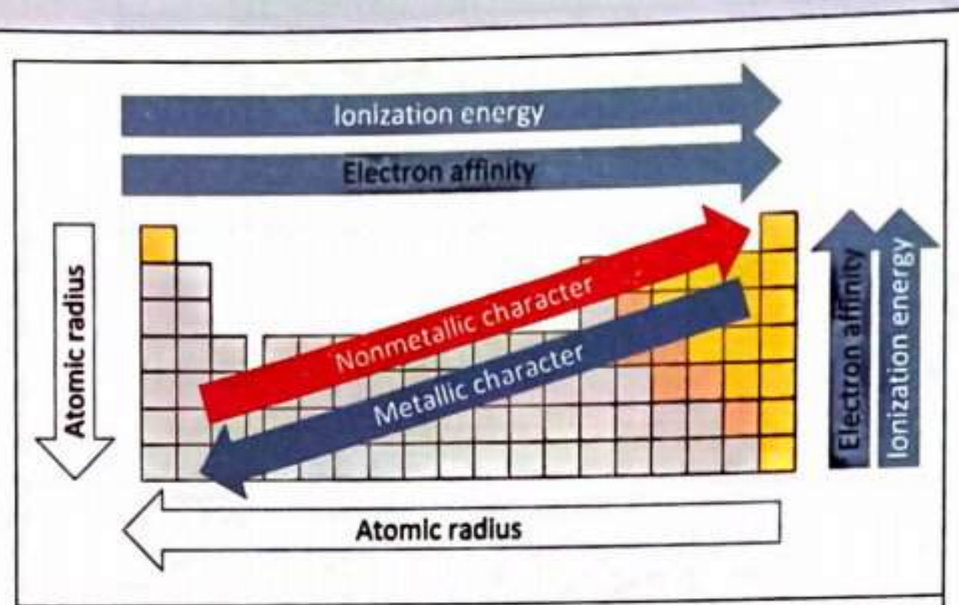


Fig 3: Trends in Modern Periodic Table

Ionisation Energy

→ Ionization energy is the energy required to remove an electron from a neutral atom in its gaseous state.

- ***Across a period (left to right):*** It *increases* across a period because it becomes harder to remove an electron from an atom with a higher nuclear charge and smaller atomic radius.
- ***Down the group (top to bottom):*** It *decreases* down a group as the outermost electrons are farther from the nucleus and more easily removed.

> - *Elements with highest electron affinity: Chlorine.*
> - *Elements with highest electronegativity: Fluorine.*

Electron Affinity

→ The energy released when an electron is added to a neutral atom to form a negative ion is called electron affinity.

- ***Across a period (left to right):*** It generally *increases* (becomes more negative) because of increasing nuclear charge and decreasing atomic size, making it easier for the atom to attract an extra electron.
- ***Down the group (top to bottom):*** It *decreases* (becomes less negative) down a group due to increasing atomic size and shielding effect.

Electronegativity

→ Electronegativity is the tendency of an atom of a given chemical element to attract shared electrons (or electron density) when forming a chemical bond.

- ***Across a period (left to right):*** It generally *increases* as atoms become more effective at attracting electrons due to increasing nuclear charge.

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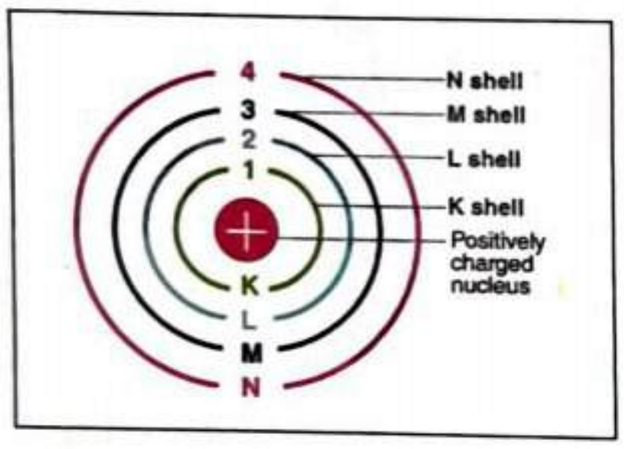
• ***Down the group (top to bottom):*** It generally *decreases* as the outermost electrons are further from the nucleus and less strongly attracted.

Electronic Configuration

• The electronic configuration is distribution of electrons of an atom or molecule in atomic or molecular orbitals.

• The *K, L, M,* and *N* shells represent the *first four energy levels* (or principal quantum numbers, n = 1, 2, 3, 4) where electrons are distributed, with *K holding a maximum of 2, L holding 8, M holding 18, and N holding 32 electrons.*

Elements	K	L	M	N
$_{3}Li$	2	1		
$_{11}Na$	2	8	1	
$_{8}O$	2	6		
$_{10}Ne$	2	8		
$_{37}Rb$	2	8	18	8, 1



Rb = $2n^2$

K: 2

L: 8

M: 18

N: 32 (8, 1)

Octet Rule

• The Octet rule refers to the tendency of atoms to prefer to have *8 electrons* in the *valence* or *outermost shell*. When atoms have fewer than 8 electrons, they tend to react to achieve a stable electronic configuration.

• Octet Rule was given by *Lewis* and *Kossel* in *1916*.

Isoelectronic Species

• Isoelectronic species are atoms, ions, or molecules that possesses the *same number of electrons*, and therefore the *same electronic structure*, even if they differ in nuclear charge.

E.g. Oxygen, Fluorine, Magnesium.

$_{8}O^{2-}$	$_{9}F^{-}$	$_{12}Mg^{2+}$
10	10	10

Atomic Mass is represented as: amu or u

Calculation of Atomic Mass *(A)*

• When protons (Z) is *even*, the number of neutrons (N) → 2Z.

• When protons (Z) is *odd*, the number of neutrons (N) → 2Z + 1.

Exceptions

$_{1}H \rightarrow 1$, $_{4}Be \rightarrow 9$, $_{7}N \rightarrow 14$, $_{18}Ar \rightarrow 40$

Valency

• Valency is the combining capacity of an atom, indicating how many electrons and atom can *lose, gain, or share* to form a *stable compound.*

$_{11}Na \rightarrow 2, 8, 1 \rightarrow 1e^- \rightarrow Na^+ \rightarrow$ Losing an e-

$_{17}Cl \rightarrow 2, 9, 7 \rightarrow 1e^- \rightarrow Cl^- \rightarrow$ Gaining an e-

Variable Valency

• It is the ability of certain elements, particularly *transition metals*, to exhibit *more than one oxidation state* or *valency* in different compounds. ***E.g. Fe → 2, 3; Ag; Cu (all transition metal show variable valency due to incomplete filling of f-orbitals).***

Valence Electrons

• Valance electrons are the electrons present in the *outermost shell* (valance shell) of an atom. These electrons determine the chemical properties and reactivity of the element.

Valency Based on Valence Electrons

• If an element has *1, 2, 3 or 4* valence electrons → its valency is *equal* to the number of valence electrons. ***E.g. Elements in Group 1 (like hydrogen and sodium) have 1 valence electrons, so their valency is 1.***

• If an element has *5, 6, 7 or 8* valence electrons → its valency is calculated as: *8 — No. of valence electrons*. ***E.g. Elements in Group 16 (like oxygen and sulphur) have 6 valence electrons, so their valency is 8 - 6 = 2.***

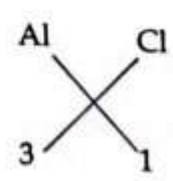
Name of Elements	Symbol	Atomic Number	Number of Electrons	Number of Protons	No. of Neutrons	Atomic Mass	Electronic Configuration				Valency
							K	L	M	N	
Hydrogen	H	1	1	1	-	1	1	-	-	-	1
Helium	He	2	2	2	2	4	2	-	-	-	0
Lithium	Li	3	3	3	4	7	2	1	-	-	1
Berylium	Be	4	4	4	5	9	2	2	-	-	2
Boron	B	5	5	5	6	11	2	3	-	-	3
Carbon	C	6	6	6	6	12	2	4	-	-	4
Nitrogen	N	7	7	7	7	14	2	5	-	-	3
Oxygen	O	8	8	8	8	16	2	6	-	-	2
Heroine	F	9	9	9	10	19	2	7	-	-	1
Neon	Ne	10	10	10	10	20	2	8	-	-	0
Sodium	Na	11	11	11	12	23	2	8	1	-	1
Magnesium	Mg	12	12	12	12	24	2	8	2	-	2
Aluminum	Al	13	13	13	14	27	2	8	3	-	3
Silicon	Si	14	14	14	14	28	2	8	4	-	4
Phosphorus	P	15	15	15	16	31	2	8	5	-	3
Sulphur	S	16	16	16	16	32	2	8	6	-	2
Chlorine	Cl	17	17	17	18	35.5	2	8	7	-	1
Argon	Ar	18	18	18	22	40	2	8	8	-	0
Potassium	K	19	19	19	20	39	2	8	8	1	1
Calcium	Ca	20	20	20	20	40	2	8	8	2	2

Table 3: Electronic Configuration of Elements

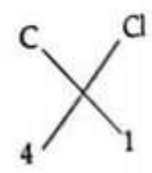
Writing Chemical Formula of a Compound

E.g.

Aluminium Chloride: $AlCl_3$



Carbon Tetrachloride: CCl_4



Duet Rule

• Duet Rule states that atoms like *Hydrogen (H)* and *Helium (H)* achieve stability when they have two electrons in their valance shell *(K shell)*. To attain this stable configuration, atoms, either gain, lose, or share electrons by forming bonds with other atoms. ***E.g. In a water (H_2O) molecule, hydrogen***

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shares electrons with oxygen to achieve a stable duet configuration.

CONCEPT OF ATOMICITY

Atomicity

• Atomicity is the number of atoms present in a single molecule of an element or compound.

Diatomic Molecules

• The substances that have *two atoms* in their molecules are called diatomic molecules.

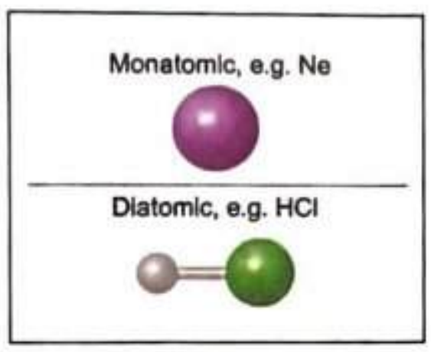
• There are only 7 elements that form *stable homonuclear diatomic molecules* and mostly exists as gases.

• They are: ***Oxygen, Nitrogen, Hydrogen, Chlorine, and Fluorine, Bromine, Iodine.*** So diatomic is atomicity of non-metals too.

Monoatomic Molecules

• The substances that are made up of *single atom* and *lacks any covalent bond* are called monoatomic molecules.

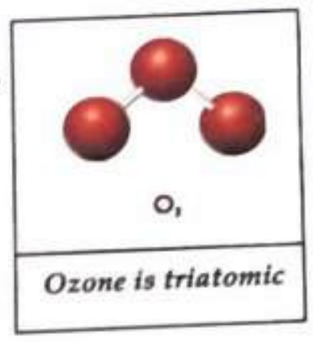
E.g. Helium, Neon, Argon, Krypton, Xenon, Radon.



Triatomic Molecules

• The substances formed of molecules that are made up of *three atoms* are called triatomic molecules.

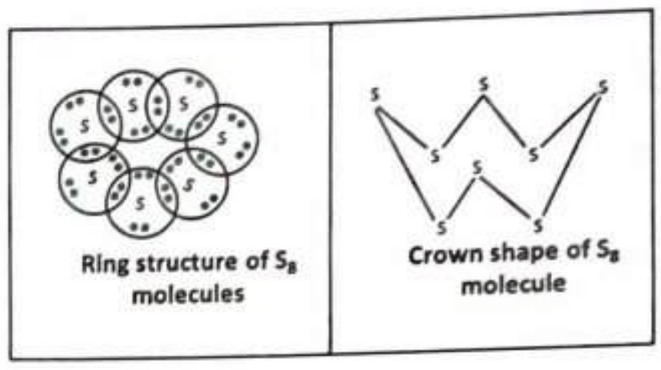
E.g. Water, Carbon dioxide, Hydrogen cyanide.



Ozone is triatomic

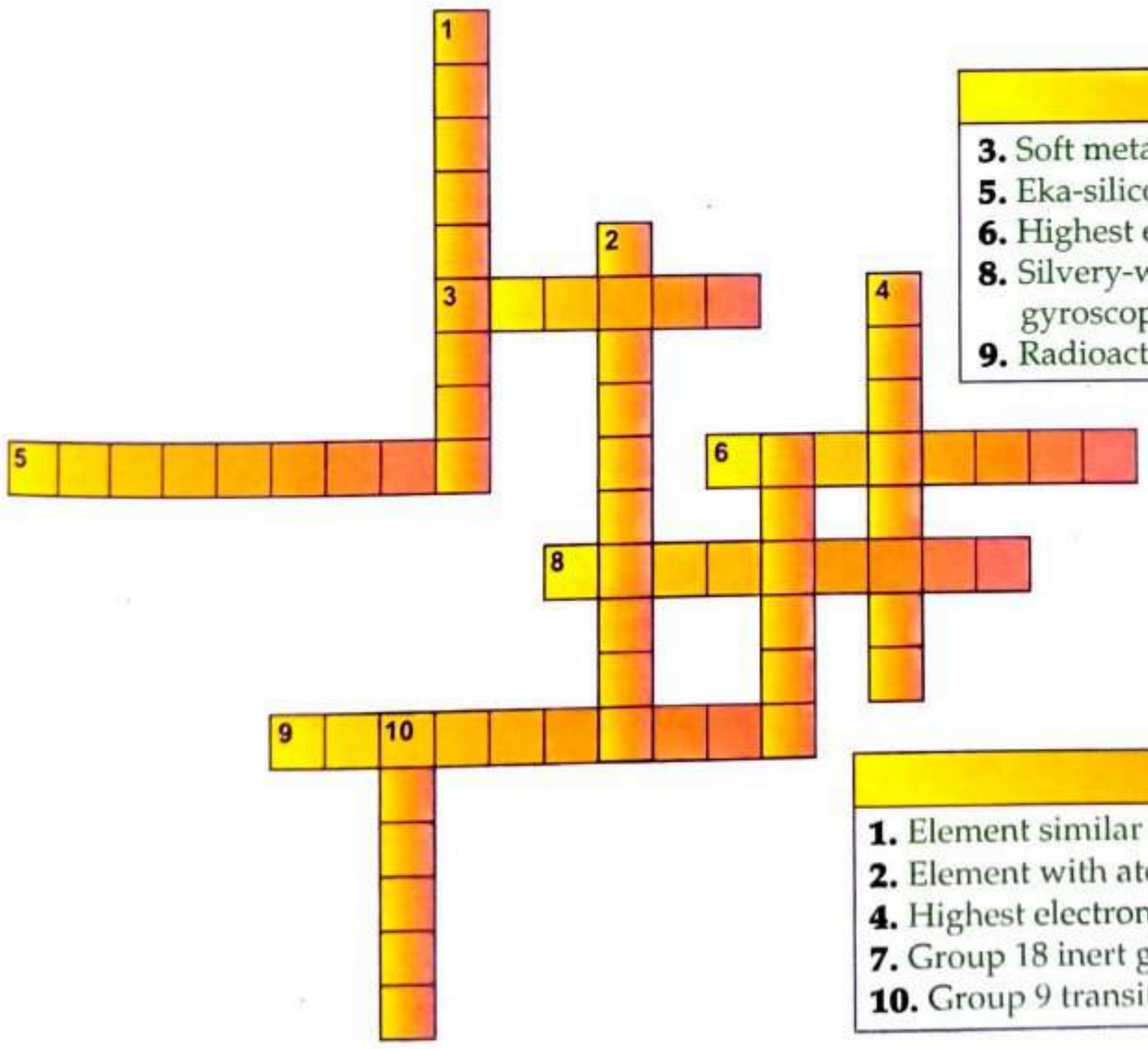
Polyatomic Molecules

• All the molecules that are made up of *four or more atoms* are known as polyatomic molecules. ***E.g. One molecule of sulphur is made up of 8 molecules, and one molecule of phosphorus is made up of 4 molecules. So both sulphur and phosphorus are polyatomic molecules.***



PARMAR'S CROSSWORD

PERIODIC TABLE



Across

3. Soft metal in Group 1 that tarnishes quickly.
5. Eka-silicon matched element.
6. Highest electron affinity element.
8. Silvery-white metal used in alloys for gyroscopes.
9. Radioactive element with atomic number 43.

Down

1. Element similar to lithium by diagonal relationship.
2. Element with atomic number 7.
4. Highest electronegativity element.
7. Group 18 inert gas used in bulbs.
10. Group 9 transition metal.

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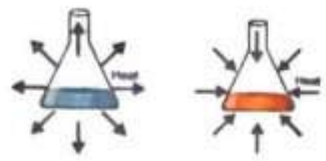
CHEMICAL REACTIONS

• Chemical reactions are processes where substances *(reactants)* transform into new substances *(products)* through the breaking and forming of chemical bonds.

• ***They can be classified as:*** *Exothermic and Endothermic Reactions.*



Exothermic Reactions and Endothermic Reactions

Exothermic Reactions	*Endothermic Reactions*
A reaction that *releases energy* from the system in the form of heat	A reaction in which the system *absorbs energy* from its surrounding in the form of heat
Exo means "out"	Endo means "in"

Types of Chemical Reaction

1. **Combination Reaction** *(most combination reactions are exothermic)*

• It is a chemical reaction where a *single product* is formed from *two or more reactants.*

$$CaO + H_2O \rightarrow Ca(OH)_2(aq) + Heat$$

Quick Lime *Slaked Lime* *(It is an exothermic reaction)*

> *Neutralisation is an exothermic reaction. E.g. mixing acid and alkali.*

• $Ca(OH)_2$ reacts slowly with CO_2 in the air to form thin layer of $CaCO_3$ (Calcium carbonate gives shiny finish to walls). Other names for $CaCO_3$ are: *Chalk/Marble/Limestone.*

$$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$$

Lime Water

CO_2 turns lime water milky.

Other Examples of Exothermic Reactions

2. ***Burning of coal*** (Combustion and Combination Reaction).
3. ***Burning of natural gas*** {Primary component: CH_4 (methane)}.

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

Methane

4. ***Burning of magnesium ribbon*** (Combination Reaction).

$$2Mg + O_2 \rightarrow 2MgO + Heat + Light \text{ (white dazzling light)}$$

Magnesium *Magnesium Oxide* (White ppt formed)

Mg is cleaned before burning in air, because it reacts with atmospheric O_2 to form MgO, which prevents further reaction with O_2.

> ***Mg is used in fireworks because it burns very hot and bright.***

5. ***Respiration is also an exothermic reaction.***

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + Energy$$

Glucose

2. **Combustion Reaction**

• It is a type of chemical reaction, where a substance reacts with oxygen gas releasing energy in the form *light* and *heat.*

$$C + O_2 \rightarrow CO_2$$

• Combustion reaction always takes place in *presence of oxygen.*

3. **Decomposition Reaction**

• It is a type of chemical reaction, where *single compound* breaks down into *two or more* simpler products, often requiring energy in the form of *heat, light, electricity.*

(a) Thermal Decomposition

> **Heat: Δ**

1. $$2FeSO_4 \xrightarrow{\Delta} Fe_2O_3 + SO_2(g) + SO_3(g) \text{ (Endothermic)}$$

Ferrous Sulphate *Ferric Oxide*

2. $$CaCO_3 \xrightarrow{\Delta} CaO + CO_2$$

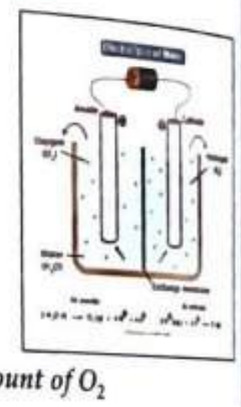
> ***Oxygen was discovered by: Joseph Priestley***

3. $$2Pb(NO_3)_2 \xrightarrow{\Delta} 2PbO + 4NO_2(g) + O_2(g)$$

Lead Nitrate *Lead Oxide* *(Brown Fumes of NO_2)*

(b) Electrolysis

Electrolysis of water



$$2H_2O \rightarrow 2H_2 + O_2$$

At Cathode | *At Anode*

H_2 gas collected is double the amount of O_2

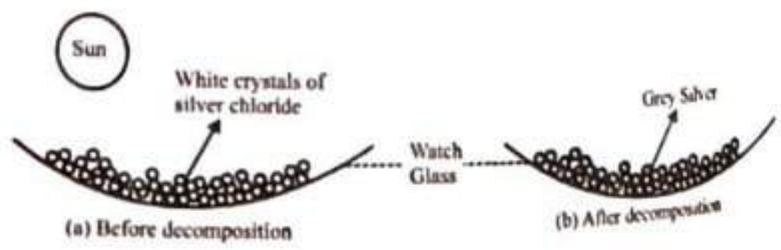
• ***Water used in electrolysis:*** Pure water, acidified water, distilled water.

(c) Photolysis

$$2AgCl \xrightarrow{\text{sun}} 2Ag + Cl_2$$
$$2AgBr \xrightarrow{\text{sun}} 2Ag + Br_2$$

They are kept in dark bottle

AgCl and AgBr is used in black and white photography. A photogenic film is coated with the chemicals. When light falls on the surface of the film, the exposed part of the film is darkened from which photograph is developed.



4. **Displacement Reaction**

• It is a type of chemical reaction in which a *more reactive element displaces a less reactive element* from its compound. ***E.g. Zn and Pb are more reactive element than Cu.***

$$Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$$
$$Pb + CuCl_2 \rightarrow PbCl_2 + Cu$$
$$Mg(s) + ZnSO_4(aq) \rightarrow MgSO_4(aq) + Zn(s)$$

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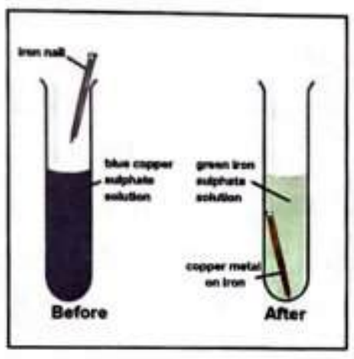
Reactivity Series

Potassium (K)
Sodium (Na)
Calcium (Ca)
Magnesium (Mg)
Aluminium (Al)
Zinc (Zn)
Iron (Fe)
Lead (Pb)
Hydrogen (H)
Copper (Cu)
Mercury (Hg)
Silver (Ag)
Gold (Au)

Reactivity decreases

$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$



**The colour of $CuSO_4$ solution changes when an iron nail is dipped in it. The iron nail becomes brownish and blue colour of $CuSO_4$ turns green.*

5. **Double Displacement Reaction**

• It is a type of chemical reaction in which two compounds *exchange their ions* to form two new compounds. It is also sometimes called *Precipitation Reaction* when one of the products is an *insoluble solid* (precipitate).

$$Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + NaCl$$

(White ppt)

$$Pb(NO_3)_2 + KI \rightarrow PbI_2 + KNO_3$$

(Yellow ppt)

$$Ba(OH)_2 + NH_4Cl \rightarrow BaCl_2 + NH_4OH$$ *(Endothermic)*

6. **Oxidation Reaction**

• Oxidation reaction is *addition of oxygen* and *removal of hydrogen.*

Reduction

$$Fe + O_2 \xrightarrow{H_2O} Fe_2O_3$$

Oxidation

7. **Reduction Reaction**

• Reduction reaction is *removal of oxygen* and *addition of hydrogen.*

Reduction

$$PbO + C \rightarrow 2Pb + CO_2$$

Oxidation

Oxidizing Agent (Oxidant): PbO because it gives oxygen to carbon.
Reducing Agent (Reduction): C because it removes oxygen from PbO.

Redox Reaction

• A *redox (oxidation-reduction) reaction* is a chemical process in which *electrons are transferred* between chemical substances.

• In redox reaction, one substance *being oxidized (losing electrons)* and another being *reduction (gaining electrons).*

• The *oxidised* substance is called *reducing agent* since it facilitates by *donating electrons*, while the *reduced* substance is the *oxidising agent*, as it *accepts electrons.*

$$Cr_2O_7^{-2} + SO_3^{2-} \rightarrow Cr^{3+} + SO_4^{2-}$$

+6 +4 +3 +6

Reduction *Oxidation*

Corrosion

• A corrosion is a process of deterioration of metal as a result of its reaction with *air or water* (present in environment) surrounding it.

E.g.

$$4Fe + 3O_2 + xH_2O \rightarrow 2Fe_2O_3 . xH_2O$$

→ When iron corrodes or rust, iron molecules react with oxygen molecules to form *iron oxide*. Rust is a *reddish brown, flaky substance* that forms on the surface of the iron. Technically, a rust is *Hydrated Iron (III) Oxide* whose chemical formula is $Fe_2O_3 . xH_2O$. Corrosion of iron is commonly known as *rusting.*

$$2Cu + H_2O + CO_2 + O_2 \rightarrow Cu(OH)_2 + CuCO_3$$

→ Copper metal when *exposed to air turns green* in color due to corrosion. When the copper vessel is exposed to air in the rainy season, the metal reacts with *gases, moisture* and *atmospheric gases* to form a mixture of $CuCO_3$ and $Cu(OH)_2$. This gives a green color to the surface of Copper metal.

*Note
Hydrogen has more than one oxidation number; +1 and -1.

Rancidity

• It is a type of *oxidation reaction.*

• It is the process by which *fats and oils* in food breakdown, resulting in unpleasant *smell, taste,* or *texture.* ***E.g. Nitrogen gas is used in chips packets to prevent oxidation, which may cause chips to become stale and soggy.***

Calculation of Oxidation Number

$\overset{x}{N}_2O_5$	$2x + 5(-2) = 0$	$2x - 10 = 0$	$x = 5$
$\overset{x}{C}aO$	$x + (-2) = 0$		$x = 2$
$\overset{x}{M}nO_2$	$x + (-2) \times 2 = 0$		$x = 4$
$\overset{x}{N}aAlH_4$	$1 + x + 4(-1) = 0$	$x + 1 - 4 = 0$	$x = 3$
$H_2\overset{x}{S}_2O_7$	$(-2) + 2x - 14 = 0$	$2x = 16$	$x = 8$

x: Oxidation state

For an interactive recap of this topic, see the crossword on Page Number 271.

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METALS

- They are generally solids.

Exception: Mercury (Hg) is liquid in room temperature, while Caesium (Cs) and Gallium (Ga) have melting points just above room temperature (28.5°C and 30°C, respectively).

- They have a metallic lustre (shine).

Exception: Lead (Pb).

- They are generally hard.

Exception: Alkali metals like Lithium, Sodium, and Potassium are soft metals and can be cut with a knife.

- They have high melting point and boiling point.

Exception: Gallium (Ga) and Caesium (Cs).

- They are malleable in nature (gold (Au) and silver (Ag) are most malleable metals). ***E.g, Sweets coated with thin sheets of Ag foil.***

Exception: Mercury (Hg → liquid), Na (soft), K (soft), Zn (brittle).

- They are ductile in nature (Au is most ductile)

Exception: Hg, Na, K, Zn.

- They are sonorous in nature. They make or produce sound. ***E.g. School bells, temple bells, etc.***

- They have high density. Osmium has the highest density.

Exception: Sodium (Na) and Potassium (K) float in water.

- They form alloys by combining with other metals or non-metals. ***E.g. Stainless steel alloy of Nickel (Ni), Chromium (Cr), and Iron (Fe). German silver, also known as "Nickel silver" is an alloy of Copper (Cu), Zinc (Zn) and Nickel (Ni).***

- Metals are good conductors of heat and electricity (free electrons are required for conduction of electricity).

Exception: Pb and Hg.

- They exhibit cationic properties.

- Metals form metal oxides when they react with oxygen. Generally, all metallic oxides are basic in nature.

NON-METALS

- They are generally solids or gases.

Exception: Bromine (liquid at room temperature).

- They are non-lustrous in nature.

Exception: Iodine, Diamond, Graphite.

- They are brittle and generally soft in nature.

Exception: Diamond which is the hardest substances on earth.

- They have low melting point and boiling point.

Exception: Diamond, Graphite, Silicon, Carbon, Boron.

- They are not malleable in nature.

Malleability

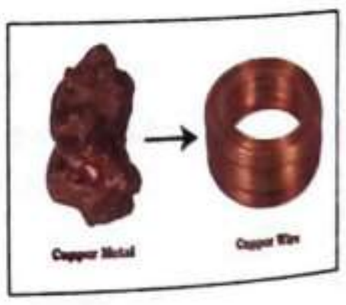
- Malleability is a physical property of metals that defines their ability to be hammered, pressed, or rolled into thin sheets without breaking. ***E.g. Similar to gold, silver is also highly malleable and can be shaped into various forms, including thin foils, and jewellery.***

- They are non-ductile in nature.

Ductility

- Ductility is a material's ability to be stretched or drawn into a thin wire or other elongated shape without breaking, meaning it can undergo significant deformation under tensile stress. ***E.g. Gold, due to its high ductility, 1 gm gold can be drawn into a wire that is about 2 km long.***

- They are non-sonorous in nature.



- They have low density.

Exception: Diamond.

- They do not form Alloys.

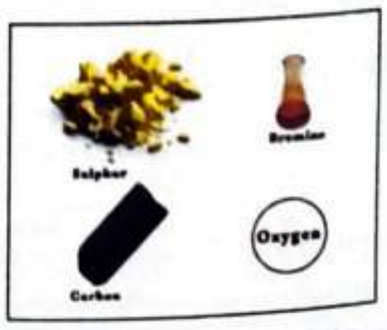
Exception: Carbon is alloyed with iron to form steel.

- They are bad conductor of heat and electricity.

Exception: Graphite which is a good conductor of electricity.

- They show anionic properties.

- Non-metals form non-metal oxides when they react with oxygen. Generally, all non-metallic oxides are acidic in nature.



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Metalloids

- Metalloids are elements that have properties of *both metals* and *non-metals.*
- There are 7 metalloids: *Boron, Silicon, Germanium, Arsenic, Antimony, Tellurium, and Polonium.*

Chemical Properties of Metals

1. **Reaction with Oxygen**

- Burning in air or formation of *oxides* (Combustion).
- Almost all metals combine with oxygen (or air) to form *metal oxides.*

E.g. *Metal + Oxygen → Metal Oxides*

(i) $4Al + 3O_2\ (g) \rightarrow 2Al_2O_3\ (s)$ — *Aluminium Oxide*

(ii) $2Cu\ (s) + O_2 \rightarrow 2CuO\ (s)$ — *Copper Oxide*

- Generally, metal oxides are basic in nature.

Amphoteric Oxides

- Amphoteric oxides are compounds that can react with *both acids and bases*, exhibiting both acidic and basic properties, and forming salts and water in these reactions. *E.g. Zinc oxide, Aluminium oxide.*

$Al_2O_3 + HCl \rightarrow AlCl_2 + H_2O$ (Acid; Salt + Water)

$Al_2O_3 + NaOH \rightarrow NaAlO_3 + H_2O$ (Base; Sodium Aluminate; Salt + Water)

Other examples with TRICK

Suno: SnO (Tin oxide)
Be: BeO (Beryllium oxide)
Zanabe: ZnO (Zinc oxide)
Ali: Al_2O_3 (Aluminium oxide)
Phir: PbO_2 (Lead oxide)
Milenge: MnO_2 (Manganese oxide)
Gali main: Ga_2O_3 (Gallium oxide)

- Most metal oxides are *insoluble in Water.*
- Some metal oxides are soluble in water and form *alkali* like *Sodium Oxide (Na_2O); Potassium Oxide (K_2O).*

Reactivity of Different Metals towards Oxygen

Sodium (Na) and Potassium (K)

- These two metals react *vigorously with oxygen* that they *catches fire if kept in open.* That is why Na and K are kept in *kerosene.*

Mg, Al, Zn, Pb

- At ordinary temperature, the surface of these metals gets covered with *thin layer of oxides.* This oxide layer protects them from further oxidation.

Iron

- Iron does not burn on heating, but iron fillings *burn vigorously* when sprinkled in flame of burner.

Alkali: Those bases that dissolve in water.

Copper

- Copper does not burn, but on heating, it forms a *black layer of copper (II) oxide (CuO).*

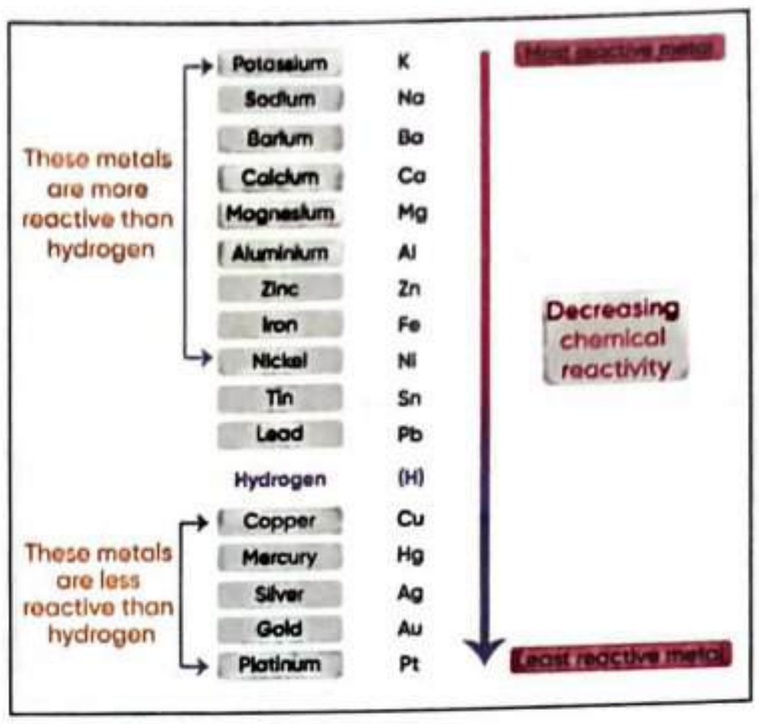
$$2Cu + O_2 \rightarrow 2CuO$$

This black coating is responsible for tarnishing of copper objects over time.

Silver (Ag) and Gold (Au)

- They *do not react with oxygen* even at high temperature.

Reactivity Series of Metals



Reaction of Metal with Water

Metals + Water → Metal Oxide + H_2 (g)

**All metals do not react with water*

Metal Oxide + Water → Metal Hydroxide

Metals	Cold Water	Hot Water	Steam
K, Na	Reacts vigorously + Exothermic (evolved H_2 gas catches fire)	✓	✓
Ca	Less violent reaction + Exothermic	✓	✓
Mg	✗	Mg starts floating because the bubbles of H_2 gas formed in the reaction stick to the surface of the metal	✓
Al, Fe, Zn	✗	✗	✓
Pb, Cu, Ag, Au	✗	✗	✗

Reactivity of Different Metals with Water

$$2K\ (s) + 2H_2O \rightarrow 2KOH\ (aq) + H_2(g) + Heat$$

$$2Na\ (s) + 2H_2O \rightarrow 2NaOH\ (aq) + H_2(g) + Heat$$

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$$Ca\ (s) + 2H_2O \rightarrow Ca(OH)_2\ (aq) + H_2\ (g)$$

$$2Al\ (s) + 3H_2O \rightarrow Al_2O_3\ (aq) + 3H_2\ (g)$$

$$3Fe\ (s) + 4H_2O \rightarrow Fe_3O_4\ (s) + 4H_2\ (g)$$

Reaction of Metal with Acids

- Except a few *less reactive metals* (such as *Cu, Hg, Ag, Au, Pt, etc.*), all metals react with dilute *sulphuric acid* (H_2SO_4) and *hydrochloric acid (HCl)* to produce salt and hydrogen gas.

Reaction of Metal with Dilute Nitric Acid (HNO_3)

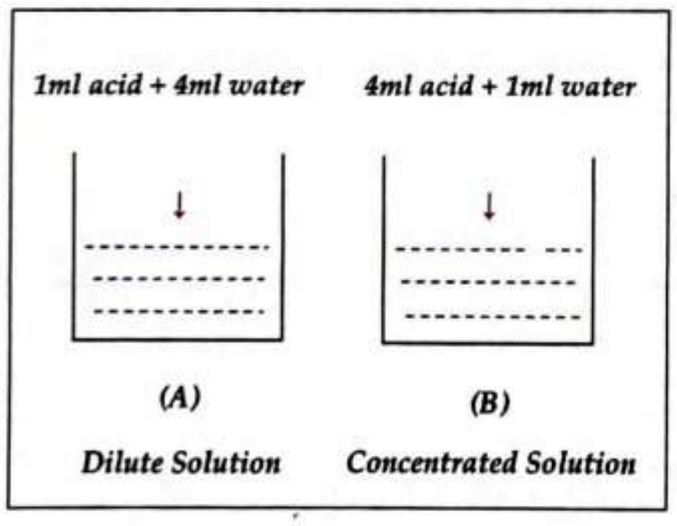
- Hydrogen gas is *not evolved* when a metal reacts with *nitric acid.*

Metal + Dilute acid → Salt + Hydrogen

(M) + (A) → (S) + (H)

$$Zn\ (s) + 2HCl\ (aq) \rightarrow ZnCl_2\ (aq) + H_2\ (g)$$

- This is due to *strong oxidising nature* of nitric acid.
- It oxidises the hydrogen, produced to water and itself gets reduced to any of the nitrogen oxide (NO, NO_2, N_2O).
- *Magnesium* (Mg) and *Manganese* (Mn) react with *dilute* HNO_3 to evolve H_2.



Metal + HNO_3 → Salt + $NO/N_2O/NO_2$

(Exceptional case: only for Mn and Mg)

Metal (Mn/Mg) + HNO_3 → Salt + H_2

**Note: Copper does not react with dilute HCl*

Aqua Regia (Royal Water)

- It is a mixture of two strong acids in the ratio:

Concentrated HNO_3 : Concentrated HCl) = 1:3

- It is *highly corrosive* in nature.
- Aqua regia is able to dissolve *gold and platinum.*

Reaction of Metals with solutions of other Metal Salt

$$Metal_1 + Metal_2\ Salt \rightarrow Metal\ Salt_1 + Metal$$

Displacement Reaction

$$Cu\ (s) + 2AgNO_3\ (aq) \rightarrow Cu(NO_3)_2\ (aq) + 2Ag\ (s)$$

**The more reactive metal replaces the less reactive metal*

Chemical Properties of Non Metals

Reaction with Oxygen

- Non-metals *do not react* with *water, steam or dilute acid.*
- The reason is that they act as an electron acceptor and *cannot accept H_+ ions* of acids to reduce them to *hydrogen gas.*
- But on heating, they readily form oxides or salts with concentrated acids.

$$S\ (s) + 2H_2SO_4\ (conc.) \xrightarrow{\Delta} 3SO_2\ (g) + 2H_2O\ (l)$$

$$S\ (s) + 6HNO_3\ (conc.) \xrightarrow{\Delta} H_2SO_4\ (aq) + 6NO_2\ (g) + 2H_2O\ (aq)$$

Reaction between Metals and Non-metals Ionic Bond formation

Ionic Bond Formation of NaCl

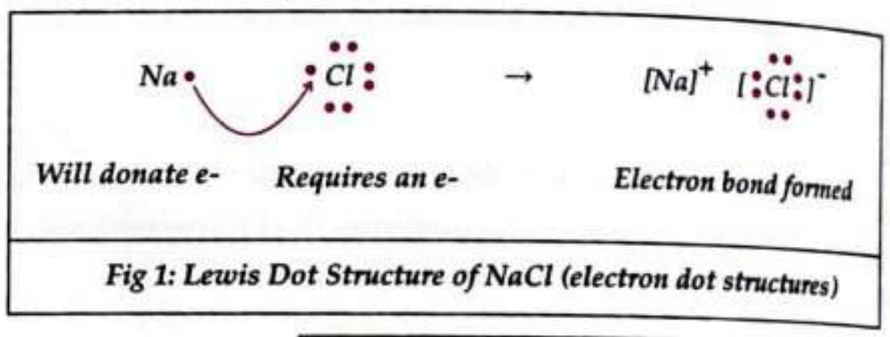


Fig 1: Lewis Dot Structure of NaCl (electron dot structures)

Na configuration: 2, 8, 1
Cl configuration: 2, 8, 7

- When Na transfers an electron to Cl, it results in NaCl. Na atom with 11 electrons and *11 proton transfers* its single valence electron to Cl atom. Na becomes positively charged and Cl atom becomes negatively charged.

Electrovalent Bond

- An electrovalent bond, also known as an *ionic bond*, is a chemical bond formed by the *complete transfer of electrons from one atom* (usually a metal) *to another atom* (usually a nonmetal), resulting in the formation of oppositely charged ions held together by electrostatic attraction.

Ionic compounds show anisotropic properties.

Ionic Bond Formation of $MgCl_2$

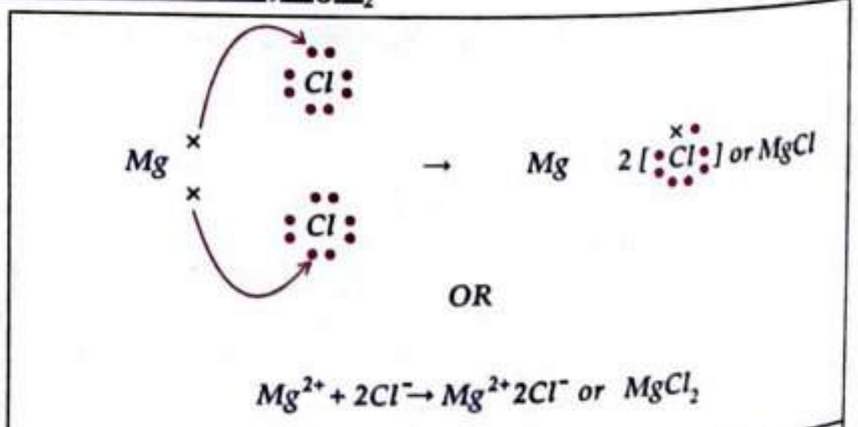


Fig 2: Lewis Dot Structure of $MgCl_2$ (electron dot structures)

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Properties of Ionic Compounds

1. ***Physical Nature:*** Ionic compounds are hard crystalline solids because of *strong force of attraction* between the *positive and negative ions*. These compounds are generally brittle and break into pieces when pressure is applied.
2. ***Melting and boiling points:*** These compounds have *high melting and boiling points* as large amount of energy is required to break strong inter-ionic attraction.
3. ***Solubility:*** These compounds are *soluble in water* (polar solvent) and *insoluble in organic solvents* (non-polar solvent) like kerosene, benzene, ether, petrol , etc.
4. ***Conduction of electricity:*** The conduction of electricity through a solution involves *movement of charged particle*. Ionic and electrovalent compounds are *good conductors of electricity*, but they conduct electricity either in *molten* form or in their *aqueous solution*, as the ions are free to move and carry charge.

Ore has: Metal + Gangue (impurities)

Occurrence of Metals in the Form of Their Ore

1. ***Aluminium: Bauxite, Cryolite***
2. ***Iron: Magnetite, Hematite, Limonite, Siderite***
3. ***Zinc: Zinc Blende/Sphalerite; Calamine; Zincite (Zinc)***
4. ***Mercury: Cinnabar***
5. ***Thorium: Monazite***
6. ***Sodium: Borax; Chile saltpeter ($NaNO_3$) and Indian saltpeter (KNO_3); Trona***
7. ***Lead: Galena***
8. ***Magnesium: Epsom salt ($MgSO_4 . 7H_2O$)***
9. ***Tin: Cassiterite***
10. ***Uranium: Pitchblende (it is made up of Uranium Oxide (UO_2) and variable proportions of UO_3)***

Corrosion

1. ***Silver:*** *Black coating* is formed due to *silver sulphide* by the reaction of silver with sulphur in air and is also known as "Tarnishing of Silver".
2. ***Copper:*** *Green coating* due to basic *copper carbonate* formed by reaction of copper with carbon dioxide in air.

Fig 3: Black coating on silver spoons

1. ***Iron:*** *Reddish brown* coating called *Rust*; iron corrode rapidly in *air and water*.

Titanium is used for making Boat because it does not corrode in sea water.

Prevention of Corrosion

1. ***Galvanisation:*** Galvanisation is protecting steel and iron from rusting by coating them with a thin layer of zinc.
2. ***Anodising:*** It is an electrochemical process that creates a thick, protective oxide layer on aluminum (and its alloys) to enhance corrosion resistance and improve its appearance.

- Metals like aluminium, magnesium, titanium can undergo anodization to form a protective oxide layer.
- Anodising process is used in aircraft industry.

Fact

- ***Aluminium is more reactive than iron, yet it is less easily corroded because it forms a protective oxide layer (Al_2O_3) when exposed to oxygen.***

Formation of Alloy

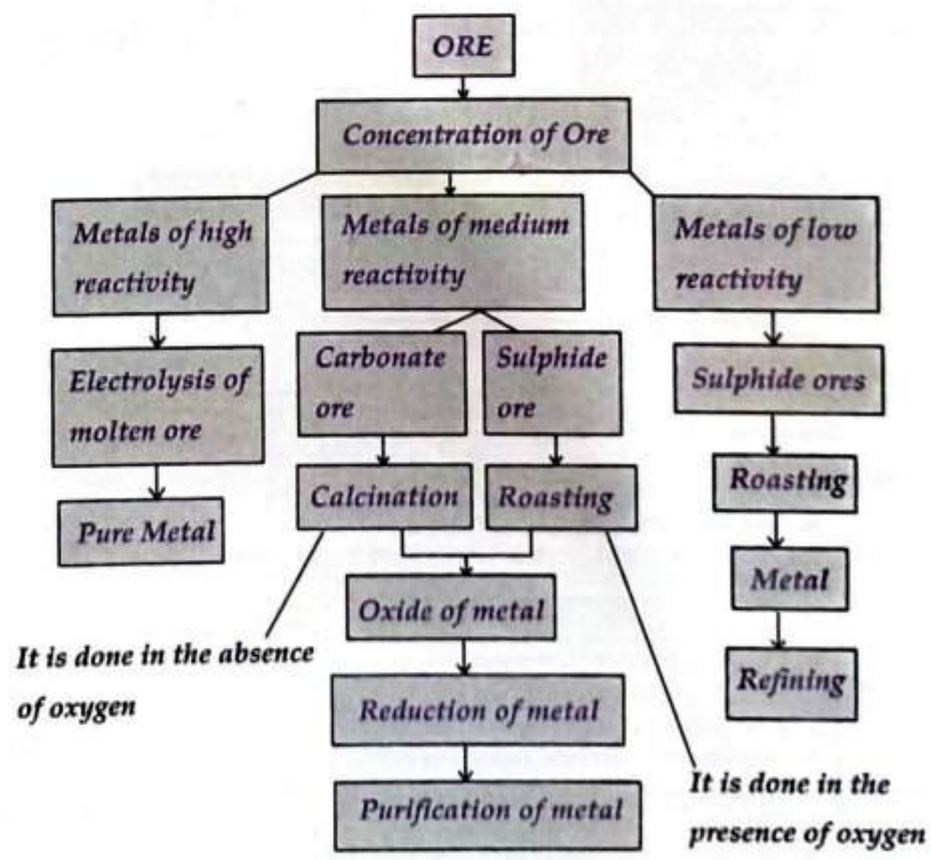
Brass	Cu (80%) + Zn (20%)
Bronze	Cu (88%) + Sn (12%)
Solder	Sn + Pb
Bell Metal	Cu + Sn
Gun Metal	Cu + Sn + Zn
Amalgam	Hg + other metals
Stainless Steel	Fe+ Ni + Cr + Carbon
Constantin	Cu + Ni
Manganin	Cu + Ni + Mn
Nichrome	Ni + Cr + Mn + Fe
German Silver	Cu + Ni + Zn
White Gold	Au (75%) + Ni + Pd
Magnalium	Al (95%) + Mg
Duralumin	Al (95%) + Mg + Mn + Cu

Steps Involved in Extraction of Metals from Ores

Metallurgy

- Metallurgy is the science of *extracting metals from their ores* and refining them into pure metals and alloys.

- ***White gold was originally developed to imitate platinum (a naturally white metal).***
- ***Jewellery made of gold is an alloy. Pure gold has (22 parts of Au + 2 parts of Cu/Ag).***
- ***Amalgam: An amalgam is a metal alloy of mercury with one or more metal.***



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Reduction of Metal

Carbon gains oxygen

$$2ZnO + C \rightarrow 2Zn + CO_2$$

Zinc loses oxygen

Thermite Reaction

- It is a type of reaction in which a metal oxide is reduced by using *aluminium* as the *reducing agent*. It is generally *exothermic* in nature.

Oxidation

$$Fe_2O_3\,(s) + 2Al\,(s) \xrightarrow{\Delta} 2Fe\,(l) + Al_2O_3\,(s)$$

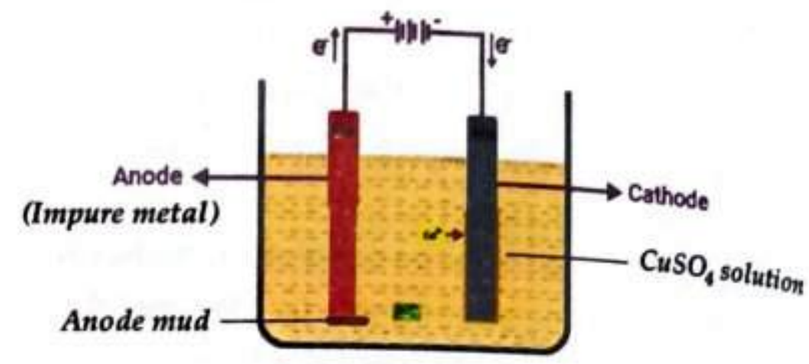
Reduction

Iron oxide (III) *Aluminium* *Iron* *Aluminium oxide*

E.g. Railway tracks are joined using thermite reaction.

Electrolytic Refining

- It is a process that uses electricity to purify impure metals. An impure metal is used as *anode* and a pure metal is used as *cathode*. A solution of a metal salt is used as *electrolyte*. When an electric current is passed through the cell, the impure metal dissolves into the electrolyte and is replaced by an equal amount of pure metal from the cathode.



- The *pure metal* is deposited at the *cathode*, while the *insoluble impurities* from the impure metal settle down beneath the *anode* as *anode mud*.

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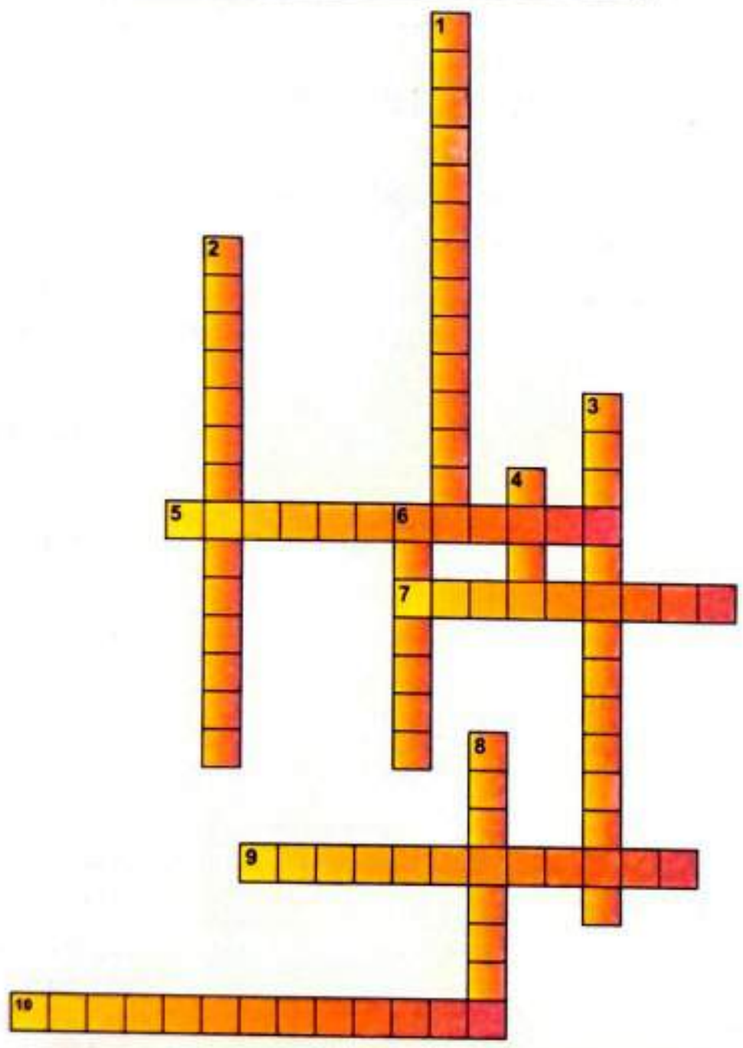
CHEMICAL REACTIONS



Across

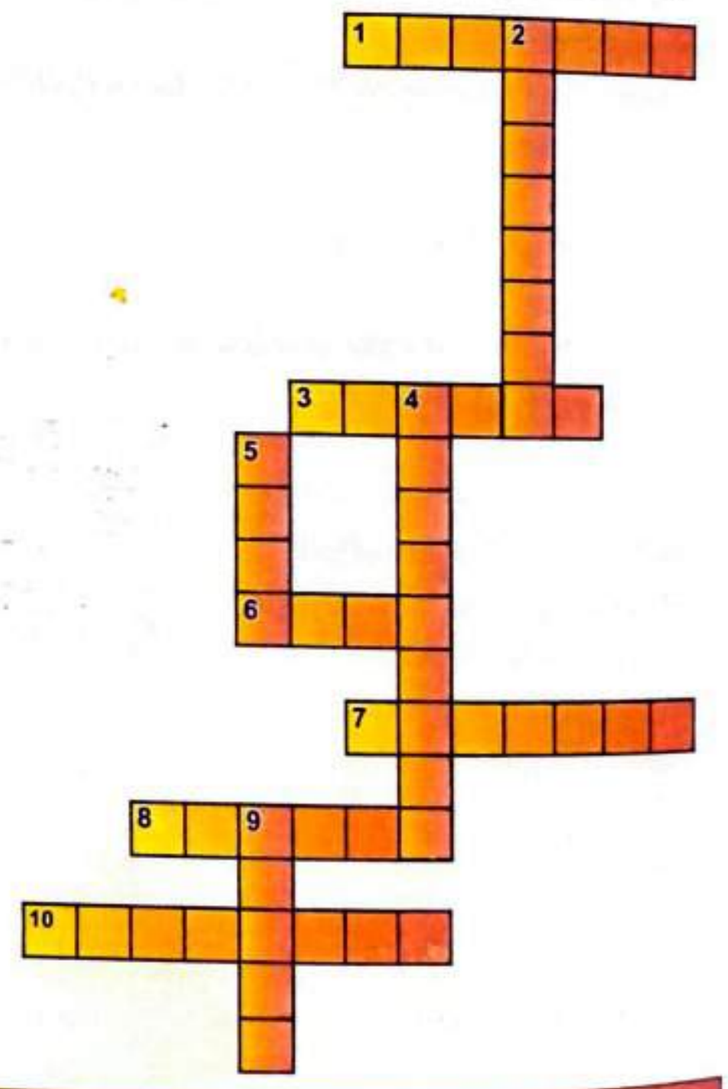
5. Reaction when iron is dipped in copper sulphate.
7. Developed combustion theory with oxygen.
9. Process turning egg white opaque.
10. Reaction when electricity passes through water.

Down

1. White precipitate from sodium sulphate and barium chloride.
2. Reaction when sugar turns into syrup.
3. Endothermic process using sunlight.
4. Order of reaction when rate is constant.
6. Popular name of Mercury(I) chloride.
8. Gas released in reaction of zinc and sulphuric acid.

PARMAR'S CROSSWORD

METALS AND NON-METALS



Across

1. Always present in amalgam.
3. Only antibacterial metal.
6. Black coating on silver jewellery.
7. Metalloid element in periodic table.
8. Most reactive metal among options.
10. Alloy of gold and silver.

Down

2. Disinfectant added to tap water.
4. Metal reacting violently with cold water.
5. Liquid that dissolves noble metals.
9. Alloy made of copper and zinc.

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Acid

- An acid is any hydrogen-containing substance that is capable of *donating a proton* (hydrogen ion → H^+) to *another substance*.
- Acids are usually identified by their *sour taste*.
- An acid turns *blue litmus paper red*.

Base

- A base is a molecule or ion able to *accept a hydrogen ion* from an acid.
- A base turns *red litmus paper blue*.

Litmus is a purple dye, which changes its colour when interacted with acid or base.

Acid-Base Indicators

1. ***Natural Indicators:*** Natural indicators are substances, often derived from *plants*, that change color in the *presence of acids or bases*, indicating their acidic or basic nature.

E.g.

1. ***Litmus:*** It is extracted from *Lichen* (Thallophyte).
2. ***Turmeric:*** It is a natural dye *Circumin* is present in it.
3. ***Coloured petals:*** Coloured petals of Hydrangea, Petunia , Geranium, Red Cabbage, China Rose, etc.

2. ***Synthetic Indicator:*** Synthetic indicators are acid-base indicators that are *man-made* or *synthesized* in a laboratory.

E.g.

1. ***Phenolphthalein:*** It is *colourless* in acidic solutions but *turns pink* in *basic solutions*.
2. ***Methyl Orange:*** It is red in *acidic solutions* and *yellow* in *basic solutions*.

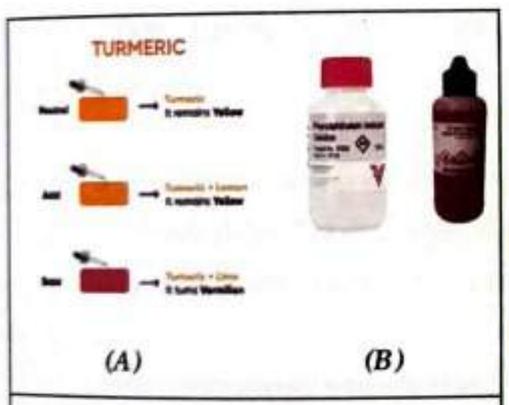


Fig 1: (A) Natural Indicator; (B) Synthetic Indicators

Guess what? I just came across a really interesting fact, and I couldn't wait to share it!
A milkman adds a small amount of baking soda to milk which makes the pH of the milk weakly alkaline.

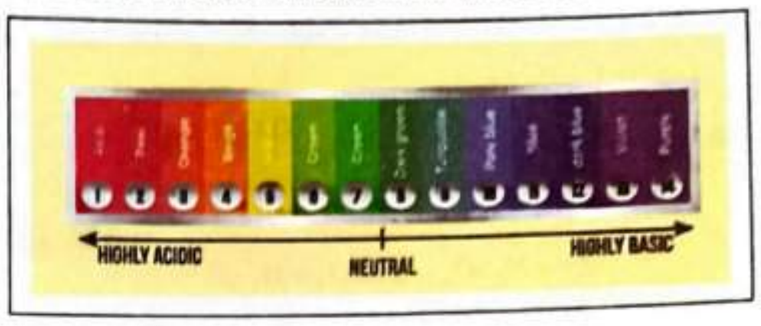
	Acid	Base
Litmus	Blue to Red	Red to Blue
Turmeric	Remains yellow	Turn to reddish brown
Phenolphthalein	Colourless	Pink
Methyl orange	Red	Yellow (a bit orangey)

Olfactory Indicators

- An olfactory indicator is a substance whose *smell changes* based on whether it is mixed with an acid or base. E.g. Vanila, Onion, Clove, etc.

Universal Indicators

- A universal indicator is a mixture of different types of indicators that *exhibits different coloration* at *different levels*.
- It is used to detect the acidic or basic nature of a substance or a solution.



Organic Acids

- ***Acids produced from organic sources:***

Acid	Sources
Acetic Acid	Vinegar
Citric Acid	Citrus Fruits (lemon, orange)
Tartaric Acid	Tamarind, Grapes, Kaccha Mango
Oxalic Acid	Tomato, Spinach
Lactic Acid	Curd
Ascorbic Acid	Citrus Fruits, Amla
Methanoic/Formic Acid	Ant Sting, Nettle Sting
Butyric Acid	Rancid Butter
Stearic Acid	Oil/ Fats
Malic acid	Apple, Banana
Lauric Acid	Coconut milk
Euric Acid	Mustard oil

Mineral Acids

- A mineral acid or an inorganic acid is any acid derived from an *inorganic compound* that dissociates to produce *hydrogen ions (H+)* in water.

Acid	Sources
Sulphuric Acid	Oil of Vitriol
Nitric Acid	Explosives
Hydrochloric Acid	Gastric Juice
Boric Acid	Antiseptic
Carbonic Acid	Soda Water
Phosphoric Acid	Fertilizers

Sulphuric acid is known as "King of Chemicals" because it is very corrosive in nature and more reactive than other acids.

Base

Base	Used In
Calcium Hydroxide	Lime Water
Ammonium Hydroxide	Window Cleaner
Sodium/Potassium Hydroxide	Soap
Magnesium Hydroxide	Milk of Magnesia

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Chemical Properties of Acids and Bases

- *Sodium Hydroxide: Strong base*
- *Magnesium Hydroxide: Mild base*

1. Reaction with Metals

- When acids react with metals, they typically produce a *salt* and *hydrogen gas*, while some metals like *zinc* and *aluminium* also react with bases to form a *salt* and *hydrogen gas*.

$$Acid + Metal \rightarrow Salt + Hydrogen\ gas$$

Burns with a pop sound

$$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2\ (g)$$

$$Zn + NaOH \rightarrow Na_2ZnO_2 + H_2\ (g)$$

2. Reaction of Metal Carbonate and Metal Hydrogen Carbonate with Acids

- When acids react with metal carbonates or metal hydrogen carbonates, they produce a *salt, carbon dioxide gas,* and *water.*

Metal Carbonate OR *Metal Bicarbonate* $+ Acid \rightarrow Salt + CO_2 + H_2O$

$$Na_2CO_3 / NaHCO_3 + HCl \rightarrow NaCl + CO_2 + H_2O$$

Test of Carbon Dioxide

- *Carbon Dioxide (CO_2)* turns lime water milky because the carbon dioxide reacts with the *calcium hydroxide ($Ca(OH)_2$)* in the lime water, forming an insoluble white precipitate of *calcium carbonate ($CaCO_3$)*.

$$Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O\ (l)$$

Calcium Hydroxide (lime water) — *Carbon dioxide* — *Calcium carbonate (white ppt)* ↓ *Turns lime water milky* — *Water*

Acid/Base in Water Solution

Conduction of Electricity

- Aqueous solutions of acids and bases conduct electricity because they contain charged particles (ions) that can move and carry an electric current, which is due to the dissociation of acids into *H^+ ions and bases into OH^- ions.*
- Distilled water, alcohol and glucose do not conduct electricity.
- All bases do not dissolve in water. E.g. copper (II) oxide.
- An alkali is a base that dissolve in water.
- All alkali are bases, but all bases are not alkali.

Dilution of Acids

- While diluting an acid, it's safer to add *acid to water slowly* and with constant stirring than to add water to an acid. Adding water to acid can cause an extreme exothermic reaction that produces a large amount of heat which can cause the solution to boil, splatter, and cause burns.

Concentrated Acid $\xrightarrow{To}$ *Diluted Acid*

Neutralisation Reaction

- A neutralization reaction is a type of acid-base reaction where an acid reacts with a base to form salt and water to *release heat* (exothermic reaction), essentially *"cancelling out"* each other's acidic or basic properties.

$$Acid + Base \rightarrow Salt + Water + Heat$$

$$\underset{Basic}{Metal\ oxide} + Acid \rightarrow Salt + H_2O$$

$$\underset{Acidic}{Non\text{-}metal\ oxide} + Base \rightarrow Salt + H_2O$$

$$Strong\ Acid + Weak\ Base \rightarrow Salt\ (Acidic) + H_2O$$

E.g. $Al(OH)_3 + HCl \rightarrow AlCl_3\ (Acidic\ salt) + H_2O$

$$Weak\ Acid + Strong\ Base \rightarrow Salt\ (Basic) + H_2O$$

E.g. $CH_3COOH + NaOH \rightarrow CH_3COONa\ (basic\ salt) + H_2O$

$$Strong\ Acid + Strong\ Base \rightarrow Salt\ (neutral) + H_2O$$

E.g. $NaOH + HCl \rightarrow NaCl\ (neutral\ salt) + H_2O$

$$Weak\ Acid + Weak\ Base \rightarrow Salt\ (neutral) + H_2O$$

E.g. $CH_3COOH + NH_4OH \rightarrow CH_3COONH_4\ (neutral) + H_2O$

pH Scale

- *"p"* stands for *"Potenz"* means *"Power"* in German language.
- pH scale was developed by *Lauritz Sorensen* (a Danish chemist).
- It is an universal indicator (a mixture of several indicators) and a logarithmic scale.
- It shows different colour at different hydrogen ion concentration.
- It measures *H^+ ion* concentration.

$$pH = -\log [H^+]$$

Importance of pH Scale in Everyday Life

- Human body works is a narrow pH range of *7-7.8*.
- pH scale is used in treatment of soil (*Quick lime/$CaCO_3$/Slaked lime* is added to acidic soil).
- When soil is too basic, then *gypsum* is added to treat it.

Important pH Values
- *Gastric juice: 1.6*
- *Lemon: 2*
- *Milk: 6.4*
- *Blood: 7.4 (slightly alkaline)*
- *Saliva: 6.5*
- *Milk of Magnesia: 10*
- *NaOH: 14*

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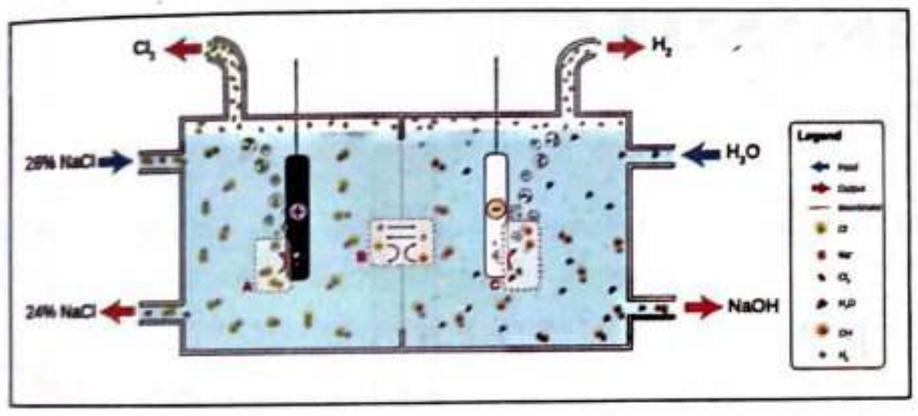
- Antacids like $Mg(OH)_2 \rightarrow$ Milk of Magnesia, *baking soda, aluminium hydroxide* is used to treat indigestion when stomach produces too much HCl.
- pH levels help in self-defence in plants and animals.

1. *Bee sting:* It contains *methanoic acid/formic acid* (causes burning sensation when it comes in contact with skin).
   Remedy: ***A mild base like Calamine lotion (contains Zinc carbonate) is applied.***
2. *Nettle plant leaves:* Sting of the hair of the nettle leaves contain *methanoic acid.*
   Remedy: ***The juice of dock leaves is applied due to its basic properties which relieves the burning or stinging sensation.***

- ***Acid rain occurs when pH of the rainwater drops below 5.6 (contains sulphur dioxide (SO_2) + nitrogen oxides.***
- ***Tooth decay starts when the pH value is less than 5.5.***

Chlor-Alkali Process

- The chlor-alkali process is an industrial method that uses electrolysis to produce *chlorine, hydrogen,* and *sodium hydroxide (caustic soda).*
- An aqueous solution of *sodium chloride (NaCl)* or *brine* is passed through an electrolytic cell. An electric current is passed through the solution. *Chlorine gas (Chlor)* and *sodium hydroxide (Alkali)* solution are produced.



$$2NaCl\,(aq) + 2H_2O \rightarrow 2NaOH\,(aq) + Cl_2(g) + H_2(g)$$

At Cathode At Anode At Cathode

Bleaching Powder

- Its chemical formula is $CaOCl_2$ *(calcium oxychloride/calcium hypochlorite).*
- It is commonly known as *Chlorinated Lime.*
- It is produced by the action of chlorine on dry *Slaked Lime ($Ca(OH)_2$).*

$$Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$$

Slaked Lime/Lime Water

Uses of Bleaching Powder

- It is used for bleaching cotton and linen clothes in textile industries.
- It is used for bleaching wood pulp in paper industries.
- It is used in laundry.
- It is used as an oxidising agent in chemical industry.
- It is used as an disinfectant for cleaning drinking water.

Baking Soda

- Its chemical formula is $NaHCO_3$ *(sodium bicarbonate).*
- Sodium chloride, water, carbon dioxide, and ammonia react to produce *sodium bicarbonate ($NaHCO_3$)* and *ammonium chloride (NH_4Cl).*

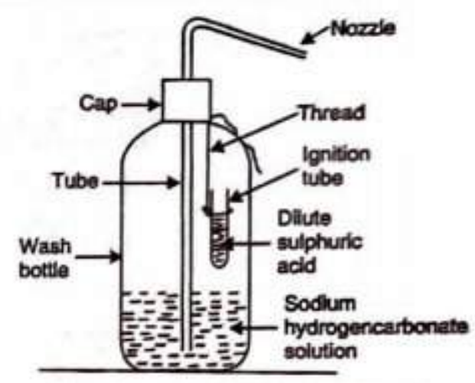
$$NaCl + H_2O + CO_2 + NH_3 \rightarrow NaHCO_3 + \underbrace{NH_4Cl}_{\text{Sublime compound}}$$

When Baking Soda is Heated

- When baking soda is heated, it undergoes a decomposition reaction, breaking down into *sodium carbonate (Na_2CO_3), water (H_2O),* and *carbon dioxide (CO_2).*

Uses of Baking Soda

- It is used to make tasty, crispy pakora and used in faster cooking.
- It is used to make baking powder = mixture of baking soda + mild edible acid.
- It is used as antacids (substances which neutralise stomach acidity).
- It is used in *soda-acid fire extinguisher (Dilute H_2SO_4 + $NaHCO_3$).*



Soda-Acid Fire Extinguisher

When the fire extinguisher's knob is turned, the sulfuric acid and sodium bicarbonate react to produce carbon dioxide gas.

Washing Soda

- Its chemical formula is $Na_2CO_3.10\,H_2O$ *(hydrated sodium carbonate).*

$$NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$$

$$Na_2CO_3 + 10\,H_2O \rightarrow Na_2CO_3.10\,H_2O$$

Uses of Washing Soda

- It is used in glass, soap and paper industries.
- It is used in manufacturing of borax ($Na_2B_4O_7.10H_2O$).
- It is used as a cleaning agent.
- It is used in removing permanent hardness of water.

- ***Hard water:*** It is a type of water that contains high levels of *calcium* and *magnesium* minerals.
- ***Heavy water*** (D_2O): It is a type of water that contains a higher concentration of *deuterium* (a heavy isotope of hydrogen) than regular water.

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Plaster of Paris

- On heating *Gypsum* at 373 K, it loses water molecules and form *Plaster of Paris* ($CaSO_4.\frac{1}{2}H_2O$ → *Calcium Sulphate Hemihydrate*).
- It is a white powder and on mixing with water, it changes to *Gypsum*.

$$\underset{\text{(Plaster of Paris)}}{CaSO_4.\tfrac{1}{2}H_2O} + 1\tfrac{1}{2}H_2O \rightarrow \underset{\text{(Gypsum)}}{CaSO_4.2H_2O}$$

Uses of Plaster of Paris

- It is used to support *fractured bones*, forming a hard cast that *immobilizes the injured limb* while it heals.
- It is used for making toys, decorative materials, smooth surface of walls, etc.

> ***Note***
> *It is always stored in moisture proof container; as it absorbs moisture to form hard Gypsum.*

Some Other Salts

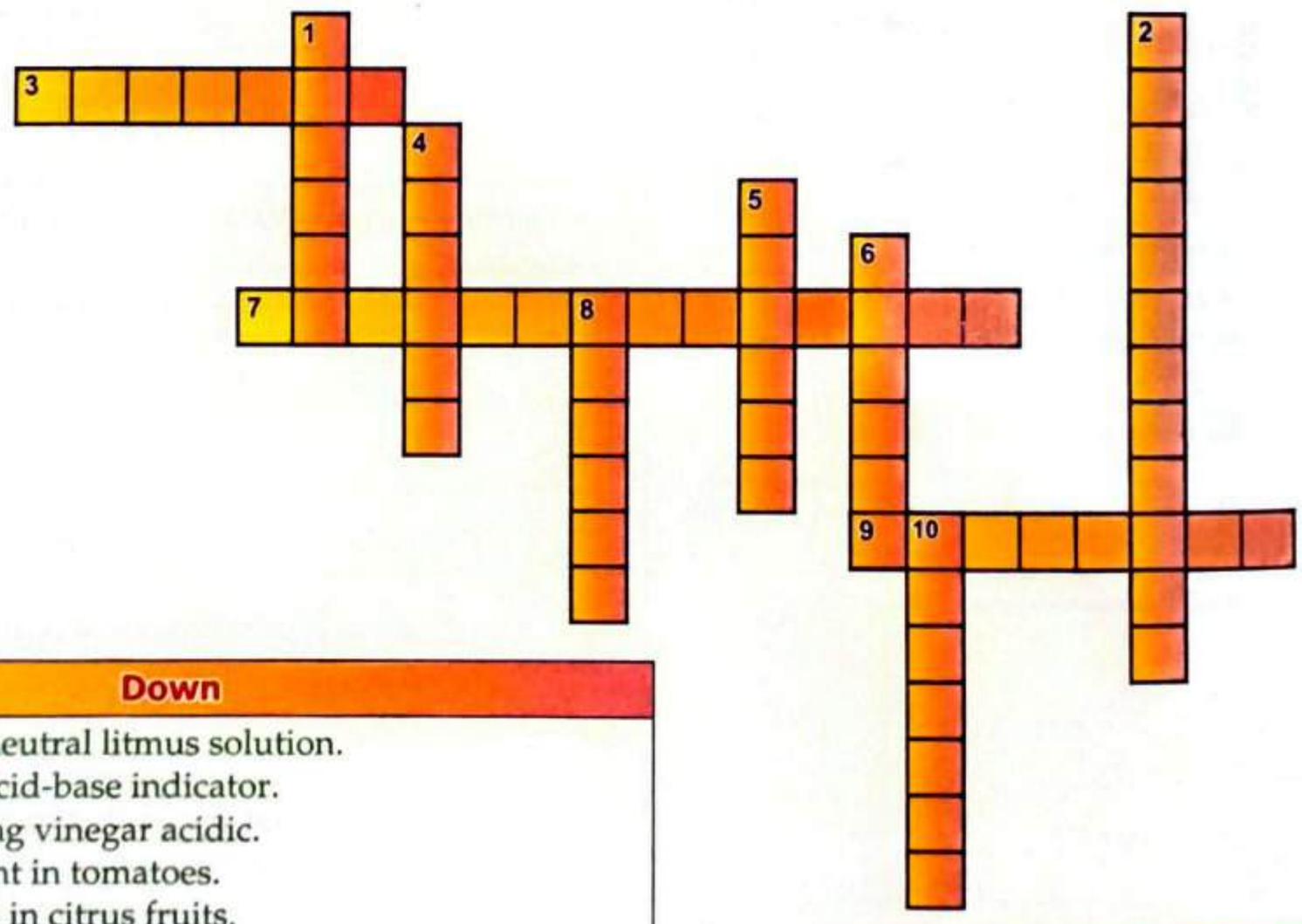
- *Blue vitriol:* $CuSO_4.5H_2O$ *(it can be used to relieve mouth ulcers).*
- *Green vitriol:* $FeSO_4.7H_2O$
- *White vitriol:* $ZnSO_4.7H_2O$
- *Mohr's Salt:* $(NH_4)_2Fe(SO_4)_2.6H_2O$
- *Alum:* $KAl(SO_4)_2.12H_2O$
- *Epsom salt:* $MgSO_4.7H_2O$

> *Anhydrous $CuSO_4$ is white or pale green in colour and has a powdery appearance.*

> *Kolbe synthesised Acetic Acid for the first time.*

PARMAR'S CROSSWORD

ACID, BASE AND SALT



Down

1. Colour of neutral litmus solution.
2. Synthetic acid-base indicator.
4. Acid making vinegar acidic.
5. Acid present in tomatoes.
6. Acid found in citrus fruits.
8. Source of natural indicator litmus.
10. Bases that dissolve in water.

Across

3. Base found in lime water.
7. Reaction between acid and base.
9. Acid formed when CO_2 dissolves in water.

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CARBON

Carbon Content

- *In earth's crust: 0.025%.*
- *In atmosphere: 0.03%.*

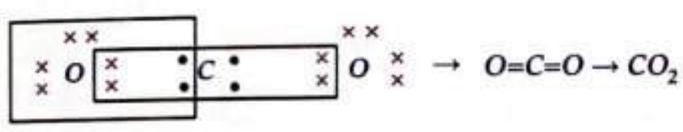
Basic Features of Carbon

Catenation	*Tetravalency*
Unique ability to form long chains of C-C bond	Capability to form 4 bonds with other atom of carbon or other monovalent elements
No other element exhibit catenation property as much as Carbon	Carbon forms a strong and stable bond due to its small size

Carbon's Ability to Catenate

- The electronic configuration of carbon plays a key role in its ability to exhibit catenation. Carbon has a total of *6* electrons, with *2 in inner shell* and *4 in the outer shell*. Its small atomic size allows it to form stronger C-C bonds compared to other elements, making carbon the most effective element in catenation.

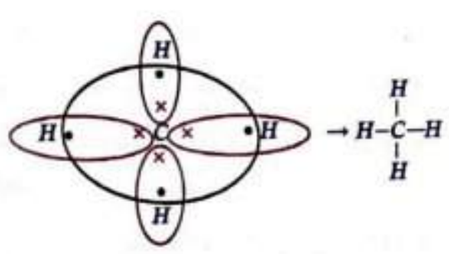
Bonding of Carbon with Oxygen



- Oxygen has *6 e-* and requires *2 more electrons* to complete its *Octet*. Carbon requires 4 more e- to complete its octet.

Bonding of Carbon with Hydrogen

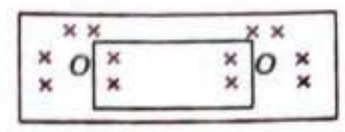
- Carbon and hydrogen form a *covalent bond* (specifically, a nonpolar covalent bond) by sharing electrons, where carbon shares its outer valence electrons with up to *four hydrogens* to complete their outer shells and this allows both carbon and hydrogen to achieve stable electronic configurations.



> ***Covalent Bond***
> *A covalent bond is a chemical bond that involves the sharing of electrons to form electron pairs between atoms.*
> *Covalent compounds exhibit weak boiling and melting point because the intermolecular forces between their molecules are weak.*
> *Covalent bonds are usually formed between non-metals.*

Oxygen

- Oxygen cannot form long chains of bonding like carbon because of its small size and high electronegativity, and because it lacks d-orbitals.



O_2

Allotropes of Carbon

Allotropy

- Allotropy is the property of some chemical elements to exist in two or more different forms, in the same physical state, known as allotropes of the elements.
- ***Allotropes of carbon are:*** *Diamond, graphite, fullerenes, graphene, etc.*

Diamond

- It has a *3D-tetrahedral* structure with *sp^3 hybridisation.*
- Diamond is a *bad conductor of electricity.*
- In the structure of diamond, each carbon atom is bonded to *4 other carbon atoms.*
- It can be synthesized by subjecting pure carbon to very *high temperature* and *pressure.*
- Diamond is the *hardest* naturally occurring substance.
- Diamond and crystalline silicon is *isomorphous.*
- It has the *highest refractive index (2.42).*

Uses of Diamond

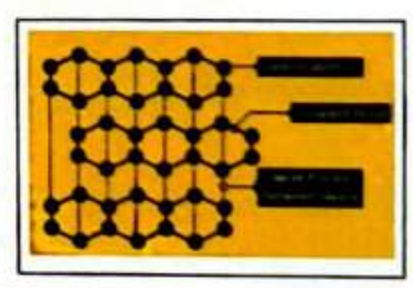
- It is used for cutting glasses.
- It is used for sharpening hard tools.
- It is used for manufacturing *Tungsten (W)* filament.

> ***Isomorphous:*** *It means having similar shapes or crystalline structures*

> *Diamond is covalent, yet it has high melting point because it has 3D network involving strong C-C Bonds that are difficult to break.*

Graphite

- It has a *2-D layered structure* (held by Van der Wall forces) and *sp^2 hybridisation.*
- It features carbon arranged in *hexagonal plane array.*
- Each carbon is bonded to three other carbon atoms, forming a hexagonal lattice. The fourth electron remains delocalized, contributing to electron conductivity.
- Graphite is a *good conductor of heat and electricity.*
- It is the *most stable* form of carbon.



> *Graphite is soft and slippery because it has a layered structure weakly bonded together because of which they could slide over each other and that is why mostly used in lubricants.*

Uses of Graphite

- Graphite is used in making electrodes.
- It is used in pencil lead.
- It is used as a dry lubricant.
- It is used as a moderator for fast moving neutron in atomic reactors.

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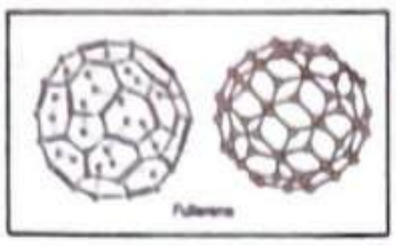
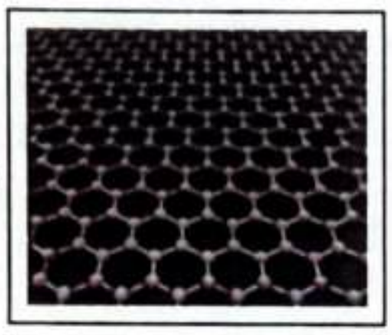
Fullerenes



- It is also known as *Buckminsterfullerene* (C60).
- It is known for its *hollow, cage-like structures* arranged in patterns of *20 hexagonal rings* and *12 pentagonal rings*.
- A hexagonal ring can be fused with hexagonal or pentagonal ring, but a pentagonal ring can only be fused with hexagonal ring.
- It has *sp^2 hybridisation*.
- It contains both *single* and *double* bond with other *3 carbon atoms*.
- Fullerenes is the purest form of carbon.

Graphene



- Graphene is a *single-atom-thick layer* of carbon atoms arranged in a *hexagonal lattice*, making it the *thinnest* material known. It exhibits exceptional electrical and thermal conductivity, making it an outstanding material for various technological applications.

HYDROCARBONS

Types of Hydrocarbons

Unsaturated Hydrocarbons

- More than 1 bond between carbon atoms
- Burns with yellow sooty flame

Alkenes/Olefins — E.g. Ethene (Double bonds)

Alkynes — E.g. Ethylene (Triple bonds)

- Other examples: Benzene, anthracene, camphor

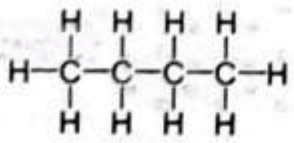
Saturated Hydrocarbons

- Single bond between carbon atoms
- Gives clean blue flame however in limited supply of air gives sooty flame

Alkanes/Paraffins — E.g. Ethane (Single bond)

- Other examples: Hexane, alcohol, butane

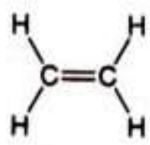
Alkanes → ane



Butane

- General Formula: CnH_{2n+2}

Alkene → ene

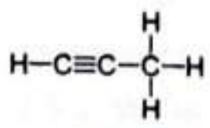


Ethene

- General Formula: CnH_{2n}

Alkyne → yne

General Formula: CnH_{2n-2}



Propyne

> - *Ethene plays an important role in fruit ripening.*
> - *LPG gas contains butane and propane.*
> - *Acetylene/Ethylene is used for welding of metals.*

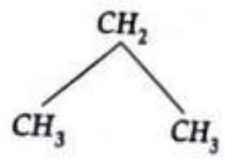
Naming of Hydrocarbons

No. of Carbon atoms	Prefix
1	meth-
2	eth-
3	prop-
4	but-
5	pent-
6	hex-
7	hept-
8	oct-
9	non-
10	dec-
11	undecane-
12	dodecane-
13	tridecane-
14	tetradecane-
15	pentadecane-
16	hexadecane-
17	heptadecane-
18	octadecane-
19	nonadecane-
20	icosane-

E.g.

$CH_3\text{-}CH_2\text{-}CH_3$ → *Propane*

C_3H_6 → *Propene*



Bond-line structure of propane

International Union of Pure and Applied Chemistry (IUPAC)

- It is a scientific organization that is responsible for naming *hydrocarbons*.
- It publishes several books often referred to as *"IUPAC Color Books"*.
  - ***Blue Book:*** Nomenclature of *organic compounds*.
  - ***Red Book:*** Nomenclature of *inorganic compounds*.

$\overset{1}{C}H_3\text{-}\overset{2}{C}\equiv\overset{3}{C}\text{-}\overset{4}{C}H_2\text{-}\overset{5}{C}H_3$ → *Pent-2-yne* — Nearest position for double/triple/functional group

$CH_3\text{-}CH_2\text{-}CH_2\text{-}C\equiv CH$ → *Pentyne*

$\overset{5}{\boxed{CH_3}}$ → *Alkyl group*

$\underset{1}{CH_3}\text{-}\underset{2}{CH_2}\text{-}\underset{3}{CH_2}\text{-}\underset{4}{CH_3}$ → *2-Methyl Butane*

Look for continuous longest chain

CH_3 → *Methyl*

$CH_3\text{-}CH_2$ → *Ethyl*

$CH_3\text{-}CH_2\text{-}CH_2$ → *Propyl*

> *Root: It is the longest continuous chain of a compound.*

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$$CH_3-CH_2-\underset{}{\overset{CH_3}{\overset{|}{CH}}}-CH_2-CH_3 \rightarrow \textit{3-Methyl Pentane}$$

$$CH_3-CH_2-\overset{CH_3}{\overset{|}{CH}}-C\equiv CH_3 \rightarrow \textit{3-Methyl Pentyne}$$

Class of the compound	Functional group	Common Formula	Examples	Suffix	Functional Groups
Alcohol	—OH	R-OH	Ethanol, CH_3CH_2OH	-ol	Ethanol
Aldehyde	O ‖ —C—H	R-CHO	Acetaldehyde, CH_3COH	-al	Ethanal
Ketone	O ‖ —C—	R-CO-R	Acetone, CH_3COCH_3	-one	Propanone
Carboxylic acid	O ‖ —C—OH	R-COOH	Acetic acid, CH_3COOH	-oic	Ethanoic
Ester	O ‖ —C—OR	R-COOR	Methyl acetate, CH_3COOCH_3	-oate	-COOR
Ether	—O—R	R-O-R	Dimethyl ether, CH_3OCH_3		

Prefix is used here

For halogens as functional groups prefix is used.

Homologous Series

- It consist of one functional group, which decides the property of carbon compounds, regardless of length of carbon chain.
- Homologous series differs by $-CH_2$ unit and mass by *14 units.*
- Chemical properties of homologous series *remains same.*
- As the molecular mass increases, the *melting point* and *boiling point* also *increases.*

Homologous Series

Alkanes	Alkynes	Alcohols
CH_4	C_2H_2	CH_3OH
CH_2	CH_2	CH_2
C_2H_6	C_3H_4	C_2H_5OH
CH_2	CH_2	CH_2
C_3H_8	C_4H_6	C_3H_7OH
CH_2	CH_2	CH_2
C_4H_{10}	C_5H_8	$C_4H_9OHCH_2$

Isomers

- Isomers are chemical compounds that have *identical chemical formulae but differ in properties* and the *arrangement of atoms* in the molecule.

$$CH_3-CH_2-CH_2-CH_3 \rightarrow C_4H_{10} \rightarrow \textit{Butane}$$

$$CH_3-CH_2-\overset{CH_3}{\overset{|}{CH}}-CH_2-CH_3 \rightarrow C_6H_{14} \rightarrow \textit{3-Methyl Pentane}$$

TRICK for Identifying No. of Isomers: $2^{(n-4)}+1$

Isomers In

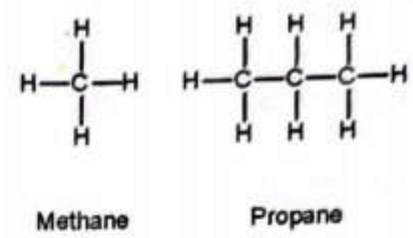
- Hexane: $2^{(6-4)}+1 = 2^2+1 = 5$
- Heptane: $2^{(7-4)}+1 = 2^3+1 = 9$
- Octane: $2^{(8-4)}+1 = 2^4+1 = 16+1+1 = 18$
- Nonane: $2^{(9-4)}+1 = 2^5+1 = 32+1+2 = 35$

- *Single bond: made of one σ bond*
- *Double bond: made of one σ and one π bond*
- *Triple bond: made of one σ and two π bond*

Organic Compounds

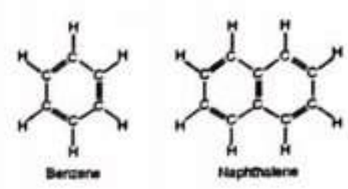
Aliphatic/Acylic Compounds

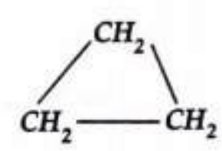
- They are *not aromatic* (lack ring structure). *E.g. Alkane, Alkene, Alkyne (open chain compounds).*



Cyclic Compunds

- They are compounds that form a *ring structure. E.g. Benzene, Naphthalene.*





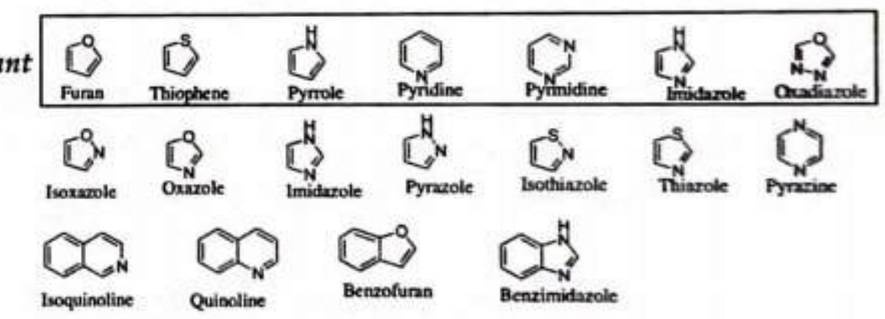
Cyclical Formula

- Alkane: CnH_{2n}
- Alkene: CnH_{2n-2}
- Alkyne: CnH_{2n-4}

Heterocyclic Compounds

- They are cycling compounds that have atoms of *at least two different elements* in their ring structure.

**Important

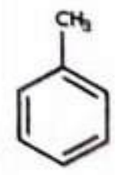


Aromatic Compounds

- They are group of compounds that have a cyclic conjugated structure and contain $(4n+2)\,\pi$ electrons, making them particularly stable (Erich Huckel's Rule).

Benzene

(Simplest aromatic compound)



Toulene

(Benzenoid aromatic compound)

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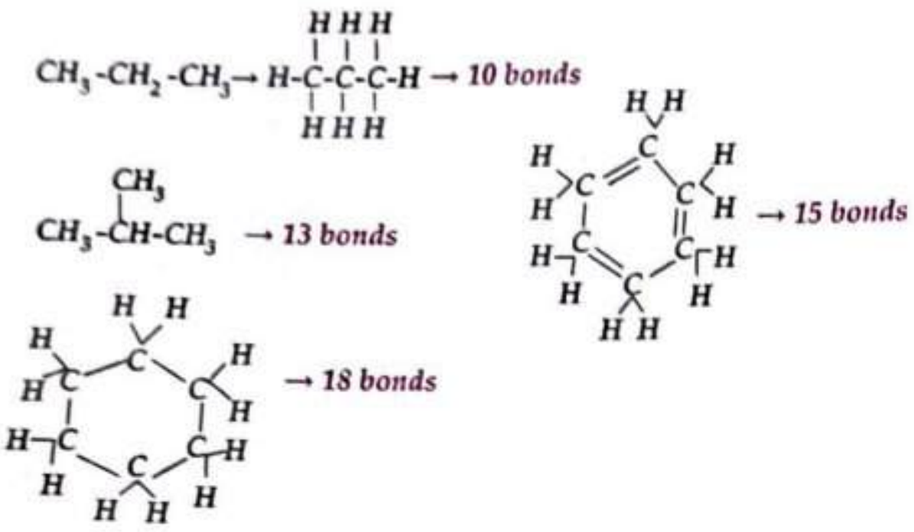
Number of Covalent Compounds



Chemical Properties of Carbon Compounds

1. **Combustion:** Carbon in all its allotropic form burns in *Oxygen* to give *Carbon Dioxide* along with the release of *Heat + Light*.

$$CH_4 + 2O_2 \xrightarrow{\text{🔥}} CO_2 + 2H_2O + Heat + Light$$

Combustion: 🔥

2. **Oxidation of Alcohol to Ethanoic Acid**

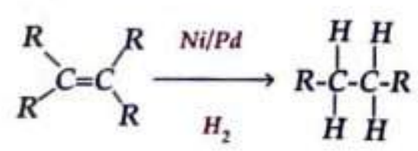
$$CH_3\text{-}CH_2\text{-}OH \xrightarrow[H^+/K_2Cr_2O_7]{H^+/KMnO_4 \text{ OR}} CH_3\text{-}\overset{O}{\overset{\|}{C}}\text{-}OH$$

Ethanoic acid

$KMnO_4$	: Potassium permanganate
$K_2Cr_2O_7$	: Potassium dichromate

**This reaction is carried out in presence of oxidising agent*

3. **Addition Reaction:** Unsaturated hydrocarbons add hydrogen in presence of *Catalyst (Ni, Pd)* to give saturated hydrocarbons.



