ANSWERS & EXPLANATIONS
GENERAL STUDIES (P) TEST – 4128 (2024)

Q 1.D

- The earth's surface receives most of its energy in short wavelengths. The energy received by the earth is known as incoming solar radiation which in short is termed as insolation.
- As the earth is a geoid resembling a sphere, the sun's rays fall obliquely at the top of the atmosphere and the earth intercepts a very small portion of the sun's energy. On an average the earth receives 1.94 calories per sq. cm per minute at the top of its atmosphere.
- The solar output received at the top of the atmosphere varies slightly in a year due to the variations in the distance between the earth and the sun. During its revolution around the sun, the earth is farthest from the sun (152 million km) on 4th July. This position of the earth is called aphelion. On 3rd January, the earth is the nearest to the sun (147 million km). This position is called perihelion.
    - Therefore, the annual insolation received by the earth on 3rd January is slightly more than the amount received on 4th July.
- **Variability of Insolation at the Surface of the Earth**
    - The amount and the intensity of insolation vary during a day, in a season and in a year. **The factors that cause these variations in insolation are :**
        - ✓ **the rotation of earth on its axis**
        - ✓ **the angle of inclination of the sun's rays**
        - ✓ **the length of the day**
        - ✓ **the transparency of the atmosphere**
        - ✓ **the configuration of land in terms of its aspect.**
- The last two however, have less influence. The fact that the earth's axis makes an angle of 66½ with the plane of its orbit round the sun has a greater influence on the amount of insolation received at different latitudes.
- The second factor that determines the amount of insolation received is the angle of inclination of the rays. This depends on the latitude of a place. The higher the latitude the less is the angle they make with the surface of the earth resulting in slant sun rays.
- The area covered by vertical rays is always less than the slant rays. If more area is covered, the energy gets distributed and the net energy received per unit area decreases. Moreover, the slant rays are required to pass through greater depth of the atmosphere resulting in more absorption, scattering and diffusion.
- **Hence option (d) is the correct answer.**

Q 2.A

- Soil erosion is essentially aggravated by faulty practices. Lands with a slope gradient of 15–25 percent should not be used for cultivation. If at all the land is to be used for agriculture, terraces should carefully be made.
- Efforts should be made to prevent gully erosion and control their formation. Finger gullies can be eliminated by terracing. In bigger gullies, the erosive velocity of water may be reduced by constructing a series of check dams. Special attention should be paid to control headward extension of gullies. This can be done by gully plugging, terracing, or by planting cover vegetation.
    - **Terracing is a soil conservation** practice applied to prevent rainfall runoff on sloping land from accumulating and causing serious erosion. Terraces consist of ridges and channels constructed across-the-slope.
- In arid and semi-arid areas, efforts should be made to protect cultivable lands from encroachment by sand dunes through the development of shelter belts of trees and agroforestry. Lands not suitable for cultivation should be converted into pastures for grazing.
- **Hence option (a) is the correct answer.**

Q 3.C

- **Red soil develops on crystalline igneous rocks in areas of low rainfall in the eastern and southern parts of the Deccan Plateau.** Along the piedmont zone of the Western Ghat, a long stretch of area is occupied by red loamy soil.
- Yellow and red soils are also found in parts of Odisha and Chhattisgarh and in the southern parts of the middle Ganga plain. The soil develops a reddish colour due to a wide diffusion of iron in crystalline and metamorphic rocks. It looks yellow when it occurs in a hydrated form.
- The fine-grained red and yellow soils are normally fertile, whereas the coarse-grained soils found in dry upland areas are poor in fertility. They are generally poor in nitrogen, phosphorous and humus.
- **Hence option (c) is the correct answer.**

Q 4.A

- **Tropical Evergreen forests are found in the western slope of the Western Ghats, hills of the northeastern region and the Andaman and Nicobar Islands.**
- **They are found in warm and humid areas with an annual precipitation of over 200 cm and mean annual temperature above 22 degree C.**
- **The Western Ghats** in India provide favorable conditions for orographic rainfall. The warm and moist air from the Arabian sea is blocked by the Western Ghats and gets lifted over mountain ranges. As the air rises and cools, orographic clouds are formed resulting in precipitation.
    - Due to orographic rainfall, the western side of the western ghats receives heavy rainfall, more than 250cm rainfall per year. and aids in growth of Tropical evergreen forests in India.
- These forests can be extremely dense and multi-layered, with a few areas being so dense that the forest floor hardly receives any sunlight due to the engulfing leaves and large trees.
- The main vegetation found in these forests is Ebony, Mahogany, and Rosewood.
- The tropical evergreen forests are known as lungs of the Earth because of huge greenery and the amount of oxygen they produce. The plants usually draw carbon dioxide and produce oxygen, hence are called as the lungs of the Earth.
- **Hence, option (a) is the correct answer.**

Q 5.A

- In the course of a year, the earth's revolution round the sun with its axis inclined at 66 1/2 degrees to the plane of the ecliptic changes the apparent altitude of the midday sun. T**he sun is vertically overhead at the equator on two days each year. These are usually 21 March and 21 September though the date changes because a year is not exactly 365 days**. **Hence statement 2 is not correct.**
- **These days are termed equinoxes meanings equal nights because, on these two days, all parts of the world have equal days and nights. Hence statement 1 is correct.**
- After the March equinox the sun appears to move north and is vertically overhead at the Tropic of Cancer (23 1/2 degrees N.) on about 21 June. This is known as the June or summer solstice, when the northern hemisphere will have its longest day and shortest night. Hence statement 2 is not correct.
- By about 22 December, the sun will be overhead at the Tropic of Capricorn (23 1/2 degrees S.). This is the winter solstice when the southern hemisphere will have its longest day and shortest night. Hence statement 3 is correct.
- The Tropics thus mark the limits of the overhead sun, for beyond these, the sun is never overhead at any time of the year. Such regions are marked by distinct seasonal changes spring, summer, autumn and winter. Beyond the Arctic Circle (66 1/2 degrees N.) and the Antarctic Circle (66 1/2 degrees S.) where darkness lasts for 6 months and daylight is continuous for the remaining half of the year, it is always cold; for even during the short summer the sun is never high in the sky.
- Within the tropics, as the midday sun varies very little from its vertical position at noon daily, the four seasons are almost indistinguishable. Days and nights are almost equal all year round.