4. **Substitution Reaction:** A hydrogen atom in a saturated hydrocarbon is replaced by a *chlorine* atom, forming a *chlorinated derivative* and *hydrogen chloride*, often in the presence of *sunlight*.

$$\underset{\text{Methane (natural gas)}}{CH_4} + Cl_2 \xrightarrow{\text{Sunlight}} \underset{\text{Chloromethane}}{CH_3Cl} + HCl \xrightarrow{\text{Sunlight}} CH_2Cl_2 + HCl$$

$$\xrightarrow{\text{Sunlight}} \underset{\text{Chloroform}}{CHCl_3} + HCl \xrightarrow{\text{Sunlight}} CCl_4 + HCl$$

Vegetable Oil Vs Animal Fats

Vegetable Oil	Animal Fats
Long unsaturated carbon chains	Saturated fats
Preferred for cooking	Harmful for health

Boiling Point and Solubility of Hydrocarbons

- Alkynes generally have slightly *higher boiling point* than *alkenes* and *alkanes* (Alkyne > Alkene > Alkane) because of the stronger intermolecular forces arising from the triple bond.

$$\underset{\text{Ethane}}{CH_3\text{-}CH_3} < \underset{\text{Propane}}{CH_3\text{-}CH_2\text{-}CH_3} < \underset{\text{Butane}}{CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_3}$$

- Alkenes have stronger intermolecular forces than alkanes due to the double bond, so their bonding point is higher than that of alkanes, but lower than alkynes.
- As the number of carbon in alkane increases, its boiling point increases significantly. Also, molecule with strong intermolecular forces will have high boiling points

Solubility of Hydrocarbons

- Solubility *decreases* as the length of hydrocarbon chain *increases*.

$$C_2H_6 > C_3H_8 > C_4H_{10}$$

Important Carbon Compounds

1. **Methanol**

- Methanol also known as *Methyl alcohol* is also called *"wood spirit"* because it was obtained in the initial stage by the *destructive distillation* of *wood*.
- Intake of methanol in very small quantities can cause *death*. Methanol oxidises to *methanal in liver* and *coagulates protoplasm*.
- Methanol also affects optic nerves, causing blindness.

2. **Ethanol**

- It is a *pleasant smelling* carbon compound.
- It is an active ingredients in alcoholic drinks.
- Denatured spirit or alcohol is ethanol which is made unfit for drinking by adding poisonous substances like *methanol* that imparts a bad taste, foul smell, or colour. A *blue dye* is also added to it, so that it is easily recognized.
- It is soluble in water in all proportion.
- ***It is a good solvent and is used in medicines such as:***

1. Tincture of iodine
2. Cough syrups

Reactions of Ethanol

1. ***Reaction with Sodium*** → Evolution of *Hydrogen gas*.

$$\underset{\text{Ethanol}}{C_2H_5OH} + Na \rightarrow C_2H_5ONa + H_2(g)$$

2. ***Dehydration of Ethanol***

- On heating ethanol at *443K* with excess *Conc. Sulphuric acid* (Dehydrating agent), it results in dehydration of *ethanol to ethene*.

$$\underset{\text{Ethanol}}{C_2H_5OH} \xrightarrow{\text{Conc. } H_2SO_4} \underset{\text{Ethene}}{CH_2{=}CH_2}$$

Alkyl group is also represented as –R

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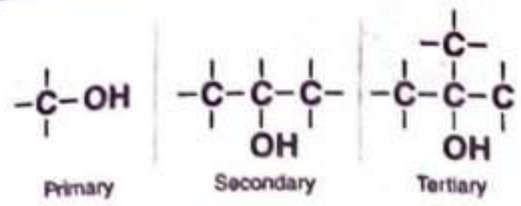
Different Types of Alcohol



3. ***Ethanoic Acid (Acetic acid)***

- A *5-8% solution* of *acetic acid* in water is called *vinegar* and is used widely as a preservative in *pickles*.
- The melting point of pure ethanoic acid is *290K* and hence it often freezes during winters and is called *glacial acetic acid*.

1. ***Reaction with Base***

- When *ethanoic acid* reacts with a base, it undergoes a *neutralization* reaction, forming a *salt (an ethanoate)* and *water*.

$$CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$$

Ethanoic acid *Sodium hydroxide* *Ethanoate*

2. ***Esterification Reactions***

- In an esterification reaction, a *carboxylic acid reacts with an alcohol*, typically in the presence of an *acid catalyst*, to form an *ester* and *water*.

$$CH_3COOH + C_2H_5OH \rightarrow CH_3\overset{O}{\overset{||}{C}}-O-C_2H_5 + H_2O$$

Carboxylic acid *Removal of water* *Ester* *Water*

$-\overset{O}{\overset{||}{C}}-OH$
-oic group

Ester

1. It is formed by reaction of *acid* and *alcohol*.
2. It is a *sweet smelling substance* used in making perfumes and flavouring agents.

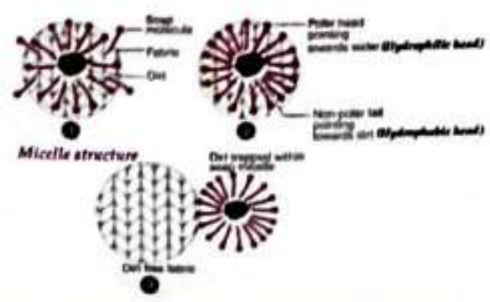
Soap and Detergents

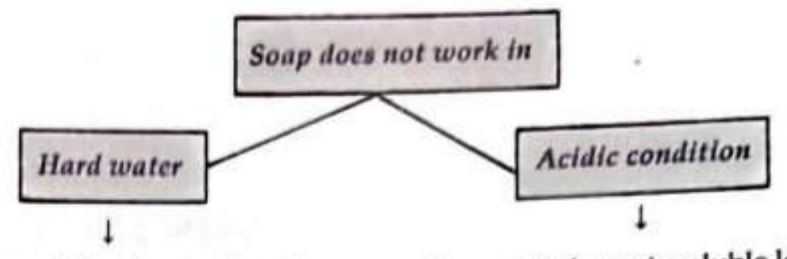
Saponification Reaction

- This reaction is used in preparation of soaps. In this reaction, an *ester* is treated with a *base* (like sodium hydroxide) that breaks it down into an *alcohol* and a *sodium salt* of a *carboxylic acid*.
- The ester is converted back to alcohol and sodium salt of carboxylic acid.

$$CH_3COOC_2H_5 \xrightarrow{NaOH} CH_3COONa + C_2H_5OH$$

- Soaps are cleansing agents that are *sodium or potassium salts* of *long-chain carboxylic acids* (also known as fatty acids).
- Soap obtained remains in *colloidal form* and is precipitated from solution by adding *NaCl*.
- The solution left after removing the soap contains *glycerol* which is later recovered by *fractional distillation*.





Because in hard water it reacts to form Calcium & Magnesium salts, which is an insoulble substance called Scum.

Because it forms insoluble long chain fatty acids.

> ***Cleansing action of soap is due to formation of micelles. It forms an emulsion in water and does not come together to precipitate because of ion-ion repulsion. Soap micelle shows Tyndal Effect, thus soap solution appears cloudy.***

Detergents

- Detergents are *sodium salt of sulphonic acids* or *ammonium salts* with Chloride, Bromide ions etc.
- Detergents work in both *hard* and *soft* water.
- They dissolve in water faster than soap.

> ***Sodium benzoate is used as preservative in many foods, medicine, and cosmetics.***

> ***Friedrich Wohler in 1828 synthesised Urea (NH_2CONH_2), an Organic Compound from an Inorganic Compound named Ammonium Cyanate (NH_4CNO).***

For an interactive recap of this topic, see the crossword on Page Number 281.

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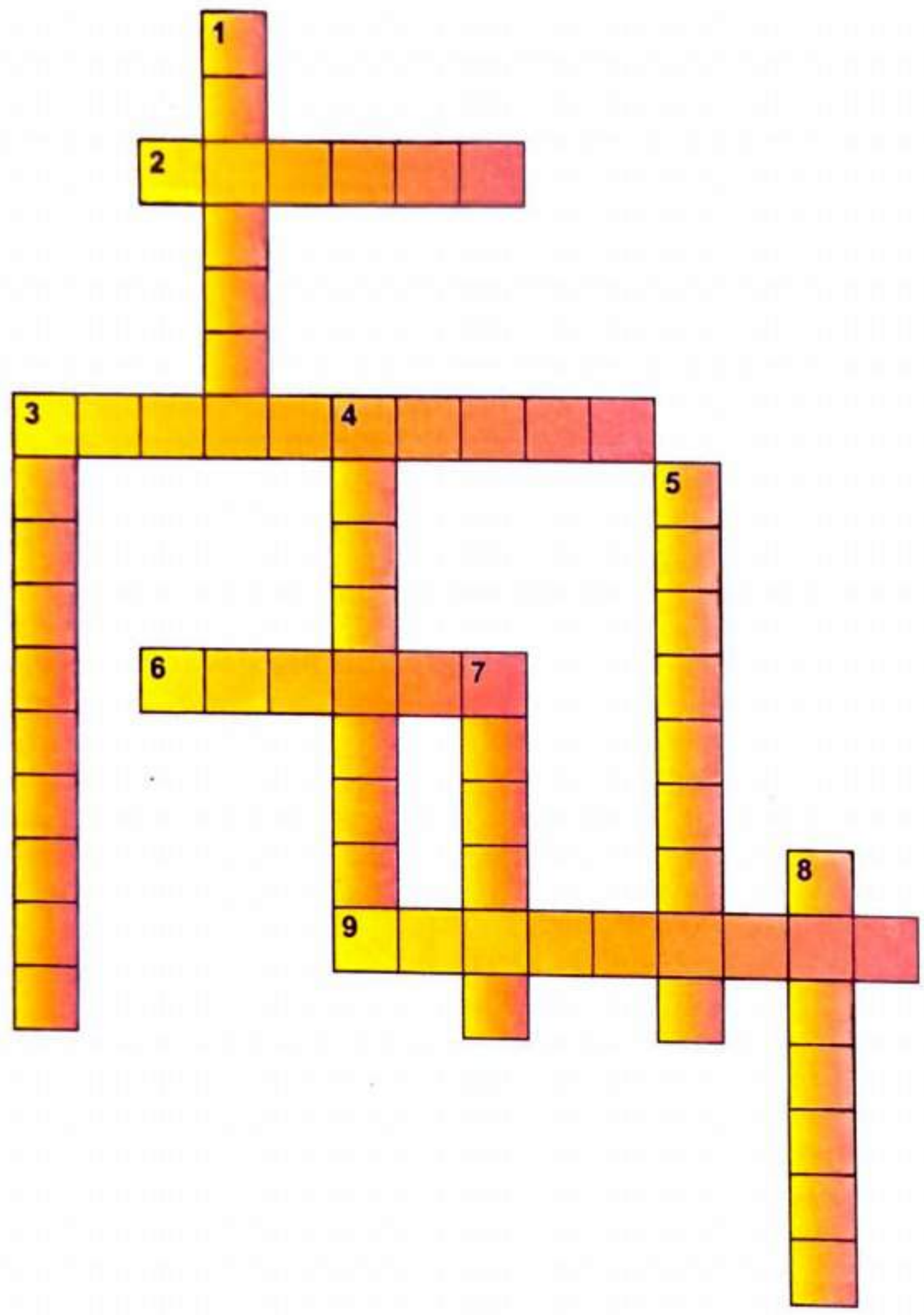
PARMAR'S CROSSWORD

CARBON AND ITS COMPOUNDS



Across

2. Straight-chain alkane with formula C_9H_{20}.
3. Carbon's ability to form C–C bonds.
6. Four-carbon chain with a triple bond.
9. Representation type of CH_3OH.

Down

1. IUPAC name of $CH_3(CH_2)_{18}CH_3$.
3. Used in the production of freon R-22.
4. Class of compounds for cyclohexane.
5. Allotrope of carbon discovered in 1985.
7. Molecule with formula C_2H_6.
8. Compound causing cooling in mint leaves.

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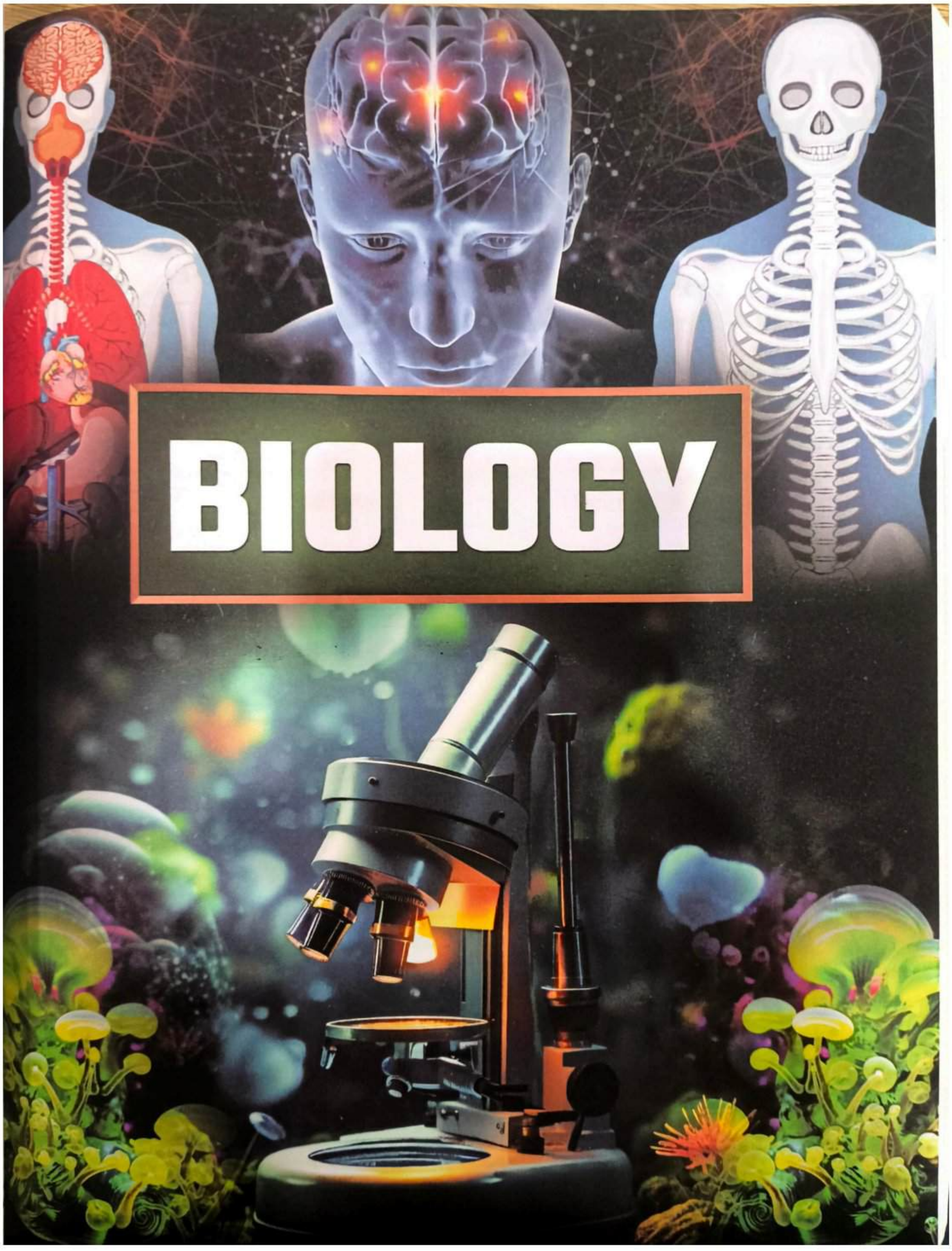

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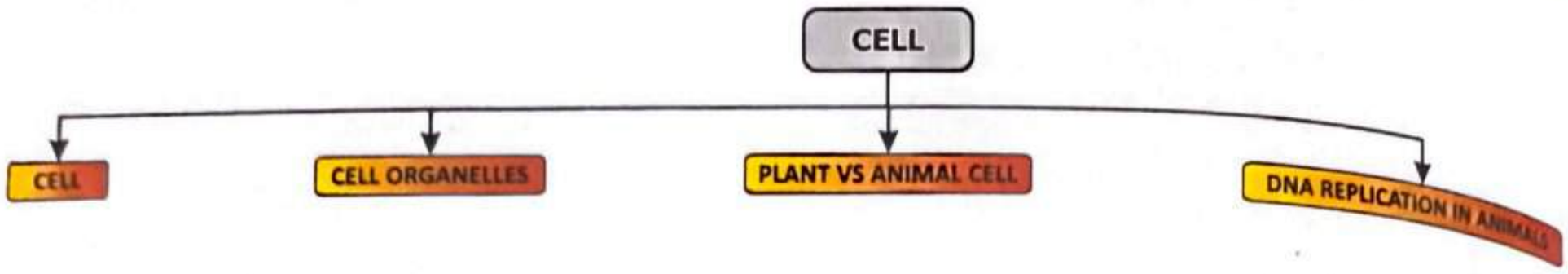

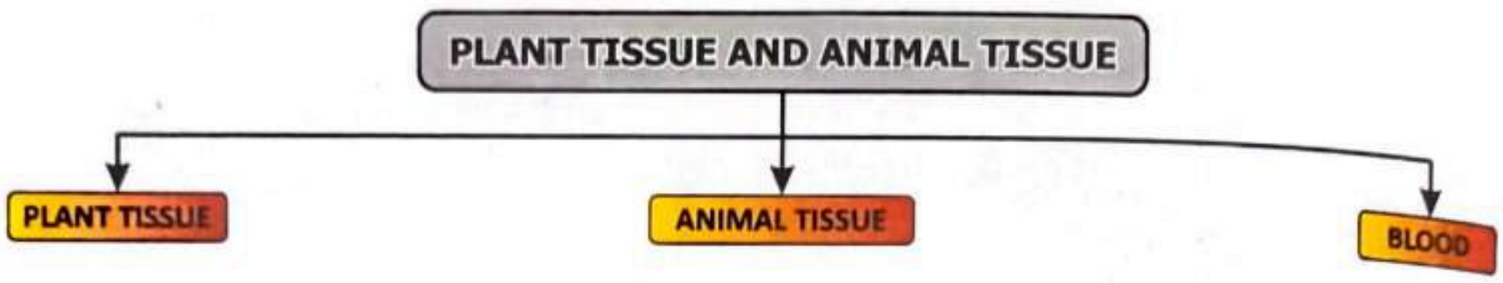

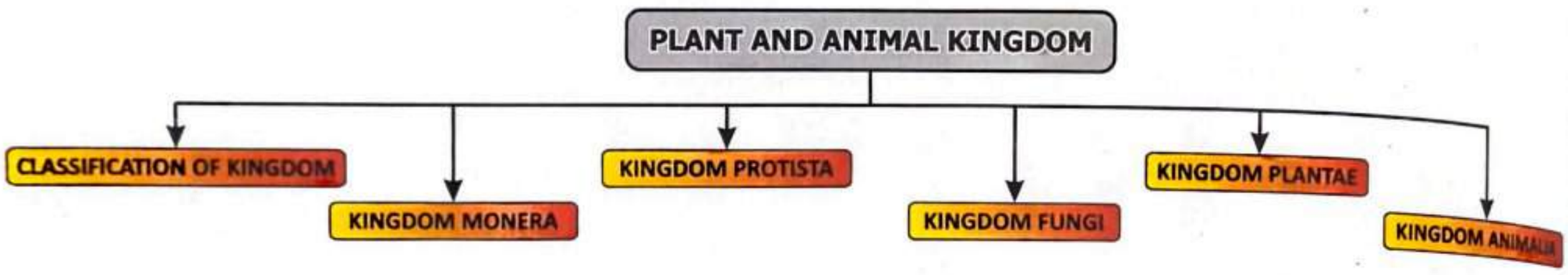

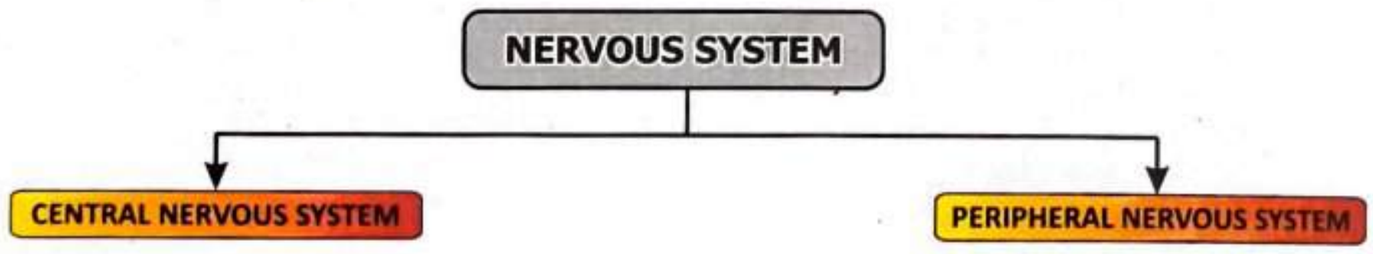

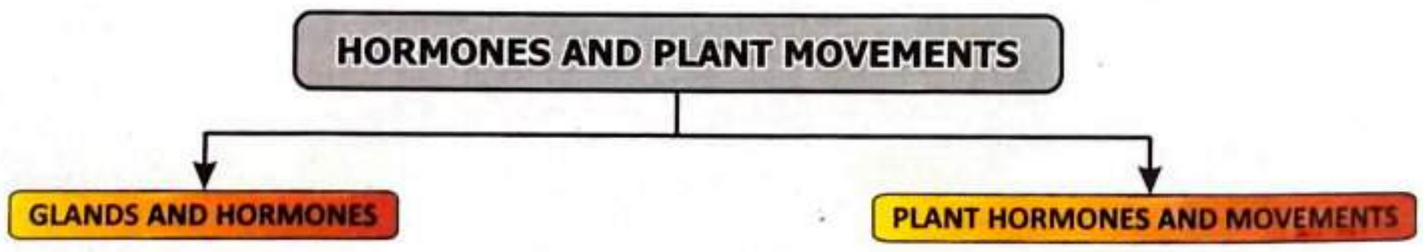

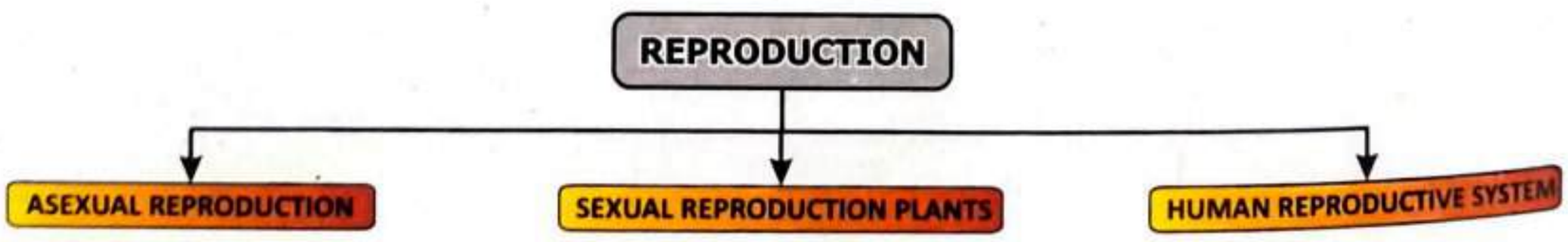

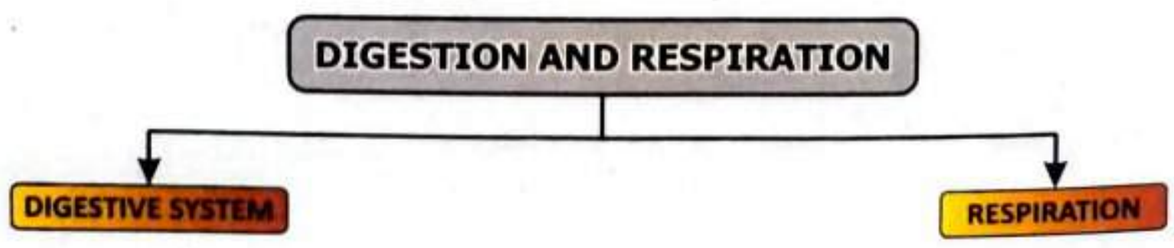

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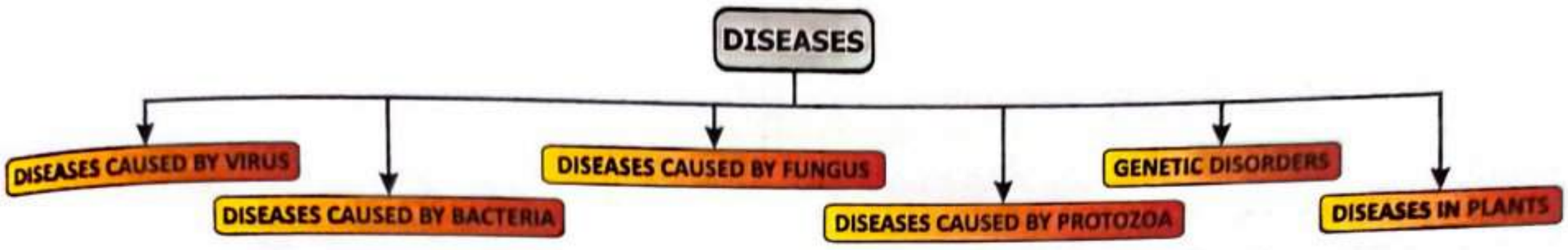

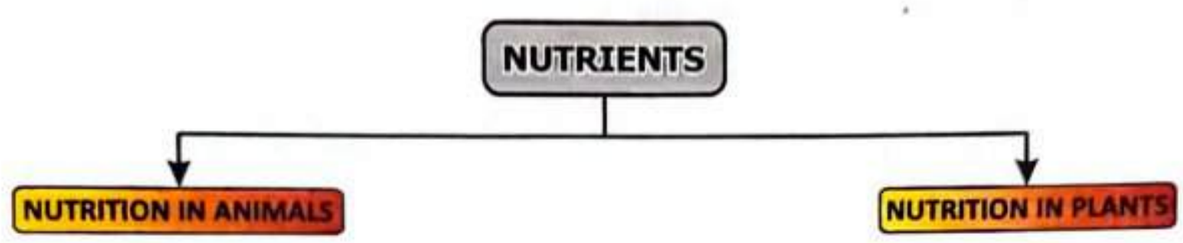

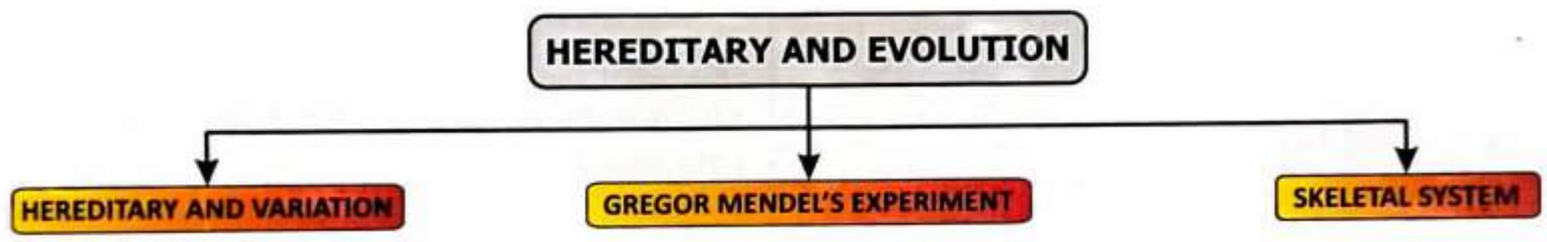

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CELL

- The study of cell is called: *Cytology.*
→ *Cyto: Cell*
→ *Logy: Study*

Cell is:
- Building blocks of life.
- Fundamental unit of life.
- Structural and functional basis of life.

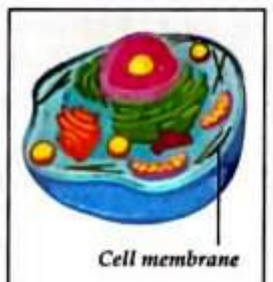
Discovery of Cell
- *Dead cell: Robert Hooke* (in cork) → *Father of Cytology (1665).*
- *Living cell: Antonie van Leeuwenhoek* (in pond water) in *1674.*

Cell Theory
- In *1838, Matthias Schleiden* and *Theodor Schwann* formulated the cell theory, stating that all living organisms are composed of cells, and the cell is the basic unit of life.
- In *1855, Rudolf Virchow* published his famous Cell Theory *"omnis cellula e cellula"*, which means new cells are formed from the pre-existing cells.

- ***Largest cell in human: Ovum (female sex cell).***
- ***Smallest cell in human: Sperm (Male sex cell).***
- ***Largest Cell in male: Neuron (also the longest cell).***
- ***Smallest cell in women: RBC.***
- ***Largest cell: Ostrich's egg.***
- ***Smallest cell: Mycoplasma (bacteria).***

Parts of Cell

Cell Membrane
- The cell membrane is also called the *plasma membrane.*
- It is a thin, elastic, and flexible structure.
- It is the outermost covering of the cell in animal cells (in plant cells, it lies just beneath the cell wall)



Cell Membrane

Functions:
- It acts as a protective barrier → like a *bodyguard.*
- It gives shape to the cell.
- It holds and protects the internal contents.
- It controls movement of substances in and out (acts as a *selectively permeable membrane*) → ***Composition: Proteins (50%) + Lipids (50%).***
  - ***Phospholipids***
  - ***Cholesterol***

Movement across Cell Membrane
- ***Diffusion:*** Spontaneous movement of molecules from *higher to lower concentration.*

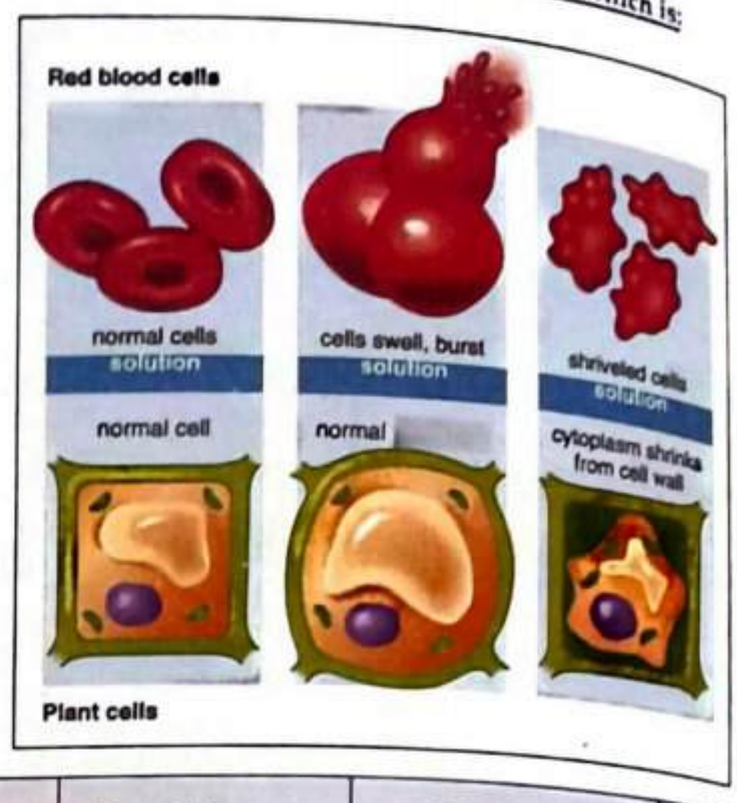
- ***Rate of Diffusion:*** *Gases > Liquids > Solids.* ***E.g. Diffusion of agarbatti smell.***

- ***Osmosis:*** Movement of water from *higher to lower concentration* but through a *semi-permeable membrane.* Cell absorbs water through osmosis, no energy is required and it last up to equilibrium state.

Solution = Solute + Solvent

Active Transport/Reverse Osmosis
- Movement of molecules *across a cell membrane* from a region of *lower to higher concentration.* It requires cellular energy.

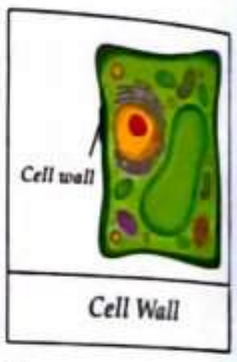
What happens to a cell when placed in a solution? which is:



Type	*Description*	*Effect on Cell*	*Solute vs Solvent*
Isotonic	Normal solution	No change in cell size	Solute = Solvent
Hypotonic	Dilute solution	Cell swells (turgidity)	Solute < Solvent
Hypertonic	Concentrated solution	Cell shrinks (plasmolysis)	Solute > Solvent

Turgor pressure causes enlargement and extensive growth of cells.

Cell Wall
- It is only present in *plant/bacteria/fungus/algae.*
- The cell wall is *not a living structure.*
- The cell wall allows the free passage of molecules, unlike the selectively permeable cell membrane.
- It provides rigidity and shape to the cell.
- It offers structural support and protection to the cell.

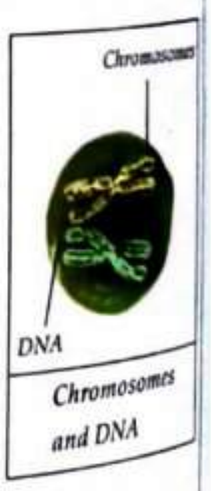


Cell Wall

Materials of Cell Wall:
- ***Bacteria:*** *Peptin/Peptidoglycan.*
- ***Fungi:*** *Chitin.*
- ***Plant:*** *Cellulose.*
- ***Algae:*** *Cellulose/Pectin.*

Glycocalyx: ***A surface layer (slime layer) that covers the cell membrane in bacteria.***

Chromosomes
- Chromosomes are *thread-like structures* in the nucleus of cells that contain DNA and genes.
- They carry genetic information from cell to cell.
- Components of Chromosomes: *DNA and Proteins* (Histones).
- ***Total:*** *46 Chromosomes* (23 pairs) in a human being.
  - ***22 pairs (autosomal).***
  - ***1 pair (sex pair): XX (female) and XY (male).***



Chromosomes and DNA

DNA
- DNA carries *genetic information,* and genes, which are functional segments of DNA, are responsible for transmitting this information from one generation to the next.

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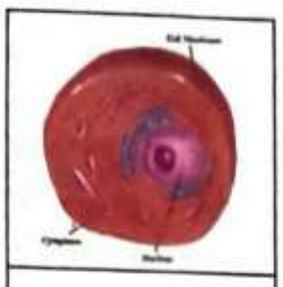
- *DNA molecule discovery: Friedrich Miescher (1869).*
- *Double-helical structure by: Watson and Crick (1953).*



Cytoplasmic Content

Cytoplasm

- Cytoplasm is the fluid that fills up the cells. It is the part that is located between the plasma membrane and nuclear envelope.
- Cell organelles are present in cytoplasm.
- ***Cytosol:*** The aqueous (water-based) fluid portion of the cytoplasm.
- ***Cytoplasmic Inclusions:*** Non-living components (pigments, nutrients, etc.) of cytoplasm. It exists in two forms: Euchromatin and Heterochromatin.

1. ***Euchromatin:*** Loosely packed, transcriptionally active.
2. ***Heterochromatin:*** Tightly packed, transcriptionally inactive.

- During cell division, chromatin condenses to form chromosomes.

Nucleus

- Nucleus is known as *"Brain of the Cell"*, it controls the activities of different cell organelles
- ***Discovered by:*** *Robert Brown in 1831.*
- The nucleus is found in the center of the cell.
- The nucleus is the *largest organelle* (double-membraned) in a eukaryotic cell.
- The nucleus is enclosed by a double-layered nuclear membrane, which separates the nucleus from the cytoplasm.
- It permits materials between nucleoplasm and cytoplasm.

The protoplasm is the living material of the cell and composed of biomolecules like nucleic acids, proteins, lipids, and carbohydrates.

Nucleoplasm

- Nucleoplasm is a type of protoplasm (the term coined by *Purkinje* in *1839*) that is composed of thick fluid and constitutes chromatin fibres made up of DNA and usually found in the nucleus of the eukaryotic cells.

Contents of Nucleoplasm:

1. ***Nucleolus:*** The nucleolus is a distinct, *non-membrane-bound* structure within the nucleus of eukaryotic cells, primarily known for its role in *ribosome biogenesis*.
2. ***Chromatin material:*** Chromatin is the complex of *DNA* and *proteins*, primarily histones, that makes up the genetic material of the cell.

Types of Cell: Prokaryotic cell and Eukaryotic cell.

Prokaryotic Cell	*Eukaryotic Cell*
Size: 1-10 μm	Size: 10-100 μm
Nucleus absent	Nucleus present
Nucleolus absent	Nucleolus present
Cell organelles is absent	Cell organelles present
Chromosome: single	Chromosome: more than one
E.g. Bacteria, Cyanobacteria (Blue green algae), mycoplasma	***E.g. Plant and animal cell***

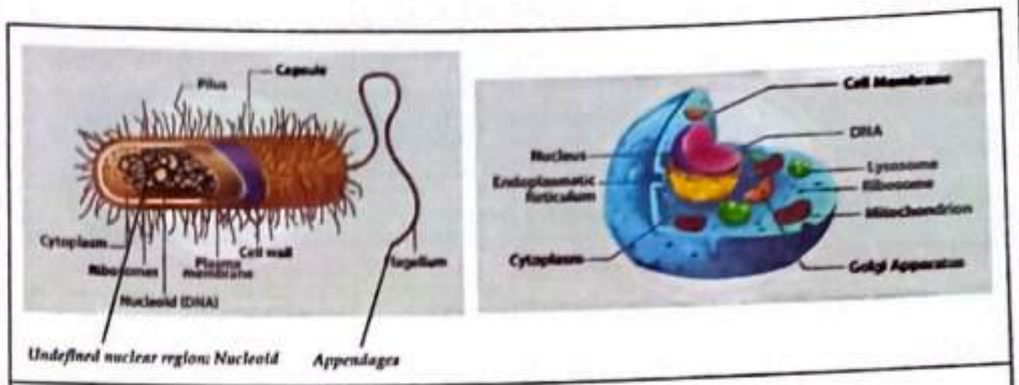
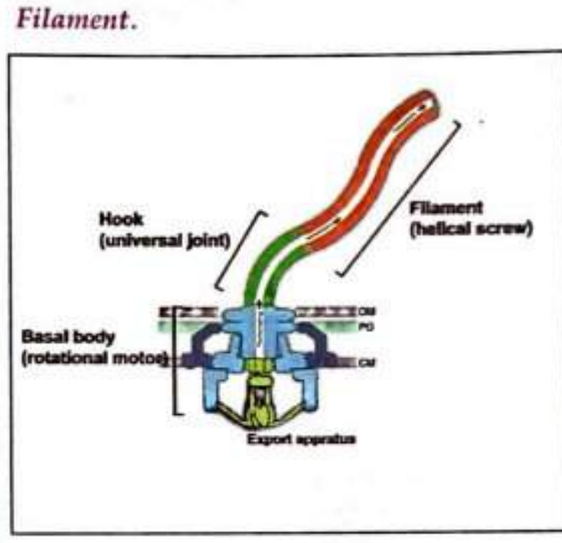


Fig 1: Prokaryotic and Eukaryotic Cell

Bacterial Flagellum

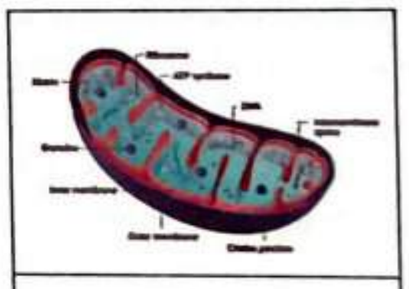
- Flagella are microscopic *hair-like structures* involved in the locomotion of a cell.
- The flagella is a helical structure composed of *flagellin protein*. The flagella structure is divided into three parts: *Basal body, Hook, and Filament*.



Basal Body: It is attached to the cell membrane and cytoplasmic membrane.
Hook: It is a broader area present at the base of the filament.
Filament: Thin hair-like structure arising from the hook.

CELL ORGANELLES

- Cell organelles are specialized, *membrane-bound structures* within cells that perform specific functions essential for cell survival and function, much like organs in the body.



Mitochondria

Mitochondria

- ***Length:*** 1-2 um (1 micro metre: 10^{-6}m).
- ***Diameter:*** 0.1-0.6 um.
- Mitochondria is involved in apoptosis (programmed cell death).
- It is also known as *"Powerhouse of the cell"* responsible for *ATP* (Adenosine Triphosphate) synthesis to make energy. ATP is also called as energy currency of the cell.
- ***Two membranes:*** Outer membrane (porous in nature) and Inner membrane (responsible for ATP synthesis).
- Mitochondria has its *own DNA and ribosomes*.
- Shape is like a "sausage".

Ribosomes

Ribosomes

- Ribosomes *do not* have membrane.
- They are essential cell structures for protein synthesis.
- ***Discovered by:*** *George E. Palade (1955).*

Endoplasmic Reticulum

- They are network of *sac-like* structures.

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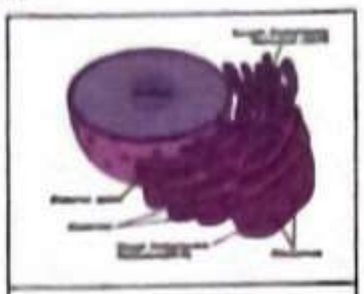
• They are attached to plasma membrane on one side and outer nuclear membrane on the other.
• Endoplasmic Reticulum serves as transport between cytoplasm and nucleus.
• Detoxify poisons, and drugs (SER in liver through an enzyme *Cytochrome P450*).
• ***Types:*** *Long tubules, Vesicles, and Cisternae.*


Endoplasmic Reticulum

Functions:

Rough Endoplasmic Reticulum

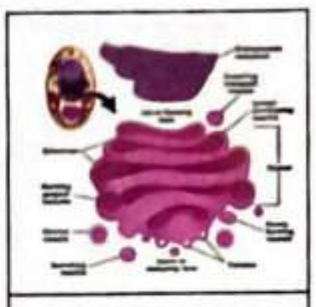
• It is characterized by ribosomes on its surface, which are responsible for *protein* synthesis.

Smooth Endoplasmic Reticulum

• It is characterized by the absence of ribosomes and plays a crucial role in synthesizing *lipids and fats*. Ribosomes are *absent* here.

Golgi Bodies

• ***Discovered by:*** *Camillo Golgi (1898).*
• It consist of *vesicles, cisternae, and vacuoles.*
• ***Golgi bodies has two distinct faces:***
→ ***Cis face:*** Convex, faces towards the nucleus (receiving side).
→ ***Trans face:*** Concave, faces towards plasma membrane (mature/shipping side).

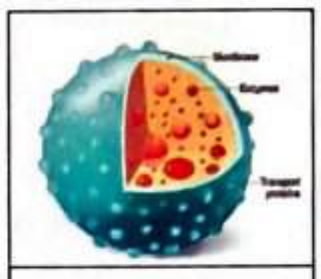

Golgi Body

Functions:

• It responsible for *packaging* and *despatching* of *proteins* and *lipids* (also known as *"Post Office"* of the cell).
• It is involved in forming complex sugar from simple sugars.
• It forms lysosomes.

Lysosomes

• It is known as *"suicide bag of the cell".*
• Lysosomes are filled with *digestive enzymes* (made in RER) that *acts* as *waste disposal system* of cell.
• When the cells get damaged, lysosomes may burst leading to enzymes *digesting their own cell.*

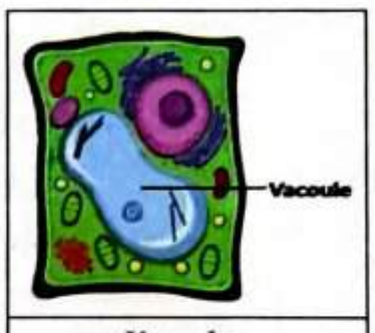

Lysosome

Vacuoles

• Vacuoles are membrane bound *solid* or *liquid* filled *sac-like* structures.

In plants:

• They are large and distinct and occupy significant portion of cell volume *(50-90%).*
• They store cell sap.
• They provide turgidity and rigidity to the cell.
• In plant cells, vacuoles are generally considered permanent, large, and central structures.



Vacuoles

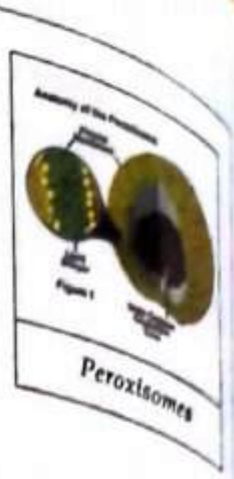
Cell sap consists of:
• Amino acids
• Sugars
• Organic acids

In animals:

• In animal cells, vacuoles are smaller, more numerous, and often *temporary.*
• They store *glucose, glycogen,* and *protein.*

Peroxisomes

• It breakdowns very long chain of fatty acid through beta oxidation.
• It contains *oxidative enzymes* (E.g. Catalase) that convert harmful *hydrogen peroxide* into water and *oxygen.* It acts as free radical scavengers, helping to detoxify the cell.


Peroxisomes

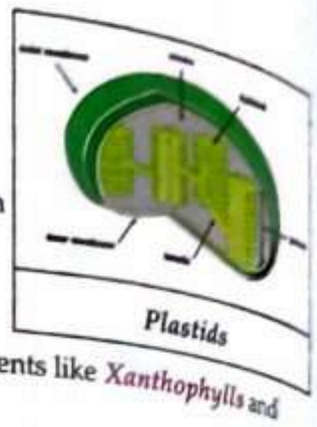
Plastids

• Plastids are only present in plant cell and not in animal cell.
• It has its own DNA and ribosomes.

Types:

1. ***Chloroplast***

• Chloroplasts are green plastids that contain *chlorophyll,* the pigment responsible for photosynthesis.
• They also contain yellow and orange pigments like *Xanthophylls* and *Carotenes.*
• Chlorophyll molecules contain *magnesium* (Mg^{2+}), which is essential for capturing solar energy during food synthesis (photosynthesis).


Plastids

2. ***Chromoplasts***

• Chromoplasts contains different types of pigments, which provides colour.
E.g. Red colour in tomato which is due to lycopene, red colour in chilli which is due to capsanthin.

3. ***Leucoplasts***

• Leucoplasts are *colourless plastids,* mainly involved in *storage.*

They are of three types:

• ***Amyloplast:*** Storage of *carbohydrates.*
• ***Aleuroplast:*** Storage of *proteins.*
• ***Elaioplast:*** Storage of *fats.*

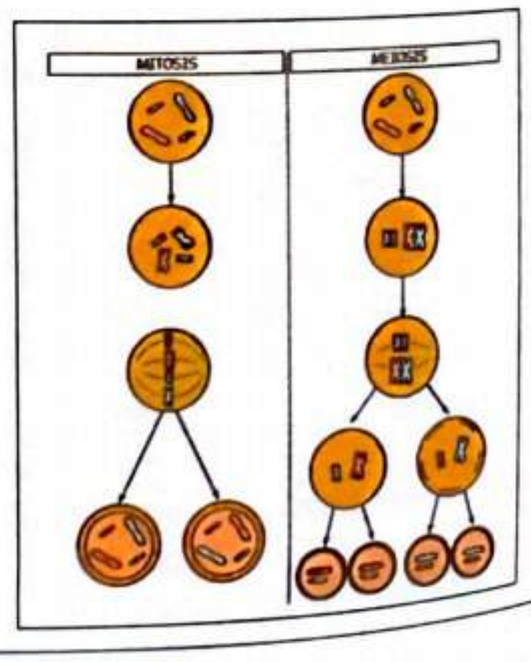
Cell Division

• Cell division is the process where a parent cell divides into *two or more daughter cells.*

Reason for division:

• Growth of organism.
• To replace old, dead, and injured cell.
• Gamete formation (Meiosis).

Mitosis and Meiosis



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Mitosis	Meiosis
Occurs in somatic cells (body cells)	Occurs in germ cells (reproductive cells)
The nucleus divides only once	The nucleus divides twice
Produces two daughter cells	Produces four daughter cells
Daughter cells are diploid (2n) → same no. of chromosomes as the parent cells	Daughter cells are haploid (n) → half the no. of chromosomes as the parent cells
Cells are genetically identical to each other and to the parent cell	Cells are genetically different from each other and from the parent cell
Responsible for growth, repair, and asexual reproduction	Responsible for formation of gametes (egg and sperm cells)
No genetic variation occurs	Genetic variation occurs due to crossing over and independent assortment
Malfunction can lead to cancer (uncontrolled cell division)	Malfunction can lead to genetic disorders such as: Down's syndrome, Klinefelter's syndrome, Turner's syndrome

Cell Cycle

- ***G1 Phase (Gap 1):*** The *cell grows* and performs its normal functions, preparing for DNA replication.
- ***S Phase (Synthesis):*** The *cell replicates its DNA*, creating two identical copies of each chromosome.
- ***G2 Phase (Gap 2):*** The cell continues to grow and *prepares for mitosis*, ensuring that DNA replication is complete and that the cell is ready to divide.
- ***Mitotic Phase:*** This phase involves the *division of the cell's nucleus* and *cytoplasm*.

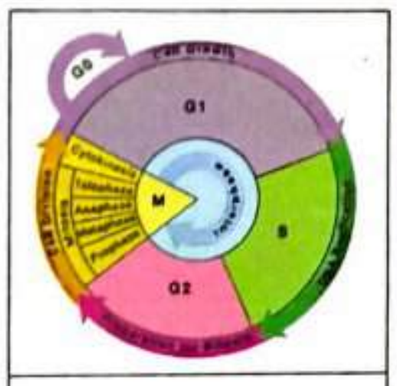
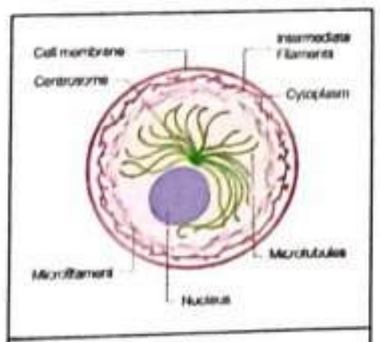


Fig 2: Cell Division

Cytoskeleton

- Cytoskeleton helps in providing structural support to cell.
- Cytoskeleton helps in *cell movement*.



Cytoskeleton

Centrosome

- The centrosome is responsible for organizing microtubules, which are essential for cell structure, movement, and division.
- Each centriole is a cylindrical structure made up of microtubule arranged in *9+0/9+2 form*.

Microtubules

- Microtubules are hollow, cylindrical structures composed of tubulin proteins that form part of the cell's cytoskeleton, providing structural support, facilitating cell movement, and playing a crucial role in cell division.

PLANT VS ANIMAL CELL

Plant Cell	Animal Cell
Cell wall is present	Cell wall is absent
Chloroplast is present for photosynthesis	Chloroplast is absent
Almost rectangular in shape	Small, irregular, or round in shape
Large vacuoles are present	Small vacuoles are present
Plastids are present	Plastids are absent
Has less number of mitochondria	Has more number of mitochondria
Reserve food material starch	Reserve food material is glycogen

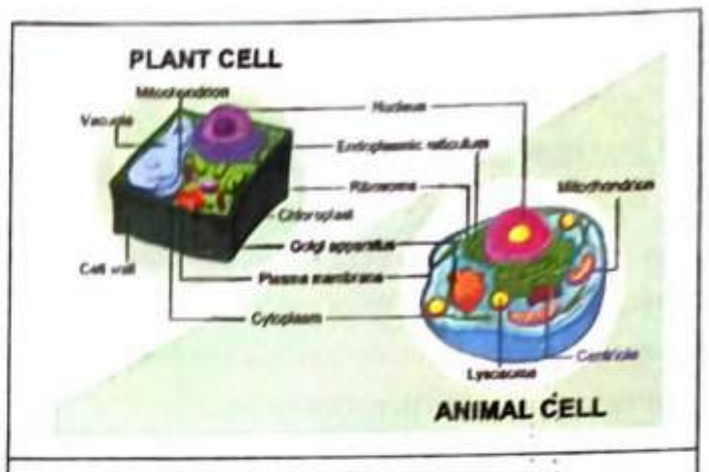


Fig 3: Plant Cell Vs Animal Cell

DNA REPLICATION IN ANIMALS

DNA replication is a process by which cell makes an exact copy of its DNA before cell division. This ensures that each new cell gets the same genetic information.

Enzymes Essential for DNA Replication in Animal Cell

- ***Helicase:*** This is an unwinding enzyme. It "unwinds" or "unzips" the double-stranded DNA.
- ***Topoisomerase:*** This enzyme prevents DNA from getting tangled (avoid supercoiling).
- ***DNA Primase:*** This enzyme initiates DNA replication (new strands are produced).
- ***DNA Polymerase:*** This enzyme doubles the amount of DNA in a cell during cell division (builder).
- ***DNA Ligase:*** This enzyme facilitates the joining of DNA strand together (gluer).

Reverse Transcriptase: the process of creating complementary strands of DNA based on RNA.

Semi Conservative DNA Replication

- It is the process of duplicating DNA to create *two new double stranded DNA molecules*, each with one *original strand*, and one *new strand*.

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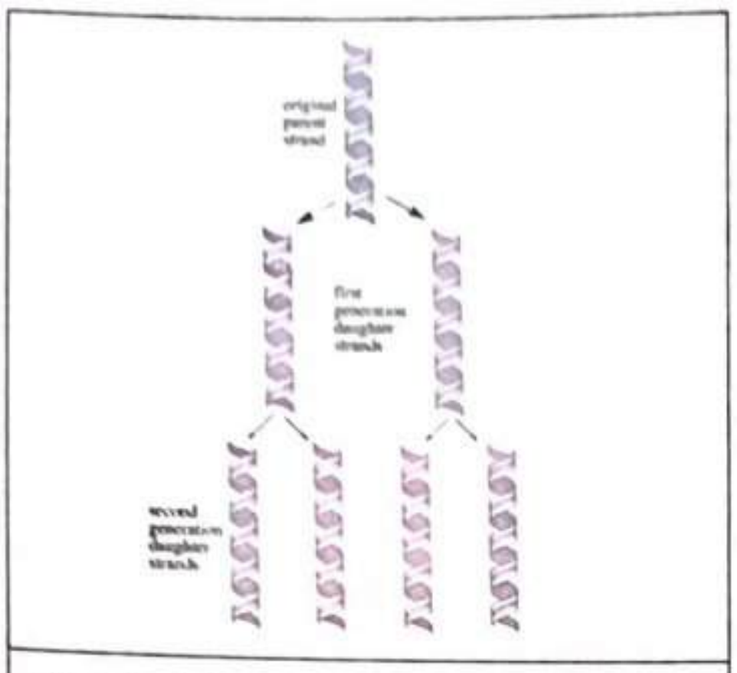


Fig 4: Semi-Conservative DNA Replication Model

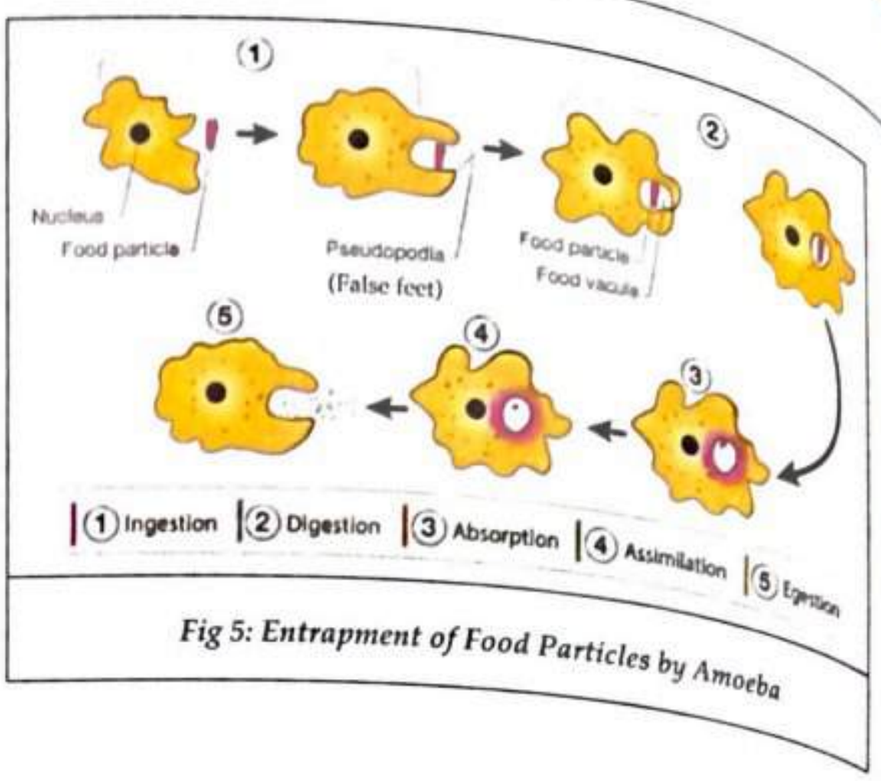


Fig 5: Entrapment of Food Particles by Amoeba

Endocytosis and Exocytosis

Endocytosis

- Endocytosis is a type of active transport where a *cell engulfs external materials*, forming a vesicle to bring them inside.
- It includes processes like *phagocytosis* (cell eating) and *pinocytosis* (cell drinking). ***E.g. Entrapment of food particles by Amoeba.***

Exocytosis

- Exocytosis is a cellular process where a cell transports *molecules out of the cell* by using vesicles that fuse with the cell membrane, releasing their contents into the extracellular space.
- It is also known as *cell vomiting*. Vomited particles are undigested residues from endocytosis → *enzymes and hormones*.

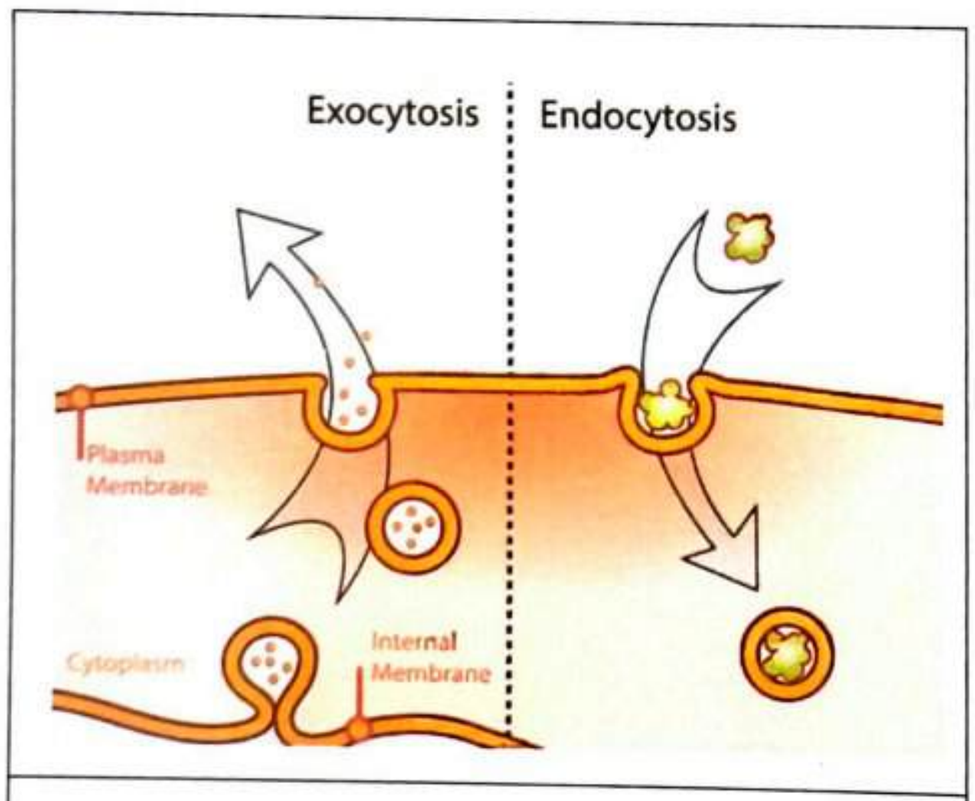
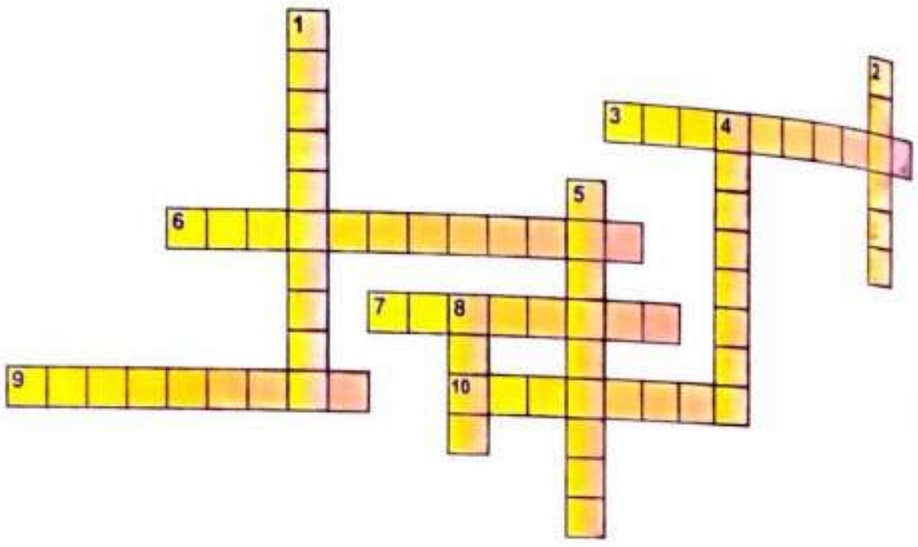


Fig 5: Endocytosis and Exocytosis

PARMAR'S CROSSWORD

CELL



Across

3. Chemical process controlling life in a cell.
6. Organelle responsible for ATP production.
7. Genetic region in prokaryotes.
9. Fluid content inside plasma membrane.
10. Suicidal bag of the cell.

Down

1. Membrane protein that transports water.
2. Group of cells with similar structure and function.
4. Fourth stage of mitosis in cell division.
5. Organelle found in both prokaryotic and eukaryotic cells.
8. Fundamental unit of living organisms.

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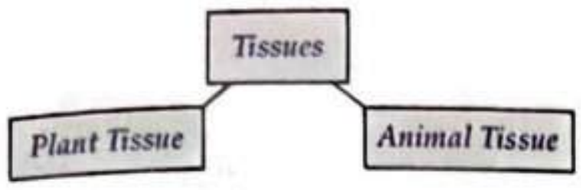
Tissue

• Tissue is a group of cells that work together to perform a specific function in the body.



Importance of Tissues

• It causes division of labour in multicellular organisms.

• It decreases workload on individual cells.

• The organization of tissues into organs and systems leads to improved body organization.

Basic unit of life → Cell
Group of cells → Tissue
Group of tissues → Organs
Group of organs → Organ System
Group of organ system → Organism

PLANT TISSUE

• Plant tissues are of broadly classified into two types: *Meristematic Tissue* and *Permanent Tissue*.

Meristematic Tissue

• These tissues are made up of cells that can divide continuously, helping in plant growth.

Characteristics:

• *Occurrence:* Growing regions of plant (root, shoot, etc.).

• *Shape:* Spherical, oval, or rectangular.

• Cells are small and thin, with dense cytoplasm and large nuclei.

• *Intercellular spaces* and *vacuoles* are absent.

• They are active cells.

• Cell wall is made up of *cellulose*.

Protoderm is a part of apical meristem found in root and shoot and gives rise to epidermis.

Permanent Tissue

• These are *non-dividing cells* that have attained maturity and perform specific functions.

• Through the process of differentiation, meristematic tissues convert into permanent tissues.

Characteristics:

• *Occurrence:* Roots, stem, leaves, etc.

• *Shape:* Round or oval or elongated, polygonal, or even irregular.

• Cell wall is thin or thick with large central vacuoles.

• *Functions:* Permanent tissues in plants perform a variety of essential functions, including support, storage, conduction, and protection.

Cambium: A thin formative layer between xylem and phloem of most vascular plants that gives rise to new cells and is responsible for secondary growth.

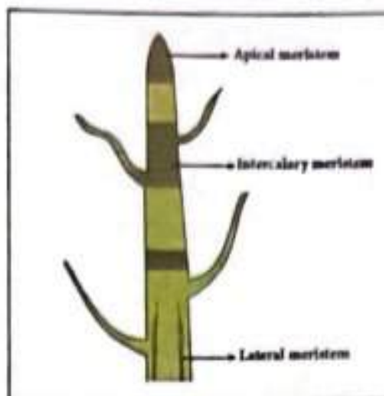


Fig 1: Meristematic Tissue

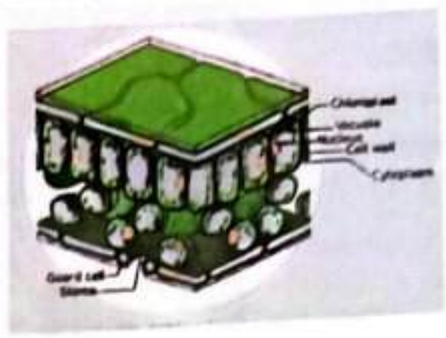


Fig 2: Permanent Tissue

Types of Meristematic Tissue

Type	*Location*	*Function*
Apical Meristem	Present at shoot apex and root apex	Increases length of root and shoot
Lateral Meristem	Beneath the bark	Increases thickness of root and stem
Intercalary Meristem	At the base of leaves or internodes (grasses)	Increase in length of leaves and internodes *(E.g. Leaf blades)*

Types of Permanent Tissue

1. *Simple Permanent Tissue:* These tissues are also known as *homogenous tissues*. They are made up of a single cell type, usually with the same origin, structure, and function.

Types:

(a) Parenchyma Tissue

• *Occurrence:* Throughout the plant body, particularly in soft parts like the cortex and pith of roots and stems, leaf mesophyll, and within vascular bundles.

• They are living cells.

Functions:

• It acts as a *food storage tissue*. In some cases, it contains chlorophyll , thus called *Chlorenchyma*.

• When loosely packed, intercellular spaces are present called *Aerenchyma*. Aerenchyma provides *buoyancy* to parts and helps them to float.

(b) Collenchyma Tissue

• *Occurrence:* In leaf stalks, stem of dicots epidermis and the vascular bundle of dicot leaf.

• Cells are living, elongated, irregularly *thickened at corners*.

• There is very little intracellular space in-between the cells.

Functions:

• They act as *mechanical tissue* and thus provide mechanical strength to plants.

• They provides flexibility (allow bending of parts). ***E.g. Tendrils and stems of climbers.***

(c) Sclerenchyma

• *Occurrence:* In stems, around vascular bundles, in leaf veins, and in the hard coverings ***(E.g. Bark, husk of coconut).***

• These are *dead tissues*, very hard and rigid in texture.

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- They provide toughness to the tissue.

Functions:

- These provide mechanical support and rigidity to the plant.
- *Sclereids* are responsible for hardness of seeds and the shell of walnut.

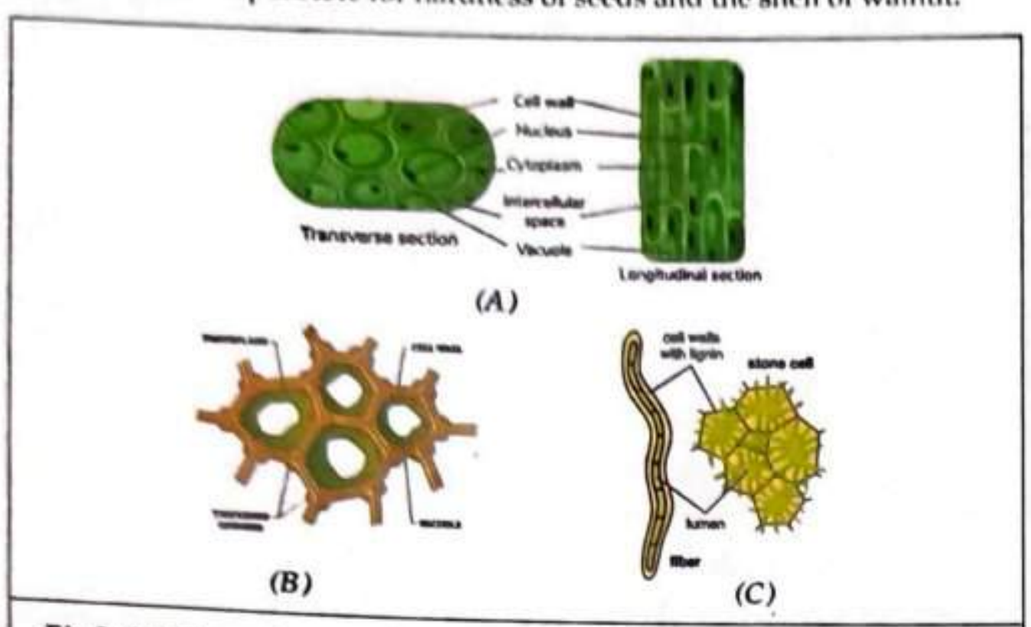

Fig 3: (A) Parenchyma Tissue; (B) Collenchyma Tissue (C) Sclerenchyma Tissue

Protective Tissue *(part of simple tissue)*

- Protective tissues in plants are specialized tissues that form the outermost layers of the plant body, serving to shield it from various external factors like mechanical damage, pathogens, and water loss.
- In plants, protective tissues include the *epidermis* and *cork*.

(a) Epidermis

- The outermost layer of cells covering plant organs.
- *Occurrence:* Occurs in outermost layer of all the plant parts. *E.g. leaves, flowers , stem and roots.*

Functions:

- It protects all parts of plants.
- Plants of dry habitats have thicker epidermis.
- Plants growing in desert have *cuticle* (waxy coverings). Layer of cutin is called cuticle. Cutin is a waxy material and water resistant. It also aids in protection against water loss, injury and invasion of fungi.
- Epidermal cells of the roots forms hair like structure. Long hair like parts *increase absorption* on surface area of roots.
- In leaves, epidermal cells form stomata that are guarded by *Guard cells*. Guard cells are kidney shaped structures that regulate *gaseous exchange* in plants.

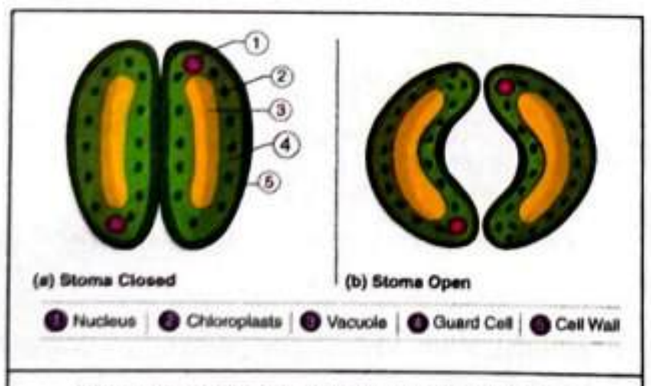

Fig 4: Opening and Closing of Stomata

(b) Cork

- Cork cells form the external protective tissue of plants. These cells are *dead* and *compactly arranged*, with their walls coated in *suberin*.
- *Occurrence:* Outer covering of stem and tree trunks.

Functions:

- It provides protection to mature roots and shoots.
- Suberin acts as a *protective barrier* for the plants. The suberin does not allow the water and gases to go outside of the cork cells.

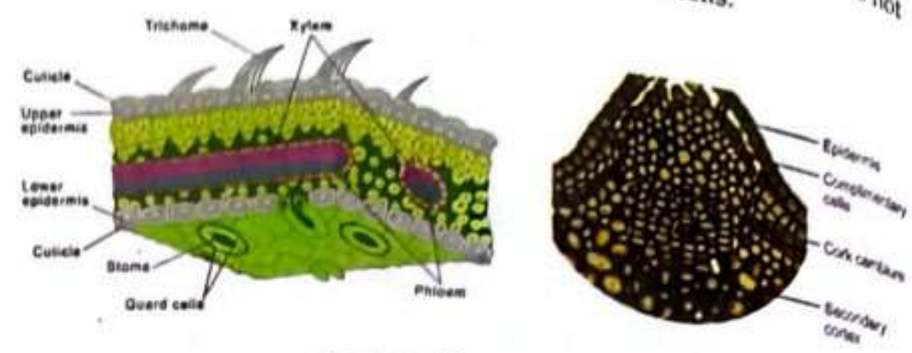

Fig 5: Epidermis and Cork

Transpiration Vs Guttation

Transpiration	*Guttation*
Loss of water vapour	Loss of water droplets
Through stomata, cuticle and lenticels	Through hydathodes (Present on leaf sides)
Leads to loss of turgidity (wilting)	No effects on turgidity
Cools the plant body	No cooling of plant body
Happens at day time	Happens at night time

2. **Complex Permanent Tissue:** These tissues are made up of *various cell types* that work together as a unit to perform a specific function.

Types:

(a) Xylem *(Conducts water → One-way conduction)*

- It transports water and nutrients from the roots to the leaves of the plant through transpiration pull.
- It provides support to the plants.
- ***It is composed of:*** Tracheids, vessels, xylem fiber, and xylem parenchyma. *Only xylem parenchyma is a living tissue.*

(b) Phloem *(Conducts food → Two-way conduction)*

- It translocates the prepared *food* from the leaves to different parts of the plant.
- ***It is composed of:*** Sieve tubes, companion cells, phloem parenchyma, and phloem fibre (provides rigidity and support). *Only phloem fibre is a dead tissue.*

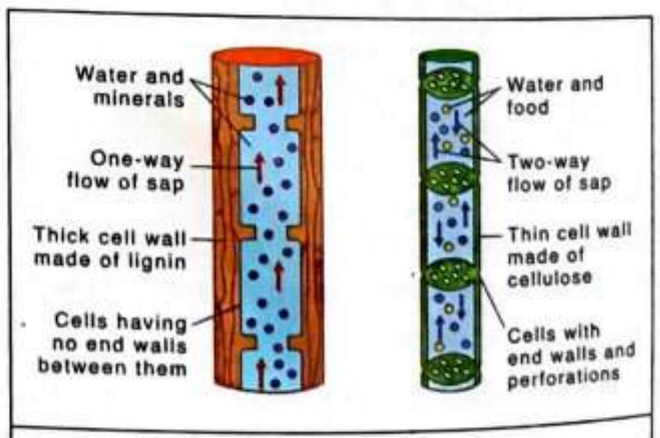

Fig 6: Xylem and Phloem

For an interactive recap of this topic, see the crossword on Page Number 292.

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ANIMAL TISSUE

- Animal tissues are groups of similar cells with specific functions working together to form body structures.
- Animal tissues can be broadly classified into four main types: *Epithelial, Muscular, Connective, and Nervous tissue.*

Epithelial Tissue

- *Occurrence:* Widespread throughout the body.

Characteristics:

- It acts as covering or protective tissue in animal body.
- Cells form continuous sheet and are tightly packed with no intercellular spaces.
- All epithelial tissues are separated by others through basement membrane.
- *Function:* It protects the body from injury or damage.
- There are two types of epithelial tissues: *Simple epithelial and Compound epithelial tissue.*

1. *Simple Epithelial Tissue*

- *Occurrence:* Lining for body cavities, ducts, and tubes.
- *Structure:* It is composed of a *single layer* of cells.
- Simple epithelial tissue is further divided into three types: *Squamous, Cuboidal, and Columnar.*

(a) *Squamous Epithelial Tissue*

- *Occurrence:* Lines blood vessels, air sacs of the lungs (alveoli), and body cavities like the peritoneum.
- *Structure:* Cells are extremely *thin* and *flat* with irregular shape.

Types of Squamous Epithelial Tissue:

1. *Simple Squamous Epithelial Tissue*

- *Occurrence:* Mouth and oesophagus (food pipe).

Characteristics:

- They are single layer of cells, *flattened with irregular* boundaries.
- They form *delicate lining.*

2. *Stratified Squamous Epithelial Tissue*

- *Occurrence:* Skin.

Characteristics:

- Cells are arranged in layers.
- Prevents *wear* and *tear.*

> *Specialised tissue for healing → Granulation Tissue.*

(b) *Cuboidal Epithelial Tissue*

- *Occurrence:* Salivary glands, sweat glands, thyroid glands, lining of kidney tubules.
- *Structure:* Cells have *cube-like structure* (height and width of the cells are equal).

(c) *Columnar Epithelial Tissue*

- *Occurrence:* Lining of intestine, stomach and gallbladder.
- *Structure:* The cells are *pillar like, tall,* and *wide* in appearance. Their nuclei is located at the *base.*

Ciliated Epithelial Tissue

- *Occurrence:* Respiratory tract, urinary tubules or kidney.
- *Structure:* Cells are *cuboidal/columnar in shape* with *hair-like projections* on their free surface called *"cilia"*, which facilitates movement (particularly movement of fluids).
- *Function:* Movement of mucus, urine, etc. through rhythmic beating of cilia.

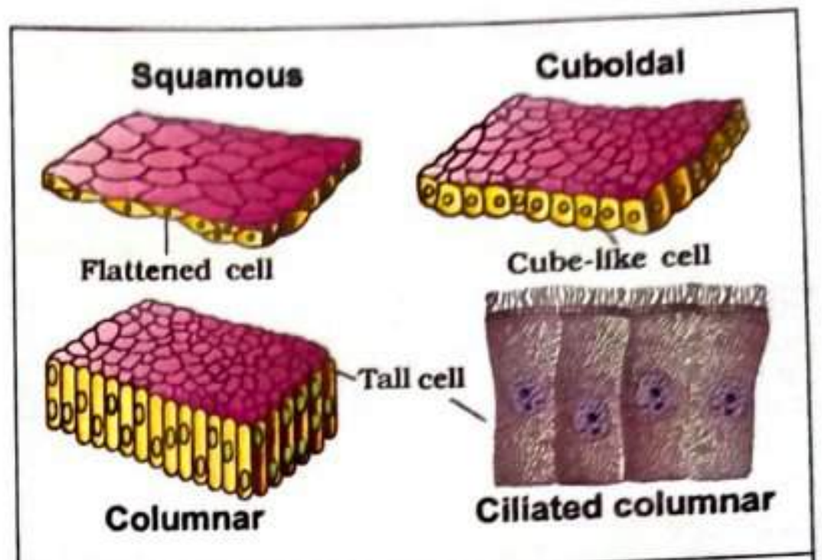

Fig 7: Types of Epithelial Tissues

Muscular Tissue

Structure:

- It is composed of muscle cells or muscle fibres.
- Muscle fibres are *elongated* and large in size. Contractile proteins are present in the *fibres* (important for movement of body).
- *Function:* Contraction and relaxation, responsible for body movement.
- Muscular tissue is further divided into three types: *Skeletal muscle, Smooth muscle, and Cardiac muscle.*

1. *Skeletal Music*

- *Occurrence:* Skeletal part of the body (containing bones).

Characteristics:

- Muscle fibres are elongated, unbranched and cylindrical in shape.
- They are fast in nature.
- They are voluntary muscles.
- Each cell is *multinucleated* (many nuclei) with *striations* (alternate, dark and light bands).
- These cells are *easily fatigue.*
- *Function:* They help in body movement and maintaining posture.

2. *Smooth Muscle*

- *Occurrence:* In organs like intestine, uterus, blood vessels, stomach, bronchi, iris.

Characteristics:

- The nucleus is located at the centre of each cell.
- Cells are *non-striated, spindle shaped/fusiform* which are held together by cell junction.
- Cells are *unbrached,* slow in growth and *do not fatigue easily.*
- They are involuntary muscles (not under our control).
- *Function: Muscle peristalsis* (a wave-like movement that propels food and other substances through the digestive tract).

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3. ***Cardiac Muscle***

• *Occurrence:* Heart.

Characteristics:

• Cardiac muscle fibres are *long, cylindrical* in shape.

• Each fibre is *uninucleated* and *branched*.

• Striations are present.

• Cardiac muscles *do not fatigue*.

• They are involuntary muscles (not under our control).

Functions:

• They perform *contraction* and *relaxation* in wall of heart.

• They help to pump and distribute blood to the body.

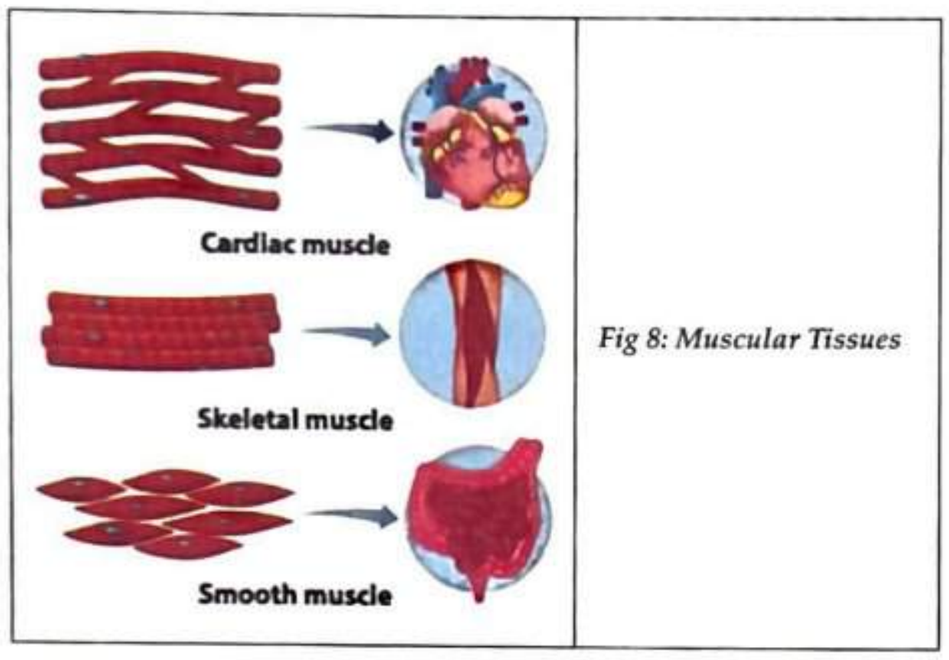


Fig 8: Muscular Tissues

Connective Tissue

• *Occurrence:* Tendons, cartilage, adipose tissue, ligaments, dermis, etc.

Characteristics:

• It connects various body parts.

• The cells are embedded in an *intracellular matrix*, this matrix may be jelly (cartilage), fluid (blood), dense or rigid (bone).

• It acts like a binding, supporting and packing material.

• It prevents organ from getting displaced by body movements.

• Connective tissue is further divided into two types: *Areolar connective tissue and Adipose connective tissue.*

1. ***Areolar Connective Tissue***

Characteristics:

• It is a type of loose connective tissue that provides support, protection, and cushioning for various structures in the body.

• It's characterized by a loosely arranged network of fibers and cells within a *semi-fluid matrix*, making it flexible and adaptable.

• It is broadly divided into: *Loose connective tissue and Dense connective tissue.*

(a) ***Loose Connective Tissue***

• *Occurrence:* Between skin and muscles, in space inside organs, in bone marrow.

• *Structure:* It is characterized by a loose, gel-like matrix consisting of cells, fibers, and a ground substance.

(b) ***Dense Connective Tissue***

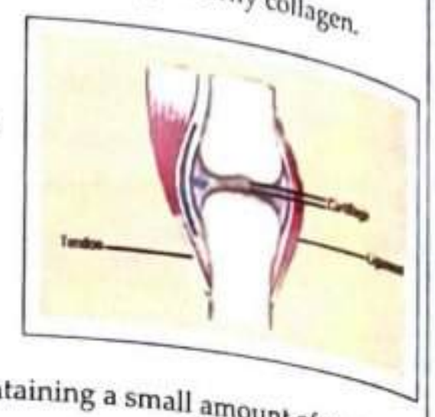
• *Characteristics:* It has a high proportion of fibers, primarily collagen.

Types:

1. ***Tendons***

• It is a fibrous tissue with great strength and limited flexibility.

• It connects *Muscle to Bones.*



2. ***Ligaments***

• It has considerable strength despite containing a small amount of matrix.

• It connects *Bones to Bones.*

2. ***Adipose Connective Tissue***

• *Occurrence:* Below the skin (individuals with more body fat have more adipose tissue), in between internal organs.

• *Structure:* Cells are round, oval shaped. There is an aggregation of *fat cells* (adipocytes).

Functions:

• It prevents body from mechanical shock.

• It acts as an *insulator.*

E.g. Camel hump.

Skeletal Connective Tissue

• Skeletal connective tissues are connective tissues with unique structures and functions beyond basic support and connection.

• They are broadly classified as: *Cartilage and Bones.*

1. ***Cartilage***

• *Occurrence:* Ear pinna, nose tip, trachea, larynx, bone surfaces at joints.

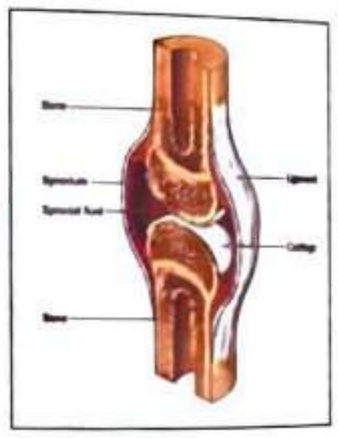
Characteristics:

• They are widely spaced out cells.

• *Matrix is gel-like* and slightly elastic.

• Cartilage is flexible in nature.

• *Function:* It supports and provides *flexibility* of body.



2. ***Bones***

Characteristics:

• Bones are hard and rigid, strong, and non-flexible in nature.

• Matrix of the bone is hard and composed of *calcium* and *phosphorous* compounds.

Functions:

• It forms a network of framework that supports the body.

• It provides shape to body and protects the vital organs like brain, lungs, etc.

(c) ***Fluid Connective Tissue***

• It connects different part of the body and maintains continuity.

• They are broadly classified as: *Blood and Lymph.*

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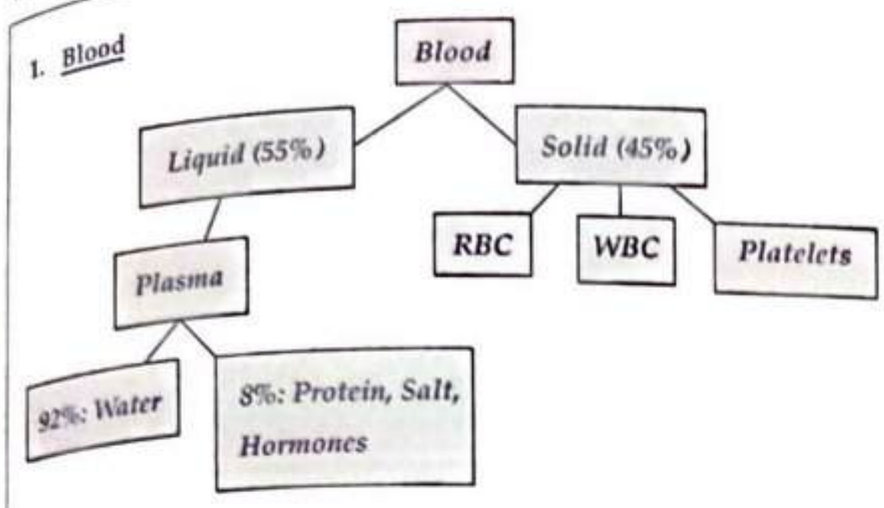
1. Blood



Liquid Part of Blood

Plasma

- It is the *yellow* in color.
- It consists of *92% water* and *8% proteins*, salt and hormones.

Proteins	Function
Fibrinogen/Heparin	Anticoagulants
Globulin	Provides defence
Albumin	To maintain osmotic balance

When clotting proteins are removed from blood, the clear liquid that remains after is called Serum.

Solid Part of Blood

RBC (Red Blood Cells)/Erythrocytes

- *Normal range: 4.5 to 5.5 million per cubic milimeter.*
- *Color: Red* in color due to presence of *heme (Fe)*. Heme has high affinity towards oxygen.
- *Shape:* Biconcave; disc-shaped.
- *Lifespan and Formation:* Bone marrow (at birth) having a lifespan of *about 120 days.*
- *Function:* It transports oxygen to whole body.
- Mature RBC's have no nucleus in them.
- Graveyard of RBC: *Spleen.*

Study of Blood: Hematology

WBC (White Blood Cells)/Leukocytes

- *Normal range: 5000-8000 per cubic milimeter.*
- WBC's protects our body from infection (provides our body a defence mechanism).
- *Formed in:* Bone marrow having life span of *13-20 days.*
- *Shape:* Round/Irregular in shape.
- *Types: Monocytes, Lymphocytes, Neutrophils, Basophils, Eosinophils.*

Platelets/Thrombocytes

- *Normal range: 1,50,000-3,50,000 per cubic milimeter* of blood.
- *Shape:* Irregular shape.
- *Formed in:* Bone marrow having life span of a *7-10 days.*
- *Function:* They are essential for preventing and *stopping bleeding* by forming *coagulation.*
- Low platelet count leads to *thrombocytopenia* (happens in case of dengue) and a very high platelet count leads to called *thrombocytosis.*

2. Lymph

Structure:

- It is a *colorless* fluid.
- RBC and blood proteins are *absent* in lymph.
- Lymph is similar to blood plasma → contains proteins, salt, glucose, and water.
- It is slightly *yellow* in color.

Function:

- Lymph plays a crucial role in maintaining bodily fluid balance and supporting the immune system.

Nervous Tissue

- Neural tissue (or nervous tissue) is a specialized tissue found in the nervous system.
- It is responsible for receiving stimuli, transmitting signals, and coordinating responses throughout the body.

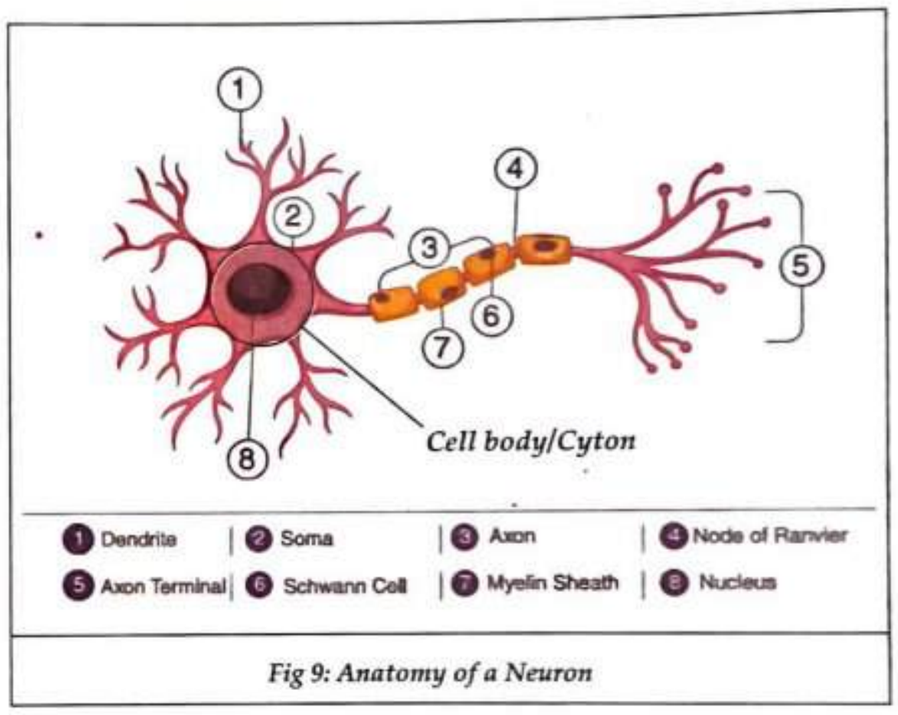


Fig 9: Anatomy of a Neuron

- *Occurrence:* Found in Brain, Spinal cord, Nerves.

Anatomy of a Neuron

- A neuron is the basic structural and fundamental unit of the nervous system. It is specialized to transmit nerve impulses.
- Neuron is the longest cell in the human body.

Parts of Neurons:

1. *Cell Body (Soma)*

- It contains the *nucleus* and *cytoplasm* and controls the activities of the neuron.

2. *Dendrites*

- Short, branched extensions from the cell body that receives signals from other neurons or sensory cells.
- It carries *impulses toward the cell body.*

3. *Axon*

- It carries nerve impulses *away from the cell body* to other neurons or

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effectors (muscles/glands)

4. *Myelin Sheath*
- A fatty layer that covers the axon that insulates the axon and *speeds up signal transmission.*

5. *Schwann Cells*
- They are glial cells that form the *Myelin Sheath* on Axons is outside the brain.

6. *Axon Terminals (Synaptic knobs)*
- The end branches of the axon that contain *neurotransmitters.*
- It helps transmit signals to the next neuron or effector cell across a synapse.

For an interactive recap of this topic, see the crossword on Page Number 302.

PARMAR'S CROSSWORD

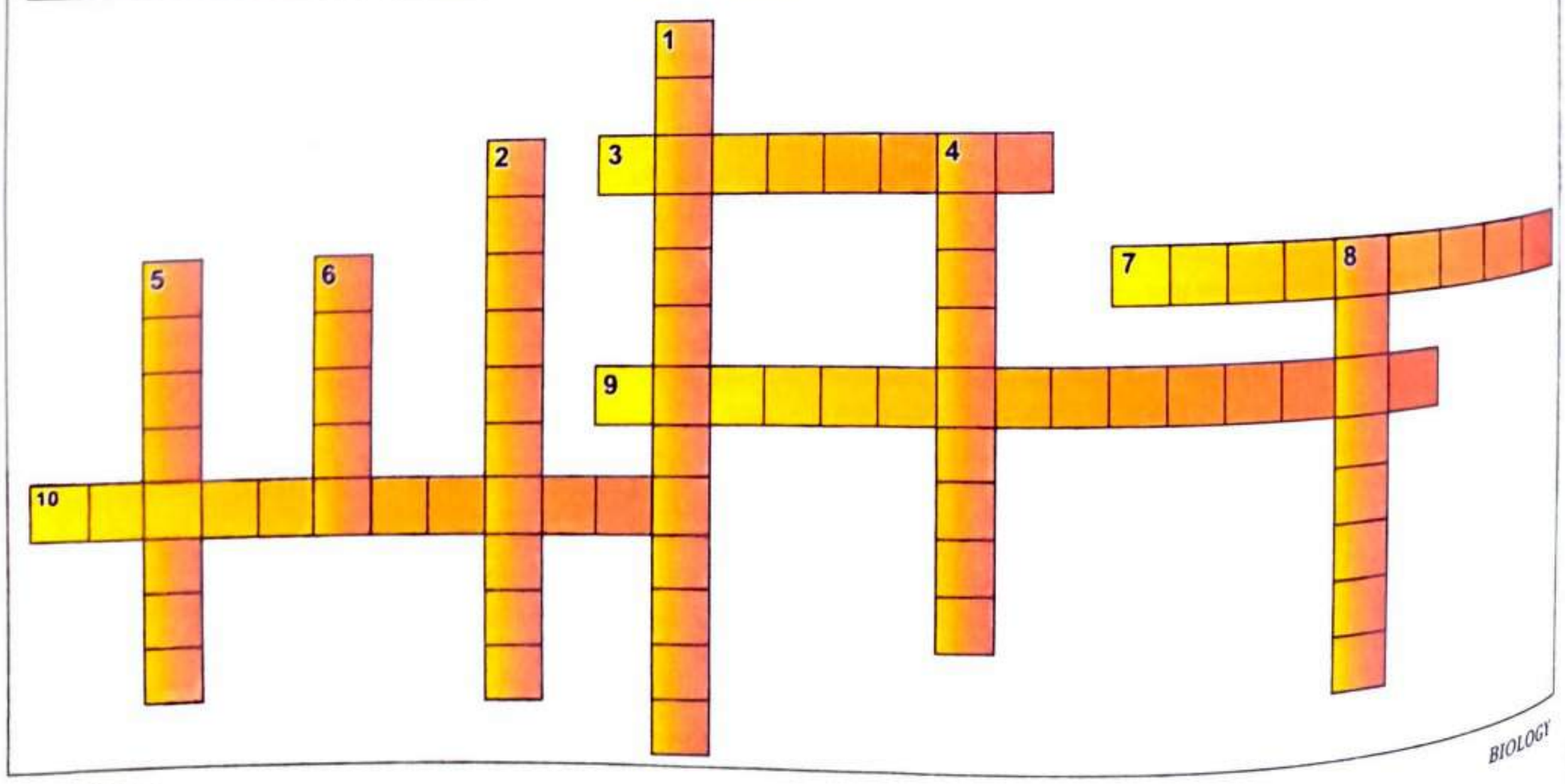
PLANT TISSUE

Across

3. Organelle absent in meristematic tissue.
7. Tissue where photosynthesis occurs.
9. Process converting meristem into permanent tissue.
10. Husk of coconut is made of.