Q 6.B

- Many local winds, some hot, others cold are common around the Mediterranean Sea. The causes are many and varied. The topography of the region with the high Alps in the north, the Sahara desert in the south, continental interiors in the east and the open Atlantic on the west give rise to great differences in temperature, pressure and precipitation.
- The passing cyclones from the Atlantic, the anticyclones from the north, and the cold air masses from the continental interiors are often interrupted or channelled by relief features, resulting in the birth of local winds around the Mediterranean. These winds varying in strength, direction and duration affect the lives, crops and activities of the people there.

- **Sirocco**.
  - **This is a hot dry dusty wind which originates in the Sahara Desert** . Though it may occur at any time of the year, it is most frequent in spring and normally lasts for only a few days. The Sirocco blows outwards in a southerly direction from the desert interiors into the cooler Mediterranean Sea. It is usually associated with depressions from the Atlantic passing from the coast eastwards inland.
- **Mistral**.
  - **Mistral is a cold wind from the north of Mediterranean sea , rushing down the Rhone valley** in violent gusts between 40 and 80 miles per hour. The velocity of the Mistral is intensified by the funnelling effect in the valley between the Alps and the Central Massif, and in extreme cases trains may be derailed and trees uprooted.
- **A similar type of cold north-easterly wind experienced along the Adriatic coast is called the Bora**. Like the Mistral, it is caused by a difference in pressure between continental Europe and the Mediterranean. This usually occurs in winter, when the atmospheric pressure over continental Europe is higher than that of the Mediterranean Sea.
- In West Africa, the North- East Trades blow offshore from the Sahara Desert and reach the Guinea coast as a dry, dust -laden wind, **called locally the Harmattan meaning The doctor'.**
  - It is so dry that its relative humidity seldom exceeds 30 per cent. The doctor' provides a welcome relief from the damp air of the Guinea lands by increasing the rate of evaporation with resultant cooling effects, but it is such a dry dusty wind that , besides ruining the crops, it also stirs up a thick dusty haze and impedes inland river navigation.
- **Hence option (b) is the correct answer.**

Q 7.D

- The height of the Western Ghats progressively increases from north to south. The highest peaks include the Anai Mudi (2,695 metres) and the Doda Betta (2,637 metres).
- **Doddabetta** is the highest mountain in the **Nilgiri Mountains** at 2,637 metres (8,652 feet). There is a reserved forest area around the peak. It is 9 km from Ooty, on the Ooty-Kotagiri Road in the Nilgiris District of Tamil Nadu, India. It is a popular tourist attraction with road access to the summit. It is the fourth-highest peak in South India next to Anamudi, Mannamalai and Meesapulimala. **Hence pair 2 is not correctly matched.**
- **Anai Mudi** is a mountain located in the Ernakulam district and Idukki district of the Indian state of Kerala. It is the highest peak in the Western Ghats and in South India, at an elevation of 2,695 metres (8,842 ft) and a topographic prominence of 2,479 metres (8,133 ft). It is located in the southern region of Eravikulam National Park at the junction of the **Cardamom Hills, the Anaimalai Hills and the Palani Hills**. **Hence pair 3 is not correctly matched.**
- **Mahendragiri** is a mountain in the Rayagada block of the district of Gajapati, Odisha, India. It is situated amongst the **Eastern Ghats** at an elevation of 1,501 metres. It is the second biodiversity Heritage Site of Odisha. This is considered one out of Seven Kula Parvat of India. **Hence pair 1 is correctly matched.**
- **Mount Dhupgarh or Dhoopgarh** is the highest point in the **Mahadeo Hills**, Madhya Pradesh, India. Located in Pachmarhi in the Narmadapuram district, it has an elevation of 1,352 metres. The top of the hill is a popular area to watch sunsets. Pachmarhi Hill station is located close to the peak. **Hence pair 4 is correctly matched.**

Q 8.A

- Alluvial soils are widespread in the northern plains and the river valleys. These soils cover about 40 percent of the total area of the country. They are depositional soils, transported and deposited by rivers and streams. **Hence statement 1 is correct.**
- The alluvial soils vary in nature from sandy loam to clay. They are generally rich in potash but poor in phosphorous. **Hence statement 2 is not correct.**
- **In the Upper and Middle Ganga plain, two different types of alluvial soils have developed, viz. Khadar and Bhangar.** Khadar is the new alluvium and is deposited by floods annually, which enriches the soil by depositing fine silts.
- Bhangar represents a system of older alluvium, deposited away from the flood plains. Both the Khadar and Bhangar soils contain calcareous concretions (Kankars). These soils are more loamy and clayey in the lower and middle Ganga plain and the Brahmaputra valley.