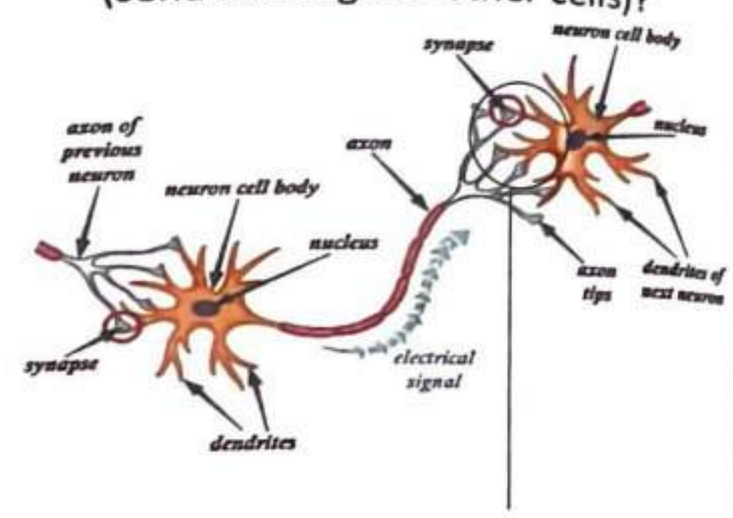
Down

1. Main driver in water transport pull model.
2. Plant tissue with large air spaces.
4. Layer where guard cells are present.
5. Non-haploid structure in ovule.
6. Non-nucleated xylem element at maturity.
8. Part of apical meristem in roots.



Transmission of Neuron Impulses
- A stimulus is received by the dendrites.
- An electrical impulse travels through the cell body and axon.
- At the axon terminals, the impulse triggers the release of neurotransmitters.
- Neurotransmitters cross the synapse and pass the signal to the next neuron or effector (like a muscle or gland).
- This leads to a response.

How do neurons transmit impulses (send message to other cells)?



One neuron's axon transmit information to other neuron's dendrite. The gap between these two is called synapse.

Camillo Golgi: First created the illustration of neuron using his silver-staining technique (Black Reaction).

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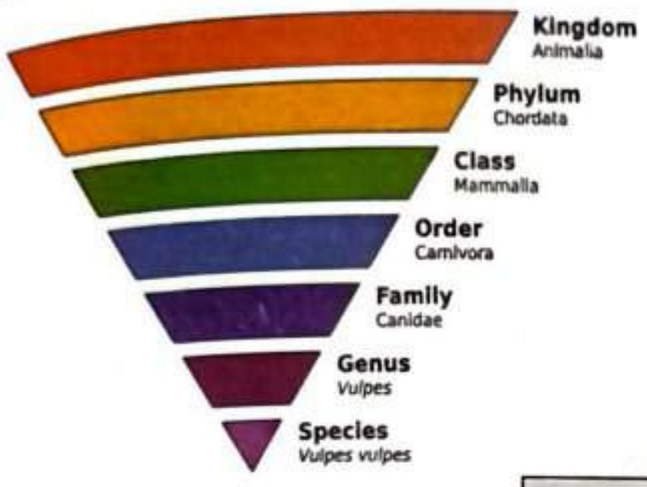
CLASSIFICATION OF KINGDOM

Taxonomy

- It is the science of describing, naming, and classifying organisms, including all plants, animals, and microorganisms.

Order of Classification



TRICK TO REMEMBER

- Kingdom → *KABADDI*
- Phylum → *PLAY*
- Class → *CLASS*
- Order → *OUR*
- Family → *OF*
- Genus → *GIRLS*
- Species → *SOME*

> *Some Girls Of Our Class Play Kabaddi.*

Classification

Two Kingdom Classification

- *Proposed by: Carolus Linnaeus (1758) → "Father of Taxonomy".*

Kingdoms:

→ *Plantae:* Included all plants, algae, fungi.

→ *Animalia:* Included all animals.

> *Linnaeus published "System Nature" in 1735.*

Three Kingdom Classification

- *Proposed by: Ernst Haeckel (1866)* → Coined the term *"Ecology"*.

Kingdoms:

→ *Plantae*

→ *Animalia*

→ *Protista:* New kingdom added for unicellular organisms *(Amoeba, Paramecium, Euglena).*

Three Domain Classification

- *Proposed by: Carl Woese (1990).*

Domains:

→ *Bacteria:* True prokaryotes *(E.g. E. coli).*

→ *Archaea:* Microorganisms with prokaryotic cells that are distinct from bacteria and are often found in extreme environments *(E.g. Halobacterium).*

→ *Eukarya:* All eukaryotic organisms *(Protists, Fungi, Plants, Animals).*

Five Kingdom Classification

- *Proposed by: R.H. Whittaker (1969).*

Kingdoms:

→ *Monera:* Prokaryotes *(bacteria, blue-green algae).*

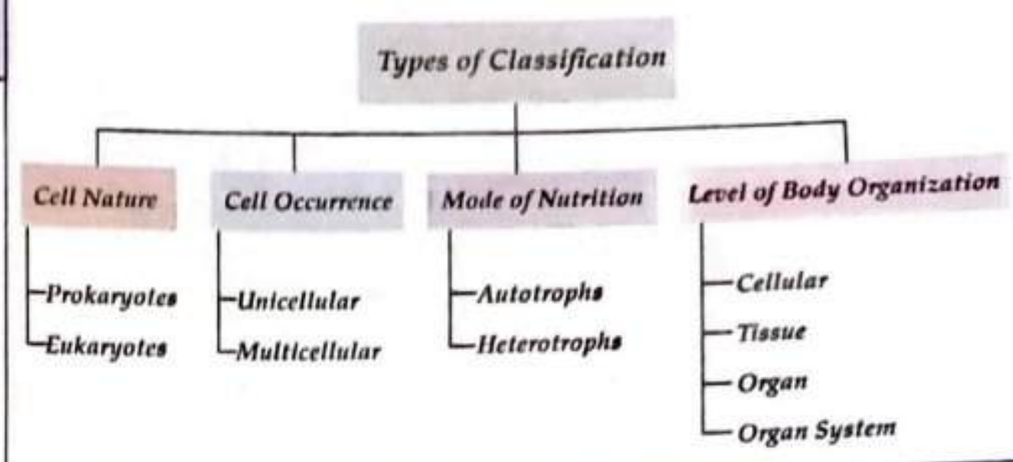
→ *Protista:* Eukaryotic unicellular organisms.

→ *Fungi:* Eukaryotic multicellular (some are unicellular) organisms, heterotrophic, spore-producing organisms.

→ *Plantae:* Autotrophic, multicellular.

→ *Animalia:* Heterotrophic, multicellular.

- **Basis of classification:** *Cell structure, mode of nutrition, body organization, reproduction.*



KINGDOM MONERA

- *Cell type:* Prokaryotic (no true nucleus or membrane-bound organelles).
- *Organization:* Unicellular, microscopic.
- *Cell Wall:* Made up of peptidoglycan (in bacteria).
- *Nutrition:* Autotrophic (photosynthetic or chemosynthetic) or heterotrophic (saprophytic or parasitic).

Classification of Kingdom Monera

Monera is mainly divided into two major groups:

1. *Eubacteria (True bacteria)*

- Most common and well-known group of bacteria.
- *Cell wall:* Contains *peptidoglycan.*
- *Nutrition:* Mostly heterotrophic (saprophytes, parasites), with some autotrophs (including photoautotrophs like cyanobacteria).

2. *Archaebacteria (Ancient bacteria)*

- They live in *extreme environments* (hot springs, salt lakes, swamps).
- *Cell wall:* Cell wall present but lacks peptidoglycan.

KINGDOM PROTISTA

- *Cell type: Eukaryotic* (has a true nucleus and organelles), cell wall is *absent.*
- *Organization:* Mostly unicellular, some are colonial or simple multicellular.
- *Locomotion:* Through appendages.

Nutrition:

→ *Autotrophic (photosynthesis):* Algae.

→ *Heterotrophic:* Protozoans (ingest food).

> *Habit:* Growth form of a plant comprising its shape, size and orientation.
> *Habitat:* Natural home or environment of a plant or animal.

Classification of Kingdom Protista

1. *Phylum Protozoa*

- *Cell type:* Unicellular.
- *Mode of Nutrition:* Heterotrophic (ingest food), parasitic or symbiotic.
- *Habitat:* Mostly aquatic, solitary however few are colonial.

E.g. Euglena (uses flagellum for movement), Amoeba (uses pseudopodia, a false-feet for movement), Paramecium (uses cilia for movement, that also helps to move food to its oral cavity), Plasmodium.

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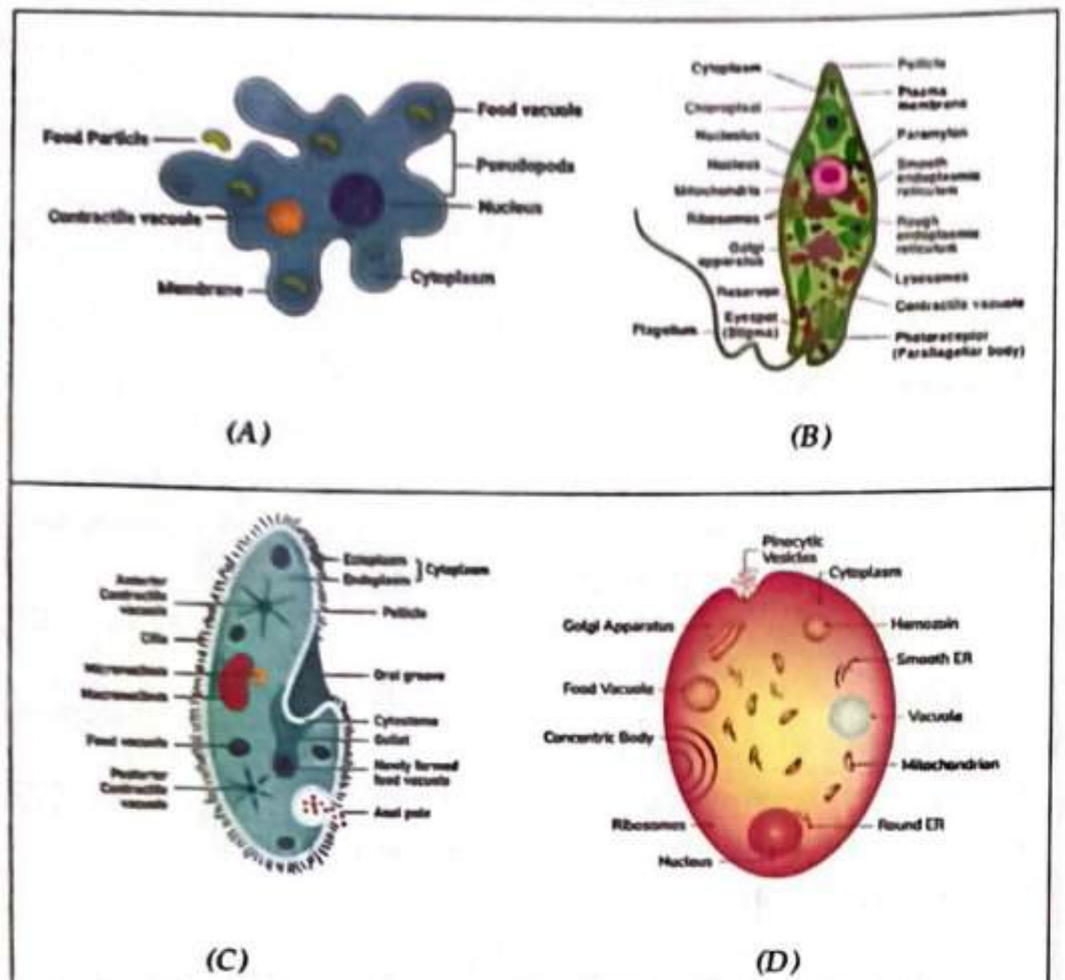


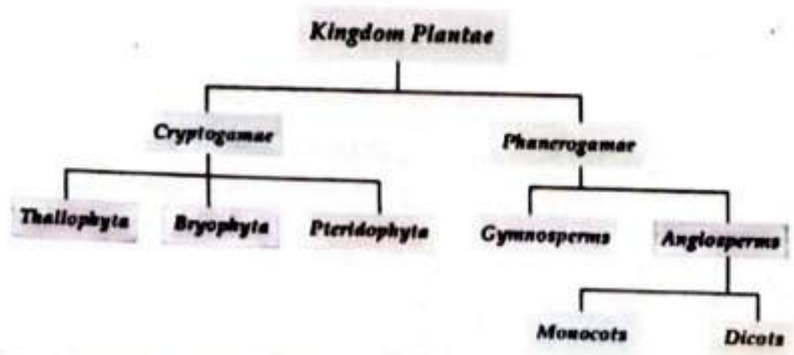
Fig 1: (A) Amoeba; (B) Euglena; (C) Paramecium; (D) Plasmodium

KINGDOM FUNGI

- ***Cell Type:*** *Eukaryotic* (has a true nucleus and membrane-bound organelles).
- ***Organization:*** Mostly multicellular, but some are unicellular ***(E.g. Yeast)***.
- ***Cell Wall:*** Present and is made of *chitin* (not cellulose like in plants).
- ***Nutrition:*** Heterotrophic, typically *saprophytic* (feed on decaying organic matter), but some are *parasitic* (dependent on protoplasm of a host organism for food or *mutualistic* (both benefits from their association and sharing of resources).
- Some of them are in symbiotic relationship (benefit from each other). ***E.g. Lichen (Blue-green algae + Fungi)***. The fungus provides shelter, protection, and access to water and nutrients, while the blue-green algae (or green algae) produce food for the fungus through photosynthesis.

Fig 2: Types of Fungi

KINGDOM PLANTAE



- ***Cell Type:*** Eukaryotic (has a true nucleus and membrane-bound organelles).
- ***Organization:*** Multicellular.
- ***Cell Wall:*** Made up of cellulose (provides structure and support).
- ***Nutrition:*** Autotrophic (producing their own food via photosynthesis using chlorophyll).

Kingdom Plantae is classified on the basis of:

- Differentiation of plant body and distinct components.
- Presence or absence of vascular tissues.
- Ability to bear seeds.
- Seats are enclosed within the fruits.
- Ability to produce flowers.

Cryptogamae Vs Phanerogamae

Cryptogamae	*Phanerogamae*
Seeds, fruits, flowers are absent.	Seeds, fruits, flowers are present.
Reproductive organs are hidden.	Reproductive organs are exposed.
Less evolved plants	Highly evolved plants
E.g. Thallophytes, Bryophytes, and Pteridophytes	***E.g. Gymnosperms and Angiosperms***

Phylums of Kingdom Plantae

Phycology: Study of Algae

1. ***Thallophyta (Algae)***

- ***Cell type:*** Eukaryotic.
- Simple, ***do not have well-differentiated body parts*** such as roots or stem (they have thallus).
- ***Non-vascular*** (no specialized tissue for transporting water and nutrients).
- ***Habitat:*** Mostly aquatic, mostly found in freshwater or marine environments. ***E.g. Spirogyra, Ulothrix, Ulva, Chara.***
- ***Movement:*** Non-motile.
- ***Nutrition:*** Autotrophic, photosynthetic (contain chlorophyll). Different pigments are present (edible or non-edible).

E.g.

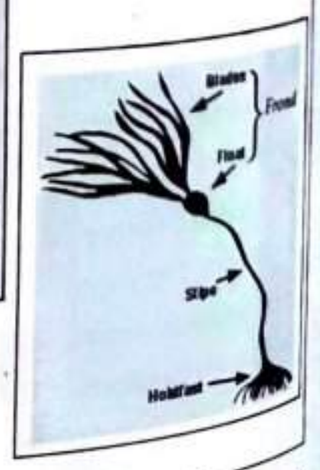
- ***Chlorophyceae (Green algae):*** Chlorella (rich in proteins), Spirulina (superfood).
- ***Phaeophyceae (Brown algae):*** Sargassum, Laminaria (Kelp).
- ***Rhodophyceae (Red algae):*** Gelidium, Porphyra, Gracilaria, Polysiphonia.

TRICK TO REMEMBER
(Chlorophyceae)
- ***S: Spirogyra***
- ***U: Ulothrix***
- ***V: Volvox***
- ***C: Chara***
- ***C: Cladophora***

SUVCC

TRICK TO REMEMBER
(Phaeophyceae)
- ***S: Sargassum***
- ***E: Ectocarpus***
- ***L: Laminaria (also known as Kelp. Mannitol is a sweet alcohol made from Kelp).***
- ***F: Fucus***

SELF



Kelp (mannitol is a sweet alcohol made from Kelp).

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• *Agar a jelly like substance, is obtained from Rhodophyceae (red algae).*

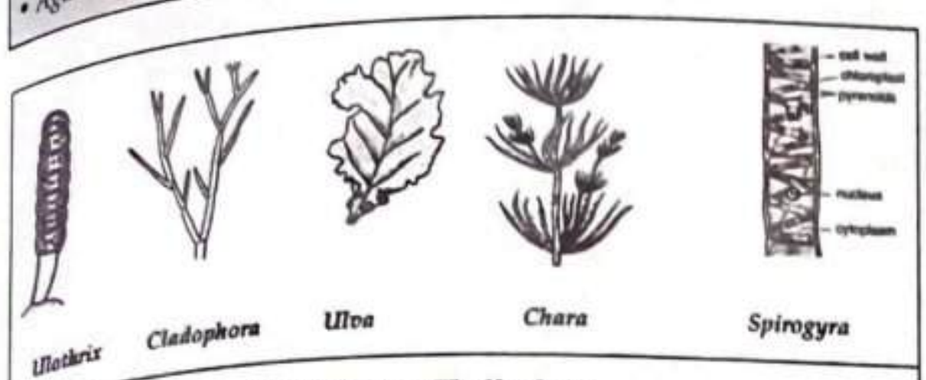


Fig 3: Phylum Thallophyta

2. *Bryophyta (Bryophytes)*

• They are known as *"Amphibians of plant kingdom"* (exists both in land and water).

• *Non-vascular plants* → no specialised tissues for water and food conduction (lack xylem and phloem).

• They have well-differentiated body however lack true roots, stems and leaves. Roots like structure present in bryophytes are called *Rhizoids.*

• ***Nutrition:*** Autotrophic.

• ***Movement:*** Non-motile.

• ***Reproduction:*** Through spores (no seeds) in water.

→ ***Male reproductive part:*** *Antheridium.*

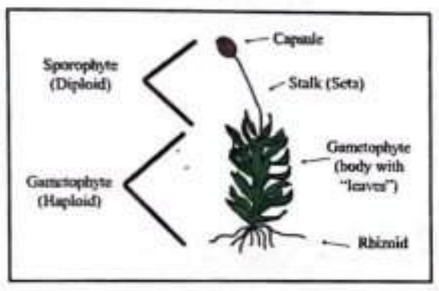
→ ***Female reproductive part:*** *Archegonium.*

• ***Habitat:*** Found in damp and moist areas.

E.g.

• ***Mosses:*** Funaria.

• ***Liverworts:*** Marchantia, Riccia.



Liverwort *Hornwort* *Moss*

Fig 4: Phyllum Bryophyta

3. *Phylum Pteridophyta*

• They are considered as *first terrestrial vascular plants* (have xylem and phloem).

• Well-differentiated roots, stems, and leaves (called fronds in ferns). Leaves are made of leaflets that bear spores called *Sporophylls.*

• They have *hidden* reproductive organs *(cryptogams).*

• ***Habitat:*** Found in cracks of rocks, moist, and shady places.

E.g. Marsilea, Ferns, and Horsetails.

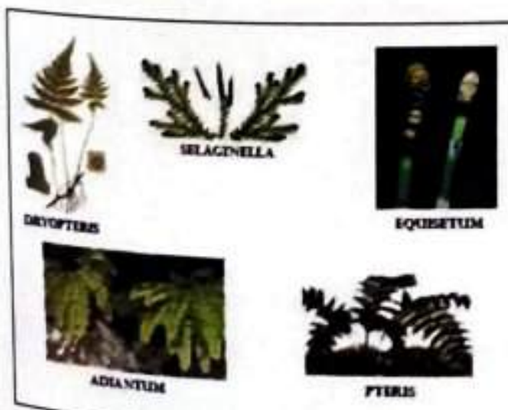


Fig 5: Pteridophytes

Gymnosperms *(Meaning: Gymno (without cover) annd Sperma (seeds without fruits))*

• *Vascular plants,* have true roots, stem and leaves (with xylem and phloem).

• Phloem Companion and Xylem Vessel are *absent.*

• Seed-producing plants, but seeds are *naked* (not enclosed in fruit). The seeds are primitive and simple.

• They are usually perennials, evergreen, and mostly woody plants.

E.g. Pines, Deodar, Cycas.

Pines *Deodar* *Cycas*

Fig 6: Gymnosperms

Angiosperms *(Meaning: Angio (covered) and Sperma (seeds))*

• They are *flowering plants* and produce *seeds enclosed within fruit* (ovary gets modified into fruit).

• *Vascular plants* with xylem and phloem. They are highly evolved.

• Flowers are the *reproductive organs.*

• Seeds have *embryo* inside it and embryos have structure called *cotyledons* (seed leaves).

Diverse group, with two major classes:

→ *Monocots:* They have one *cotyledon.* ***E.g., grasses, lilies.***

→ *Dicots:* They have two *cotyledons.* ***E.g., roses, sunflowers.***

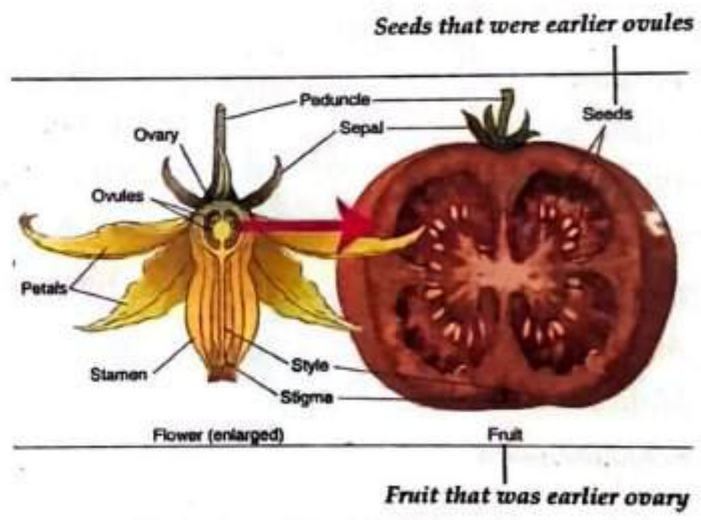


Fig 7: Flower to Fruit

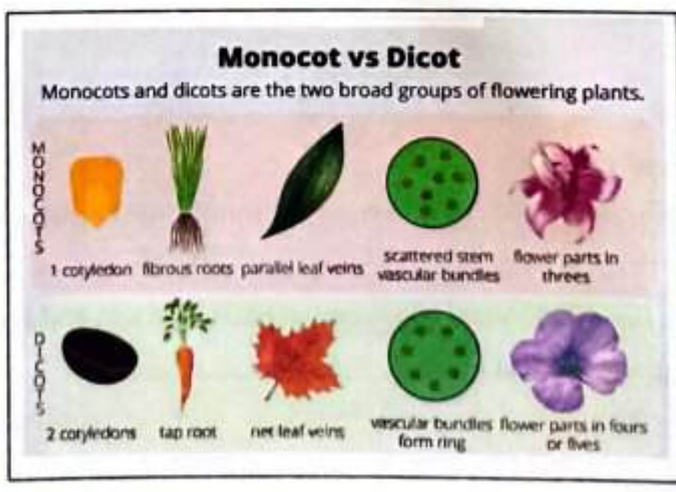


Fig 8: Monocot Vs Dicot

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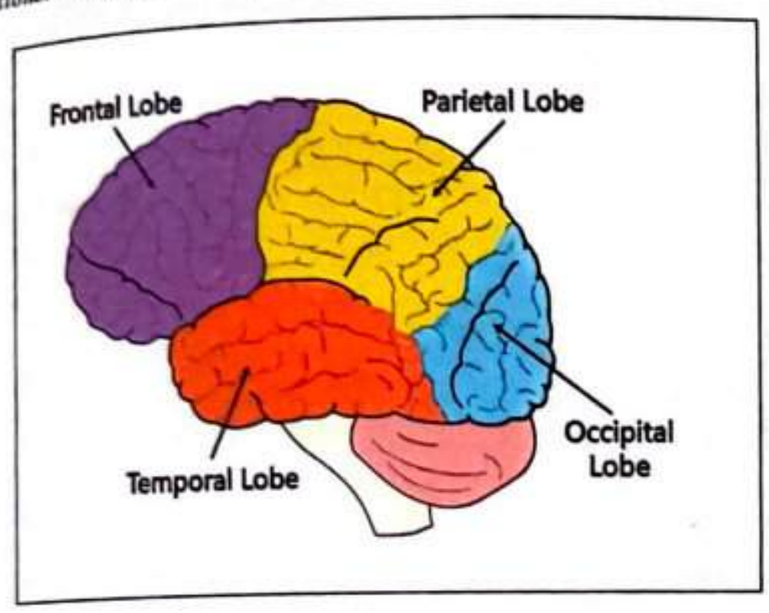
2. *Parietal Lobe*
- Location: Behind the frontal lobe.
- Functions: Processes sensory information (touch, pain, temperature), spatial awareness.

3. *Temporal Lobe*
- *Location:* Sides of the brain.
- *Functions:* Auditory processing, language comprehension, memory, emotions.

4. *Occipital Lobe*
- *Location:* Back of the brain
- *Functions:* Visual processing, understanding spatial relationships.

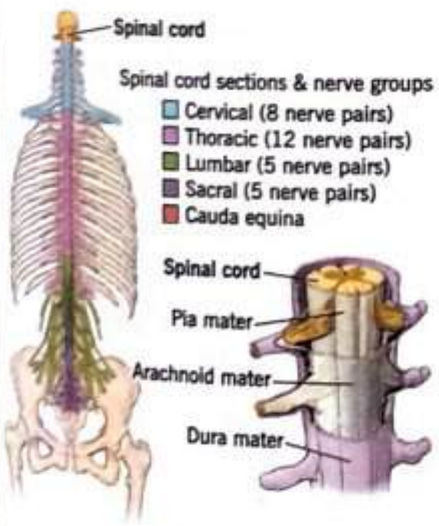


Spinal Cord

- The spinal cord transmits *signals* from the *brain to the body* and *sensory information* from the *body back to the brain*. It also plays a role in coordinating reflexes.

The Spinal Cord is divided into three sections:

1. Cervical: Neck.
2. Thoracic: Upper back.
3. Lumbar: Lower back.



→ There are a total of 31 pair of nerves connected to the spinal cord.

- ***Cervical:* 8 nerve pairs.**
- ***Thoracic:* 12 nerve pairs.**
- ***Lumbar:* 5 pairs of nerves**
- ***Sacral:* 5 pairs of nerves**

Peripheral Nervous System (PNS)

- ***The final nerve is a bundle at the base of spine called "cauda equina" that gives sensation to your lower body.***

Peripheral Nervous System *(PNS)*

- The peripheral nervous system (PNS) is a network of nerves that extends from the CNS (brain and spinal cord) throughout the body, connecting it to *all other parts.*

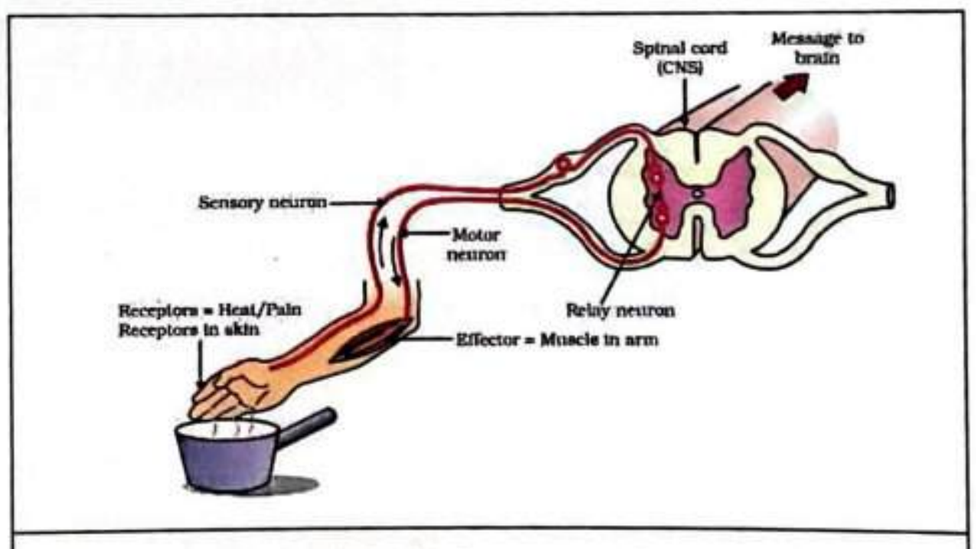
1. **Somatic Nervous System:** The somatic nervous system is a part of the peripheral nervous system that controls *voluntary movements* of skeletal muscles and receives sensory information from the skin, muscles, and joints.

   Types:
   - (a) **Sensory Nervous System:** They carry information from *body organs to CNS*. They are also known as *Afferent Nerves.*
   - (b) **Motor Nervous System:** They carry information from *CNS to body organs*. They are also known as *Efferent Nerves.*

2. **Automatic Nervous System:** The autonomic nervous system is a part of the peripheral nervous system that regulates *involuntary physiologic processes* including heart rate, blood pressure, respiration, digestion, and sexual arousal.

   Types:
   - (a) **Sympathetic Nervous System:** They control the body's *"Flight-or-Fight"* response (help you in times of need, such as danger or stress).
   - (b) **Parasympathetic Nervous System:** They control the body's *"Rest and Digest"* response (It relaxes the body's system and return them to normal).

Pathway to Peripheral Nervous System



- ***Pathway:* Stimulus (Heat) → Receptors → Sensory Neuron → Spinal Cord (Relay Neuron) → Motor Neuron → Muscle (Effector) → Response (Hand moves away)**

Brain Diseases

1. ***Meningitis:*** Meningitis is a serious medical condition where the protective membranes (called *meninges*) covering the brain and spinal cord *become inflamed.*
2. ***Alzheimer's Disease:*** Alzheimer's disease is a *progressive brain disorder* that slowly destroys memory, thinking skills, and the ability to carry out simple tasks. It is the most common cause of *dementia* (loss of memory) in older adults.

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3. ***Amnesia:*** Amnesia is a condition where a person *loses their memory,* either partially or completely. It affects a person's ability to remember past experiences or form new memories.

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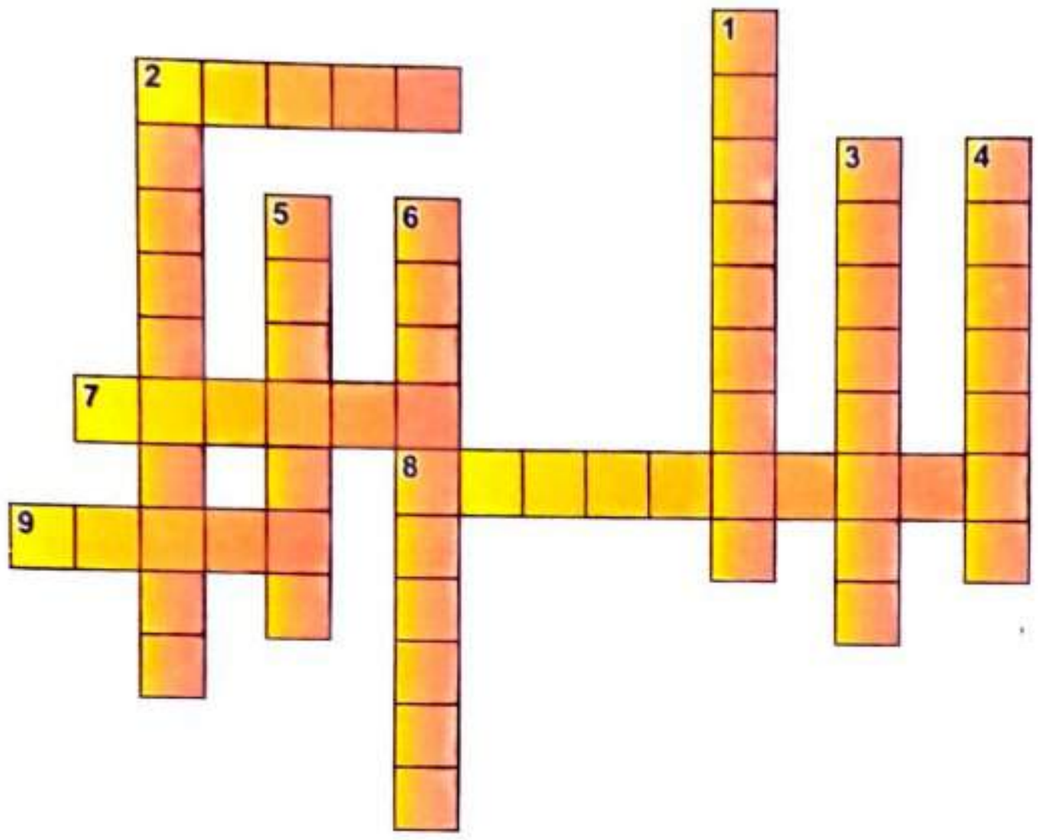
NERVOUS SYSTEM



Across

2. Co-winner of Nobel Prize with Golgi.
7. Long and branched cell type.
8. Brain disorder causing dementia.
9. Scientist who photographed nerve tissue in 1873.

Down

1. Hunger control center is located in.
2. Brain part responsible for balance and movement.
3. Gland producing glucagon.
4. Brain's primary energy source.
5. Gland related to goitre.
6. Vertebrae protect which part.

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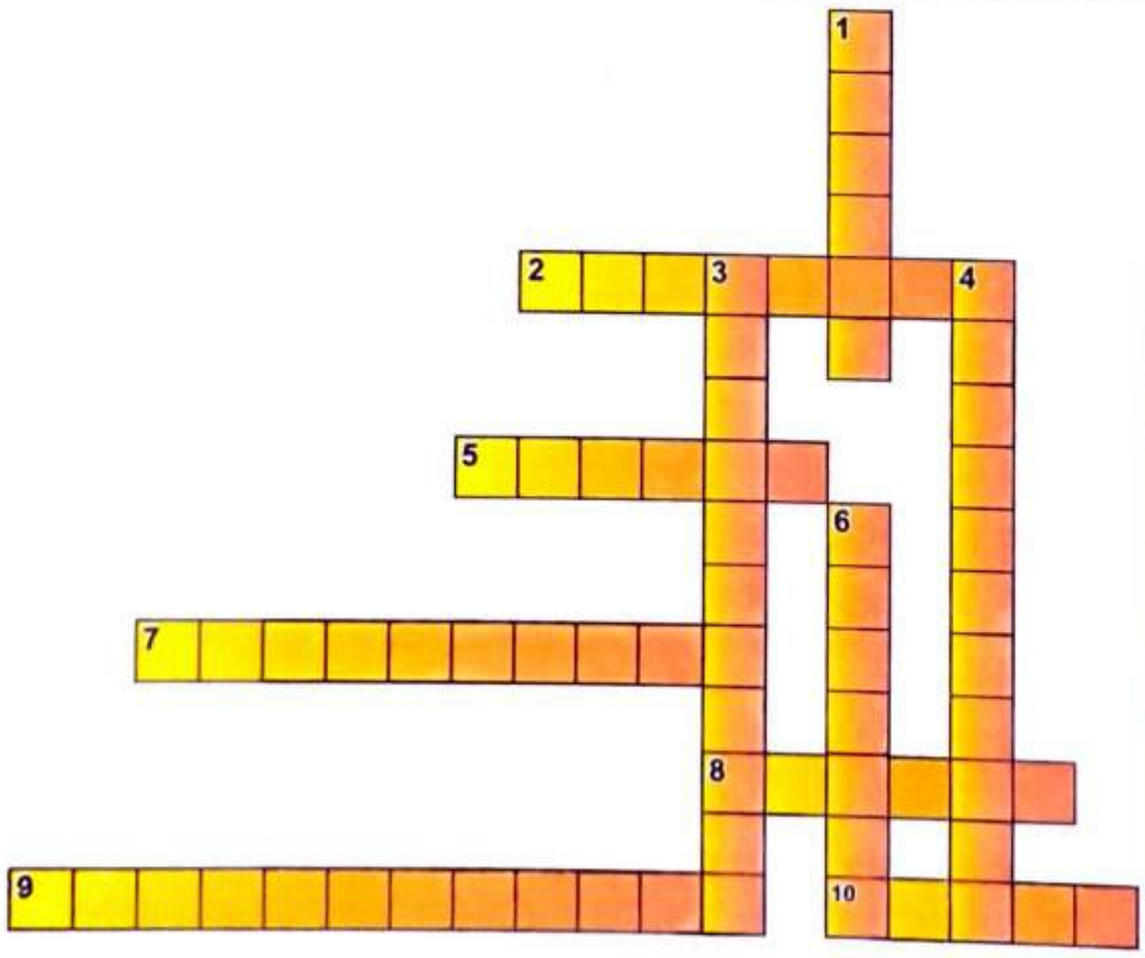
ANIMAL TISSUE



Across

2. Fluid making joint movement easy.
5. Bean-shaped lymphoid organ in body.
7. Protective tissue in animal body.
8. Muscles found in uterus, iris, and bronchi.
9. Other name for blood platelets.
10. Acidic dye used in histological staining.

Down

1. Largest dental tissue.
3. Cells not made by bone marrow.
4. Cells producing antibodies.
6. Tissue where fat is stored.

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GLANDS AND HORMONES

- Glands are organs in the body that produce and release substances, either hormones or other chemicals, to perform specific functions.
- *Types of glands:* *Endocrine Glands* and *Exocrine Glands*.

Endocrine Glands	*Exocrine Glands*
They release hormones	They release enzymes
They release hormones directly into the blood	They secrete their enzymes using a duct
They are ductless glands	They have ducts

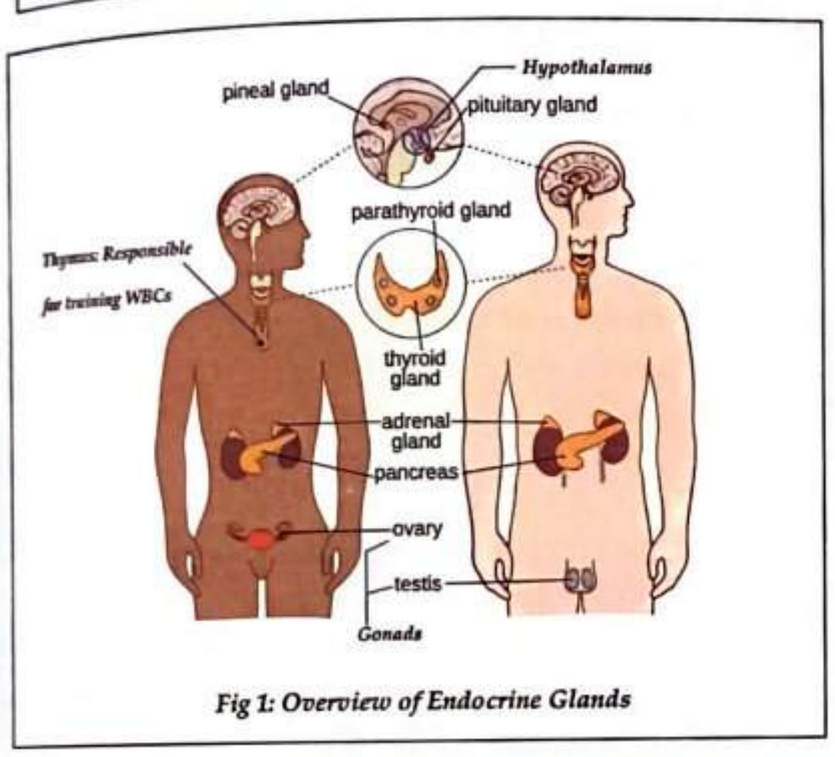

Fig 1: Overview of Endocrine Glands

- *Hormones discovered by: E. H. Starling.*
- *1st hormone discovered: Secretin (1902).*

Major Endocrine Glands

Pituitary Gland

- It is also known as the *"master gland"*, this *pea-sized* gland is located at the base of the brain.
- It produces hormones that regulate other endocrine glands, including growth hormone, prolactin, and oxytocin.
- The pituitary gland is controlled by *hypothalamus*.

Hypothalamus

- The hypothalamus is a brain region crucial for regulating many bodily functions, including *hormone release, body temperature, hunger,* and *sleep-wake cycles.*
- The hypothalamus is responsible for regulating the secretion of hormones, and the pituitary gland releases these hormones into the bloodstream.

Pituary Regions

1. **Anterior Pituitary (Adenohypophysis):** The anterior pituitary produces and secretes a variety of hormones that regulate various physiological processes, including growth, metabolism, reproduction, and stress response.

   Hormones released:

   (a) ***Growth Hormone (Somatotropin):*** *GHRH* (Growth hormone-releasing hormone) releases *growth hormones* in anterior pituitary.

   (b) ***Prolactin*** It is involved in formation of milk.

   - ***Deficiency of GH leads to:*** *Dwarfism* (shortness in height due to genetic or medical condition).
   - ***Excess of GH causes:*** *Gigantism* (excessive growth and abnormal skeletal development), *Acromegaly* (result in excess growth of certain parts of human body).

2. **Posterior Pituitary (Neurohypophysis):** The posterior pituitary stores and releases hormones produced by the hypothalamus, but does not produce hormones itself.

   Hormones released:

   (a) ***ADH (Antidiuretic hormone)/Vasopressin:*** It regulates the *amount of water* (reabsorption of H_2O, helps control blood pressure).

   (b) ***Oxytocin (Love hormone):*** Involved in *secretion of milk* and stimulates the *uterine muscle* to contract during labour.

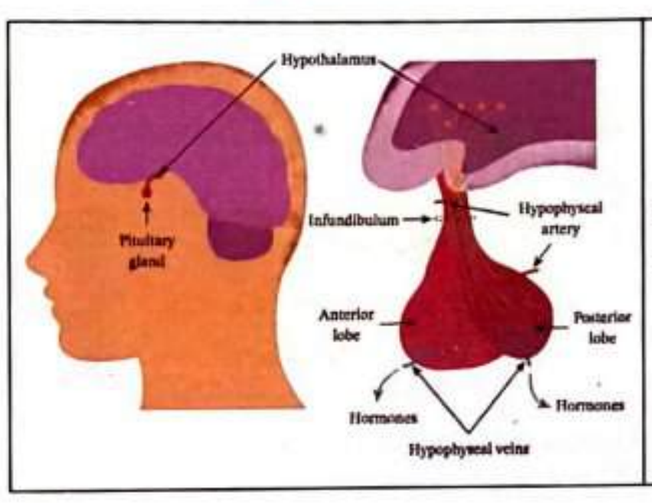

Fig 2: Anterior and Posterior Pituitary

Pineal Gland

- The pineal gland is a tiny endocrine gland in the *middle of our brain* that helps regulate body's circadian rhythm by secreting the hormone *melatonin*.

> *Melatonin is a hormone secreted by the pineal gland in response to darkness, often called the "hormone of darkness". It helps regulate the sleep-wake cycle by sensing light and dark through signals received from the retina of the eye.*

Thymus

- Located in the upper chest, behind the sternum (breastbone) and in front of the heart.
- It plays a crucial role in the *immune system*, especially during childhood.
- It responsible for the *maturation of T-lymphocytes* (T-cells), which are essential for fighting infections.

> *Serotonin hormone regulates moods and feelings.*

Thyroid Gland

- The thyroid is a *butterfly-shaped gland* located in the neck.
- It produces a hormone called *thyroxine*, which plays a vital role in increasing the body's metabolism.
- The production of thyroxine requires iodine, a mineral obtained from our diet.
- A deficiency of iodine can lead to *hypothyroidism*, a condition where the body doesn't produce enough thyroid hormone.

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• This deficiency may also cause the thyroid gland to enlarge, leading to a condition known as *goitre*. An excess production of iodine can result in *hyperthyroidism*, where the thyroid becomes overactive and produces too much thyroxine.

Parathyroid Gland

• The parathyroid glands are *four small glands* located behind the thyroid gland in the neck.

• The main role of the parathyroid glands is to *regulate the level of calcium* in the *blood* and *bones*. They do this by producing a hormone called *parathyroid hormone* (PTH).

> *Diabetes Insipidus is caused when the body produces too much urine and is not able to retain water (due to lack of ADH/Vasopressin).*

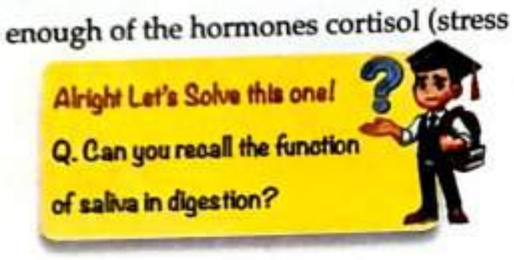
Adrenal Gland

• It is a *cap-like structure* located above both the kidneys.

• It releases *Adrenal hormone* → also known as *"Flight-or-Fight hormone"*.

• It increases the blood pressure, heart rate, and metabolism in response to stress level.

• ***Deficiency causes:*** *Addison's disease* (a rare chronic condition in which your adrenal glands don't produce enough of the hormones cortisol (stress hormone) and aldosterone).



Major Exocrine Glands

Sweat Glands

• They release sweat, a secretion, onto the skin's surface through ducts.

Salivary Glands

• These glands are a type of exocrine gland located in and around the oral cavity. They produce saliva, a fluid essential for digestion, lubrication, and protection of the mouth.

Liver

• The liver is positioned in the *upper right portion* of the abdomen, beneath the diaphragm. It is a large organ.

• The liver is responsible for numerous functions, including filtering blood, producing bile for digestion, metabolizing proteins, carbohydrates, and fats, and storing glycogen and vitamins.

Stomach

• The stomach helps break down food by squeezing it (mechanical) and mixing it with acids (HCl) and enzymes (chemical). *Ghrelin* released by stomach stimulates appetite hence it is known as *"Hunger Hormone"*.

Heterocrine/Mixed Glands

• A heterocrine gland is a gland that functions as both an endocrine gland and an exocrine gland.

Examples of heterocrine glands:

Pancreas

• Pancreas releases both hormones and enzymes (covered in digestive system) thus acting as a *mixed gland*.

• It is the *second largest gland* of our body.

Hormones released by pancreas:

• *Islets of Langerhans:* These are cells scattered throughout the pancreas.

Types:

- *α-Cells:* Produces *Glucagon* → converts *Glycogen to Glucose* through *Glycogenolysis*.
- *β-Cells:* Produces *Insulin* → converts *Glucose to Glycogen* through *Glycogenesis*. *Diabetes Mellitus* is caused when not enough insulin is produced by the body.

Gonads

• They are the primary *reproductive organs*.

Gonads include:

• *Testes:* In *male* → releases *testosterone* hormone.

• *Ovary:* In *female* → releases *Estrogen* (responsible for female characteristics) and *Progesterone* (it supports menstruation and maintains pregnancy).

> *The Atrial wall of human heart secretes a very important peptide hormone known as: ANF (Atrial Natriuretic Factor). ANF helps regulate the blood pressure.*

PLANT HORMONES AND MOVEMENTS

Hormones	Function
Auxin	Elongation of stem
Gibberellin	Germination or flowering in plants
Cytokinin	Cell division
Abscisic Acid	Stress hormone that inhibits growth
Ethylene	Gaseous hormone responsible for fruit ripening

Plant Movements

• ***Plant movements are of two types:*** *Tropic Movements* and *Nastic Movements*.

1. **Tropic Movements:** They are *directional* and occur in response to stimuli like light, gravity, water, and chemicals. They can be positive or negative.
   - (a) *Positive Tropism:* When a plant part *moves towards the stimulus*, it's considered positive tropism.
   - (b) *Negative Tropism:* When a plant part *moves away from the stimulus*, it's considered negative tropism.

Types of Tropic Movements:

1. *Phototropism:* Movement of plant in response to *light*. Movement in response to light. Shoots bend *towards light* (positive), while roots *bend away* from it (negative).
2. *Geotropism:* Movement in response to *gravity*. Roots grow *downwards* towards the gravity (positive growth), while shoots grow *upwards* away from the gravity (negative growth).

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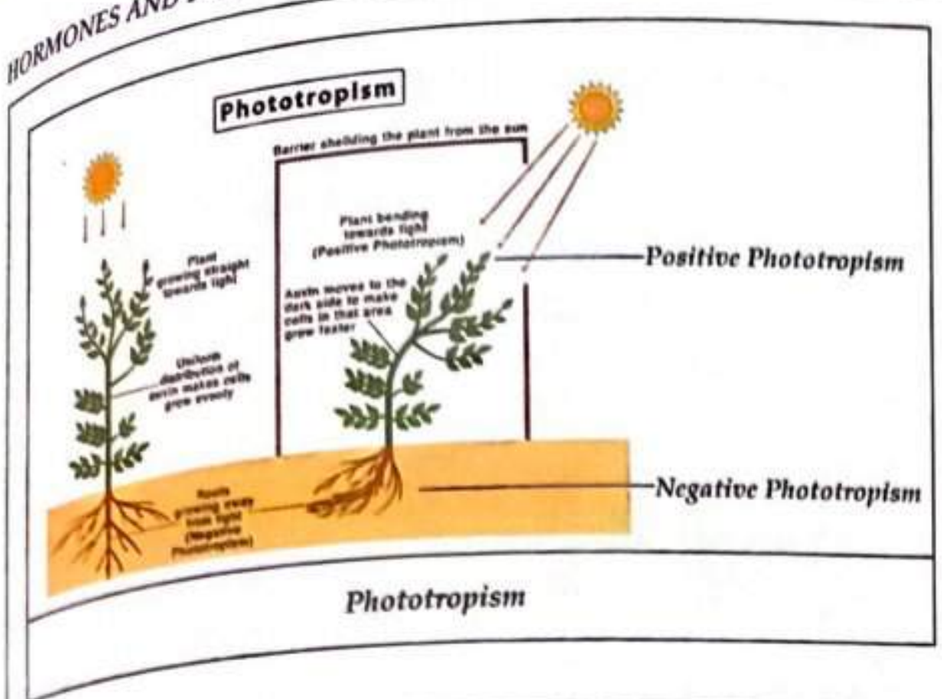
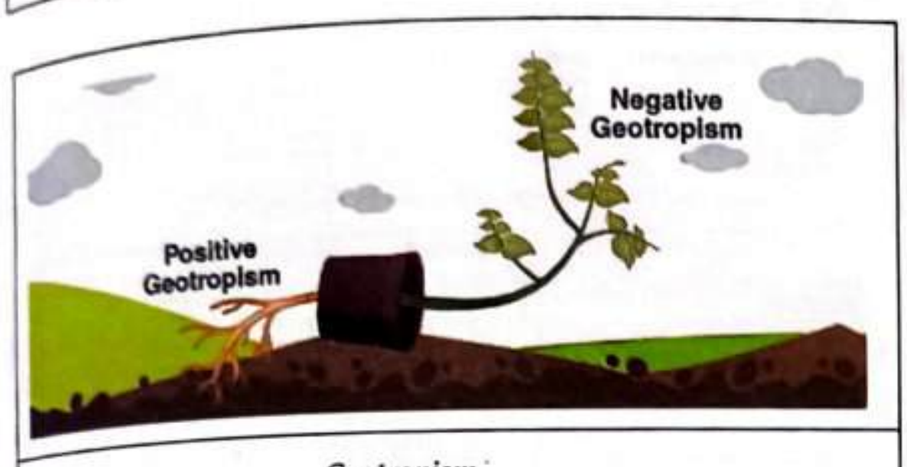
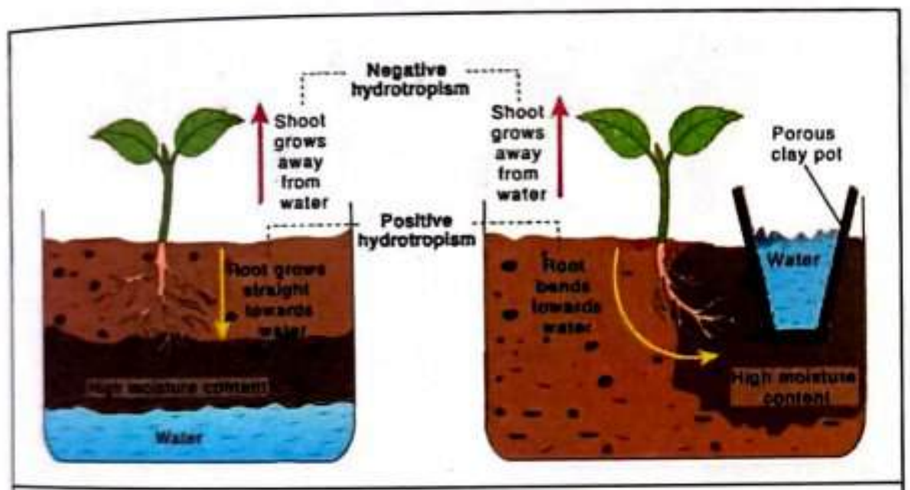


Phototropism



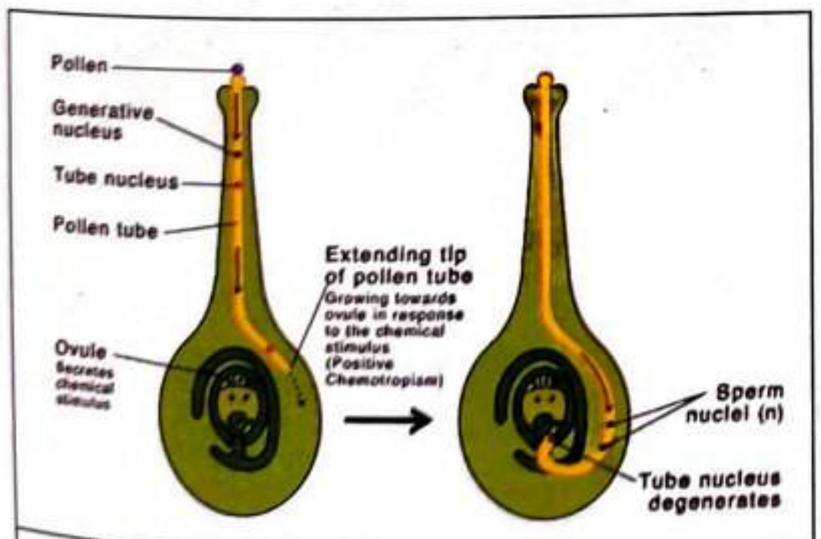
Geotropism

3. ***Hydrotropism:*** Movement in response to *water*. Roots grow towards water sources (positive growth).



Hydrotropism

4. ***Chemotropism:*** Movement in response to *chemicals*. ***E.g. The movement of pollen tubes towards the ovary during fertilization.***



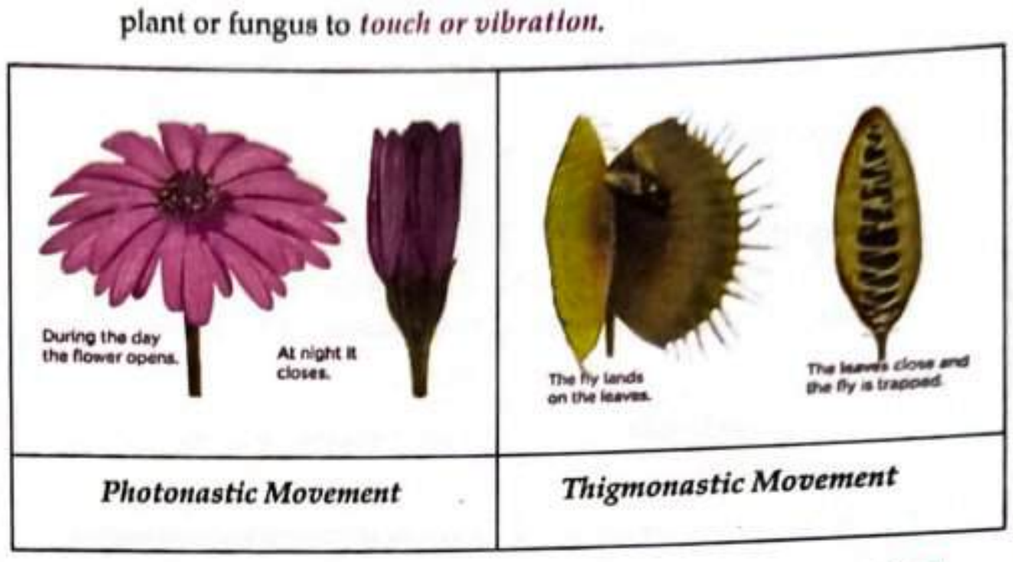
Chemotropism

2. **Nastic Movements:** They are *non-directional movement* of a plant part in response to an external stimulus, such as light, touch, or temperature.

Types:

(a) ***Photonastic Movement:*** The non-directional movement of plant part, usually flower petals, in response to changes in *light intensity.*

(b) ***Thigmonastic Movement:*** A non-directional response of plant or fungus to *touch or vibration.*



Photonastic Movement | *Thigmonastic Movement*

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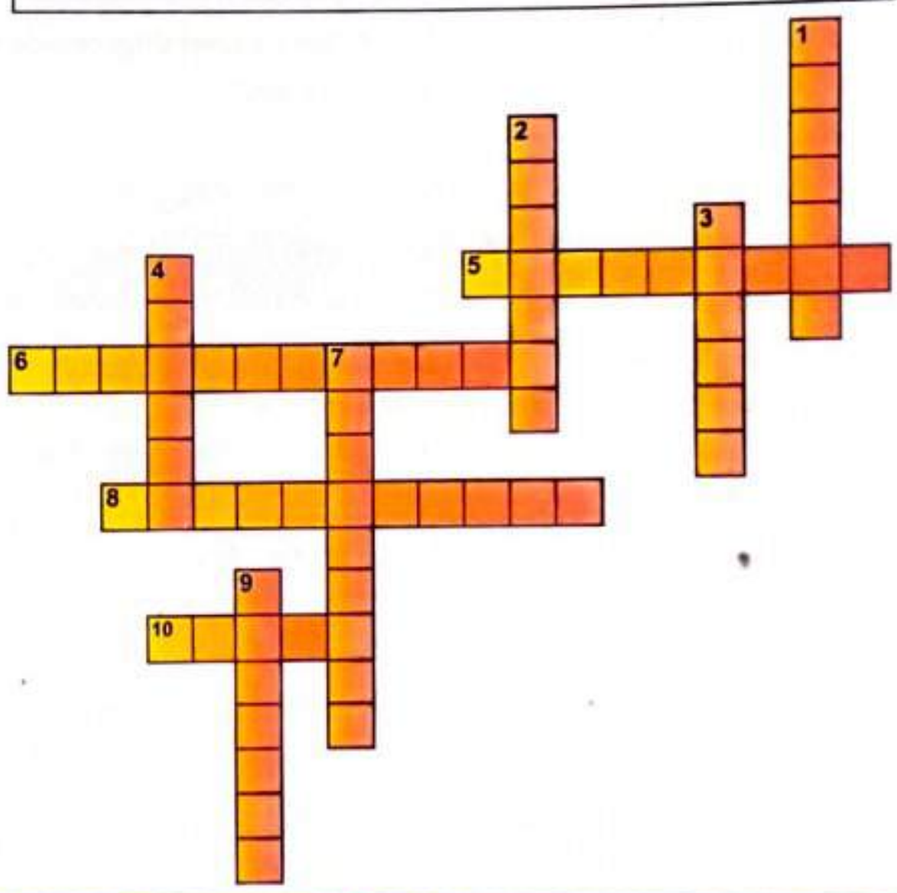
HORMONES AND PLANT MOVEMENTS



Across

5. Hormone regulating sleep-wake cycles.
6. Condition caused by low calcium and parathyroid hormone.
8. Pigment capturing sunlight in plants.
10. Hormone that elongates stem cells.

Down

1. Hormone known as hunger hormone.
2. Gland producing cortisol.
3. Mineral needed to make thyroid hormones.
4. Another name for somatotropin hormone.
7. Hormone promoting cell division in plants.
9. Hormone responsible for milk ejection.

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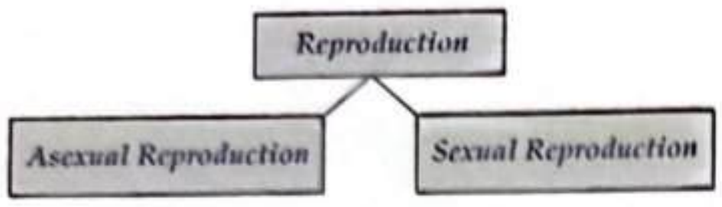
Reproduction

- Reproduction is the biological process by which living organisms produce offspring to continue their species.
- It is not essential for individual's survival, but is crucial for survival of a species.



Asexual Reproduction Vs Sexual Reproduction

Asexual Reproduction	Sexual Reproduction
Only one parent plant is involved	Both male and female parents are involved
Occurs in unisexual plants	Occurs in bisexual plants
Occurs in lower plants	Occur in higher plants
Genetic similarity is commonly seen here	Genetic diversity is commonly seen here
Reproductive organs are not present	Fully developed reproductive parts are present

Metagenesis: A type of life cycle in which one generation of plants or animals *reproduce asexually, followed by sexually reproducing generation* i.e., some individual of species are diploid and some are haploid.
E.g. Obelia.

ASEXUAL REPRODUCTION

Types of Asexual Reproduction

1. ***Binary Fission***

- It is a process of asexual reproduction in which a *unicellular organism divides into two organisms.*
- It is common only in unicellular organisms. *E.g. Amoeba.*

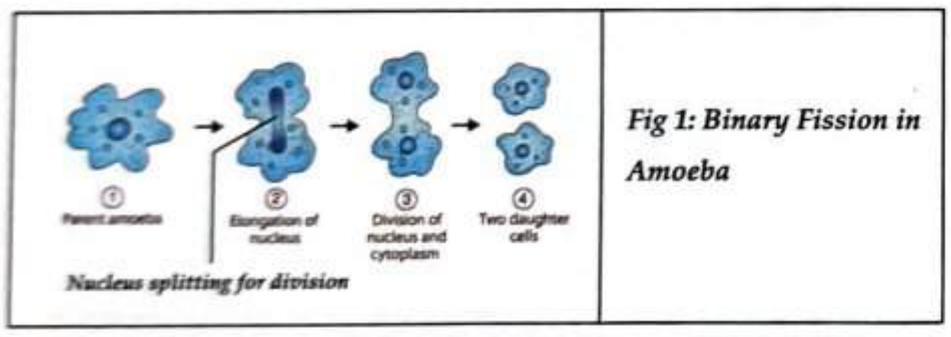


Fig 1: Binary Fission in Amoeba

2. ***Multiple Fission***

- It is a process of asexual reproduction in which the *nucleus divides multiple times*, and the cytoplasm divides later to form many new daughter cells.
- Many offsprings are produced. *E.g. Plasmodium (malarial parasite).*

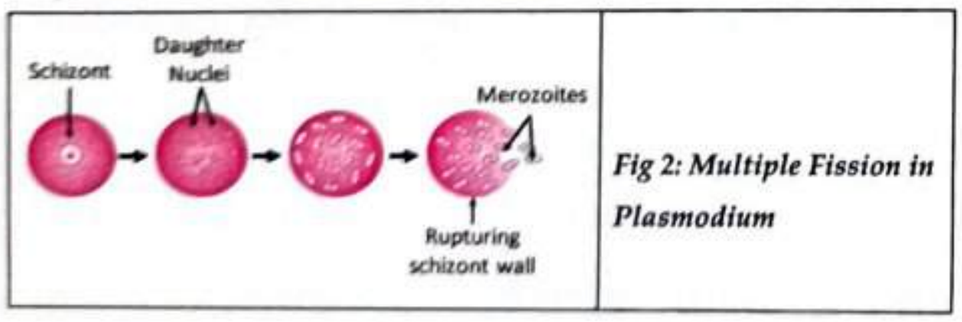


Fig 2: Multiple Fission in Plasmodium

3. ***Fragmentation***

- It is a process of asexual reproduction in which the *body breaks into pieces*, and *each fragment* grows into a new organism.
- It occurs in *simple multicellular organisms. E.g. Spirogyra (green algae), Rhodophyte (red algae), and sea anemone.*

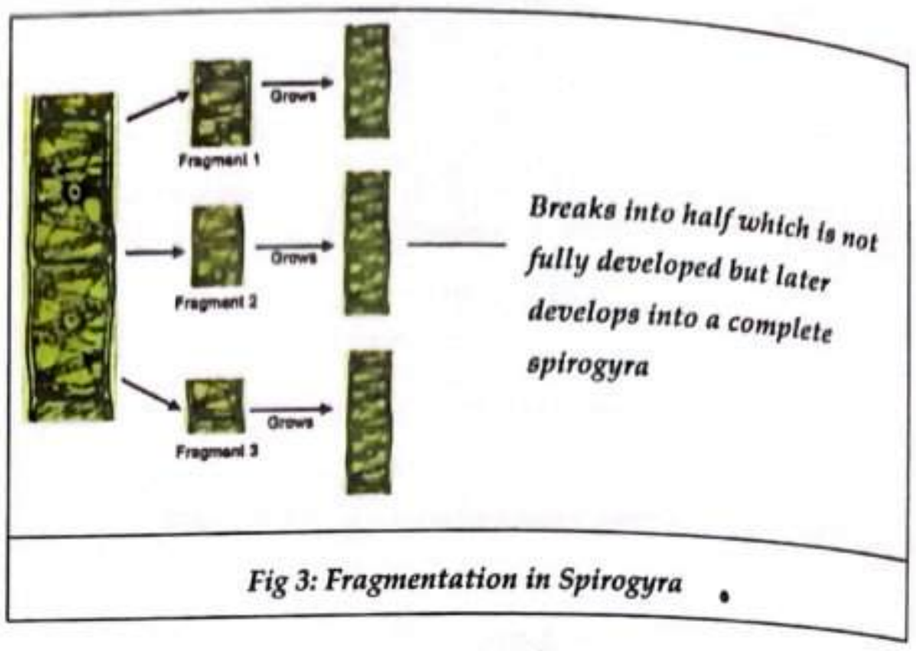


Fig 3: Fragmentation in Spirogyra

4. ***Budding***

- It is a process of asexual reproduction in which a new organism develops from a *bud or outgrowth* on the parent organism.
- A small bud forms on the parent body due to cell division. It grows and detaches to form a new organism.
- It occurs in *simple multicellular* and *unicellular organisms. E.g. Hydra (multicellular) and Yeast (unicellular).*

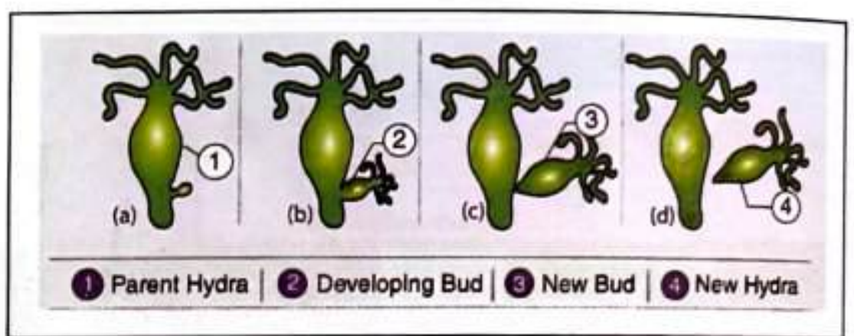


Fig 4: Budding in Hydra

5. ***Regeneration***

- It is a process of asexual reproduction in which a new organism develops *from a part of the original organism. E.g. Planaria, Hydra.*

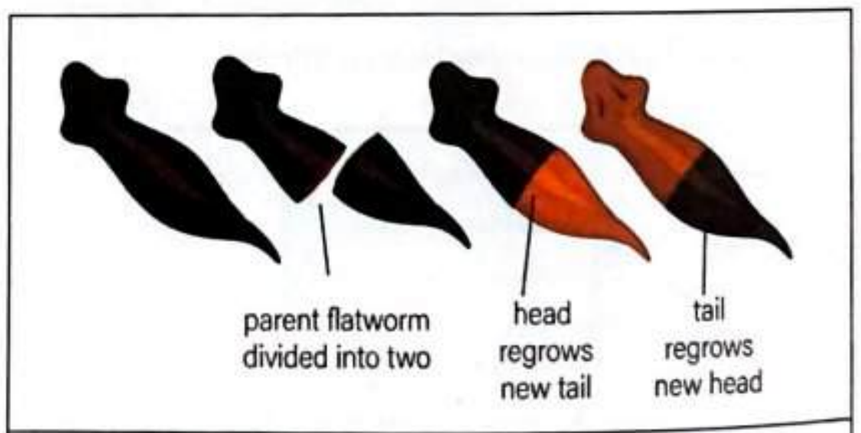


Fig 5: Regeneration in Planaria

Note: In higher organisms like lizards, tail regeneration does not form a new organism → just a part.

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6. **Vegetative Propagation**

• It is a process of asexual reproduction in which a new plant grows from the *vegetative parts of the parent plant*, such as the root, stem, or leaf. It can also occur through cutting or grafting parts of the plant.

• This method does not involve seeds, and the new plant is genetically identical to the parent.

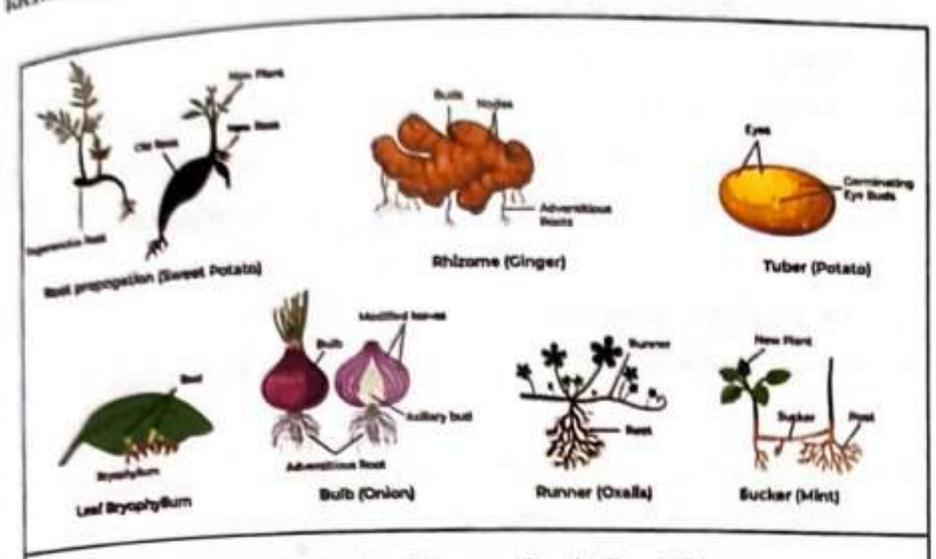


Fig 6: Vegetative Propagation in Few Plants

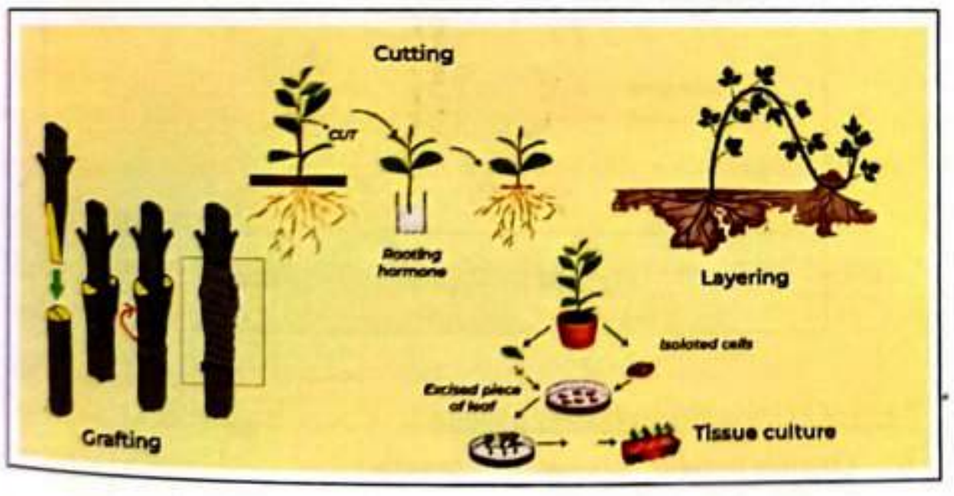
The buds in potato are called "eyes", they are axillary buds located at the nodes of stem. These eyes can grow into a new potato plant.

Types of Vegetative Propagation:

(a) **Cutting:** A *part of plant (stem or leaf)* is cut and planted into the soil. ***E.g. Rose plant, money plant, banana plant, sugarcane plant.***

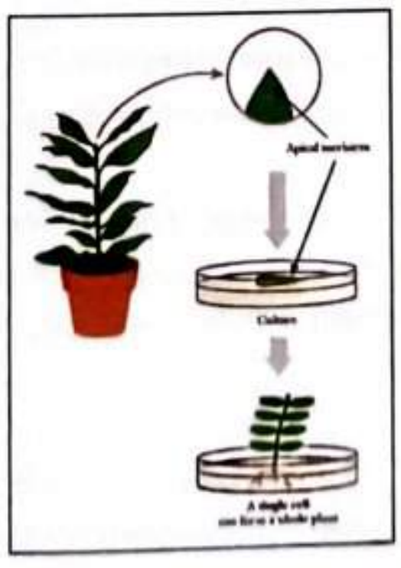
(b) **Layering:** The stem of the *plant is bent to the ground* and covered with soil. ***E.g. Lemon, strawberry.***

(c) **Grafting:** Cutting from *some other plant attached to the stem* of the plant and planted into the soil. ***E.g. Rose plant.***



7. **Tissue Culture**

• Tissue culture is a modern method of asexual reproduction used to grow new plants from a small group of *cells or tissues in a laboratory* under sterile conditions. ***E.g. Tissue culture is widely used in ornamental plant like snake plant. Cost of such plants are very high.***



8. **Spore Formation**

• It is a process of asexual reproduction in which an organism produces *spores* → tiny, usually single-celled structures, that can grow into new individuals under favorable conditions. ***E.g. Spore formation in Rhizopus (bread mould) a type of fungi.***

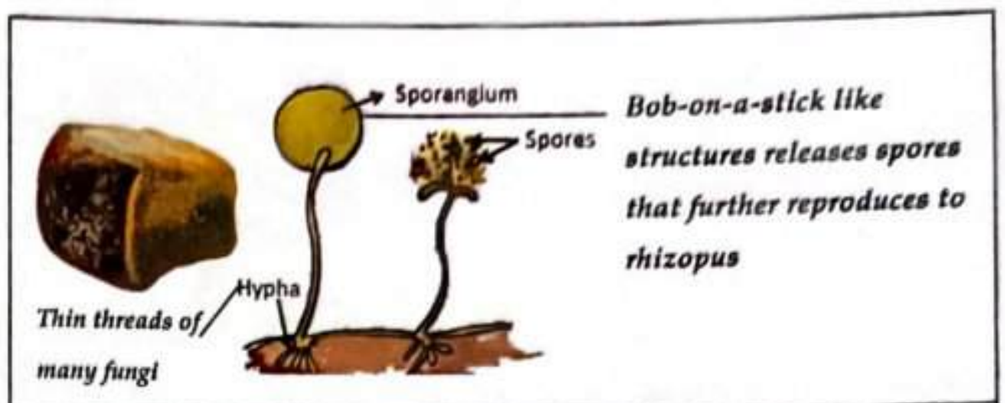


Fig 7: Spore Formation in Rhizopus

SEXUAL REPRODUCTION IN PLANTS

• Sexual reproduction in plants involves the fusion of male and female gametes (pollen and ovule) to form a zygote, which develops into a seed that grows into a new plant.

• This process occurs through flowers, the reproductive organs of plants.

Types of Flowers

1. **Bisexual Flowers** *(Hermaphrodite Flowers)*

• These flowers contain *both male (stamens)* and *female (pistil)* reproductive organs in the *same flower.*

• They are capable of *self-pollination* as well as *cross-pollination.* ***E.g. Hibiscus, mustard, lily, sunflower.***

2. **Unisexual Flowers**

• These flowers contain *only one reproductive organ* → either stamens or pistil, but not both.

• They are capable of *cross-pollination.* ***E.g. Male flower that only has only stamens → Corn, Cucumber, Female flower that only has carpels → Papaya, watermelon.***

→ **Monoecious Plants:** Male and female reproductive parts are present on the *same plant.* ***E.g. Maize, cucumber.***

→ **Dioecious Plants:** Male and female reproductive parts are present on *separate plants.*

E.g. Papaya, date palm.

Anatomy of a Flower

• Male reproductive part (collectively called *Stamen*) consists of:

→ ***Filament:*** Supports anther.

→ ***Anther:*** Produces *pollen* (yellow colour).

• Female reproductive part (collectively called *Pistil*) consists of:

→ ***Stigma:*** Sticky bulb that catches pollen.

→ ***Style:*** Passageway for pollen.

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→ ***Ovary:*** The part of pistil that holds the eggs awaiting fertilization and later becomes the *fruit*.

- ***Isogamy:*** Fusion of morphologically similar gametes (same size and shape). ***E.g. Chlamydomonas.***
- ***Anisogamy:*** Fusion of morphologically dissimilar gametes (different size and shape). ***E.g. Some algae, fungi.***
- ***Oogamy:*** A type of anisogamy where large, non-motile egg fuses with small, motile sperm. ***E.g. humans***

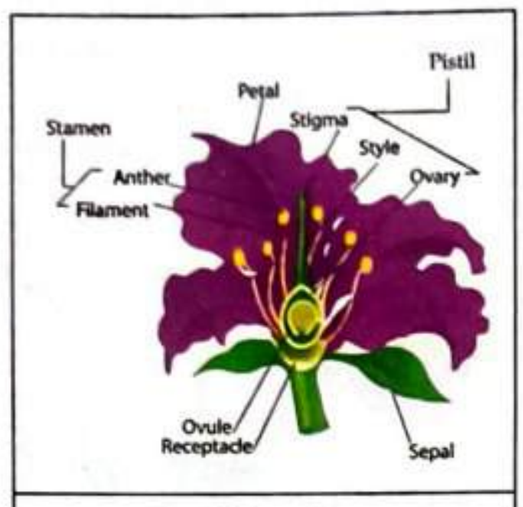

Fig 8: Flower Parts

Pollination

- Pollination is the process where pollen, containing a plant's male reproductive cells, is transferred to the female part of a plant (stigma). This transfer is essential for plant reproduction, leading to fertilization and the development of seeds.

Types of Pollination:

1. ***Self-Pollination (Autogamy)***
- Pollen from anther is transferred to the *stigma of the same flower or another flower* on the *same plant.*
- No genetic variation. ***E.g. Pea, tomato.***

2. ***Cross-Pollination (Allogamy)***
- Pollen is transferred from the *anther of one flower to the stigma of another flower* on a *different plant of the same species.*
- Promotes genetic diversity. ***E.g. Apple, sunflower.***

Agent	Type of Pollination	Examples
Insect	Entomophily	Rose, Lotus
Wind	Anemophily	Maize, Grass
Water	Hydrophily	Vallisneria

- After pollination, the pollen grain germinates on the stigma and forms a pollen tube that carries the male gamete to the ovule in the ovary.

Male and female gametes fuse to form the *Zygote*. Zygote develops into an *embryo*. The *ovule* becomes *seed* and *ovary* becomes *fruit*.

Specific Terms Associated

False Fruit

- A fruit that develops from *other parts of a flower, in addition to ovary,* and does not require fertilisation. In this type of fertilization, thallus is also involved. ***E.g. Apple, cashew nut.***

Parthenocarpic Fruits

- They are seedless fruits, that develops *without fertilisation of an ovule.*

E.g. Banana, grape, cucumber.

Drupe Fruit

- It is a type of fruit with a *hard shell that includes a seed* and has an inner flesh. ***E.g. Coconut.***

HUMAN REPRODUCTIVE SYSTEM

Parts of Male Reproductive System

1. ***Testes***
- It is located in the *scrotum* (a sac outside the body to keep sperm cool).
- It produces *sperm* and *testosterone* (male sex hormone).
- Sperm production in males typically begin around the age of *10-12 yrs.*

2. ***Vas Deferens (Sperm Duct)***
- Tube that transports *mature sperm* from epididymis to urethra.

3. ***Seminal Vesicles and Prostate Gland***
- It adds *seminal fluid* to sperm to form *semen.*
- Semen provides nutrients and a medium for sperm to swim.

4. ***Urethra***
- It carries semen and urine, but never at the same time.
- It passes through the penis and exits the body.

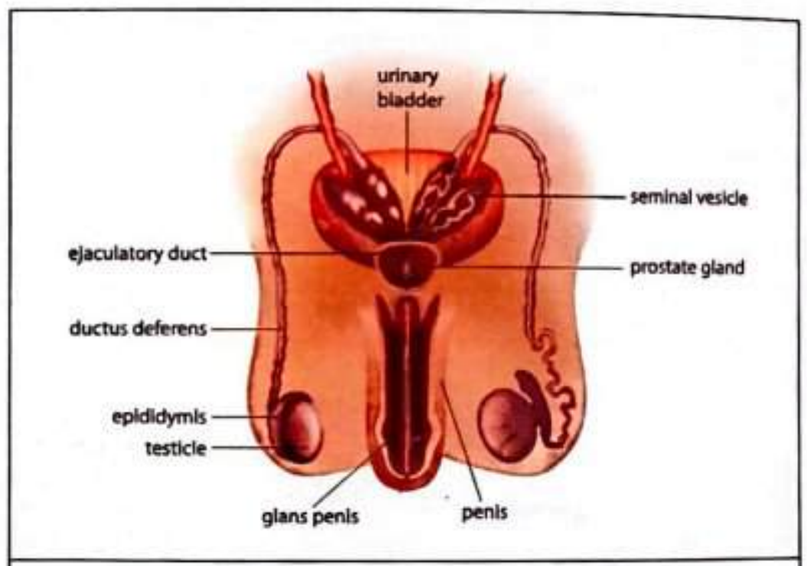

Fig 9: Male Reproductive System

Parts of Female Reproductive System

1. ***Ovaries (primary sex organ in females)***
- Ovaries produce eggs (ova) and *estrogen + progesterone* (female sex hormones).
- A female is born with *all the egg cells* (oocytes) she will ever have. At the age of *12*, the ovaries start to mature.

2. ***Fallopian Tubes (Oviducts)***
- The site where sperm meet egg and fertilization occurs. The cilia inside the fallopian tubes push the egg towards the uterus.

3. ***Uterus (Womb)***
- Muscular organ where a fertilized egg implants and develops into a foetus. The innermost lining of the uterus is called *endometrium.*

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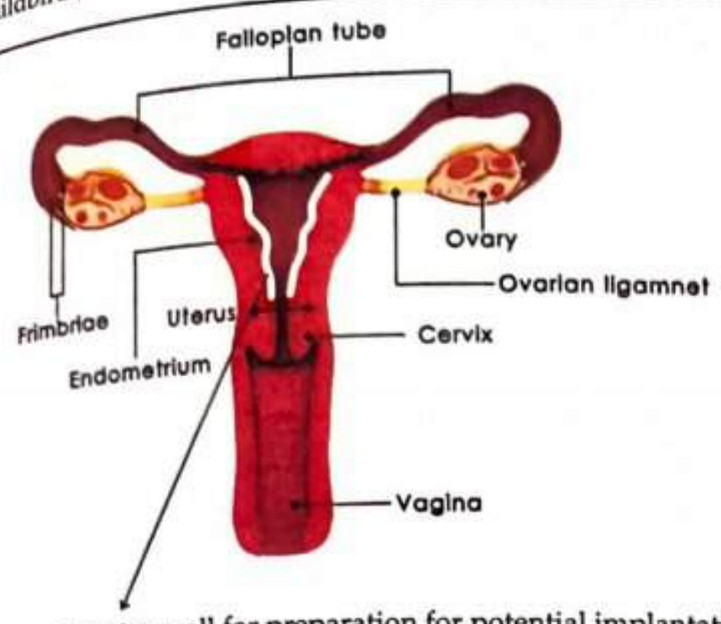
4. Cervix
• The cervix is the lower part of the uterus that connects to the vagina. During childbirth, it must *open to allow the baby to pass through.*



Thickening of uterine wall for preparation for potential implantation of fertilised egg during pregnancy. When pregnancy does not occur after the uterine lining thickens, the lining is shed through *menstruation.*

Fig 10: Female Reproductive System

Cervical cancer is caused by: HPV (Human Papilloma Virus).

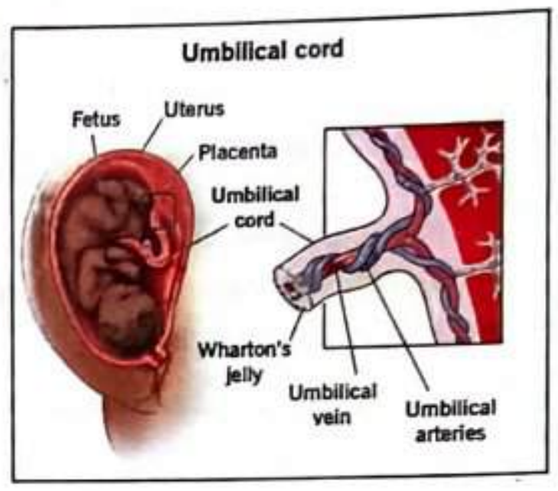
Menopause
• Menopause is the *permanent cessation of menstruation* in women, marking the end of their reproductive years. It typically occurs in the *late 40s to early 50s*, with the average age being around 51. This stage is characterized by the *ovaries no longer releasing eggs* and a decrease in the production of *estrogen* and *progesterone.*

Fertilization
• Fertilization is the process where a male gamete (sperm) and a female gamete (egg) fuse to form a *zygote*, which is the first cell of a new individual.
Types of Fertilisation
1. *Internal Fertilisation:* The process of a sperm cell and an egg cell fusing *inside the female body* during reproduction. ***E.g. In humans.***
2. *External Fertilisation:* A reproductive process where a male sperm fertilises a female's egg *outside of the female's body.* ***E.g. Frog, earthworms, crab.***

• Viviparous: Animals that *develop inside the parent's body* and give birth to live offspring. ***E.g. Cats, dogs, humans.***
• Ovoviviparous: Animals that *lay eggs and the eggs develop inside mother's body.* ***E.g. Sharks, snakes, some fishes (like guppies).***
• Oviparous: Animals that *lay eggs and the eggs develop outside the mother's body.* ***E.g. Birds, frogs, lizards, (Exception: Platypus is the only mammal reproduced oviparously).***

Process of Fertilization
Process involved:
1. *Gametogenesis:* This is the process of forming gametes → Sperm in males and eggs in females, essential for reproduction.
2. ***Insemination:*** It involves the transfer of sperm into the female reproductive tract during intercourse.
3. ***Fertilisation:*** The sperm meets and fuses with the egg, forming a zygote (the first cell of the new baby).
4. ***Implantation:*** The zygote develops into a blastocyst and attaches itself to the uterine wall, beginning pregnancy.
5. ***Gestation:*** This is the period of development where the embryo grows and forms into a foetus inside the uterus.
6. ***Parturition:*** The final stage, where the baby is delivered through childbirth.

Role of Arteries and Veins in Pregnancy
During pregnancy:
• Arteries in the uterus (especially the spiral arteries) supply *oxygen-rich blood* and nutrients to the *placenta, supporting the growing fetus.*
• Veins carry *deoxygenated blood* and waste products from the *placenta back to the mother's* circulation for disposal.



Totipotency
• It is the ability of a single cell to produce a fertile, adult individual.

In-Vitro Fertilisation *(IVF)*
• In in-vitro fertilisation (IVF), an egg is combined with a sperm *outside the mother's body,* in a laboratory setting.

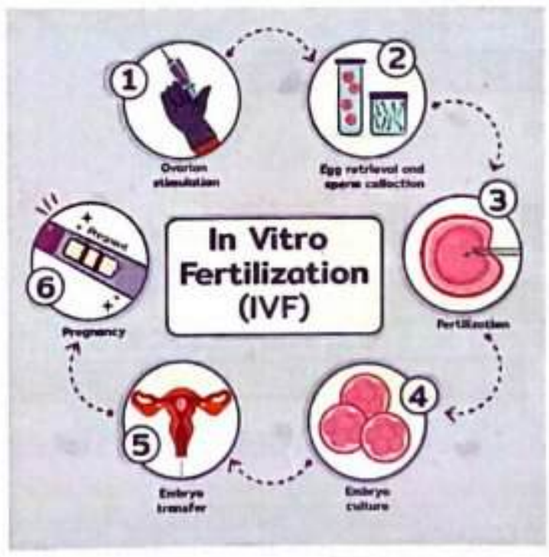


Fig 11: In-Vitro Fertilization Process

Parthenogenesis
• A type of asexual reproduction, where an *organism develops from an unfertilised egg,* without the need for sperm. The unfertilised egg completely develops into a new organism. ***E.g. Honey bees, lizards.***

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Metamorphosis in Butterfly

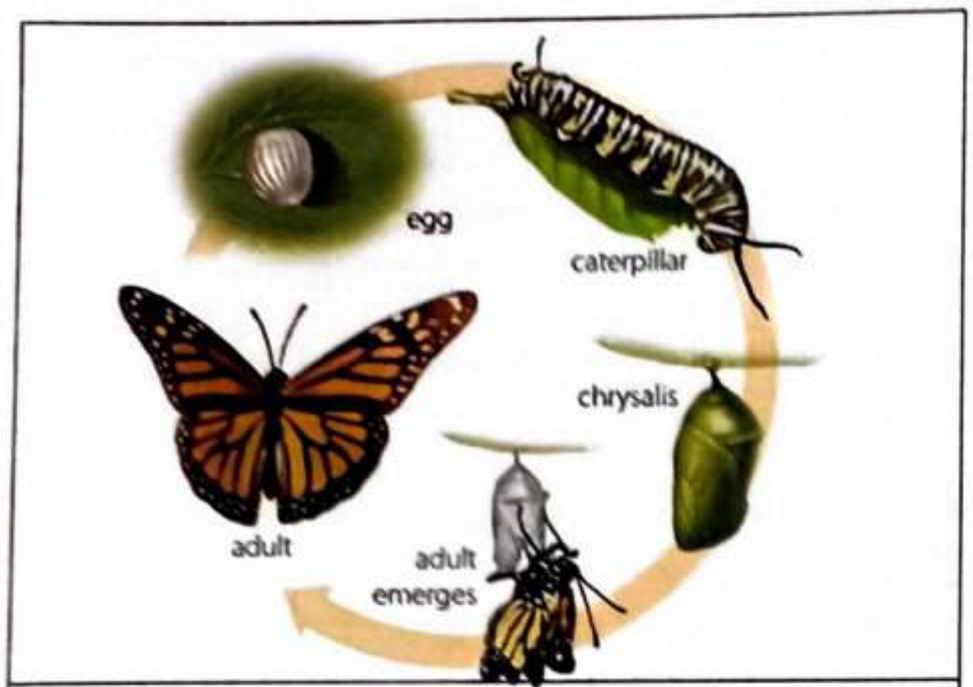
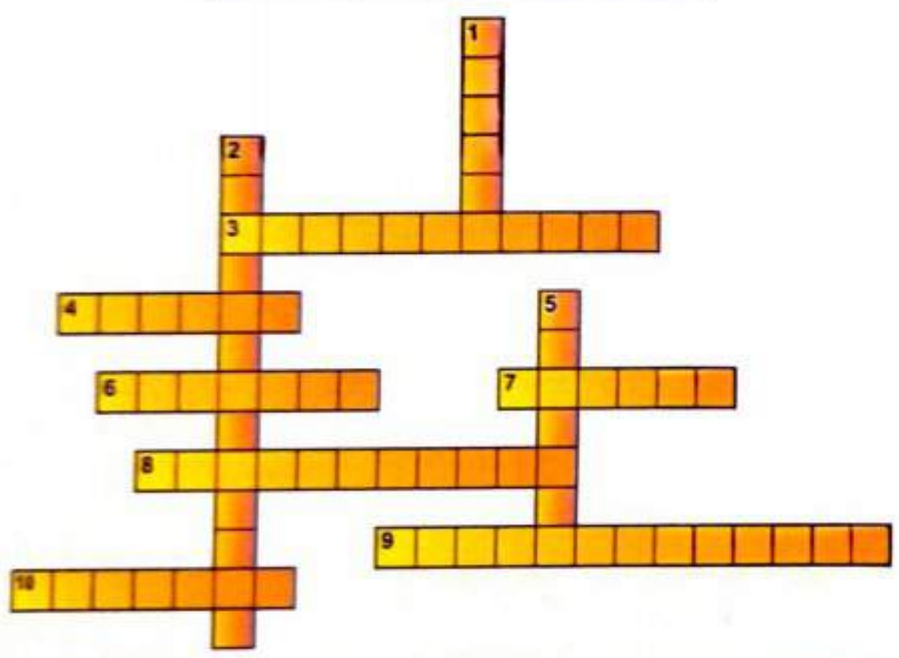


Fig 12: Metamorphosis of a Larva into. Adult

Butterfly metamorphosis is a complete transformation involving four distinct stages: Egg, larva (caterpillar), pupa (chrysalis), and adult butterfly.

PARMAR'S CROSSWORD

REPRODUCTION



Across

3. Discovered motile organisms called animalcules.
4. Sticky part on top of pistil that traps pollen.
6. Type of reproduction in Hydra.
7. Innermost part of a flower.
8. Flowerless plants with naked seeds.
9. Fruit formation without fertilization.
10. Reproduction involving only one parent.

Down

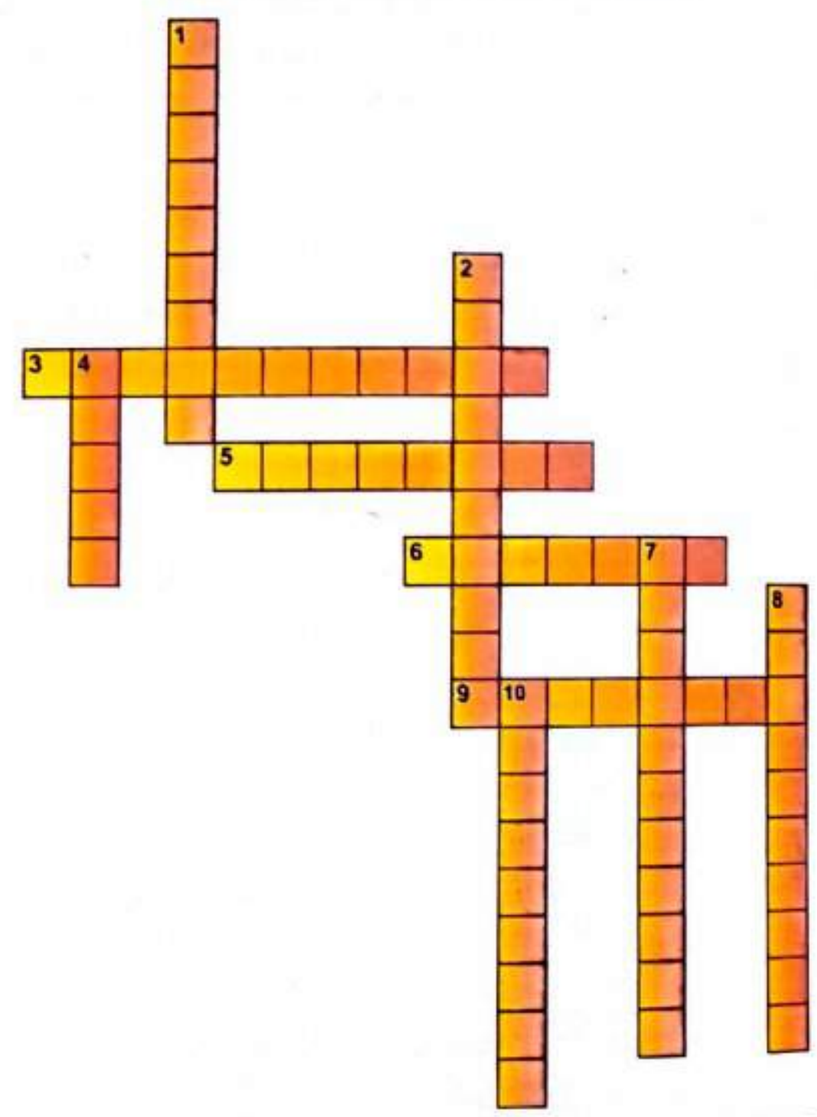
1. Yellow dust in flower is part of.
2. Unicellular green algae.
5. Explained algae structure in 1935.

Types of Culture

Types	*Culture*
Vegetable farming	Horticulture
Silk rearing	Sericulture
Bee keeping	Apiculture
Fish farming	Pisciculture
Flower framing	Floriculture
Rearing aquatic plants and animals	Aquaculture
Cultivation of grapevines	Viticulture / Viniculture
Bird farming	Aviculture

PARMAR'S CROSSWORD

ANIMAL KINGDOM



Across

3. Subphylum of arachnids.
5. Phylum showing radial symmetry like jellyfish.
6. Group that can interbreed and produce fertile offspring.
9. Phylum including earthworms.

Down

1. Arthropod example.
2. Largest phylum in animal kingdom.
4. Organism not belonging to Porifera.
7. Sponge with silica spicules.
8. Protozoan causing malaria.
10. Present in all chordates.

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DIGESTIVE SYSTEM

Digestion

• Digestion is the process of breaking down food into simpler substances so the body can absorb and use the nutrients.

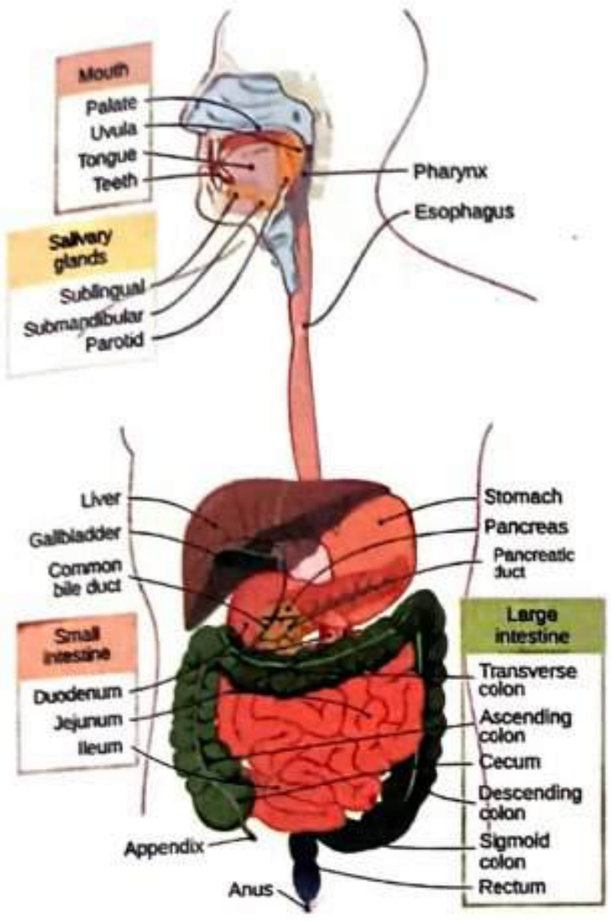

Fig 1: Overview of Digestive System

Main Organs of Digestive System

Mouth *(Oral Cavity)(Buccal Cavity)*

• Digestion starts here. Teeth chew the food (mechanical digestion).

• Saliva (from salivary glands) contains *salivary amylase*, which breaks down *starch* (complex carbohydrates to simple carbohydrates).

• Tongue helps in mixing food and swallowing.

Pharynx and Oesophagus

• Pharynx connects *mouth to esophagus*.

• Oesophagus (length: *25 cm*) is a muscular tube that pushes food to the stomach through peristalsis (wave-like movement).

Stomach

• *J-shaped* muscular organ.

Secretes:

• ***Hydrochloric acid (HCl):*** Kills germs and provides acidic medium. HCl is present in *gastric juice* (pH: 1.6).

• ***Pepsin:*** Digests proteins (works in acidic medium only).

• ***Mucus:*** Protects the delicate stomach lining from acid.

Sphincter Muscle

• It allows food to pass from stomach to small intestine.

Small Intestine

• It is the longest part of the *alimentary canal* (6.5 to 7.5 meters). It is the main site of *digestion* and *absorption*.

• It is divided into three parts: *duodenum, jejunum, ileum.*

Digestive Juices Received in Small Intestines from Liver

Bile (bile juice)

• Bile juice is stored in *gall bladder* and released by *liver*.

• Bile is not an enzyme but plays a crucial supporting role in digestion.

> ***Maltase enzyme in small intestine converts Maltose to Glucose.***

Function of Bile:

• Bile is *alkaline* (basic) in nature.

• It neutralizes the acidic food before it enters the small intestine.

• This creates a favorable pH for the action of pancreatic and intestinal enzymes.

Emulsification of Fats:

• Bile breaks down large *fat globules* into *smaller globules*. This process is called *emulsification*.

Pancreas

• ***Function:*** Digests carbs, proteins, and fats.

• Pancreas release pancreatic juice:

→ ***Amylase:*** Breaks down *carbs*.

→ ***Lipase:*** Breaks down fats into *fatty acids* and *glycerol*.

→ ***Trypsin (works in basic medium):*** Breaks down proteins into *amino acids*.

> ***Roughage found in:***
> • *Green leafy vegetables, Fruits, etc.*
> • *Fibre: Promotes peristalsis*

Large Intestine

• ***Length:*** *1.5 m.*

• ***Function:*** Absorbs water and electrolytes from the remaining undigested food, solidifying it into feces for elimination.

• ***Large intestine comprises of:***

→ ***Cecum:*** First part of the large intestine, and it connects the small intestine to the colon.

→ ***Colon:*** Responsible for absorbing water from indigestible food residues.

Liver

• The study of the liver is called *Hepatology*.

• The liver is the *largest gland* in the human body.

• It is located on the right side of the abdomen and is *dark red-brown* in color.

Functions of the Liver:

• It converts *glucose* into *glycogen* for storage (process known as glycogenesis).

• It converts *amino acids* into *proteins* (vital for growth and repair).

• It stores *glycogen* in liver cells to maintain blood sugar levels.

Important Liver Cells:

1. ***Kupffer Cells***

• *Star-shaped phagocytic cells* found in the lining of liver sinusoids.

Functions:

• They are involved in the breakdown of *RBCs*.

• They are clean pathogens and debris from the blood.

• Kupffer cells have *regenerative* ability

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2. **Hepatocytes**

- The main *parenchymal* (functional) cells of the liver.
- Perform various cellular functions, including: Metabolism of carbohydrates, proteins, and fats and detoxification of blood.

Villi

- Villi are *finger-like projections* found in the inner wall of the small intestine.
- They significantly *increase the surface area* of the intestinal lining, enhancing nutrient absorption (assimilation).

Rectum and Anus

- Rectum stores feces.
- Anus is the opening through which waste is excreted from the body.

Mouth
↓
Pharynx
↓
Esophagus
↓
Stomach
↓
Small Intestine
- *Duodenum*
- *Jejunum*
- *Ileum*

↓
Large Intestine
- *Cecum*
- *Colon*
- *Rectum*

↓
Anus

Alimentary Canal Flowchart

RESPIRATION

- It is a biochemical process of enzyme, including oxidative breakdown of organic compounds inside living cells, releasing energy in the form of ATP (Adenosine Triphosphate).

Breathing

- Breathing is the process of *inhaling oxygen* and *exhaling carbon dioxide* by the lungs.

Guttation: Water loss in plants during night through hydathodes present in leaf edges.

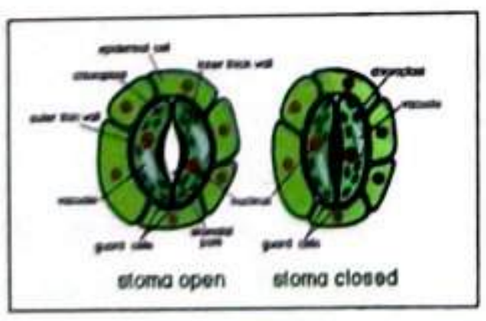
Respiration in Plants

By Roots

- Air is present in the spaces between soil particles (soil interspaces).
- The *root hairs* and *epiblema cells* (outermost layer of young roots) are in direct contact with this soil air.
- Oxygen from the air in the soil diffuses through the root hairs and epiblema cells into the inner tissues of the root.
- This oxygen is then used in aerobic respiration by root cells to break down *glucose* and *release energy*.

By Leaves

- Leaves and young stems are well-suited for the quick *exchange of gases* due to their thin structure and presence of pores.
- Stems, especially mature ones, are covered by an impermeable epidermis to prevent water loss. This outer layer helps in *conserving moisture*.
- The epidermis of leaves contains tiny openings called *stomata*.
- Each stoma is bordered by two specialized cells known as *guard cells*.
- Guard cells control the *opening* and *closing of stomata*, regulating gas exchange and *water loss* (transpiration).



Respiration in Animals

Mechanism of Respiration

- ***Nose → Pharynx → Larynx → Trachea → Bronchi → Bronchioles → Alveoli.***

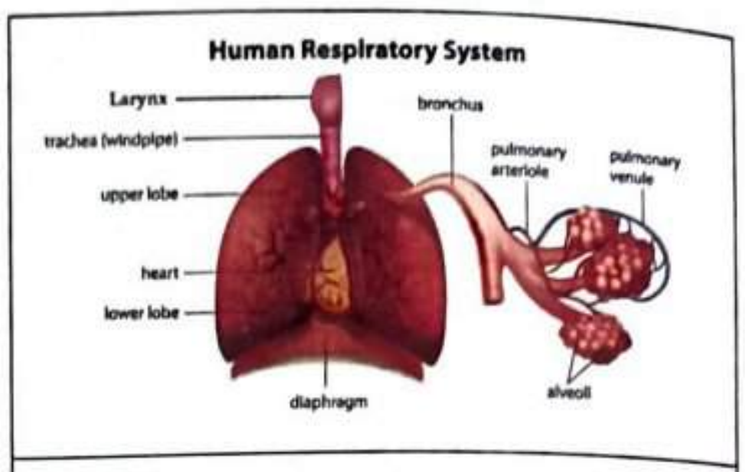


Fig 2: The Respiratory System

Pleura: Outer covering of lungs

Nose

- First entry point for air into the respiratory system.
- Hair inside the nose traps dust and impurities, allowing *only filtered air* to pass through.
- Mucus lining inside the nose moistens the air, traps dust particles and bacteria. It also helps in cleaning and protecting the respiratory tract.

Diaphragm: Forms the floor of the chest cavity.

Pharynx

- A common passage for both *air* and *food*.
- It connects the *nasal cavity* to the larynx.
- It ensures air is directed towards the *windpipe* (trachea).

Larynx *(Voice Box)*

- It also known as the *Adam's Apple*.
- It contains vocal cords, which produce sound when air passes through them.
- It is located at the *top of the trachea*.

Respiration centre is in Medulla Oblongata.

Trachea *(Windpipe)*

- A long tube that carries air from the larynx to the bronchi.
- Surrounded by *C-shaped cartilage rings* that prevents the trachea from collapsing during inhalation and keeps the airway open at all times.

Bronchi *(Singular: Bronchus)*

- The trachea divides into *two bronchi* → one for each lung.
- Each bronchus enters a lung and carries air deeper inside.
- Bronchi also contain *mucus* and *cilia* to trap dust and microbes.

Bronchioles

- Inside the lungs, each bronchus further branches into smaller tubes called *bronchioles*.
- These are narrower and more numerous, spreading air throughout the lungs.
- Bronchioles lead directly to the *air sacs (alveoli)*.

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Alveoli (Air Sacs)

- Tiny *balloon-like structures* present at the ends of bronchioles.
- The lungs contain millions of alveoli that are surrounded by *capillaries* (tiny blood vessels).

Functions:

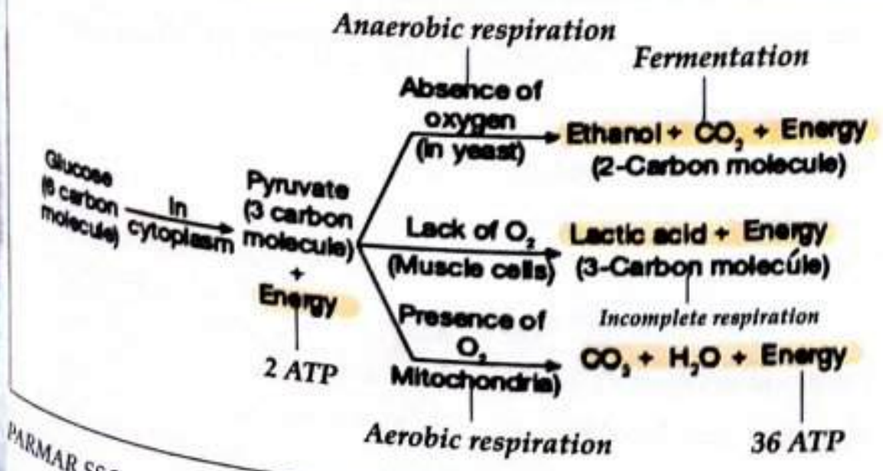
- *Exchange of gases* occurs here, oxygen from the air diffuses into the blood and carbon dioxide from the blood diffuses into the alveoli to be exhaled.
- Their thin walls and large surface area make gas exchange very efficient.

Inhale	*Exhale*
Rib cage goes up	Rib cage goes down
Diaphragm goes down	Diaphragm goes up
Lung expands	Lung contract
% of gases: O_2: 21% CO_2: 0.04%	*% of gases:* O_2: 16.4% CO_2: 4.4%

Epiglottis: It protects our airway and prevents food and liquid from entering our lungs while we swallow.

Aerobic Vs Anaerobic Respiration

Aerobic Respiration	*Anaerobic Respiration*
It requires molecular oxygen	It does not require molecular oxygen
It occurs in mitochondria and cytoplasm	It occurs in cytoplasm
The end products are CO_2 and H_2O and energy	The end products are CO_2 and C_2H_5OH (ethanol) and energy
Large amount of energy is released during this process	Small amount of energy is released during this process
During aerobic respiration, 38 ATP molecules are generated	During aerobic respiration, only 2 ATP molecules are generated



- *Yeast is used in dough to make baked goods. It makes the dough soft and fluffy.*
- *Accumulation of lactic acid in the muscles causes cramps.*

Cellular Respiration

- Cellular respiration is the process by which cells break down *glucose* (sugar) in the presence of oxygen to release energy in the form of *ATP* (Adenosine Triphosphate).

Overall Reaction

Glucose ($C_6H_{12}O_6$) + Oxygen 6(O_2) → Carbon dioxide 6(CO_2) + Water 6(H_2O) + Energy (ATP)

Steps in Cellular Respiration

1. **Glycolysis** *(in the cytoplasm)*

- Glucose (6C) is broken down into *2 molecules of pyruvate* (3C each).
- In this process a small amount of *ATP* and *NADH* is produced.

2. **Krebs Cycle** *(Citric Acid Cycle) (in mitochondria)*

- Pyruvate is further broken down.
- *CO_2* is released, and energy carriers *NADH* and *$FADH_2$* are produced.

3. **Electron Transport Chain** *(ETC) (in the inner mitochondrial membrane)*

- NADH and $FADH_2$ donate electrons.
- *Oxygen* acts as the final electron acceptor.
- Large amounts of *ATP* are produced (up to *34 ATP*).

Nicotinamide adenine dinucleotide (NADH) is a coenzyme that plays a vital role in cellular respiration by transporting electrons to the Electron Transport Chain.

→ About *38 ATP* molecules are produced per molecule of glucose during aerobic respiration.

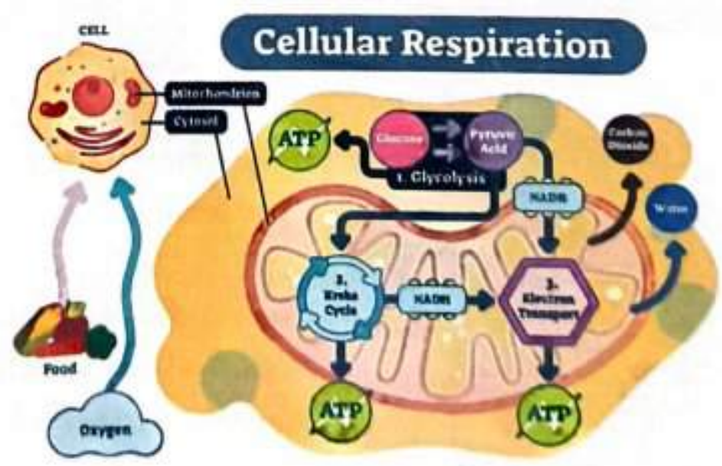


Fig 4: Cellular Respiration Process

For an interactive recap of this topic, see the crossword on Page Number 316.

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CIRCULATORY SYSTEM

Human Heart

• The heart is a *fist-sized organ* that pumps oxygenated blood throughout the body.

• It controls the rhythm and speed of heart rate and maintains blood pressure.

Anatomy of Heart

→ Human heart has four chambers:

• The heart's top two chambers (left and right) are known as *atrium*.

• The heart's bottom two chambers (left and right) are known as *ventricles*.

→ ***The wall of the heart comprises three layers:***

• The heart wall's *outer layer* is known as the *epicardium*.

• The heart wall's *middle layer* is known as the *myocardium*.

• The heart wall's *inner layer* is known as the *endocardium*.

Heart Beat

• The rhythmic contraction and relaxation of the heart, which includes one *systole* (contraction phase) and one *diastole* (relaxation phase) of the heart.

• Heart beat count of healthy person is *72 times per minute*.

• Sound of heart: *Lub-Dub*.

- ***Lub:*** The sound of the *mitral* and *tricuspid valves closing*.
- ***Dub:*** The sound of the *aortic* and *pulmonary valves closing*.

Cardiac Output

• The amount of blood pumped by *heart per minute* is called cardiac or heart output. The value of cardiac output of a normal person is about *72 bpm × 70 mL per beat = 5040 mL* or about *5L per minute*.

> ***Sphygmomanometer is used to monitor blood pressure.***

Electrocardiogram (ECG)

• An electrocardiogram (ECG) is a test that records the *electrical activity of the heart*. It produces a graph of voltage versus time using electrodes placed on the skin. This graph helps in detecting abnormal heart rhythms and conditions related to heart function.

> ***A stethoscope is used as an instrument to measure heartbeat.***

Structure and Function of Heart

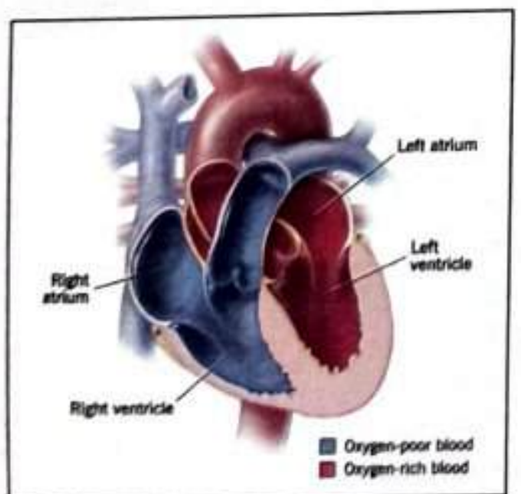

Fig 1: Chambers of Heart

1. **Right Atrium**

• Location: Upper right side of the heart.

• Function: It receives *deoxygenated blood* from different parts of body through:

→ ***Superior vena cava*** (from upper body)

→ ***Inferior vena cava*** (from lower body)

• Oxygenated blood is usually carried by *arteries*, which are thick-walled and carry blood from the heart to different parts of the body through high pressure.

→ ***Exception: The pulmonary artery carries deoxygenated blood from the heart to the lungs.***

• Deoxygenated blood is usually carried by *veins*, which carry blood from different parts of the body back to the heart.

→ ***Exception: The pulmonary vein carries oxygenated blood from the lungs to the heart.***

• Blood passes into the right ventricle through the tricuspid valve.

> ***Varicose veins: Swollen blush veins resulting from the valves that do not close properly.***

2. **Right Ventricle**

• Location: Lower right side of the heart.

• Function: It receives blood from the right atrium.

• Pumps *deoxygenated blood* to the lungs via the pulmonary artery.

Valves Involved:

• ***Tricuspid valve:*** It prevents backflow into the right atrium.

• ***Pulmonary valve:*** It controls flow from right ventricle to pulmonary artery.

3. **Left Atrium**

• Location: Upper left side of the heart

• Function: It receives *oxygenated blood* from the lungs through four *pulmonary veins*.

• Blood flows from the left atrium into the left ventricle through bicuspid (mitral) valve.

4. **Left Ventricle**

• Location: Lower left side of the heart.

• It is the *thickest chamber* of the heart.

• Function: It receives *oxygen-rich blood* from the *left atrium* and pumps blood into the *aorta*, which supplies it to the entire body.

Valves Involved:

• ***Bicuspid (mitral) valve:*** It prevents backflow into the left atrium.

• ***Aortic valve:*** It prevents backflow from aorta to the left ventricle.

> • ***Aorta: It is the largest artery in human body.***
> • ***Inferior Vena Cava: It is the largest vein in human body.***

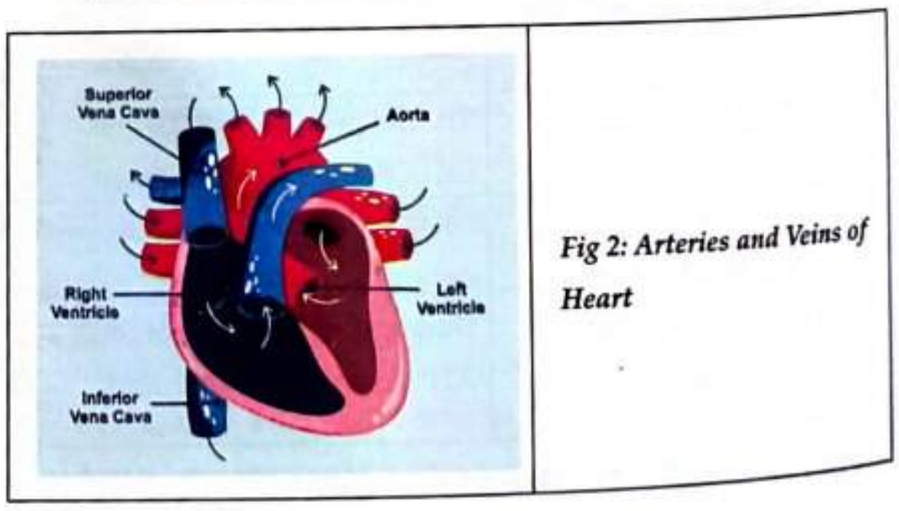

Fig 2: Arteries and Veins of Heart

Double Circulation

• Double circulation is the type of blood circulation in humans (and all mammals) where the *blood passes through the heart twice* during one complete cycle around the body.

> ***Blood circulation was discovered by William Harvey.***

E.g.

(i) The blood pumped by the right ventricle (deoxygenated blood) is transported through pulmonary artery to lungs where *CO_2 is exchanged*

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with O_2 through diffusion and returns back to the heart through *pulmonary vein.*

(ii) The oxygenated blood from left ventricle is transported through *aorta* to different body parts (cells and tissues) where *O_2 is exchanged with CO_2* through diffusion and then returned back to the heart through *vena-cava.*

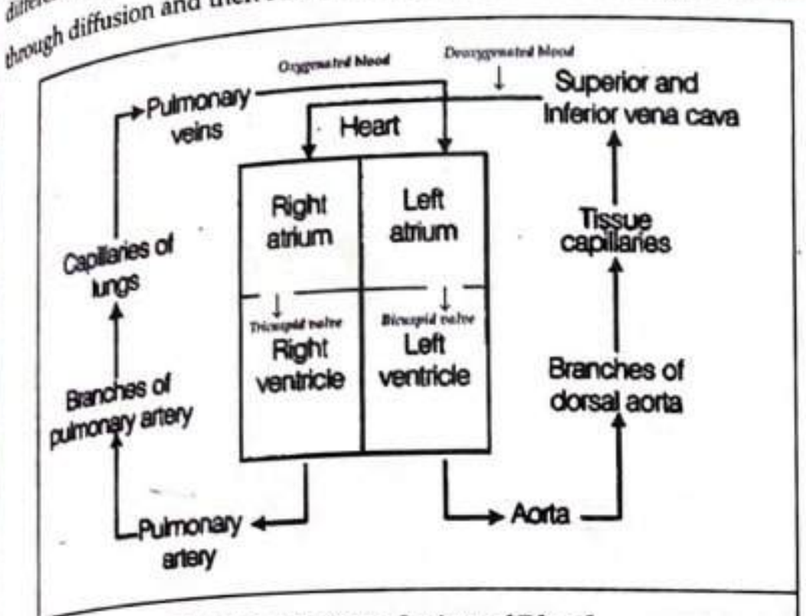
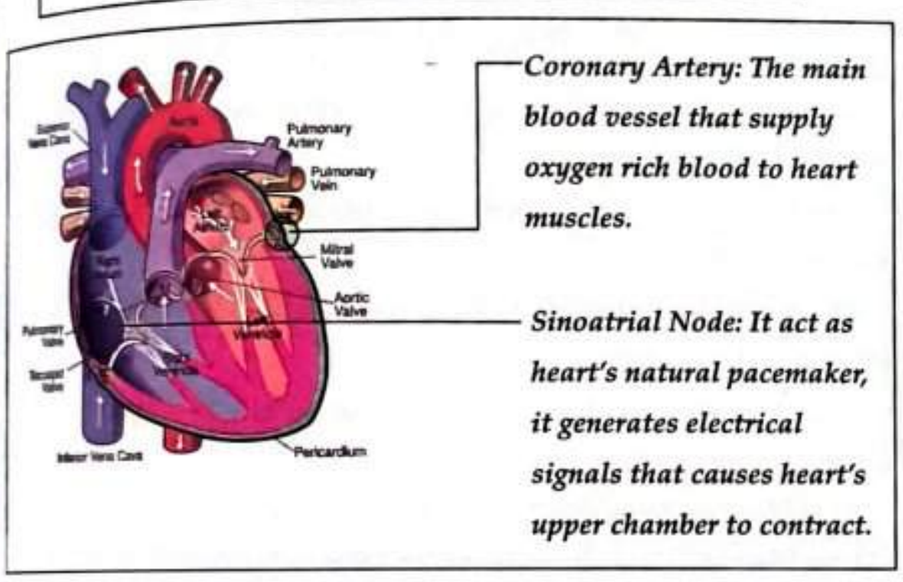


Fig 3: Double Circulation of Blood



Coronary Artery: The main blood vessel that supply oxygen rich blood to heart muscles.

Sinoatrial Node: It act as heart's natural pacemaker, it generates electrical signals that causes heart's upper chamber to contract.

Sphygmomanometer

- A sphygmomanometer is a medical instrument used to measure *blood pressure.*

It Measures:

- ***Systolic Pressure:*** The heart *contracts* and *pumps blood out* of the body (normal: *~120 mm of Hg*).
- ***Diastolic Pressure:*** The heart *relaxes* and *fills with blood* to prepare for the next beat (normal: *~80 mm of Hg*).

Pulse Rate

- The number of times your heart beats per minute.
- Normal range: *60-100 beats per minute.*

pH of human blood is: 7.4

Blood

- Blood is a special connective tissue consists of fluid matrix (plasma), and solid components (blood cells).
- There are three main types of blood cells: *RBC (Red blood cells), WBC (White blood cells),* and *Platelets.*

RBC (Red Blood Cells)/Erythrocytes

- ***Structure:*** Red in colour, circular and biconcave in shape, denucleated, elastic, lack of cell organelles like ER, ribosomes, mitochondria etc.
- Normal range of RBC count in human blood: *4.5 to 5.5 million per cubic millimetre.*
- ***Formed in:*** Bone marrow (from birth) having a lifespan of *about 120 days.*
- ***Function:*** Transport of oxygen and some amount of CO_2.
- ***Graveyard of RBC:*** *Spleen* (a large bean-shaped lymphoid organ).

Low blood count causes Anemia.

WBC (White Blood Cells)/Leukocytes

- Normal range of WBC count in human blood: *5000-8000 per cubic millimetre.*

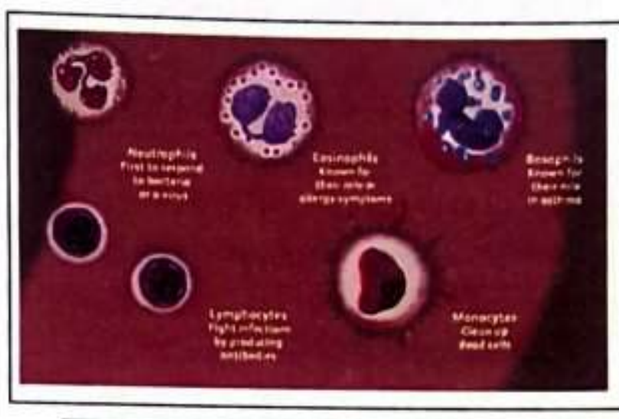


Fig 4: Types of WBC Cells

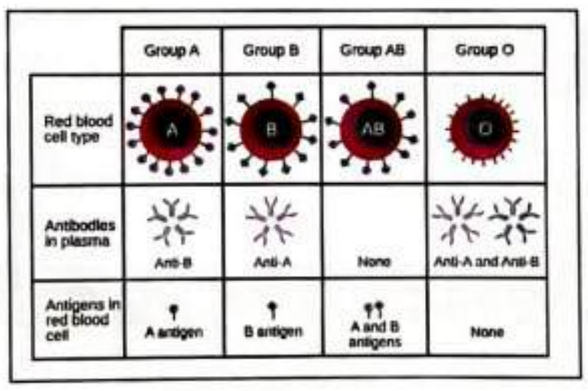
Leukemia is a type of blood cancer that affects blood cells in bone marrow usually WBCs.

Plasma

- The *liquid part of blood* or *lymph* which is yellow coloured, viscous fluid and contains about *90-92%* of water and *6-8%* proteins.

Blood Group

- The four main blood groups *(A, B, AB, and O)* were discovered by Austrian scientist *Karl Landsteiner* in *1900*. He identified the *O, A, and B* blood types, which led to the understanding of the *ABO* blood group system.
- Bombay Blood Group was discovered by *Y. M. Bhende* in *1952*.



Universal donor: O-
Universal acceptor: AB+

Blood Types	Gives	Receives
A+	A+, AB+	A+, A-, O+, O-
O+	O+, A+, B+, AB+	O+, O-
B+	B+, AB+	B+, B-, O+, O-
AB+	AB+	Everyone
A-	A+, A-, AB+, AB-	A-, O-
O-	Everyone	O-
B-	B+, B-, AB+, AB-	B-, O-
AB-	AB+, AB-	AB-, A-, B-, O-

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Rh Factor

- The Rh factor *(Rhesus factor)* is an inherited protein found on the surface of red blood cells. The name "Rh" comes from the *rhesus monkey*, whose red blood cells were first used in research to detect this antigen in humans.
- If a person has the Rh protein, they are said to be *Rh-positive (Rh+)*. If they lack the Rh protein, they are *Rh-negative (Rh-)*.

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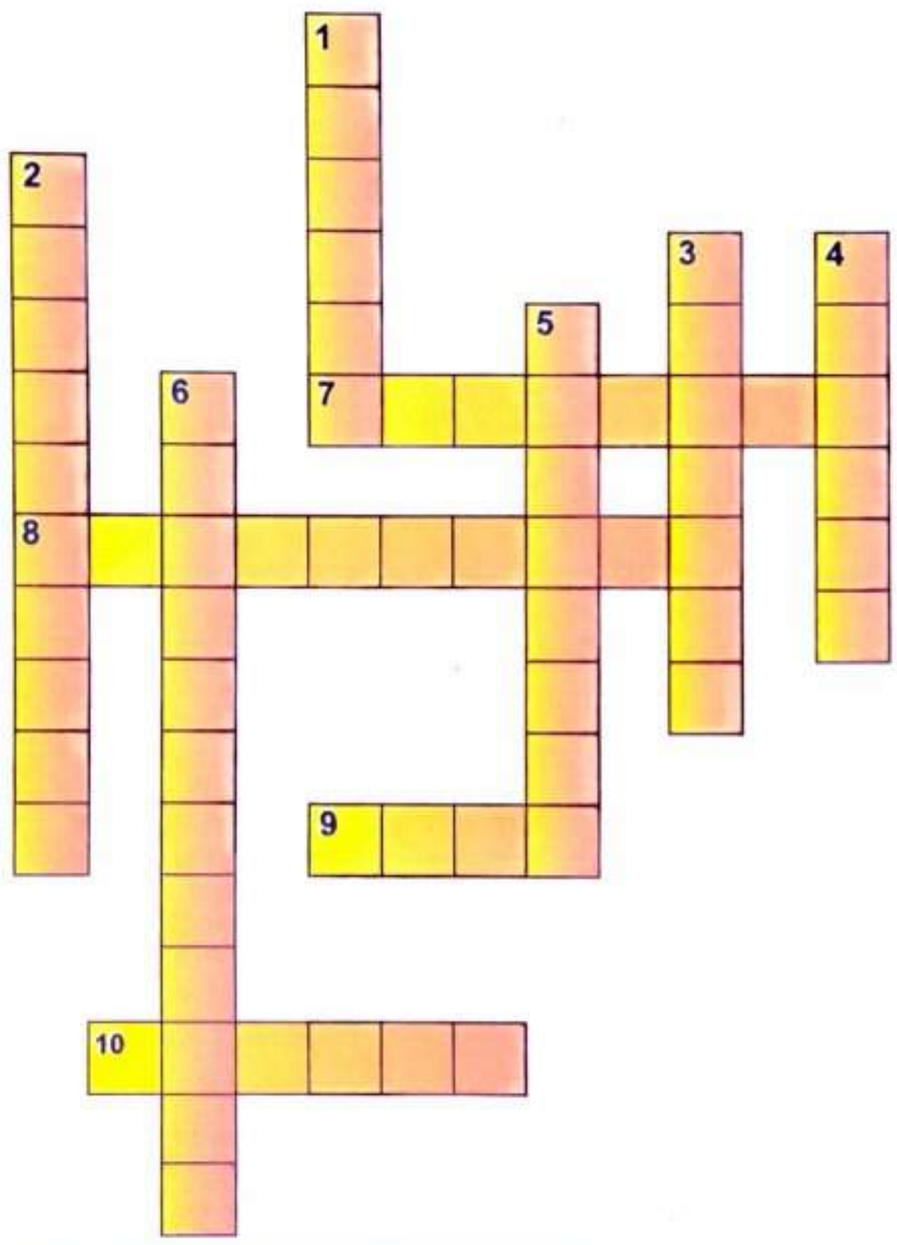
DIGESTION AND RESPIRATION



Across

7. Antibacterial enzyme in saliva and tears.
8. Connects mouth to stomach.
9. Fat-emulsifying secretion stored in gallbladder.
10. Enzyme breaking down emulsified fats.

Down

1. Cavity where carbohydrate digestion begins.
2. Good microbes restoring digestive health.
3. Pancreatic enzyme for protein digestion.
4. Pouch between small and large intestine.
5. Indigestible portion essential for digestion.
6. Process of absorbing nutrients into blood.

EXCRETORY SYSTEM

- The excretory system is responsible for removing waste products from the body to maintain internal chemical balance (homeostasis). The main waste product removed is urea, along with excess water and salts.
- The main organs of the human excretory system: *Kidneys (2), Ureters (2), Urinary Bladder and Urethra.*

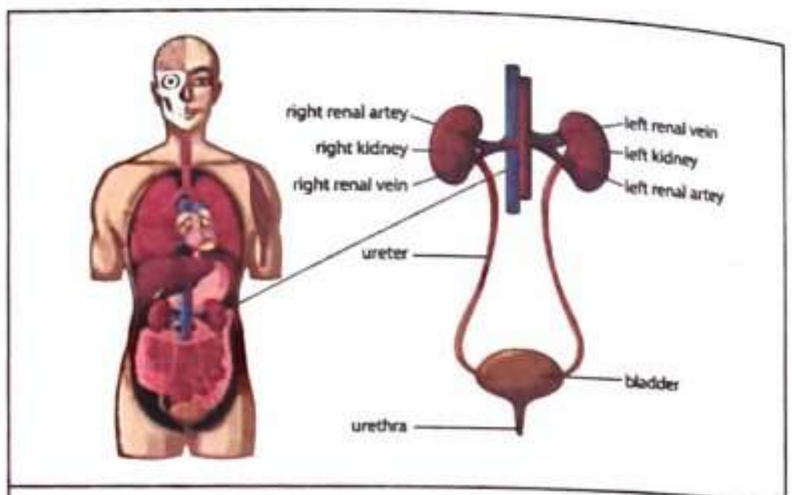


Fig 5: Excretory System

Kidneys

- Size and structure: *10-12 cm* in length, *5-7 cm* in width, *2-3 cm* thick, and average weight is about *120-170 g*.
- It is a *bean-shaped organs* located on either side of the backbone, just below the ribcage.
- Right kidney is positioned *slightly lower* in comparison to left kidney (located on dorsal side).
- Main function: Filter blood to remove urea, excess salts, and water, forming urine.
- Each kidney contains about *1 million nephrons* (basic functional units).
- Outer layer of kidney: Renal cortex and Renal capsule.

Nephrons

- It is a basic unit of Kidney.
- Nephrons remove waste material from blood, through ultrafiltration.

Structure of Nephron

→ ***Bowman's Capsule:*** *Cup-shaped* structure that encloses the glomerulus.

→ ***Glomerulus:*** A bunch of capillaries where blood is filtered. The filtration of blood in glomerulus, about *1100-1200 mL* of blood is filtered by the kidney per minute.

→ ***PCT (Proximal convoluted tubule):*** Reabsorbs useful substances like glucose, water, and salts.

→ ***Collecting Duct:*** Collects urine and passes it to the renal pelvis.

→ ***JGA (Juxtaglomerular Apparatus):*** Responsible for regulating *blood pressure* and *glomerular filtration rate* (GFR).

Processes in the Nephron

- ***Ultrafiltration:*** Blood pressure forces water and solutes into the Bowman's capsule.
- ***Reabsorption:*** Useful substances (like glucose and some water) are reabsorbed in the tubule.
- ***Secretion:*** Some extra wastes are actively secreted into the tubule.
- ***Excretion:*** Final urine is sent to the collecting duct.

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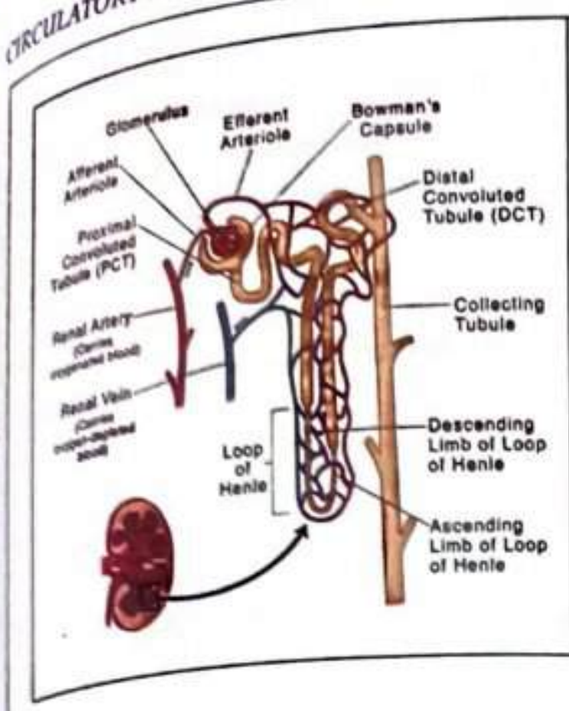

Fig 6: Nephron Structure

Ureters

- Two narrow tubes that carry urine from the kidneys to the urinary bladder.

Urinary Bladder

- It is a muscular sac that stores urine temporarily that can expand and contract.
- When urinary bladder is full, it sends signals to the brain to initiate urination.

Urethra

- It is a tube through which urine is excreted out of the body.
- It is controlled by a *sphincter muscle* that opens during urination.

Dialysis

- The procedure involves *filtering of waste* and *excess fluid* from the blood, when the kidneys are no longer functioning properly, the machine removes blood from body filters it through a *dialyzer* and returns the clean blood to the body.

> *Urea (NH_2CONH_2) was first synthesised by Friedrich Wöhler in 1828 from simple inorganic compounds NH_4Cl and KNO.*

Urine

- Urine components: *Water* (95%) and *Urea* (2%).
- pH: 4.5-5.
- Waste Product: *Ammonia* (Kidney converts ammonia into urea).
- The colour of urine is *yellow* → This colour comes from *urochrome/urobilin*, a waste product that comes from breakdown of *haemoglobin*.

Kidney Stone

- Kidney stones (made of *Calcium Oxalate*) are hard deposit of minerals and acid salts that stick together in concentrated *urine*.
- ***Main causes of kidney stones:*** Drinking less than 2L of water, obesity, eating food with too much salt and sugar.

> *• Bilirubin: An orange-yellow pigment formed in the liver by breakdown of haemoglobin and excreted in bile.*
> *• The colour of solid waste from anus is yellow due to bilirubin.*

Role of Other Organs in Excretion

- ***Lungs:*** It removes CO_2 (18L/day) and water.
- ***Liver:*** It secretes bile pigments like *bilirubin* and *biliverdin*, which are by products of the breakdown of hemoglobin. These substances, along with cholesterol, certain drugs, and degraded steroids hormones are eliminated from the blood via bile.
- ***Sweat and sebaceous glands:*** The sweat glands of the skin help eliminate a small amount of *urea, sodium chloride (NaCl), lactic acid* through sweat. The sebaceous gland secrete sebum, an oily substance that helps eliminate certain lipid-based waste products, such as steroids, hydrocarbons, and waxes.
- ***Saliva:*** It can help to eliminate small amount of *nitrogenous waste*.

Excretion in Animals

- ***Ammonotelism:*** The animals which excrete *ammonia* are called ammonotelic and excretion of ammonia is known as *ammonotelism*. ***E.g. Amoeba, sycon, hydra, liver fluke, tapeworm, Leech, Prawn, bony fishes, etc.***
- ***Ureotelism:*** Excretion of *urea* is known as ureotelism and the animals which excrete urea are *ureotelic animals*. ***E.g. Mammals, many terrestrial amphibians and marine fishes and sting rays, etc.***
- ***Uricotelism:*** Excretion of *uric-acid* is known as uricotelism and the animals which excrete uric-acids are called *uricotelic*. ***E.g. Most insects, land snails, lizards, etc.***

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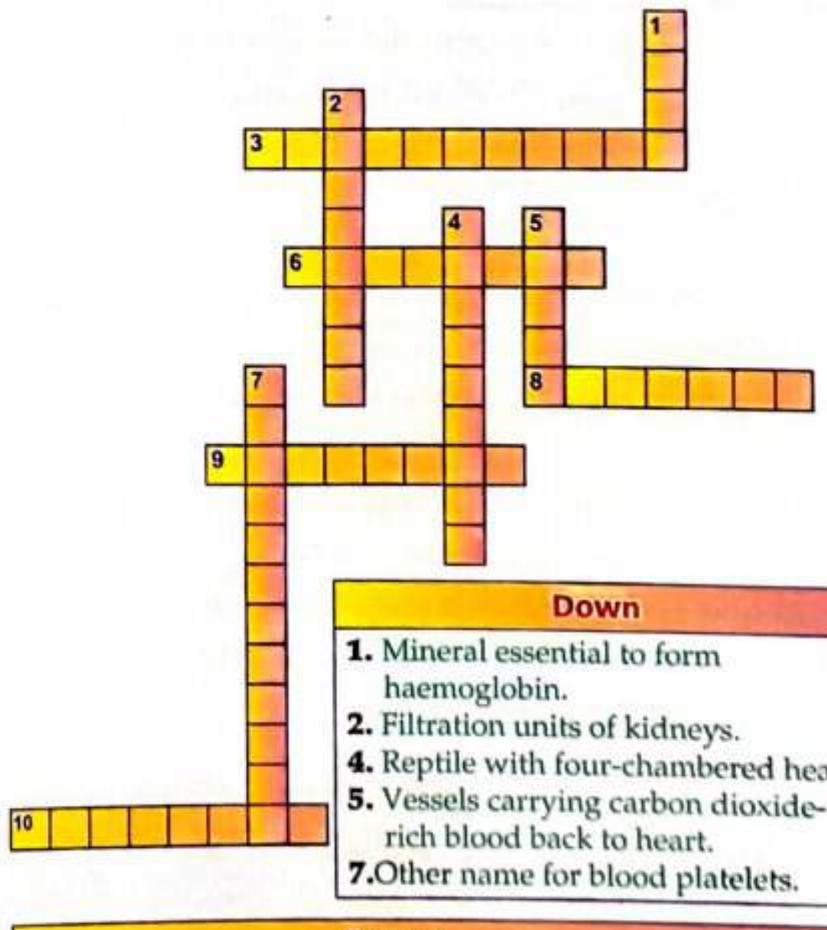
CIRCULATORY SYSTEM AND EXCRETORY SYSTEM



Down

1. Mineral essential to form haemoglobin.
2. Filtration units of kidneys.
4. Reptile with four-chambered heart.
5. Vessels carrying carbon dioxide-rich blood back to heart.
7. Other name for blood platelets.

Across

3. Pigment giving blood its red colour.
6. Vessels carrying blood away from the heart.
8. Large bean-shaped lymphoid organ.
9. Chemical responsible for yellow colour of urine.
10. Swollen bluish veins due to valve failure.

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DISEASES

• A disease can be defined as any disturbance in the internal structure and function of any organ or part of the body, which is usually associated with specific signs and symptoms.

Classification of Diseases on Basis of Time

Acute Diseases	*Chronic Diseases*
They last for a short period of time, cause major effects on health in a short time *E.g. Fever, cold, cough,* etc.	They last for a longer period of time and takes a long time to cause major effects on health *E.g. Diabetes, TB (tuberculosis), Elephantiasis, etc.*

Communicable and Non-Communicable Diseases

Communicable Diseases	*Non-Communicable Diseases*
These are diseases which spread from one person to another They are caused by pathogens *E.g. Malaria, AIDS, TB, chicken pox, COVID, etc.*	These are diseases which do not spread from one person to another They are caused by deficiency of nutrients or due to some allergy or proliferation of abnormal cells *E.g. Diabetes, arthritis, asthma, cancer, etc.*

Pathogens Responsible for Diseases

• Pathogens are disease-causing agents, that are responsible for *causing infections* and *diseases in their hosts*, often by entering the body and causing physiological disruptions.

Pathogens include:

Virus:

• They are small infectious agents that *need a host cell to replicate* and cause diseases like the *common cold, flu,* and *HIV*.

• In virus, the genetic material is included in a protein envelope known as *Capsid*.

• Genetic material in viruses are made up of *RNA* (retrovirus with single stranded RNA) or *DNA* (with double stranded DNA).

• Antibiotics work against the formation of cell wall. Viruses are surrounded by a protective protein coating; they don't have cell walls that can be attacked by antibiotics like bacteria do.

Bacteria:

• They are *single-celled organisms* that can reproduce and cause diseases like *pneumonia, strep throat,* and *food poisoning*.

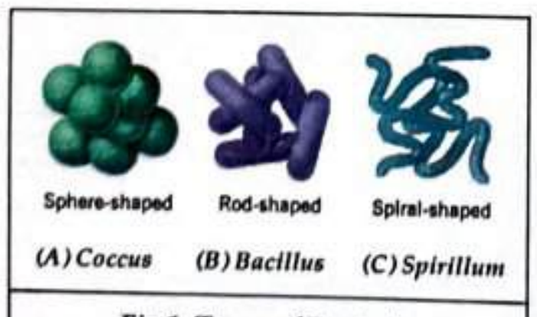


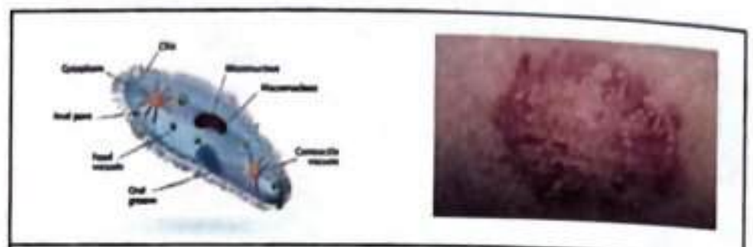
Fig 1: Types of Bacteria

Protozoa:

• They are one-celled organisms that can cause various diseases, including *intestinal infections, amoebiasis, giardiasis, toxoplasmosis*. There often spread through contaminated water or by insect bites.

Fungus

• A group of eukaryotic organism that can cause diseases like athlete's foot and yeast infections.



Protozoa | *Fungal Infection*

Virus Vs Bacteria

Virus	*Bacteria*
Genetic material: DNA/RNA + Protein (capsid)	They are prokaryotes, they lack true nucleus and membrane bound organelles. Instead, they have nucleoid and their genetic material is called Genophore (bacterial DNA)
Non-living entity	Unicellular and living entity
It needs a host cell	It divides on its own
Parasitic in nature	Parasitic/Saprophytic in nature
Antibiotics cannot be used to treat viral infections	Antibiotics can be used to treat bacterial infections
Smaller (20-400nm)	Larger (1000nm)

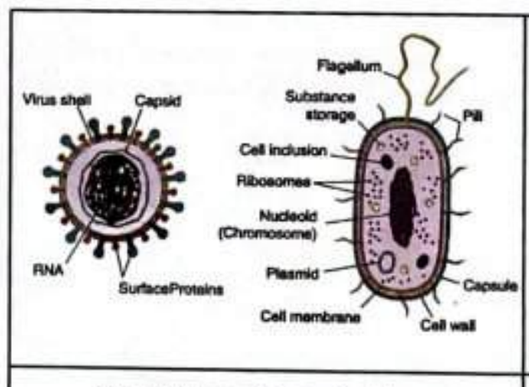


Fig 2: Virus Vs Bacteria

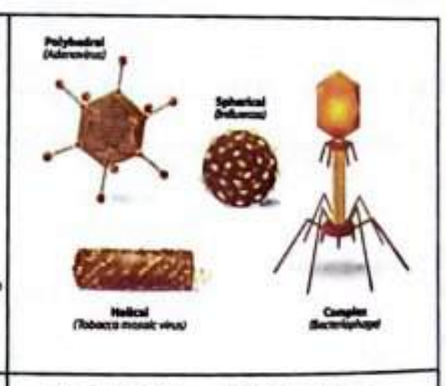
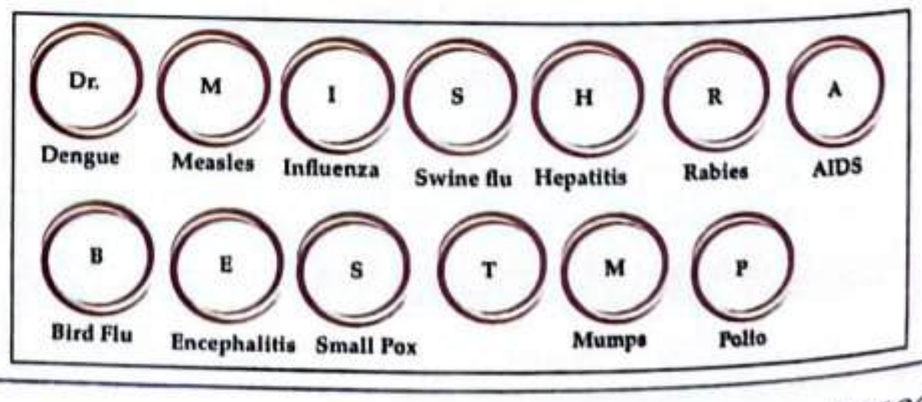


Fig 3: Different Viral Shapes

DISEASES CAUSED BY VIRUS

TRICK: *Dr. MISHRA BEST MP*



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Hepatitis *(Type A, B, and C)*

- *Affects:* Liver.
- *Symptom:* Jaundice (mainly affects liver).

→ *Hepatitis A:* Transmitted through food.

→ *Hepatitis B:* Sexually transmitted through bodily fluids.

→ *Hepatitis C:* Transmitted when in contact with infected blood.

Fig 4: Hepatitis affecting Liver

India's first indigenous Hepatitis-A vaccine: Havisure

Mumps

- It is a viral disease that affects the *parotid salivary glands* (cheek and jaw area).

Flu

- *Caused by: Influenza viruses → Types A, B, and C.*
- Influenza also known as *"evil influence of stars"*.

Common Cold

- *Caused by: Rhinovirus.*

Polio

- *Caused by: Poliomyelitis/Polio virus.*
- Polio is totally eradicated from India, as declared in *2014*.
- It affects the nervous system, the nerves in *spinal cord* or *brain stem cells*.
- First polio vaccine was created by: *Dr. Jonas Salk.*
- India launched the *Pulse Polio Immunisation Programme* on *October 2, 1995*.

Poliomyelitis

Cervical Cancer

- *Caused by: Human Papillomavirus Causes (HPV).*
- It affects the cervix region in women.
- *Detected through: PAP Smear Test.*

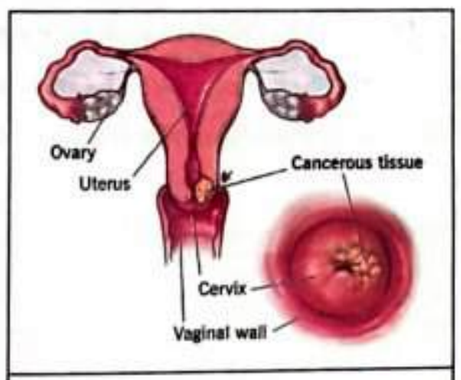


Fig 5: Cervical Cancer in Cervix Region

Chicken Pox

- *Caused by: Varicella Zoster Virus.*

Small Pox

- *Caused by: Variola Virus.*
- *Vaccine by: Edward Jenner (1796).*
- Eradicated from India in: *1977.*

Dengue

- *Caused by: Flavivirus (DENV1-4).*
- *Carrier of virus: Aedes Aegypti mosquito* (also responsible for Chikungunya).

Rabies

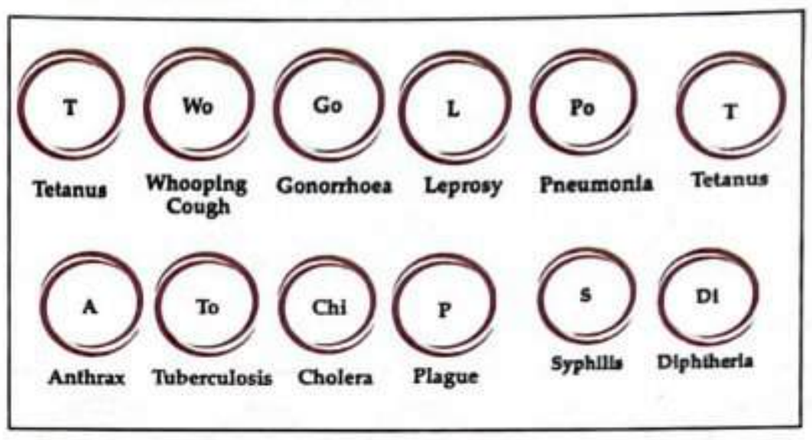
- *Caused by: Lyssavirus.*
- In rabies Central Nervous System (CNS) is affected which leads to hydrophobia.

AIDS (Acquired Immunodeficiency Syndrome)

- *Caused by: HIV (Human Immunodeficiency Virus → retrovirus).*
- It is a sexually-transmitted disease.
- *Death:* Due to weak immune system.
- *Method of transmission:* Sexual contact, blood transfusions, from mother to baby.
- *Test for detection: ELISA Test* (Enzyme-linked Immunosorbent Assay).
- *"AIDS DAY"* is celebrated on: *1st Dec.*

DISEASES CAUSED BY BACTERIA

TRICK: *TWo GoL PoTATo ChIPS Di*



Plague

- *Caused by: Yersinia pestis.*
- Death due to plague known as: *Black Death.*
- *1897-1906:* 12 Million deaths in India was reported.

Leprosy

- *Caused by: Mycobacterium leprae.*
- Leprosy affects skin and is also known as *Hansen's Disease*.

Fig 6: Cholera affecting Small Intestine

Cholera

- *Caused by: Vibrio cholera.*
- It is a water borne disease. Death caused due to cholera is known as *"Blue Death"*.

Bronchitis

- *Caused by: Bordetella pertussis.*
- It causes inflammation of the lining of bronchial tubes, which carry air to and from the lungs.

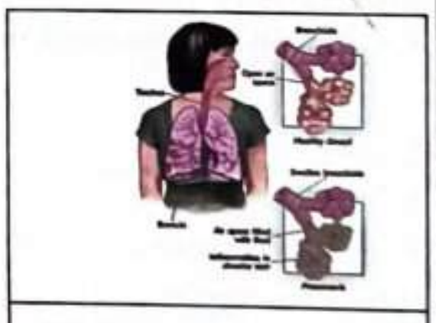


Fig 7: Pneumonia affecting lungs

TB *(Tuberculosis Bronchitis)*

- *Caused by: Mycobacterium tuberculosis.*
- Vaccine provided against it: *BCG* (Bacillus Calmette-Guerin).

Fig 8: Tuberculosis affected lungs

Pneumonia

- *Caused by: Streptococcus pneumoniae.*

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Diphtheria

- ***Caused by:*** *Corynebacterium diphtheriae.*
- It affects the respiratory system (mucous membranes of nose and throat).

Diarrhoea

- ***Caused by:*** *E. Coli (Escherichia coli).*

> *E. Coli is a gram-negative facultative anaerobic, rod-shaped, coliform bacterium.*

Peptic Ulcers

- ***Caused by:*** *Helicobacter pylori.*

Typhoid

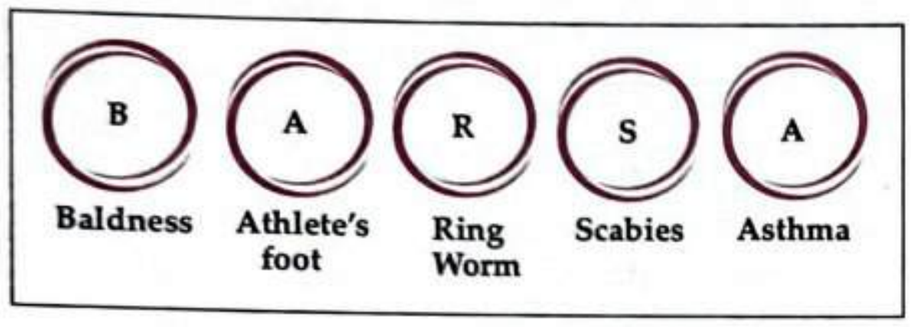
- ***Caused by:*** *Salmonella typhi.*
- It affects small intestine (gut).
- Test to detect Typhoid: *Widal Test.*

Acne

- ***Caused by:*** *Staphylococcus bacteria.*

DISEASES CAUSED BY FUNGUS

TRICK: ***BARSA***



Baldness

- A fungal infection specifically *tinea capitis*, also known as *scalp ringworm*, can cause patchy hair loss.

Athlete's Foot

- A type of *ring worm* disease that affects the feet.

Ring Worm

- A common skin infection that can cause a red, itchy rash.

Scabies

- ***Caused by:*** *Sarcoptes scabiei* (a microscopic mite).
- This mite burrows into the skin, where it lays eggs that hatch into adult mites. The mites cause an itchy rash.

Asthma

- Fungal exposure can be a significant trigger or contributor to asthma symptoms

DISEASES CAUSED BY PROTOZOA

Malaria

- ***Malaria Day:*** *25th April.*
- ***Protozoa:*** *Plasmodium.*

> *Cinchona tree is found in Evergreen Forest.*

- ***Carrier:*** Female *Anopheles* mosquito.
- ***Treatment:*** *Quinine* (found in bark of *cinchona tree*).

Sleeping Sickness

- ***Protozoa:*** *Trypanosoma.*
- ***Carrier:*** *Tse Tse fly.*

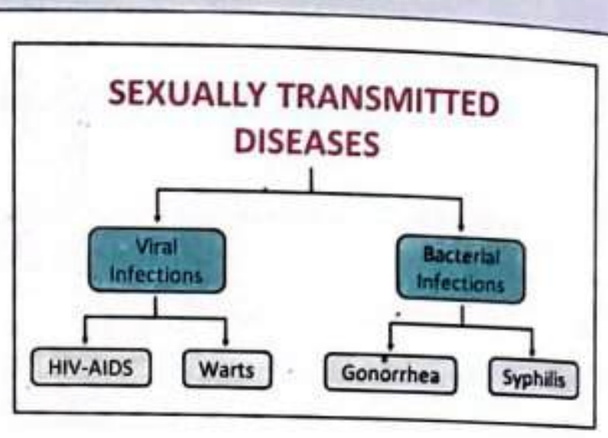
Kala Azar

- ***Protozoa:*** *Leishmania.*
- ***Carrier:*** *Sandfly.*

Fig 9: Enlargement of Spleen and Liver due to Kala Azar Disease

Water-borne Diseases	*Air-borne Diseases*
Hepatitis A	Influenza
Diarrhoea	Tuberculosis
Typhoid	Measles
Cholera	Pertussis
Giardiasis	Chickenpox
	Covid-19

GENETIC DISORDERS



1. ***Chromosomes:*** Disorders in chromosomes.

- ***Autosomal Disorders:*** A genetic disorder that occurs when a *gene on a non-sex chromosome is muted.*

E.g. Down's syndrome: The person has an extra copy (or partial copy) of chromosome 21 (Trisomy 21) for a total of 47 chromosomes instead of 46; Albinism (the body makes little or no melanin).

- ***Sex-Linked Disorders:*** Disorders that affect the *sex chromosomes.*

E.g. Turner's syndrome: One X chromosome is missing in females (XO); Klinefelter's syndrome: One extra X chromosome is present in males (XXY).

> *Haemophilia affects the recessive gene located on X chromosome. It is a rare disorder in which the blood does not clot.*

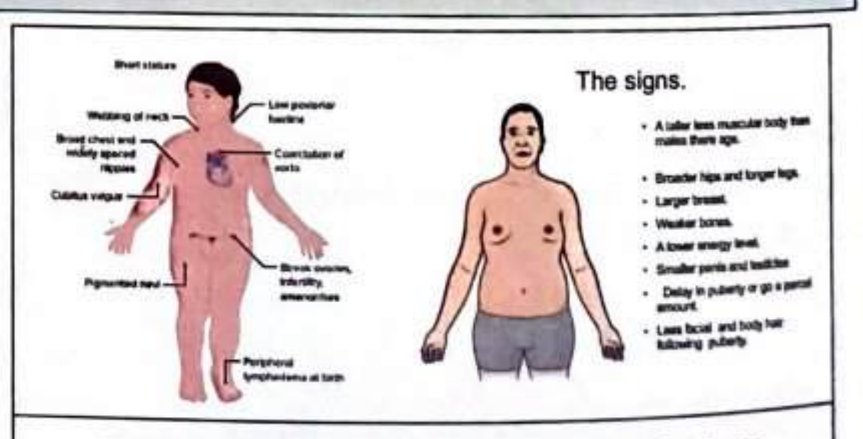


Fig 10: Turner's Syndrome and Klinefelter's Syndrome

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2. ***Mendelian Disorders:*** Disorders that may occur mainly by the alteration or mutation in a single gene. ***E.g. Sickle cell anaemia, Thalassemia, Colour blindness, Haemophilia, etc.***

Glaucoma

- It is a disease that damages the *eye's optic nerve* leading to vision loss or blindness (usually a genetic disorder).
- Glaucoma is caused when there is an increase in *eye fluid pressure*

(*Trachoma* is another disease in which fluid pressure of eye increases but due to a bacteria called *Chlamydia trachomatis*).

Pandemic, Epidemic and Endemic

Pandemic	*Epidemic*	*Endemic*
Sudden increase in cases across several countries, continents, or the world	Sudden increase in cases spreading through a large population	The diseases that are constantly present in a population or region with relatively low spread

Some Other Diseases

- ***Wilson Disease:*** Wilson disease is a rare, autosomal recessive disorder caused by abnormal *copper* accumulation in the body particularly involving the brain, liver, and cornea

- ***Mad Hatter Disease:*** Mad hatter's disease refers to neurological symptoms of *mercury* poisoning (also responsible for *Minamata Disease*) over a long period of exposure.

- ***Siderosis Disease:*** It is caused due to excessive deposition of *iron* in body tissue.

- ***Itai Itai:*** It is caused due to *cadmium* deposition.

- ***Blue Baby Syndrome:*** It is caused due to *nitrate* deposition.

> *• Patau syndrome, also known as trisomy 13, is a genetic disorder caused by having an extra copy of chromosome 13.*
> *• Charcot-Marie-Tooth disease is caused by duplication of the peripheral myelin protein-22 (PMP22) gene on chromosome 17.*

DISEASES IN PLANTS

Disease	*Causal Organism*	*Affects*
Citrus canker	Bacteria	Affects Citrus fruits
Rust of wheat	Fungus	
Yellow vein mosaic	Virus	Affects okra plants
Aster Yellow	Bacteria	
Crown Gall	Bacteria	
Ergot	Fungus	Affects bajra plants
Snow mold	Fungus	
Black knot	Fungus	
Blight	Fungus/Bacteria	
Tobacco mosaic virus	Fungus	Tobacco plant

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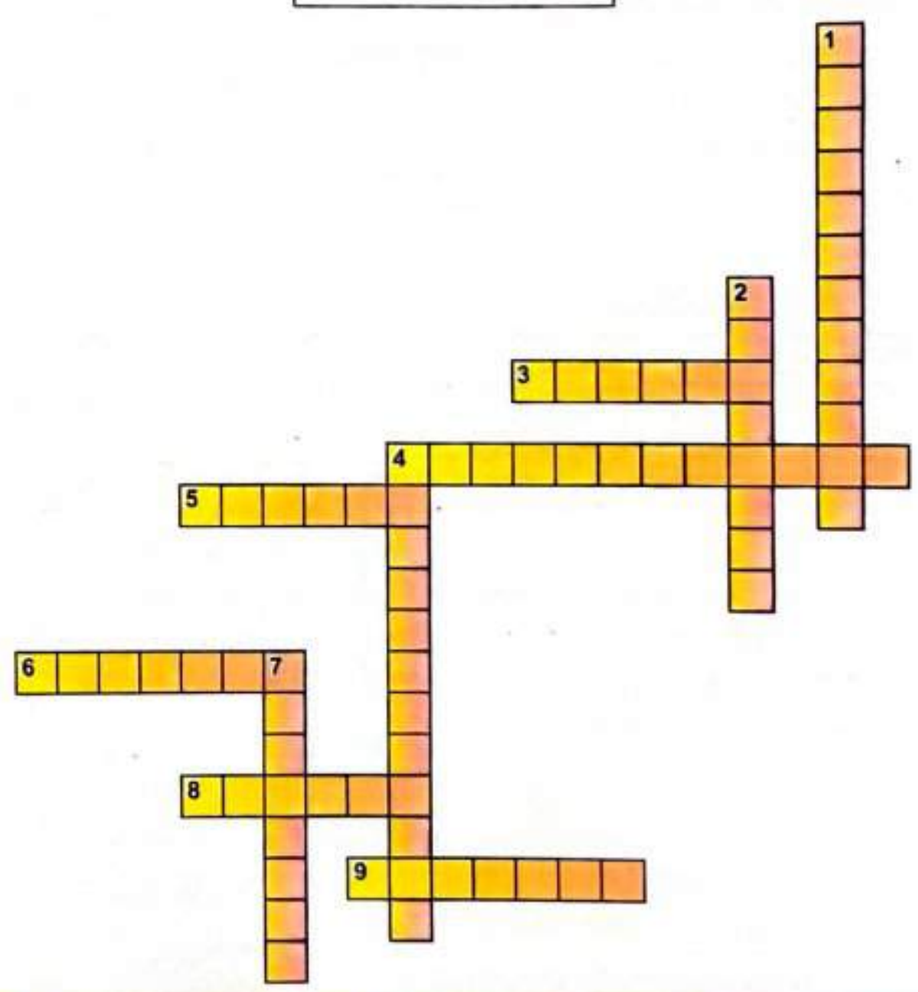
DISEASES



Across

3. Heart-related chest pain.
4. Low calcium condition.
5. Vitamin C deficiency disease.
6. Food-borne bacterial disease.
8. Disease caused by iodine deficiency.
9. Bone disorder due to Vitamin D deficiency.

Down

1. Bacterial infection affecting lungs.
2. Inability to regulate blood sugar levels.
4. Sodium-related electrolyte disorder.
7. Genetic disorder affecting pigmentation.

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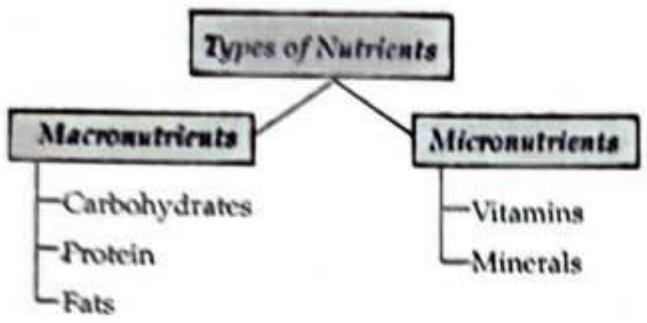
NUTRITION IN ANIMALS

Nutrients divided into two categories:

1. **Macronutrients:** Macronutrients are nutrients that the *body needs in large amounts* to function, including carbohydrates, fats, and proteins.
2. **Micronutrients:** Micronutrients are vitamins and minerals that the *body needs in small amounts* for growth, development, and health.

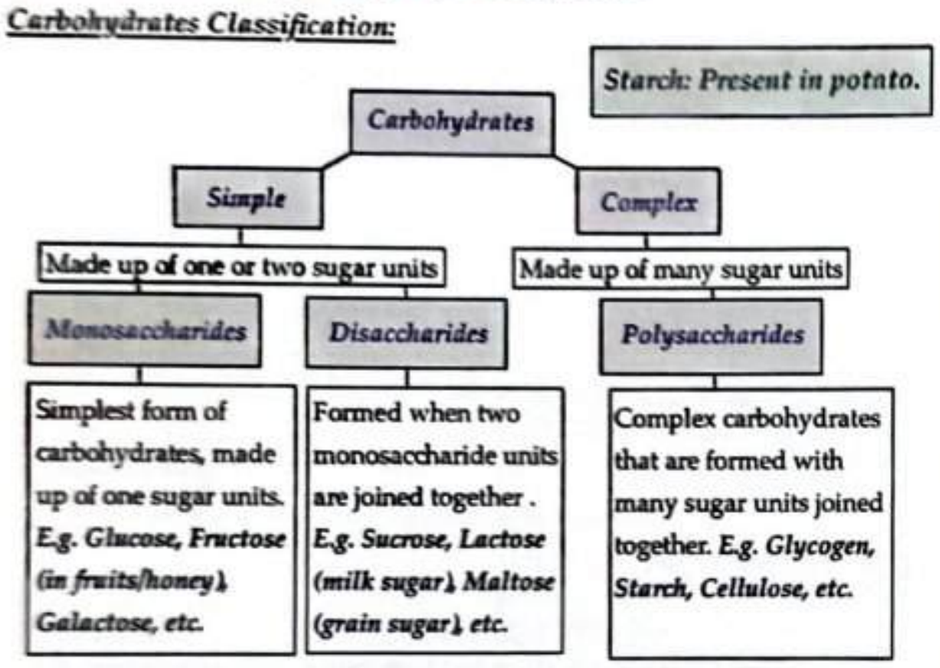


MACRONUTRIENTS

Carbohydrates

- Carbohydrates are biomolecules composed of carbon, hydrogen, and oxygen, primarily used as a source of energy in living organisms.
- These are quick form of energy.
- *4 calories are released from 1 gm of carbohydrates.*

→ **Carbohydrates Classification:**



Fats

**9 calories are released from from 1 gm of fat.*

- Fats are a crucial type of nutrient, vital for energy, building cell structures, and supporting various bodily functions.
- *Adipose tissues* in our body store fats in the form of *triglycerides*.

Types:

1. **Saturated Fats:** They are *not easily digested* as the molecules are tightly packed together. They have higher melting point and are found in red meat, pork, etc.
2. **Unsaturated Fats:** They are *easily digested* in our body and healthier in comparison to saturated fats. They are found in vegetable oil, nuts, and seeds.

Nuts, vegetable oil, fish are rich source of Omega-3.

Proteins

- Proteins are built from smaller units called *amino acids*.
- ***Requirement:*** *0.8 gm/kg* of body weight per day.
- ***Present in:*** Egg, yolk, soybeans, pulses, chicken, fish, etc.

Proteins in:

- ***Milk:*** *Casein*
- ***Hair/Nail:*** *Keratin*
- ***Rice:*** *Glutelin, Albumin*
- ***Grains:*** *Gluten*
- ***Egg white:*** *Albumin*

The white part of an egg solidifies when cooked due to the process of protein denaturation.

Amino Acids

- Amino acids are the fundamental building blocks of proteins.
- There are total *20* amino acids, out of which *9* are essential amino acids.

Types:

1. **Essential Amino Acids:** Essential amino acids, which the *body cannot synthesize*, must be obtained through the diet.

Amino Acids	Functions
Histidine	Important for growth, tissue repair, and production of histamine (immune response)
Isoleucine	Helps in muscle metabolism and energy regulation; found in muscle tissue
Leucine	Stimulates protein synthesis, muscle repair, and regulates blood sugar levels
Lysine	Aids calcium absorption, collagen formation, and immune system function
Methionine	Involved in metabolism and detoxification; precursor of other amino acids
Phenylalanine	Precursor to neurotransmitters (dopamine, epinephrine); improves mood and alertness
Threonine	Helps with protein balance, tooth enamel, and fat metabolism
Tryptophan	Precursor of serotonin and melatonin (affects mood and sleep)
Valine	Promotes muscle growth and tissue repair; provides energy

2. **Non-Essential Amino Acids:** Non-essential amino acids can be *produced by the body*, but certain circumstances can make them temporarily essential.

→ **Types:** Glycine, Serine, Proline, Glutamic acid, Alanine, Aspartic acid, Cystine, Tyrosine, Asparagine, and Glutamine.

Diseases Caused by Deficiency of Proteins

Kwashiorkor

- Kwashiorkor is a type of malnutrition characterized by severe *protein deficiency*. It causes *fluid retention* and a *swollen, distended abdomen*.
- Kwashiorkor most commonly affects children, particularly in developing countries with high levels of poverty and food insecurity.

Kwashiorkor

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Marasmus

• Marasmus is a severe form of malnutrition caused by a *lack of calories* and *protein*, resulting in significant *loss of muscle mass* and *subcutaneous fat*. It's characterised by emaciation and wasting of the body, often affecting children in developing countries due to factors like poverty and food scarcity.

Marasmus

Vitamins

• Vitamins are essential, organic substances found in foods that are needed in small amounts for various bodily functions, including growth, metabolism, and nervous system activity.

Types of Vitamins

1. ***Water Soluble Vitamins:*** hese vitamins *dissolve in water* and are not stored in the body → *Vitamin B* and *Vitamin C*.
2. ***Fat Soluble Vitamins:*** These vitamins *dissolve in fat* and are stored in the body's fatty tissues and liver → *Vitamin A, Vitamin D, Vitamin E, Vitamin K*.

1912: Casimir Funk, coined the term "Vitamin".

Vitamin	Name	Deficiency/Symptoms
Vitamin A	Retinol	Night blindness
Vitamin B1	Thiamine	Beriberi disease
Vitamin B2	Riboflavin	Decrease in RBC
Vitamin B3	Niacin	Pellagra
Vitamin B5	Pantothenoic Acid	Fatigue, numbness, muscle cramps
Vitamin B6	Pyridoxine	Anaemia
Vitamin B7	Biotin	Hair loss, brittle nails, skin rashes
Vitamin B9	Folic acid	Fatigue, neural tube defects in babies
Vitamin B12	Cyanocobalamin	Pernicious anemia, memory loss, fatigue
Vitamin C	Ascorbic Acid	Scurvy (bleeding gums)
Vitamin D	Calciferol	Osteomalacia, muscle pain, rickets
Vitamin E	Tocopherol	Anti-sterility, vision problems
Vitamin K	Phylloquinone	Excessive bleeding, poor blood clotting, hemorrhagic disease in newborns

Vitamin D

• It is also known as "Sunshine Vitamin". It is also considered as a hormone.

Types:

• Vitamin D2 (Ergocalciferol): Helps in calcium absorption.

• Vitamin D3 (Cholecalciferol): More effective at raising vitamin D levels in the blood.

• Pellagra is also known as 3D Disease.

Sources of Vitamins

Vitamin	Sources
Vitamin A	Spinach, carrots, yellow fruits, sweet potatoes
Vitamin B	Meat (especially liver), seafood, poultry, eggs, dairy products, legumes, green leafy vegetables
Vitamin C	Spinach, lemon, oranges, amla, strawberries
Vitamin D	Cod liver oil, salmon, swordfish, tuna, egg yolk
Vitamin E	Kale, spinach, lettuce, parsley
Vitamin K	Soya bean, coriander, green leafy vegetables, peas

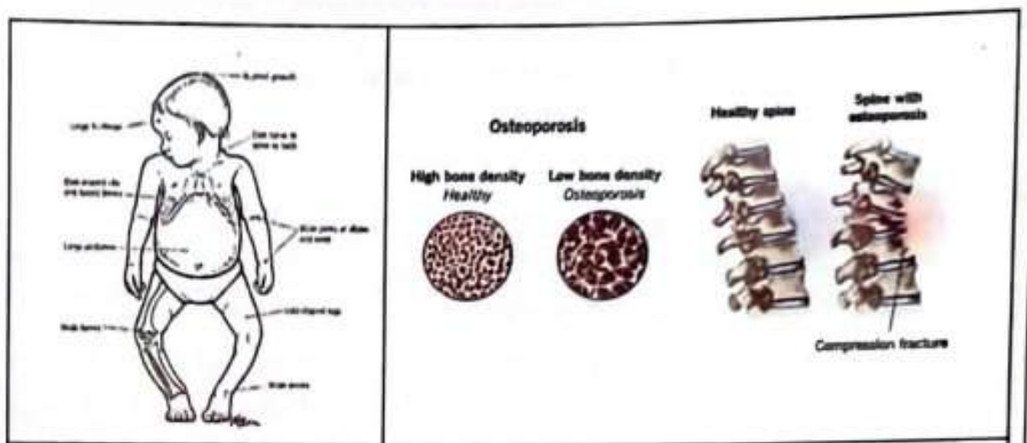

Fig 1: Child Suffering from Rickets | *Fig 2: Osteoporosis*

Osteoporosis: ***Osteoporosis is a bone disease that develops when bone mineral density and bone mass decreases.***

Osteomalacia: ***Osteomalacia, also known as "soft bones", is a metabolic bone disease that weakens bones and makes them more likely to break.***

Minerals

• Minerals are naturally occurring, inorganic chemical elements that the body needs in small amounts for proper development and functioning.

• Millets like *Jowar, Bajra, Ragi* have abundant minerals in them.

- ***Magnesium:*** Involved in metabolism, supports *bone health*. A typical adult human body contains about *25 g* of magnesium.
- ***Zinc:*** Important for wound healing, involved in *protein synthesis* and *cell growth*.
- ***Iodine:*** Essential component of *thyroid hormone* which regulates metabolism, growth, and development, iodine also impacts *brain function* and *cognitive development*.

• Excess fluoride in water causes *Fluorosis*.

Collagen

• Collagen is the most abundant protein of our body that are found in *extracellular spaces* (skin, bone joints).

• Triple helical structure of collagen was discovered by: *G. N. Ramachandran*.

• *Vitamin C* is important for synthesis of collagen.

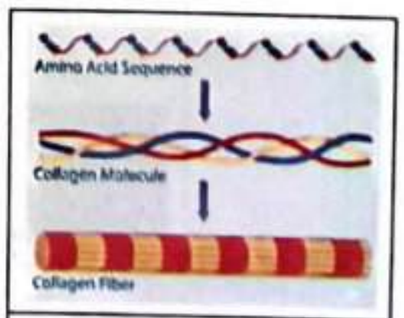

Fig 3: Structure of Collagen

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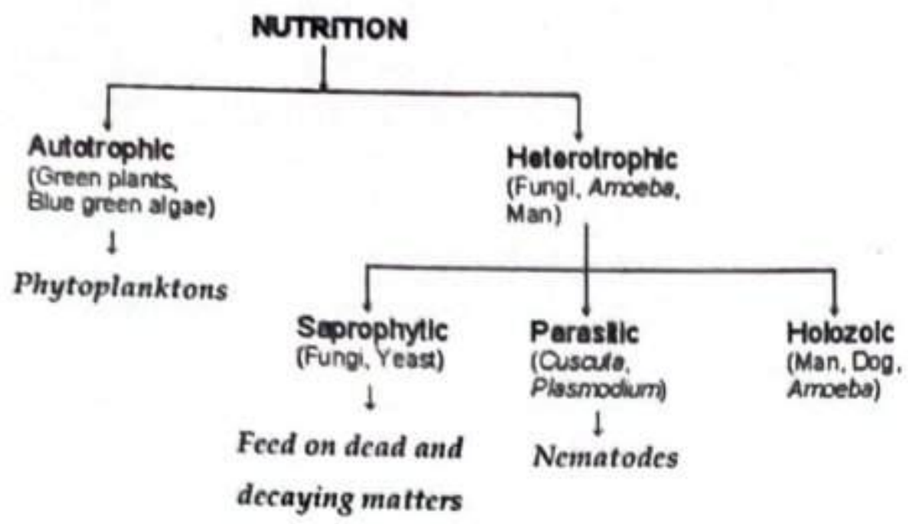
NUTRITION IN PLANTS

Modes of Nutrition



1. **Autotrophic:** In this mode of nutrition an organism can *produce its own* food, using light, water, carbon dioxide, and other chemicals.
2. **Heterotrophic:** In this mode of nutrition an organism *cannot produce its own food*, however, takes nutrition from other organisms, primarily plant or animal matter.

Types:

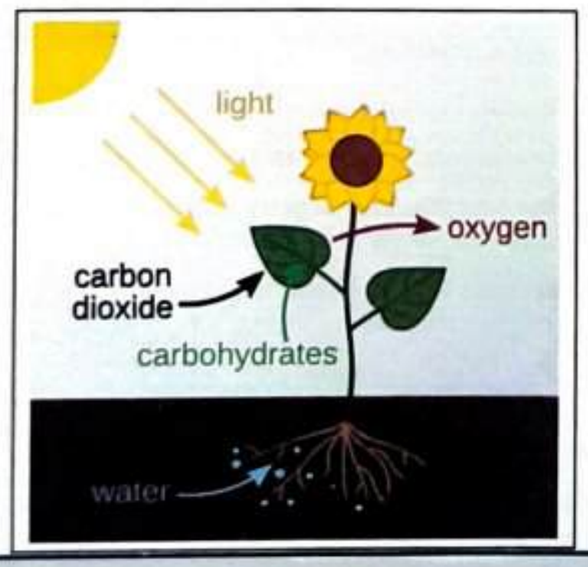
(a) **Saprophytic:** In this type of nutrition, the organism, particularly fungi, obtain *nutrients directly from dead organic matter or wastes.*

(b) **Parasitic:** In this type of nutrition, plants derive some or all of its nutrition requirements from *another living plant (host).*

(c) **Holozoic:** In this type of nutrition, the organism consume *solid or liquid food* and break it down internally.

Photosynthesis

- Photosynthesis is the process by which green plants make their own food using sunlight, carbon dioxide, and water.
- It takes place in the leaves, in cells containing chlorophyll. Sunlight provides energy to split water into hydrogen and oxygen. Carbon dioxide from the air combines with hydrogen to form glucose (sugar). Oxygen is released as a byproduct.



$$\text{Carbon dioxide} + \text{Water} \xrightarrow{\text{Sunlight}} \text{Glucose} + \text{Oxygen}$$

$$6CO_2 + 6H_2O \xrightarrow{\text{Sunlight}} C_6H_{12}O_6 + 6O_2$$

- Chlorophyll makes plant appear green because it absorbs *red* and *blue light* from sunlight while *reflecting green light.*

Light and Dark Reaction in Chloroplast

Chloroplast

- A chloroplast is an organelle in plant cells and algae that converts *sunlight into chemical energy* through photosynthesis.

Two types of reactions takes place in Chloroplast:

Light Dependent Reaction

- The light-dependent reactions occur in the *thylakoid membranes* where light splits water into *Hydrogen* and *Oxygen* in the form of *ATP* and *NADPH.*

Light Independent Reaction *(Calvin Cycle)*

- The light-independent reactions occur in the *stroma* where there is a use of *ATP* and *NADPH* to convert *Carbon Dioxide* into *Glucose.*

Structure of Chloroplast

- ***Inner membrane:*** Controls the movement of materials in and out.
- ***Outer membrane:*** Protective layer; allows small molecules to pass.
- ***Stroma:*** Fluid-filled space where the Calvin cycle occurs.
- ***Thylakoids:*** Disc-shaped sacs that contain chlorophyll.
- ***Grana (Granum):*** Stacks of thylakoids where light reactions take place.
- ***Lamella:*** Membranous bridges connecting grana.

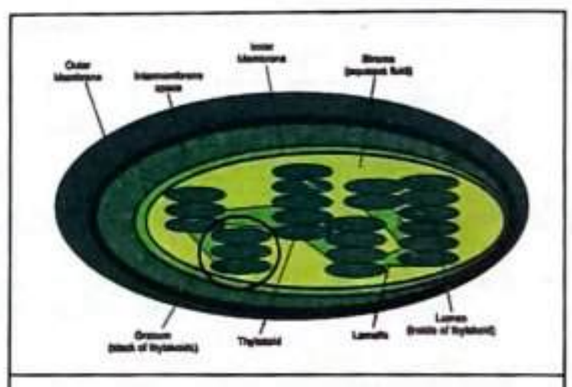


Fig 4: Structure of Chloroplast

Mesophyll cells are primary site for photosynthesis.

Guard cells regulate the opening and closing of stomata pores, and they respond to changes in carbon dioxide concentration in leaves.

Micronutrients and Macronutrients in Plants

Macronutrients	*Micronutrients*
N: Nitrogen	Fe: Iron
P: Phosphorus	Mn: Manganese
K: Potassium	Cu: Copper
S: Sulphur	Zn: Zinc
Ca: Calcium	B: Boron
Mg: Magnesium	Cl: Chlorine
C: Carbon	Mo: Molybdenum
H: Hydrogen	
O: Oxygen	

- *1828: Friedrich Wohler* synthesised *Urea.*
- Urea (CH_4N_2O or NH_2CONH_2) is a *Nitrogen* containing fertilizer.

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• Legumes such as lentils do not require fertilisers as their roots have *Nitrogen Fixing Bacteria* such as *Rhizobium, Azotobacter*. They convert atmospheric Nitrogen into fixed Nitrogen that is usable by plants.

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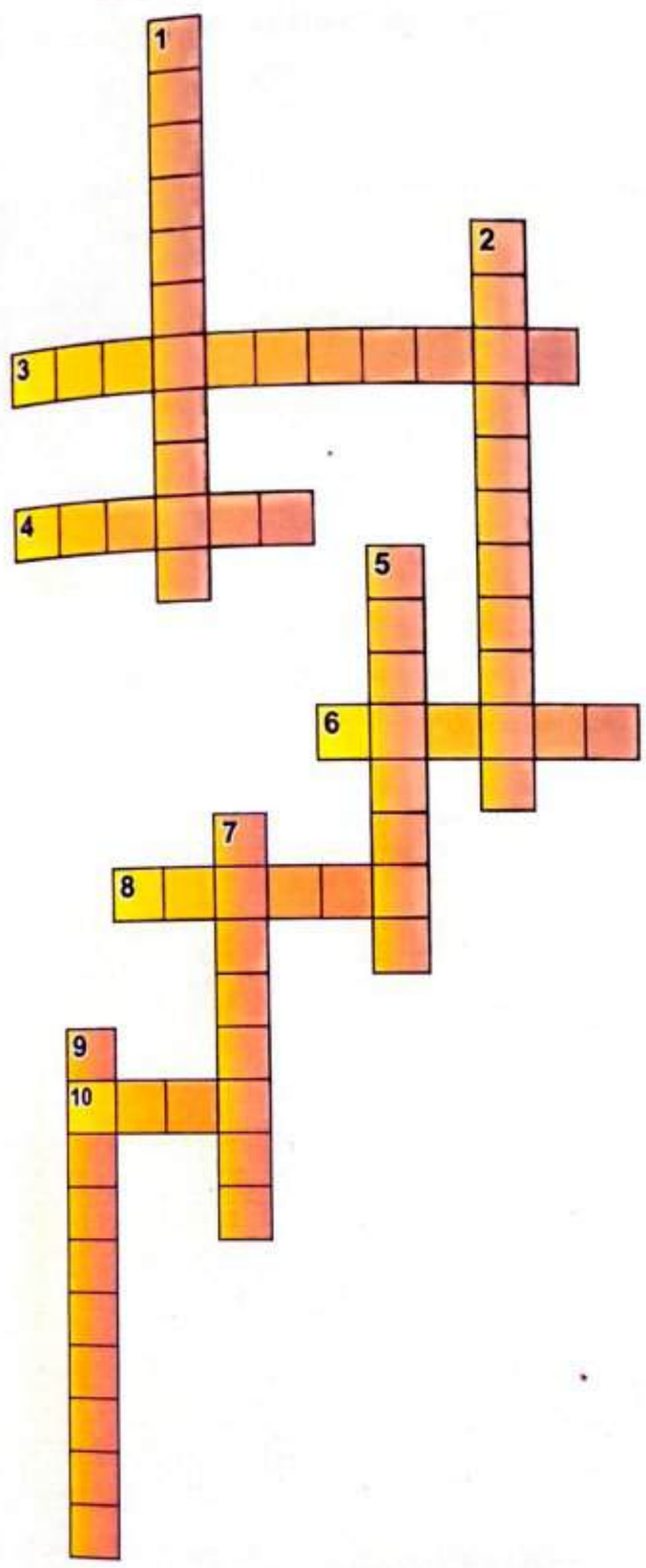
NUTRIENTS



Across

3. Pigment capturing solar energy.
4. Broad green part of leaf.
6. Main milk protein.
8. Released in photosynthesis.
10. Grain containing oryzenin.

Down

1. Nutrition where organisms make their own food.
2. Plants adapted to sunlight.
5. First discovered B vitamin.
7. Pigment giving tomatoes red colour.
9. Process of water vapour release from leaves.

Few Important Terms

• ***Xerophytes:*** Xerophytes are plants adapted to survive in *dry or arid environments*, characterized by limited water availability.

• ***Heliophytes:*** Heliophytes, also called *sun-loving plants*, are those that require full exposure to the sun for their optimum growth.

• ***Neophytes:*** A neophyte is a plant species which is *not native to a geographical region* and was introduced in recent history.

• ***Protophytes:*** Protophyte plants are *primitive, simple, and often microscopic plants* that represent the earliest forms of plant life.

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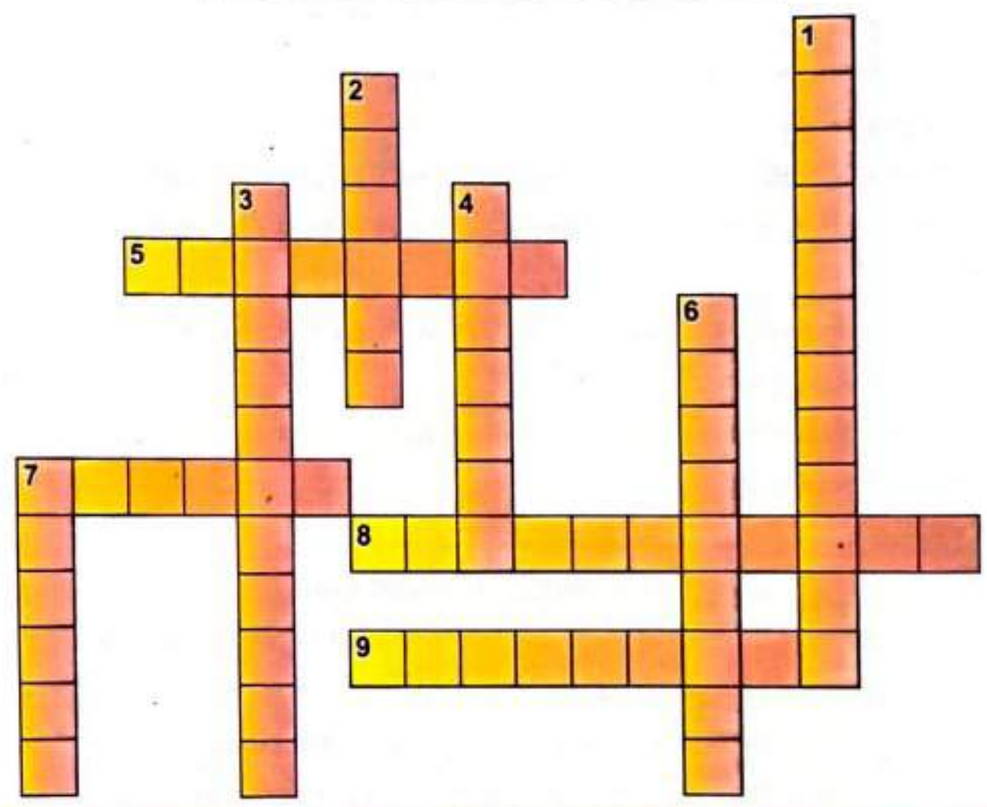
PLANT KINGDOM



Across

5. Published Systema Naturae in 1735.
7. Kingdom of organisms without a defined nucleus.
8. Group with undifferentiated body and aquatic habitat.
9. Filamentous green alga in floating masses.