Q 9.A

- Most known volcanic activity and earthquakes occur along converging plate margins and mid-oceanic ridges. **Nearly 70 percent of earthquakes occur in the Circum-Pacific belt. Another 20 percent of earthquakes take place in the Mediterranean-Himalayan belt** including Asia Minor, the Himalayas, and parts of north-west China.
- **Only 10 percent to 20 percent of all volcanic activity is above the sea,** and terrestrial volcanic mountains are small when compared to their submarine counterparts. **Hence statement 3 is correct.**
- **The circum-Pacific region popularly termed the 'Pacific Ring of Fire', has the greatest concentration of active volcanoes. The volcanic** belt and earthquake belt closely overlap along the 'Pacific Ring of Fire'.
- **Mount Cameroon**
  - It is an active volcano that is also known by many other names, and it is located near the Gulf of Guinea, within the Republic of Cameroon.
  - Mt. Cameroon is the highest peak in **sub-Saharan western and central Africa** and the **westernmost extension of a series of hills and mountains** that form a natural boundary between northern Cameroon and Nigeria. **Hence statement 1 is not correct.**
- **In Africa, some volcanoes are found along the East African Rift Valley, e.g. Mt. Kilimanjaro and Mt. Kenya. Hence statement 2 is not correct.**
- **Mount Kilimanjaro**
  - Located in Tanzania, Mount Kilimanjaro is Africa's tallest mountain at about 5,895 meters (19,340 feet). It is the largest free-standing mountain rise in the world, meaning it is not part of a mountain range.
  - Also called a stratovolcano (a term for a very large volcano made of ash, lava, and rock), **Kilimanjaro is made up of three cones: Kibo, Mawenzi, and Shira.** Kibo is the summit of the mountain and the tallest of the three volcanic formations. **While Mawenzi and Shira are extinct, Kibo is dormant and could possibly erupt again. Scientists estimate that the last time it erupted was 360,000 years ago.**
- **Mediterranean volcanism**
  - Volcanoes of the Mediterranean region are **mainly associated with the Alpine folds**, e.g. Vesuvius, Stromboli (Light House of the Mediterranean) and those of the Aegean islands. A few continue into Asia Minor (Mt. Ararat, Mt. Elbruz).
  - **Mt. Stromboli** is a small island in the Tyrrhenian Sea, off the north coast of Sicily, **containing one of the three active volcanoes in Italy**. It is one of the eight Aeolian Islands, a volcanic arc north of Sicily.

Q 10.C

- For the first time ever, **the Ministry of Culture has announced a year-long commemoration of the birth anniversary of Banjara Dharmaguru Santh Sevalal Maharaj.**
  - Born in 1739 in Shivamogga district of Karnataka.
  - He was a social reformer and **spiritual teacher of Banjara Community. Hence option (c) is the correct answer.**
    - ✓ Spread across India, Banjara Community is a nomadic community with nearly 10-12 crore population. They are classified as SC, ST and OBC in different states.
    - ✓ Having sound knowledge in Ayurveda and Naturopathy, he eradicated myths and superstitions prevalent among forest dwellers and nomadic tribe.

Q 11.B

- Atmosphere is a mixture of different gases and it envelopes the earth all round. It contains life-giving gases like oxygen for humans and animals and carbon dioxide for plants. The air is an integral part of the earth's mass and 99 per cent of the total mass of the atmosphere is confined to the height of 32 km from the earth's surface.

Constituent	*Formula*	*Percentage by Volume*
Nitrogen	N_2	78.08
Oxygen	O_2	20.95
Argon	Ar	0.93
Carbon dioxide	CO_2	0.036
Neon	Ne	0.002
Helium	He	0.0005
Krypto	Kr	0.001
Xenon	Xe	0.00009
Hydrogen	H_2	0.00005

- As per NASA CO2 composition by volume at present is 0.407%.
- The concentration of carbon dioxide in Earth's atmosphere is currently at nearly 412 parts per million (ppm) and rising. This represents a 47 percent increase since the beginning of the Industrial Age, when the concentration was near 280 ppm,
- **Hence option (b) is the correct answer.**

Q 12.B

- **Gerosoppa Falls, also known as Jog Falls, is located in the Shimoga district of Karnataka.** It is one of the highest waterfalls in India, with a height of 253 metres (829 feet). It is a segmented waterfall that, depending on rain and season, becomes a plunge waterfall.
- **The waterfall is formed by the Sharavati River, which originates in the Western Ghats.** It is an important river in Karnataka, flowing towards the west. It flows through the dense forests of the Western Ghats and drops down the rocky cliffs at Jog Falls. The water plunges into a deep green valley and creates a spectacular view. **Hence option (b) is the correct answer.**
- **Other important waterfalls in India-**

Kunchikal Falls	Varahi River
Dhuandhar Falls	Narmada River
Shivanasamudra Falls	Kaveri River
Dudhsagar Falls	Mandovi River

Q 13.C

- **Data embassies**
  - They are a set of servers that store one country's data and are under that country's jurisdiction while being located in another country. **Hence statement 1 is correct.**
  - It is a physical data center of trusted nations that enjoy diplomatic immunity from local laws. **Hence statement 2 is correct.**
  - The government may allow only non-personal datasets to be stored in data embassies.

Q 14.A

- During the southwest monsoon period after having rained for a few days, if rain fails to occur for one or more weeks, it is known as a break in the monsoon. These dry spells are quite common during the rainy season. These breaks in the different regions are due to different reasons:
  - **In northern India, rains are likely to fail if the rain-bearing storms are not very frequent along the monsoon trough or the ITCZ over this region.**
  - Over the west coast, the dry spells are associated with days when winds blow parallel to the coast.
- **Hence option (a) is the correct answer.**

Q 15.B

- **Dry deciduous forest covers vast areas of the country, where rainfall ranges between 70 -100 cm.**
- On the wetter margins, it has a transition to the moist deciduous, while on the drier margins to thorn forests.
- These forests are found in rainier areas of the Peninsula and the plains of Uttar Pradesh and Bihar.

- **In the higher rainfall regions of the Peninsular plateau and the northern Indian plain, these forests have a parkland landscape with open stretches in which teak and other trees interspersed with patches of grass are common.**
- **As the dry season begins, the trees shed their leaves completely** and the forest appears like a vast grassland with naked trees all around.
- **Tendu, palas, amaltas, bel, khair, axlewood, etc. are the common trees of these forests.**
- In the western and southern part of Rajasthan, vegetation cover is very scanty due to low rainfall and overgrazing.
- **Hence, option (b) is the correct answer.**

Q 16.A

- **Recent context:** Paris Club likely to provide financial assurances to IMF on Sri Lanka debt.
  - The Paris Club is a group of mostly western creditor countries that grew from a 1956 meeting in which Argentina agreed to meet its public creditors in Paris.
  - Their objective is to find sustainable debt-relief solutions for countries that are unable to repay their bilateral loans. **Hence, statement 1 is correct.**
  - **All 22 are members of the group called Organisation for Economic Co-operation and Development (OECD).**
  - The **members** are: Australia, Austria, Belgium, Brazil, Canada, Denmark, Finland, France, Germany, Ireland, Israel, Italy, Japan, Korea, Netherlands, Norway, Russian Federation, Spain, Sweden, Switzerland, United Kingdom, United States of America.
  - **It operates on the principles of consensus and solidarity.** Any agreement reached with the debtor country will apply equally to all its Paris Club creditors.
  - A debtor country that signs an agreement with its Paris Club creditors, should not then accept from its non-Paris Club commercial and bilateral creditors such terms of treatment of its debt that are less favourable to the debtor than those agreed with the Paris Club.
  - **India and China are not members.** India acts as an ad-hoc participant. **Hence, statement 2 is not correct.**

Q 17.D

- The **Chilika Lake** is the **largest saltwater lake** in India. It lies in the state of Orissa, to the south of the Mahanadi delta. In 1981, Chilika Lake has designated the first Indian wetland of international importance under the Ramsar Convention.
  It is the largest wintering ground for migratory birds on the Indian sub-continent. The lake is home to a number of threatened species of plants and animals. The lake is an ecosystem with large fishery resources. It sustains more than 150,000 fishers–folk living in 132 villages on the shore and islands. **Hence, statement 1 is not correct.**
- **India's only active volcano** is found on **Barren island** in the **Andaman and Nicobar group of Islands.** The first recorded eruption of the volcano dates back to 1787. Since then, the volcano has erupted more than ten times, with the most recent one being in 2020. The island is a protected area under Barren Island Wild Life Sanctuary. **Hence**, **statement 2 is not correct.**

Q 18.C

- The summer months are a period of excessive heat and falling air pressure in the northern half of the country. Because of the heating of the subcontinent, the ITCZ moves northwards occupying a position centered at 25°N in July.
- In the heart of the ITCZ in the northwest, the dry and hot winds known as 'Loo', blow in the afternoon, and very often, they continue to well into midnight. Dust storms in the evening are very common during May in Punjab, Haryana, Eastern Rajasthan, and Uttar Pradesh.
- Towards the end of summer, there are pre-monsoon showers which are common phenomena in Kerala and coastal areas of Karnataka. Locally, they are known as mango showers since they help in the early ripening of mangoes. These are called mango showers.
- Blossom showers help coffee flowers blossom in Kerala and nearby areas.
- Norwesters are dreaded evening thunderstorms in Bengal and Assam. Their notorious nature can be understood from the local nomenclature of 'Kalbaisakhi', a calamity of the month of Baisakh. These showers are useful for tea, jute, and rice cultivation. In Assam, these storms are known as "Bardoli Chheerha". **Hence, option (c) is the correct answer.**

Q 19.C

- Measurement of Earthquakes is done according to the magnitude or intensity of the shock.
- **Magnitude Scale:**
  - Magnitude is the **amount of energy released** and is based on the direct measurement of the size of seismic waves. The magnitude scale is known as the **Richter Scale. Hence statement 1 is correct.**
  - The Richter magnitude scale was developed in 1935 by Charles F. Richter as a mathematical device to compare the size of earthquakes. The magnitude of an earthquake **is determined from the logarithm of the amplitude of waves recorded by seismographs.**
  - Because of the logarithmic basis of the scale, **each whole number increase in magnitude represents a ten-fold increase in measured amplitude;** as an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value.
- **Intensity Scale:**
  - **The intensity of an earthquake is measured in terms of its effects on human life.** The intensity of an earthquake at a specific location depends on a number of factors the total amount of energy released, the distance from the epicenter, the types of rocks, and the degree of consolidation.
  - **The Mercalli intensity scale is a scale used for measuring the intensity of an earthquake.** The scale quantifies the effects of an earthquake on the Earth's surface, humans, objects of nature, and man-made structures **on a scale of I through XII, with I denoting 'not felt', and XII 'total destruction'. Hence statement 2 is correct.**
  - Data is gathered from individuals who have experienced the quake, and an intensity value will be given to their location.