Down

1. Group including ferns and horsetails.
2. Example of an angiosperm plant.
3. Male reproductive structure in bryophytes.
4. Bryophyte with small flattened leaves and rhizoids.
6. Amphibians of the plant kingdom.
7. Non-vascular flowerless plants in Bryophyta.

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HEREDITARY

Hereditary and Variation

Heredity

- Heredity is the biological process through which traits or characteristics are passed from parents to offspring through genes. It is responsible for transmission of physical, behavioural, and physiological traits, such as eye colour, blood group, and certain genetic disorders.
- The basic unit of heredity is the *gene*, which is made up of *DNA*.

Variation

- It refers to the differences in traits or characteristics among individuals within a species. These differences can be caused by *genetic variations* or environmental factors that influence how genes are expressed.
- Variation is necessary for *survivability*.
- It is seen more in sexual organisms than asexual organisms (as only a single parent involved in asexual reproduction).

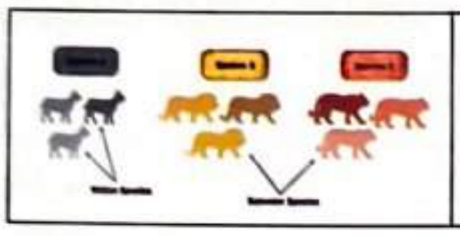


Fig 1: Types of Variation Within and Between Species

Genetic Traits

- A genetic trait is a characteristic or feature of an organism that is determined by genes and can be passed down from one generation to the next.
- Traits can be determined by genes, environmental factors or by a combination of both.
- Traits can be *qualitative* (such as eye color) or *quantitative* (such as height or blood pressure).

Types of Traits:

1. ***Acquired Traits:*** Characteristics that develop in an organism during its *lifetime* as a result of *environmental influences* rather than genetics. ***E.g. Teaching, riding bike, etc.***
2. ***Inherited Traits:*** Characteristics or quality that is passed down from *parents to their offsprings through DNA*. ***E.g. Eye colour, blood group, etc.***

Alleles

- Alleles are *alternate forms of genes, or DNA sequence*, that occur at the same location on a chromosome. Alleles control the same trait, but they can produce different effects.

Types of Alleles:

1. ***Dominant Traits:*** Trait that is expressed out when *one or both alleles are dominant*.
2. ***Recessive Traits:*** Trait that is expressed out when *both the alleles are recessive*.

GREGOR MENDEL'S EXPERIMENT

- Gregor Johan Mendel is known as *"Father of Genetics"*. He conducted experiments of Inheritance traits in *Pea Plant* (***Pisum sativum***).

Reasons for Choosing a Pea Plant

- It is easier to grow.
- It has short life cycle.
- It can be self-pollinated or cross-pollinated by hand.
- Different traits were easily observable.
- Many offsprings of pure pea plant can be easily obtained through self-pollination.

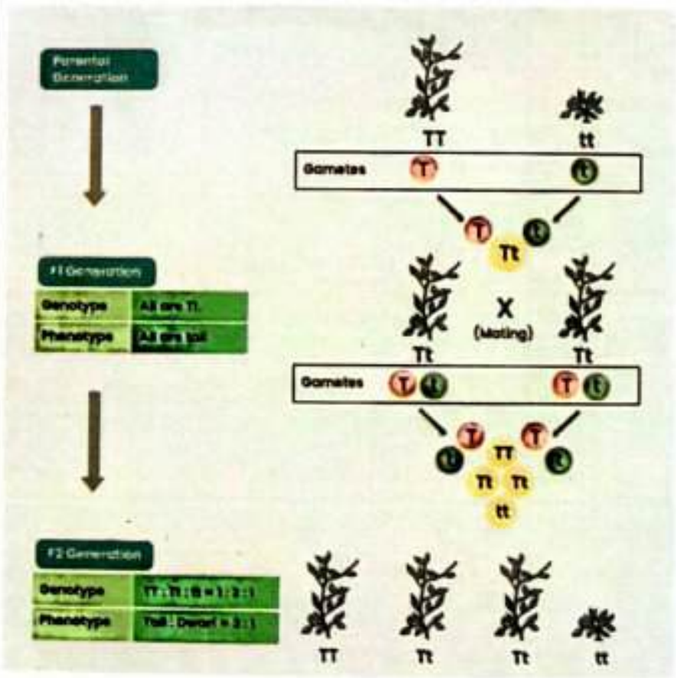
Three Laws of Inheritance ***(proposed by Gregor Mendel)***

1. ***1st Law (Law of Dominance):*** It stated that when parents with contrasting traits are crossed, only the *dominant trait will appear* in the offsprings.
2. ***2nd Law (Law of Segregation):*** It stated that during the formation of gametes, the pairs of gene variants, or alleles are separated from each other. Each gamete receives one allele.
3. ***3rd Law (Law of Independent Assortment):*** It stated that during gamete formation, alleles of two (or more) different genes get sorted into *gametes independently of one another*.

Monohybrid Cross

- A monohybrid cross is a genetic experiment that studies how a *single trait* is passed from parents to their offspring. It involves crossing *two organisms that differ in one trait*. ***E.g. A cross between a tall pea plant and a short (dwarf) pea plant.***

Tall Plant ***Dwarf Plant***



	T	t
T	TT	Tt
t	Tt	tt

TT: Dominant trait

tt: Recessive trait

Observation

- In the first generation Mendel found that all the offspring shared one feature, which he called dominant trait (they were all tall), and did not display any recessive trait.
- When the first-generation plants were self-fertilized, the second generation showed the reappearance of the recessive trait in about 1 out of every 4 plants. This resulted in a 3:1 ratio, with three plants showing the dominant trait for every one showing the recessive trait.

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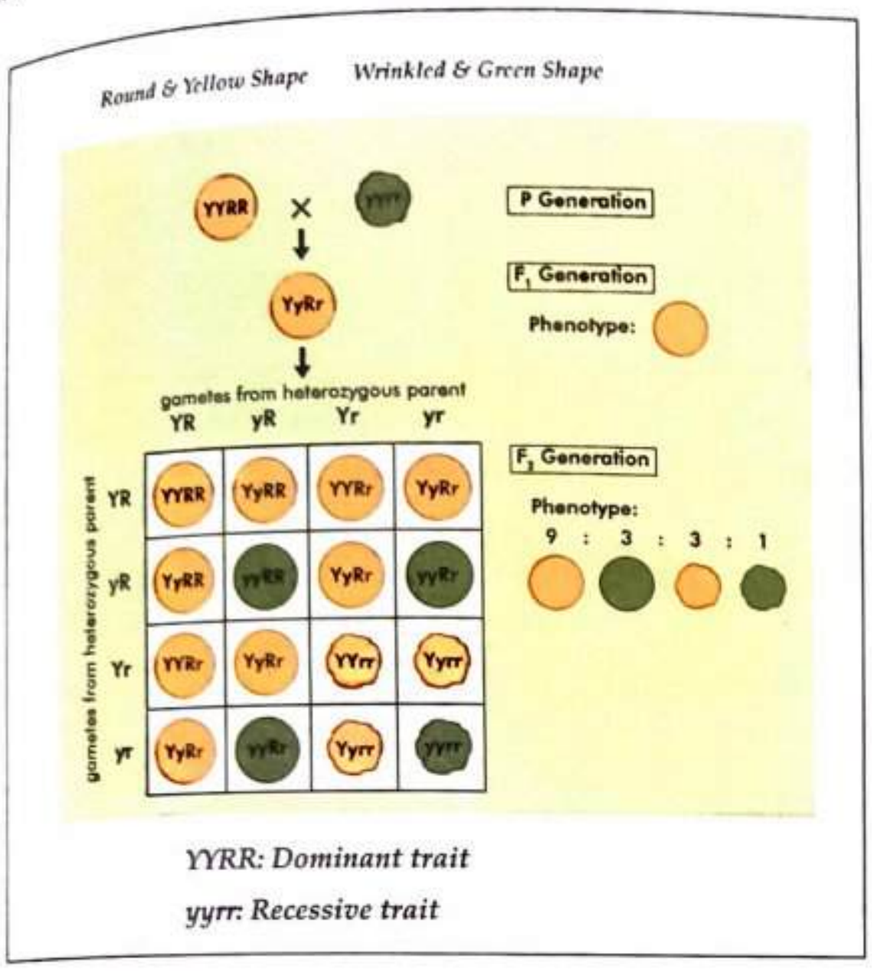
Dihybrid Cross

• A dihybrid cross is a genetic cross involving *two different traits*, each with *two contrasting alleles*, where both parents are *heterozygous* for both traits. *E.g. A cross between a seed shape (round vs. wrinkled) and seed color (yellow vs. green).*



Observation

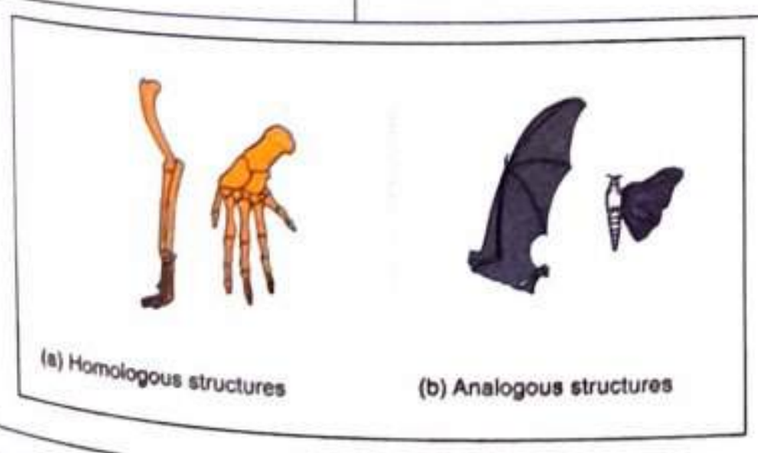
• In the first generation of the dihybrid cross, Mendel found that all the offspring showed both *dominant traits* (round and yellow seeds), with *no sign of the recessive traits* (wrinkled and green).

• When these first-generation plants were self-fertilized, the second generation showed new combinations of traits. Mendel observed four types of offspring → some showed *one dominant* and *one recessive trait*.

• This resulted in a *9 : 3 : 3 : 1* ratio, with *nine* showing *both dominant traits*, *three* showing *one dominant (YR)* and *three recessive trait (yR)*, another *three* showing the other combination *(Yr)*, and *one showing both recessive traits (yr)*.

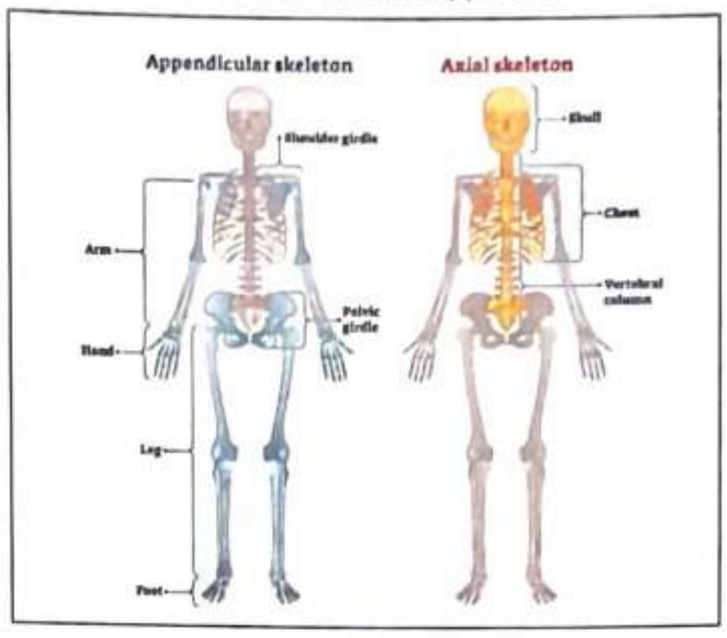
Homologous Organ and Analogous Organ

Homologous Organ	*Analogous Organ*
They are organs that have the same structure but different function and are inherited from an common ancestor	They are organs of different species that have different anatomical structure but perform similar functions



SKELETAL SYSTEM

• The skeletal system is the body's framework, providing support, protection, and allowing for movement. It comprises bones, cartilage, and ligaments, and is divided into the axial and appendicular skeletons.



Appendicular Skeleton

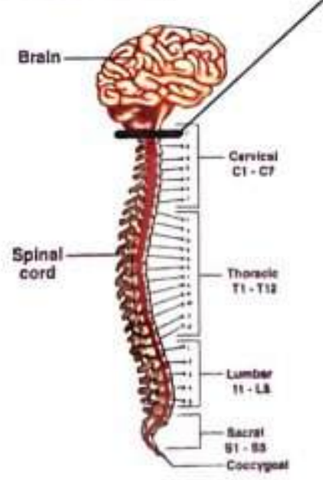
• It provides support and leverage for limb movement; facilitates locomotion; and includes bones that are primarily involved in movement. *E.g. bones in shoulder, pelvis, limbs, etc.*

Bones in adult human beings: 206
Bones in children: 300
Total Axial bones: 80
Total Appendicular bones: 126

Axial Skeleton

• It protects the brain, spinal cord, heart, and lungs; supports the head, neck, and body; and provides a rigid framework for muscle attachment. *E.g. Bones in head, neck, back including skeleton etc.*

Axial Skeleton

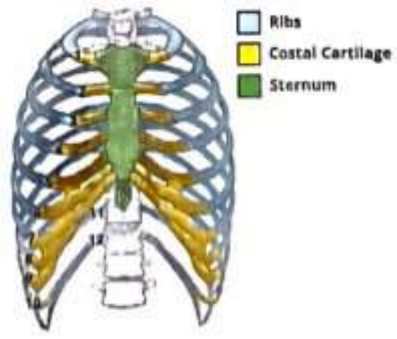


Atlas bone

• The bone that connects the scalp to the spine and supports the head.

Bones in Spinal Cord

• ***Adults only have 26 bones.***
• ***Cervical:*** 7 vertebrae
• ***Thoracic:*** 12 vertebrae
• ***Lumbar:*** 5 vertebrae
• ***Sacral:*** 5 vertebrae (fuse to form 1 sacrum)
• ***Coccygeal:*** 4 vertebrae (fuse to form 1 coccyx (tailbone)



Sternum

• Central part of the chest.
• It is connected to ribs via cartilage.

Bones in Rib Cage

• ***Total:*** 24 + 1 (sternum) = 25

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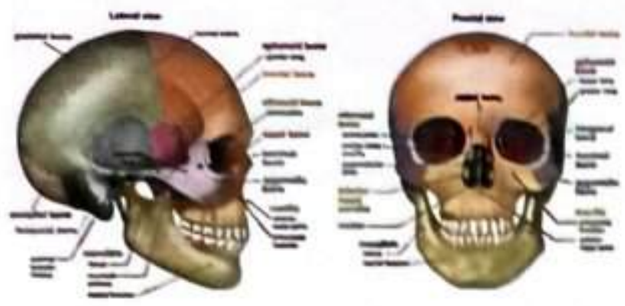
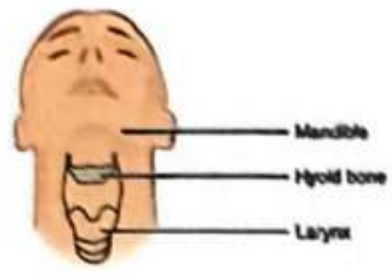


Bones in Skull

- ***Total:*** 22 bones
- ***Cranial:*** 8
- ***Facial:*** 14

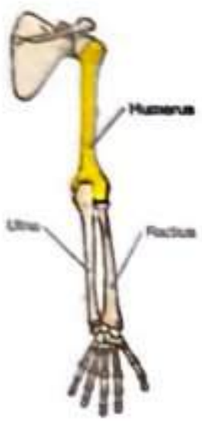


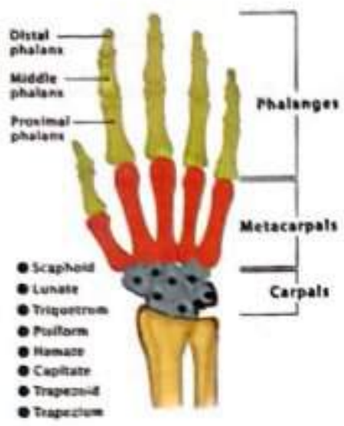
Hyoid Bone

Bones in Ear

- ***Total:*** 3 × 2 =6
- ***Incus, Malleus, Stapes***

Appendicular Skeleton





Bones in Arm

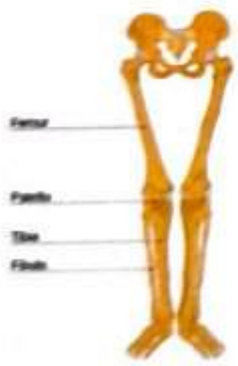
- ***Total:*** 3
- ***Radius, Ulna, Humerus***

Bones in Hand

- ***Total:*** 27
- ***Phalanges:*** 14
- ***Metacarpals:*** 5
- ***Carpals:*** 8

27 + 3 = 30

30 × 2 (arms) = 60



Bones in Legs

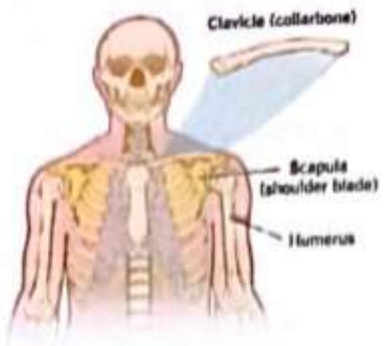
- ***Total:*** 4
- ***Femur*** (thigh bone): 1
- ***Patella:*** 1
- ***Tibia:*** 1
- ***Fibula:*** 1

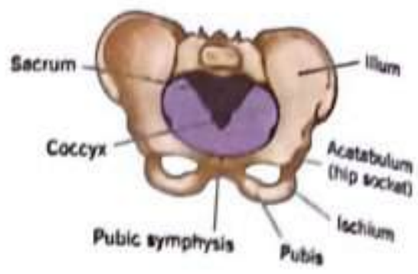
} 4 × 2 = 8

Bones in Foot

- ***Total:*** 26
- ***Tarsals:*** 7
- ***Metatarsal:*** 5
- ***Phalanges:*** 14

} 26 × 2 = 52





Bones in Pelvis

- ***Total:*** 2

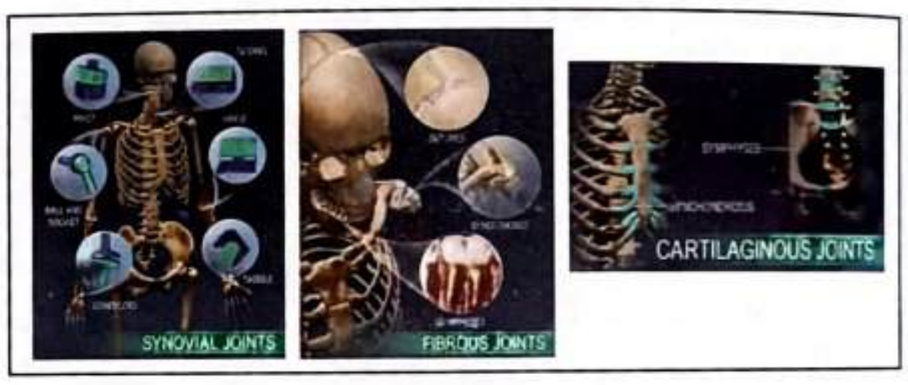
- ***Clavicle:*** 2
- ***Scapula:*** 2

Joint

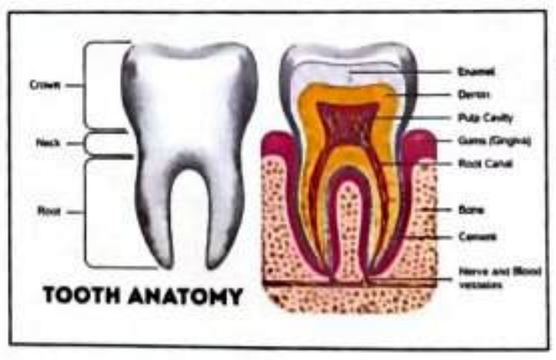
- A joint is a point or location where *two or more bones meet*, allowing for movement. Joints are also called *articulations*, and they are essential for flexibility and mobility in the skeletal system.

Joints and its Types

1. ***Synovial Joint:*** These joints have a *fluid-filled cavity* between the bones, allowing for a *wide range of motion*. ***E.g. knee, elbow, and shoulder.***
2. ***Fibrous Joint:*** These joints connect bones with dense connective tissue, allowing for *little to no movement*. ***E.g. Sutures in the skull and the connection between teeth and the jawbone.***
3. ***Cartilaginous Joint:*** In these joints, bones are connected by cartilage, allowing for *slight movement*. ***E.g. Joints between vertebrae and the connection between ribs and the sternum.***



Teeth and its Structure



Enamel

- Hardest part of the body (made of Calcium phosphate).

→ ***Total adult teeth:*** 32 *permanent teeth* (16 in upper jaw + 16 in lower jaw including wisdom teeth)

- ***Incisors:*** 4 → They are used for bitting and cutting of food.
- ***Canine:*** 2 → They are used for tearing of food.
- ***Premolars:*** 4 → They are used in grinding of food.
- ***Molars:*** 6 → They are used for chewing and crushing of food.

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Dental Formula

2, 1, 2, 3 = I, C, P, M → *Adults*
2, 1, 2, 3 = I, C, P, M

2, 1, 0, 2 = I, C, P, M → *Children*
2, 1, 0, 2 = I, C, P, M • Total: 20 (milk teeth)

**In children there are no premolars.*

Sex Determination

• Sex determination is the biological system that decides whether an individual organism will develop as male or female. It is based on genetic, chromosomal, environmental, or a combination of factors.

In humans, there are 23 pairs of chromosomes:

→ 22 pairs are autosomes

→ 1 pair is the sex chromosomes

Sex Chromosomes in Humans

• ***Females:*** Have XX chromosomes.

• ***Males:*** Have XY chromosomes.

Who Determines the Sex of the Baby?

• The father's sperm determines the child's sex.

• The mother's ovum always carries an *X chromosome*.

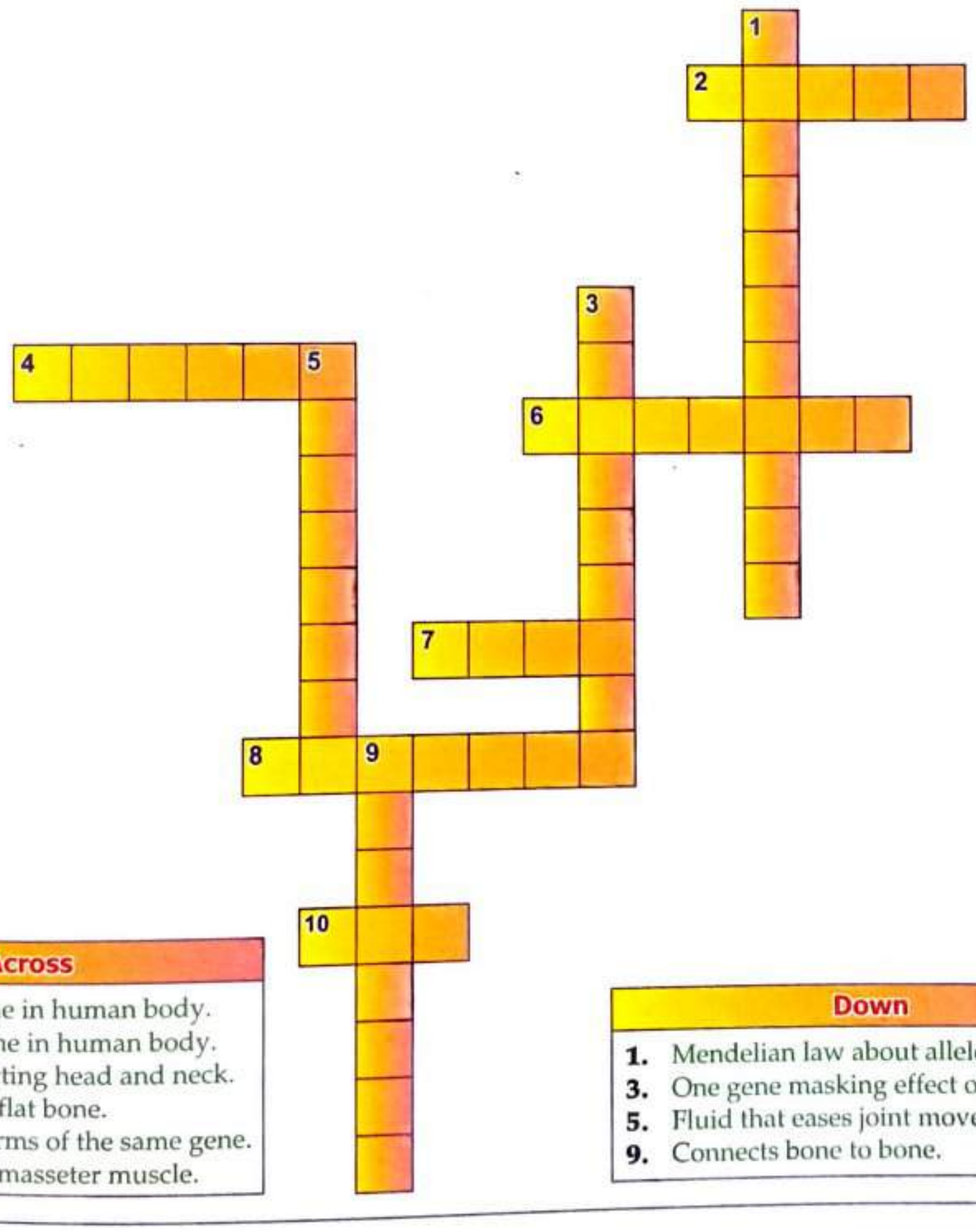
The sperm may carry either:

• *X chromosome → XX = Female child*

• *Y chromosome → XY = Male child*

PARMAR'S CROSSWORD

HEREDITARY AND EVOLUTION



Across

2. Longest bone in human body.
4. Smallest bone in human body.
6. Joint connecting head and neck.
7. Example of flat bone.
8. Different forms of the same gene.
10. Location of masseter muscle.

Down

1. Mendelian law about allele separation.
3. One gene masking effect of another.
5. Fluid that eases joint movement.
9. Connects bone to bone.

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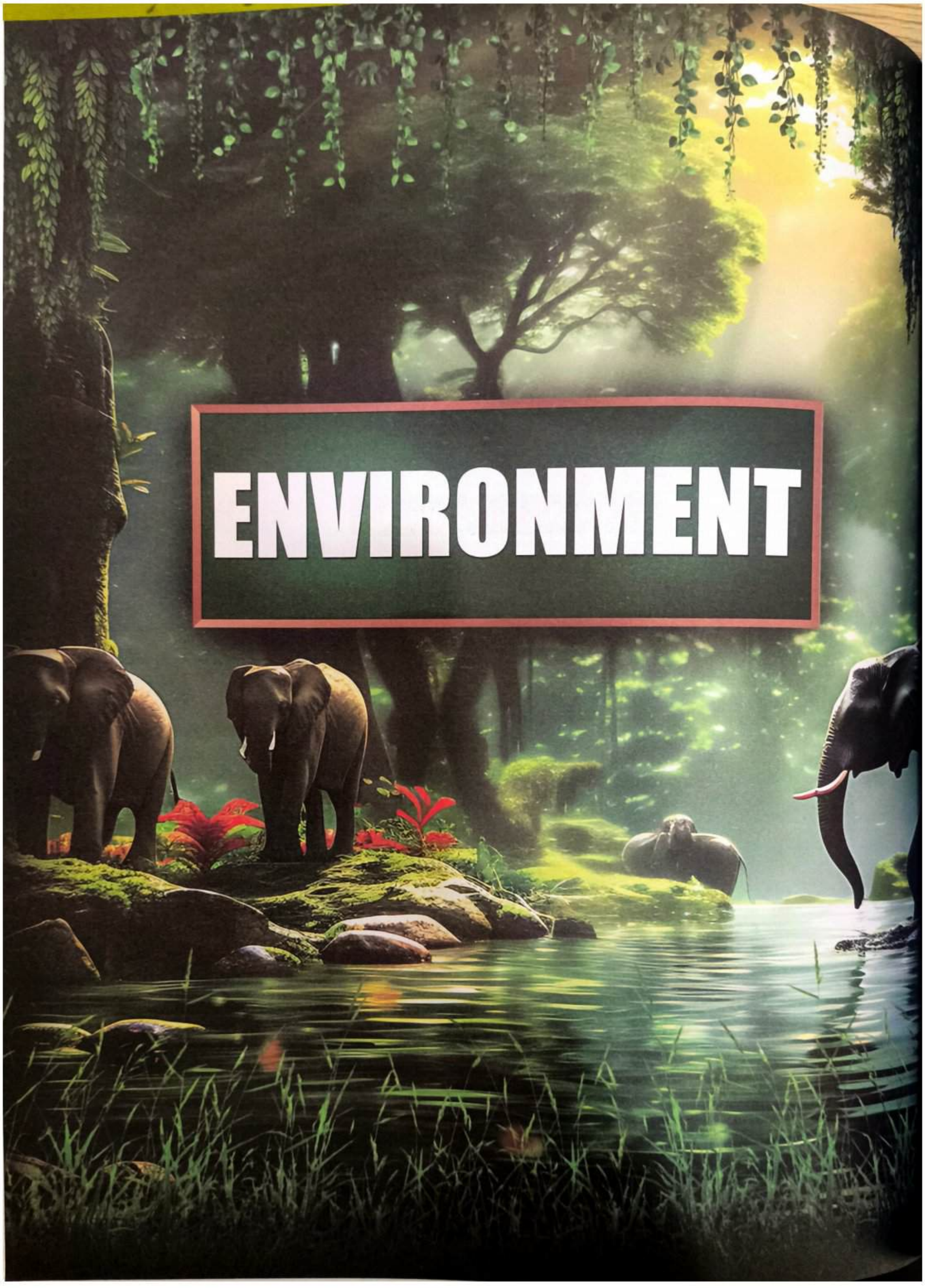

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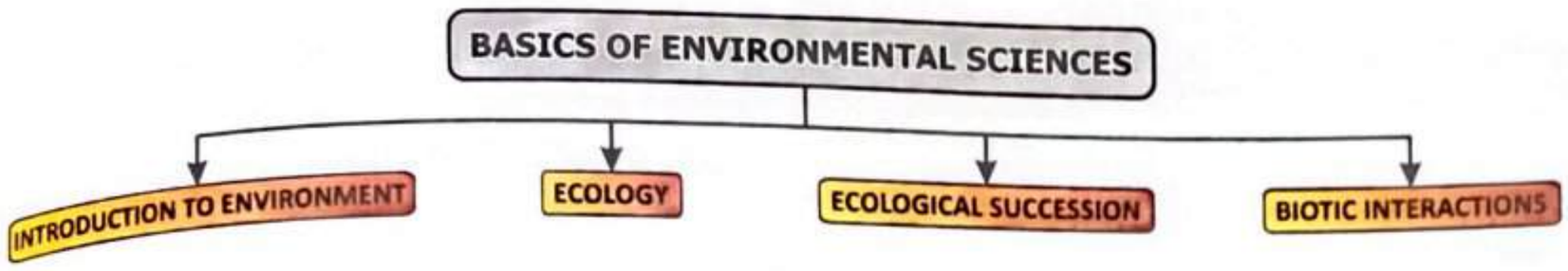

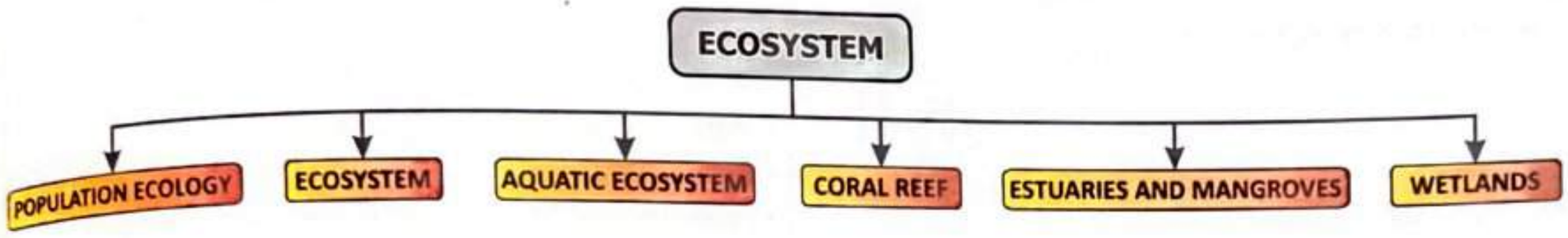

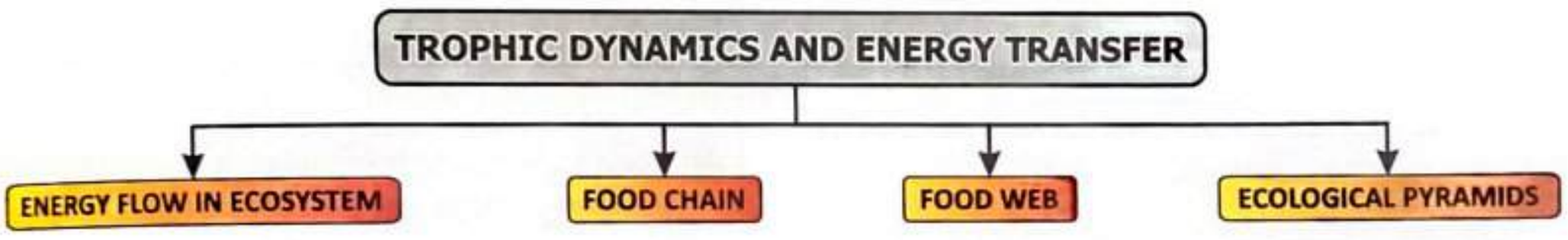

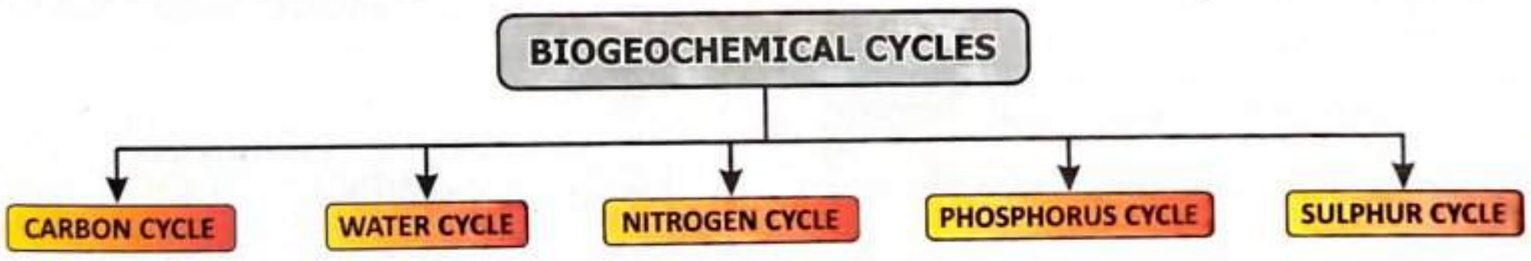

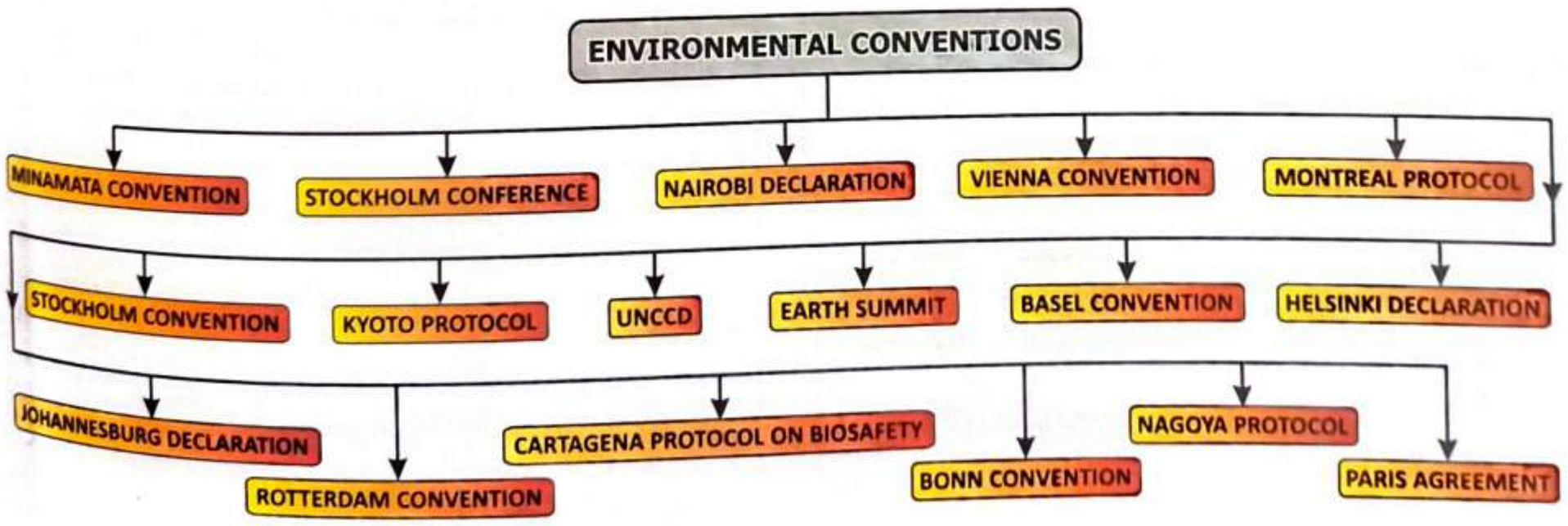

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INTRODUCTION TO ENVIRONMENT

• The word *"Environment"* comes from the French word *"environner"*, meaning *"to surround"*.

• **Definition:**

The environment refers to the sum total of all living (biotic) and non-living (abiotic) components, as well as the natural forces and events that surround and affect an organism.

Components of the Environment

1. **Abiotic : Non-living components**

• Light
• Rainfall
• Temperature
• Atmosphere
• Soil

Abiotic components

2. **Biotic : Living components**

• Plants
• Animals

Biotic components

ECOLOGY

Ecology: The study of the relationships between organisms and their environment.

• Term *"Ecology"* was coined by *Ernst Haeckel* (German zoologist) in *1866*.
• Derived from Greek word *"oikos"*, meaning *"house"*.
• Father of Indian Ecology: *Ramdeo Mishra*
• Father of Modern Ecology: *Eugene Odum*

Levels of Organization in an Ecosystem

Organism: Individual living being

Population: Group of organisms of the same species

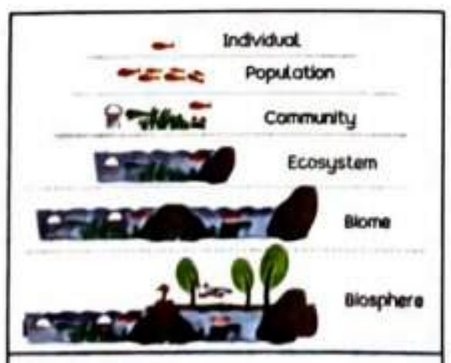
Community: Collection of populations of different species living together in a specific area. These species are interdependent and interact with each other.

Ecosystem: A community of organisms and their environment.

Biome: A large regional ecosystem characterised by distinct climate conditions, vegetation and animal life.

Major types of Biomes in India:

• Tropical Humid Forest
• Tropical Dry/Deciduous Forests
• Warm Deserts and Semi-Deserts
• Coniferous Forests
• Alpine Meadows



Ecological levels of organisation

Biosphere: Global sum of all ecosystems, the zone of life on Earth is called Biosphere.

• **3 main realms of Biosphere** → *Atmosphere, Lithosphere & Hydrosphere.*

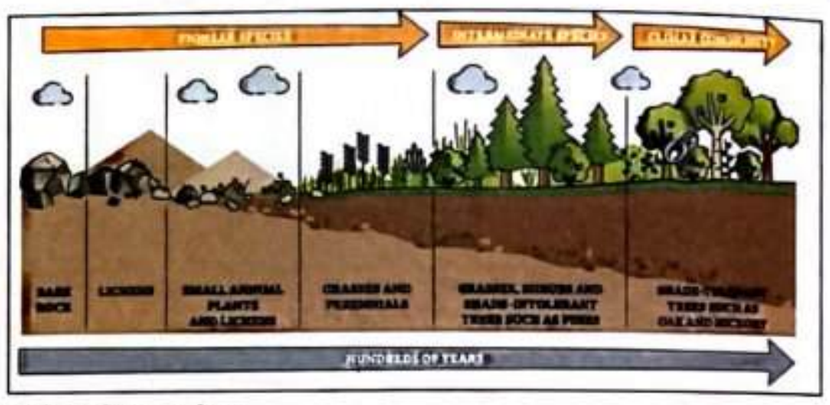
ECOLOGICAL SUCCESSION

Ecological Succession: A natural, orderly process of ecosystem's development and change leading to a stable mature or complex community.

Types of Succession:

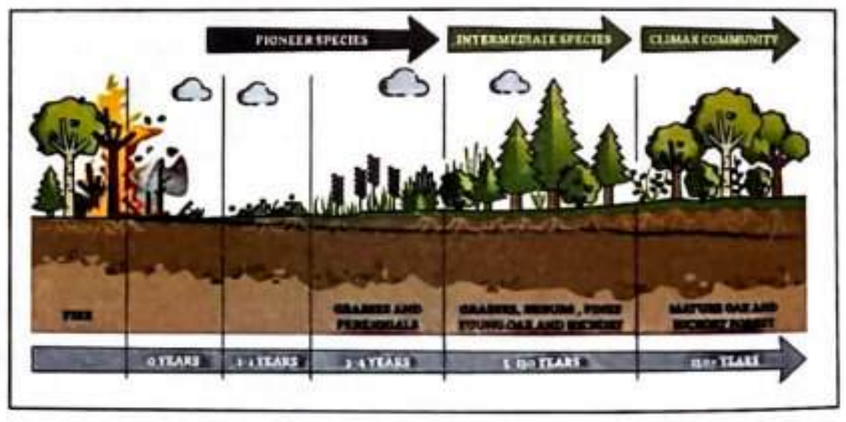
Primary Succession

• Occurs in areas where no previous life existed (e.g., bare rocks, lava, new ponds).
• Pioneer community: First community to inhabit an area
• Climax community: last and stable community.
• Sere: Entire series of communities.
• Seral stage : Community stage between pioneer and climax community.



Secondary Succession

• Occurs where previous ecosystems existed but were disturbed (e.g., forest fires, floods).
• Quicker than primary succession due to presence of soil/sediment.



ADAPTATION AND ACCLIMATION

• Characteristics that enhance survival and reproduction of an organism in a specific environment is called *Adaptation.*

For Example:

Allen's Rule: Mammals in cold climates have shorter limbs and ears to minimise heat loss.

• Short-term adjustments by an organism to environmental changes are called *Acclimatization.*

• Organisms also exhibit acclimatization, which involves short-term, reversible physiological or behavioral adjustments to changing environmental conditions. Unlike Adaptation, these changes are not inherited but occur within an individual's lifetime.

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ECOLOGICAL NICHE

An ecological niche is the role a species plays in its ecosystem, including where it lives, what it eats, how it interacts with other organisms, and how it contributes to the environment.

HABITAT

• The specific physical environment where an organism lives naturally.

It is categorised into:

Terrestrial Habitat → ***Land based***

• Mountains, Deserts, Grasslands

Aquatic Habitat → ***Water based***

• Oceans, Rivers, Lakes

> ***An ecotone is a transitional area where two different ecosystems or biomes meet and interact. Maximum biodiversity is seen in an ecotone.***

SPECIES

• A species is a group of similar organisms capable of interbreeding and producing fertile offspring.

• It is the *basic unit of classification in taxonomy.*

EVOLUTION

• Evolution is the change in the characteristics of a species over several generations, it relies on factors like Natural Selection and Genetic Drift.

• ***The Theory of Evolution by Natural Selection was jointly proposed by Charles Darwin and Alfred Russel Wallace in 1859.***

• The modern version of Darwin's theory is known as *Neo-Darwinism*. It integrates Darwin's natural selection with Mendelian genetics, molecular biology, and population genetics.

BIOTIC INTERACTIONS

• Biotic interactions refer to the ways that living organisms in an ecosystem relate to each other.

• These interactions significantly impact survival, reproduction, and population size.

Categorisation of Biotic Interactions

Positive Interaction: Member of one or both the interacting species are benefitted but neither is harmed.

Examples of Positive Interaction—

1. **Mutualism / Symbiosis (+ +)**

• A close and often *obligatory relationship* between two species.

• **Both species benefit** and often depend on each other.

• Examples:

Lichens: Mutualism between algae and fungi

Mycorrhizae: Association between fungi and roots of higher plants

2. **Commensalism (+ 0)**

• **One species benefits, while the other is neither harmed nor benefited.**

• Example: *Sucker fish (Remora)* attaches to a shark using a suction disc on its head for transport and food scraps.

Negative Interaction : One or both interacting species is harmed.

Examples of Negative Interaction —

1. **Parasitism (+ -)**

• One species (parasite) benefits, while the other (host) is harmed.

• The host provides nourishment but is not killed immediately.

• ***Types of Parasites:***

→ *Ecto-parasites*: Live on host's surface (e.g., *lice, leeches*)

→ *Endo-parasites*: Live inside host's body (e.g., *tapeworm, plasmodium*)

2. **Predation (+ -)**

• One organism (predator) kills and consumes another (prey).

• e.g., a wolf hunting a deer for food.

3. **Amensalism (- 0)**

• One species is inhibited or destroyed by another, which remains unaffected.

• Example: *Penicillium fungi* secrete penicillin, inhibiting bacterial growth.

4. **Competition (- -)**

• Both species are negatively affected as they compete for the same resources.

• ***Types of Competition:***

→ *Inter-specific*: Between different species (e.g., *sharks, dolphins, seabirds competing for fish*)

→ *Intra-specific*: Within the same species (e.g., *Paramecium aurelia vs. Paramecium caudatum*)

Neutral Interaction:

• Interacting species are neither benefitted nor do they suffer.

• Example: *Birds and Squirrels*

For an interactive recap of this topic, see the crossword on Page Number 334.

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POPULATION ECOLOGY

Population Ecology is the study of populations in relation to environment.

• ***Population size:*** Number of individuals in a defined geographic area which is governed by:

• Natality (birth rate)

• Mortality (death rate)

• Immigration (entry into population)

• Emigration (exit from population)

• Dispersion is a pattern of spacing among individuals within the geographic boundaries. Three types of Dispersion are—
Clumped,Uniform,Random

• ***Biotic Potential***: Maximum reproductive capacity under optimal conditions.

• ***Carrying Capacity***: Maximum sustainable population size in an environment.

• ***Limiting Factors***: Environmental variables that restrict population growth.

Life history Strategies

• These strategies describe how organisms adapt their reproductive and developmental traits to different environmental conditions and resource availability.

Feature	r-selected species	K-selected species
Size	Small	Large
Reproduction	Many offsprings, short time	Few offsprings, long time
Life Expectancy	Short lifespan	Long lifespan
Example	Insects, frogs, weeds, bacterias, etc.	Humans, Elephants, whales, trees, etc.

ECOSYSTEM

• The term *"Ecosystem "* was coined by *"Sir Arthur George Tansley"* in *1935*.

• An ecosystem is a functional unit where living organisms interact with each other and their physical environment.

• It was described as *the basic unit of ecology* by *Francis Evans in 1956.*

• Ecosystems provide the following services:

a) *Provisioning Services*: Direct material benefits like **food, water, wood, fuel.**

b) *Regulating Services*: Help maintain ecological balance like **air/water quality, flood control, pollination.**

c) *Supporting Services:* Enable other services (e.g., **habitats, genetic diversity).**

d) *Cultural Services*: Non-material benefits (e.g., **recreation, spiritual value).**

TERRESTRIAL ECOSYSTEM

• Land-based ecosystems involving interaction of biotic and abiotic components in a given area.

Subdivisions of Terrestrial Ecosystem are:

a) *Forest Ecosystem*

b) *Grassland Ecosystem*

c) *Desert Ecosystem*

d) *Tundra Ecosystem*

DEFORESTATION

Deliberate clearance of forests is known as Deforestation.

Causes for deforestation:

•Shifting cultivation

•Development projects

•Fuel needs

•Raw material demands

Deforestation

Effects of Deforestation on Ecosystem:

•Lower groundwater levels

•Reduced precipitation

•Soil erosion

•Landslides

DESERTIFICATION

• Continuous degradation of dry land ecosystems due to climate change and human activity is called Desertification.

AQUATIC ECOSYSTEM

Aquatic Organisms

• ***Classification of Aquatic Organisms:***

Neuston : Float / attached to the upper surface of water

Periphyton : Attached to submerged surfaces (e.g., Algae, Cyanobacteria)

Plankton : *Phytoplankton* → autotrophs *(e.g., algae)*

Zooplankton → freely floating and bottom dwelling *(e.g., crustacean, Protozoa)*

Nekton :Organisms capable of active locomotion (e.g., fish, squid)

Benthos : Bottom dwelling organisms. (e.g. crabs, mollusks)

Factors affecting Productivity in Aquatic Habitats

• **SunLight:**

Photic Zone: Upper layer where light enables photosynthesis

Aphotic Zone: Deeper layer, where light penetration is restricted, hence, limited to respiration only.

• **Dissolved Oxygen(DO):**

Cold water holds more oxygen than warm water.

DO *below* ***3–5 ppm*** can *harm* aquatic life

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TYPES OF AQUATIC ECOSYSTEM :

Aquatic ecosystems are categorized based on the nature and movement of water.

1. **Lentic Ecosystem:**
- Still water bodies like lakes, ponds, and swamps.
- Also known as *lacustrine ecosystems.*
- Productivity influenced by nutrient content, light penetration, and depth.

2. **Lotic Ecosystem:**
- Flowing water systems such as rivers and streams.
- Known as *riverine ecosystems.*
- Well-oxygenated and nutrient-rich; organisms adapt to water currents.

3. **Marine Ecosystem:**
- Saltwater environments like oceans and seas with *salinity ≥35 ppt.*
- Cover over *70%* of Earth's surface.
- Include diverse habitats like *estuaries* and *coral reefs.*
- Dominated by producers such as phytoplankton and algae.

CORAL REEF

Coral reefs are complex underwater structures formed by colonies of tiny animals called *coral polyps,* which are related to jellyfish and sea anemones.
- Each *polyp* secretes a *calcareous exoskeleton,* which remains after it dies and serves as a base for new polyps.
- Over time, this leads to the formation of large reef structures.

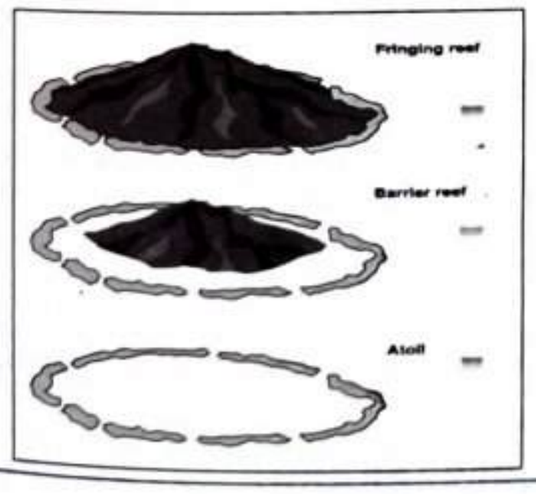
Ideal Conditions for Coral Growth:

Can you recall the phylum of Corals?

- Shallow, sunlit waters (up to 30 meters deep)
- Warm temperatures (typically 25–30°C)
- Clean and clear saline water
- Low nutrient levels (corals thrive in oligotrophic conditions)

TYPES OF CORAL REEFS

- *Fringing Reefs:* Closest to the shoreline, directly attached to land.
- *Barrier Reefs:* Separated from land by a lagoon; typically found further offshore.
- *Atoll reefs :* An atoll is a ring- shaped coral reef that encircles a central lagoon, but no central island is visible above sea level.



Threats to Coral Reefs:
- ***Global Warming***: Leads to temperature rise and coral stress
- ***Coral Bleaching***: Expulsion of symbiotic algae due to heat
- ***Ocean Acidification***: Increased CO_2 makes seawater more acidic, weakening coral skeletons
- ***Pollution and Sedimentation:*** Reduce light penetration and smother coral
- ***Natural Disasters***: Storms and tsunamis can break coral structures

Coral Reefs in India:
→*Gulf of Mannar*
→*Andaman & Nicobar Islands*
→*Lakshadweep Islands*
→*Gulf of Kutch*

Coral Reef

ESTUARIES AND MANGROVES

ESTUARIES
- The Region where rivers meet the sea
- Form a *transition zone i.e. a. ecotone* between freshwater and marine ecosystems
- Mostly rich in : diatoms, dinoflagellates, green & blue-green algae

MANGROVES
- Mangroves are *salt-tolerant trees (halophytes)* that grow in coastal intertidal zones, especially in tropical and subtropical regions.
- They act as a transitional zone (ecotone) between *land and sea.*
- With their dense root systems, mangroves stabilize shorelines, reduce erosion, and serve as natural barriers against storm surges and tsunamis.
- They thrive in saline, waterlogged, and oxygen-poor soils.

Functions:
- ***Produce Pneumatophores***: Aerial roots that facilitate breathing in anaerobic soil.
- ***Viviparous in nature***: Seeds germinate while still attached to the parent tree.
- ***Salt Excretion/Filtration***: Roots filter salt or excrete it via leaves.
- Helps in carbon sequestration, storing more carbon per hectare than most other forests
- Support biodiversity and act as buffers against extreme weather events

Mangroves

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WETLANDS

- Wetlands are Transitional lands between aquatic and terrestrial ecosystems.
- They act as *ecotones and buffer zones*
- ***Examples***: *Chilika Lake, Keoladeo Ghana*
- ***Montreux Record***: A list of 48 endangered wetlands. *India's Keoladeo National Park of Rajasthan and Loktak Lake of Manipur* are on that list.

Challenges in Aquatic Ecosystems

Eutrophication: A process by which a water body becomes overly enriched with nutrients, resulting in oxygen depletion and excessive algae growth.

Types of Eutrophication

Natural Eutrophication : Gradual aging of lakes via nutrient accumulation.

Cultural Eutrophication : Accelerated by human activity (e.g., fertilisers, sewage discharge etc.)

Effects of Eutrophication

- Algal bloom
- Oxygen depletion - due to which the Biological Oxygen Demand increases.
- Decline in aquatic biodiversity

Algae Bloom

Algal Bloom

It refers to the rapid increase of algae population in a water body.

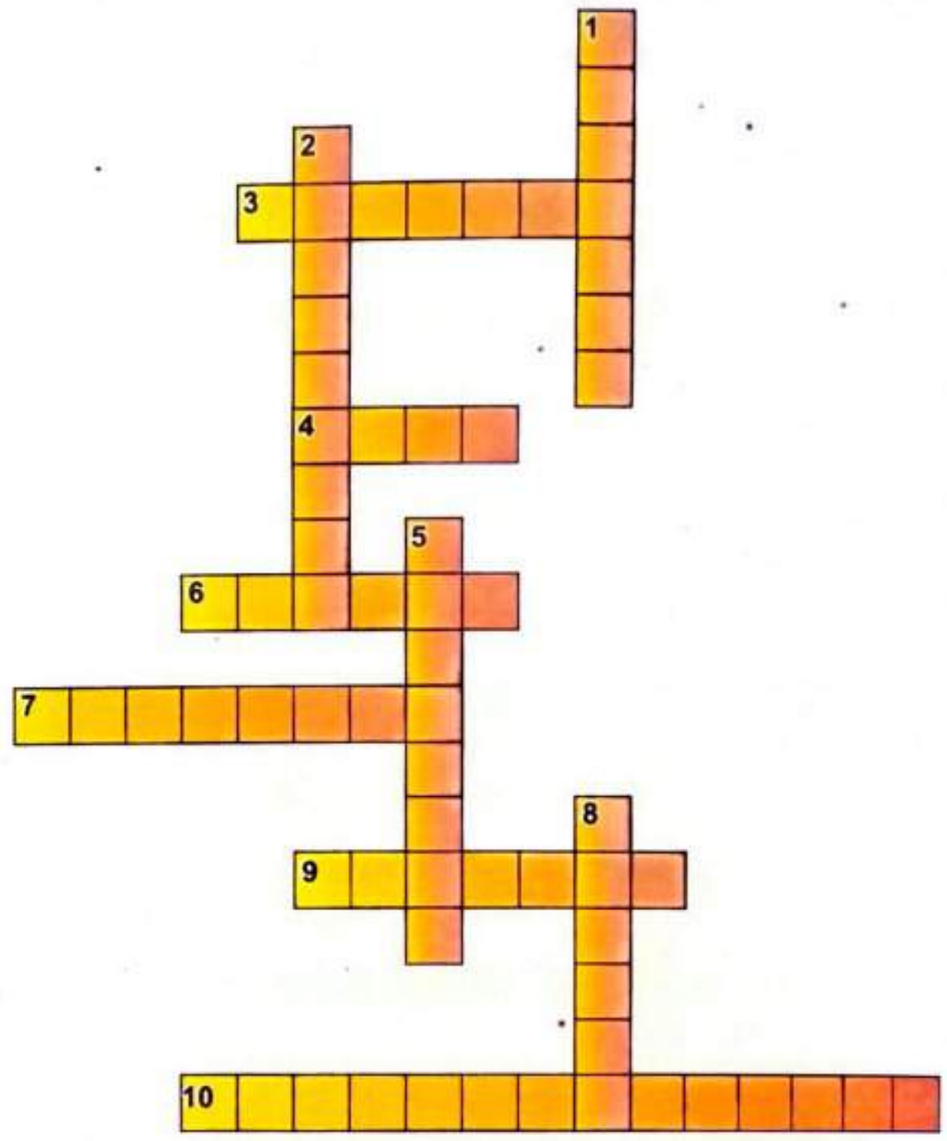
Effects of Algae bloom:

- Toxin production
- Creation of dead zones (Hypoxia)
- Harmful to humans and animals

Hypoxia: Very less oxygen concentration in a water body for living organisms to survive.

PARMAR'S CROSSWORD

BASICS OF ENVIRONMENTAL SCIENCES AND ECOSYSTEM



Across

3. Coined the term Ecology.
4. Known as Father of Modern Ecology.
6. Known as Father of Indian Ecology.
7. Floating organisms in aquatic ecosystem.
9. Coined the term Ecosystem.
10. Main process in Photic Zone.

Down

1. Example of wetland in India.
2. Trees growing in saline coastal water.
5. Reefs attached directly to the shoreline.
8. Aquatic organisms with active movement.

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ENERGY FLOW IN ECOSYSTEM

Energy is the fundamental driving force behind all biological and metabolic processes. Energy flow in an ecosystem is *unidirectional* i.e. from producers to top consumers.

• *Trophic level interactions* help illustrate how organisms are interconnected via food and energy transfer.

TROPHIC LEVEL INTERACTION

• *Trophe* means *nourishment*
• A trophic level refers to an organism's position in the food chain.
• Energy flows only from *lower to higher trophic levels.*
• At each level, energy is lost as heat, reducing available energy at higher trophic levels.

Trophic Levels		
I	Autotrophs	Green plants (Producers)
II	Heterotrophs	Herbivore (Primary consumers)
III	Heterotrophs	Carnivores (Secondary Consumers)
IV	Heterotrophs	Carnivores (Tertiary Consumers)
V	Heterotrophs	Top carnivores (Quaternary consumers)

FOOD CHAIN

• A food chain is a linear sequence of organisms where each is eaten by the next member in the chain.

• Plants convert solar energy into chemical energy through *photosynthesis.*
• It demonstrates the flow of energy and nutrients.

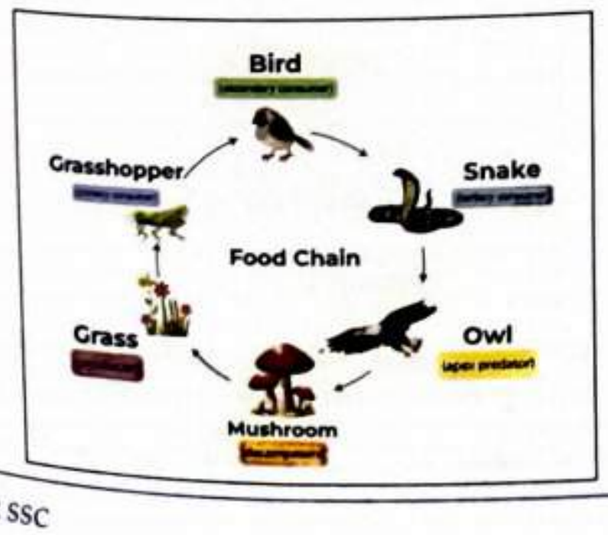
Food Chain:

Producers (plants) → Primary Consumers (herbivores) → Secondary Consumers (carnivores) → Tertiary Consumers

Types of Food Chains

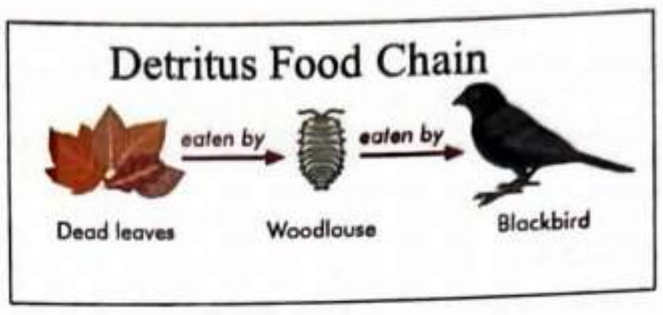
1. **Grazing Food Chain:**

• Starts with green plants (producers) that are consumed by herbivores and subsequently by carnivores.
• Main source of energy- *Plant biomass*
• **Example: Grass → Grasshopper → Frog → Snake → Hawk**



2. **Detritus Food Chain:**

• Begins with *dead organic matter (detritus)* consumed by decomposers and detritivores (e.g., beetles, worms).
• Main source of energy : *dead organic matter*
• Microorganisms play a crucial role in breaking down complex organic materials.



STAGES OF DECOMPOSITION

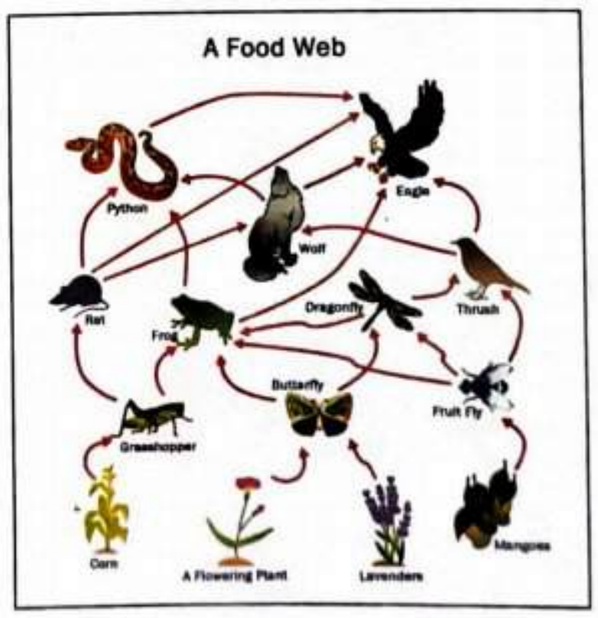
• ***Fragmentation***: Breakdown of dead organic matter into smaller pieces (e.g., by beetles, worms).
• ***Leaching***: Water-soluble nutrients are washed away.
• ***Catabolism***: Microbial breakdown of organic compounds into simpler substances.
• ***Humification***: Formation of humus (a dark-colored, amorphous, colloidal organic substance).
• ***Mineralization***: Final step—conversion of organic matter into inorganic nutrients.

Favourable Conditions for Decomposition:

• *High temperature*
• *High nitrogen content*
• *Low lignin and chitin in detritus*

FOOD WEB

• A food web represents all possible feeding relationships among organisms in an ecosystem, an *accumulation of various food chains.*
• More realistic than a food chain, as it depicts the interconnectedness of food pathways.
• Reflects the complex and non-linear flow of energy and nutrients.



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ECOLOGICAL PYRAMIDS

Ecological pyramids are graphical representations of trophic levels in an ecosystem.

• With each step from the producer to the consumer level, the number, biomass and energy of organisms decrease. Hence the diagrammatic depiction takes a pyramid form.

• This concept was developed by *Charles Elton in 1927.*

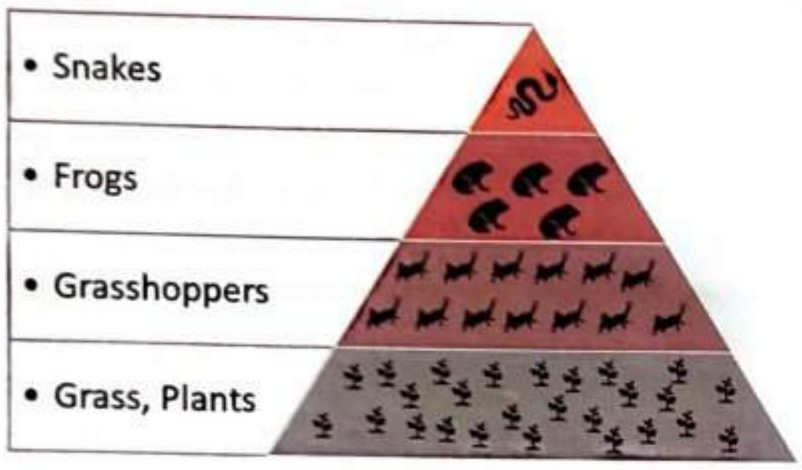
• Following are the major three types of Pyramids :

1. **Pyramid of Numbers**

• Depicts the number of individuals at each trophic level,

• *Typically upright* - can be seen in grassland ecosystems.

• This pyramid is *inverted* in a *Desert Ecosystem*



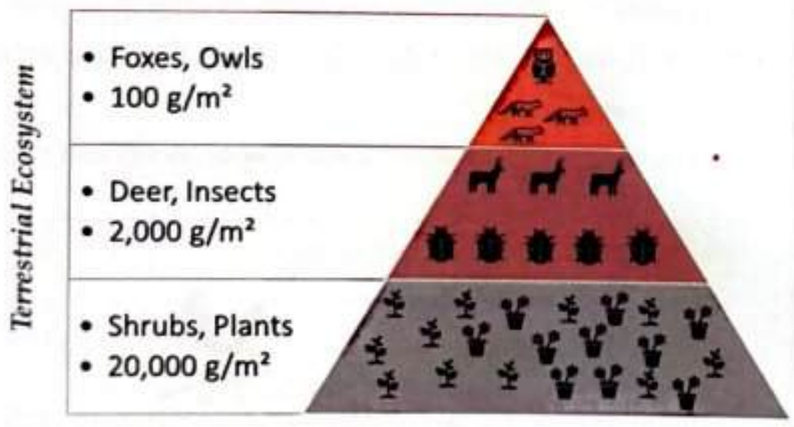
2. **Pyramid of Biomass**

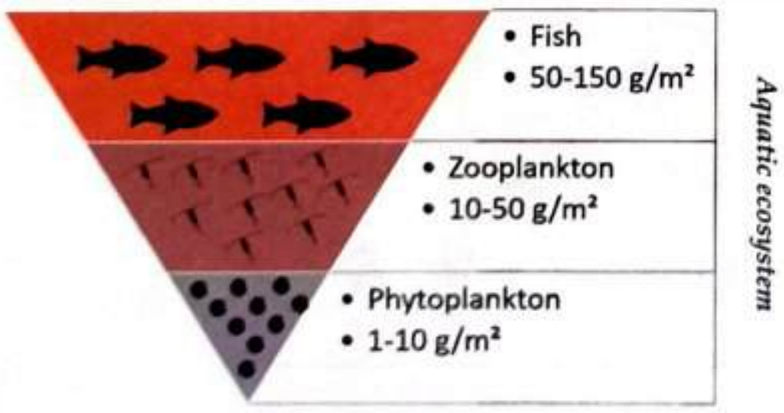
• Shows total dry weight of organisms at each level (g/m²).

• *Usually upright but is inverted in aquatic systems.*

• *In 1938, Bodenheimer* gave the *Pyramid of Biomass* on the lines of Elton's Pyramid of Numbers.

• Aquatic chain: Phytoplankton → Zooplankton → Small Fish → Large Fish



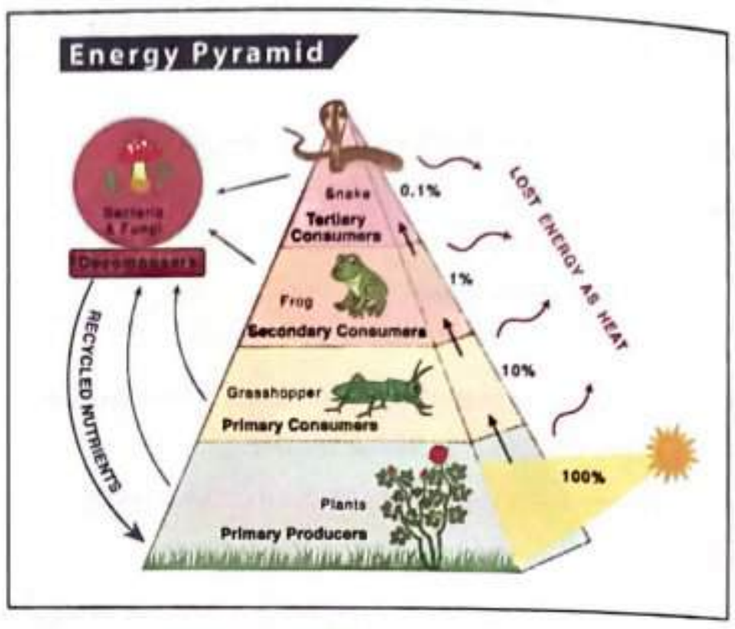


3. **Pyramid of Energy:**

• Illustrates the rate of energy flow through trophic levels.

• *Always upright* due to the energy loss at each level in the form of heat.

• Given by *G.E. Hutchinson & Raymond Lindeman (1942).*



• **10% Rule**: On average, only about 10% of energy from one trophic level is passed to the next. The rest is lost to metabolism, heat, and waste.

POLLUTANTS AND TROPHIC LEVEL

• Non-degradable pollutants (e.g., heavy metals, pesticides) can accumulate in organisms and move through trophic levels. These movements of the pollutants involves two main processes:

Bioaccumulation:

• Refers to the accumulation of pollutants in a food chain over time.

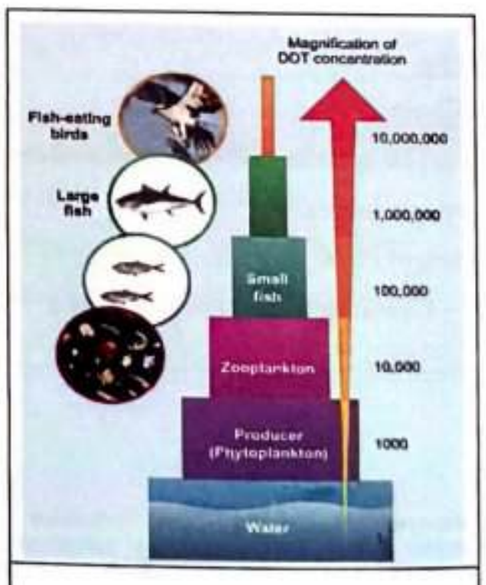
• Occurs when an organism absorbs a toxic substance faster than it can excrete it.

Biomagnification:

• Refers to the increasing concentration of pollutants as they move up the food chain.

• Top consumers have the highest toxin levels due to accumulation from multiple prey.

Bioremediation : use of Biotechnology to decontaminate an area.



Biomagnification

For an interactive recap of this topic, see the crossword on Page Number 339.

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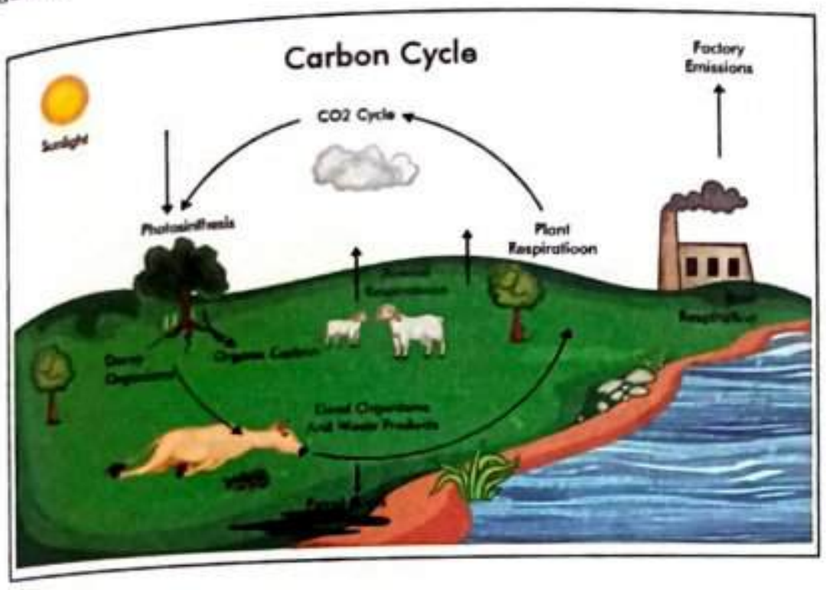
MAJOR BIOGEOCHEMICAL CYCLES

CARBON CYCLE

The carbon cycle is a biogeochemical process where carbon is exchanged among the biosphere, geosphere, hydrosphere, atmosphere, and pedosphere. Green plants absorb carbon dioxide for photosynthesis, storing carbon. When plants die, they form fossil fuels. Animals obtain carbon by consuming plants and release it back through respiration and decomposition. Burning fossil fuels in industries releases stored carbon dioxide into the atmosphere, continuing the cycle.

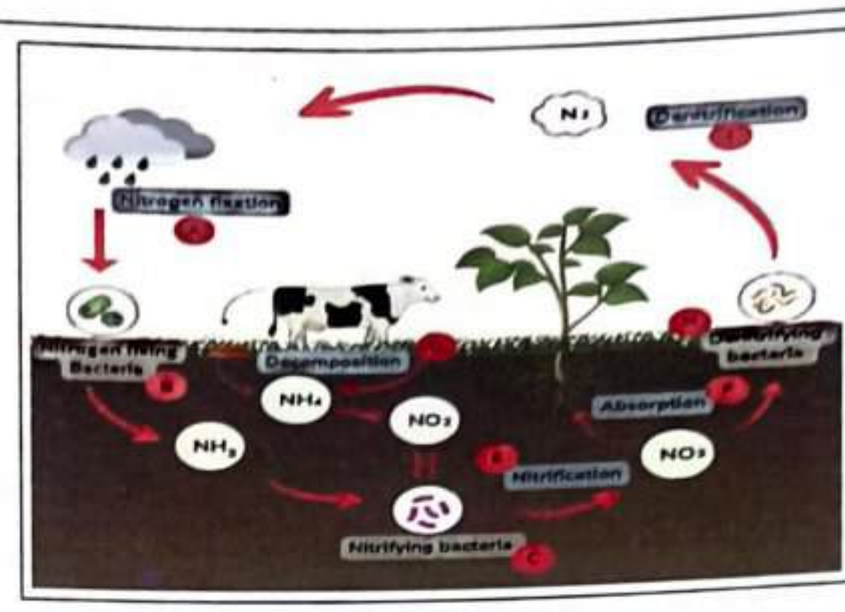


WATER CYCLE (HYDROLOGICAL CYCLE)

The water cycle is a biogeochemical process where water moves continuously through the atmosphere, land, and oceans. Water evaporates from surfaces, forms clouds through condensation, and returns as precipitation. Some of it infiltrates the ground to recharge aquifers, while the rest runs off into water bodies. Plants also release water through transpiration. This cycle ensures the distribution and renewal of freshwater across ecosystems.

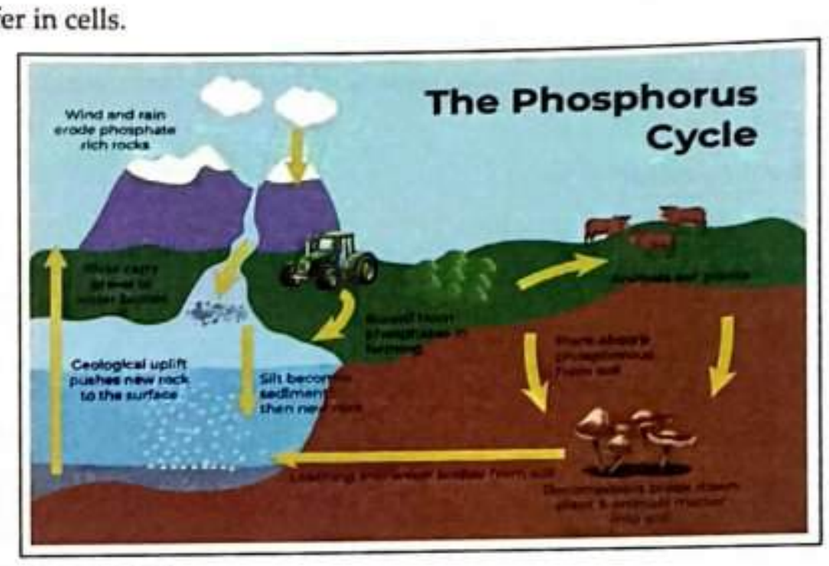
NITROGEN CYCLE

The nitrogen cycle involves the transformation and movement of nitrogen among the atmosphere, soil, and living organisms. Atmospheric nitrogen is fixed by lightning or nitrogen-fixing bacteria into usable forms like ammonia and nitrates. Plants absorb these compounds, which are passed through the food chain. Decomposition and excretion return nitrogen to the soil, while denitrifying bacteria release nitrogen gas back to the atmosphere, completing the cycle.



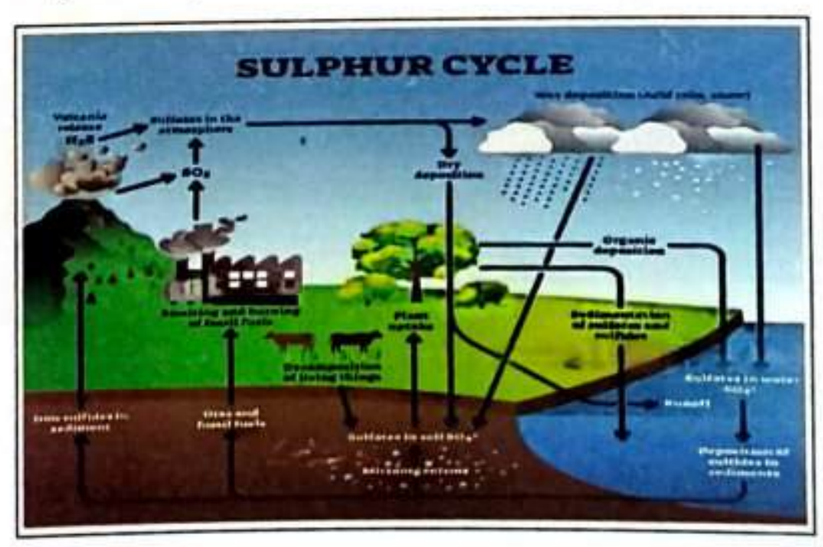
PHOSPHORUS CYCLE

The phosphorus cycle describes the movement of phosphorus through rocks, soil, water, and organisms. Unlike other cycles, it does not involve the atmosphere. Phosphorus is released from rocks by weathering and taken up by plants. Animals obtain it by eating plants. When organisms die or excrete waste, phosphorus returns to the soil and may eventually form sedimentary rock again. It is essential for DNA, RNA, and energy transfer in cells.



SULPHUR CYCLE

The sulphur cycle traces the movement of sulphur through the atmosphere, lithosphere, and biosphere. Sulphur is released into the air from volcanic eruptions, fossil fuel combustion, and decay of organic matter. It falls back to the earth via rain as sulphuric acid, is absorbed by plants, and then moves through the food web. Decomposition and microbial processes return sulphur to the soil and atmosphere, influencing both ecosystems and acid rain formation.



For an interactive recap of this topic, see the crossword on Page Number 339.

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Important International Environmental Conventions and Protocols

1. Minamata Convention
Adopted in: *2013* (entered into force in 2017)
Objective: Protect human health and the environment from mercury emissions and releases.

2. Stockholm Conference
Held in: *1972*
Objective: *First major UN conference* on the human environment; raised global awareness and led to the creation of UNEP.

3. Nairobi Declaration
Adopted in: *1982*
Objective: Strengthen UNEP's role and reaffirm commitments made in the Stockholm Conference.

4. Vienna Convention
Adopted in: *1985*
Objective: Protection of the ozone layer from human-made chemicals.

5. Montreal Protocol
Adopted in: *1987*
Objective: Phase out production and consumption of ozone-depleting substances.
Kigali Amendment (2016): Added HFCs to the list of controlled substances.

6. Helsinki Declaration
Adopted in: *1964* (latest revision: 2013)
Objective: Set ethical principles for medical research involving human subjects.

7. Basel Convention
Adopted in: *1989*
Objective: Control and reduce transboundary movements of hazardous wastes and ensure their environmentally sound disposal.

8. Earth Summit (Rio Summit)
Held in: *1992*
Objective: Promote sustainable development; resulted in Agenda 21, Rio Declaration, and UNFCCC.

9. UN Convention to Combat Desertification (UNCCD)
Adopted in: *1994*
Objective: Combat desertification and drought, particularly in Africa; ensure sustainable land management.

10. Kyoto Protocol
Adopted in: *1997*
Objective: Legally binding commitment to reduce greenhouse gas emissions in developed countries.

11. Stockholm Convention
Adopted in: *2001* (entered into force in 2004)
Objective: Eliminate or restrict the production and use of persistent organic pollutants (POPs).

12. Johannesburg Declaration *(World Summit on Sustainable Development)*
Held in: *2002*
Objective: Reaffirm commitment to sustainable development and strengthen implementation of ***Agenda 21***.

13. Rotterdam Convention
Adopted in: *1998* (entered into force in 2004)
Objective: Promote shared responsibilities in international trade of hazardous chemicals and pesticides through prior informed consent.

14. Cartagena Protocol on Biosafety
Adopted in: *2000* (entered into force in 2003)
Objective: Protect biological diversity from potential risks posed by living modified organisms (LMOs).

15. Bonn Convention (Convention on Migratory Species - CMS)
Adopted in: *1979* (entered into force in 1983)
Objective: Conserve migratory species of wild animals across their range.

16. Nagoya Protocol
Adopted in: *2010* (entered into force in 2014)
Objective: Fair and equitable sharing of benefits from the utilization of genetic resources.

17. Paris Agreement
Adopted in: *2015* (entered into force in 2016)
Objective: Strengthen global response to climate change by limiting global warming to well below 2°C above pre-industrial levels.
Linked to: *COP21 (21st Conference of the Parties to UNFCCC).*

For an interactive recap of this topic, see the crossword on Page Number 339.

TsuNamî

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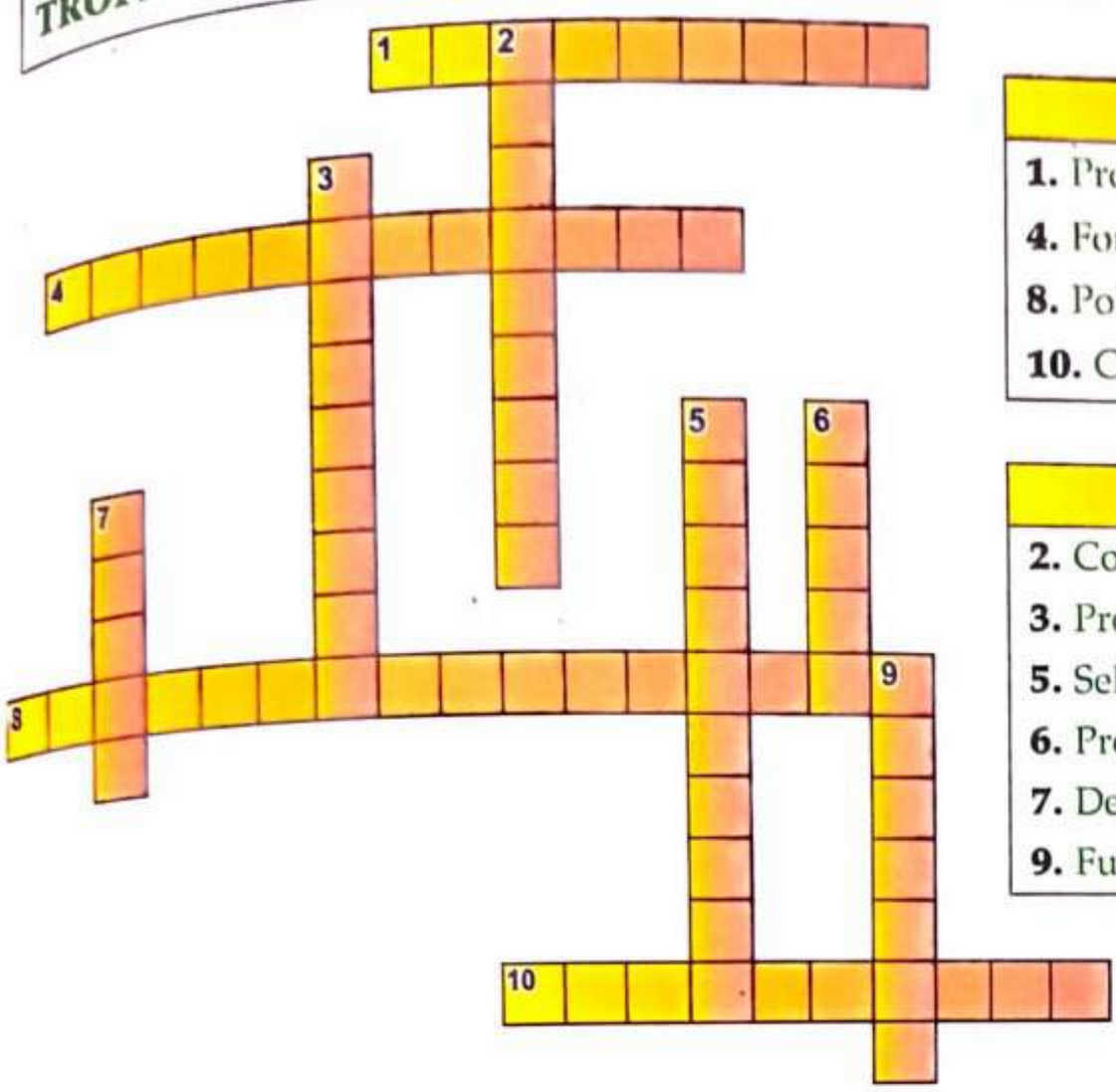
PARMAR'S CROSSWORD

TROPHIC DYNAMICS, ENERGY TRANSFER AND BIOGEOCHEMICAL CYCLES



Across

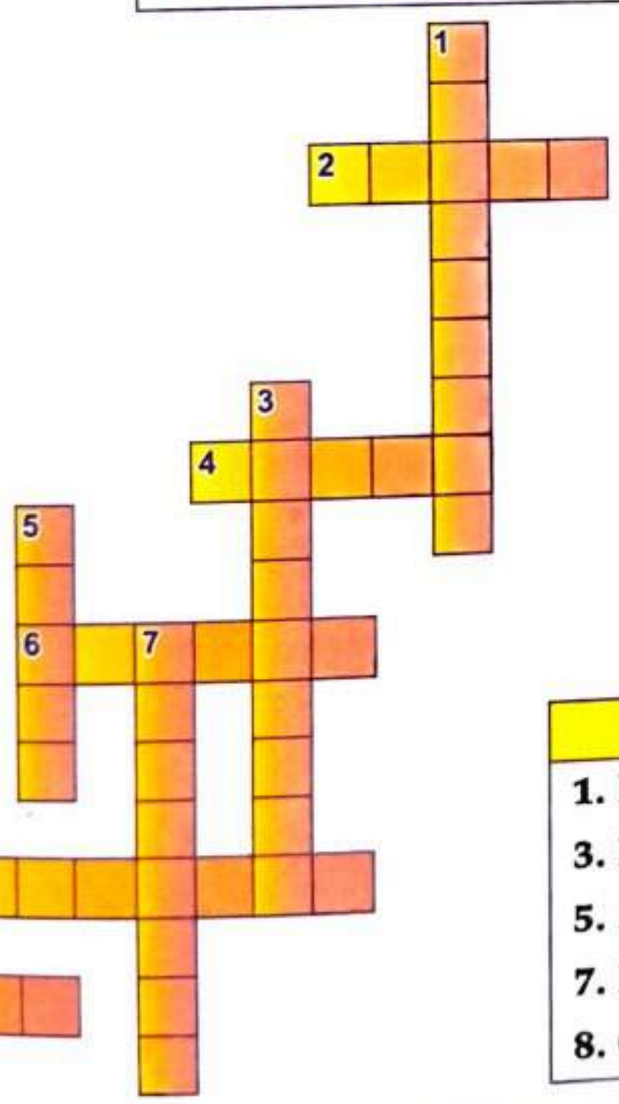
1. Protocol on biosafety and GMOs.
4. Formation of humus during decomposition.
8. Pollutant concentration increase in food chain.
10. Cycle excluding atmospheric interaction.

Down

2. Convention on hazardous chemical trade.
3. Proposed 10% energy transfer rule.
5. Self-nourishing organisms in food chain.
6. Protocol on greenhouse gas reduction.
7. Developed concept of ecological pyramids.
9. Functional unit of kidney.

PARMAR'S CROSSWORD

ENVIRONMENTAL CONVENTIONS



Across

2. Protocol with legally binding emission reduction targets.
4. Convention controlling transboundary movement of hazardous wastes.
6. Convention for protection of wetlands.
9. Convention on trade of hazardous chemicals with prior informed consent.
10. Framework to protect ozone layer signed in 1985.

Down

1. First major UN conference on human environment in 1972.
3. Protocol on biosafety of genetically modified organisms.
5. Agreement to limit global warming below 2°C.
7. Protocol to phase out ozone-depleting substances.
8. Convention on migratory species conservation.

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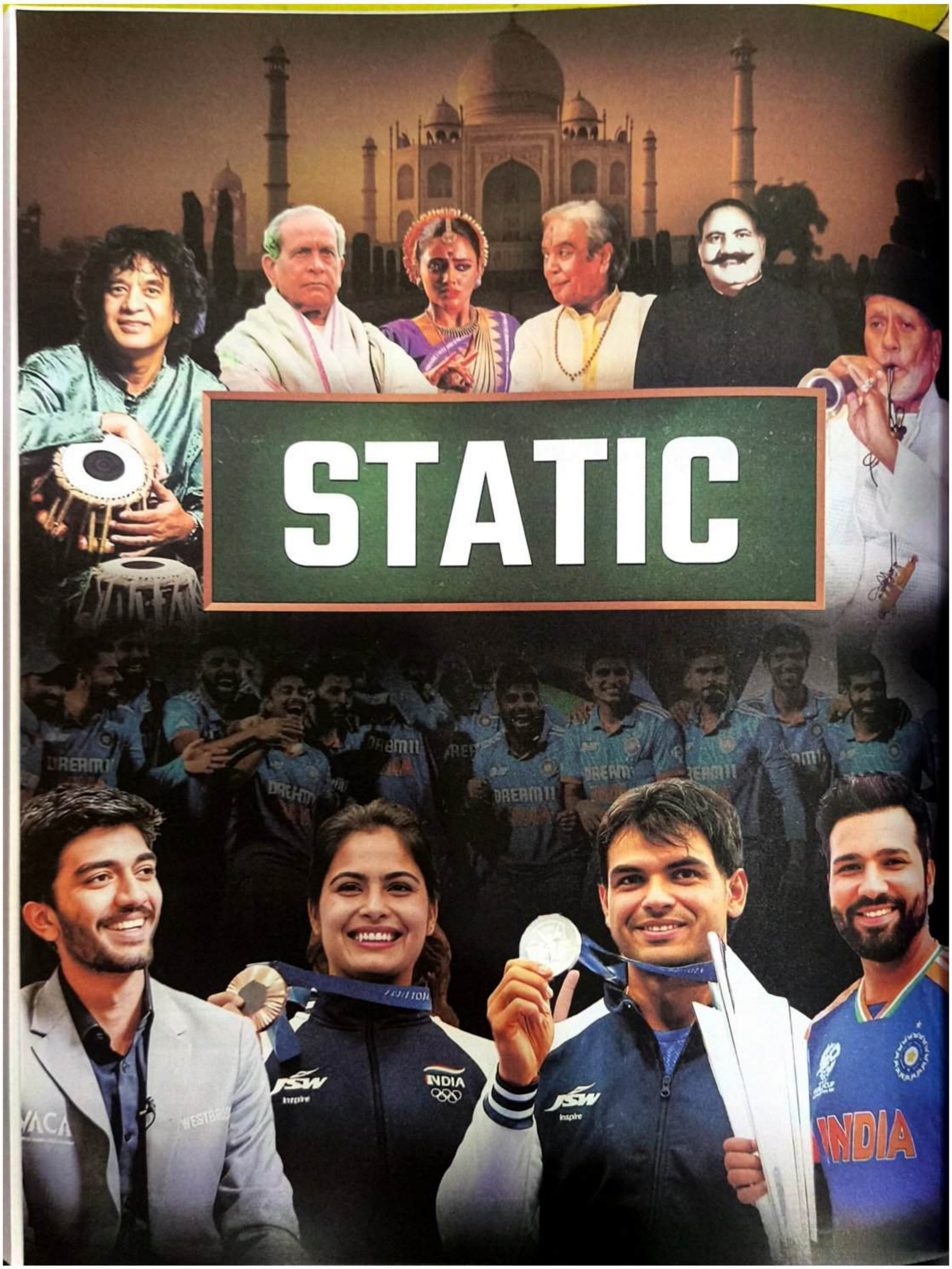

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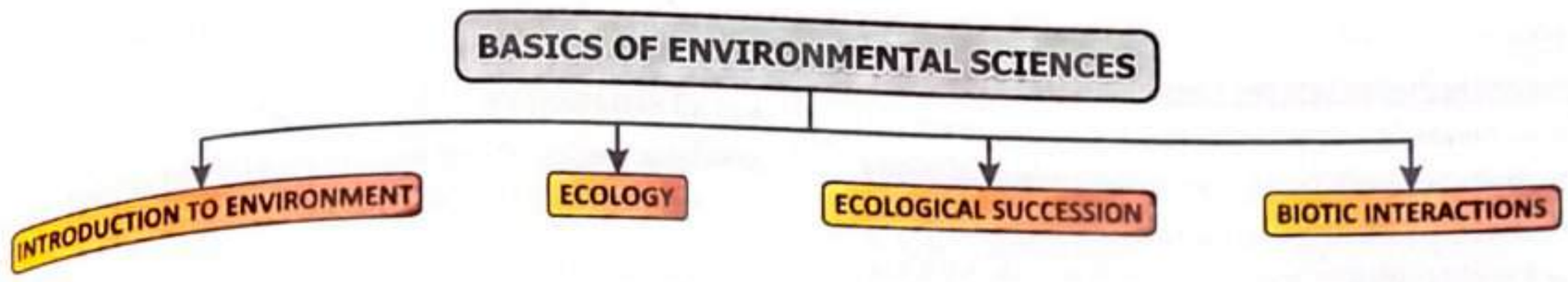

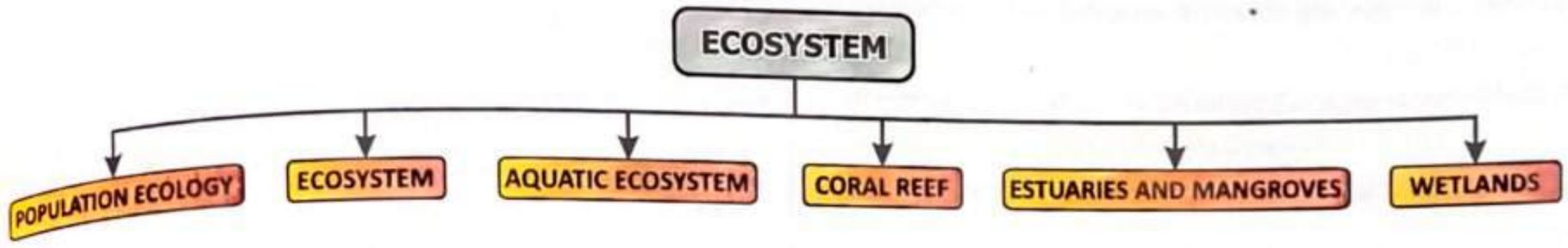

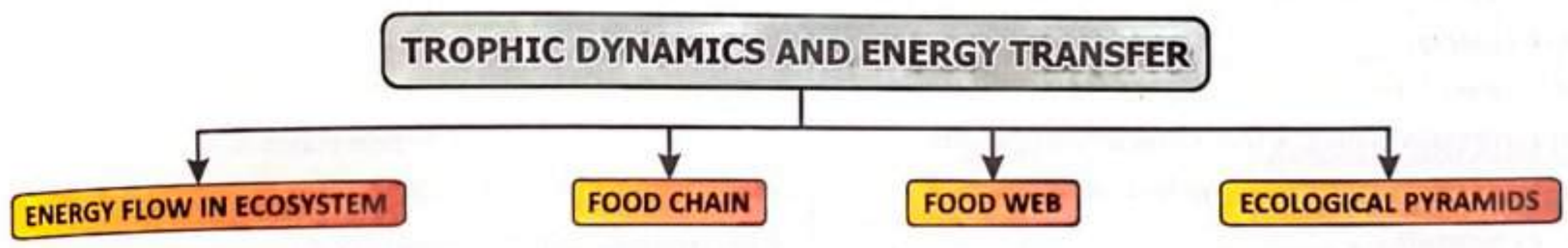

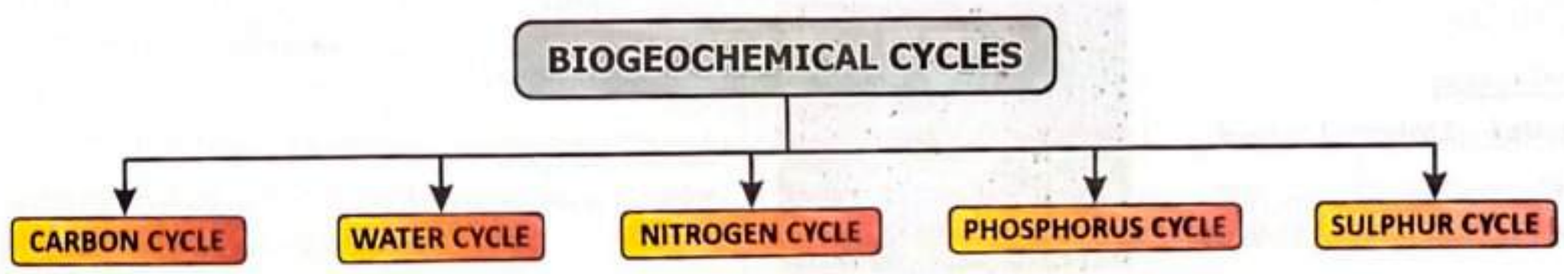

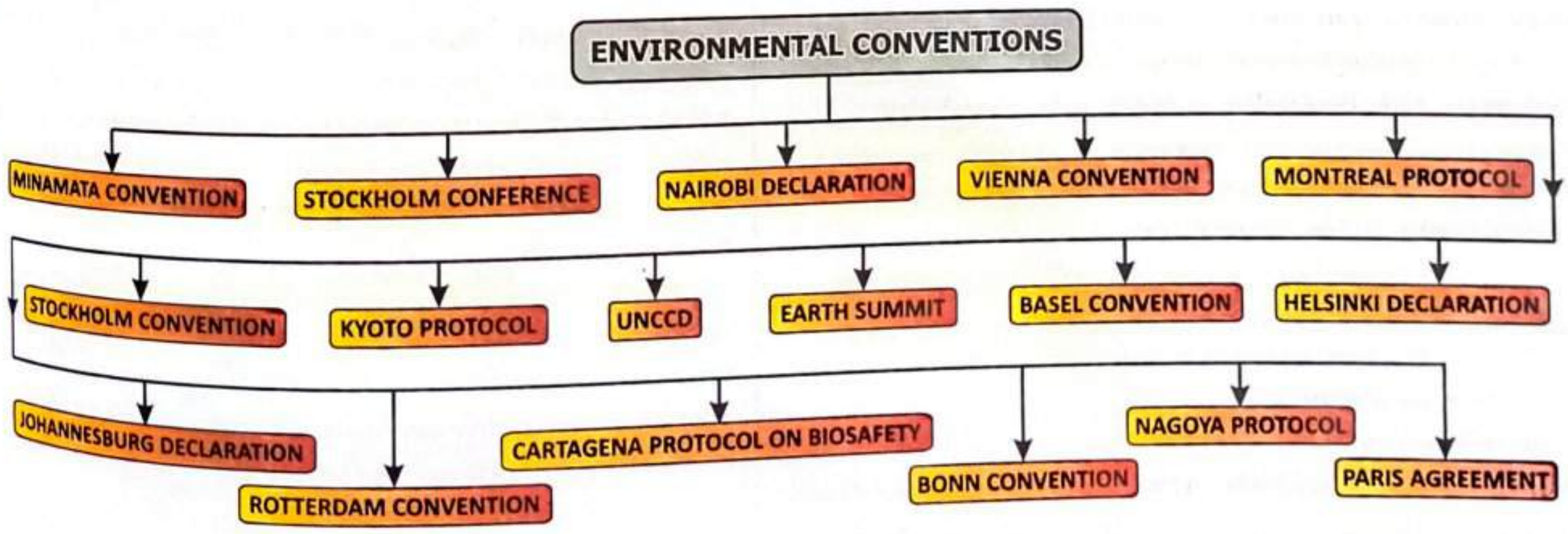

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Indian Dance Forms

Indian dance forms can be divided into two types:

1. **Classical Dance Forms:** They have *particular steps* that need to be performed in particular events (mostly performed in temples).
2. **Folk Dance Forms:** *No particular steps* are defined. They are performed in a specific ritual.

CLASSICAL DANCE FORMS

• There are *8 classical dances* according to *Sangeet Natak Academi* (HQ: New Delhi) however the *Ministry of Culture* recognises *9 classical dances (8 classical dances + Chhau)*.

• ***Origin:*** Rooted in *Natya Shastra* (considered as *"Fifth Veda"*), written by *Bharat Muni*.

• *Abhinaya Darpana* by *Nandikeshvara* describe expressions, movements, and gestures.

• *Nritta:* Pure form of dance.

• *Nritya:* Expressive form of dance (pure dance + expression).

BHARATNATYAM *(Tamil Nadu)*

• It is the *oldest classical dance* of India that is performed solo (by a single person) → known as *Ekaharya*.

• ***Earlier Names:*** *Sadirattam, Thevarattam, Parathaiyar Attam.*

• Bharatnatyam was earlier also known as *Dasiattam* as it was traditionally performed by *Devadasis* (female dancers) in temples (last surviving devadasi: *R. Muthukannammal*).

• ***Symbolises:*** Fire

• It is found in Natya Shastra and is associated with *Kalakshetra style*.

• It was banned by Britishers in *1910* but was later revived.

• ***Revival by:*** *E. Krishna Iyer* and *Rukmini Devi Arundale* → renamed the dance Sadirattam to Bharatnatyam.

Forms of Classical Dance:

• ***Shaivite (majority)*** → Dedicated to *Lord Shiva* (masculine).

• ***Vaishnavite*** → Dedicated to *Lord Vishnu* (feminine).

• ***References in literature:*** Found in *Cilappatikaram* (by *Ilango Adigal*) and *Manimegalai* (by *Chithalai Chathanar*).

• ***Main mudra:*** *Kataka Mukha Hasta*

• Bharatnatyam was performed by certain families of the *Tanjore district* and these inheritors were known as *'Nattuvanar'*.

• ***Performance Style:*** *Pandanallur, Vazhuvoor, Kalakshetra, Melattur, Tanjore.*

• ***Movements/Stages of Dance:*** *Alarippu* (flowers offering), *Jatiswaram, Shabdam, Varnam, Padam, Tillana, Mangalam.*

Facts

• Tamil text *Tolkappiyam* was composed during *2nd Sangam*.

• *Lasya:* Feminine (Parvati)

• *Tandava:* Masculine (Shiva)

• Bharatnatyam is also depicted in temple *Gopuram (Chidambaram Temple)*.

TRICK TO REMEMBER EXPONENTS

भरत की अलार्म बाजी और उसने उठते ही अपनी माता रुक्मिणी देवी के पद्म छुए और अपनी सुंदर दोस्त मीनाक्षी और अपने सारे भाइयों को लेकर बालकृष्ण लीला देखने चला गया और धन लाकर सो गया

भरत	→	Bharatnatyam
अलार्म	→	Alarmel Velli (also an exponent of Odissi dance)
रुक्मिणी देवी	→	Rukmini Devi Arundale
पद्म	→	Padma Subrmanyam (leading figure in Bharatnatyam)
सुंदर दोस्त मीनाक्षी	→	Meenakshi Sundaram Pillai
सारे भाइयों	→	Mrinalini Sarabhai (also an exponent of Kathakali dance), Mallika Sarabhai (also an exponent of Kuchipudi dance).
बाल	→	Bala Saraswati
कृष्ण	→	Yamini Krishnamurthy (also an exponent of Kuchipudi dance)
लीला	→	Leela Samson
धन	→	Shanta Dhananjayan/V P Dhananjayan
सो गया	→	Sonal Mansingh (also an exponent of Odissi dance)

Rukmini Devi Arundale

• She is the *first woman* to be nominated in *Rajya Sabha*.

• She is the founder of *Kalakshetra Dance School* (Estd. *1936*).

• ***She received:*** Padma Bhushan *(1956)*.

> *Alarmel Valli is associated with Pandanallur style.*

Yamini Krishnamurthi

• *"Asthana Narthaki"* (Resident Dancer) title was bestowed upon her by *Tirumala Tirupathi Devasthanam Temple*.

• ***She received:*** Padma Vibhushan *(2016)*, Padma Bhushan *(2001)*, Padma Shri *(1968)*, Sangeet Natak Academi Award *(1977)*.

Sonal Mansingh

• She is *youngest recipient* of Padma Vibhushan *(2003)*.

• ***Other Exponents:*** Rama Vaidyanathan, Meenakshi Chittaranjan, Narthaki Nataraj, Urmila Satyanarayanan, M K Saroja, Radha Sridhar, Deepak Mazumdar, CV Chandrashekhar.

KUCHIPUDI *(Andhra Pradesh)*

• ***Earlier known as:*** *Bhagavata Mela Dance* (Tanjore, Tamil Nadu).

• ***Modern form of dance is attributed to:*** *Tirtha Narayanayati* and *Siddhendra Yogi* {developed as a dance-drama → *Bhama Kalpam* (story of *Satyabhama*, the charming but jealous wife of Lord Krishna)}

• ***Symbolises:*** Earth

• ***Elements:*** *Ganesha Vandana, Jatiswaram, Shabdam, Kalapam, Padam, Tarangam* (it is the concluding part of dance where the dancer dances on a rim of *brass plate*).

• *Yakshagana* was performed in Andhra Pradesh in earlier times. It is traditionally presented from dusk till dawn.

TsuNamî

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TRICK (1) TO REMEMBER EXPONENTS

जिनके सरनेम में भी Reddy दिख जाए वह Kuchipudi से Related होगा

- Raja Reddy, Radha Reddy, Padmaja Reddy, Bhavana Reddy, Yamini Reddy.
- *Other Exponents:* Yamini Krishnamurthy, Mallika Sarabhai.

TRICK (2) TO REMEMBER EXPONENTS

सत्यम और सतीश लक्ष्मी जी की सत्यनारायण कथा में गए जहाँ उन्होंने एक सुंदर लड़की शोभा के साथ कुच्ची पूड़ी खायी

सत्यम	→	Vempata Chinna Satyam
सतीश	→	Aparna Satisham
लक्ष्मी	→	Lakshmi Narayan Shastri
सत्यनारायण	→	Vendantam Satyanarayan (Padma Shri Awardee)
सुंदर	→	Swapna Sundari
शोभा	→	Shobha Naidu
कुच्ची पूड़ी	→	Kuchipudi
		Halim Khan

- *Kuchipudi was initially performed by Brahmin boys.*
- *Sri Krishna Leela Tarangini authoured by Narayan Teertha*

ODISSI *(Odisha)*

- *Symbolises:* Water
- *Gotipua* is a traditional dance form of Odisha that was originally performed by *Maharis*, female temple dancers. Today, *young boys* perform the dance in the style of the Maharis. Gotipua is the *precursor* to the classical Odissi dance.

TRICK (1) TO REMEMBER

डमर नाम में Mohapatra और Mohanty दिख जाए तो Odissi से Related है

- *Kelucharan Mohapatra* (considered as *father of Odissi* who popularised the dance; *Padma Vibhushan* in *2000*), Sujata Mohapatra, Leela Mohanty, Niharika Mohanty.
- *"Adiguru"* of Odissi dance: Pankaj Charan Das
- *Other Exponents:* Kiran Sehgal, Mayadhar Raut, Indrani Rehman.
- *Protima Gauri* founded *Nrityagram* (an institution in Karnataka) dance village and popularised Odissi.

TRICK (2) TO REMEMBER EXPONENTS

भूटान के प्रधान माधवी से मिलने उडीशा आए और यह बात विजय ने संजू और साहू को बता दी

भूटान	→	Shagun Bhutani
प्रधान	→	Gangadhar Pradhan
माधवी	→	Madhavi Mudgal
उडीशा	→	Odissi
विजय	→	Bijayni Satpathy
संजू	→	Sanjukta Panigrahi
साहू	→	Sudhakar Sahu
		Sutapa Talukdar

- ***Elements in Odissi:*** *Mangalacharan, Batu Nritya, Pallavi, Tharijham, Moksha.*

KATHAK *(Uttar Pradesh)*

- The name is derived from *"Katha" (storytelling).*
- It is the only classical dance to feature *Persian elements*. The *Mughals* patronised this dance.
- It is performed in *Hindustani music* and *Urdu ghazals*.
- The last Nawab of Awadh *(Wajid Ali Shah)* widely associated with the patronage of Kathak dance.
- ***Elements:*** *Amad, Thaat (standing position), Tukra, Paran, Jugalbandhi, Tarana, Bhaav, Kramalaya Ghat.*
- ***Gharanas associated with this dance:*** Lucknow Gharana (Founder: *Ishwari Prasad*), Jaipur Gharana (Founder: *Bhanuji Maharaj*), Banaras Gharana (Founder: *Janaki Prasad*).

TRICK TO REMEMBER EXPONENTS

अरे महाराज नारायण और देवी में आस्था रखो उनका प्रसाद खाओ विद्या मिलेगी लखपति बनोगे और सब मंगल होगा

महाराज	→	Birju Maharaj, Lacchu Maharaj, Acchan Maharaj
नारायण	→	Shovna Narayan
देवी	→	Sitara Devi
आस्था	→	Kamini Asthana, Nalini Asthana
प्रसाद	→	Narayan Prasad, Kalka Prasad, Ishwari Prasad
विद्या	→	Vidhya Gauri Adkar
लखपति	→	Kumudini Lakhia
मंगल	→	Aditi Mangal Das
		Kumkum Dhar
		Roshan Kumari

Birju Maharaj

- He is from *Kalka Bindadin Gharana (Lucknow).*
- He founded the dance school *Kalashram* in *Delhi* in *1998*.
- ***Received:*** Padma Vibhushan *(1986)*
- ***Other Exponents:*** Gopi Krishan, Rani Kasna, Geetanjali Lal, Maulik Shah.

MOHINIYATTAM *(Kerala)*

- This dance form is associated with Hindu God *Vishnu* (his female avatar *"Mohini"*).
- This dance is also called *"Dance of Enchanters"* (graceful dance).
- ***Symbolises:*** Air
- References of this dance is mentioned in *"Vyavaharamala"* (ancient text) written by *Mazhamangalam Narayanan Namputiri*.
- This dance form has *no abrupt jerks* but has smooth performance.
- This classical dance is known to have **24** *hand gestures*.
- ***Elements:*** *Cholkettu, Jatiswaram, Padavarnam, Padam, Tillana, Slokam, Saptam.*
- ***Dance Forms:*** *Tevitichiyattam, Nangai Natakam, Dasiyattam.*

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TRICK TO REMEMBER EXPONENTS

मोहिनी गोपी के कान में सुना जय राधा कृष्णा की अम्मा

मोहिनी	→	Mohiniyattam
गोपी	→	Gopika Verma
कान	→	Kanak Rele
सुना	→	Sunanda Nair
जय	→	Jayaprabha Menon
राधा	→	Radha Dutta
कृष्णा	→	Pallavi Krishnan
अम्मा	→	Kalyanikutty Amma

Kalyanikutty Amma

- She played a major role in revival of this dance form.
- *Received:* Sangeet Natak Akademi Award *(1974)*.
- She is the founder of *Kerala Kalyanam (Estd. 1952)*.

V N Menon

- He helped repeal the *ban on temple dancing* in Kerala thereby reviving the Mohiniyattam.

- *King Swathi Thirunnal* not only revived Mohiniyattam, but was also responsible for inculcating *Carnatic classical music* into the dance form.

KATHAKALI *(Kerala)*

- Katha means *"Story"* and Kali means *"Performance"*.
- This dance form is performed by a *male performer*. This dance is usually performed in temples after *Sevakali* session.
- The vocal performance of this dance is in *Sanskritised Malayalam*.
- It is based on epics of *Ramayana* and *Mahabharata*.
- There is use of *facial expressions* and *face colour* (face is *painted in green* → the colour represent *strength*). Hence considered as *"Mask Dance"*.
- Colors and their meanings: Green *(strength)* and Red *(evil)*.
- Vesham (5), Expression (9), Hand gesture (24).
- ***Forms:*** *Natyam, Nritham, Nrithyam, Sangeetam, Vadya.*
- ***Elements:*** *Kelikottu, Thodayam, Purappadu, Tiranokku, Ilakiyattam, Kalasam.*
- *Aharya* means *costume* and *makeup* in Sanskrit.

> • *Kalaripayattu is a martial dance.*

There are five major Veshams (makeup)

- *Pacha:* Green, for noble, heroic, and generous characters
- *Kathi:* Knife, for villainous characters
- *Thadi:* Beard, for characters with beards
- *Kari:* Black, for evil characters
- *Minukku:* Radiant, for noble, virtuous female characters

TRICK TO REMEMBER EXPONENTS

बाल मिले ना मिले कुछ गोपी की कली मिल जाए

बाल	→	P. V. Balkrishna
मिले	→	Milena Salvini
कुछ	→	Kunchu Kurup
गोपी	→	Gopi Nath
काली	→	Kottakal Nandakumaran Nair Mrinalini Sarabai

MANIPURI *(Manipur)*

- It is an introverted type of dance form which is based on *Vaishnavism* (a Vaishnavite form of dance).
- Ashtapadis of *Jayadeva's Gita Govinda* are sung in Manipuri.

Forms of Manipuri Dance:

1. **Raas Leela**
- It depicts the love story of *Krishna* and *Radha*.
- ***Propounder:*** *Rajarshi Bhagya Chandra*

2. **Sankirtana Tradition**
- *Jagoi* and *Cholom* are two parts of this tradition.
- Cholom is *masculine aspect* of the dance form in which *pung* (drum) is used to perform the dances.

3. **Thang-Ta**
- It is a *martial dance*.

TRICK TO REMEMBER EXPONENTS

- ***Surname with Devi is mostly associated with Manipuri dance:*** Kalavati Devi, Gambhini Devi, Bimbavati Devi

- ***Exponents:*** Jhaveri sisters, Nirmala Mehta, Guru Bipin Singh (He received the title *"Hanjaba"* from some Manipur King), Charu Mathur, Devyani Chalia, Aluna Kabuini.
- Other Exponents: Rajkumar Singhajit Singh, Nileshwar Mukherjee.

SATTRIYA *(Assam)*

- It is a *Vaishnavite* form of dance that was included under classical dance category in *2000*.
- The theme of dance form is related to *Lord Krishna*.
- ***Founder of Sattriya Dance:*** *Srimanta Sankaradeva*
- Ankiya Naat is a *"one-act play"* written in *Brajavali*. In Assam, it is called as *"Bhaona"* a traditional art form that combines *dance, music,* and *visual art*.

- ***Dance numbers:*** *Chali* (no theatre components), *Jhumura, Nadu Bhangi*.
- ***Exponents:*** Jatin Goswami, Bhupen Hazarika (Bharat Ratna in 2019), Guru Ghanakanta Bora, Indira Bora, Maniram Dutta, Krishnakshi Kashyap, Meenakshi Medhi, Sharodi Saikia.

TsuNamî

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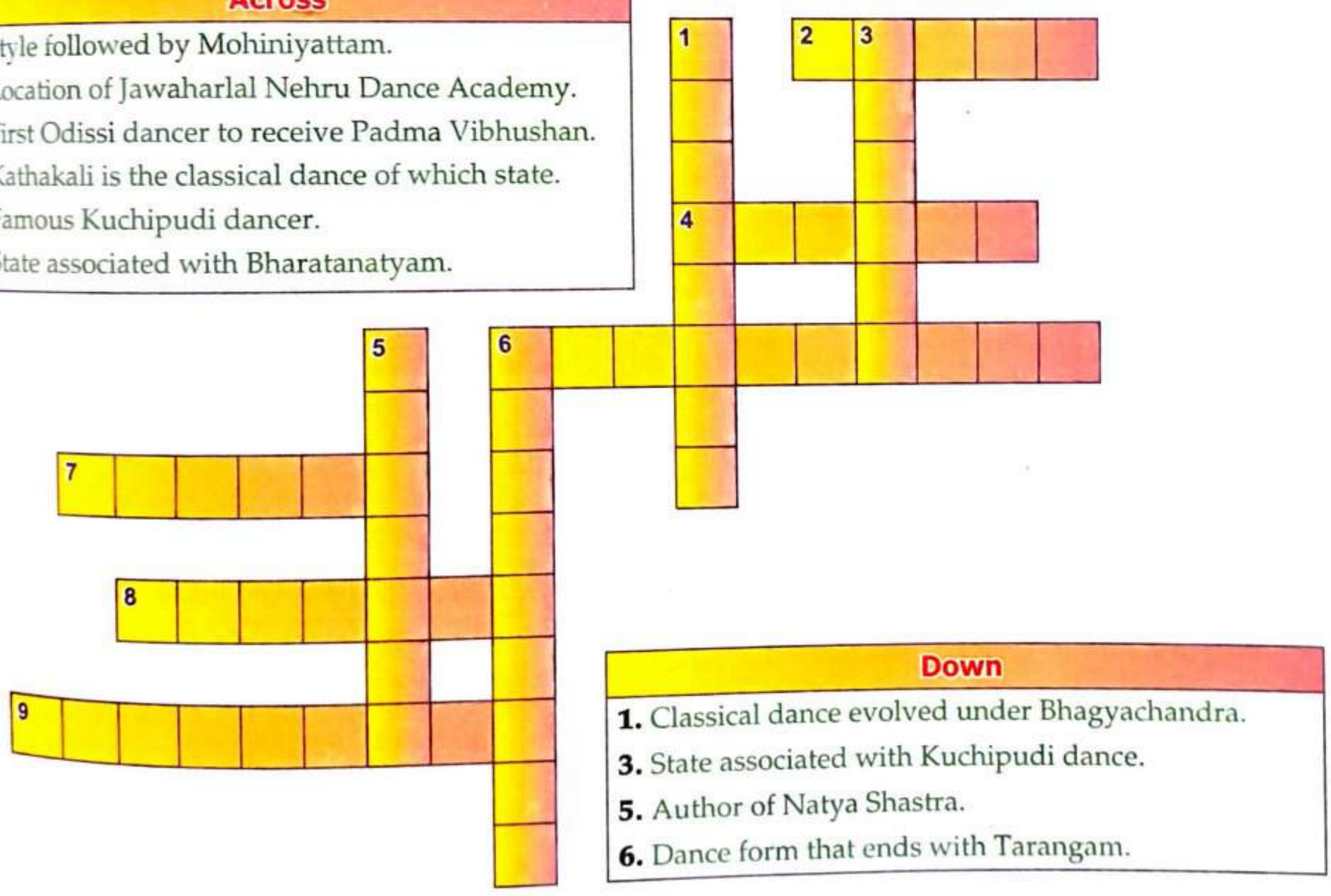
VARIOUS ORGANISATIONS

1. ***Sangeet Natak Akademi/Indian National School of Dance:*** Delhi.
2. ***Kalakshetra School of Dance:*** Rukmini Devi Arundale (mother of Modern Bharatnatyam).
3. ***National Institute of Kathak:*** 1964 (New Delhi).
4. ***Nehru Manipur Dance Academy:*** 1954 (Imphal).
5. ***Govindji Nrityalaya:*** Manipur.
6. ***Darpana Academy of Performing Arts*** established by Mrinalini Sarabhai and Vikram Sarabhai: 1949 (Ahmedabad).
7. ***Nalanda Nritya Kala Mahavidyalaya:*** Mumbai.
8. ***National Institute of Performing Arts:*** Mumbai.
9. ***Kalasharam Kathak School established by Birju Maharaj:*** New Delhi.
10. ***Kadam School of Dance and Music founded by Kumudini Lakhia:*** 1967 (Ahmedabad).

PARMAR'S CROSSWORD

CLASSICAL DANCE



Across

2. Style followed by Mohiniyattam.
4. Location of Jawaharlal Nehru Dance Academy.
6. First Odissi dancer to receive Padma Vibhushan.
7. Kathakali is the classical dance of which state.
8. Famous Kuchipudi dancer.
9. State associated with Bharatanatyam.

Down

1. Classical dance evolved under Bhagyachandra.
3. State associated with Kuchipudi dance.
5. Author of Natya Shastra.
6. Dance form that ends with Tarangam.

TsuNamî

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ANDHRA PRADESH

TRICK TO REMEMBER: *Veer Logon Ke Liye Dhimese Koyle Ki Bhaap Se Burra Banalu*

TRICK		Dance
Veer	→	*Veeranatyam (Dance of Brave):* Performed by *Veeramusti community* [believed to be followers of Veerabhadra (Lord Shiva)].
Logon	→	*Lambadi: Banjara tribe.*
Dhimese	→	*Dhimsa (tribe of Araku valley):* Performed by 15-20
	→	women forming a chain.
Koyle	→	*Kolattam*
Bhaap	→	*Bhamakalapam (dance-drama):* Composed by Sidhyendra Yogi.
Burra	→	*Burrakatha*
Banalu	→	*Bonalu:* Celebrated in honour of Goddess Mahakali.
	→	*Butta Bommalu (mask dance):* Performed in West Godavari region. Butta Bommalu means "Basket Toys".
	→	*Dappu Nrityam*

Bhamakalapam

Dhimsa Dance

Butta Bommalu Dance

ARUNACHAL PRADESH

TRICK TO REMEMBER: *Rekha → Aruna Aji Wancho Baua Ke Pas Chalo Sham Ko Aur Mask Lagake Lion and Peacock Dance Dekho*

TRICK		Dance
Rekha	→	*Rikhampada: Mishmi tribe.*
Aji	→	*Aji Lamu: Monpa tribe.*
Wancho	→	*Wancho: Wancho tribe.* Celebrated in March/April during Oriah festival.
Baua Ke	→	*Buiya: Digaru Mishmi tribe.*
Pas	→	*Pasi Kongki: Adi tribe* performs this on Abhang songs.
Chalo	→	*Chalo Loku: Nocte tribe* performs in Oct-Nov.
Sham Ko	→	*Bardo Chham:* Dance of 12 zodiacs *(Sherdukpen community)* and is associated with Tibetan-Buddhist.
Mask	→	*Mask*
Lion and Peacock	→	*Lion and Peacock: Monpa tribe.*
	→	*Popir:* Performed by *Garo tribe* in tribute to Mopin Ape (Goddess of prosperity and fertility).
	→	*Ponung: Adi tribe.*
	→	*Yak Chham Dance (mask dance):* It is also known as Yak dance.

Lion and Peacock Dance

Rikhampada Dance

ASSAM

TRICK TO REMEMBER: *Ali Bhor Main Deo Ke Pass Gaya, Hey Bhagawan Maths Main Ank Dila Dena Iss Pali Main Jhum Ke Nachunga*

TRICK		Dance
Ali	→	*Ali ai Ligang: Mishimi tribe* performs Gumrag dance in this festival (observed on first Wednesday of Feb-March).
Bhor	→	*Bhortal:* Developed by Narhari Burha Bhakat and is performed by *Satriya community* in Barpeta.
Deo	→	*Deodhani:* Performed to pay tribute to Goddess Mansa (Snake Goddess).
Ank	→	*Ankiya Naat (one-act play):* It is centred around acts of Lord Krishna and teachings of Vaishnavite faith.
Pali	→	*Ojapali:* Semi-dramatic tradition folk dance.
Jhum	→	*Jhumur:* Performed by *Kulis* (people who work in tea gardens).
	→	*Bagarumba:* Performed by *Bodo tribe* during Bwisaga festival (women wear Dokhona/Arunai).
	→	*Bihu:* It is a dance and also a festival.
	→	*Baidima: Dimasa tribe.*
	→	*Bawang: Karbi Anglong tribe.*

Bihu Dance

Ojapali Dance

BIHAR

TRICK TO REMEMBER: *Do Natwe Jat-Jatin Apna Sohar Khila Rahe Hai Jhum Ke*

TRICK		Dance
Natwe	→	*Natwa: Chamar community.*
Jat Jatin	→	*Jat-Jatin:* Shows tragic lovestory of Jat and Jatin. It is performed in Mithila region during moonlit nights (monsoon).
Sohar Khila	→	*Sohar Khelwana:* Performed during child birth.
Jhum Ke	→	*Jhumeri:* Performed in Mithilanchal region during Karthik month (Oct-Nov).

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	Dance
Bidesia	Dance based on social issue of society.
Jhurni	Juhula community.
Jhijhiya (Mithila region)	Women balance lanterns while balancing this dance.
Kajari	Performed during monsoon season.
Paika dance, Dhibia dance.	

Jhijhiya Dance

Bidesia Dance

CHHATTISGARH

TRICK TO REMEMBER: *Aksar Suwa Karma Na Karke Gendiya Marte Hai Pagalpanti Karte Hai Aur Pandavo Ke Saath Jhumur Ke Niche Saila Dance Karte Hai*

TRICK		Dance
Aksar	→	*Kaksar: Abujhmaria tribe* of Bastar region.
Suwa	→	*Suwa Nacha (Parrot Dance): Kamar tribe.*
Karma	→	*Karma Nacha:* Performed during Karma festival around sacred Karma tree.
Gendiya	→	*Gendi: Baiga tribe.*
Marte Hai	→	*Gaur Maria*
Pagalpanti	→	*Panthi Nacha:* Performed by *Satnami community* (followers of Satnam panth).
Pandavo	→	*Pandavani:* A style of folk singing which includes narration of tales from Mahabharata.
Jhumur	→	*Jhumair*
Saila Dance	→	*Saila:* Performed by boys of *Bhil tribe* during harvest season.

Suwa Nacha

Pandavani Dance

Famous Exponents of Pandavani Dance: Usha Barle (Padma Shri in 2023) and Teejan Bai (Padma Vibhushan in 2019).

GUJARAT

TRICK TO REMEMBER: *Gujarat Ki Gopiyan Dandiya* aur *Garba Khelne Siddiyon Se Matak Ke Padhar Rahi Hai*

TRICK		Dance
Gopiyan	→	*Gop Raas*
Dandiya	→	*Dandiya Raas:* The dance depicts fight between Durga Mate and Mahisasura. It is performed during Navratri after aarti.
Garba	→	*Garba:* Graceful dance performed during Navratri before aarti.
Siddiyon Se	→	*Siddhi Dhamal: Siddhi community.*
Matak	→	*Matukadi: Ravari* and *Bharwad* community.
Padhar	→	*Padhar: Padhar community.*
	→	*Tippani: Koli* and *Kharwa tribe* (Chorwad district).
	→	*Hudo: Bharwad tribe* (shepherd community).
	→	*Bhavai*
	→	*Lasya*
	→	*Vinchhudo*

Garba Dance

Tippani

GOA

TRICK TO REMEMBER: *Mandvi Ghode Gadi Jaguar Dekhne Aur Patang Udane Goa Ja Rahi Hai. Chalo Gaon Romat So Jao Jake*

TRICK		Dance
Mandvi	→	*Mando:* This dance depicts love and romance.
Ghode	→	*Ghode Modhni:* This dance depicts bravery and victory and honours Maratha warriors.
Gadi	→	*Talgadi, Fugdi* (celebrated during Ganesh Chathurthi).
Jaguar	→	*Jagor:* This dance starts at midnight and continues till early morning.
Dekhne	→	*Dekhni:* Performed by Christian girls wearing Indian attire in a music that is a blend of Indian melody and Western rhythm.
Patang	→	*Tarangmel:* Performed during Holi and Dussehra festivals.
Goa	→	*Goa*
Chalo	→	*Dhalo:* Performed by women standing in two parallel rows interlocking their arms.
Gaon	→	*Gonf:* Performed during festivals after the harvest.
Romat	→	*Romat:* The dance is associated with Shigmo festival in the month of Phalgun (Feb-March).
So Jao	→	*Sao Jao:* Performed during Sao Jao festivals in the month of June.
		Kunbi

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Ghodemodni Dance

Gonf Dance

HIMACHAL PRADESH

TRICK TO REMEMBER: *Nata Chhora Aman Him Pe Rakshasho Ka Chola Aur Mala Odh Ke Sandh Per Baithkar Dang Lekar Chapa Chap Kar Raha Hai*

TRICK		Dance
Nata	→	*Nati:* The dance holds Guiness World Record for the most
	→	number of dancers (9,892 dancers) participating in Kullu
	→	district.
Chhora	→	*Jhora/Jhali*
Aman	→	*Dhaman:* Performed during Dussehra in Kullu region.
Him Pe	→	*Himachal Pradesh*
Rakshasho	→	*Rakshas Nritya:* Performed wearing a demon mask.
Chola	→	*Cholamba:* Oldest dance performed after killing a tiger.
Mala	→	*Kayang Mala:* Performed by boys and girls who form a garland-like pattern by interlocking their arms.
Sandh	→	*Shand/Shabu:* Performed mainly in Buddhist monastries and Lahaul.
Dang	→	*Dangi*
Chapa	→	*Chapeli:* Performed in Sirmaur and Chamba districts.
Chap	→	*Cham:* Performed by Buddhist monks to ward off evil spirits.
	→	*Rasa:* Performed in Sirmaur district.

Nati Dance

Rakshasa Dance

HARYANA

TRICK TO REMEMBER: *Haryana Ki Choriya Daphli aur Manjira Leke Jhumar Ke Niche Dhamaal Macha Rahe Phalgun Main*

TRICK		Dance
Choriya	→	*Khoria:* This dance is a variety of Jhumur dance style.
Daphli	→	*Daph:* Performed in spring season to commemorate bountiful harvest.
Majira	→	*Manjira:* Performed in Mewat district.
Jhumar	→	*Jhumar:* Performed by young married girls.
Dhamaal	→	*Dhamaal:* Performed by men of *Ahir community* outside in moonlight (in Phalgun). The origin of dance is rooted back to Mahabharata.
Phalgun	→	*Phag:* Performed in Phalgun during Holi.
	→	*Loor:* Performed by girls of Bangar region in Phalgun during Holi.
	→	*Saang:* A popular folk theatre dance.
	→	*Gugga:* Performed by men in loving memory of Saint Gugga.

Jhumar Dance

Khoria Dance

JAMMU & KASHMIR

TRICK TO REMEMBER: *Harris Rouf Bhand Hoke Dhul Main Kud Raha Hai Manali* Main

TRICK		Dance
Harris Rouf	→	*Rouf:* Performed by women in standing in rows during Eid/Ramadan (in spring).
Bhand	→	*Bhand Pather:* It is a dance-drama.
Dhul	→	*Dumhal:* Performed by men of *Wattal tribe.*
Kud	→	*Kud:* Performed at night to honour Lok Devta.
Hai	→	*Hikat:* Performed in spring in harvest season. Participants join hands and spin while singing.
Manali	→	*Damali*

Rouf Dance

Bhand Pather Dance

JHARKHAND

Karam/Karma Dance: Performed by ***Oraon tribe*** where they worship Kadam tree during the festival (autumnal festival).

Paika Dance: It is a traditional martial art dance performed by ***Munda tribe*** or ***Sadar community.***

Mundari Dance: A traditional tribal dance of the ***Munda community*** performed during harvest festivals.

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Domkach Dance: It is a Nagpuri folk dance.

Jhumair Dance: It is a folk dance performed by ***Sadan community.***

Chhau Dance: It is a martial art dance → Three types: Purulia Chhau (West Bengal), Seraikella (Jharkhand), and Mayurbhanj Chhau (Odisha).

Santhali Dance: This dance is also known as Jhika Dasain and is performed in October month by ***Santhal tribe.***

Hunta Dance: An ancient tribal dance performed by Santhal tribe which is a form of preparation for hunting.

Phagua Dance

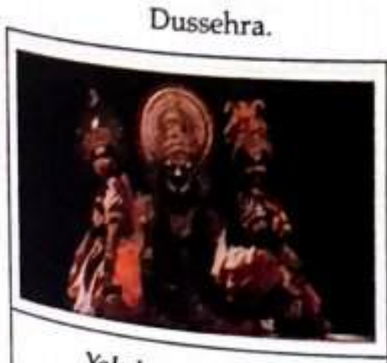
Domkach Dance

Mundari Dance

KARNATAKA

TRICK TO REMEMBER: *Yash Bola Kam Kar Saale Doll Bhootha Nagamandali Veerta Khatam Karegi*

TRICK		Dance
Yash	→	***Yakshagana:*** Performed in colourful dresses in coastal regions. Yakshagana meaning "song of the celestial beings".
Bola	→	***Bolak***
Kam	→	***Kamsale:*** Performed by devotees of God Mahadeshwara. Kamsale is a brass instrument.
Kar	→	***Karga***
Doll	→	***Dollu Kunitha (drum-dance):*** Performed by ***Kuruba community.*** Dollu means "drum" in Kannada.
Bhootha	→	***Bhootha Aradhne:*** A ristualistic dance performed in coastal regions to celebrate connection between human, nature and divine spirit.
Nagmandali	→	***Nagamandala:*** Performed by two priests, one enacts male snake and other as female snake.
Veerta	→	***Veeragase:*** Performed by ***Virabhadra community*** during Dussehra.



Yakshagana Dance

Dollu Kunitha Dance

KERALA

Ottamthullal Dance: A dance-drama was introduced by Kunchan Nambiar.

Kaliyattam Dance: It is also known as Theyyam and depicts religious rituals of sacred grooves of Malabar coast.

Koodiyattam Dance: This dance is a traditional Sanskrit theatre art dance.

Kolakali Dance: In this dance, the dancers move in a circle striking small sticks in rhythm with their steps.

Chakyar Koothu: A monologue performance where the performer narrates episodes from Hindu epics (such as Ramayana and Mahabharata).

Thappukali Dance, Kooravarakali Dance, Thiruvathirakali Dance.

Ottamthullal Dance

Kaliyattam Dance

MADHYA PRADESH

TRICK TO REMEMBER: *Aksar Goriya Ada Dikhane Ke Liye Matki Main Jawara Aur Phulpati Rakhke Manch Pe Khada Nachti Hai Aur Tali Bajati Hai*

TRICK		Dance
Aksar	→	***Kaksar: Abujhmaria*** or ***Muria tribe*** of Madhya Pradesh and Chhattisgarh.
Goriya	→	***Bhagoria: Bhil tribe*** of Jhabua district.
Ada	→	***Aada:*** The dance is variation of matki dance performed in Malwa region.
Matki	→	***Matki:*** Performed in Malwa region.
Jawara	→	***Jawara:*** Harvest dance.
Phulpati	→	***Phulpati:*** Performed by unmarried girls of Malwa region.
Manch	→	***Maach:*** Performed in Malwa region.
Khada Nachti	→	***Khada Nach***
Tali	→	***Tertali: Kamar tribe.***
	→	***Saila:*** Performed during Dussehra.

Khada Nach

Tertali

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MANIPUR

Thang-Ta Dance: Manipuri martial art dance.

Lai Haraoba Dance: *Meitei tribe.*

Dhol Cholom: Drum-dance performed during Holi.

Pung Cholom: This dance is also known as Mridanga kirtan or Dhumal.

Jagoi Dance: This dance is also known as Manipuri Raasleela.

Khamba Thoibi Dance: *Meitei tribe.*

Nupa Dance

Thang-Ta Dance

Pung Cholom Dance

MEGHALAYA

Nongkrem Dance: *Khasi tribe.*

Wangala Dance: Performed by *Garo tribe* during Wangala festival (also known as "Festival of Hundred Drums").

Behdeinkhalam Dance: *Jaintia tribe.*

Laho Dance: *Jaintia tribe.*

Shad Suk Mynsiem: *Khasi tribe.*

Wangala Dance

Nongkrem Dance

MIZORAM

TRICK TO REMEMBER: *Mizoram Ke Manch Pe Khullam Chillam Zang Chal Rahi*

TRICK		Dance
Khullam	→	*Khullam:* It is also known as "Dance of Guests".
Chillam	→	*Chailam:* Performed during Chapchar Kut festival.
Zang	→	*Zangtalam: Paite tribe.*
Chal	→	*Cheraw:* This dance is also known as Bamboo dance.
	→	*Chheihlam*

Cheraw Dance

Zangtalam Dance

MAHARASHTRA

TRICK TO REMEMBER: *Eh Kohli Vadapav Lana, Lazy Kahin Ki Tamasha Kar Rahi Hai, Dafa Hoja Varna Mouni Jo Dhangka Natak Karti Hai Uske Paas Chala Jaunga*

TRICK		Dance
Kohli	→	*Koli:* Performed by *fisherman community.*
Vadapav	→	*Povadas:* The dance describes events in life of Chhatrapati Shivaji.
Lana	→	*Lavani:* A combination of traditional song and dance performed to the beats of Dholki.
Lazy	→	*Lezim:* An acrobatic dance that involves calisthenic moves.
Tamasha	→	*Tamasha:* It is derived from Sanskrit drama "Prahsana" and "Bhana".
Dafa	→	*Gafa:* Performed by *Gond tribe* in Vidharbha region.
Mouni	→	*Mouni*
Dhangka	→	*Dhangari:* Performed by shepherds, cowheards and blanket weavers of Sholapur district (known as Dhangars).
Natak	→	*Natak*

- *Baithakichi Lavani: Lavani performed for a private audience.*
- *Sulochana Chavan is known as Lavani Samradhni (Lavani Queen).*

Tamasha Dance

Koli Dance

NAGALAND

TRICK TO REMEMBER: *Nagaland Ke Log Bamboo Main Naag, Aloo, Butterfly Gai Dalke Kha Rahe*

TRICK		Dance
Bamboo	→	*Bamboo: Kuki tribe.*
Naag	→	*Rengma (Warrior Dance):* Performed during Hornbill festival (1-10 Dec).
Aloo	→	*Aaluyattu: Konyak tribe.*

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Butterfly → Butterfly: Zeliang tribe.
Gai → Changai: Changai tribe.
Zeilang: Zeliang tribe.
Modse: Ao tribe.

Bamboo Dance

Rengma Dance

ODISHA

TRICK TO REMEMBER: Pua Khaya Dalkhai Danda Leke Ghum Raha Bhaga Nacha

TRICK		Dance
Pua Khaya	→	*Gotipua:* Performed by young boys dressed as women to praise Lord Jagannath and Lord Krishna.
Dalkhai	→	*Dalkhai:* Performed in Sambalpur region.
Danda Leke	→	*Danda Nata:* Performed in Kalahandi district.
Ghum	→	*Ghumura (Tiger Dance):* Performed in Kalahandi district.
Bhaga Naccha	→	*Bhaga Nacha (Tiger Dance):* Performed in Ganjam district.
	→	*Chhau*
	→	*Karma*
	→	*Ranappa:* Performed in Ganjam district. The dance is dedicated to Lord Krishna.
	→	*Chaiti Ghoda dance*

Gotipua Dance

Dalkhai Dance

RAJASTHAN

TRICK TO REMEMBER: Raja Ganga Kal Ghoom Rahe The Chaar Thali Leke Susaini Ke Saath Lekin Khayalon Main

TRICK		Dance
Ganga	→	*Gangaur:* Performed to worship Mata Gauri (Lord Shiva's wife).
Kal	→	*Kalbeliya (Sapera Dance): Kalbeliya tribe* (known as snake charmers).
Ghoom Rahe	→	*Ghoomar: Bhil tribe.*
Chaar	→	*Chari:* Performed by women of *Gujjar community.*
Thali	→	*Terah Taali: Kamar tribe.*
Susaini	→	*Suisini*
Khayalon	→	*Khayal: Bhawai tribe.*

Gulabo Sapera is well known Kalbeliya dancer.

Ghoomar Dance

Terah Tali Dance

SIKKIM

TRICK TO REMEMBER: Chandni Sikkim Ki Zameen Pe Singh Ke Saath Ghante Bhar Se Yatra Kar Rahi Hai

TRICK		Dance
Chandni	→	*Chu-Faat:* Performed by *Lepcha tribe* in Pang Lhabsol festival to honour God Kanchenjunga.
Sikkim Ki	→	*Sikmari:* Performed by *Lepcha tribe* to celebrate beauty of nature.
Zameen	→	*Zo-Mal-Lok (Yak Dance): Lepcha tribe.*
Singh	→	*Singhi Chham (Kanchendzonga Dance):* Performed by *Bhutia tribe* during Pang Lhabsol festival.
Ke Saath	→	*Kagyed*
Ghante	→	*Ghantu*
Yatra	→	*Yakcham:* Performed in honour to yak during Losar festival.
	→	*Maruni:* Nepali folk dance of *Magar community.*

Chu Faat Dance

Zo-Mal-Lok Dance

TAMIL NADU

Kolattam Dance (stick dance): Women use sticks to create rhythmic beats and perform intricate movements.

Silambattam Dance: This is a martial art dance.

Oyilattam Dance: Performed in Madurai region.

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Devarattam Dance: This dance is also known as "Dance of Gods".

Kudirai Attam Dance (Poikkal Kuthirai Attam Dance): Dancers wear a dummy horse structure while performing the dance.

Kummi Dance: Performed by women during Pongal festival (harvest festival).

Kavadi Attam Dance (Burden Dance): Performed to worship Lord Murugan, the devotees carry decorated Kavadis on head.

Kolattam Dance

Devarattam Dance

TELANGANA

TRICK TO REMEMBER: *Dhime Se Gadi Gusa Lun Madhuri*

TRICK		Dance
Dhimsa Se	→	***Dhimsa:*** Performed by women of ***Porja tribe*** in Andhra Pradesh and Telangana.
Gadi	→	***Lambadi: Lambadi tribe.***
Gusa Lun	→	***Gussadi:*** Performed by ***Raj Gond tribe*** during Dandari festival (Dussehra/Diwali festival).
Madhuri	→	***Mathuri:*** Performed in Adilabad district.
	→	***Bonalu:*** Performed during Bonali festival to honour Goddess Mahakali.

Dhimsa Dance

Lambadi tribe

TRIPURA

TRICK TO REMEMBER: *Biju Dadagiri Mata Pe Haq Hai Sang Ghar Le Jaunga*

TRICK		Dance
Biju	→	***Bijhu: Chakma tribe.***
Dadagiri	→	***Hojagiri: Reang (Bru) community.***
Haq Hai	→	***Hai Hak:*** Performed by ***Halam community*** to honour Goddess Lakshmi after harvest.
Mata Pe	→	***Maimata: Kalot community.***
Ghar	→	***Garia:*** Performed during harvest festival (Spring season).
Le Jaunga	→	***Lebang:*** A harvest dance that depicts how bamboo clappers catch insects.
	→	***Cheraw: Lusai community.***
	→	***Sangrai Dance:*** Performed by ***Mog tribe*** in Sangria festival during Chaitra month (Bengali calendar year).

Hojagiri Dance

Bijhu Dance

UTTAR PRADESH

Charkula Dance: Performed in Braj region of UP.

Raslila Dance: This dance depicts the scene from the life of Lord Krishna.

Nautanki Dance: A popular folk theatre form that combines music, dance, dialogue and narration.

Kajri Dance: It is performed during the rainy season in Bhojpuri region of UP and Bihar.

Ramlila Dance: A dramatic folk dance that re-enacts the life of Lord Rama.

Dadra Dance: A semi-classical romantic dance form that originated in Mirzapur district and is performed by both men and women.

Raslila Dance

Ramlila Dance

UTTARAKHAND

TRICK TO REMEMBER: *Ashish Chanchlani Chora Hai Jhola Leke Dandi Rakh Chapa Chap Kar Raha Hai*

TRICK		Dance
Chanchlani	→	***Chanchari:*** Performed in Kumaon and Garhwal regions.
Chora	→	***Jhora:*** Performed in Kumaon region.
Jhola	→	***Chholia:*** A sword dance that depicts martial traditions of ***Kumaoni tribe.***

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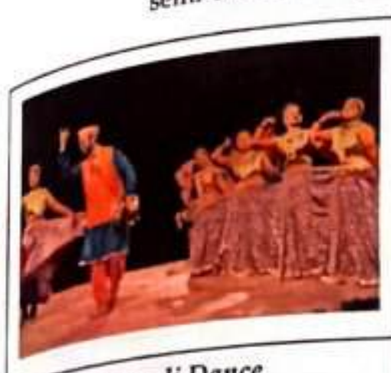
Dance

TRICK

Dandi → *Tandi:* Performed by men in half circles.

Chapa Chap → *Chhapeli:* Performed in Kumaon region.

Thadiya: Performed in Garhwal region. The dancers form semi-circle arcs by holding each other's shoulders.



Chhapeli Dance

Thadiya Dance

WEST BENGAL

Gambhira Dance, Purulia Chhau Dance, Tusu Dance, Bhadu Dance, Ranpa Dance, Gambhira Dance

Gambhira Dance

Purulia Chhau Dance

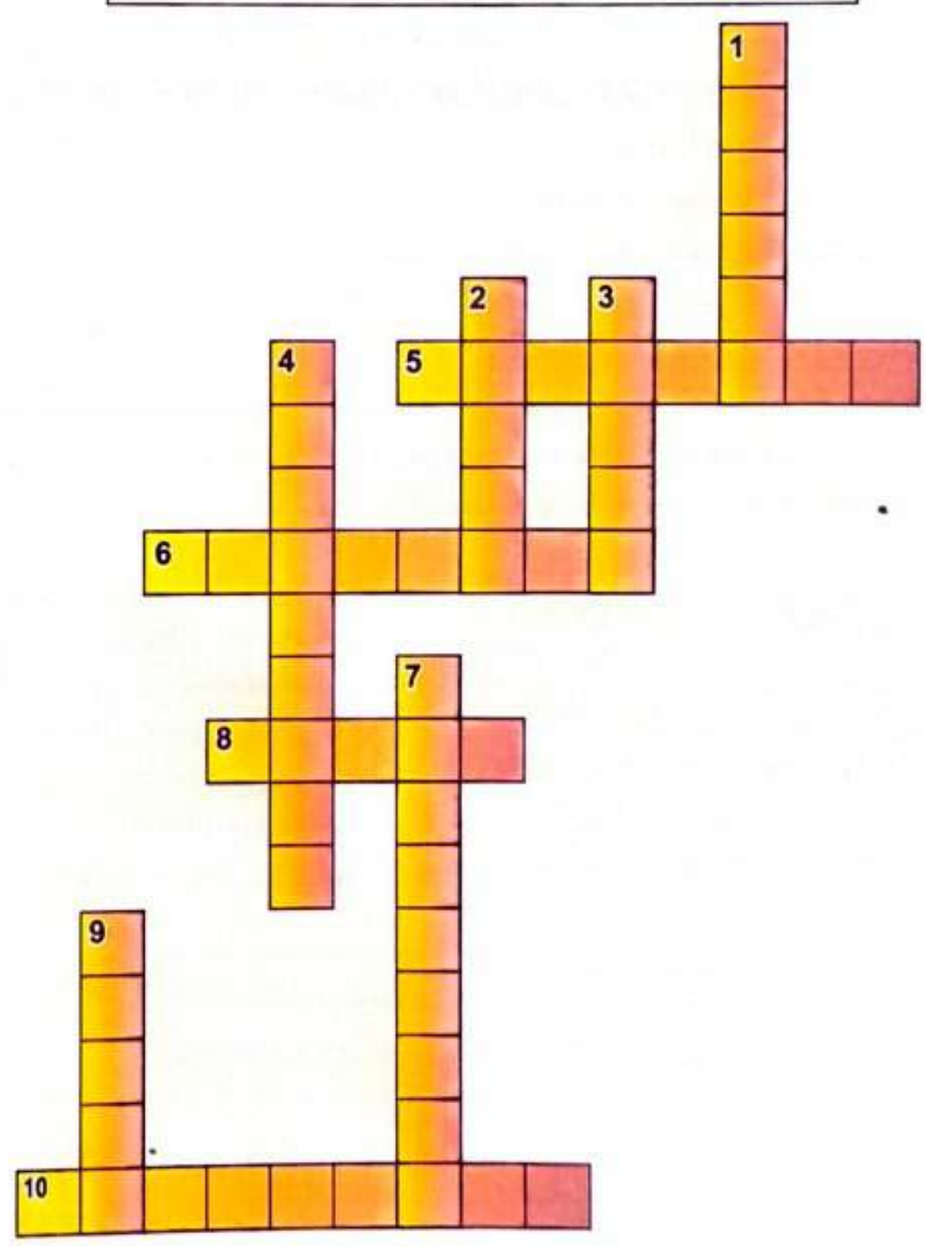
Sangria Dance: The Sangria dance is a traditional Indian dance performed by the Mog tribal community on the occasion of the Sangria festival during the month of Chaitra of the Bengali calendar year.

MARTIAL ART DANCES

Martial Art Dance	*State*
Lathi	Punjab / West Bengal
Gatka	Punjab
Silambam	Tamil Nadu
Sarit Sarak / Thang-Ta	Manipur
Kalaripayattu	Kerala
Thoda	Himachal Pradesh
Inbuan	Mizoram
Mardani Khel	Maharashtra
Pari Khanda	Bihar
Mallakhamba	Madhya Pradesh
Mushti Yudha	Varanasi

PARMAR'S CROSSWORD

FOLK DANCES OF INDIA



Across

5. State where Kuki dance is performed.
6. Folk dance of Maharashtra.
8. Listed in UNESCO Intangible Heritage.
10. State associated with Yakshagana dance.

Down

1. State associated with Dalkhai dance.
2. Dance form of Arjun Singh Dhurve.
3. Folk dance of Madhya Pradesh.
4. State linked with Tera Tali folk dance.
7. Dance performed during Bwisagu festival.
9. Folk dance of Odisha.

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CENSUS

- A Census is the official enumeration of the population conducted periodically by the government.
- ***Frequency:*** In India, it is carried out once in every 10 years.
- ***Conducting authority:*** *Registrar General* and *Census Commissioner of India*, under the *Ministry of Home Affairs* (MoHA).
- ***Legal framework:*** *Census Act, 1948* governs census operations.

History of Census in India

- First city where Census was conducted: *Dacca* (Now Dhaka, Bangladesh) in *1830* by *Henry Walter* (he is also known as *"Father of Indian Census"*).
- First Census *(Non-Synchronized/Incomplete)* conducted in *1872* [(During *Lord Mayo's* tenure *(1869-1872)*].
- First *(Synchronized/Complete)* Census conducted in *1881* by the then Census Commissioner of India → *W. C. Plowden* [(During *Lord Ripon's* tenure *(1880-1884)*].
- ***First Post-Independence Census:*** *1951.*
- ***Latest Census conducted:*** *2011* (*15th Census* from 1872 and *7th Post-Independence Census*).
- ***Census 2021:*** Census 2021 was not conducted due to *COVID-19* and has been delayed till *October 2024*.

CENSUS 2011

- ***Registrar General of Census 2011:*** *C. M. Chandramouli* (At present: *M K Narayan*) as of *April 2025*.
- ***Motto:*** *"Our Census, Our Future"*.
- ***Data was collected from:*** *35 States/UTs* and *640 Districts*.

Census was conducted in two phases:

- House Listing (April-September 2010).
- Date of Enumeration: *9-28th February 2011*, during population enumeration total *29 questions* were asked during.

India's Population in 2011 Census

- ***Total population:*** *1.21 Billion* (1210.2 M).
- ***India's share in world population:*** *17.5%.*
- ***China's share in world population:*** *19.4%.*
- ***Male population:*** *623.7 M (51.54%).*
- ***Female population:*** *586.46 M (48.46%).*

> *Concept of Standard Urban Area (SUA) was introduced during: 1971 Census.*

> - *Maharashtra has the highest slum population.*
> - *Delhi has the highest slum population among UT.*

> ***According to area wise***
> - ***Highest:*** *Andaman & Nicobar*
> - ***Lowest:*** *Lakshadweep*

Highest and Lowest Population

Category	*Highest*	*Lowest*
State	Uttar Pradesh (16% of total population) > Maharashtra > Bihar	Sikkim > Mizoram > Arunachal
UT	Delhi	Lakshadweep (State + UT)
District	Thane (Maharashtra)	Dibang Valley (Arunachal Pradesh)
City	Mumbai	Kapurthala (Punjab)

> ***Highest crude death rate: 1901-1921***

Growth Rate

- ***Average annual growth rate (2001-2011):*** *1.64%.*
- ***Decadal growth rate (2001-2011):*** *17.64%* (Total increase: 181 M (18.19 Cr) people) → Male: *17.19%* and Female: *18.12%*.
- ***As per 1901 Census:*** *238 M.*
- ***According to 1951 Census:*** *361 M.*
- ***Highest decadal growth rate (1961-1971):*** *24.8%.*
- ***Lowest decadal growth rate (1911-1921):*** *- 0.31%* (Reason: Due to *famine*).

> ***Year of the Great Divide (1921).***
> ***Reason:***
> - ***Before 1921:*** *High death rate, unstable population*
> - ***After 1921:*** *Declining death rate, rising population*

Category	*Highest*	*Lowest*
State	Meghalaya (27.8%) > Arunachal Pradesh > Bihar	Nagaland (- 0.47%) > Kerala > Goa
UT	Dadra & Nagar Haveli (55.5%)	Lakshadweep (6.23%)
District	Kurung Kumey (Arunachal Pradesh; 111%)	Longleng (Nagaland)

Child Population (0-6 years)

- ***Total:*** *158.8 M* (13.1% of the population) → *0.38%* decreased as compared to *2001*.
- ***Highest population:*** *Uttar Pradesh.*
- ***Lowest population:*** *Lakshadweep.*
- ***District wise:*** *Kupwara, J & K* (highest) and *Dibang Valley, Arunachal Pradesh* (lowest).

Sex Ratio *(Females per 1000 Males)*

The sex ratio refers to the number of females *per 1000 males* in a given area at a specified time period.

- ***As per 2011 Census:*** *943.*
- ***As per 2001 Census:*** *933.*

Category	*Highest*	*Lowest*
State	Kerala (1084) > Tamil Nadu (996) > Andhra	Haryana (879) > J & K (889)
UT	Puducherry (1037) Lakshadweep (900)	Daman & Diu (618) > Dadra & Nagar Haveli (774)
District	Mahe (Puducherry)	Daman

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Child Sex Ratio *(0-6 years)*

- *As per 2001 Census: 927.*
- *As per 2011 Census: 919.*

According Provisional Census: 914

Category	Highest	Lowest
State	Arunachal Pradesh (972) > Mizoram	Haryana (834)
UT	Andaman & Nicobar (968)	Daman & Diu
District	Lahaul and Spiti Valley (Himachal Pradesh)	Jhajjar (Haryana)

***As per Census 2011, Maharashtra recorded negative growth in child sex ratio.*

Literacy Rate

- In India, only people aged *7 and above* are considered for calculating literacy rates.
- A person is considered literate if they can read and write with understanding in any language.

Adult (above 15 yrs) literacy: 69.3%

Overall Literacy Rate

- *As per 2001 Census: 64.83%* → Male: *75.85%* and Female: *54.16%*
- *As per 2011 Census: 74.04%* → Male: *82.14%* and Female: *65.46%*.

Increase in Literacy Rate: 9.2%

- As per provisional Census 2011, the literacy rate is *72.98%* → Male: *80.9%* and Female: *64.63%*.
- *Difference in male and female literacy rate: 16.68%.*

Provisional: Preliminary or tentative data that is subject to revision.

- State with highest difference in male and female literacy rate: *Rajasthan (27.85%)*, 2nd: *Jharkhand*.
- State with least difference in male and female literacy rate: *Meghalaya* and 2nd: *Kerala*.
- During last decade highest improvement in literacy rate was observed in Rural Females.

Category	Highest	Lowest
State	Kerala (94%) > Mizoram (91.33%)	Bihar (61.8%) > Arunachal Pradesh (65.38%)
UT	Lakshadweep (91.85%)	Dadra & Nagar Haveli (77.24%)
District	Serchhip (Mizoram)	Alirajpur (Madhya Pradesh)

Literacy Rate Gender-wise

- *Male (highest): Kerala.*
- *Female (highest): Lakshadweep/Kerala.*
- *Male (lowest): Bihar.*
- *Female (lowest): Bihar.*

Literacy Rate Category-wise *(According to 2011 Census)*

- *Scheduled Caste: 66.1%.*
- *Scheduled Tribe: 59%.*

Population Density

- It is the measure of the number of individuals per square kilometre.
- *As per 2001 Census: 325.*
- *As per 2011 Census: 382.*

Category	Highest	Lowest
State	Bihar (1106) > West Bengal > Kerala	Arunachal Pradesh (17) > Mizoram (52)
UT	Delhi (11,320) > Chandigarh	Andaman & Nicobar (46)
District	NE Delhi	Dibang Valley (Arunachal Pradesh)

Rural and Urban Divide

- *Rural: 833.1 M (68.8%).*
- *Top 3 States: Uttar Pradesh > Bihar > West Bengal.*
- *Bottom 3 States: Sikkim > Mizoram > Goa.*
- *Urban: 377.1 Million (31.2%).*
- *Top 3 States: Maharashtra > Uttar Pradesh > Tamil Nadu.*
- *Bottom 3 States: Sikkim > Arunachal Pradesh > Mizoram.*

• Highest % of rural population: Lakshadweep (among UTs)
• Highest % of urban population: Delhi

• Chandigarh and Lakshadweep are the most urbanised UT.
• Daman & Diu has the highest % of rural population.

Percentage-wise Rural and Urban Divide

- *Rural (highest): Himachal Pradesh (89.9%) > Bihar (88.7) > Assam (85.92%).*
- *Urban (highest): Goa (62.17%) > Tamil Nadu (48.4%) > Kerala (47.7%).*

Caste-Based Population

Scheduled Caste (SC) Population: *201 Million* (16.6% of the total population).

- *Highest population: Uttar Pradesh.*
- *Highest percentage-wise population: Punjab.*
- *Lowest population: Mizoram.*
- *Lowest percentage-wise: Mizoram.*
- *State/UTs with 0% SC population: Nagaland, Arunachal Pradesh, Andaman & Nicobar, Lakshadweep.*

Scheduled Tribe (ST) Population: *104.3 Million* (8.6% of the total population).

- *Highest population: Madhya Pradesh.*
- *Highest percentage-wise population: Lakshadweep.*
- *Lowest population: Haryana > Punjab > Delhi > Puducherry > Chandigarh* (these three states have zero ST population).

Religion Based

Religious group	Population % 1951	Population % 1961	Population % 1971	Population % 1981	Population % 1991	Population % 2001	Population % 2011
Hindu	84.1%	83.45%	82.73%	82.30%	81.53%	80.46%	78.35%
Muslim	9.8%	10.69%	11.21%	11.75%	12.61%	13.43%	14.2%
Christian	2%	2.44%	2.60%	2.44%	2.32%	2.34%	2.34%
Sikh	1.89%	1.79%	1.89%	1.92%	1.94%	1.87%	1.87%
Buddhist	0.74%	0.74%	0.70%	0.70%	0.77%	0.77%	0.77%
Jain	0.46%	0.46%	0.46%	0.47%	0.40%	0.41%	0.41%
Parsi	0.13%	0.09%	0.09%	0.09%	0.08%	0.06%	0.06%
Animist, others	0.43%	0.43%	0.41%	0.42%	0.44%	0.72%	0.72%

Table 1: Population Trends for major Religious Groups in India (1951-2011 Census)

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- *Hindu* population declined by: *0.7 pp.*
- *Sikh* population declined by: *0.2 pp.*
- *Buddhist* population declined by: *0.1 pp.*
- *Muslim* population declined by: *0.8 pp.*
- Highest decadal growth rate: *Muslims (24.6%)* → they are *least literate*.
- Lowest decadal growth rate: *Jains* (they have the higest literacy rate amongst all the communities).

pp: Percentage point

Religious Groups	Population in millions			Decadal Growth rate	
	1991	2001	2011	1991-2001	2001-2011
Hindu	687.65	827.58	966.26	20.35	16.76
Muslim	101.60	138.19	172.25	36.02	24.65
Christian	19.64	24.08	27.82	22.61	15.53
Sikh	16.26	19.22	20.83	18.18	8.42
Buddhist	6.39	7.96	8.44	24.54	6.13
Jain	3.35	4.23	4.45	26.02	5.37
Other	3.68	7.37	10.81	99.93	46.66

Source: Census of India (decadal growth rate is calculated by the authors)

Table 2: Religion-based Decadal Growth Rate

- State with largest Buddhist and Jain population: *Maharashtra.*
- State with largest Christian population: *Kerala.*
- State with largest Hindu population: *UP.*
- State with largest Muslim population: *J&K.*
- Highest % of Hindu population: *Himachal.*
- Highest % of Muslim population: *Lakshadweep (96.58%).*

Demographic Dividend

- A demographic dividend is a period of economic growth that happens when a country's population ages and the working-age population increases
- *Working age group in India: 15-64 or 15-59.*

Work Force in India

- Male work force participation: *53.26%.*
- Female work force participation: *25.5%.*
- *Himachal* has the highest female LFPR (Labor Force Participation Rate) in *rural* India (47.4%).
- *Tamil Nadu* has the highest female LFPR in *urban* India.

Migration Trends

- Highest out-migration states: *Uttar Pradesh > Bihar.*
- Highest in-migration state: *Maharashtra.*
- Percentage of total migrants from Nepal: *15.1%.*
- Percentage of total migrants from Sri Lanka: *2.9%.*

Main Reason for Migration

- *For men:* Work and employment.
- *For women:* Marriage.

- ***The 1st Socio-Economic and Caste Census (SECC) was first conducted in 1931 by Ministry of Rural Development.***
- ***According to 2011 Census, 2.21% of India's population (i.e. 26.8 Million) were identified as disabled.***
- ***Adolescent population: 21% (10-19 yrs).***

Language

Language	Speakers (M)	Speakers% in Population
Hindi	692	57.1
English	129	10.6
Bengali	107	8.9
Marathi	99	8.2
Telugu	95	7.8
Tamil	77	6.3
Gujarati	60	5
Urdu	63	5.2
Kannada	59	4.9
Malayalam	36	2.9
Punjabi	36	3
Assamese	24	2
Maithili	14	1.2
Sanskrit	0.025	0.3 *(Least speaking population)*

CENSUS 1951

- ***Population according to 1951 Census: 361 M.***
- ***Literacy rate: 18.33%*** → Male ***(27.16%)*** and Female ***(5.56%)***.
- ***Sex ratio: 946.***
- ***Population density: 117.***

Miscellaneous Facts

- *Census 2024* will be conducted through *Census Management and Monitoring System* (CMMS) which is a *Digitalized System.*
- *National Population Policy (NPP) 2000:* It aims to achieve a stable population by *2045*.

For an interactive recap of this topic, see the crossword on Page Number 371.

TsuNamî

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Types of Musical Instruments of India

In Natya Shastra, ***Bharat Muni*** categorizes Indian musical instruments into four main types: ***Avanaddha (membranophones), Ghana (idiophones), Sushira (aerophones), and Tat (chordophones).***

1. ***Tantu Vadya (Chordophones) → String Instruments***

• Sound is produced by ***plucking*** or ***bowing*** the stretched strings. ***E.g., Sitar, Sarod, Santoor, Veena, Rudra Veena, Violin, Surbahar, Guitar, Mohan Veena.***

2. ***Sushir Vadya (Aerophones) → Wind Instruments***

• Sound is produced by ***blowing air*** through intrument. ***E.g., Flute, Shehnai, Nadaswaram.***

3. ***Avanaddha Vadya (Membranophones) → Percussion Instruments***

• Sound is produced by ***striking a stretched membrane*** (made of animal skin) or drumhead. ***E.g., Tabla, Pakhawaj, Mridangam, Drums.***

Percussion instruments are of two types:

1. ***Idiophones:*** An idiophone is any musical instrument that creates sound primarily by the vibration of the instrument itself, without the use of air flow, strings, membranes or electricity. ***E.g. Xylophones, bells, etc.***
2. ***Membranophones:*** A membranophone is an instrument which produce sound by a stretched membrane that is struck or vibrated. ***E.g. Tabla, mridangam, etc.***

4. ***Ghana Vadya (Idiophones) → Solid Instruments***

• Sound is produced by ***striking or shaking*** solid materials. ***E.g., Ghatam, Manjira, Kartal.***

Some Traditional Instruments

• ***Kamaicha:*** A bowed flute played by ***Manganairs*** of ***West Rajasthan.***

• ***Kartal:*** A wooden clapper from the state of ***Rajasthan*** that comes under Idiophones.

• ***Chinkara:*** A stringed instrument played popularly in ***Madhya Pradesh.***

• ***Pena:*** A traditional stringed instrument that is played in states of ***Manipur*** and ***Assam.***

MUSICAL INSTRUMENTS AND EXPONENTS

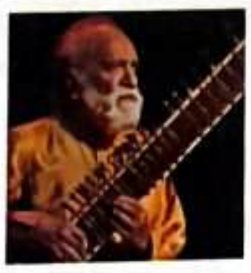
STRING INSTRUMENTS ***(Tantu Vadya)***

Sitar

• Sitar is a plucked string instrument used in Hindustani music.

Exponents

Pt. Ravi Shankar



Pt. Ravi Shankar

• First Indian to win Grammy for the album ***"West Meets East" (1968).***

• He is also the Indian to win ***most no.*** of Grammys ***(a total of 5).***

• He is the ***second*** Indian musician to receive ***Bharat Ratna*** (India's highest civilian award) in ***1999.***

• ***Anoushka Shankar, Vilayat Khan, Imrat Khan, Nikhil Banerjee, Budhaditya Mukherjee, Pt. Harashankar Bhattacharya, Arvind Parikh, Anupama Bhagwat, Rajeeva Janardhan (Imdadkhani Gharana).***

• ***First Grammy won by Mickey Hart in 1992.***

• ***First female*** to win Grammy: ***Tanvi Shah***

• ***Father of Fusion dance*** (also known as ***"III"*** form of dance) → ***Pt. Uday Shankar*** (brother of Pt. Ravi Shankar)

Sarod

Amjad Ali Khan

• A stringed instrument known for its deep, resonant sound.

Exponents

Amjad Ali Khan

• He is known as ***"Sarod Samrat".***

• He is known for ***fast*** and ***clear ekhara taan.***

• He has received ***Padma Bhushan (1991)*** and ***Padma Vibhushan (2001).***

• ***Alauddin Khan (Maihar Gharana), Ali Akbar Khan (Maihar Gharana), Hafiz Ali Khan, Rajeev Taranath (disciple of Ali Akbar Khan), Buddhadev Dasgupta.***

Santoor

• It is known as ***"Shattantri Veena"*** in Sanskrit and has ***72 strings.***

Exponents

Shivkumar Sharma

Shivkumar Sharma

• He ***popularised*** Santoor.

• He has received ***Sangeet Natak Akademi Award (1986)*** and ***Padma Vibhushan (2001).***

• ***Rahul Sharma, Ulhas Bapat, Bhajan Sapori, Tarun Bhattacharya (won Sangeet Natak Akademi Award in 2018), Hafiz Ali Khan (Padma Vibhushan in 1998).***

Sarangi

Pt. Ram Narayan

• It is a ***bowed, short-necked*** instrument often used in classical and folk music.

Exponents

• ***Pt. Ram Narayan (Padma Vibhushan in 2005), Ustad Sabri Khan, Bundu Khan, Binda Khan, Shakoor Khan, Abdul Latif Khan, Ustad Sultan Khan.***

Veena

Jayanthi Kumaresh

• It is an ancient, ***revered stringed*** instrument.

• ***Samudragupta*** (Gupta Dynasty) is depicted playing Veena on his ***coins.***

• Mughal Emperor ***Aurangzeb*** and former PM ***APJ Abdul Kalam*** also played Veena.

Exponents

• ***S. Balachander, Jayanthi Kumaresh (plays Saraswati Veena), Chitti Babu, E. Sankara Sastry, Doraiswamy Iyengar.***

Saraswati Veena is crafted from the wood of Jackfruit.

TsuNamî

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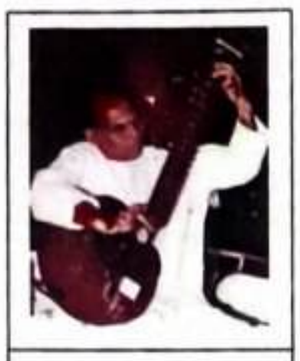
Rudraveena

- It is used in *Dhrupad* music.

Exponents

- ***Asad Ali Khan, Zia Mohiuddin Dagar, Sadik Ali Khan.***



Asad Ali Khan

Surbahar

- It is a plucked string instrument also known as *bass sitar.*

Exponents

- ***Annapurna Devi, Ustad Imrat Khan (also known as Surbahar instrument master), Wahid Khan, Imdad Khan.***

Annapurna Devi

Violin

- It is a stringed instrument with *4 strings* held against the shoulder under the chin and *played with a bow.*

Exponents

- ***T.N. Krishnan (Padma Bhushan in 1992), Nagai Muralidharan, Lalgudi Gopala Iyer Jayaraman (Padma Bhushan in 2001), Mohanan Chandrasekaran (an awardee of Madras Music Academy's Kalanidhi), Dwaram Venkataswamy Naidu, V. G. Jog, N. Rajam, Ragini Shankar, Nandini Shankar, M. Gopalkrishna (Padma Bhushan in 2012), Ganesh and Kumaresh Rajagopalan, Lakshminarayana Subramaniam, Mysore Nagaraj and Mysore Manjunath (Mysore Brothers).***

T.N. Krishna

Mandolin

- A mándolin is a stringed musical instrument in the lutefamily and is generally plucked with a pick.

Exponents

U. Srinivas, S Balamuralikrishna, Nagen Dey, Khagen Dey.

U. Srinivas

Guitar

- It is a stringed instrument with *6 strings* that is played by *plucking* or *strumming.*

Exponents

- ***Brij Bhushan Kabra (won Sangeet Natak Academy in 2005), Thakur Chakrapani Singh.***

Brij Bhushan Kabra

Mohan Veena

- It is a *modified Hawaiian guitar* with *20 strings.*

Exponents

Pt. Vishwa Mohan Bhatt

- He won *Grammy (1994)* for album *"A Meeting by the River".*
- He also won *Sangeet Natak Akademi Award (1998)* and *Padma Bhushan (2017).*

Pt. Vishwa Mohan Bhatt

Ektara

- Ektara is a *single string,* musical instrument made using *bamboo* and a *gourd,* mostly used by traditional folk singers in *Maharashtra.*

WIND INSTRUMENTS *(Sushir Vadya)*

Flute *(Bansuri)*

- It is a wind instrument consisting of a tube and *6 or 7 fingerholes.*

Exponents

Hariprasad Chaurasiya

- He was born in Prayagraj.
- He has received *Padma Bhushan (1992)* and *Padma Vibhushan (2000).*

Hariprasad Chaurasiya

- ***Pannalal Ghosh (other name: Amal Jyoti Ghosh), Rajendra Prasanna, Rajendra Kulkarni, Rakesh Chaurasiya, Prabhat Sharma.***

Prasanna surname associated with Flute.

Shehnai

- It is an instrument made of wood that has *7 fingerholes.*
- It is also known as *Mangala Vadya* (auspicious instrument).

Exponents

Ustad Bismillah Khan

- He was born in Dumraon, Bihar.
- He played Shehnai at *Red Fort* on *India's first Independence Day (15th August 1947).*

Ustad Bismillah Khan

- He has received all the four highest civilian awards: *Bharat Ratna (2001), Padma Vibhushan (1980), Padma Bhushan (1968)* and *Padma Shri (1961).*
- The Iranian city of *Tehran* named an auditorium after him → *Tahar Mosiquee Ustaad Bismillah Khan.*
- He is also the *3rd* Indian musician to receive Bharat Ratna.

- ***Raghunath Prasanna (also plays flute), S. Ballesh, Ali Ahmed, Bageswari Quamar, Krishna Chaudhary.***

Nadaswaram

- It is *similar to Shehnai but larger in size,* mostly played in South Indian temples.

Exponents

- ***T.N. Rajarathinam Pillai, Rajratna Pillai, Neeru Swami Pillai, Sheikh Chinna Maulana.***

T.N. Rajarathinam Pillai

Harmonium

- A harmonium is a *keyboard instrument* that produces sound by blowing air through *metal reeds.*

Exponent

- Tulsidas Borkar

"Aur yeh toh pata hi hoga ki abba humare Harmonium bajate the"

TsuNamî

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PERCUSSION INSTRUMENTS *(Avanaddha Vadya)*

Tabla

Exponents

Zakir Hussain

- ***Total Grammy received: 4***
- He has received a total of 3 *Grammy* (in 2024) for: *"Pashto", "As We Speak", "This Moment"* with fusion music group *Shakti.*
- *4th* Grammy for a collaborative album *"Global Drum Project".*
- He has received *Padma Bhushan (2002)* and *Padma Vibhushan (2023).*

Zakir Hussain

- ***Nikhil Ghosh (Padma Bhushan in 1990), Bickram Ghosh, Ananda Gopal Bandopadhyay (Benaras Gharana), Anokhelal Mishra, Pt. Swapan Choudhary, Ananda Gopal Bandopadhyay, Shubhankar Banerjee, Shreya Bhattacharjee.***

Pakhawaj

- It is used in *Dhrupad* music.

Exponents

- ***Kunal Patil, Tota Ram Sharma, Pt. Bhavani Shankar, Ustad Rahman Khan, Kelucharan Mohapatra.***

Tota Ram Sharma

Pudukkotai Dakshinamurthi Pillai is renowned for his exceptional skills in playing the Kanjira.

Mridangam

- A mridangam is a *double-headed drum* used in South Indian classical music.

Exponents

Umayalpuram K. Sivaraman

- He has received *Padma Bhushan (2003), Padma Vibhushan (2010),* and *Sangeet Natak Akademi (1992).*

Umayalpuram K. Sivaraman

- ***V.K. Sivaraman, Rajna Swaminathan, Guruvayur Dorai, RV Raghavan.***

Ghatam

- It is a *clay pot* used as a percussion instrument.

Exponents

E. M. Subramaniyam

- He was awarded the title of *"Kalaimamani" (2000)* and has won *Sangeet Natak Akademi Award (2011).*

E. M. Subramaniyam

TH Vinaykram

- He is also known as *Vikku Vinaykram.*
- He has received *Padma Bhushan (2014).*

Drums

- Drums make sound when struck.

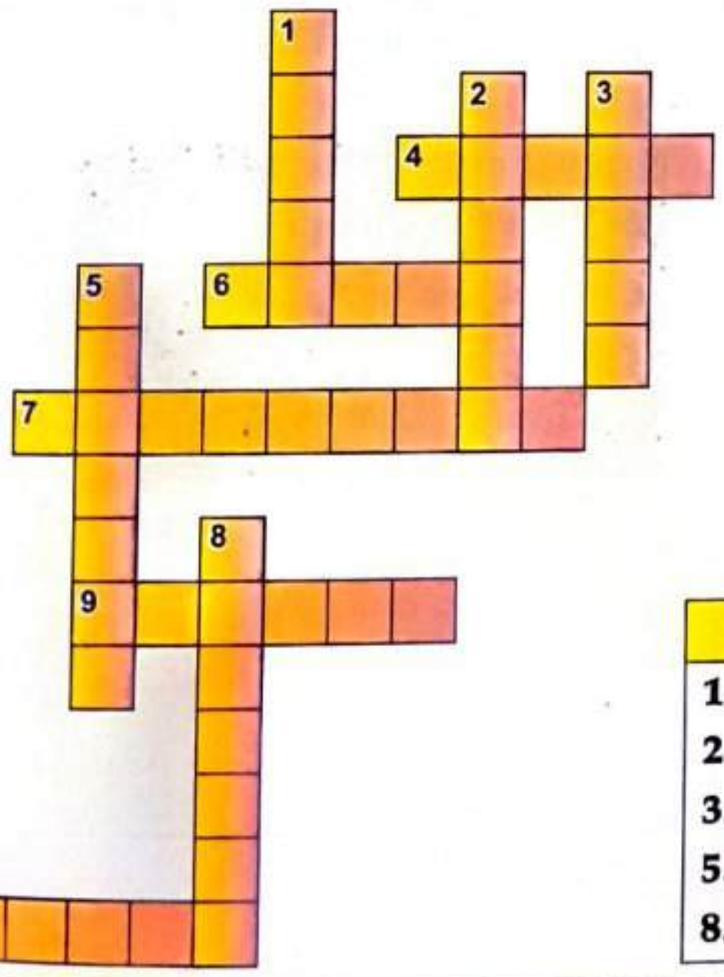
Exponents

- ***Sivamani***

Sivamani

PARMAR'S CROSSWORD

MUSICAL INSTRUMENTS



Across

4. Instrument played by Vilayat Ali Khan.
6. Instrument associated with Jayanthi Kumaresh.
7. Umayalpuram Sivaraman plays which instrument.
9. Award won by Vishwa Mohan Bhatt in 1994.
10. Instrument associated with Annapurna Devi.

Down

1. Instrument played by Hariprasad Chaurasia.
2. Gharana of Gangu Bai Hangal and Prabha Atre.
3. Instrument associated with Alla Rakha.
5. Pandit Ram Narayan is a maestro of which instrument.
8. Instrument played by Tarun Bhattacharya.

TsuNamî

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INDIAN CLASSICAL MUSIC

• Indian classical music is divided into two categories: *Hindustani music* and *Carnatic music*.

1. **Hindustani Music** *(North India)*
• Sung in languages: *Hindi, Braj, Avadhi, Rajasthani, Marathi.*
2. **Carnatic Music** *(South India)*
• Sung in languages: *Sanskrit, Kannada, Telugu, Malayalam, Tamil.*

Common Elements in Both Traditions

1. *Raga:* A *melodic framework*, each associated with a specific emotion or time of the day. *E.g. Miyan ki Todi (sung during late morning hours).*
2. *Taal:* A rhythmic framework based on *cyclic time units.*
3. *Sruti:* The smallest measurable difference between *musical pitches.*

7 Basic Swaras in Indian Music (Sargam)

• *Sa → Shadjam*
• *Re → Rishabham*
• *Ga → Gandharam*
• *Ma → Madhyamam*
• *Pa → Panchamam*
• *Da → Dhaivatham*
• *Ni → Nishadham*

Bhoop corresponds to the "Mohanam Ragam" of carnatic music.

3 Major Vocal Forms of Hindustani Music

Dhrupad

• It is sung with a *Tanpura* and *Pankhawaj.*
• Dhrupad was first composed by *Miyan Tansen.*
• It was propounded by *Dagar family* and *Darbhanga Gharana.*

Khayal

• A more lyrical and expressive form that evolved from *Dhrupad*, known for its freedom of expression and romantic themes.
• Khayal was first composed by *Amir Khusrau.*

Tarana

• It is performed towards the *end of concert.*
• It is used to convey the mood of elation.
• *Tillana of Carnatic music* is based on this.

***Lighter vocal forms in Hindustani classical music, often considered semi-classical, include Dhamar (associated with Dhrupad), Kajari, Tappa, Thumri, Ghazal, Bhajan, Tripal, and Chaiti.*

Major Styles of Carnatic Music

1. *Gitam:* A simple melodic extension of the *raga* with a uniform tempo and introductory piece.
2. *Svarajati:* Mix of *devotional* and *heroic elements.* This is learnt after a course of *Gitam.*
3. *Kirtanam:* It comprises of *devotional songs.*
4. *Tillana:* Short, crisp compositions, similar to *Tarana* in Hindustani music.
5. *Kriti:* It comprises of highly evolved musical compositions. It is a *development from Kirtana.*
6. *Suladi:* An extension of *raga-based* compositions.
7. *Padam:* A love poem/tempo.

Important Personalities in Indian Classical Music

Hindustani Music

• *Vishnu Narayan Bhatkhande* → He categorised ragas into *10* basic musical scales called *Thaats.*
• *Vishnu Digambar Paluskar* → He founded *Gandharva Mahavidyalaya* (1901, Lahore).

There are 7 basic Talams in Carnatic music.

Carnatic Music

• *Purandar Das* → He is considered as the *Father of Carnatic Music.*
• *M. S. Subbulakshmi* → She is known as the *Queen of Carnatic Music.*
• *"Trinity of Carnatic Music"* also known as *"Three Jewels of Carnatic Music"* (18th Century) → *Tyagaraja, Muthuswami Dikshitar,* and *Syama Sastri.*

M. S. Subbulakshmi was the first musician to receive Bharat Ratna in 1998.

GHARANAS (SCHOOL OF MUSIC)

Gwalior Gharana

• It is considered as the *oldest* and *most influential* Khyal Gharana in Indian classical music.
• It is said to have emerged during the reign of Mughal Emperor → *Akbar* (16th Century).
• *Ramtanu Pandey,* later known as *"Miyan Tansen"* was one of the first and most famous vocalists of this Gharana (Akbar gave the honorific title *"Miyan"* to him).
• Founders: *Hassu Khan, Haddu Khan* & *Nathoo Khan, Nathan Pir Baksh.*
• Exponents: *Raja Bhaiya Poonchwale, Krishnarao Shankar, Pt. Omkarnath Thakur, Veena Sahasrabuddhe, Vishnu Digambar Paluskar, Bade Mohammad Khan.*

Gwalior Gharana contemporary artist Sharad Sathe performing.

• *Tansen initially served in the court of Raja Ramchandra Singh of Rewa.*
• *Guru of Tansen: Saint Haridas (he started Dagar Gharana)*

TsuNamî

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MAJOR GHARANAS

Kirana Gharana *(Uttar Pradesh)*

- This Gharana is known for its *perfect note rendition* (Sargam).
- Founders: *Abdul Karim Khan* and *Abdul Wahid Khan.*

Exponents

Pt. Bhimsen Joshi *(from Karnataka)*

- He received: *Bharat Ratna (2008), Padma Vibhushan (1999), and Padma Bhushan (1985).*
- *Sawai Gandharva (Guru of Pt. Bhimsen Joshi), Gangubai Hangal, Prabha Atre, Manik Varma, Chhannulal Mishra.*

Abdul Karim Khan and Abdul Wahid Khan

Kumara Gandharva *(from Karnataka)*

- Original name: *Shivaputra Siddaramaiah Komkalimath.*
- He *refused* to be associated with any Gharana.

Patiala Gharana

- It was inspired and influenced by four Gharanas: *Delhi, Rewa, Gwalior, Jaipur Gharanas.*
- This Gharana is known for its *Ghazal, Khayal,* and *Thumri* styles.
- Founder: *Mian Kallu* (he played Sarangi).
- Propounded by: *Ustad Bade Fateh Ali Khan* and *Ustad Ali Baksh Jarnail Khan.*
- Exponents: *Bade Ghulam Ali Khan, Begum Akhtar, Ajay Chakraborty, Naina Devi, Parveen Sultana, Lakhsmi Shankar, Amanat Ali Khan.*

Ustad Bade Fateh Ali Khan

Mewati Gharana *(Haryana)*

- This Gharana is known for *Tarana* form of singing.
- Founder: *Ghagge Nazir Khan.*

Exponents

Pt. Jasraj

- He introduced *Jugalbandi* form of singing *(Padma Vibhushan in 2000).*
- *Maniram, Kala Ramnath (associated with Violin), Tripti Mukherjee, Ratan Mohan Sharma, Arvind Thatte.*

Ustad Ghagge Nazir Khan

Maihar Gharana

- Founder: *Ustad Allauddin Khan.*
- Unique feature: This Gharana is known for its blending of *Hindustani* and *Carnatic* elements, as well as its influence on *Western music.*

Exponents

Annapurna Devi

- She plays surbahar and is daughter of Allaudin Khan.
- She is the founder of *Senani Gharana.*

Ustad Allaudin Khan

- *Ravi Shankar (Sitar), Nikhil Banerjee (Sitar), Ali Akbar Khan (Sarod and is son of Allaudin Khan), Hariprasad Chaurasia (Flute), Pannalal Ghosh (Flute), V G Jog (Violin).*

Indore Gharana

- Founder: *Ustad Amir Khan.*
- Exponents: *Sultan Khan (plays Sarangi), Pt. Amarnath, Shankar Lal Mishra, Kalyan Banerjee, Purabi Mukherjee.*

Ustad Amir Khan

Jaipur Atrauli Gharana

- Founder: *Alladiya Khan* (he was from Aligarh then migrated to Jaipur).
- Exponents: *Kesarbai Kerkar, Mallikarjun Mansur, Vidyadhar Vyas, Bande Ali Khan (Rudra Veena), Pt. Lakshman Prasad, Kishori Amonkar.*

Alladiya Khan

Punjab Gharana

- Founder: *Lal Bhawani Singh.*
- Exponents: *Alla Rakha (Guru and father of Zakir Hussain), Zakir Hussain (he received Padma Vibhushan (2023)) → Both are Tabla player, Nikhil Ghosh (Tabla), Shafaat Ahmed Khan, Ustad Ashfaque Hussain, Miyan Qadir Baksh.*

Benaras Gharana of Khayal

- Founder: *Pt. Gopal Mishra.*

Benaras Gharana of Tabla

- Founder: *Pt. Ram Sahai.*
- Exponents: *Ustad Bismilla Khan (plays Shehnai; received Bharat Ratna in 2001), Pt. Anokhelal Mishra (Tabla), Pt. Kishan Maharaj, Samta Prasad, Pt. Kanthe Maharaj, Gopal Mishra, Hanuman Prasad Mishra.*

Pt. Ram Sahai

Rampur Sehaswan Gharana *(Uttar Pradesh)*

- Founders: *Ustad Inayat Khan* and *Mahbub Khan.*
- Exponents: *Ghulam Mustafa Khan, Ustad Rashid Khan, Sadik Hussain Khan, Ustad Nisar Khan, Zeeshan Khan, Abbas Khan.*

Ustad Inayat Khan

Bhendi Bazar Gharana *(Mumbai)*

- Founder: *Ustad Chhajju Khan* (Moradabad, Uttar Pradesh)

TsuNamî

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• Exponents: ***Aman Ali Khan, Lata Mangeshkar, Anjanibai Malpekar, Shashikala Koratkar.***

Agra Gharana

• This Gharana is known for its blend of *Khyal* and *Dhrupad-Dhamar* styles.

• They are descendants of *Nauhar Bani.*

• Founders: *Haji Sujan Khan*

• Exponents: ***Faiyaz Khan, Malka Jaan, Latafat Hussain Khan, Dinkar Kaikini, Vijay Kichlu, Lalita Rao, Ghagge Khuda Baksh.***

Delhi Gharana

• Founder: *Sidhar Khan Dhadi.*

• Exponent: ***Tanras Khan.***

Darbhanga Gharana *(Bihar)*

• They sing *Khandar Vani* and *Gauhar Vani* forms of singing.

• Founder: *Radha Krishna* and *Karta Ram.*

• Exponents: ***Ram Chatur Mallick, Premkumar Mallick, Siyaram Tiwari, Vidur Mallick.***

Dumrao Gharana

• Founder: *Pt. Ghanarang Baba.*

• Exponents: ***Pt. Tilak Chand Dubey, Ramjee Mishra.***

Dagar Gharana

• This Gharana is famous for its *Dhrupad* styles.