Q 20.A

- As the summer sets in and the sun shift northwards, the wind circulation over the subcontinent undergoes a complete reversal at both, the lower as well as the upper levels. By the middle of July, the low-pressure belt nearer the surface, **(termed as Inter Tropical Convergence Zone (ITCZ), shifts northwards, roughly parallel to the Himalayas between 20° N and 25° N. Hence statement 1 is correct.**
- By this time, **the westerly jet stream withdraws from the Indian region.** In fact, meteorologists have found an interrelationship between the northward shift of the equatorial trough (ITCZ) and the withdrawal of the westerly jet stream from over the North Indian Plain. **Hence statement 2 is not correct.**
- At the upper level, **an easterly jet stream flows over the southern part of the Peninsula in June and has a maximum speed of 90 km per hour.** In August, it is confined to 15°N latitude, and in September up to 22° N latitude. The easterlies normally do not extend to the north of 30° N latitude in the upper atmosphere. **Hence statement 3 is not correct.**

Q 21.B

- A volcano is a place where gases, ashes and/or molten rock material – lava – escape to the ground. A volcano is called an active volcano if the materials mentioned are being released or have been released out in the recent past.
  - The layer below the solid crust is mantle. It has higher density than that of the crust. The mantle contains a weaker zone called asthenosphere. It is from this that the molten rock materials find their way to the surface.
- Volcanoes are classified on the basis of nature of eruption and the form developed at the surface. Major types of volcanoes are as follows
  - **Shield Volcanoes**
    - ✓ Barring the basalt flows, the shield volcanoes are the largest of all the volcanoes on the earth. The Hawaiian volcanoes are the most famous examples. These volcanoes are mostly made up of basalt, a type of lava that is very fluid when erupted.
    - ✓ For this reason, these volcanoes are not steep. They become explosive if somehow water gets into the vent; otherwise, they are characterised by low-explosivity. The upcoming lava moves in the form of a fountain and throws out the cone at the top of the vent and develops into cinder cone.
  - **Composite Volcanoes**
    - ✓ **These volcanoes are characterised by eruptions of cooler and more viscous lavas than basalt. These volcanoes often result in explosive eruptions. Along with lava, large quantities of pyroclastic material and ashes find their way to the ground. This material accumulates in the vicinity of the vent openings leading to formation of layers, and this makes the mounts appear as composite volcanoes.**

        - Composite volcanoes, also known as stratovolcanoes, are tall, steep-sided volcanoes formed from alternating layers of lava flows, ash, and other volcanic debris. They are characterized by their distinctive conical shape and their explosive eruptions.
        - Some of the features of composite volcanoes are
            - Steep-sided cone shape: Composite volcanoes have a tall, conical shape, with steep sides that can reach up to 30 degrees.
            - Crater: At the summit of the volcano, there is often a bowl-shaped depression called a crater. This is the vent through which lava, ash, and other volcanic materials are ejected during an eruption.
            - Lava flow: Composite volcanoes are typically composed of both explosive eruptions and effusive eruptions, which produce lava flows. The lava flows from these volcanoes can be quite thick and viscous, meaning that they don't travel very far from the vent.
            - Lahars: Composite volcanoes are prone to producing lahars, which are fast-moving mudflows that are triggered by volcanic activity. Lahars can be highly destructive, as they can carry large boulders, trees, and other debris, and can travel many kilometers from the volcano.
    - Caldera
        - ✓ These are the most explosive of the earth's volcanoes. They are usually so explosive that when they erupt they tend to collapse on themselves rather than building any tall structure. The collapsed depressions are called calderas. Their explosiveness indicates that the magma chamber supplying the lava is not only huge but is also in close vicinity.
    - Flood Basalt
        - ✓ Provinces These volcanoes outpour highly fluid lava that flows for long distances. Some parts of the world are covered by thousands of sq. km of thick basalt lava flows. There can be a series of flows with some flows attaining thickness of more than 50 m. Individual flows may extend for hundreds of km.
        - ✓ The Deccan Traps from India, presently covering most of the Maharashtra plateau, are a much larger flood basalt province. It is believed that initially the trap formations covered a much larger area than the present.
    - Mid-Ocean Ridge Volcanoes
        - ✓ These volcanoes occur in the oceanic areas. There is a system of mid-ocean ridges more than 70,000 km long that stretches through all the ocean basins. The central portion of this ridge experiences frequent eruptions.
- **Hence option (b) is the correct answer.**

Q 22.C

- As the monsoon winds approach the Indian subcontinent, their southwesterly direction is modified by the relief and thermal low pressure over northwest India. The monsoon approaches the landmass in two branches: the Arabian Sea branch and the Bay of Bengal branch.
- The monsoon winds originating over the Arabian Sea splits into three branches.
    - Its one branch is obstructed by the Western Ghats. They bring heavy rainfall in the windward side of the Sahyadris and western coastal plains.
    - Another branch of the Arabian sea monsoon strikes the coast north of Mumbai. Moving along the Narmada and Tapi river valleys, these winds cause rainfall in extensive areas of central India.
    - A third branch of this monsoon wind strikes the Saurashtra Peninsula and the Kachchh. It then passes over west Rajasthan and along the Aravalis, causing only a scanty rainfall. **In Punjab and Haryana, it too joins the Bay of Bengal branch. These two branches, reinforced by each other,** cause rains in the **western Himalayas**. **Hence, statement 1 is correct.**
- The Bay of Bengal branch strikes the coast of **Myanmar and part of southeast Bangladesh**. But the Arakan Hills along the coast of Myanmar deflect a big portion of this branch toward the Indian subcontinent. The monsoon, therefore, enters West Bengal and Bangladesh from the south and southeast instead of from the south-westerly direction. **Hence, statement 2 is correct.**

Q 23.B

- The distribution of water on earth is quite uneven. Many locations have plenty of water while others have very limited quantity. The hydrological cycle, is the circulation of water within the earth's hydrosphere in different forms i.e. the liquid, solid and the gaseous phases. It also refers to the continuous exchange of water between the oceans, atmosphere, landsurface and subsurface and the organisms.
- About 71 per cent of the planetary water is found in the oceans. The remaining is held as freshwater in glaciers and icecaps, groundwater sources, lakes, soil moisture, atmosphere, streams and within life.