• Exponents: ***Gundecha Brothers (Padma Shri in 2012), Zia Mohiuddin Dagar (Rudra Veena)***

A distinct "dhrupad style" is associated with Bishnupur Gharana.

Lata Mangeshkar

• Bharat Ratna: 2001

• Padma Vibhushan: 1999

• Padma Bhushan: 1969

• Dada Saheb Phalke Award: 1989

Ustad Faiyaz Khan

Zia Mohiuddin Dagar

GHARANAS OF KATHAK DANCE

Lucknow Gharana of Kathak

• Founder: *Ishwari Prasad.*

• Exponents: ***Pandit Birju Maharaj, Shambhu Maharaj, Lacchu Maharaj, Kalika Prasad, Manjari Chaturvedi.***

Benaras Gharana of Kathak *(Uttar Pradesh)*

• Founder: *Janaki Prasad.*

Jaipur Gharana of Kathak

• Founder: *Bhanu Ji Maharaj.*

• Exponent: ***Vidyagauri Adkar.***

Raigarh Gharana of Kathak

• Founder: *Raja Chakradhar Singh.*

(A) *(B)* *(C)*

(A) Pt. Birju Maharaj; (B) Janaki Prasad; (C) Raja Chakradhar Singh

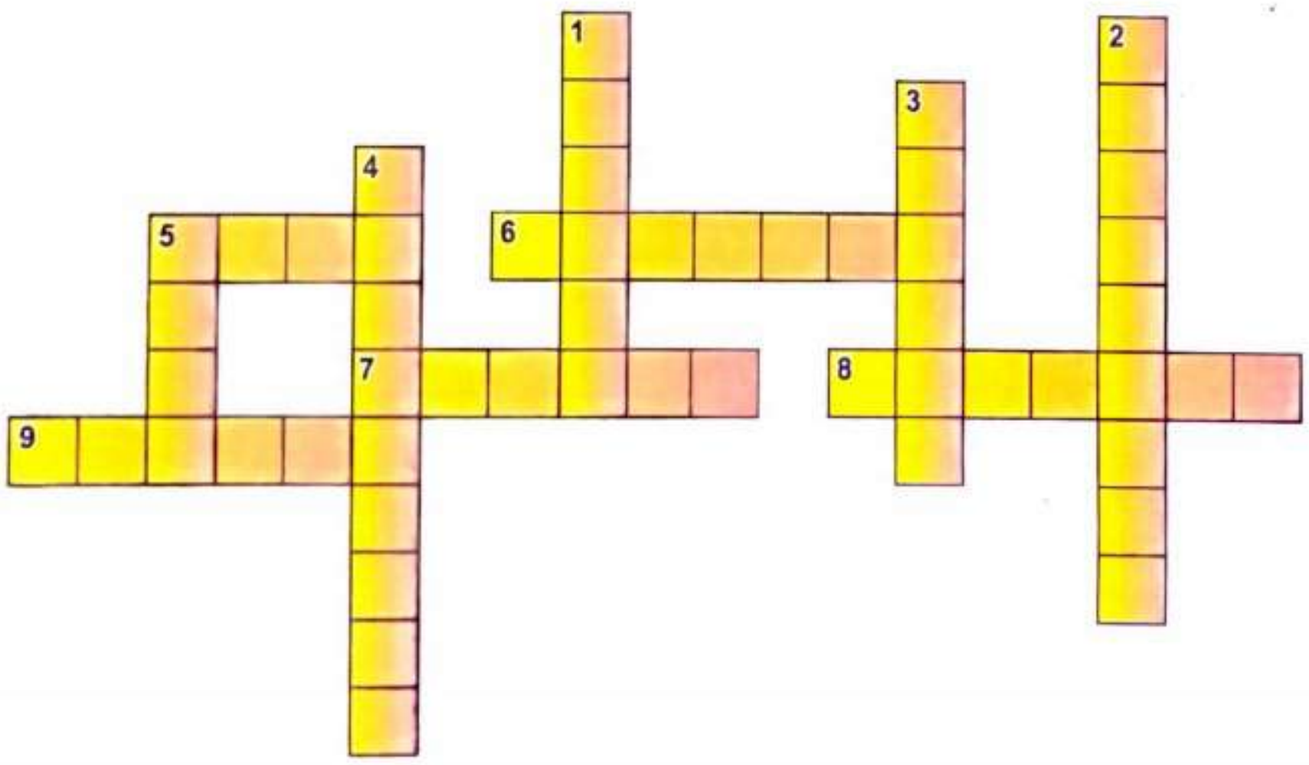
Wanawun music is sung in wedding ceremonies in J&K.

PARMAR'S CROSSWORD

GHARANAS

Across

5. Vijay Kichlu is associated with which Gharana.
6. Instrument played by Bundu Khan.
7. Gharana of Kala Ramnath.
8. Bade Ghulam Ali Khan belonged to which Gharana.
9. Gharana of Padma Vibhushan awardee Prabha Atre.



Down

1. Gharana of Gangu Bai Hangal and Prabha Atre.
2. Siyaram Tewari is associated with which Gharana.
3. Gharana of Ali Akbar Khan.
4. Award received by Kamalini and Nalini Asthana in 2022.
5. Founder of Indore Gharana

TsuNamî

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JANUARY

- *1st:* English New Year / Global Family Day.
- *4th:* World Braille Day.
- *5th:* National Birds Day.
- *6th:* World War Orphans Day.
- *9th:* Pravasi Bhartiya → Diwas *Non-Resident Indian (NRI) Day.*
- *10th:* World Hindi Diwas.

> *International Days are recognised by United Nations.*

> - *Hindi was first spoken at the UN General Assembly (UNGA) in 1949.*
> - *This date is also commemorated as "World Hindi Day".*

- *11th:* Death Anniversary of Lal Bahadur Shashtri.
- *12th:* National Youth Day → On *12 January 1863, Swami Vivekananda* was born.
- *15th:* Army Day.

> ***Reasons for celebration of Army Day:***
> - To commemorate the appointment of *Field Marshal K.M. Cariappa* as the *first Indian Commander-in-Chief* of the Indian Army.

- *16th:* Startup Diwas
- *23rd:* Netaji's Birthday (S.C. Bose) → This day is also celebrated as *Parakaram Divas.*

> *ECI was established on 25th Jan 1950.*

- *24th:* National Girl Child Day.
- *25th:* National Voters Day
- *26th:* International Customs Day.
- *27th:* International Holocaust Day; International Tourism Day.
- *28th:* Birth Anniversary of Lala Lajpat Rai; Data Protection Day.
- *30th:* Martyr's Day (also known as *Mahatma Gandhi's* martyrdom day); World Leprosy Eradication Day.
- *31st:* International Zebra Day.

FEBRUARY

- *1st:* Indian Coast guard Day.
- *2nd:* World Wetlands Day → On this day, *Ramsar Convention* was adopted in *1971* in *Ramsar, Iran.*
- *4th:* World Cancer Day.
- *6th:* International Day of Zero tolerance for Female Genital Mutilation.
- *6th-12th Feb:* International Development Week.
- *8th:* Safer Internet Day.
- *10th:* National Deworming Day; World Pulses Day.
- *11th:* World Day of the Sick; Int. Day of Women and Girls in Science.
- *21st:* International Mother Language Day.
- *22nd:* World Thinking Day.
- *24th:* Central Excise Day.
- *27th:* World NGO Day.
- *28th:* National Science Day.

> - *Sarva Dava Sewan* is a program that aims to eliminate *lymphatic Filariasis* by 2027.
> - *National Filaria Control Programme (NFCP)* was launched in 1955 to eliminate lymphatic Filariasis.

> - *28 February 1928, Sir C. V. Raman and his student K. S. Krishnan discovered the Raman effect for which Raman received Nobel Prize in Physics in 1930 and Bharat Ratna in 1954.*

MARCH

- *1st:* Zero Discrimination Day.
- *3rd:* World Wildlife Day.
- *4th:* National Safety Day.
- *8th:* International Women's Day.
- *2nd Wednesday of March:* No Smoking Day.
- *10th:* CISF Raising Day.
- *14th:* Pi Day.
- *15th:* World Consumer's Right Day.
- *16th:* National Vaccination Day.
- *20th:* International Day of Happiness; World Sparrow Day.
- *21st:* International Day of Forests.
- *22nd:* World Water Day.
- *23rd:* World Meteorological Day.
- *24th:* World Tuberculosis (TB) Day.

> The *last Saturday* of March): Earth's Hour Day → It is celebrated rom *8:30 pm to 9:30 pm* local time, encouraging people to *turn off non-essential lights* for an *hour* to raise awareness about environmental issues.

APRIL

- *1st:* Odisha Foundation Day; April Fool's Day.
- *1st-7th:* Prevention of Blindness Week.
- *2nd:* World Autism Awareness Day.
- *5th:* National Maritime Day.
- *7th:* World Health Day → On *1948, World Health Organization (WHO)* was established.
- *10th:* World Homoeopathy Day.
- *13th:* Jallianwala Bagh Massacre Day.
- *14th:* B.R Ambedkar Remembrance Day.
- *17th:* World Haemophilia Day.
- *18th:* World Heritage Day.
- *21st:* National Civil Services Day.
- *22nd:* World Earth Day.
- *24th:* National Panchayati Raj Day → *73rd CA 1992* constitutionalised Panchayati Raj system in India.
- *25th:* World Malaria Day.
- *26th:* World Intellectual Property Day.
- *28th:* World Day for Safety and Health at Work.

> *In haemophilia, blood does not clot due to deficiency of certain clotting factors.*

MAY

- *1st:* International Labour Day; Maharashtra Day; Gujarat Day.

> *World Laughter Day (First Sunday of May)*

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- **3rd:** Press Freedom Day.
- **7th:** World Athletics Day.
- **8th:** World Red Cross Day; World Thalassemia Day (Thalassemia occurs when body does not make enough *hemoglobin*).
- **9th:** Rabindranath Tagore Jayanti.
- **11th:** National Technology Day.
- **12th:** International Nurses Day → *Florence Nightingale* was the founder of *modern nursing* (lady with a lamp).
- **16th:** Buddha Jayanti or Buddha Purnima.
- **17th:** World Telecommunication Day, World Hypertension Day.
- **18th:** International Museum Day.
- **21st:** National Anti-Terrorism day / Tea Day.
- **25th:** Thyroid Day.
- **31st:** Anti-Tobacco Day.

1st Tuesday of May: World Asthama Day.

Mother's Day (Second Sunday of May).

JUNE

- **1st:** World Milk Day.
- **2nd:** International Sex Workers' Day.
- **2nd:** Telangana Formation Day.
- **5th:** World Environment Day.
- **7th:** World Food Safety Day.
- **8th:** World Oceans Day.
- **12th:** World Day Against Child Labour.
- **14th:** World Blood Donor Day.
- **20th:** World Refugee Day.
- **21st:** International Yoga Day.
- **23rd:** International Olympic Day.
- **27th:** Micro, Small and Medium-sized Enterprises (MSME) Day.
- **29th:** National Statistics Day → It is celebrated on the birth anniversary of *P C Mahalanobis.*

JULY

- **1st:** National Doctor's Day; National Postal Worker Day; Chartered Accountants Day.
- **11th:** World Population Day → On this day the world population reached *5 Billion.*
- **26th:** Kargil Vijay Diwas.
- **28th:** World Hepatitis Day; Nature Conservation Day.
- **29th:** International Tiger Day.

The *St. Petersburg Declaration* on Tiger Conservation was made on *29th July 2010* which aimed to raise awareness about tigers and the efforts to protect them.

AUGUST

- **6th:** Hiroshima Day (On *1945*, an atomic bomb named *"Little Boy"* was dropped on *Hiroshima, Japan*).
- **7th:** National Handloom Day; National Javelin Day.
- **8th:** Quit India Movement Day.
- **9th:** Nagasaki Day (On this day, an atomic bomb named *"Fat Man"* was dropped on *Nagasaki, Japan*); International Day of the World's Indigenous Peoples.
- **12th:** International Youth Day; World Elephant Day.
- **13th:** World Organ Donation Day.
- **15th:** National Mourning Day (Bangladesh); Independence Day in India.
- **16th:** Parsi New Year *(Nowruz).*
- **19th:** World Humanitarian Day.
- **20th:** World Mosquito Day; Sadbhavna Diwas.
- **26th:** Women's Equality Day.
- **29th:** National Sports Day → This day is observed as the birth anniversary of *Major Dhyanchand.*

Friendship Day (First Sunday of August).

SEPTEMBER

- **1st-7th:** National Nutrition Week.
- **5th:** International Day of Charity; Teachers' Day (it is celebrated to honour the birth anniversary of *Dr. Sarvepalli Radhakrishnan* in India).
- **8th:** International Literacy Day.
- **10th:** World Suicide Prevention Day (WSPD).
- **14th:** World First Aid Day; Hindi Diwas → On *1949, Hindi* was adopted as a *official language of India.*
- **15th:** Engineer's Day (India); International Day of Democracy.
- **16th:** World Ozone Day → On *1987*, at *Montreal, Canada, Ozone Convention* was held.
- **21st:** International Day of Peace (UN); World Alzheimer's Day.
- **22nd:** Rose Day → It is celebrated for the welfare of *Cancer patients*).
- **22nd:** World Rhino Day.
- **27th:** World Tourism Day.

World Maritime Day → It is celebrated on the last Thursday of September every year.

OCTOBER

- **1st:** International Day of the Older Persons.
- **2nd:** Gandhi Jayanti; International Day of Non-Violence.
- **5th:** World Teachers' Day.
- **8th:** Indian Air Force Day.
- **9th:** World Postal Day.
- **10th:** World Mental Health Day.
- **11th:** International Day of the Girl Child.
- **13th:** International Day for Disaster Risk Reduction.
- **17th:** International Day for the Eradication of Poverty.
- **20th:** World Statistics Day.
- **24th:** United Nations Day; World Development Information Day.
- **31st:** Rashtriya Ekta Diwas or National Unity Day → It is celebrated as the birth anniversary of *Sardar Vallabhbhai Patel* (he was the first Home Minister of India).

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NOVEMBER	DECEMBER
• *1st:* Formation Day of 8 States *(Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Haryana, Punjab, Chhattisgarh, Madhya Pradesh).* • *6th:* International Day for Preventing the Exploitation of the Environment in War and Armed Conflict. • *7th:* Infant Protection Day; National Cancer Awareness Day. • *11th:* National Education Day. • *14th:* World Diabetes Day; Children's Day. • *19th:* International Men's Day; World Toilet Day. • *25th:* International Day for the Elimination of Violence against Women. • *26th:* Constitution Day of India → On *26th November 1949*, our *Indian Constitution was adopted.* • *29th:* International Day of Solidarity with Palestinian People.	• *1st:* World AIDS Day. • *2nd:* National Pollution Control Day Computer Literacy Day; International Day for the Abolition of Slavery. • *3rd:* International Day of Persons with Disabilities. • *4th:* Indian Navy Day. • *5th:* International Volunteer Day; World Soil Day. • *7th:* Armed Forces Flag Day; International Civil Aviation Day. • *9th:* International Anti-Corruption Day. • *10th:* Human Rights Day. • *11th:* International Mountain Day. • *14th:* National Energy Conservation Day. • *16th:* Vijay Diwas → This day is celebrated (16th December 1971) to commemorate India's victory over Pakistan in Indo-Pak War. • *18th:* Minorities Rights Day in India; International Migrants Day. • *19th:* Goa's Liberation Day (*Operation Vijay* carried out in *1961* that led to the liberation of *Goa, Daman, and Diu* from *Portuguese* rule); National Integration Day (it is celebrated to honour the birth anniversary of *Indira Gandhi*). • *20th:* International Human Solidarity Day. • *22nd:* National Mathematics Day *(Ramanujan Day)* → This day is celebrated as birth anniversary of *Ramanujan.* • *23rd:* Kisan Diwas. • *24th:* National Consumer Rights Day. • *25th:* National Good Governance Day → It is observed as the birth anniversary of *Atal Vihari Vajpayee* (1954). • *26th:* Veer Bal Diwas → It is celebrated to commemorate the extraordinary sacrifices made by the four sons of *Guru Gobind Singh Ji.* • *31st:* New Year's Eve.

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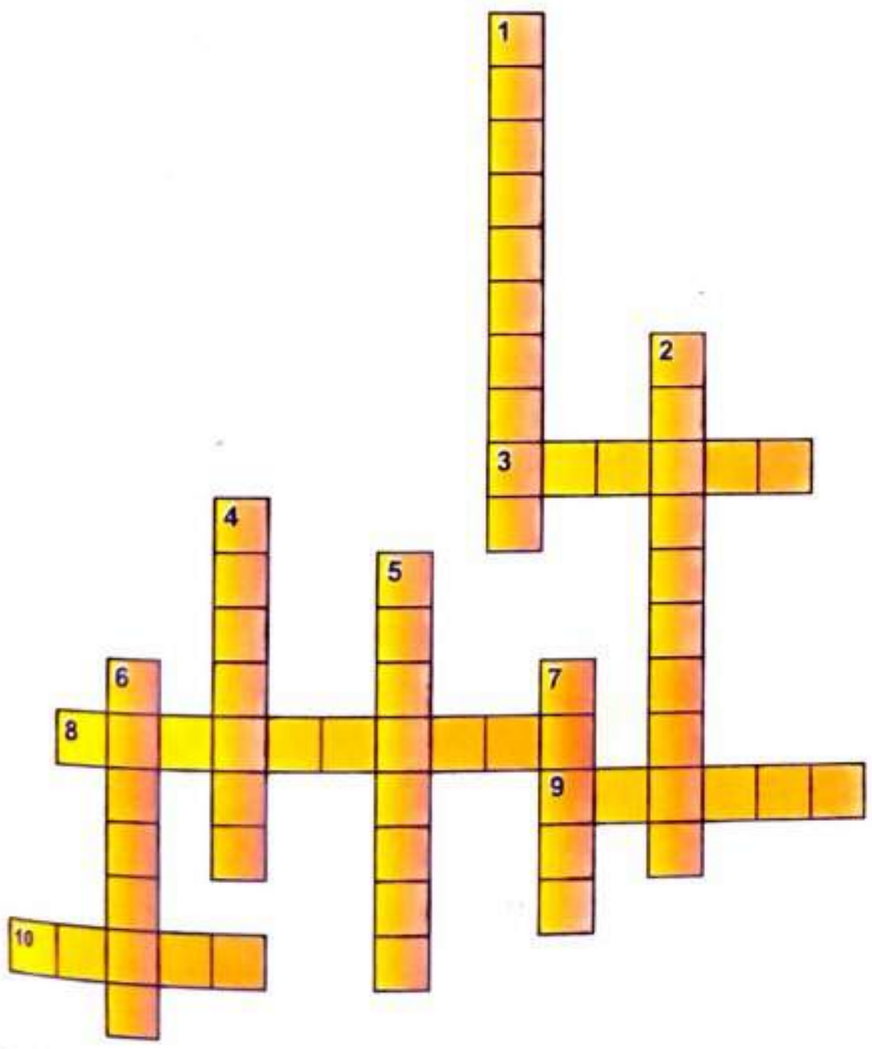
IMPORTANT DAYS

Across

3. National Javelin Day is named after which Olympian.
8. Teacher's Day is celebrated to honour whom.
9. International Day of Non-Violence marks birth of which leader.
10. Janjatiya Gaurav Diwas celebrates birth of which tribal hero.



Down

1. National Sports Day commemorates which athlete.
2. Good Friday is associated with which religion.
4. 24th Tirthankara of Jainism.
5. First month of Islamic calendar.
6. Army Day is celebrated in which month.
7. International Day observed on 29 July to protect which animal.

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BOOKS BY SPORTS PERSONALITIES	
AUTHOR	BOOK TITLE
Sanjay Manjrekar	• Imperfect
Devendra Prabhudesai	• The Nice Guy Who Finished First: A Biography of Rahul Dravid
Yuvraj Singh	• The Test of My Life
Sachin Tendulkar, Boria Majumdar	• Playing It My Way
Sourav Ganguly	• A Century is Not Enough: My Roller-Coaster Ride to Success
Kapil Dev	• Straight from the Heart
Sunil Gavaskar	• Straight Drive
Shane Warne	• No Spin: My Autobiography
Milkha Singh	• The Race of My Life
Sania Mirza	• Ace Against Odds
Saina Nehwal	• Playing to Win
Abhinav Bindra	• A Shot at History
Usain Bolt	• Faster than Lightning: My Autobiography
Mary Kom	• Unbreakable: An Autobiography
Vishwanathan Anand	• Mind Master: Winning Lessons from a Champion's Life
Major Dhyan Chand	• Goal
Anil Kumble	• Wide Angle
David Beckham	• My Side
Mike Tyson	• Undisputed Truth: My Autobiography
Maria Sharapova	• Unstoppable: My Life So Far
Muhammad Ali	• The Soul of a Butterfly: Reflections on Life's Journey
Ashish Ray	• Cricket World Cup: The Indian Challenge
Chris Gayle	• Six Machine: I Don't Like Cricket...I Love It.

BOOKS BY POLITICAL AND HISTORICAL FIGURES	
AUTHOR	BOOK TITLE
A. P. J. Abdul Kalam	• Wings of Fire: An Autobiography • Ignited Minds • My Journey: Transforming Dreams Into Action
Fali S. Nariman	• Before Memory Fades: An Autobiography
Surendranath Banerjee	• A Nation in Making
General V. K. Singh	• Courage and Conviction: An Autobiography
Margaret Alva	• Courage and Commitment: An Autobiography
Barack Obama	• Dreams from My Father: A Story of Race and Inheritance
Arnold Schwarzenegger	• Total Recall: My Unbelievable True Life Story
Anne Frank	• The Diary of a Young Girl
Kiran Bedi	• Fearless Governance
Benazir Bhutto	• Daughter of Destiny: An Autobiography
Mahatma Gandhi	• The Story of My Experiments with Truth • Hind Swaraj
Lala Lajpat Rai	• Young India: An Interpretation and A History of the Nationalist Movement from Within
Hillary Rodham Clinton	• Living History • What Happened
Jawaharlal Nehru	• An Autobiography: Toward Freedom • Glimpses of World History • Letters From A Father to His Daughter • The Discovery of India • A Bunch of Old Letters

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Maulana Abul Kalam Azad	• India Wins Freedom
The 14th Dalai Lama	• Freedom in Exile
Nelson Mandela	• Long Walk to Freedom
L. K. Advani	• My Country My Life
Bhagat Singh	• Why I Am an Atheist
Swami Vivekananda	• My Master • Raja Yoga • Karma Yoga
Dadabhai Naoroji	• Poverty and Un-British Rule in India
Pranab Mukherjee	• The Coalition Years
B. R. Ambedkar	• Riddles in Hinduism • Ranade, Gandhi and Jinnah • Waiting For A Visa: Autobiographical Notes • Annihilation of Caste • The Buddha and His Dhamma
Indira Gandhi	• My Truth
Sarojini Naidu	• The Golden Threshold
P. Chidambaram	• Speaking Truth to Power: My Alternative View
Al-Biruni	• Kitab-ul-Hind
Manmohan Singh	• The Quest For Equity in Development
Sarvepalli Radhakrishnan	• The Brahma Sutra: The. Philosophy of Spiritual Life
Shashi Tharoor	• The Great Indian Novel • An Era of Darkness • Paradoxical Prime Minister • Why I am a Hindu • Ambedkar: A Life
Michelle Obama	• Becoming
Bill Gates	• The Road Ahead
Arjun Singh	• A Grain of Sand in the Hourglass of Time: An Autobiography
Sheikh Muhammad Abdullah	• Aatish-e-Chinar
Amit Shah	• Karmayoddha Granth
Faizi and Abdal Qadir Badauni	• Razmnama
Dina Bandhu Mitra	• Neel Darpan
Bankim Chandra Chattopadhyay	• Anandmath
Adolf Hitler	• Mein Kampf
Megasthenes	• Indica
Jyotibha Phule	• Gulamgiri • Sarvajanik Satyadharma
Hiuen Tsiang	• Si-Yu-Ki
Malik Muhammad Jayasi	• Padmavat
Tarabai Shinde	• Stripurush Tulna
Bal Gangadhar Tilak	• The Arctic Home In The Veda
Stephen Hawking	• A Brief History of Time
Charles Darwin	• On the Origin of Species
Jaswant Singh	• Defending India
Bipin Chandra Pal	• Memories of My Life and Time in the Days of My youth

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Rassundari Devi	• Amar Jiban
Annie Besant	• New India • Common Weal
Narendra Modi	• Social Harmony
James Mill	• The History of British India

BOOKS BY INDIAN AUTHORS

Classical Old Indian Writers

Panini	• Ashtadhyayi
Kalidasa	• Raghuvamsha • Kumarasambhava • Malvikagnimitra • Ritusamhara • Meghaduta • Abhijnana Shakuntalam
Rabindranath Tagore	• Gitanjali • A Grain of Sand • Kabuliwala • Nationalism • Galpaguchchha.
Raja Rao	• Kanthapura
Sarngadeva	• Sangita Ratnakar (Sanskrit text)
Tulsidas	• Ramcharitmanas
Jayadeva	• Gita Govinda
Sri Aurobindo	• The Life Divine • The Secret of Veda
Vishnu Sharma	• Panchatantra
Vatsyayana	• Kama Sutra
Paramhansa Yogananda.	• Autobiography of a Yogi
Kalhana	• Rajatarangini
Asvaghosha	• Buddhacharita
Chithalai Chathanar	• Manimekhalai: The Dancer with the Magic Bowl
Sage Jamini	• Mimasa Sutras
Sant Dhyaneshwar	• Bhavartha Dipika • Amritanubhava
Bhaskara	• Lilavati
Allasani Peddana	• Manu Charitra
Bhavabhuti	• Malatimadhava (Playwright)
Munshi Premchand	• Godan • Gaban • Kaphan • Nirmala • Namak ka Daroga • Idgah • Mansarovar
Adikavi Pampa	• Vikramarjuna Vijaya
Nandikeshvara	• Abhinaya Darpan
Harivansh Rai Bachchan	• In The Afternoon of Time: An Autobiography • Madhushala
R. K. Narayan	• The English Teacher • Malgudi Days • Swami and Friends • The Dark Room • The Guide
Vrindavan Lal Sharma	• Mrignayani
Mulk Raj Anand	• Untouchable • Coolie • Sword and Sickle • The Village • Across the Black Waters • Seven Summers

New and Modern Indian Writers

Vikram Seth	• A Suitable Boy
Khushwant Singh	• A Train to Pakistan • Truth, Love and a Little Malice

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Sudha Murthy	• The Gopi Diaries • Wise and Otherwise • Dollar Bahu • House of Cards
Nirad C Chaudhari	• The Autobiography of an Unknown Indian
Chetan Bhagat	• Half Girlfriend • What Young India Wants • One Indian Girl • One Night at the Call Centre • 400 Days • The Three Mistakes of My Life • Five Point Someone. • Revolution 2020
Arundhati Roy	• The God of Small Things • Ministry of Utmost Happiness • An Ordinary Person's Guide to Empire
Amitav Ghosh	• Sea of Poppies • The Living Mountain • River of Smoke • The Hungry Tide
Amish Tripathi	• Scion of Ikshvaku • The Immortals of Meluha • Secret of Nagas • The Oath of Vayuputras • Raavan • Sita-Warrior of Mithila
Devdutt Pattanaik	• Secrets of the Goddess • My Gita • Myth = Mithya : A Handbook of Hindu Mythology • 7 Secrets of Vishnu • SITA: An Illustrated Retelling of Ramayana • Secret of Shiva • Devlok • Decoding Hindu Mythology
Aravind Adiga	• Selection Day • The White Tiger • Last Man in Tower
Vikas Swarup	• Slumdog Millionaire
Salman Rushdie	• Midnight's Children • The Satanic Verses • Knife: Meditations After an Attempted Murder • Grimus: Roman • The Moor's Last Sigh
Jhumpa Lahiri	• Interpreter of Maladies • The Namesake • Unaccustomed Earth
Ravi Subramaniam	• If God was a Banker • In The Name of God • Bankster • The Incredible Banker • God is a Gamer
Rohinton Mistry	• A Fine Balance
Taslima Nasrin	• Lajja
Mala Sen	• India's Bandit Queen: A True Story of Phoolan Devi
Chitra Banerjee Divakaruni	• The Palace of Illusions. • The Forest of Enchantments • Before We Visit the Goddess
Ruskin Bond	• The Tiger in the Tunnel • The Room on the Roof • The Blue Umbrella • Roads to Mussoorie • A Handful of Nuts
Akshat Gupta	• The Hidden Hindu.
Sitaram Yechury	• Modi Government: New Surge of Communalism
Roy Moxham	• Outlaw: India's Bandit Queen and Me.
Shivaji Sawant	• Mrityunjay
Anna Chandy	• Atmakatha

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Anita Desai	• Fasting, Feasting • In Custody
Sunjeev Sahota	• The Year of the Runways
Meghna Pant	• Boys Don't Cry
Anuradha Roy	• Sleeping On Jupiter
Shobhaa De	• Sultry Days
R. K. Laxman	• The Tunnel of Time: An Autobiography • Timeless Laxman
Satyajit Ray	• Jakhan Choto Chilam • Childhood Days: A Memoir
Indra Nooyi	• My Life in Full: Work, Family, and Our Future.
Nandini Sengupta	• The King Within
Krishna Sobti	• The Heart Has Its Reasons
Jeet Thayil	• Nacropolis
Ahmed Ali	• Twilight in Delhi
Kashi Nath Singh	• Kashi Ka Assi
Aribam Syam Sharma	• Living Shadows
Bhisham Sahni	• Tamas
Phanishwar Nath Renu	• Maila Anchal
Siddharth Dhanvant Shanghvi	• The Last Song of Dusk
Avni Doshi	• Burnt Sugar
Jaishankar Prasad	• Kamayani (Poem)
Twinkle Khanna	• Mrs Funnybones
Anupam Kher	• The Best Thing About You is You • Your Best Day is Today • Lessons Life Taught Me Unknowingly : An Autobiography
Rishi Singh Gherwal	• Kundalini: The Mother Of The Universe. The Mystery of Piercing The Six Chakras
Nand Kishore Acharya	• Chheelate Hue Apne Ko
Paro Anand	• Being Gandhi
Shrilal Shukla	• Raag Darbari

Fakir Hassen	• 150 Years of Celebrating of Mahatma: The South African Legacy
Nirupama Yadav	• Vishesh: Code To Win
Ram Chandra Guha	• Democrats and Dissenters
Jairam Ramesh	• The Light of Asia: The Poem that Defined the Buddha
Mukul Kesavan	• Men in White: A Book Of Cricket
G. Krishnan	• The Hitman: The Rohit Sharma Story
Prem Prakash	• Reporting India: My Seventy-Year Journey As A Journalist (Memoir).
Jugal Hansraj	• Cross Connection: The Big Circus Adventure
Rajendralala Mitra	• Buddha Gaya: The Hermitage of Sakya Muni
Sarbpreet Singh	• Night of The Restless Spirits: Stories from 1984
Shuja Nawaz	• Crossed Swords: Pakistan, Its Army and The War Within
Sunil Gangopadhyay	• Those Days (Translated from the Bengali novel "Sei Samay")
N. Chandrasekaran	• Bridgital Nation Solving Technology's People Problem
Anand Neelakantan	• Asura: Tale of the Vanquished
K. Siva Reddy	• Pakkaki Ottigilite (Poem)
Mahasweta Devi	• Hazara Chaurasi Ki Maa
Ravish Kumar	• The Free Voice: On Democracy Culture and The Nation
Khalid Jawed	• The Paradise of Food
Andimuthu Raja	• 2G Saga Unfolds
Tahira Kashyap Khurrana	• The 7 Sins of Being a Mother
R. C. Dutt	• The Economic History of India

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Anuja Chauhan	• The Zoya Factor
Salim Ali	• The Fall of a Sparrow
Priyanka Chopra	• Unfinished: A Memoir
Vikram Chandra	• Red Earth and Pouring Rain
Indu Sundaresan	• The Mountain of Light
Ishtiaq Ahmed	• Jinnah: His Successes, Failures and Role In History
Subramanian Swamy	• Reset: Regaining India's Economic Legacy
Navin Chawla	• Every Vote Counts: The Story of India's Elections
Amrita Pritam	• Pinjar
Kailash Satyarthi	• Every Child Matters
Sushil Kumar	• A Prime Minister To Remember Memories of A Military Chief.
Nilima Chitgopekar	• The Reluctant Family Man: Shivaji in everyday Family Life
V. S. Naipaul	• India: A Million Mutinies Now • Role in History
Satya Nadella.	• Hit Refresh (Memoir)
Meira Kumar	• Indian Parliamentary Speaker's Perspective
Kiran Desai	• The Inheritance of Loss
Kuldip Nayar	• Beyond the Lines • Without fear: The Life and Trial of Bhagat Singh • The Judgement: Inside Story of the Emergency in India
Venkat Raman Singh Shyam (Renowned Pradhan Gond artist) and S Anand	• Finding My Way
Emraan Hashmi	• The Kiss of Life
Mithali Raj	• Unguarded (Autobiography)

BOOKS BY FOREIGN AUTHORS	
Thomas Hardy	• Tess of the d'Urbervilles
F. Scott Fitzgerald	• The Great Gatsby
Gillian Flynn	• Gone Girl
Leo Tolstoy	• Anna Karenina • My Confession • War and Peace • Resurrection.
E. M. Forster	• A Passage to India
Lewis Carroll	• Alice's Adventures in Wonderland
Jane Austen	• Pride and Prejudice • Sense and Sensibility • Mansfield Park • Emma
Mark Twain	• The Adventures of Huckleberry Finn • The Gilded Age: A Tale of Today
Harper Lee	• To Kill a Mockingbird
Ernst Hemingway	• A Movable Feast
Arthur C. Clarke	• 2001: A Space Odyssey
Margaret Atwood	• The Testaments • The Handmaid's Tale
Bernardine Evaristo	• Girl, Women, Other
J.K. Rowling	• The Tales of Beedle the Bard • Harry Potter and Prisoner of Azkaban
Kenzaburo Oe	• The Silent Cry
Haruki Murakami	• A Wild Sheep Chase • What I Talk About When I Talk About Running
George Bernard Shaw	• Caesar and Cleopatra
Anna Sewell	• Black Beauty

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David A. Vise	• The Google Story
John Hicks	• Capital and Growth
John Maynard Keynes	• The General Theory of Employment, Interest and Money
Maya Angelou	• I Know Why the Caged Bird Sings
Stephen King	• On Writing: A Memoir of the Craft
George Orwell	• Animal Farm
J. T. Owens	• Elon Musk : The Unauthorised Autobiography
Viktor Frankl	• Man's Search For Meaning
Rudyard Kipling	• The Jungle Book • The Man Who Would Be King • Rikki-Tikki-Tavi
Etaf Rum	• A Woman Is No Man: A Novel
Roald Dahl	• Charlie And The Chocolate Factory • Boy: Tales of Childhood
William Dalrymple	• The Anarchy: The Relentless Rise of East India Company • The Last Mughal: The Fall of a Dynasty, Delhi 1857 • White Mughals • The Golden Road • The Anarchy: The East India Company, Corporate Violence, and the Pillage of an Empire
Jay Shetty	• Think Like A Monk
Wendell Rodricks	• Poskem : Goans in the Shadows
Malala Yousafzai	• We Are Displaced
Marie Louise Burke	• Swami Vivekanand in the West: New Discoveries
Adam Smith	• The Inquiry of Nature and the Causes of The Wealth of Nations • The Theory of Moral Sentiments
Andy Marino	• Narendra Modi: A Political Biography

BOOKS BY FILM AND MUSIC PERSONALITIES	
Sonu Sood	• I Am No Messiah
James Brown	• The Godfather of Soul
Karan Johar	• Unsuitable Boy
Rishi Kapoor	• Khullam Khulla
Shatrughan Sinha	• Anything But Khamosh
Ayushmann Khurrana	• Cracking the Code: My Journey to Bollywood
Dev Anand	• Romancing with Life
Johnny Marr	• Set The Boy Free
Michael Jackson	• Moonwalk
George David Robert	• Shantaram
Pt. Ravi Shankar	• Raga Mala
Shiv Kumar Sharma	• Journey with a Hundred Strings: My life in Music
Ramakrishnabuwa Vaze	• Sangeet Kala Prakash
Balraj Sahni	• Meri Filmy Atmakatha

OTHER NOTABLE AUTOBIOGRAPHIES	
BV Acharya	• All From Memory: An Autobiography
Teju Behun	• Drawing From the City
Kamala Das	• My Story
Amrita Pritam	• Revenue Stamp: An Autobiography
Shantabai Krushnaji Kumble	• Majya Jalmachi Chittarkatha
Karan Thapar	• Devil's Advocate: The Untold Story
Banarasi Das Jain	• Ardhakathanaka (The Half Story)
Baba Ramdev	• My Life, My Mission

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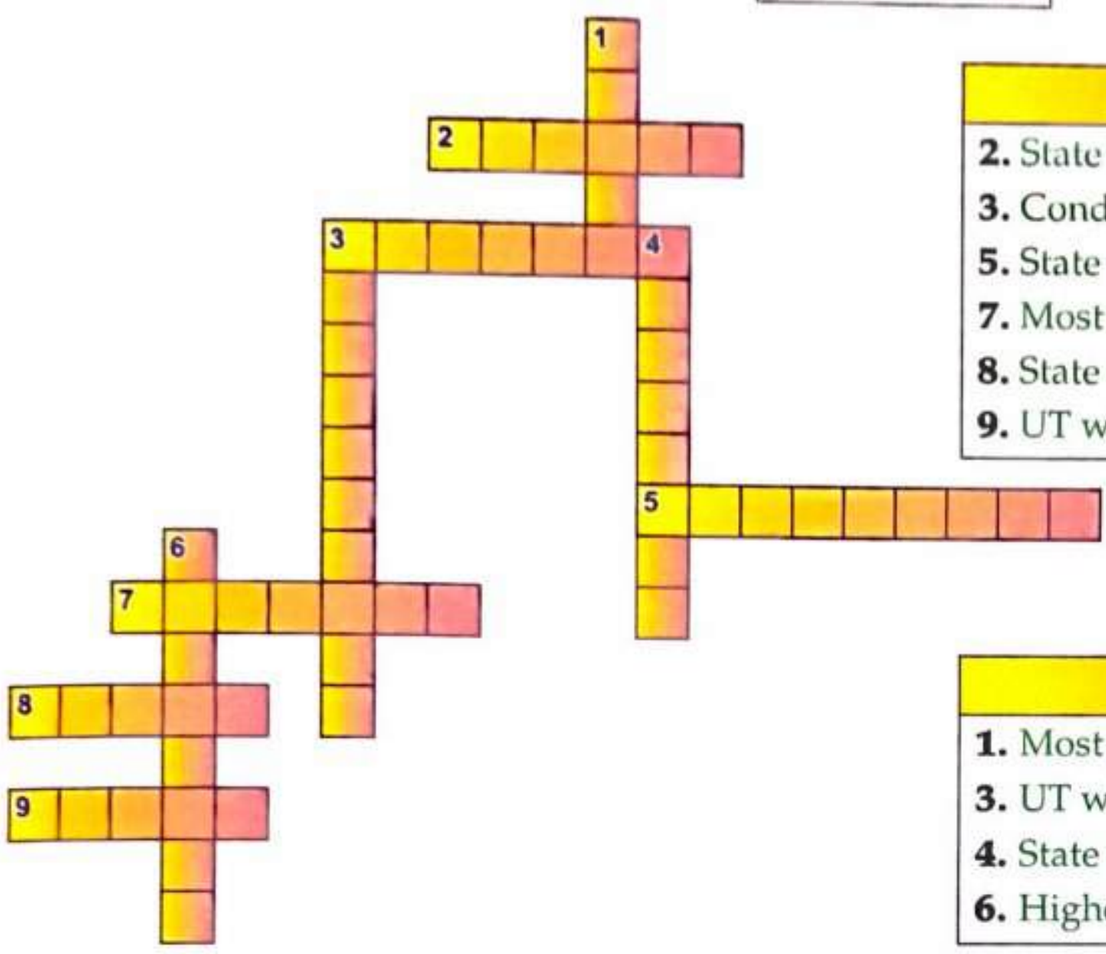
PARMAR'S CROSSWORD

CENSUS



Across

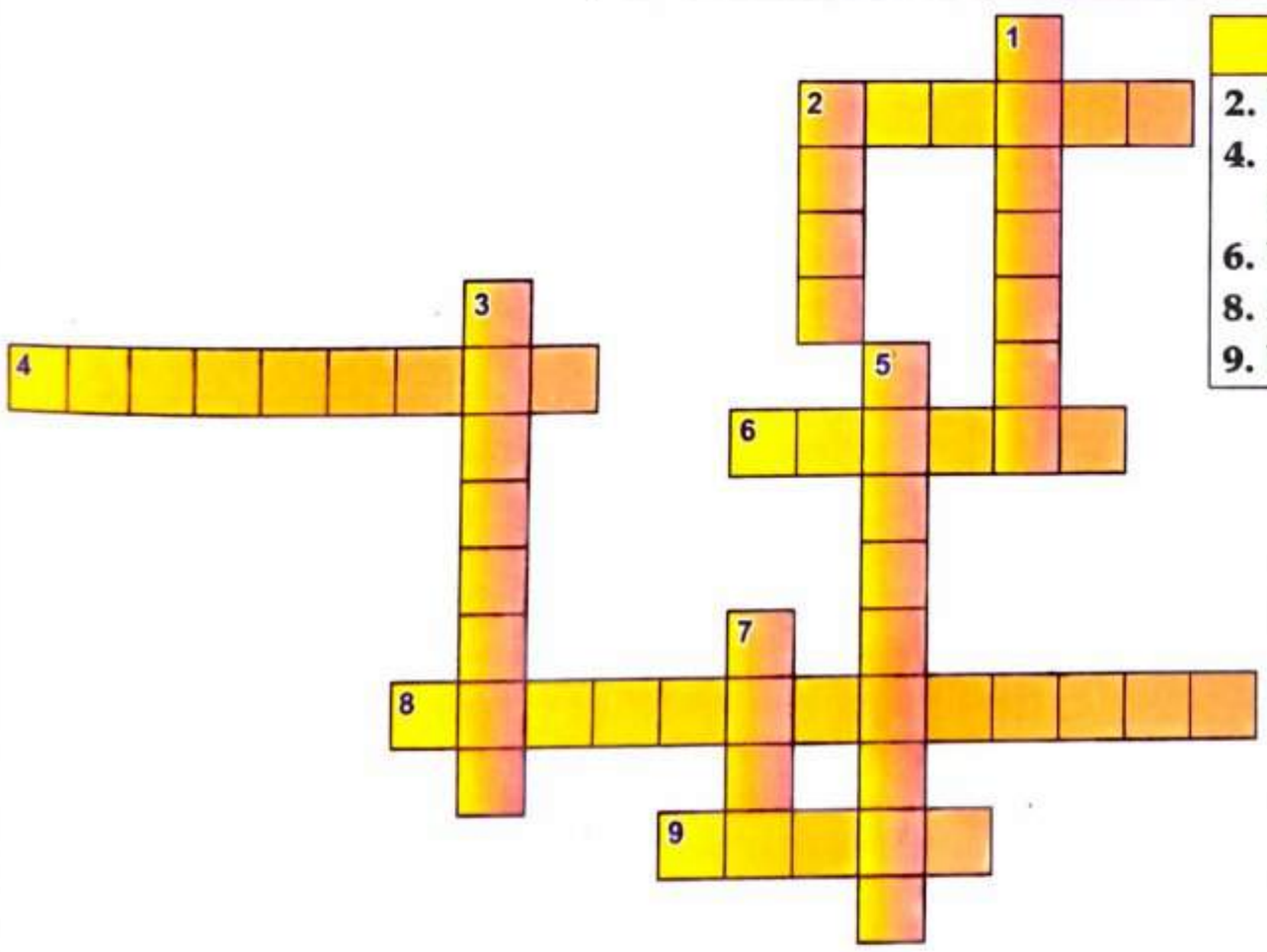
2. State with highest literacy rate.
3. Conducted Census of 1881.
5. State with lowest literacy rate.
7. Most literate North-East state.
8. State with highest population density.
9. UT with highest slum population.

Down

1. Most populated district in 2011 Census.
3. UT with highest sex ratio.
4. State with negative population growth.
6. Highest rural female workforce state.

PARMAR'S CROSSWORD

BOOKS AND AUTHORS



Across

2. Wrote Tarikh-i-Firuzshahi.
4. Autobiography titled Playing It My Way.
6. Wrote Ungalil Oruvan.
8. Author of From Plassey to Partition.
9. Wrote The Inheritance of Loss

Down

1. Writer of Poverty and Un-British Rule in India.
2. Wrote Fearless Governance.
3. Writer of Sangeet Bal Prakash.
5. Author of The Thousand Faces of Night.
7. Author of The Indian Struggle.

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OLYMPICS

History of Olympics

- ***Governing body:*** *International Olympic Committee* (IOC) → Conducts Olympics.
- ***Headquarters:*** Initially in *Paris, France* → Currently in *Lausanne, Switzerland.*
- ***Founded in:*** *1894* by *Pierre de Coubertin* (2nd President of IOC) and *Demetrius Vikelas* (1st President of IOC).
- ***Current President of IOC:*** *Thomas Bach.*
- ***Official motto:*** *"Citius, Altius, Fortius – Communiter"* (Faster, Higher, Stronger – Together).
- ***Symbol:*** Olympic Rings *(Blue, Yellow, Black, Green, Red)* representing the unity of the five continents.
- ***Total member countries:*** *206.*
- ***Selection of host cities:*** They are chosen through a *Secret Ballot.*

Olympic Games Timeline

- ***First Summer Olympics:*** *1896 (Athens, Greece).*
- ***First Winter Olympics:*** *1924 (Chamonix, France).*
- ***First Paralympics:*** *1960 (Rome, Italy).*
- ***First Youth Summer Olympics:*** *2010 (Singapore).*
- ***First Youth Winter Olympics:*** *2012 (Innsbruck, Austria).*
- ***Second Olympic Games:*** *1900 (Paris, France)* → First women participation was seen here.

> *The first Winter Paralympics Games held in Sweden in 1976.*

> *• 2 years gap between Summer and Winter Olympics.*

Upcoming Olympics Events

- *2024 (33rd Edition) Summer Olympics: Paris (France).*
- *2026 Winter Olympics: Milan and Cortina (Italy).*
- *2028 Summer Olympics: Los Angeles, California, USA.*
- *2030 Winter Olympics: French Alps (France).*
- *2032 Summer Olympics: Brisbane (Australia).*
- *2034 Winter Olympics: Salt Lake City (USA).*

Hosting Cities

- ***Most number of times hosted by:*** *USA* (8 times → 4 Summer and 4 Winter Olympics).
- *London:* ***3 times.***
- *Paris:* ***3 times.***
- *Los Angeles:* ***3 times.***

INDIA'S PERFORMANCE IN OLYMPICS

- *1900:* First participation of India in *Paris, France.*
- ***First Indian medalist:*** *Norman Pritchard* (Anglo-Indians) → won 2 *silver* medals in *1900.*
- *1920:* India's first-ever Olympic contingent, a *six-member team* participated in *Belgium Olympics* → ***First flag bearer:*** *Purma Banerjee.*
- ***Total medals won by India:*** *41 medals.*
- *10 Gold medals* (*8 medals* won by *Indian Hockey Team* and 2 *individual medals* won) + *10 Silver* + *21 Bronze.*

In Hockey

- The Indian Men's Hockey team is the most successful team in Olympics with a record of winning *8 gold + 1 silver + 4 bronze* till now.

Participation of Indian Men's Hockey Team

- 1916: No Olympics held due to World War I (1914-1918).
- *1928:* Amsterdam Olympics→ Captain of Indian Men's Hockey Team: *Jaipal Singh Munda. 14 goals* scored by *Major Dhyanchand* (he is considered as *"Wizard of Hockey"*).
- *1932:* Los Angeles Olympics → Won from *US* by *24-1.*
- *1936:* Berlin Olympics (Capital: Dhyanchand).
- 1940-1944: No Olympics due to World War II (1939-1945).
- *1948:* London Olympics → Men's Hockey team was led by *Kishan Lal.*
- *1952:* Helsinki Olympics → *Balbir Singh Sr.* scored *5 goals* (he is the first recipient of Padma Shri award).
- *1956:* Melbourne Olympics → *6th* gold medal won.
- *1960:* Rome Olympics → A *silver* medal won.
- *1964:* Tokyo Olympics → *7th* gold medal won by defeating *Pakistan.*

India also won 2 *Bronze medals* in :

- *1968:* Mexico Olympics → *bronze* medal won.
- *1972:* Munich Olympics → *bronze* medal won.
- *1976:* Montreal Olympics → India went home with no medal.
- *1980:* Moscow Olympics → *8th* gold medal won.

Individual Gold Medals Won by India in Olympics

- *2008: Beijing Olympics* → *Abhinav Bindra* in 10 m Air Riffle *Shooting.*
- *2020: Tokyo Olympics* → *Neeraj Chopra* was the first Indian to win gold in *Track and Field* (record: 87.58 m) on 7th August (this day is now celebrated as *"National Javelin Day"*).

> *Abhinav Bindra is the first Indian to receive the International Shooting Federation (ISSF) Blue Cross.*

Some Notable Olympic Medalists of India

- *1952:* Helsinki Olympics → First individual bronze medal won by *K.D. Jadhav* in *Wrestling.*
- *1996:* Atlanta Olympics → *Leander Paes* won *bronze* medal in *Tennis.*
- *2000:* Sydney Olympics → *Karnam Malleswari* became the first woman to win medal *(bronze)* in Olympics in weightlifting.
- *2004:* Athens Olympics → *Silver* medal won by *Rajyavardhan Singh Rathore* in shooting (1st Indian to win medal in shooting).
- *2008:* Beijing Olympics → *Vijendra Singh* won *bronze* medal in boxing and *Sushil Kumar* won *bronze* medal in *wrestling.*

> *Beijing is the first city to host both Summer and Winter Olympics editions.*

2012 London Olympics

- *Sushil Kumar:* He won a *silver* in wrestling.
- *Vijay Kumar:* He won a *silver* in shooting.
- *Saina Nehwal:* She won a *bronze* medal and is also the first Indian to win a medal in *Badminton.*
- *Mary Kom:* She won a *silver* medal and is also the first Indian woman to win a medal in *Boxing.*
- *Yogeshwar Dutt:* He won a *bronze* medal in *wrestling.*
- *Gagan Narang:* He won a *bronze* medal in *10m air riffle shooting* event.

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2016 Rio Olympics

- *PV Sindhu:* She won a *silver* medal in Badminton.
- *Sakshi Malik:* She won a *bronze* medal in wrestling.

2020 Tokyo Olympics

- The phrase *"we have wings"* is associated with the opening ceremony of the Tokyo 2020 Paralympic Games.
- ***Official mascot of 2020 Tokyo Paralympics:*** *Someity.*
- ***India's rank in Tokyo Olympics 2020:*** *48 th.*
- *Mirabai Chanu:* She won a *silver* medal in *weightlifting.*
- *Lovlina Borgohain:* She won a *bronze* medal in *boxing.*
- *PV Sindhu:* She won a *bronze* medal in *badminton.* She has the honour of being a "double medallist" at the Olympics.
- *Bajrang Punia:* He won *bronze* medal in *wrestling.*
- *Neeraj Chopra:* He won a *gold* medal in javelin throw.
- *Men's Hockey Team:* They won a *bronze* medal.

2024 Paris Olympics

> *Someity is related to: Tokyo Paralympics 2020.*

- ***Torch bearer:*** *Abhinav Bindra.*
- ***Flag bearer for opening ceremony:*** *Achanta Sharath Kamal* (table tennis player) and *PV Sindhu.*
- ***Flag bearer for closing ceremony:*** *PR Sreejesh* and *Manu Bhaker.*
- ***Chef de Mission:*** *Gagan Narang.*
- *Bilquis Mir:* She is the first Indian women to be *jury member* in Olympics.

Medals Tally of India in 2024 Paris Olympics

- India sent a contingent of *117 athletes* to the Paris 2024 Olympics.
- In all event, India won *6 medals* → *a silver* and *5 bronze medals.*
- ***India's rank:*** *71* out of 206 Nations.

Athlete	*Event*	*Sport*	*Medal*
Manu Bhaker	Women's 10m air pistol	Shooting	Bronze
Manu Bhaker & Sarabjot Singh	Mixed team 10m air pistol	Shooting	Bronze
Swapnil Singh	Men's 50m riffle 3 positions	Shooting	Bronze
Team India	Men's event	Hockey	Bronze
Neeraj Chopra	Men's javelin throw	Athletics	Silver
Aman Sehrawat	Men's freestyle 57kg	Wrestling	Bronze

About Manu Bhaker

- She is the *first Indian woman* to win a Olympic shooting medal.
- She is also the first Indian woman to *win multiple medals* in a single edition of the Olympics, after she won a *bronze* medal in mixed team *10m pistol event* with *Sarabjot Singh.*

Medals Tally of India in 2024 Paris Paralympics Olympics

- First Paralympics held in: 1960 in Rome, Italy.
- Total medals won in 2024: 7 gold, 9 silver, and 13 bronze.

> *Total medals: 29*

Gold Medals Won by Athletes Paralympics

Athlete	*Event*	*Sport*	*Medal*
Avani Lekhara	Women's 10m air riffle standing SH1	Shooting	Gold
Nitesh Kumar	Men's single SL3	Badminton	Gold
Sumit Antil	Javelin throw F64	Athletics	Gold
Harvinder Singh	Men's individual recurve open	Archery	Gold
Dharambir	Men's club throw F51	Athletics	Gold
Praveen Kumar	Men's high jump T64	Athletics	Gold
Navdeep Singh	Men's javelin throw F41	Athletics	Gold

INDIAN OLYMPIC ASSOCIATION (IOA)

- ***Established:*** *1927.*
- ***First President:*** *Dorabji Tata (1927).*
- ***Second President:*** *Maharaja Bhupindra Singh (1928).*
- ***Current President:*** *P.T. Usha* (she is also known as *"Payyoli Express"*).
  - **Records in**
    - Asian Games in *1982, Delhi* and *1986, Seoul.*
    - In *1984* Olympics, she lost bronze medal by 0.01 seconds.

Some Facts on Olympics

- *Michael Phelps* is the most decorated olympian of USA to win *28 medals* (23 golds) in Olympics.
- *Cricket* to be included in *2028 Los Angeles Olympics* along with other sports → *Football, Squash, Baseball, Softball, Lacrosse.*
- *Satish Kumar* is the first Indian to participate in a *Super Heavyweight Boxing* event in the *2020* Olympic Games.
- *Archery* event was hosted at *Lord's Cricket Ground* (LCG) at the *2012* Olympics.
- *Thomas Hicks* was the first *American* male athlete to win the *Marathon gold medal* in the Olympic Games.
- Marathon Distance: The official length is *42.195 km.*
- *South Africa* has never hosted Olympics.
- In *1992, Shiny Wilson* became the *first woman to carry India's flag* at the opening ceremony of the Summer Olympic Games.
- *Shabana Akhtar* became the *first female athlete* to represent *Pakistan* in *1996 Atlanta Olympics.*
- The major component of modern Olympic gold medals is silver, with a minimum of *92.5% silver,* and then plated with a minimum of *6 grams of pure gold.*

COMMONWEALTH GAMES

- ***First held in:*** *1930, Hamilton, Canada.*
- ***Not held in:*** *1942* and *1946* (due to WWII).
- ***Previously called as:*** *British Empire Games* (1930-1950).
- ***Current Head:*** *King Charles III.*
- ***Most hosted by:*** *Australia* (5 times)

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- ***India hosted in:*** *2010* (New Delhi) → India finished in *2nd* place.
- 2022 *Birmingham CWG:* India finished *4th*.
- *2026: Glasgow* (Scotland) to host for the *4th* time.
- ***Commonwealth ratification:*** *May 1949.*
- ***Commonwealth Nations:*** *56 countries* (India, Australia, Canada, South Africa, Britain, etc.).

ASIAN GAMES

- Asian Games are also known as *Asiad*.
- It is a *quadrennial multi-sport* event for athletes from *Asia*.
- ***Organized by:*** *Olympic Council of Asia.*
- ***First Asian Games held at:*** *1951, New Delhi, India.*
- India also hosted Asian Games in *1982*.
- ***Most hosted by:*** *Thailand* (4 times) and *South Korea* (3 times).

Upcoming Asian Games

- *2022:* Hangzhou, China.
- *2026:* Nagoya, Japan.
- *2030:* Doha, Qatar.

Some Facts on Asian Games

- *Neeraj Chopra* first set the senior national record during the *2016 South Asian Games* held at *Guwahati*.
- *India* won *5 gold medals* in *1986* Asian Games held in *Seoul, South Korea*.

CRICKET

- ***Governing body (international cricket):*** *International Cricket Council (ICC).* ICC was established as *Imperial Cricket Conference* in *1909* and became ICC in *1989*.
- ***Headquarters:*** *Dubai, UAE.*
- ***Governing body (Indian Cricket): Board of Control for Cricket in India (BCCI).***
- ***Headquarters: Mumbai.***
- ***First Test Match:*** *1877* (Australia vs England, in England).
- ***First ODI Match:*** *1971* [Australia vs England, Melbourne Cricket Ground (MCG)].

> ***Sports Authority of India (SAI) was setup in 1984.***

Cricket World Cup

- ***First cricket World Cup:*** Women *(1973, in England)* and Men *(1975, in England* → Winner: *West Indies).*
- ***India has won World Cup two times:*** *1983* (under *Kapil Dev's* captaincy) by defeating *West Indies* and in *2011* (under *MS Dhoni's* captaincy) by defeating *Sri Lanka*.
- 2023 World Cup (held in India): Won by *Australia* (6th title) by defeating India. Australia holds the record for the *most* ICC Men's Cricket World Cup titles.

> ***Nick names of MS Dhoni: "Captain cool"; "Thala"; "Mahi".***

ICC Men's Cricket World Cups Hosted by India

- *1987:* India and Pakistan jointly hosted.
- *1996:* India, Sri Lanka and Pakistan jointly hosted.
- ***2011:*** India, Sri Lanka, and Bangladesh jointly hosted (*"Stumpy"* the elephant was its official mascot).
- ***2023:*** India.
- ***2032:*** India (upcoming).

> ***2027 World Cup: Will be hosted by South Africa, Zimbabwe, Namibia.***

T20 Cricket World Cup

- ***First Edition:*** *2007* (held in South Africa and won by India).
- ***Most titles:*** *England, West Indies and India (2 each).*
- ***2022:*** Held in Australia and won by England
- ***India has won two times:*** In *2007* and *2024*.
- ***2024 hosts:*** *USA* and *West Indies* (*India won* by defeating *South Africa*).
- ***Upcoming:*** *2026* (will be hosted by *India* and *Sri Lanka*) and *2028* (will be hosted by *Australia* and *New Zealand*).

Champions Trophy)

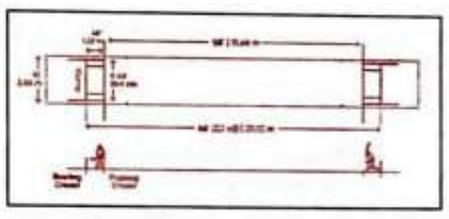
- ***Inaugurated in:*** *1998 (Winner: Bangladesh).*
- ***Current Champion:*** *India (2025).*
- ***Most successful teams:*** *India* (3rd title) and *Australia* (2nd title).

Asia Cup

- ***1st held in:*** *1984 (Sharjah, UAE).*
- ***Most won by:*** *India* (8 times).
- ***Current Champion:*** *India.*

Dimensions

- Cricket field shape: It is generally *oval* or *circular*.
- Weight of cricket ball: *156-163 g*.
- Cricket pitch length: *22 yards*. The distance between the stumps and the popping crease at the same end of a cricket pitch is *1.22 m*.
- Wicket (Stump) height: *28 inches.*
- In One Day Internationals (ODIs), a bowler can bowl a maximum of *10 overs*, while in T20 matches, the maximum is *4 overs*.



- Ball change is allowed to only after *80 overs*.
- Strike rate calculation: $\frac{\textit{Total runs scored}}{\textit{Total balls faced}} \times 100$
- In a test match cricket, a team can play a minimum of *90 overs* in a day.
- Test match per hour is of *15 overs* and ODI match is of *50 overs* and *3.5 hrs*.

Terms Associated

- *"Strike rate"* best describes the average number of runs a batter makes per *100 deliveries* in cricket.
- In cricket, if the umpire raises an index finger above the head it means: *Batsman is out*.
- In Cricket, if the umpire extends both hands horizontally it means: *Wide ball*.
- The first slip fielding position is behind the batsman.
- The term *"Chinaman"* in cricket refers to leg-spin delivery by a left-arm bowler.

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Associated Trophies

• *Duleep Trophy; Ranji Trophy; ICC World Cups; ICC Champions Trophy; Asia Cup.*

Facts Associated with Cricket

• India ODI debut was in *1971* against *England.*

• The *Maharaja of Vizianagaram* was the first Indian cricketer to serve as President of the Board of Control for Cricket in India (BCCI).

• The average circumference of the standard cricket ball in international cricket is: *8.81 inches-9 inches.*

• *Sachin Tendulkar* scored his first ODI century in his *79th* match. He has also featured in most no. of international cricket matches.

• *Lala Amarnath* was the first Test cricket captain of an independent Indian team.

• *Narendra Modi Cricket Stadium* is the largest cricket stadium in the world located at *Ahmedabad (India).*

FOOTBALL *(also known as SOCCER)*

• *Governing Body: Fédération Internationale de Football Association (FIFA).*

• *Headquarters: Zurich, Switzerland.*

• *First FIFA Match: 1872* (England vs Scotland).

• *First FIFA World Cup: 1930* held at *Uruguay* (winner: Uruguay).

• *Most Wins: Brazil (5 times).*

• *2022 Winner: Argentina* (held at *Qatar*).

> ***Football World Cup started in 1930.***

> ***• Indian Football Association was established in 1893.***
>
> ***• Football leagues in India: Indian Super League (ISL) and 1st Edition was won by Atletico de Kolkata***

Upcoming FIFA World Cups

• *2026 Hosts:* Canada, Mexico and USA.

• *2030 Hosts:* Morocco, Portugal, and Spain.

Ball

• Circumference of the ball: 68-70 cm.

• Weight of the ball: 410-460 gm.

About the Game

• *Minimum players to start a game: 7.*

• *Total no. of players in each team: 11.*

• *Game Duration: 90 minutes* (divided into two 45 mins halves).

• *Tie Breaker: 30 minutes* (penalty shootout if needed).

• *Substitutes allowed: 3.*

Famous Football Players

• India: Sunil Chhetri, Bhaichung Bhutia, P.K. Banerjee.

• World: Cristiano Ronaldo (Portuguese footballer); Lionel Messi (Argentine footballer); Neymar Jr (Brazilian footballer); Aitana Bonmati (Spain footballer).

Field Dimensions

• Length: 91-120 m (Standard: 105 m).

• Width: 45-91 m (Standard: 68 m).

• Goal post: Width: 24 ft (7.32 m) and Height: 8 ft (2.44 m).

• Distance between goal posts: 7.32 m (24 ft).

• Distance between penalty mark from midpoint of the goal post is: 11 m.

Cards in Football

• *Yellow card:* Foul and misconduct (caution to the player).

• *Red card:* Serious misconduct (player's dismissal from field).

Terms Associated: Dribble (it is also used in hockey and basketball); Banana Kick, Bicycle Kick.

Trophies Associated

• *India: Durand Cup* (founded in *1888* in *Shimla* and is the oldest football tournament in India), *Santosh Trophy, Rovers Cup* (started in 1891).

• *World: Merdeka Cup, Scissors Cup, La Liga.*

• In football, when the ball strikes the frame of the goal or the referee and remains within the goal and touch lines, it is still in play.

Facts Associated with Football

• *Sunil Chhetri* is the second Indian footballer to play 100 international games after *Bhaichung Bhutia.*

• *Mohammed Salim* was the first player from the Indian subcontinent to play for a *European Football club* (Celtic FC).

• *Manisha Kalyan* is the first Indian female football player to play in *Union of European Football Association* (UEFA)'s women's champions league.

• The *Super Bowl,* an annual championship game of Football, is held in *USA.*

HOCKEY

Field Dimensions

• Length: 91.44 m

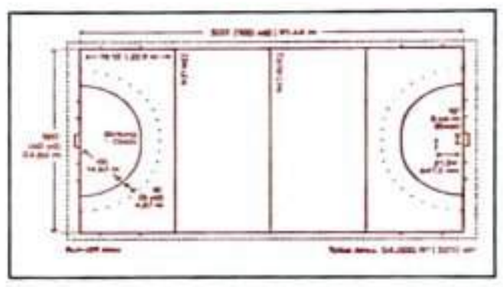
• Width: 55 m

• Astroturf is a synthetic surface, where Hockey is played.

Goalpost Size

• Height: 2.14 m

• Width: 3.66 m



About the Game

• Ball Weight: 156-163 gm

• *Number of Players: 11.*

• *Substitutes allowed: No limit.*

• Game Duration: 60 minutes (divided into 15 mins quarter). Earlier, the game was of 70 mins format with two 30 mins halves.

Cards in Hockey

• *Green Card:* Time penalty of 5 minutes.

• *Yellow Card:* Time penalty of 10 minutes.

• *Red Card:* Permanent expulsion from the game.

Hockey World Cup

• *First World Cup: 1971* (Winner: Pakistan).

• *Most titles won by: Pakistan* (4 times).

• India won it once *(1975)* → hosted hockey *4 times* (most no. of times)].

Refree's signals

FIH Hockey5s World Cup

• *First Edition held at: 2024, Muscat, Oman.*

• *Winners: Netherlands* (Men & Women).

Terms Associated: Dribble; Scoop; Backstick; 16-yard hit.

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Associated Trophies

- *Nehru Trophy; Wellington Trophy; Aga Khan Cup; Maharaja Ranjit Singh Cup; Rangaswamy Cup; Sultan Azlan Shah Cup* (hosted in Malaysia); *Sultan of Johor Cup* (hosted in Malaysia); *Begum Rasul Trophy; Murugappa Gold Cup; Beighton Cup* (oldest Hockey tournament in India established in *1895*).

Facts Associated with Hockey

- In the game of *ice hockey*, during normal play *6 players* are there in each team on the ice at any one time to compete.
- In hockey, long corner is awarded if the ball goes over the back line after last being touched by a defender.
- *Major Dhyan Chand* is known as *"Wizard of Hockey"*.
- *Rani Rampal* is the *first woman* Hockey player to receive the *Rajiv Gandhi Khel Ratna Award*.
- *P. R Sreejesh* was awarded *"Major Dyan Chand Khel Ratna Award"* in *2021*.
- The *Birsa Munda International Hockey Stadium*, the largest Hockey stadium in the country, is situated in *Rourkela, Odisha*.

TENNIS

Field Dimensions

- Length: 78 ft (23.77 m).
- Height: 27 feet (8.23 m) for singles and 36 feet (10.97 m) for doubles.
- Net height: 3 feet (0.914 m) in the center and 3 feet 6 inches (1.07 m) at the posts.

Tennis Grand Slam Tournaments

Tournament	*Played In*	*First Played On*	*Type of Court*
Wimbledon	July	1877	Grass
US Open	Aug-Sep	1881	Hard court
French Open	May-June	1891	Clay court
Australian Open	January	1905	Hard court

Famous Players

- Roger Federer (lawn tennis): Switzerland
- Rafael Nadal: Spain
- Leander Paes, Sania Mirza, Mahesh Bhupathi, Rohan Bopanna, Vijay Amritraj, and Anand Amritraj.

The French Open also known as Roland-Garros.

- Tennis was first introduced in the Olympics in *1896*.

Terms Associated: Deuce (equality in points → 40-40); Advantage Out (score when the receiver wins the next point after deuce), Love (a score of zero).

Associated Trophies: Davis Cup.

In Tennis, 6-4 score is a complete set.

Facts Associated with Tennis

- *Leander Paes* and *Mahesh Bhupathi* became the first two Indians as a pair to reach the finals of all Grand Slams in a year in the Open era, winning the French Open and Wimbledon as top seeds.

Leander Paes is the first Indian and Asian tennis player to win an Olympic medal.

Tennis Court Dimensions

TABLE TENNIS

- Table Tennis is also known as *"Ping Pong"*.

Dimensions

- Table: 9 feet (2.74 m) long × 5 feet (1.525 m) wide and 2.5 feet (76 cm) high.
- Net height: 15.25 cm.

Ball Specifications

- Diameter: 40 mm.
- Weight: 2.7 g.
- Color: White or orange (with matte finish).

Tournaments

- *World Table Tennis Championships.*
- *ITTF World Cup.*
- *Olympic Games.*
- *Asian Games.*

Associated Trophies: Corbillon Cup

Famous Players

- Sharath Kamal Achanta (Veteran, Arjuna Awardee).
- Manika Batra (India's top-ranked female TT player). She also won bronze medal in the Asian Cup tournament.
- Sathiyan Gnanasekaran.
- Sreeja Akula.

Table Tennis Dimensions

Facts Associated with Table Tennis

- In table tennis, the period during which a ball is in play is called *Rally*.
- In Table Tennis, unlimited lets are allowed in a row on a serve.
- Shake hand grip is used in Table Tennis.
- The first edition of the *World Para Table Tennis Championships* held in *Assen, Netherlands* (1990).

BADMINTON

- ***Governed by:*** *Badminton World Federation (BWF)*.
- It was initially known as *"Poona"*.

Badminton was introduced in Olympics in 1992.

Court Dimensions

- Length: 44 ft (13.40 m)
- Width: 20 ft (6.10 m)
- Net height: 5 ft in middle and 5 ft 1 inch at the edges of the court.
- Shuttlecock weight: 4.74-5.50 g

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• *Game format:* Matches are played in the best of 3 games, with each game going up to 21 points. In case of deuce, a player must win by at least 2 points, unless the score reaches 29-29, in which case the next point decides the winner.

Cards in Badminton

• *Yellow Card:* Official warning.
• *Red Card:* Fault (opponent is awarded a point).
• *Black Card:* Disqualification (for severe misconduct).

Associated Tournaments

• *Thomas Cup (China):* Men's international team championship (1st Edition: 1949), *Uber Cup (China):* Women's international team championship.
• *Syed Modi International Badminton Championships (India), Narang Cup, Maharaja Ranjit Singh Gold Cup, Lady Ratan Tata Trophy, Yonex Cup*
• India has won Thomas Cup only once *(2022)*.

Facts Associated with Badminton

• *Saina Nehwal* won the *first badminton medal* in the Olympics games from India in *2012 London Olympics*.
• India will organise the *World Badminton Championship* event *2026*.
• The *Pullela Gopichand Badminton Academy* founded in *Hyderabad* (2008).
• *K. Srikanth* is associated with Badminton.

BALL BADMINTON

• Ball Badminton is a racket sport played with a *yellow ball*.
• Origin: Tamil Nadu, India.

BASKETBALL

• ***Basketball (India) governed by:*** *Basketball Federation of India (BFI)*.

Court Dimensions

• Shape: Rectangle
• Length: 94 feet long (28.65 m).
• Height: 50 ft wide (15.24 m).
• Weight of the ball: Between 20 and 22 ounces (567 and 624 g).
• *Total players:* Each team has *5 players* (a total of 10 players on the court).

Terms Associated: Dribble; Pivot; Double dribble.

Facts Associated with Basketball

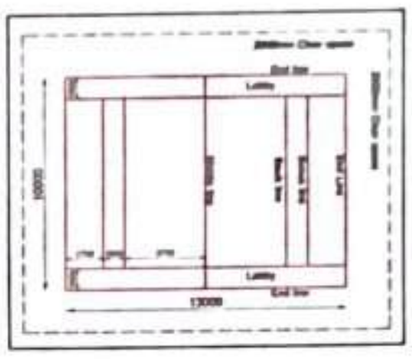
• In Basketball, the maximum number of points that can be scored in a shot is: *4*.
• A free throw in the games is worth 1 point.
• The Basketball centre line is part of the Back court.
• A *FIBA* sanctioned game of basketball typically consists of 4 quarters of 10 minutes each.

KABADDI

• *Team size: 7 players* on court (up to 5 substitutes)

Match Duration

• Men: 2 halves × 20 minutes (with 5-minute break)
• Women & Juniors: Same duration



Court Dimensions (Standard Kabaddi)

• Men's Court: 13 m × 10 m
• Women's Court: 12 m × 8 m

Cards in Kabaddi

• *Green Card:* Warning.
• *Yellow Card:* 2-minute suspension.
• *Red Card:* Player is out of the match.

Terms Associated

• Raider; defender; raid; tackle; all-out; bonus; attack line, lona, bauk line.

Associated Tournaments

• *Pro Kabaddi League (PKL):* Franchise-based Indian league.
• *Kabaddi World Cup:* Organized by International Kabaddi Federation (IKF).
• *Asian Games Kabaddi:* Introduced in 1990.
• *South Asian Games.*
• *Senior National Kabaddi Championship:* Held annually in India.

Facts Associated with Kabaddi

• The first winner of the *Arjuna Award* in Kabaddi is *Sahanand Mahadev Shetty*.
• The *Pro Kabaddi League* founded in *India* in the year *2014* (*Jaipur Pink Panthers* won the first season).

KHO KHO

• Origin: India.
• ***Governing Body (India):*** *Kho Kho Federation of India (KKFI)*.
• ***Recognized by:*** *Sports Authority of India & School Games Federation.*
• Played between two teams of *12 players* (9 take the field at a time).

Kho Kho Worldcup 2025

• Theme: Speed, Agility, and Teamwork
• Mascot: Tejas and Tara

Terms Associated: Inning.

BILLIARDS

• Ball weight: 160-170 g.
• ***Famous players:*** *Pankaj Advani, Sourav Kothari.*

CHESS

• ***Governing body:*** *FIDE – Fédération Internationale des Échecs (World Chess Federation)*
• ***Established in:*** *1924.*
• ***Headquarters:*** *Lausanne, Switzerland.*

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- ***Governing body (India):*** *All India Chess Federation (AICF).*
- ***Headquarters:*** *New Delhi.*

Basic Setup

- Board Size: 8 × 8 grid = *64 squares* (alternating black and white)
- Each player starts with 16 pieces:
- ***1 King:*** Moves one square in any direction.
- ***1 Queen:*** Moves diagonally, horizontally, or vertically.
- ***2 Rook:*** Moves horizontally or vertically.
- ***2 Bishop:*** Moves diagonally.
- ***2 Knight:*** Moves in an 'L-shape'.
- ***8 Pawn:*** Moves one square forward, but on its first move, it can move two squares forward.

Terms Associated: Stalemate; Checkmate; Gambit, Grandmaster (GM), Castling.

Associated Tournament: *FTX Crypto Cup.*

First woman GM:
S. Vikayalakshmi.

Famous Players

- ***Viswanathan Anand:*** 5-time World Champion, *India's first GM (1988).* He is also the *1st recipient* of *Rajiv Gandhi Khel Ratna Award.*
- ***Dibyendu Barua:*** India's 2nd Grandmaster after Viswanathan Anand.
- ***R Praggnanandhaa:*** Young prodigy, reached 2023 FIDE World Cup final.
- ***Gukesh D:*** Among youngest Super Grandmasters, broke into world top 10.
- Top women players: ***Koneru Humpy*** (*1st* Indian Grandmaster in *Women's Chess* to become *World Rapid Champion*); ***Tania Sachdev; Bhakti Kulkarni; R Vaishali.***
- ***Magnus Carlsen:*** Norwegian Chess Grandmaster.

The current World Chess Champion is Gukesh Dommaraju. He won the title by defeating Ding Liren in the 2024 World Chess Championship in Singapore. Gukesh became the youngest World Chess Champion ever at 18 years old.

Facts Associated with Chess

- ***P. Harikrishna*** was the first Indian to win the *Under-10 World Chess Championship* in *Menorca, Spain* in the year *1996.*

Sports	*No. of Players*
Basketball	5
Volleyball	6
Netball/Handball/ Water Polo/Kabaddi	7
Korfball (male + female)	8
Baseball/Kho Kho	9
Football/Cricket/Hockey	11
Polo	4
Futsal	5
Ice Hockey	6

MISCELLANEOUS *(One Liners)*

- Archery has a target of 10 circles.
- Terms associated with Squash game (a racket sport): Let Ball; Stroke Ball; and No Let.
- Famous players (Squash): Deepika Pallikal; Anahat Singh; Jahangir Khan (Pakistan).
- The most often described as gymnastics and dance on horseback is described as Equestrian vaulting. The term "dressage" is associated with this sport. Famous player: Divyakriti Singh.
- The first South Asian Federation Games was held in Kathmandu (1984).
- The Athletics Federation of India was formed in 1946.
- Netaji Subhas National Institute of Sports is situated in Patiala.
- Linthoi Chanambam is associated with Judo.
- The first Indian who won a bronze medal in World Athletics Championship is Anju Bobby George.
- The first Janjatiya Khel Mahotsav held in Odisha.
- The weight of the ball in handball for men is 425-475 gm.
- The US came out with the first 'official' compilation of volleyball rules and it was published by the YMCA.
- The equipment called antenna (colour: Red and White) used in Volleyball.
- The distance between the hurdles in 100 m women's hurdles in metres is 8.50 m.
- Dr Ajmer Singh (Arjuna Awardee) is associated with Athletics.
- Bhimrao Ambedkar Multipurpose Stadium situated in: Faizabad.
- The first 4 sets in Volleyball are played to 25 points.
- Maharashtra has recognised Dahi Handi as a sports event.
- The National Sports University located in Manipur.
- Khelo India Winter Games started in 2020.
- The Nehru trophy boat race was organized by Kerala.
- The number of flights in a 110 m hurdle race is 10.
- Terms associated with Gymnastics: Pommel Horse, Roman Rings, Vaulting Table.
- Simone Biles; Dipa Karmakar (Tripura, India); Produnova are associated with Gymnastics.
- The First Field Handball World Championships were played in Germany (1938).
- Milkha Singh (Flying Sikh) is a famous track and field sprinter of India.
- The National Anti-Doping Bill, 2021 targets sports sector of India.
- The thickness of a wrestling mat should be between 5 and 7 cm.
- Formula 1 is an international level professional auto racing sport.
- Judo has its origin in the ancient Japanese art of Ju-jitsu.
- Lovely Choubey is a famous Indian sportswoman associated with Lawn Bowls sport.
- The age range for the Youth Boxer category is 17-18 years.
- The area of bout called a ring: Boxing.
- In AIBA Boxing Junior Boys and Girls Competitions, the bouts must consist of each round of 2 mins.
- In all AIBA Boxing competitions, the rest time between each round is 1 min.
- The length of a Beach Volleyball court is: 16 m long and 8 m wide.

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- In Triple Jump, white flag indicates trail is valid.
- In case of first false start in a running event, the athlete(s) shall be warned.
- The 1979 Asian Wrestling Championships organised by the Asian Associated Wrestling Committee (AAWC) for the first time held Jalandhar, India.
- "Trump" is a sports term used in card game Bridge.
- Ruia Gold Cup is associated with Bridge.
- Hima Das, nicknamed "Dhing Express" is an Indian sprinter from the state of Assam.
- Mallakhamb is traditional Indian sports game from the state of Madhya Pradesh.
- Baton is used in Relay Race, a Track and field event.
- In running events laps are counted by a lap scorer.
- The JRD Tata Sports Complex located in Jamshedpur, Jharkhand.
- Shot is the name of heavy spherical metal used in shot put Shot put ball weighs 7.26 Kg in men's competition and 4 Kg in women's competition.
- The European Champions Cup or Heineken Cup is associated with Rugby.
- Wilson Jones was India's first world champion in any sport after independence.

Mallakhamb

- The National Institute of Water Sports is in Goa.
- Pele, a soccer player holds the distinction (by any player) of having the most wins of the FIFA World Cup.
- The first Indian swimmer to swim across the English Channel (in 1958) was Mihir Sen.
- Terms associated with Golf: Birdie, eagle and albatross.
- Kambala is an annual buffalo race held in the state of Karnataka.
- The first para-athlete to receive the Rajiv Gandhi Khel Ratna was Devendra Jhajharia (Javelin thrower).
- Bhavani Devi is Indian sportsperson is associated with Fencing.
- Assam Riffles Public School in Shillong is the first Khelo India Sports school in North East India.
- Annu Rani is the first Indian woman to cross a distance of 60 m in Javelin throw.
- Sagol kangjei, an indigenous game of manipur is similar to the modern day sports of Polo.
- 'Tenpins' refers to the game of bowling.
- Mardani Khel, one of the famous martial art forms in India belongs to the state of Maharashtra.

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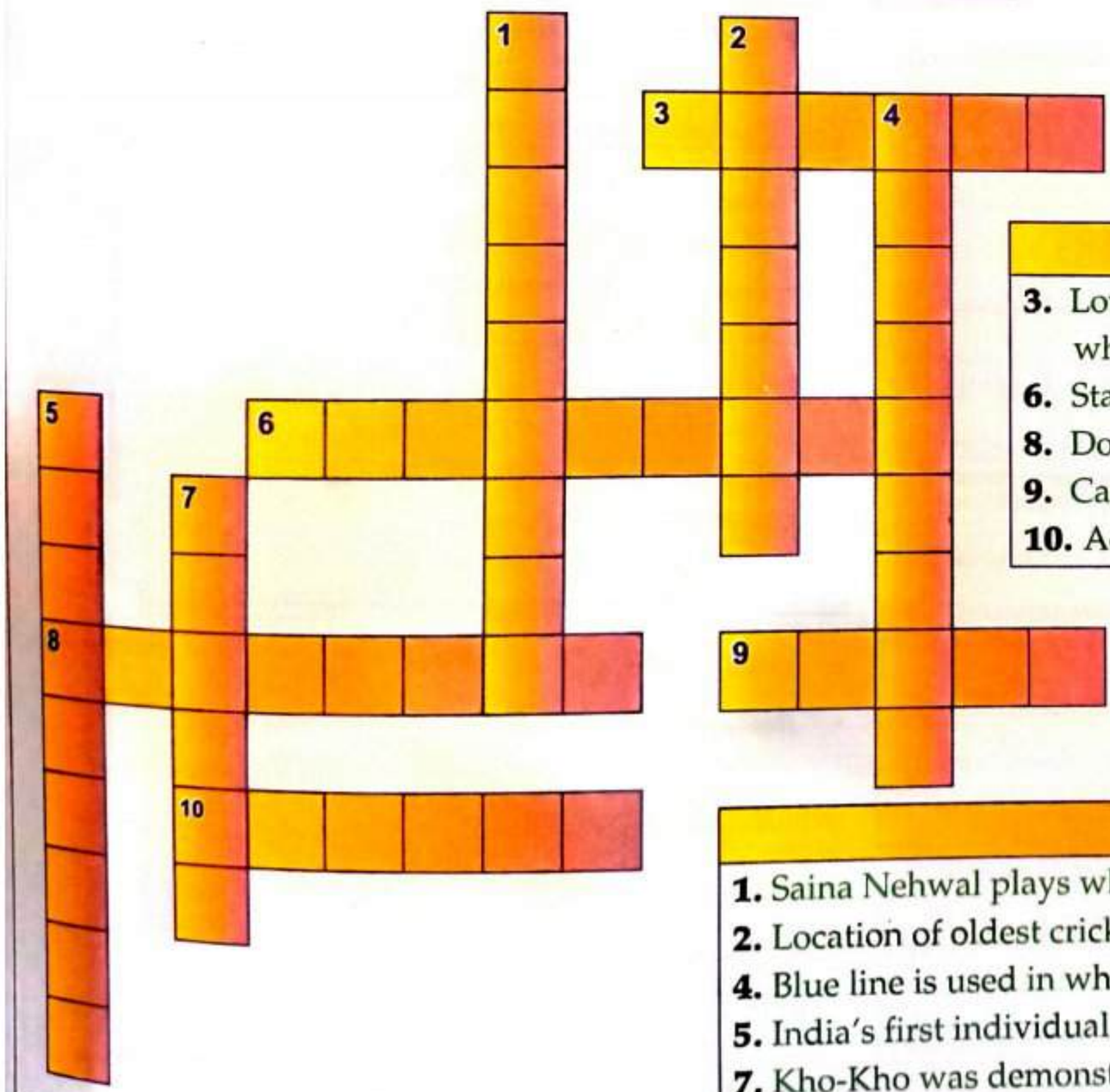
SPORTS



Across

3. Lovlina Borgohain is associated with which sport.
6. Standard length of a cricket pitch in yards.
8. Dolphin kick is used in which sport.
9. Castling is a move in which game.
10. Ace is a term used in which sport.

Down

1. Saina Nehwal plays which sport.
2. Location of oldest cricket club in India.
4. Blue line is used in which sport.
5. India's first individual Olympic medal was in which sport.
7. Kho-Kho was demonstrated in which Olympic year.

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UNITED NATIONS (UN)

- ***Established***: *24 October 1945*
- ***Headquarters***: *New York, USA*
- ***Forrunner organisation*** : *League of Nations* formed by *Treaty of Versailles, 1919*
- Formed at *UN Conference on International Organization, 1945*
- ***Original Signatories***: *50 countries + 1(Poland signed later)*
- ***Logo***: Globe, olive branches
- Term coined by *Franklin Roosevelt*
- ***Secretary-General***: *António Guterres (Portugal)*
- ***Total Countries***: *193*
- ***Objective***: Maintain international peace and security, develop friendly relations among nations, and achieve international cooperation.
- ***Official languages:*** *Arabic, Chinese, English, French, Russian, Spanish*

UNITED NATIONS

Principal Organs Of The United Nations

1. UN GENERAL ASSEMBLY

- *Includes all UN Members*
- *Two-thirds majority* needed for major decisions, otherwise *a simple majority*
- Decisions *not binding* on UN members
- ***Key functions***: Approves the UN budget, appoints the Secretary-General, makes recommendations through resolutions.

2. UN SECURITY COUNCIL

- ***Total*** *15 members*
- 5 Permanent Members (with veto power) are: *Britain, France, China, USA, Russia*
- *10* Non- Permanent Members elected for a *two-year term.* (Originally 6) *India has been a member 8 times*
- *Japan* : elected as a non permanent member most number of times.

3. UN ECONOMIC and SOCIAL COUNCIL

- Promotes international economic and social cooperation
- *54 members elected for three-year terms*

4. UN INTERNATIONAL COURT OF JUSTICE

- Judicial organ of the UN.
- Located in *The Hague, Netherlands*
- *15 Judges* elected for *9-year terms*
- successor of *Permanent Court of International Justice (estd: 1920) under League of Nations*

5. UN TRUSTEESHIP COUNCIL

- suspended on *1 Nov, 1994* with independence of *Palau*

6. UN SECRETARIAT

- Headed by the *Secretary-General* appointed for *5 year term.*
- Implements UN policies, administers peacekeeping operations, and prepares reports.

UN FUNDS AND PROGRAMMES

United Nations International Children's Fund (UNICEF)

- ***Established***: *11 December 1946*
- ***Headquarters***: *New York, USA*
- ***Objective***: Provide humanitarian aid to children worldwide.
- ***Key Focus:*** Child nutrition, education, immunization.

United Nations Environment Programme (UNEP)

- ***Established***: *5 June 1972*
- ***Headquarters***: *Nairobi, Kenya*
- ***Founded by***: UN General Assembly *(at Stockholm Conference)*
- **UNEP + World Meteorological Organization = *IPCC*** *in 1988*

  [IPCC- Inter Governmental Panel on Climate Change]

United Nations Development Programme (UNDP)

- ***Established***: *1965*
- ***Headquarters***: *New York*
- Important reports by UNDP are:

→ *Human Development Report*

→ *Gender Inequality Index*

→ *Global Multidimensional Poverty Index*

- ***Key Focus*** : poverty eradication, inclusive growth, reduce inequalities , achieve SDGs

United Nations Human Settlements Programme (UN- Habitat)

- ***Established*** : *1977*
- ***Headquarters*** : *Nairobi, Kenya*

World Food Programme (WFP)

- ***Established*** : *1961*
- ***Headquarters*** : *Rome, Italy*
- ***WFP*** *won* the *Nobel Peace Prize in 2020.*

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Food and Agriculture Organisation (FAO)

- *Established : 1945*
- *Headquarters: Rome, Italy*

United Nations Population Fund (UNFPA)

- *Established : 1969*
- *Headquarters: New York*

United Nations High Commissioner For Refugees (UNHCR)

- *Established : 1950*
- *Headquarters: Geneva, Switzerland*
- Provides support and protection to refugees worldwide.
- *Won the Nobel Peace Prize in 1954 and 1981*

International Civil Aviation Organization (ICAO)

- *Established : 1947, Chicago Convention*
- *Headquarters : Montreal, Canada*

International Fund for Agricultural Development (IFAD)

- *Established : 1977*
- *Headquarters: Rome, Italy*

OTHER SPECIALISED AGENCIES OF THE UN

International Labour Organization (ILO)

- *Established: 1919 (through the Treaty of Versailles)*
- *Headquarters: Geneva, Switzerland*
- *Received Nobel Peace Prize in 1969.*

International Maritime Organization (IMO)

- *Established: 1948*
- *Headquarters: London, UK*
- Focuses on maritime safety and environmental protection.

Established as Inter-Governmental Maritime Consultative Organization (IMCO) in 1948; became a specialized agency of the United Nations in 1959; renamed as International Maritime Organization in 1982.

International Monetary Fund (IMF)

- *Established: 1944 (Bretton Woods Conference)*
- *Headquarters: Washington, D.C., USA*
- Works to ensure global monetary cooperation and financial stability.
- Uses *SDR (Special Drawing Rights)* as its reserve asset/currency
- SDR- Basket of 5 currencies : US Dollar, Yen, Euro, Pound and Renmibi.

World Bank

- *Established: 1944 (Bretton Woods Conference)*
- *Headquarters: Washington, D.C., USA*
- The World Bank is a group of following 5 institutions:

IMF & World Bank are known as Twin Organisations.

→ *IBRD (International Bank for Reconstruction and Development)*

→ *IDA (International Development Association)*

→ *IFC (International Finance Corporation)*

→ *MIGA (Multilateral Investment Guarantee Agency)*

→ *ICSID (International Centre of Settlement of Investment Disputes*

International Telecommunication Union (ITU).

- *Established: 1865*
- *Headquarters: Geneva, Switzerland*
- Regulates international communication and radio frequencies.

United Nations Educational, Scientific and Cultural Organization (UNESCO)

- *Established: 1945*
- *Headquarters: Paris, France*
- Promotes education, science, and cultural heritage protection.
-

United Nations Industrial Development Organization (UNIDO)

- *Established: 1966*
- *Headquarters: Vienna, Austria*
- Supports industrial growth in developing nations.

World Health Organization (WHO)

- *Established: 7 April 1948 (celebrated as World Health Day)*
- *Headquarters: Geneva, Switzerland*
- Works on global health initiatives, disease prevention, and medical research.

United Nations Conference on Trade and Development (UNCTAD)

- *Established: 1964*
- *Headquarters: Geneva, Switzerland*
- Focuses on trade, investment, and development issues.

United Nations Office on Drugs and Crime (UNODC)

- *Established: 1997*
- *Headquarters: Vienna, Austria*
- Works against drug trafficking, corruption, and international crime.

World Intellectual Property Organization (WIPO)

- *Established: 1967*
- *Headquarters: Geneva, Switzerland*
- Releases Global Innovation Index alongwith INSEAD, Cornell University.

International Atomic Energy Agency (IAEA)

- *Established: 1957*
- *Headquarters: Vienna, Austria*
- Promotes the peaceful use of nuclear energy and ensures nuclear safety.

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United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP)

- ***Established***: *1947*
- ***Headquarters***: *Bangkok, Thailand*
- Works on regional development, economic growth, and social issues in Asia-Pacific.

World Trade Organization (WTO)

- ***Established***: *1995* (through the Marrakesh Agreement, 1994)
- ***Headquarters***: *Geneva, Switzerland*
- Regulates international trade between nations
- ***Replaced*** *GATT (General Agreement on Tariffs and Trade)*, established in *1948*.
- ***GATT had*** *23 member countries*, ***WTO has*** *166 member countries, currently.*
- ***Current Director-General***: *Ngozi Okonjo-Iweala (Nigeria)*

REGIONAL ORGANISATIONS

South Asian Association for Regional Cooperation (SAARC)

- ***Established***: *8 December 1985 (Dhaka, Bangladesh)*
- ***Headquarters***: *Kathmandu, Nepal*
- Aims to promote economic and regional integration in South Asia.
- ***Total Members***: *8 (Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka, Maldives).*
- ***Observers***: *9 countries*

Association of Southeast Asian Nations (ASEAN)

- ***Established***: *8 August 1967 (Bangkok, Thailand)*
- ***Headquarters***: *Jakarta, Indonesia*
- Focuses on political, economic, and security cooperation in Southeast Asia.
- ***Members***: *10 (Malaysia, Brunei, Myanmar, Singapore, Thailand, Vietnam, Indonesia, Philippines, Laos, Cambodia)*

Bay of Bengal Initiative for Multi-Sectoral Technical & Economic Cooperation (BIMSTEC)

- ***Established***: *1997*
- ***Headquarters***: *Dhaka, Bangladesh*
- ***Member Countries***: *7 (Bangladesh, India, Myanmar, SriLanka, Thailand, Nepal, Bhutan)*
- ***1st BIMSTEC Youth Summit*** was held in *Gandhinagar, Gujarat in February' 2025*

BRICS

- ***Established***: *2009, Russia*
- ***Member Countries***: *10*
- ***Headquarters***: *Shanghai*
- ***BRICS is acronym where:*** **B**: *Brazil* **R**: *Russia* **I**: *India* **C**: *China* **S**: *South Africa(joined in 2010)*

> ***New Development Bank was established by BRICS countries in 2014, Headquarters: Shanghai China.***

- ***5 New Members Added in 2023-*** *Saudi Arabia, Egypt, United Arab Emirates (UAE), Ethiopia, Iran, making it BRICS+*
- While 6 countries were invited to join BRICS in 2023, only 5 joined, ***Argentina declined the invitation in December 2023*** after a change in government.
  So as of January 2024, BRICS has 10 members.

Shanghai Cooperation Organization (SCO)

- ***Established***: *2001 (by China & Russia)*
- ***Headquarters***: *Beijing, China*
- ***Member Countries***: *10 (China, Russia, India,Pakistan (Joined in 2017), Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, Iran, Belarus (joined in 2024)*

Regional Anti-Terrorist Structure (RATS)

- A Counter-Terrorism body under the ***Shanghai Cooperation Organization (SCO).***
- ***Established*** : *2002*
- ***Headquarters***: *Tashkent, Uzbekistan*
- ***Member Countries***: *9 (As part of SCO)*

Asian Development Bank (ADB)

- ***Established:*** *1966*
- ***Headquarters:*** *Manila, Philippines*
- ***Member Countries:*** *69 (India is a founding member of ADB)*

→ India started availing of ADB's assistance in 1986.

European Union (EU)

- ***Established:*** *November 1, 1993 in Maastricht, Netherlands*
- ***Headquarters:*** *Brussels, Belgium*
- ***Member Countries:*** *27* ***(After Brexit in 2020)***
- ***Awarded the Nobel Prize in*** *2012.*
- ***Has a Eurozone where countries adopt the*** *Euro as currency*
- ***Total Eurozone Countries: 20***
- ***Latest Member:*** *Croatia : Joined in 2023.*

> ***The European Economic Community (EEC), a precursor to the European Union was established in 1958 through the Treaty of Rome.***

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North Atlantic Treaty Organization (NATO)

- ***Established:*** *1949 (Through the North Atlantic Treaty)*
- ***Member Countries:*** 32
- ***Headquarters:*** *Brussels, Belgium,*
- ***Military Headquarters:*** *Mons, Belgium*
- ***Latest Member:*** *Sweden (joined in March, 2024)*

Collective Security Treaty Organization (CSTO)

- ***Established:*** *After the USSR Disintegration in 1991*
- ***Member Countries:*** *6 (Armenia, Belarus, Kazakhstan, Kyrgyzstan, Russia, Tajikistan)*

International Solar Alliance (ISA)

- ***Established:*** *30 November, 2015 (Paris, France)*
- ***Headquarters:*** *Gurugram, Haryana*
- ***Founding members:*** *India & France*
- ***Concept:*** Proposed by Indian Prime Minister Narendra Modi in *2015* at *Wembley Stadium, UK.*
  He referred to Sunshine Countries as *"Suryaputra"(Sons of the Sun).*
- ***Launch Event:*** *India Africa Summit*
- ***Opened for signature in*** *Marrakesh Morocco.*
- ***Number of Member Countries:*** *120+*
- ***Present Director General:*** *Ashish Khanna*

Group of Twenty (G20)

- ***Established:*** *1999*
- ***Member Countries:*** *21 (19 countries + European Union + African Union)*
- ***Latest Member Joined:*** *African Union, September 2023 (G20 India)*
- ***Current Presidency (2024-25):*** *Brazil*
- ***Next Presidency (2025-26):*** *South Africa*
- ***Major Annual Event: G20 Leaders' Summit***
- G20 countries account for *85% of the world GDP and more than 2/3rd of the total* world's population.

G20 in India: 2023

Theme: *"Vasudhaiva Kutumbakam" (One Earth, One Family, One Future)*

G20 Summit Venue: *New Delhi, Bharat Mandapam*

G20 Sherpa for India: *Amitabh Kant*

G20 Countries

G7 (Group of Seven).

G20 & G7 have no permanent secretariat/office.

- ***Established:*** *1975*
- ***Members:*** Canada, France, Germany, Italy, Japan, United Kingdom (Britain) United States, and the European Union. ***(TRICK : BF JUICE)***
- EU participates but does not hold presidency.

G8 (Group of Eight)

- ***Established:*** *1997 (when Russia joined G7)*
- ***Members:*** *G7 + Russia*
- Dissolution: ***Suspended in 2014*** after Russia's annexation of Crimea, reverting back to G7.

Financial Action Task Force (FATF)

Promotes effective implementation of legal measures to combat money laundering, terrorist financing etc.

- ***Established:*** *1989 (Initiative of G7 Countries)*
- ***Headquarters:*** *Paris, France*
- ***Blacklist Countries:*** North Korea, Iran, and Myanmar

International Criminal Police Organization (INTERPOL)

- ***Established :*** *1923*
- ***Headquarters:*** *Lyon, France*
- Provides a platform for law enforcement agencies to collaborate, even between countries without diplomatic relations.

INTERPOL NOTICES

Bharatpol

- Developed by the *Central Bureau of Investigation (CBI),* this portal allows both central and state agencies to connect with *INTERPOL* for real-time information sharing.
- Replaces the previous system where only the CBI had direct access to INTERPOL.

World Economic Forum (WEF)

- ***Established:*** *1971*
- ***Headquarters:*** *Cologny, Switzerland*

Important reports released by World Economic Forum—

1) Global Risks Report
2) Global Competitiveness Report
3) Global Gender Gap Report
4) Global Travel and Tourism Report
5) Energy Transition Index

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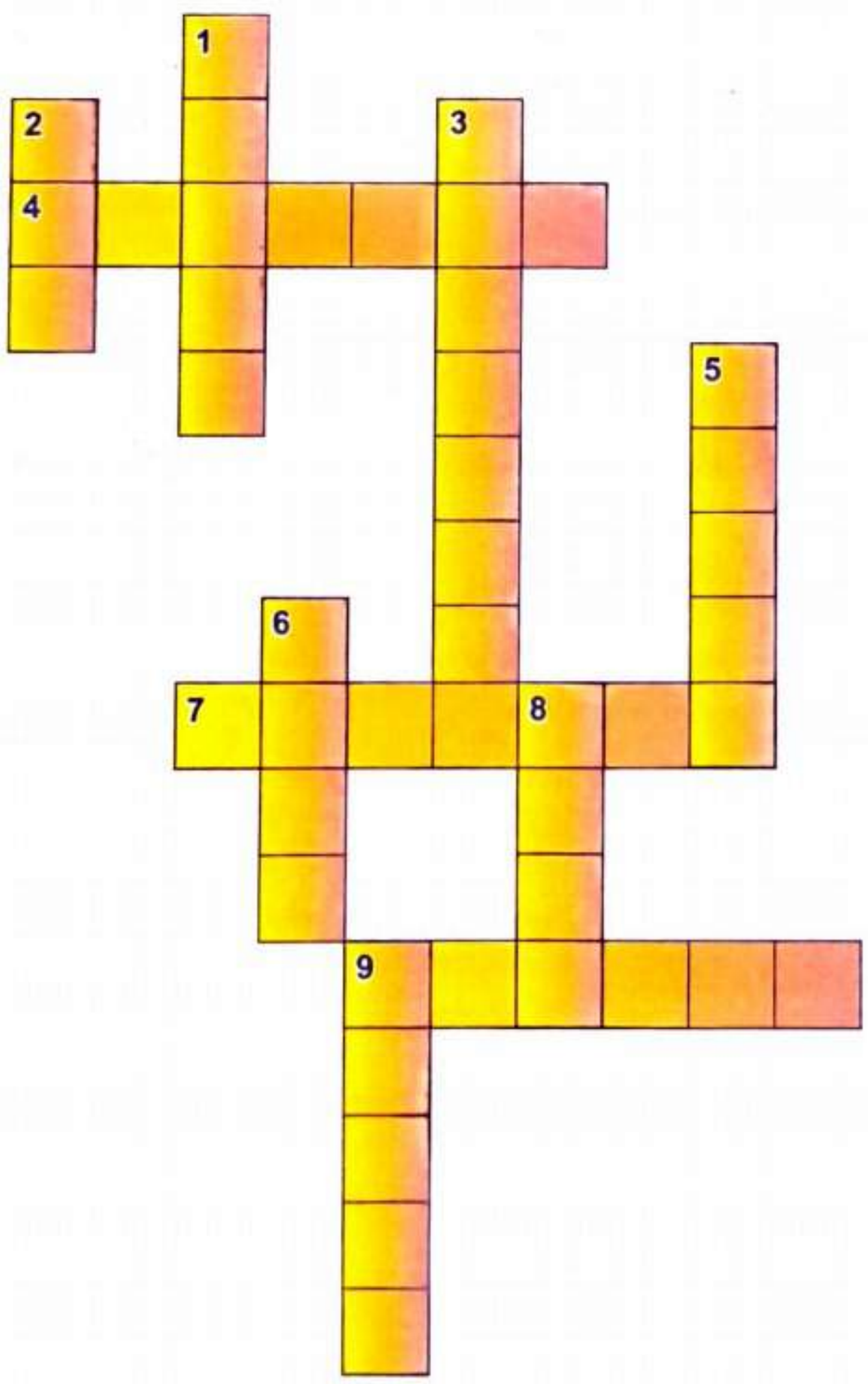
OTHER ORGANISATIONS AND THEIR HEADQUARTERS

Organisations	Headquarters
Organization of the Petroleum Exporting Countries (OPEC)	Vienna, Austria
World Anti-Doping Agency (WADA)	Montreal, Canada
International Bureau of Weights and Measures (BIPM)	Saint-Cloud, France
World Meteorological Organisation (1950)	Geneva, Switzerland
Amnesty International (focused on Human Rights)	London

17 Sustainable Development Goals

PARMAR'S CROSSWORD

INTERNATIONAL ORGANIZATIONS



Across

4. Not a member of SAARC.
7. Not a member of NATO.
9. UN body not awarded the Nobel Prize.

Down

1. Headquarters of BIMSTEC.
2. Provides help during balance of payment crisis.
3. Headquarters of ASEAN.
5. Convention India joined in 1976 for wildlife trade.
6. TIWB is a joint initiative of UNDP and which body.
8. Headquarters of World Food Programme.
9. UN body awarded Nobel Peace Prize twice.

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SCIENCE AND RESEARCH INSTITUTES		AGRICULTURE RELATED INSTITUTES	
Name	**Location**	**Name**	**Location**
Council of Scientific & Industrial Research (CSIR)	New Delhi	Indian Agricultural Research Institute	New Delhi
Indian Academy of Sciences	Bangalore, Karnataka	Central Sugarcane Research Institute (ICAR- Sugarcane Breeding Institute)	Coimbatore, Tamil Nadu
Indian National Science Academy	New Delhi	Indian Institute of Sugarcane Research	Lucknow, Uttar Pradesh
Raman Research Institute	Bangalore, Karnataka	National Institute for Research on Commercial Agriculture	Rajahmundry, Andhra Pradesh
National Metallurgical Laboratory	Jamshedpur, Jharkhand	National Sugar Institute	Kanpur, Uttar Pradesh
Central Mechanical Engineering Research Institute	Durgapur, West Bengal	National Dairy Research Institute	Karnal, Haryana
Central Salt & Marine Chemicals Research Institute	Bhavnagar, Gujarat	Central Leather Research Institute	Chennai, Tamil Nadu
Centre for Ecological Sciences	Bangalore, Karnataka	Indian Institute of Soil Sciences	Bhopal, Madhya Pradesh
National Dope Testing Laboratory	New Delhi	National Rice Research Institute	Cuttack, Odisha
Indian Institute of Astrophysics	Bangalore, Karnataka	Indian Institute of Horticulture Research	Bengaluru, Karnataka
Indian Statistical Institute	Kolkata, West Bengal	Indian Institute of Spices Research	Kozhikode (Calicut), Kerala
Tata Institute of Fundamental Research	Mumbai, Maharashtra	Indian Institute of Maize Research	Ludhiana, Punjab
National Institute of Ocean Technology	Chennai, Tamil Nadu	Indian Institute of Millets Research	Hyderabad, Telangana
National Environmental Engineering Research Institute	Nagpur, Maharashtra	Indian Institute of Oilseeds Research	Hyderabad, Telangana
Indian Institute of Tropical Meteorology	Pune, Maharashtra	Central Agroforestry Research Institute	Jhansi, Uttar Pradesh
National Physical Laboratory	New Delhi	Indian Veterinary Research Institute	Izatnagar, Bareilly, Uttar Pradesh
National Institute of Science Education and Research (NISER)	Bhubaneswar, Odisha	Indian Council of Agricultural Research (ICAR)	New Delhi
Indian Institute of Geomagnetism	Navi Mumbai, Maharashtra	Central Institute for Cotton Research	Nagpur, Maharashtra
Aryabhatta Research Institute of Observational Sciences (ARIES)	Nainital, Uttarakhand	Central Institute of Fisheries Education	Mumbai, Maharashtra
Bose Institute	Kolkata, West Bengal	Central Institute for Subtropical Horticulture	Lucknow, Uttar Pradesh
Institute of Genomics and Integrative Biology	New Delhi	Indian Institute of Pulses Research	Kanpur, Uttar Pradesh
National Brain Research Centre	Manesar, Haryana	Indian Institute of Agricultural Biotechnology	Ranchi, Jharkhand

TsuNamî

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Name	Location
Central Arid Zone Research Institute (CAZRI)	Jodhpur, Rajasthan
Indian Grassland and Fodder Research Institute (IGFRI)	Jhansi, Uttar Pradesh
National Bureau of Plant Genetic Resources (NBPGR)	New Delhi
Central Tuber Crops Research Institute (CTCRI)	Thiruvananthapuram, Kerala
National Institute of Animal Biotechnology (NIAB)	Hyderabad, Telangana
Directorate of Rapeseed-Mustard Research	Bharatpur, Rajasthan
National Research Centre for Banana	Tiruchirappalli, Tamil Nadu
Spices Board of India	Kochi, Kerala

DEFENCE AND DEVELOPMENT RELATED INSTITUTES

Name	Location
Defence Research and Development Organisation (DRDO)	New Delhi
Indian Space Research Organisation (ISRO)	Bengaluru, Karnataka
Border Roads Organisation (BRO)	New Delhi
Hindustan Aeronautics Limited (HAL)	Bengaluru, Karnataka
Bharat Electronics Limited (BEL)	Bangalore, Karnataka
Institute for Defence Studies and Analyses (IDSA)	New Delhi
Electronics Corporation of India Limited (ECIL)	Hyderabad, Telangana
National Highways Authority of India (NHAI)	New Delhi

MEDICAL AND HEALTH INSTITUTES

Name	Location
All India Institute of Medical Sciences (AIIMS)	New Delhi
Central Drug Research Institute	Lucknow, Uttar Pradesh
Food Corporation of India	New Delhi
National Institute of Virology	Pune, Maharashtra
National Institute of Nutrition	Hyderabad, Telangana
Indian Council of Medical Research (ICMR)	New Delhi
Post Graduate Institute of Medical Education and Research (PGIMER)	Chandigarh
National Institute of Mental Health and Neurosciences (NIMHANS)	Bengaluru, Karnataka
Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER)	Puducherry
Central Institute of Psychiatry	Ranchi, Jharkhand
National AIDS Research Institute	Pune, Maharashtra
Rajiv Gandhi Centre for Biotechnology	Thiruvananthapuram, Kerala
ICMR- National Institute of Virology	Pune, Mahrashtra
National Institute of Epidemiology	Chennai, Tamil Nadu
National Institute of Occupational Health	Ahmedabad, Gujarat
National Centre for Disease Control	New Delhi
National Institute of Immunology	New Delhi,
National Institute of Ayurveda	Jaipur, Rajasthan

TsuNamî

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OTHER IMPORTANT INSTITUTIONS

Name	Location
National Institute of Fashion Technology (NIFT)	New Delhi
Indian Institute of Foreign Trade (IIFT)	New Delhi
National Institute of Design (NID)	Ahmedabad, Gujarat
Bureau of Indian Standards (BIS)	New Delhi
Indian Patent Office	Kolkata, West Bengal
Lalit Kala Akademi	New Delhi
Sangeet Natak Akademi	New Delhi
Sahitya Akademi	New Delhi
Archaeological Survey of India (ASI)	New Delhi
Press Council of India	New Delhi
Indian Museum	Kolkata, West Bengal
Indira Gandhi National Centre for the Arts (IGNCA)	New Delhi
Centre for Development of Advanced Computing (C-DAC)	Pune, Maharashtra
Centre for Cellular and Molecular Biology (CCMB)	Hyderabad, Telangana
National Archives of India	New Delhi
National Gallery of Modern Art	New Delhi
Central Forest Research Institute	Dehradun, Uttarakhand
Tagore Centre for study of Culture and Civilisation	Shimla, Himachal Paradesh
National Sample Survey Organization	New Delhi
National Institute of Mountaineering and Adventure Sports(NIMAS)	Dirang, West Kameng, Arunachal Pradesh
Atal Bihari Vajpayee Institute of Mountaineering and Allied Sports	Manali, Himachal Pradesh
Nehru Institute of mountaineering	Uttarkashi, Uttarakhand
Indian Institute of Tourism and Travel Management	Gwalior, Madhya Pradesh
Federation of Indian Chambers of Commerce and Industry (FICCI)	New Delhi
Food, Safety and Standard Authority of India, (FSSAI)	New Delhi
Netaji Subhash national Institute of sports ("Mecca of Indian Sports")	Punjab
Sports Authority of India (SAI)	New Delhi
Lakshmibai National Institute of Physical Education	Gwalior, Madhya Pradesh
Lakshmibai National College of Physical Education	Thiruvananthapuram, Kerala

For an interactive recap of this topic, see the crossword on Page Number 393.

TsuNamî

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OTHER IMPORTANT INSTITUTIONS

Name	Location
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For an interactive recap of this topic, see the crossword on Page Number 393.

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ANDHRA PRADESH

- **Ugadi : Telugu New Year :** marks the beginning of a *new Hindu Lunisolar calendar.*
- **Tirupati Brahmotsavam:** Annual festival of *Lord Venkateswara at Tirumala,* celebrated for *9 days.*
- **Durgamma Festival:** celebrated in *Durga Pooja*
- **Visakha Utsav:** held in December
- **Yellama Jatara**
- **Sankranti (Pedda Panduga)**

Tirupati Brahmotsavam

ASSAM

TRICK TO REMEMBER: Assam ki *Bahu* ne *Bai ko Patak* patak ke mara kyunki usko *Ali* ke *Abbu* ke saath *Majuli* Festival dekhne jana tha.

Bahu → **Bihu,** celebrated *thrice a year*
- *Rongali/Bohag Bihu*: in April, marks beginning of *Assam's New Year*
- *Kati/Kongali Bihu*: in Oct-Nov
- *Bhogali /Magh Bihu*: in January.

Baiko → **Baikho :** celebrated by *Rabha Community, pre-harvest.*
Baishagu festival

Patak → **Dehing Patkai:** *a* 3-day annual festival held in January at *Lekhapani* in *Tinsukia district*

Ali → **Ali Ai Ligang :** Harvest festival of *Mishing Tribe*

Abbu → **Ambubachi :** held at *Kamakhya temple,*
-*Marks the Menstrual phase of Goddess Kamakhya,*
-Also known as *Ameti/ Tantric fertility Festival*

Majuli → **Majuli: a 3- day festival held in November**

Some Other Festivals :

Rongker Festival: celebrated by *Karbi Tribe*

Junbeel Mela : exchange of products through *Barter exchange*

Bihu

Ambubachi Mela

ARUNACHAL PRADESH

TRICK TO REMEMBER: *Arun* kya tere *Sang Solun* is *Tree* ke neeche *Chalo Sir Meri Pin* pakdo aur *Paas aao*

Arun → **Arunachal Pradesh**

Sang → **Sangken ;** a *3 day festival* celebrated in April

Solun → **Solung;** a *10 day harvest festival* celebrated by *'Adi Tribe'*

Tree → **Dree Festival;** celebrated by *Apatani tribe* in the month of July

Cha → **Chalo Loku :** celebrated by *Nocte tribe* in July/ August

Lo Sir → **Losar :** *New Year Festival* of Tibetan Buddhism, celebrated by *Monpa tribe,* marks the *1st day of Tibetan calendar.*

Meri Pin → **Mopin :** celebrated by *Galo tribe* in April

Paas aao → **Pangsau :** to honour the *war heroes* who died in WW2

Some Other Festivals :

Ziro Festival : founded in 2012

Boori-Boot : celebrated by *Nyishi Tribe*

Solung

BIHAR

TRICK TO REMEMBER: *Sonu Shaam* ko *Chhath* par *Bahu La*

Sonu → **Sonepur Cattle Fair :** one of Asia's largest Cattle Fair, held in November

Shaam → **Sama Chakeva :** originates from *Mithila region*

Chhath → **Chhath Pooja :** to honour the *Sun God* and *Chhathi Maiya,* in the month of Kartika

Bahu La → **Bihula:** celebrated in the month of August, devotees pray to the *Serpent Goddess Mansa.*

Rajgir Festival : *3 days festival , started in 1986*

Chhath Pooja

Sonepur Cattle Fair

TsuNamî

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CHHATTISGARH

TRICK TO REMEMBER: *36 Madai Soncha* aur *Bola Haveli* me *Basta* leke *Dussehra* Manaenge

36 → **Chhattisgarh**

Madai → **Madai:** celebrated by *Gond tribe*

Soncha → **Goncha :** The Chariot festival of tribes of *Bastar district* celebrated for *9 days*

Bola → **Pola :** a thanksgiving festival, to acknowledge the importance of *Bulls & Oxen*
- also celebrated in Maharashtra

Haveli → **Hareli :** *a Harvest festival of Shravan month (July/August)*

Basta Dussehra → **Bastar Dussehra :** to honour *Goddess Danteshwari*

Some Other Festivals :

- **Karam :** tribute to *Karam Tree*, a harvest festival
- **Champaran Mela :** an annual fair held in *Champaran region, Raipur*
- **Narayanpur Mela**

GOA

TRICK TO REMEMBER : 3 *Kings* went to Goa's *St. Francis Xavier* church took some *Grapes* lekin *Car Nahi* mili aur *Sunburn* ho Gaya

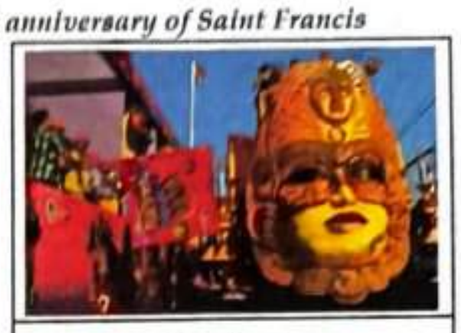
3 Kings → **3 Kings Festival :** also known as *Epiphany festival*

St. Francis Xavier → **Feast of Saint Francis Xavier :** celebrated on 3rd December - *Death anniversary of Saint Francis*

Grapes → **Grapes Escapade**

Car Nahi → **Carnival**

Sunburn → **Sunburn**



Carnival

Some Other Festivals :

- **Shigmo :** *Shigmotsav/ Shishirotsava* is a spring festival celebrated in Falgun month of the Hindu calendar.
- **Sao Jao**
- **Bonderam:** celebrated on *4th Saturday of every August* in the *Divar Island.*
- **Chikal Kalo :** a *mud festival* that celebrates Lord Krishna's childhood, in the *Devaki Krishna temple of Marcel, Goa*

GUJARAT

TRICK TO REMEMBER : *Sharma Ji Madhav* se *Karva Chauth* pe *Rann* kar rahe the.

SharmaJi → **Shamlaji Melo :** celebrated in November for *3 weeks,* dedicated to *Lord Vishnu*

Madhav → **Madhavpur mela :** celebrates *marriage of Lord Krishna and Rukmini,* in the *Porbandar* district of Gujarat

Modhera Dance Festival: celebrated at *Modhera Sun temple (Mehsana district)* for 3 days in the 3rd week of January

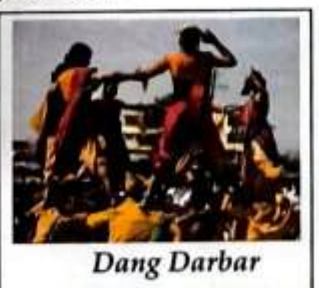
Chauth → **Vautha Mela :** *an Animal trading festival*

Rann → **Rann Utsav :** also known as *White dessert Festival,* continues for *3 months* in the *Great Rann of Kutch*

Some Other Festivals :

- **Dang Darbar :** a tribal festival celebrated *just before Holi.*
- **Chitra Vichitra Fair**
- **Bhavnath Fair**
- **Dhrang Fair**

Rann Utsav



Dang Darbar

HIMACHAL PRADESH

TRICK TO REMEMBER : *Him Pari* ko *Haldi* aur *Phul* se *Saza* do *Kalinjar* ke Raja aa rahe hain

Him → **Himachal Pradesh**

Pari → **Pori :** also known as *Horse Festival*

Haldi → **Halda :** celebrated in *Lahaul Spiti Valley*

Phul → **Phulaich :** also known as *Ukyam Festival* is a *festival of flowers.*

Saza → **Sazo :** celebrated in *Kinnaur Valley*
- **Sair festival**

Kalinjar → **Minjar Fair:** held in town of *Chamba* for *one week*

Phulaich

Pori

TsuNamî

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HARYANA

TRICK TO REMEMBER: *Suraj* ki *Pin Ganga* me *Gum* ho gayi.

Suraj	→	Surajkund festival : held in *Faridabad*
Pin	→	Pinjore
Ganga	→	Gugga Navami : dedicated to *Gugga Pir, worship of snakes*
Gum	→	Gangaur : dedicated to *Goddess Gauri or Parvati;* is also celebrated in Rajasthan & Madhya Pradesh.

JHARKHAND

TRICK TO REMEMBER: *Rohini* ka *Bhagta Sohar*, usko *Susu* lagi aur usne ye *Karam Sarhad* pe kar diya.

Rohini	→	Rohini : marks the beginning of sowing season
Bhagta	→	Bhagta Parab : to honour *Budha Baba* celebrated by indigenous tribes of *Jharkhand*
Sohar	→	Sohrai : a *harvest* festival, celebrated on the *new moon day of Kartik*
Susu	→	Tusu Parab : held on the last day of Hindu month Paush
Karam	→	Karam : to honour *Karam Devta*- God of Power and Youthfulness, for a good harvest.
Sarhad	→	Sarhul : marks the arrival of Spring

Jawa : a celebration of fertility, by unmarried tribal girls

KARNATAKA

TRICK TO REMEMBER : *Humara kaam wala Abhishek kal* apne *abba* ke sath *gaadi Karke* aya tha.

Humara	→	Hampi festival : also known as *'Vijay Utsav'*
Kaam wala	→	Kambala : *a buffalo race event*
Abhishek	→	Mahamatsya Abhishek : held every *12 years* Anointment of the *Bahubali Gommateshwara* statue located at *Shravanabelagola* in *Karnataka,*
Kal	→	Pattadakal Dance Festival Kailpodh festival: Worshipping of arms and Weapons, celebrated by *Kodava community* of *Kodagu* district.
Abba	→	Gombe Habba : *Festival of dolls,* 10 days celebration during Navratri. Gowri Habba.
Gaadi	→	Ugadi : *New Year Festival*
Karke	→	Karga: a festival dedicated to *Draupadi.*

KERALA

TRICK TO REMEMBER: *Pooram Vasu they are* at *Pain* because they lost *Boat Race on Makar Sankranti* .

Pooran	→	Thrissur Pooram :held at *Vadakkumnathan temple*
Vasu	→	Vishu : *New Year Festival*
They	→	Theyyam : celebrated mostly in *North Malabar*
Are	→	Arattu
At	→	Attukal Pongal
Pain	→	Painkuni : celebrated at *Padmanabha Swamy temple.*
Boat race	→	Vallam Kalli Boat Race
On	→	Onam : A harvest festival, welcomes the return of *Asura Mahabali*
Makar Sankranti	→	Makar Vilakku : held at *Sabarimala temple,* dedicated to *lord Ayyappa*

MADHYA PRADESH

TRICK TO REMEMBER : *Ghade* me *Rang* lagake *Khajur* ka *Ras* dalke *Nagmani* rakhke *Ganga* ke *Madhya Gira* do aur *Bhag* jao.

Ghade	→	Ghadlya : celebrated in the month of Aug-Sept.
Rang	→	Lokrang : commences on *Republic Day.*
Khajur	→	Khajuraho : held in *Chhatarpur district*
Ras	→	Ras Nawa : celebrated by *Baigas of Mandla district*
Nagmani	→	Panchmarhi Utsav : *a 6 day festival*
Ganga	→	Gangaur
Gira	→	Chethiyagiri Vihara : to worship the relics of *Sariputta and Mahamogallena, in Sanchi, MP*
Bhag	→	Bhagoria Haat : a *harvest* festival in spring season.

- Malwa Utsav is also celebrated in MP.

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MANIPUR

TRICK TO REMEMBER : *Mani* aate hi apne *Sang Doll* and *Cherry lai* fir *Hindon* me *Nhai.*

Mani	→	Manipur
Sang	→	Kang Jatra Kut
doll	→	Dol Jatra (Yaosang) : known as *'Holi' of Manipur*
Cherry	→	Cherry Blossom
Lai	→	Lai Haroba : by Meitei tribe to honour *Umang Lais, a sacred tree*
Hindon	→	Heirku Hidongba
Nhai	→	Lui Ngai Ni Gang Ngai

Lai Haroba

MEGHALAYA

- Shad Suk Mynsiem.
- Nongkrem Festival. : by *Khasi Tribe*
- Behdienkhlam Festival. : by *Jayantia Tribe*
- Shad Sukra
- Wangala Festival : by *Garo Tribe (aka Festival of Festivals)*
- Strawberry Festival.
- Cherry Blossom Festival

MIZORAM

- Chapchar Kut
- Mim Kut
- Phawang Kut

Chapchar kut

Mim kut

MAHARASHTRA

- Vithoba : dedicated to *'Vitthal'* form of Lord Vishnu.
- Gudi Padwa: symbolises the victory of *good over evil.*
- Kala Ghoda Mahotsav : *9 days long art festival*
- Narali Purnima
- Banganga
- Vat Purnima
- Kojagiri
- Ganesh Chaturthi
- Elephanta festival
- Pola festival
- Palkhi festival

Gudi Padwa

Ganesh Chaturthi

Palkhi festival

NAGALAND

TRICK TO REMEMBER : *Nag Bill* me *Aao, Muh* se *sakkar* khao

Nag	→	Nagaland
Bill	→	Hornbill : celebrated from *1-10 December.*
Aao	→	Aoleang : celebrated in the 1st week of April by the *Konyak Naga people.*
Muh	→	Moatsu : celebrated by *Ao Tribe*
Sakkar	→	Sekrenyi : annual festival of the *Angami Nagas*

ODISHA

TRICK TO REMEMBER : 6 Khai ya *Nau Khai,* ye *Kaun* batayega? *Kalinga* ke *Raja* Jo *Rath* pe baithe hain.

Nau Khai	→	Nua Khai
Kaun	→	Konark Festival : a *5 day Dance festival* held from (1- 5)Dec.
Kalinga	→	Kalinga Mahotsav: 2 day long event
Raja	→	Raja Prabha
Rath	→	Rath Yatra

Some Other Festivals :

- Chhau
- Bal Yatra

Rath Yatra

PUNJAB

- Hola Mohalla : celebrated a day after Holi
- Guru Purab : celebrates the birth of *Guru Nanak- 1st Sikh Guru*
- Lohri : a part of Makar Sankranti.
- Baisakhi : commemorates the formation of *Khalsa Panth*

RAJASTHAN

- Pushkar Fair : *A Camel fair in Ajmer*
- Gangaur : dedicated to *Goddess Gauri*
- Desert festival : celebrated in *Jaisalmer*
- Nagaur fair : *a cattle fair*
- Chandrabhaga fair : held in *Kartik month (Oct-Nov)*
- Bundi Utsav : held in *Kartik month (Oct- Nov)*
- Baneshwar : *Bhil tribe,* dedicated to Baneshwar Mahadev(lord Shiva)
- Kolayat fair : also known as *Kapil Muni fair,* held in Bikaner during Kartik Purnima.

Gangaur

TsuNamî

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SIKKIM

- **Losoong :** *Bhutia tribe*
- **Namsoong:** *Lepcha tribe*
- **Losar :** *New Year Festival*
- **Sakewa :** annual 9 day festival by *Kirat Khambu Rai Community.*
- **Pang Lhabsol :** *Chu Faat* a sacred folk dance is performed by the *Lepcha tribe* of Sikkim during the Pang Lhabsol festival. It signifies the worship of 5 *sacred peaks- Mt. Kanchenjunga, Mt. Kabru, Mt. Simbrum, Mt. Pandim, and Mt. Narshing.*
- **Sonam Lochar / Tamu Lochar**
- **Saga Dawa :** also known as *Triple Blessed festival.*

TAMIL NADU

- **Pongal :** means *'to boil'*
  - *Bhogi Pongal*
  - *Thai Pongal*
  - *Mattu Pongal*
  - *Kaanum Pongal*

During the Pongal festival, Kolam Rangoli is drawn at the entrance of homes.

- **Jallikattu:** *Bull Fighting Event*
- **Puthandu:** *New Year Festival*
- **Natyanjali**
- **Karthigai Deepam**
- **Thaipusam :** to worship *lord Murugan, Kavadi is carried.*

Jallikattu

- **Mahamaham :** known as *'Kumbh of South';* celebrated once every 12 years.

TELANGANA

TRICK TO REMEMBER : *Bathua Banalu Sam me Padunga*

Bathua → **Bathukamma :** *a 9 day flower festival celebrated by women.*

Banalu → **Bonalu :** to honour *goddess Mahakali.*

Sam → **Sammak Jatara also known as Medaram Jatara :** rituals of this festival is performed by *Koya tribe.*

Padunga → **Dunnapothula Panduga :** also known as *Sadar festival;* celebrated by *Yadava Community.*

TRIPURA

- **Kharchi Puja**
- **Hojagiri :** celebrated by *Reang community* to worship *Goddess Mailuma (Laxmi)*
- **Garia Puja**
- **Bijhu :** celebrated by *Chakma tribe* , to celebrate new year

UTTARAKHAND

- **Harela**
- **Bhitauli**
- **Syaldey Bikhauti Mela**

Celebrated in Kumaon region

- **Phool dei**
- **Kale Kauva (Ghugutiya)**
- **Kandali**
- **Ganga Dussehra**

Kandali

WEST BENGAL

- **Poila Boisakh :** *New Year*
- **Durga Puja**
- **Kali Puja**
- **Dol Purnima/ Dol Jatra**

Durga Puja

NEW YEAR FESTIVALS

State	*Festival name*	*Month*
Andhra Pradesh	Ugadi	March–April
Arunachal Pradesh	Mopin (Galo tribe) Longte (Nyishi tribe) Losar (Monpa tribe)	March–April
Assam	Bohag Bihu (Rongali Bihu)	April
Kerala	Vishu	April
Sikkim	Losoong / Sonam Losar	December–January
Tamil Nadu	Puthandu	April
West Bengal	Pohela Boishakh	April
Punjab	Baisakhi	April
Maharashtra	Gudi Padwa	March–April
Parsi Community	Navroz (Jamshedi / Pateti Navroz)	March
Sindhi Community	Cheti Chand	March–April

For an interactive recap of this topic, see the crossword on Page Number 393.

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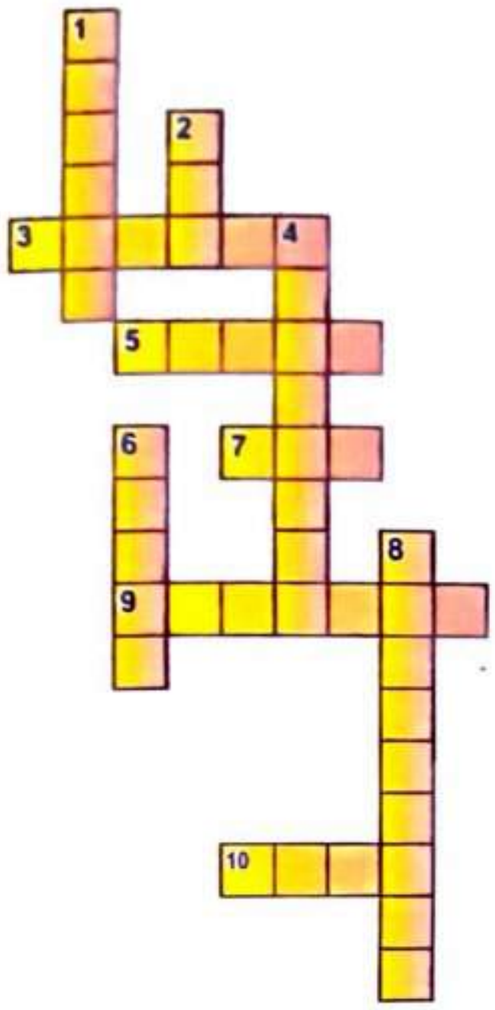
PARMAR'S CROSSWORD

NATIONAL ORGANIZATIONS



Across

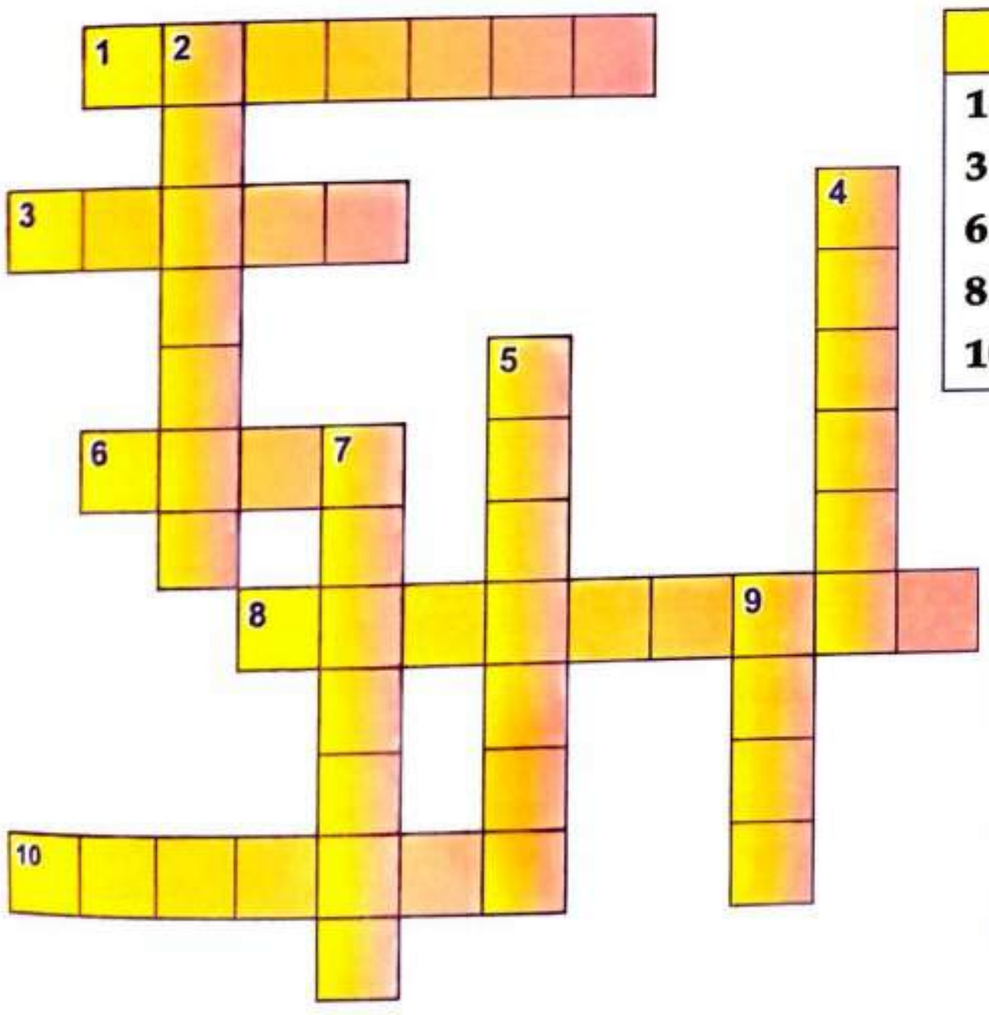
3. Accredited body for Adaptation Fund.
5. Headquarters of Spices Board.
7. Manufacturer of Advanced Light Helicopter.
9. Headquarters of CPCL.
10. Works under Ministry of Defence.

Down

1. Key leader of Indian National Army.
2. Headquarters of National Institute of Oceanography.
4. Location of Indian Institute of Remote Sensing.
6. Business body formed in 1927.
8. Location of Indian Academy of Sciences.

PARMAR'S CROSSWORD

FESTIVALS OF INDIA



Across

1. Zoroaster's birth anniversary is celebrated on which day.
3. Jamshedi Navroz is celebrated by which community.
6. Snake boat races are part of which Kerala festival.
8. Braj Festival is celebrated in which Indian state.
10. Mewar festival is celebrated during which occasion.

Down

2. Pinjore Heritage Festival is held in which state.
4. Hampi Utsava is also known as which Utsava.
5. Camel festival is celebrated in which city of Rajasthan.
7. Kachin Manaw festival is celebrated in which country.
9. Sikh festival celebrated as Hola Mohalla.

TsuNamî

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CENTRAL GOVERNMENT SCHEMES

Pradhan Mantri Gram Sadak Yojana (PMGSY)

- ***Launched in***: *2000*
- ***Ministry***: *Ministry of Rural Development*
- ***Purpose***: Provide all-weather road connectivity to rural villages.

Sarva Shiksha Abhiyan (SSA)

- ***Launched in***: *2001*
- ***Ministry***: *Ministry of Education*
- ***Purpose***: *Free compulsory elementary education for children between 6- 14 years (Class I-VIII)*

Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)

- ***Launched in***: *2005*
- ***Became effective in :*** *2006*
- ***Ministry***: *Ministry of Rural Development*
- ***Purpose***: Guarantees *100 days of wage employment* per year to rural households to enhance livelihood security.
- Renamed from **NREGA** to **MGNREGA on** *2nd Oct,2009*

National Rural Health Mission (NRHM) – Now part of Ayushman Bharat

- ***Launched in***: *2005*
- ***Ministry***: *Ministry of Health & Family Welfare*
- ***Purpose***: Improve healthcare infrastructure in rural areas, reduce infant mortality, and provide accessible medical services.

National Food Security Act (NFSA)

- ***Launched in***: 2013
- ***Ministry***: *Ministry of Consumer Affairs, Food & Public Distribution*
- ***Purpose***: Provide *subsidised food grains* (rice, wheat, coarse cereals) to ~67% of India's population under the *Public Distribution System (PDS)*.

Pradhan Mantri Jan Dhan Yojana (PMJDY)

- ***Launched in***: *2014*
- ***Ministry***: *Ministry of Finance*
- ***Purpose***: Financial inclusion by providing zero-balance bank accounts, insurance, and overdraft facilities to the unbanked poor.

Swachh Bharat Mission (SBM)

- ***Launched in***: *2014*
- ***Ministry***: *Ministry of Jal Shakti (Rural) / Ministry of Housing & Urban Affairs (Urban)*
- ***Purpose***: *Eliminate open defecation* and improve solid waste management Urban: SBM-U, Rural: SBM-G).

Make in India

- ***Launched in***: *2014*
- ***Ministry***: *Ministry of Commerce & Industry*
- ***Purpose***: Boost manufacturing, attract FDI, and create jobs by promoting India as a global manufacturing hub.

Pradhan Mantri Awas Yojana (PMAY)

- ***Launched in***: *2015*
- ***Ministry***: *PMAY-Gramin (Rural): Ministry of Rural Development*
  PMAY-Urban: Ministry of Housing & Urban Affairs
- ***Purpose***: Affordable housing for the urban and rural poor.

Digital India

- ***Launched in***: *2015*
- ***Ministry***: *Ministry of Electronics & IT*
- ***Purpose***: Transform India into a digitally empowered society (e-governance, broadband connectivity, digital literacy).

Pradhan Mantri Mudra Yojana (PMMY)

- **Launched in**: *2015*
- ***Ministry***: *Ministry of Finance*
- ***Purpose***: Provide *loans (up to ₹20 lakh) to micro/small businesses and entrepreneurs.*

Beti Bachao Beti Padhao (BBBP)

- ***Launched in***: *2015*
- ***Ministry***: *Ministry of Women & Child Development*
- ***Purpose***: Improve girl child education, reduce gender discrimination, and curb female foeticide.

Pradhan Mantri Ujjwala Yojana (PMUY)

- ***Launched in***: *2016*
- ***Ministry***: *Ministry of Petroleum & Natural Gas*
- ***Purpose***: Provide *free LPG connections to women from Below Poverty Line (BPL)* families.

Pradhan Mantri Fasal Bima Yojana (PMFBY)

- ***Launched in***: *2016*
- ***Ministry***: *Ministry of Agriculture & Farmers Welfare*
- ***Purpose***: Crop insurance for farmers against natural disasters at subsidized premiums.

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Startup India

- ***Launched in***: *2016*
- ***Ministry***: *Ministry of Commerce & Industry*
- ***Purpose***: Promote startups through tax benefits, funding, and simplified regulations.

Stand-Up India

- ***Launched in***: *2016*
- ***Ministry***: *Ministry of Finance*
- ***Purpose***: Promote entrepreneurship among SC/ST and women by providing bank loans (₹10 lakh–₹1 crore).

Ayushman Bharat Pradhan Mantri Jan Arogya Yojana (AB-PMJAY)

- ***Launched in***: *2018*
- ***Ministry***: *Ministry of Health & Family Welfare*
- ***Purpose***: *World's largest health insurance scheme (₹5 lakh/year per family)* for economically vulnerable households.

Aspirational Districts Programme

- ***Launched in:*** *2018*
- ***Authority:*** *NITI Aayog*
- ***Purpose:*** Focused on 112 backward districts

Pradhan Mantri Kisan Samman Nidhi (PM-KISAN)

- ***Launched in***: 2019
- ***Ministry***: *Ministry of Agriculture & Farmers Welfare*
- ***Purpose***: Direct income support of ₹6,000/year to small and marginal farmers.

One Nation One Ration Card (ONORC)

- ***Launched in***: *2019 (nationwide by 2021)*
- ***Ministry***: *Ministry of Consumer Affairs*
- ***Purpose***: Enable portability of food security benefits across India for migrant workers.

Jal Jeevan Mission (JJM)

- ***Launched in***: *2019*
- ***Ministry***: *Ministry of Jal Shakti*
- ***Purpose***: Provide piped potable water to every rural household by 2024.

PM SVANidhi

- ***Launched in***: *2020*
- ***Ministry***: *Ministry of Housing & Urban Affairs*
- ***Purpose***: Provide *micro-credit (up to ₹10,000) to street vendors* affected by COVID-19.

Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY)

- ***Launched in***: *2020 (COVID-19 relief)*
- ***Ministry***: *Ministry of Consumer Affairs*
- ***Purpose***: *Free food grains (5 kg/person/month) to 80 crore beneficiaries* during the pandemic.

National Education Policy (NEP) 2020

- ***Launched in***: *2020*
- ***Ministry***: *Ministry of Education*
- ***Purpose***: Overhaul India's education system with focus on skill development, multilingualism, and digital learning.

National Digital Health Mission (NDHM) – Now Ayushman Bharat Digital Mission

- ***Launched in***: *2020*
- ***Ministry***: *Ministry of Health & Family Welfare*
- ***Purpose***: Create digital health IDs and a unified health infrastructure for seamless medical services.

PM Gati Shakti - National Master Plan

- ***Launched in***: *2021*
- ***Ministry***: *Ministry of Commerce & Industry*
- ***Purpose***: Infrastructure development with multi-modal connectivity (roads, rails, ports) to boost logistics efficiency.

PM Schools for Rising India (PM-SHRI)

- ***Launched in***: *2022*
- ***Ministry***: *Ministry of Education*
- ***Purpose***: Modernize 14,500 schools with digital labs, vocational training, and holistic education.

Kisan Rin Portal

- ***Launched in***: *2023*
- ***Ministry***: *Ministry of Agriculture & Farmers Welfare*
- ***Purpose***: Digital platform for farmers to access subsidized loans under *Kisan Credit Card (KCC)*.

Anand Matrimony Scheme

- ***Launched in***: *2023*
- ***Ministry***: *Ministry of Social Justice & Empowerment*
- ***Purpose***: *Financial assistance (₹2.5 lakh/couple) for inter-caste marriages* to promote social harmony.

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PM Vishwakarma Yojana

- ***Launched in***: *2023*
- ***Ministry***: *Ministry of Micro, Small & Medium Enterprises (MSME)*
- ***Purpose***: Support traditional artisans (carpenters, blacksmiths, etc.) with skill training, loans, and market linkages.

National Green Hydrogen Mission

- ***Launched in***: *2023*
- ***Ministry***: *Ministry of New & Renewable Energy*
- ***Purpose***: Make India a global hub for green hydrogen production (₹19,744 crore investment).

Dekho Apna Desh

- ***Launched in***: *2022*
- ***Ministry***: *Ministry of Tourism*
- ***Purpose***: Promote domestic tourism with discounts on flights, trains, and curated travel package

SHRESHTA Schools

- ***Launched in***: *2022*
- ***Ministry***: *Ministry of Social Justice & Empowerment*
- ***Purpose***: Provide quality education to SC students through CBSE-affiliated residential schools.

Vibrant Villages Programme

- ***Launched in***: *2022*
- ***Ministry***: *Ministry of Home Affairs*
- ***Purpose***: Develop infrastructure in border villages (especially China-facing areas) to curb migration, *4 states (Arunachal Pr., Sikkim, Uttarakhand, Himachal Pr.)+ 1UT (Ladakh)*

PM-YUVA 2.0

- ***Launched in***: *2023*
- ***Ministry***: *Ministry of Education*
- ***Purpose***: Mentor young authors and promote Indian literature globally.

Namo Bharat (RRTS)

- ***Launched in***: *2023*
- ***Ministry***: *Ministry of Housing & Urban Affairs*
- ***Purpose***: *India's first regional rapid transit system* (Delhi-Meerut corridor, 180 km/h trains).

PM-SURAJ Portal

- ***Launched in***: *2024*
- ***Ministry***: *Ministry of Social Justice & Empowerment*
- ***Purpose***: Centralized platform for SC/ST entrepreneurs to access credit and entrepreneurship schemes.

Agnipath Scheme

- ***Launched in***: *2022*
- ***Ministry***: *Ministry of Defence*
- ***Purpose***: Transform military recruitment with *4-year contractual service* (45,000 'Agniveers' annually).

e-SHRAM Portal

- ***Launched in***: *2021*
- ***Ministry***: *Ministry of Labour & Employment*
- ***Purpose***: National database of 38+ crore unorganized workers for targeted welfare delivery.

PM Janjati Adivasi Nyaya Maha Abhiyan (PM-JANMAN)

- ***Launched in***: *2023*
- ***Ministry***: *Ministry of Tribal Affairs*
- **Purpose**: Provide basic facilities (housing, roads, telecom) to *75 Particularly Vulnerable Tribal Groups (PVTGs)*

PRITHVI Vigyan (Earth Science Scheme)

- ***Launched in***: 2021
- ***Ministry***: *Ministry of Earth Sciences*
- ***Purpose***: Enhance research in earth sciences (climate, oceanography, seismology) for disaster management and sustainable development.

PM Matsya Sampada Yojana (PMMSY)

- ***Launched in***: *2020*
- ***Ministry***: *Ministry of Fisheries, Animal Husbandry & Dairying*
- ***Purpose***: Boost *fish production to 22 million tons by 2025;* supports 55 *lakh* fishermen/fish farmers.

Vivad se Vishwas (VSV)

- ***Launched in***: *2020*
- ***Ministry***: *Ministry of Finance*
- ***Purpose***: Settle tax disputes by waiving 100% penalty for pending cases if paid by March 2021.

Atal Pension Yojana (APY)

- ***Launched in***: *2015*
- ***Ministry***: *Ministry of Finance*
- ***Purpose***: Pension scheme for workers in the unorganized sector (guaranteed post-retirement income).

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ADITI Scheme (Acing Development of Innovative Technologies with Innovation)

- *Launched in*: 2024
- *Ministry*: *Ministry of Defence*
- *Purpose*: Fund startups and MSMEs developing military-grade tech (drones, AI, cybersecurity). Targets *300+ startups with grants up to ₹25 crore.*

UNNATI Scheme (Uttam Nagrik Nidhi Awas Takniki Initiative)

- *Launched in*: 2023
- *Ministry*: *Ministry of Housing & Urban Affairs*
- *Purpose*: Upskill urban poor in construction (6-month training). Aims to train 50,000 annually under PM SVANidhi linkage.

PRERNA Programme (Pradhan Mantri Encouragement for Rationalizing Norms in Agriculture)

- *Launched in*: 2022
- *Ministry*: *Ministry of Agriculture & Farmers Welfare*
- *Purpose*: *Reduce chemical fertilizer use* through farmer training. Focus on *10 lakh farmers in 100 districts.*

Namo Drone Didi

- *Launched in:* 2024
- *Ministry*: *Ministry of Agriculture & Farmers Welfare*
- *Purpose*: *Train 15,000 women SHG members as drone pilots* for crop monitoring/spraying.

PM USHA (Pradhan Mantri Uchchatar Shiksha Abhiyan)

- *Launched in:* 2023
- *Ministry*: *Ministry of Education*
- *Purpose*: *Upgrade 1,500+ state universities/colleges.* Prioritizes NE, aspirational districts.

Atal Beemit Vyakti Kalyan Yojana

- *Launched in*: *2018 (revamped 2022)*
- *Ministry*: *Ministry of Labour & Employment*
- *Purpose*: Unemployment aid (25% of avg. salary for 3 months). For ESIC-insured workers.

Amazon Future Engineer Programme

- *Launched in*: 2021
- *Ministry*: *Collaboration with Education Ministry*
- *Purpose*: Teach coding to 1 lakh+ govt school students annually.

PM PRANAM (Promotion of Alternate Nutrients for Agriculture Management)

- *Launched in*: 2023
- *Ministry*: *Ministry of Chemicals & Fertilizers*
- *Purpose*: Reduce chemical fertilizer use by incentivizing states for organic farming.

SVAMITVA (Survey of Villages and Mapping with Improvised Technology in Village Areas)

- *Launched in*: 2020
- *Ministry*: *Ministry of Panchayati Raj*
- *Purpose*: Provide digital property cards to rural landowners; 1+ lakh villages mapped

PM DIVINE (PM Development Initiative for North East)

- *Launched in*: 2022
- *Ministry*: *Ministry of Development of North Eastern Region (DoNER)*
- *Purpose*: Accelerate infrastructure projects in Northeast (roads, telecom, tourism).

MISHTI (Mangrove Initiative for Shoreline Habitats & Tangible Incomes)

- *Launched in*: 2023
- *Ministry*: *Ministry of Environment, Forest & Climate Change*
- *Purpose*: Plant mangroves along 540 km coastline to protect biodiversity and support livelihoods.

Naya Savera Scheme

- *Launched in*: 2021
- *Ministry*: *Ministry of Minority Affairs*
- *Purpose*: *Free coaching for minority students (JEE/NEET/UPSC).* Covers 80,000+ students yearly.

SHREYAS (Scheme for Higher Education Youth in Apprenticeship and Skills)

- *Launched in*: 2019
- *Ministry*: *Ministry of Education*
- *Purpose*: Integrate apprenticeships with degrees. *Targets 10 lakh students by 2025.*

GOBAR DHAN (Galvanizing Organic Bio-Agro Resources Dhan)

- *Launched in*: 2018
- *Ministry*: *Ministry of Jal Shakti*
- *Purpose*: Convert cattle waste to biogas/fertilizer. *Aims for 100% village coverage by 2025.*

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VAIBHAV Fellowship

- ***Launched in***: *2023*
- ***Ministry***: *Ministry of Science & Technology*
- ***Purpose***: Attract *100+ NRI scientists annually for 3-year research* collaborations.

UDAN (Ude Desh ka Aam Naagrik)

- ***Launched in***: *2016*
- ***Ministry***: *Ministry of Civil Aviation*
- ***Purpose***: Regional air connectivity with fares capped at ₹2,500/hour; 470+ routes operational.

Pradhan Mantri Fasal Bima Yojana (PMFBY)

- ***Launched in***: *2016*
- ***Ministry***: *Ministry of Agriculture*
- ***Purpose***: Provide affordable crop insurance to farmers (premium: 2% Kharif, 1.5% Rabi).

MPLADS (Members of Parliament Local Area Development Scheme)

- ***Launched in***: *1993*
- ***Ministry***: *Ministry of Statistics & Programme Implementation*
- ***Purpose***: MPs recommend developmental works (₹5 crore/MP/year) in their constituencies.

E-Bus Sewa Scheme

- ***Launched in***: *2023*
- ***Ministry***: *Ministry of Housing & Urban Affairs*
- ***Purpose***: *Deploy 10,000 e-buses in 100 cities to reduce urban pollution.*

SATHI (Seed Traceability, Authentication, and Holistic Inventory)

- ***Launched in***: *2023*
- ***Ministry***: *Ministry of Agriculture & Farmers Welfare*
- ***Purpose***: Modernize agri-infrastructure (cold storage, seed hubs) for farmers.

PM KUSUM (Kisan Urja Suraksha evam Utthaan Mahaabhiyan)

- ***Launched in***: *2019*
- ***Ministry***: *Ministry of New & Renewable Energy*
- ***Purpose***: Promote solar energy in agriculture (30 lakh solar pumps, grid-connected farms).

NAMASTE (National Action for Mechanised Sanitation Ecosystem)

- ***Launched in***: *2022*
- ***Ministry***: *Ministry of Social Justice & Empowerment*
- ***Purpose***: *Eliminate manual scavenging* by providing sanitation workers with PPE and training.

Amrit Dharohar Scheme

- ***Launched in***: *2023*
- ***Ministry***: *Ministry of Forest and Climate Change*
- ***Purpose***: Develop spiritual tourism circuits (e.g., Ramayana, Buddhist trails).

PARMAR'S CROSSWORD

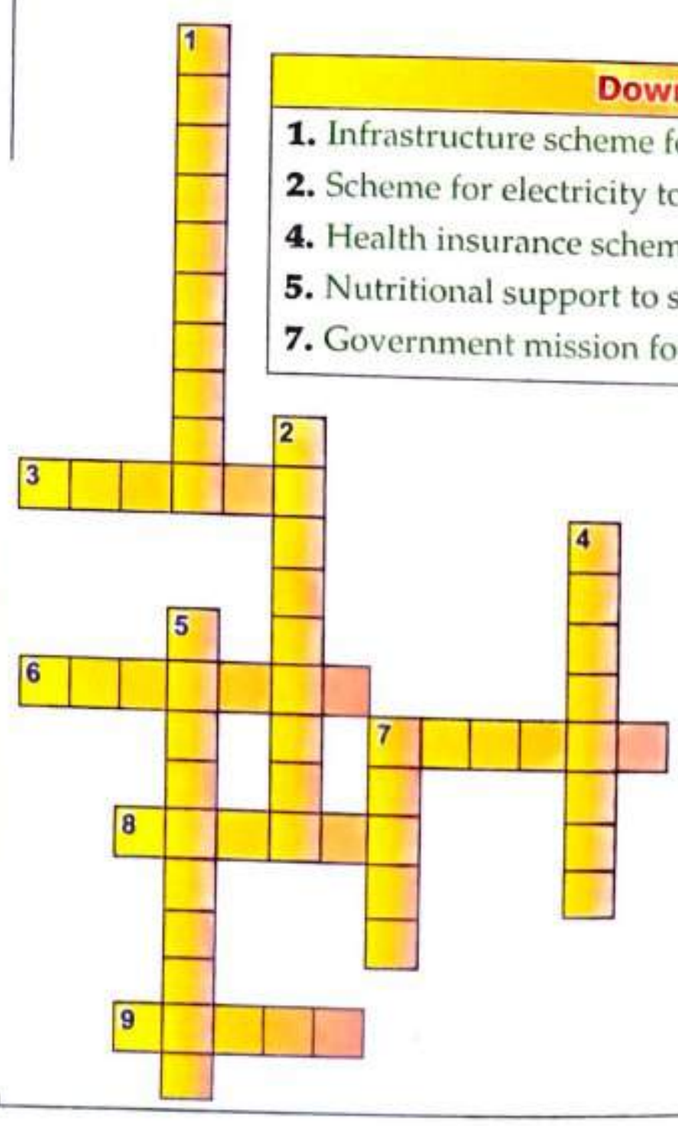
GOVERNMENT SCHEMES

Across

3. Free LPG connection to BPL families.
6. Direct income support to small farmers.
7. Mission for sanitation and toilet access.
8. Safe motherhood scheme by government.
9. UMEED scheme is run in which union territory.

Down

1. Infrastructure scheme for highways.
2. Scheme for electricity to all households.
4. Health insurance scheme by Government.
5. Nutritional support to school children.
7. Government mission for vocational training.



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CIVILIAN AWARDS

• India's Civilian Awards recognize outstanding contributions in various fields, including arts, literature, science, public service, and social work. These awards are announced *every year on Republic Day (26th January) and are conferred by the President of India at Rashtrapati Bhavan.*

1. Bharat Ratna (Highest Civilian Award)

- ***Eligibility:*** Any individual, irrespective of nationality.
- ***Instituted in:*** *1954*
- Total recipients till date: 53 (as of 2024)
- ***First recipient:*** *C. Rajagopalachari, Dr. S. Radhakrishnan, and Dr. C.V. Raman (1954)*
- ***First female recipient:*** *Indira Gandhi (1971)*
- ***First posthumous recipient:*** *Lal Bahadur Shastri (1966)*
- ***First sportsperson recipient:*** *Sachin Tendulkar (2014)* (Also the Youngest recipient: at age 40)
- ***Non-Indian recipients:*** *Khan Abdul Ghaffar Khan (1987), Nelson Mandela (1990)*

Bharat Ratna Awardees for 2024:

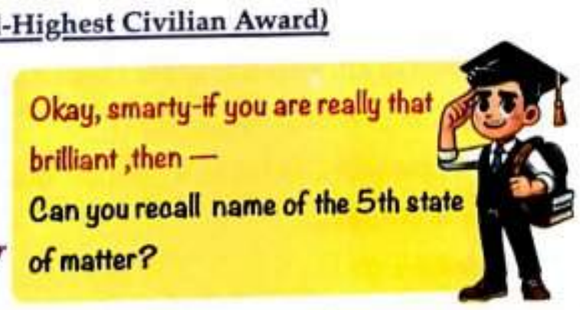
Name	Field of Service
Karpoori Thakur (Posthumous)	Public Affairs (Politics)
M.S. Swaminathan (Posthumous)	Science & Engineering (Agriculture)
P.V. Narasimha Rao (Posthumous)	Public Affairs (Politics)
L.K. Advani	Public Affairs (Politics)
Chaudhary Charan Singh (Posthumous)	Public Affairs (Politics)

2. Padma Awards

- ***Instituted in :*** *1954*
- Fields covered: Arts, literature, education, science, industry, sports, medicine, social work, and public affairs.

i. Padma Vibhushan (Second-Highest Civilian Award)

- ***First recipients :***
- *Satyendra Nath Bose*
- *Nandalal Bose*
- *Zakir Hussain*
- *Balasaheb Gangadhar Kher*
- *V.K. Krishna Menon*
- *Jigme Dorji Wangchuk*



Padma Vibhushan Awardees for 2025:

Name	Field of Service	State
Dr. D. Nageshwar Reddy	Medicine	Telangana
Justice (Retd.) Jagdish Singh Khehar	Public Affairs	Chandigarh
Smt. Kumudini Rajnikant Lakhia	Art	Gujarat
Shri Lakshminarayana Subramaniam	Art	Karnataka
Shri M. T. Vasudevan Nair (Posthumous)	Literature and Education	Kerala
Shri Osamu Suzuki (Posthumous)	Trade and Industry	Japan
Smt. Sharda Sinha (Posthumous)	Art	Bihar

ii. Padma Bhushan (Third-Highest Civilian Award)

First recipients (1954) -

- *V.K. Krishna Menon* - ***Public Affairs***
- *Homi J. Bhabha* - ***Science & Engineering***
- *Shanti Swaroop Bhatnagar*- ***Science & Engineering***
- *Mahadeva Iyer Subramania Iyer*- ***Civil Service***
- *M.S. Subbulakshmi* - ***Arts (Music)*** **[first female recipient]**

iii. Padma Shri (Fourth-Highest Civilian Award)

GALLANTRY AWARDS

India's Gallantry Awards are presented to military personnel and civilians *for acts of bravery and valor in the face of extreme danger.* These awards are divided into wartime gallantry awards and peacetime gallantry awards.

1. Wartime Gallantry Awards

Param Vir Chakra *(Highest Wartime Gallantry Award)*
Mahavir Chakra *(Second-Highest)*
Vir Chakra *(Third-Highest)*

2. Peacetime Gallantry Awards

Ashoka Chakra *(Highest Peacetime Gallantry Award)*
Kirti Chakra *(Second-Highest)*
Shaurya Chakra *(Third-Highest)*

SPORTS AWARDS

India's Sports Awards recognize excellence in various sporting disciplines. These awards are presented annually by the President of India to honor outstanding achievements in sports and games.

1. Major Dhyan Chand Khel Ratna Award (Highest Sporting Honour)

- ***Instituted:*** *1991-92*
- *₹25 Lakhs* ***awarded by*** *Mo Youth Affairs & Sports* ***to each recipient.***
- ***First Recipient:*** *Viswanathan Anand (Chess) - 1991-92*

Khel Ratna Awardees for 2024:

Sports	Name
Chess	Gukesh D
Hockey	Harmanpreet Singh
Para-Athletics	Praveen Kumar
Shooting	Manu Bhaker

In August 2021, Rajiv Gandhi Khel Ratna Award got renamed to Major Dhyan Chand Khel Ratna Award.

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2. Arjuna Award (Second highest Sporting honour)

Arjuna Award

- ***Instituted***: *1961*
- *₹15 Lakh given to recipients.*
- ***First Recipients (1961):***

P.G. Sethi - **Golf**
Bajarangi Prasad - **Swimming**
Karni Singh - **Shooting**
Krishna Das - **Archery**
Udey Chand -**Wrestling**
P.K. Banerjee - **Football**
Kumari Ann Lumsden- **Hockey**
Salim Durani - **Cricket**
Gurbachan Singh Randhawa - **Athletics**

1st Woman to get Arjuna Award : Meena Shah (1962) for Badminton.
1st Arjuna Award recipient for Kabaddi: Sahanand Mahadev Shetty (1972)

Arjuna Awardees, 2024:

Sports	Name
Athletics	Jyothi Yarraji Annu Rani
Boxing	Nitu Ghangas Saweety Boora
Chess	Vantika Agarwal
Hockey	Salima Tete Abhishek Sanjay Jarmanpreet Singh Sukhjeet Singh
Para-Archery	Rakesh Kumar
Para-Athletics	Preeti Pal Jeevanji Deepthi Ajeet Singh Sachin Sarjerao Khilari Dharambir Pranav Soorma H. Hokato Sema Simran Navdeep Singh
Para-Badminton	Nitesh Kumar Thulasimathi Murugesan Nithya Sre Sumathy Sivan Manisha Ramadass
Para-Judo	Kapil Parmar
Para-Shooting	Mona Agarwal Rubina Francis
Shooting	Swapnil Kusale Sarabjot Singh
Squash	Abhay Singh
Swimming	Sajan Prakash
Wrestling	Aman Sehrawat

Arjuna Lifetime Achievement Awardee, 2024:

Athletics	Sucha Singh
Para-Swimming	Murlikant Rajaram Petkar

3. Dronacharya Award

Given to coaches for producing outstanding sportspersons at the international level.

- ***Instituted***: *1985*
- ***First Recipients (1985):*** *Bhalchandra Bhaskar Bhagwat* **(Wrestling)**, *O.M. Nambiar* **(Athletics)**, *Om Prakash Bharadwaj* **(Boxing)**
- ***First female recipient***: *Hansa Sharma (Wrestling) in 2000.*

Dronacharya Awardees for 2024:

	Sports	Names
Regular Category	Para-Shooting	Subhash Rana
	Shooting	Deepali Deshpande
	Hockey	Sandeep Sangwan
Lifetime Category	Badminton	S Muralidharan
	Football	Armando Colaco

4. Dhyan Chand Award
(or Dhyan Chand Award for Lifetime Achievement Award in Sports & Games)

Given to **retired sportspersons** for their lifetime contribution to sports.

Instituted: *2002*
First Recipients: *Shahuraj Birajdar* **(Boxing)**,
Ashok Diwan **(Hockey)**,
Aparna Ghosh **(Basketball)**

Dhyan Chand Award

LITERARY AWARDS

1. Jnanpith Award (Highest Literary Award)

Given to writers for their literary excellence in any of *the 22 languages of India as listed in 8th Schedule of the Constitution of India.*

- ***Given by***: *The Bhartiya Jnanpith,*
- **Prize amount of** *Rs. 11 lakhs*, **a** *citation* **and** *a bronze replica of Goddess Saraswati* **is awarded.**
- ***Instituted in :*** *1961*
- ***First Recipient (1965):*** *G. Sankara Kurup* for *Odakkuzhal (Malayalam)* which means *The Bamboo Flute,* published in *1950*
- ***First female Recipient (1976):*** *Ashapoorana Devi* for her novel *Pratham Pratishruti.*
- ***59th Jnanpith Awardee (2024):*** *Vinod Kumar Shukla*
- *Damodar Mauzo*, the **first Indian writer in English** won the *57th Jnanpith* Award.

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2. Sahitya Akademi Award

Given to writers for their literary excellence in one of *the 24 recognised Indian languages including English and Hindi.*

- ***Instituted***: *1954*
- ***First Recipient in Hindi Category, 1955***: *Makhan Lal Chaturvedi* for *"Him-Tarangini" (poetry)*
- ***First Recipient in English Category, 1960***: *R.K. Narayan* for his novel *"The Guide"*

3. Saraswati Samman

Annual award for outstanding literary works published in any of India's *22 official languages*, listed in 8th Schedule of the Constitution of India.

- ***Instituted***: 1991
- ***Given by :*** *K.K. Birla Foundation*
- ***First Recipient***: *Harivansh Rai Bachchan (Hindi) - 1991*

4. Vyas Samman

Annual award given for outstanding literary works in *Hindi.*

- ***Instituted***: *1991*
- ***Given by :*** *K.K. Birla Foundation*
- ***First Recipient : 1991*** - *Ram Vilas Sharma* for his book *" Bharat ke Pracheen Bhasha Parivar aur Hindi"*

FILMS AND ENTERTAINMENT AWARDS

1. Dadasaheb Phalke Award (Highest Film Honour)

For Lifetime contribution to Indian cinema.

- ***First Recipient***: *Devika Rani (1969)*
- ***Dadasaheb Phalke Awardee for 2024***- *Mithun Chakraborty*

2. National Film Awards

70th National Film Awards, 2024:

- ***Best Feature Film***: *Aattam (The Play)*
- ***Best Hindi Film :*** *Gulmohar*
- ***Best Animation Film :*** *Brahmastra: Part 1 - Shiva*
- ***Best Actor***: *Rishabh Shetty– Kantara*
- ***Best Actress***: *Nithya Menen (Thiruchitrambalam), Mansi Parekh (Kutch Express)*
- ***Best Popular Film Providing Wholesome Entertainment***: *Kantara*
- ***Best Director***: *Sooraj R. Barjatya – Uunchai*
- ***Best Supporting Actress***: *Neena Gupta– Uunchai*
- ***Best Supporting Actor :*** *Pavan Malhotra- Fouja*

3. Filmfare Awards

Filmfare Awards 2024 :

- ***Best Film***: *12th Fail*
- ***Best Actor***: *Ranbir Kapoor – Animal*
- ***Best Actress***: *Alia Bhatt – Rocky Aur Rani Ki Prem Kahani*
- ***Best Director***: *Vidhu Vinod Chopra – 12th Fail*

GLOBAL AWARDS

1. Nobel Prize

- ***Instituted***: *1901* by *the Nobel Foundation (Sweden/Norway)*
- ***6 Categories***: **Peace, Literature, Physics, Chemistry, Medicine, Economics**
- All Nobel prize is awarded in Stockholm, Sweden while Nobel Peace Prize is awarded in Oslo, Norway.
- ***First Recipient***: *Wilhelm Conrad Röntgen (Physics, 1901) - for the discovery of X-rays.*
- ***First female recipient:*** *Marie Curie(1903) - Only women to win 2 Nobel :*

—Shared *1st Nobel* with her husband *Pierre Curie & Henri Becquerel.*

— Won *2nd Nobel in 1911* for the discovery *of Radium & Polonium.*

Nobel Prize for Economics was established in *1968 by Sweden's Central Bank.* **Originally known as** *Sveriges Riksbank Prize in Economic Sciences.* *Nobel prize is given in the memory of Alfred Nobel (discoverer of Dynamite)*

- ***First Indian Recipient***: *Rabindranath Tagore (Literature) 1913 for Geetanjali.*

Other Indian Recipients:

C.V. Raman – Physics, 1930

Mother Teresa – Peace, 1979

Amartya Sen – Economic Sciences, 1998

Venkatraman Ramakrishnan – Chemistry, 2009

Kailash Satyarthi – Peace (for struggle against child labour), 2014

Abhijit Banerjee – Economic Sciences (work in poverty alleviation), 2019

Abel Prize is considered as Nobel Prize of Maths.

2. Ramon Magsaysay Award

Named after **Ramon Magsaysay, former President of Philippines** (known for integrity and public service)

Instituted: *1957* by the **Rockefeller Brothers Fund** (Philippines)

- ***First Recipient***: *Wu San Lien* (Public Service, 1958)
- ***First Indian Recipient***: *Acharya Vinoba Bhave*, 1958

Other Indian Recipients:

Kiran Bedi – Government Service, 1994

Aruna Roy – Community Leadership, 2000

Bezwada Wilson – Emergent Leadership, 2016

Ravish Kumar - Ethical Journalism, 2019

Ravish Kumar

Dr. Ravi Kannan – Public service in medical field, 2023

3. Booker Prize

- ***Instituted***: *1969 (UK)*
- For Best original novel written in English and published in the UK or Ireland.
- ***First Recipient***: *P.H. Newby – Something to Answer For, 1969*
- ***First Indian Recipient***:*Arundhati Roy* – The God of Small Things, 1997

Other Indian Recipients:

Kiran Desai – The Inheritance of Loss, 2006

Aravind Adiga – The White Tiger, 2008

Geetanjali Shree – Tomb of Sand (International Booker), 2022

Note: The International Booker Prize is awarded for a book translated into English and shared between the author and the translator.

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4. Pulitzer Prize

- ***Instituted***: *1917 by the will of Joseph Pulitzer (USA)*
- ***Awarded by :*** *Columbia University, New York*
- Categories : Journalism, Literature, Drama, Music, etc.
- ***First Recipient***: *Herbert Bayard Swope* (Reporting, 1917)
- ***First Indian Recipient***: *Gobind Behari Lal – Journalism* (Science Reporting), 1937

Other Indian Recipients:

→*Jhumpa Lahiri* – Interpreter of Maladies (Fiction), 2000

→*Geeta Anand* – Wall Street Journal investigative reporting, 2003

→*Siddhartha Mukherjee* – The Emperor of All Maladies (General Nonfiction), 2011

→ *Indian Staff of Reuters* – Photography, 2020 (for coverage of protests in Hong Kong)

5. OSCAR Awards -

(Also known as The Academy Awards)

- ***Instituted in***: *1929*
- ***First Recipient***: *Emil Jannings (Best Actor) & Janet Gaynor (Best Actress)*
- ***First Indian Recipient***: *Bhanu Athaiya (Best Costume Design, Gandhi - 1983)*
- *Satyajit Ray* ***is the first Indian to receive an Honorary Oscar (1992)***
- *A. R. Rahman* ***is the first Indian to win two Oscars in the same year (2009)***
- *The Elephant Whisperers (2023)* ***was India's first win in the Documentary Short Film Category***

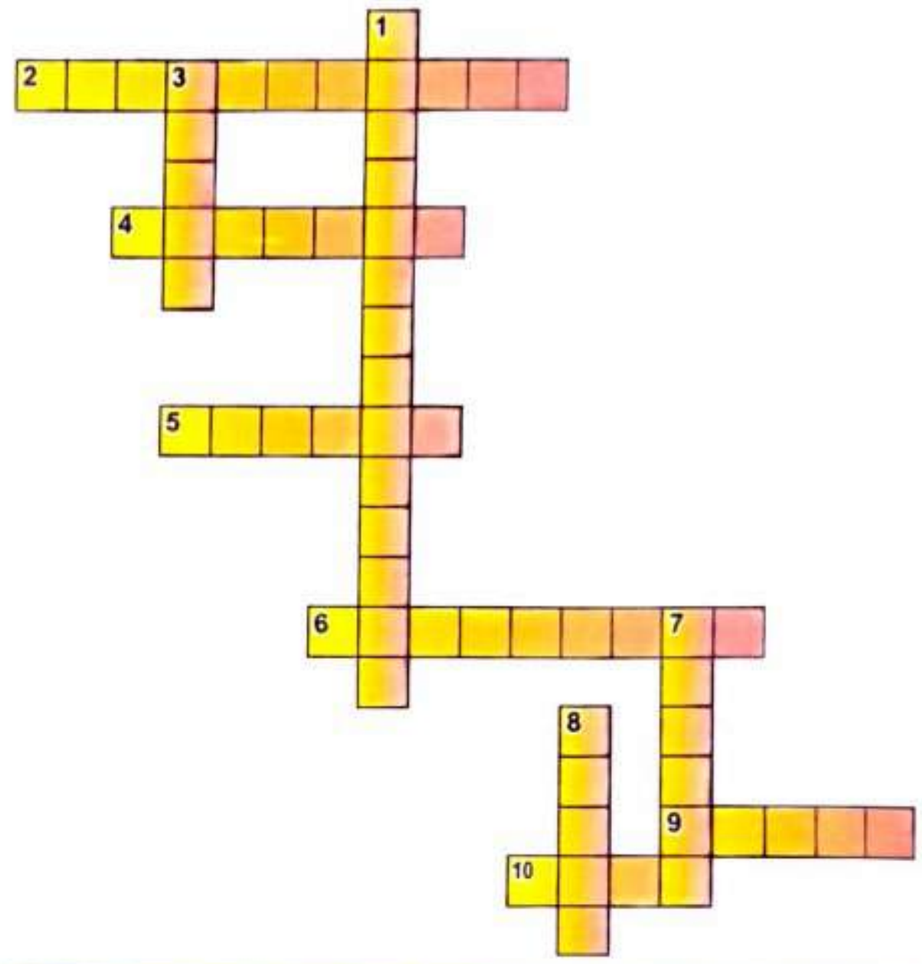
Oscar Awards 2025 Winners:

→ ***Best Picture***: *Anora*
→ ***Best Director***: *Sean Baker (Anora)*
→ ***Best Actor***: *Adrien Brody (The Brutalist)*
→ ***Best Actress***: *Mikey Madison (Anora)*
→ ***Best Supporting Actor***: *Kieran Culkin (A Real Pain)*
→ ***Best Supporting Actress***: *Zoe Saldana (Emilia Perez)*
→ ***Best Animated Feature***: *Flow*
→ ***Best International Feature Film***: *I'm Still Here*
→ **Best Original Screenplay**: *Anora*
→ **Best Adapted Screenplay**: *Conclave*

Emmy awards are given in Television Industry and Grammy Awards are given in Music Industry

PARMAR'S CROSSWORD

AWARDS AND HONOURS



Across

2. India's highest civilian award.
4. Prestigious award for classical arts.
5. Award by Government of India for peace.
6. Asian equivalent of Nobel Prize.
9. International award for peace and sciences.
10. Award for lifetime achievement in Indian cinema.

Down

1. Second highest civilian award.
3. First Indian to win Nobel in Physics.
7. Award given for excellence in sports.
8. Award for excellence in cinema by Academy.

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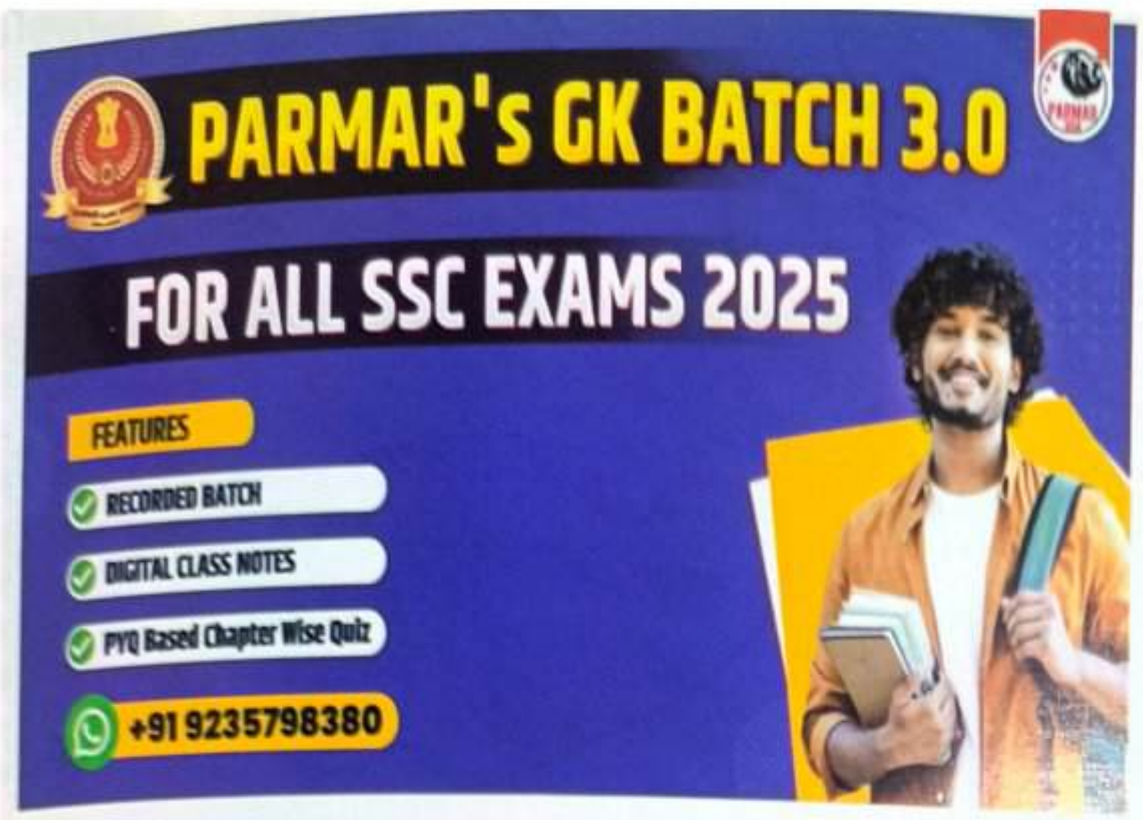

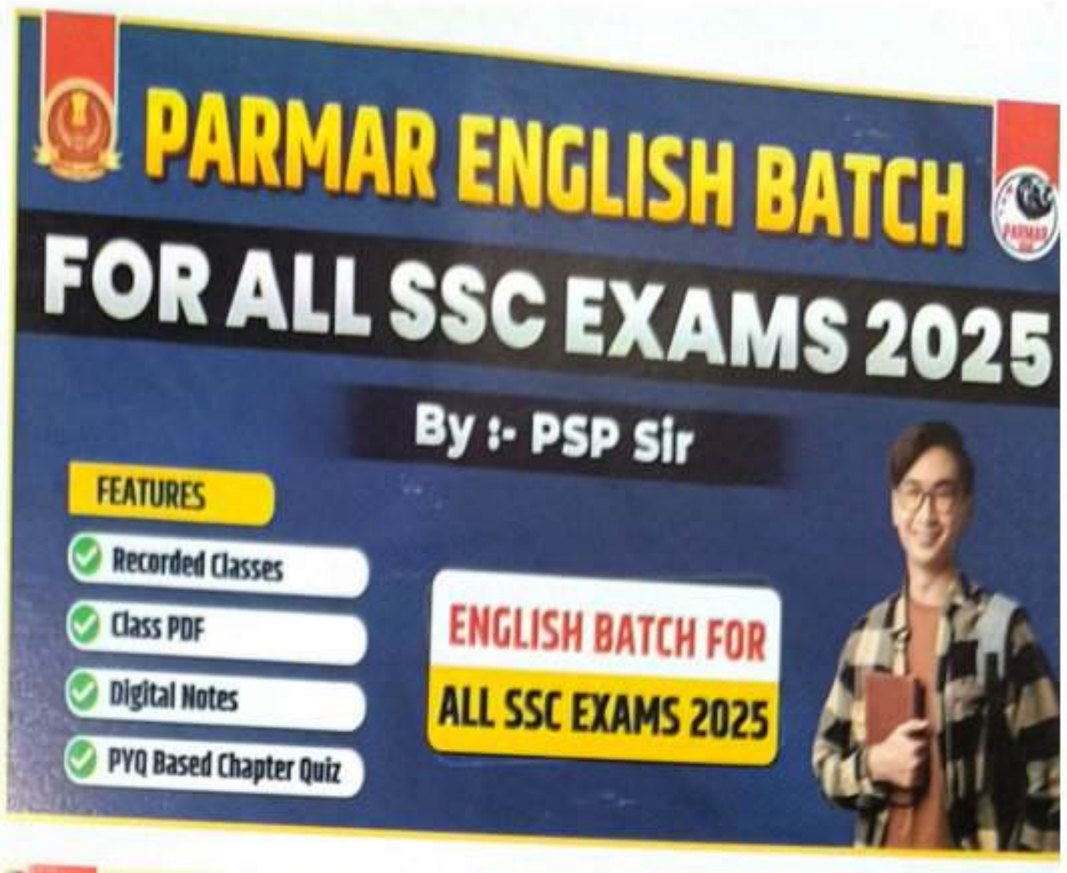

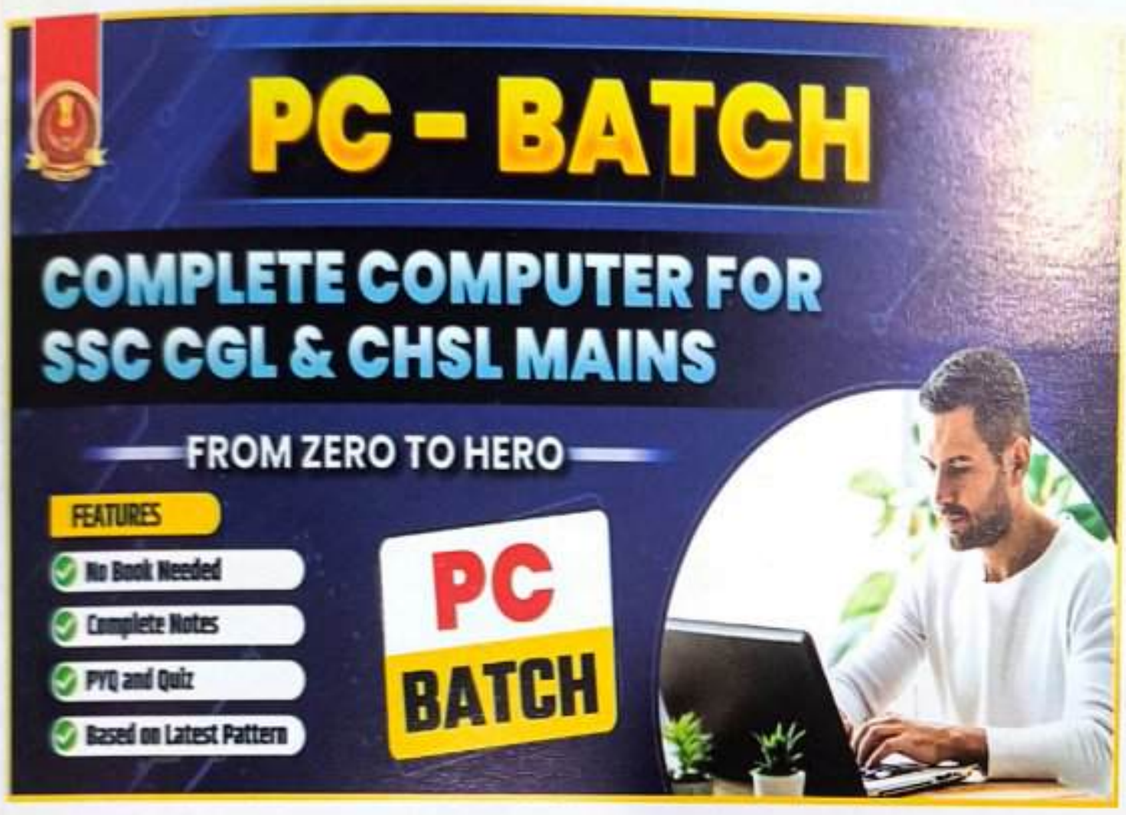

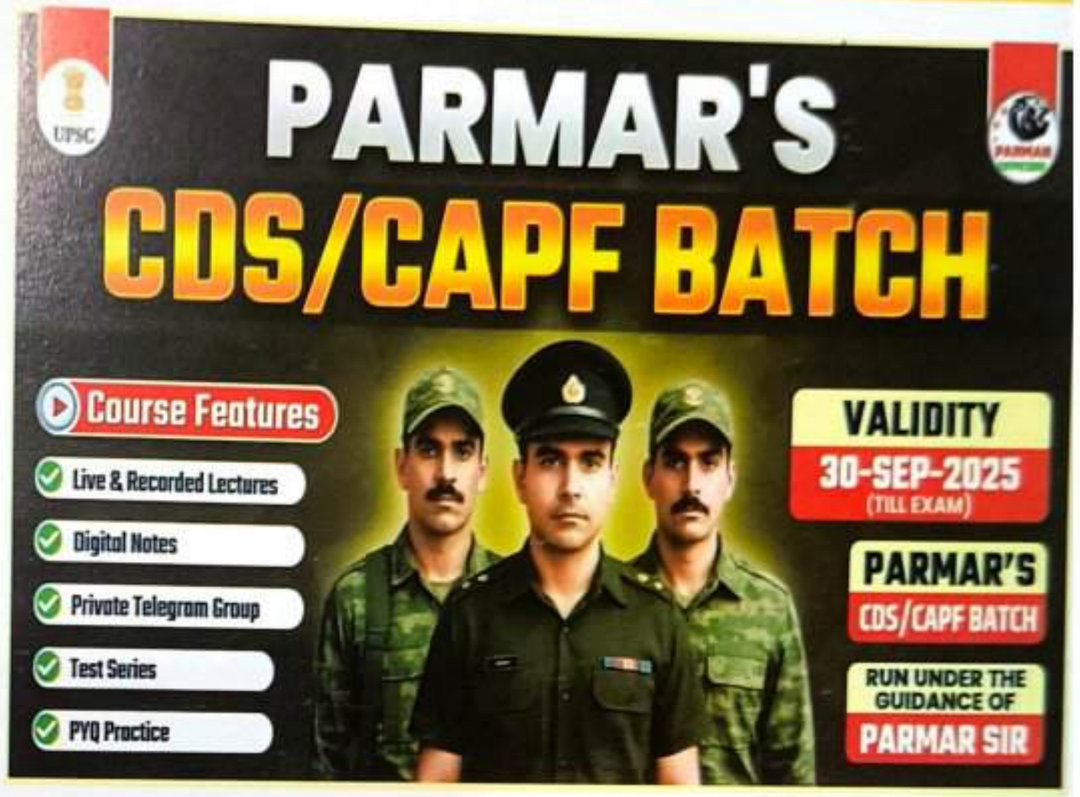

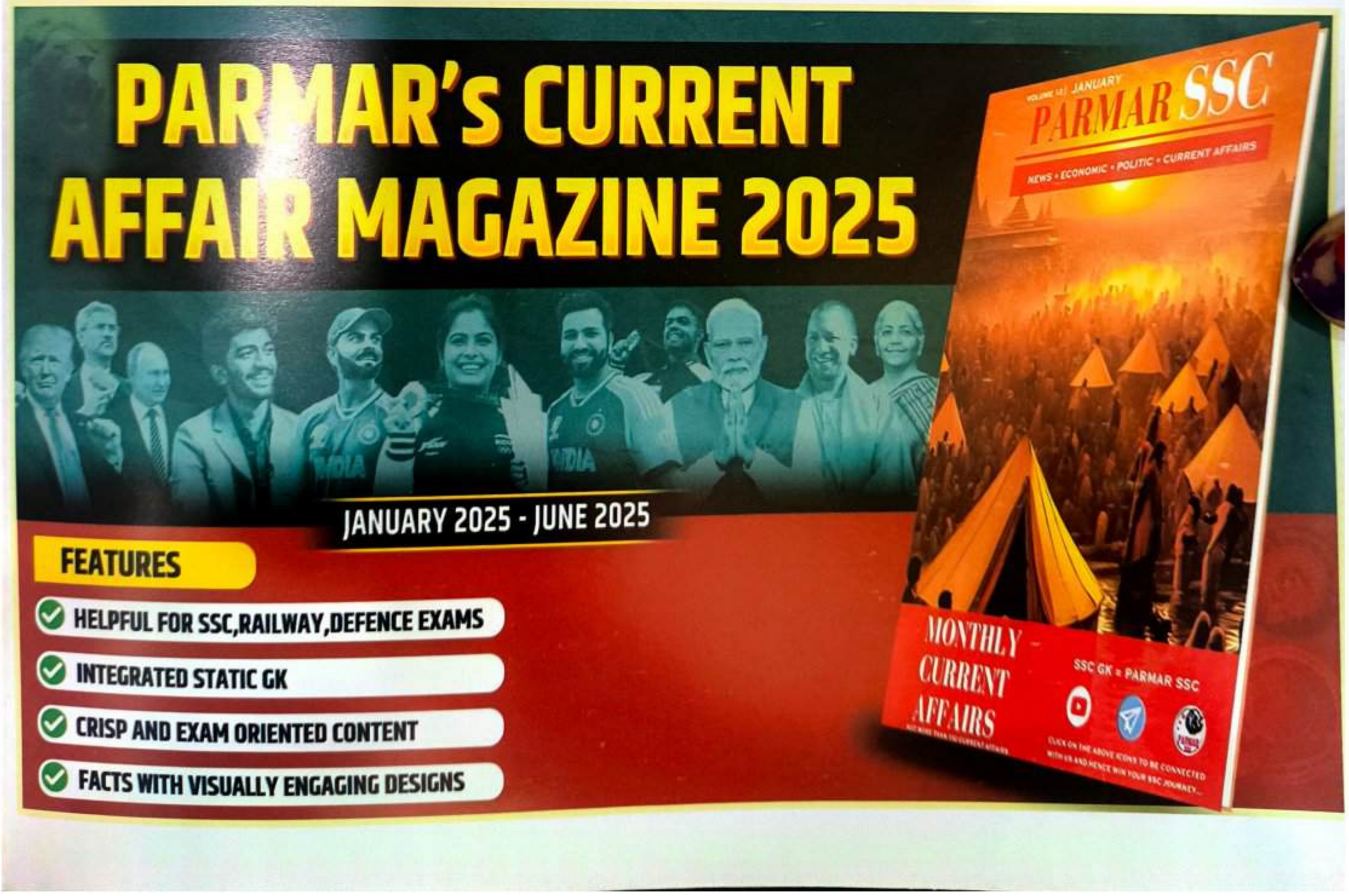

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Late Shri Y.S Parmar
(Shailendra)

This book is a heartfelt tribute to my father, whose determination and sacrifices have been the cornerstone of my achievements. Despite having only completed his 10th grade education, he left no stone unturned to ensure I received the best possible education. His dedication and belief in the power of learning shaped not just my life but also the lives of countless students who now benefit from his legacy through me. Every milestone I achieve is a reflection of his unwavering support and guidance. I am forever indebted to his efforts and values. Additionally, I express my profound gratitude to my **PARMARIANS** for their overwhelming love and encouragement, which constantly motivates me to strive for excellence

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