Nearly 59 per cent of the water that falls on land returns to the atmosphere through evaporation from over the oceans as well as from other places.

- **Distribution of water resources**

Reservoir	*Volume (Million Cubic km)*	*Percentage of the Total*
Oceans	1,370	97.25
Ice Caps and Glaciers	29	2.05
Groundwater	9.5	0.68
Lakes	0.125	0.01
Soil Moisture	0.065	0.005
Atmosphere	0.013	0.001
Streams and Rivers	0.0017	0.0001
Biosphere	0.0006	0.00004

- **Hence option (b) is the correct answer.**

Q 24.B

- **Recent Context:** The Driving Holistic Action for Urban Rivers (DHARA) Conference was organized recently by the National Mission for Clean Ganga (NMCG) and the National Institute of Urban Affairs (NIUA) in Pune.
  - **DHARA is the annual meeting of the members of the River Cities Alliance (RCA).**
  - It provides a platform to co-learn and discuss solutions for managing local water resources.
  - One of the thrust areas of the **Urban 20 (U20) Initiative** is to promulgate urban water security and DHARA 2023 is in sync with U20 as healthy rivers are vital to enhancing overall water security.
- **About River Cities Alliance (RCA)**
  - It is a collaborative effort between the National Mission for Clean Ganga (NMCG) and the National Institute for Urban Affairs (NIUA). **Hence statement 2 is correct.**
  - It is launched by the Ministry of Jal Shakti along with the Ministry of Housing and Urban Affairs.
  - River Cities Alliance started with 30 cities in 2021 and currently has 95 cities as members across India.
  - The Alliance is open to all river cities of India. Any river city can join the Alliance at any time. **Hence statement 1 is not correct.**
  - The Alliance focuses on three broad themes Networking, Capacity Building, and Technical Support.
  - It is a dedicated platform for river cities in India to ideate, discuss and exchange information for sustainable management of Urban Rivers such as:
    - ✓ Minimizing their water footprint,
    - ✓ Reducing impacts on river and water bodies,
    - ✓ Capitalizing on natural, intangible, architectural heritage and associated services and
    - ✓ Develop self-sufficient, self-sustainable water resources through recycling, and reuse strategy.

Q 25.D

- India is known for its herbs and spices from ancient times. Some 2,000 plants have been described in Ayurveda and at least 500 are in regular use. **The World Conservation Union's Red List has named 352 medicinal plants of which 52 are critically threatened and 49 endangered.** The commonly used plants in India are:
  - **Sarpagandha: Used to treat blood pressure; it is found only in India.**
  - **Jamun**: The juice from ripe fruit is used to prepare vinegar, which is carminative and diuretic, and has digestive properties. The powder of the seed is used for controlling diabetes.
  - **Arjun: The fresh juice of leaves is a cure for earache. It is also used to regulate blood pressure.**
  - **Babool: Leaves are used as a cure for eye sores. Its gum is used as a tonic.**
  - **Neem**: Has high antibiotic and antibacterial properties.
  - **Tulsi**: Is used to cure cough and cold.
  - **Kachnar: It is used to cure asthma and ulcers. The buds and roots are good for digestive problems.**
- **Hence, option (d) is the correct answer.**

Q 26.C

- **Karewas** are the thick deposits of glacial clay and other materials embedded with moraines. The **Kashmir Himalayas** are also famous for Karewa formations, which are useful for the cultivation of Zafran, a local variety of saffron. **Hence pair 1 is correctly matched.**
- The extension of the Peninsular plateau can be seen as far as Jaisalmer in the West, where it has been covered by longitudinal sand ridges and crescent-shaped sand dunes called **barchans**. To the northwest of the Aravali hills lies the **Great Indian desert**. It is a land of undulating topography dotted with longitudinal dunes and barchans. This region receives low rainfall below 150 mm per year; hence, it has an arid climate with low vegetation cover. It is because of these characteristic features that this is also known as Marusthali. **Hence pair 2 is not correctly matched.**
- Dehradun is the largest of all the duns with an approximate length of 35-45 km and a width of 22-25 km. In the **Great Himalayan range**, the valleys are mostly inhabited by the Bhotias. These are nomadic groups who migrate to '**Bugyals**' (the summer grasslands in the higher reaches) during the summer months and return to the valleys during winter. The famous 'Valley of flowers' is also situated in this Region. **Hence pair 3 is not correctly matched.**

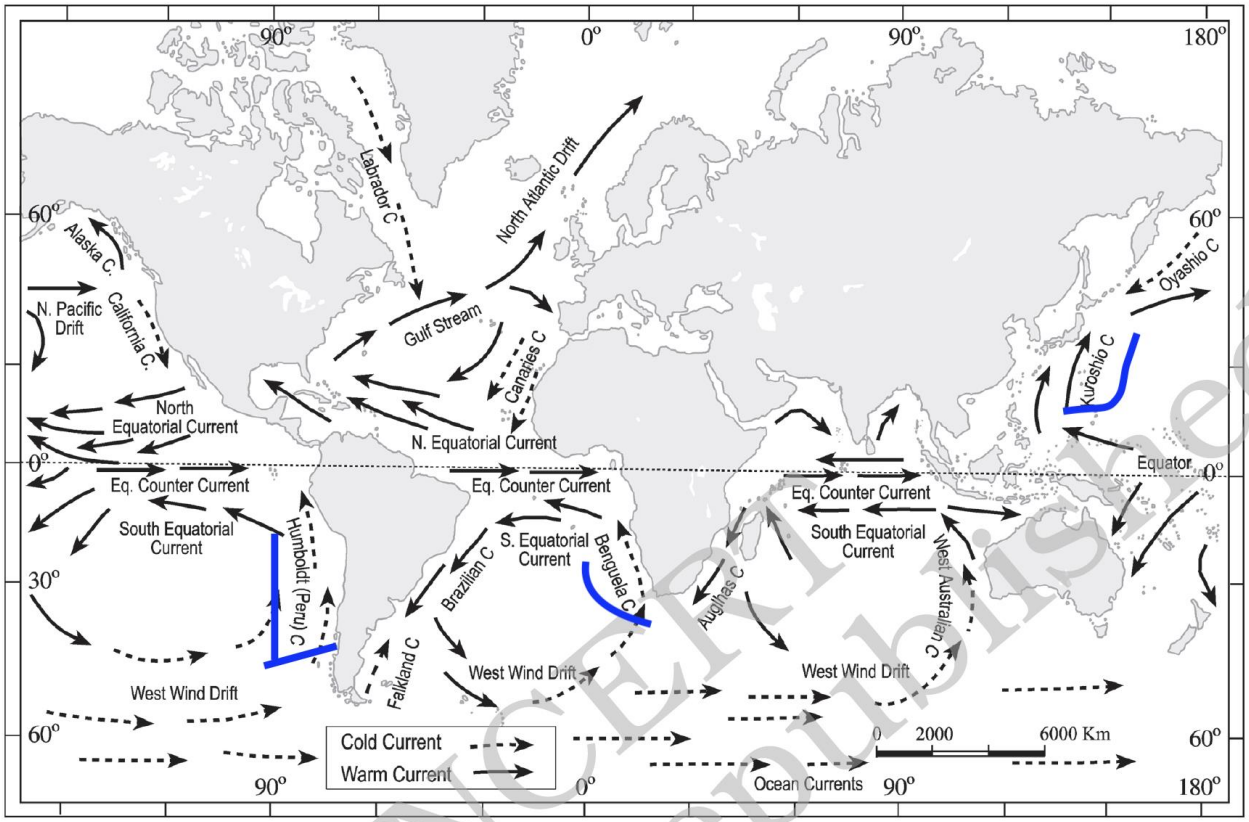
Q 27.B

- Earthquake focus depth is an important factor in shaping the characteristics of the waves and the damage they inflict. The focal depth can be deep (from 300 to 700 km), intermediate (60 to 300 km) or shallow (less than 60 km).
- **Deep focus earthquakes are rarely destructive because the wave amplitude is greatly attenuated by the time it reaches the surface. Hence statement 1 is not correct.**
- Shallow focus earthquakes are more common and are extremely damaging because of their close proximity to the surface.
- **The main seismic belts are as under:**
    - **Circum-Pacific Belt:** The Belt includes the **coastal margins of North America, South America and East Asia.** These are as represent the eastern and western margins of the Pacific Ocean respectively, and account for **about 65 per cent of the total earthquakes of the world. Hence statement 2 is correct.**
        - ✓ The western marginal zones are represented by the Rockies and the Andes mountain chains. These are also the zones of convergent plate boundaries where the Pacific oceanic plate is subducted below the American plates.
        - ✓ The eastern marginal zones are represented by the island arcs of Kamchatka, Sakhalin, Japan and Philippines. The earthquakes are caused due to collision of the Pacific and the Asiatic plates and the consequent volcanic activity. Japan records about 1500 seismic shocks every year.
    - **Mid-Continental Belt:** The Mid-Continental Belt includes the **Alpine mountains and their off shoots in Europe, Mediterranean Sea, northern Africa, eastern Africa and the Himalayas.** The Mid-Continental Belt extends through Sulaiman and Kirthar zones in the west, the Himalayas in the north and Myanmar in the east. This belt represents the weaker zone of Fold Mountains. About 21 per cent of the total seismic events are recorded in this belt.
    - **Mid-Atlantic Ridge Belt:** The Mid-Atlantic Ridge Belt includes the Mid-Atlantic ridge and several islands near the ridge. It records moderate earthquakes which are caused due to the moving of plates in the opposite directions. Thus the seafloor spreading and the fissure type of volcanic eruptions cause earthquakes of moderate intensity in this region.

Q 28.B

- Ocean currents are like river flow in oceans. They represent a regular volume of water in a definite path and direction.
- The ocean currents may be classified based on their depth as surface currents and deep water currents :
    - surface currents constitute about 10 per cent of all the water in the ocean, these waters are the upper 400 m of the ocean
    - deep water currents make up the other 90 per cent of the ocean water.
- These waters move around the ocean basins due to variations in the density and gravity. Deep waters sink into the deep ocean basins at high latitudes, where the temperatures are cold enough to cause the density to increase.
- Ocean currents can also be classified based on temperature: as cold currents and warm currents:
    - **cold currents** bring cold water into warm water areas. These currents are usually found on the west coast of the continents in the low and middle latitudes (true in both hemispheres) and on the east coast in the higher latitudes in the Northern Hemisphere

- **warm currents** bring warm water into cold water areas and are usually observed on the east coast of continents in the low and middle latitudes (true in both hemispheres). In the northern hemisphere they are found on the west coasts of continents in high latitudes.



- The Kuroshio Current, also known as the Black or Japan Current or the Black Stream, is a north-flowing, warm ocean current on the west side of the North Pacific Ocean basin.
- **Hence option (b) is the correct answer.**

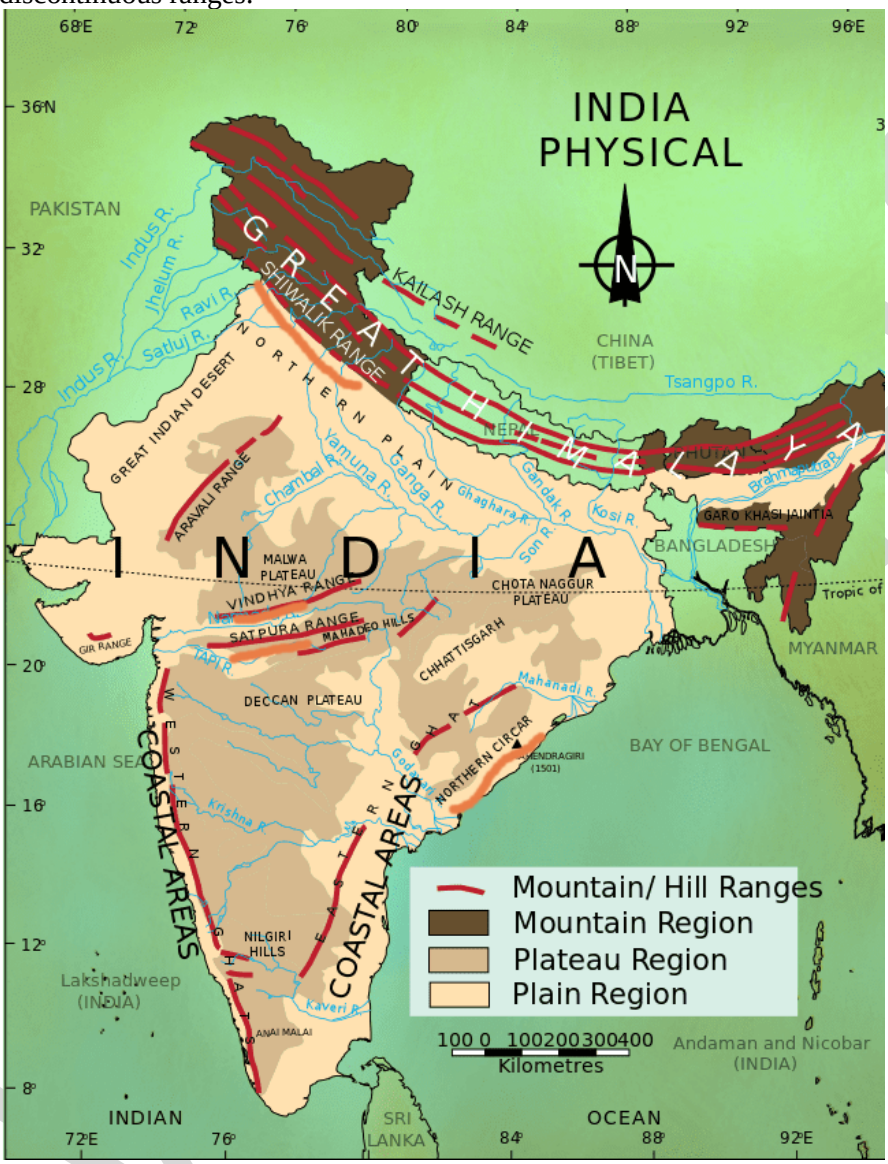
Q 29.D

- Most of the ranges in Northeast India are separated from each other by numerous small rivers. The Barak is an important river in Manipur and Mizoram.
- The physiography of **Manipur** is unique by the presence of a large lake known as '**Loktak' lake** at the center, surrounded by mountains from all sides. **Hence, statement 1 is not correct.**
- **Mizoram** which is also known as the '**Molassis basin**' is made up of soft unconsolidated deposits. Most of the rivers in Nagaland form the tributary of the Brahmaputra. While two rivers of Mizoram and Manipur are the tributaries of the Barak river, which in turn is the tributary of Meghna; the rivers in the eastern part of Manipur are the tributaries of Chindwin, which in turn is a tributary of the Irrawaddy of Myanmar. **Hence, statement 2 is not correct.**
- They are flanked by Nepal Himalayas in the west and Bhutan Himalayas in the east. It is relatively small but is a most significant part of the Himalayas. Known for its fast-flowing rivers such as Tista, it is a region of high mountain peaks like Kanchenjunga (Kanchengiri), and deep valleys.

Q 30.A

- **Siwalik Range**, also called Siwalik Hills or Outer Himalayas, Siwalik also spelled Shiwalik, is the sub-Himalayan range of the northern Indian subcontinent. It extends west-northwestward for more than 1,000 miles (1,600 km) from the Tista River in Sikkim state, northeastern India, through Nepal, across northwestern India, and into northern Pakistan. Though only 10 miles (16 km) wide in places, the range has an average elevation of 3,000 to 4,000 feet (900 to 1,200 meters). It rises abruptly from the plain of the Indus and Ganges (Ganga) rivers (south) and parallels the main range of the Himalayas (north), from which it is separated by valleys. The Siwaliks are sometimes considered to include the southern foothills of the Assam Himalayas, which extend eastward for 400 miles (640 km) across southern Bhutan to the bend of the Brahmaputra River. The range proper, to which the name Siwalik (from Sanskrit, meaning "Belonging to [the God] Shiva") was formerly restricted, is the 200 miles (320 km) of foothills in India extending from the Ganges River at Haridwar, Uttarakhand state, northwestward to the Beas River.

- **Vindhya Range** is a broken range of hills forming the southern escarpment of the central upland of India. From Gujarat state on the west, it extends about 675 miles (1,086 km) across Madhya Pradesh state to abut on the Ganges (Ganga) River valley near Varanasi, Uttar Pradesh. The mountains form the southern edge of the Malwa Plateau and then divide into two branches: the Kaimur Range, running north of the Son River into western Bihar state, and the southern branch, running between the upper reaches of the Son and Narmada rivers to meet the Satpura Range in the Maikala Range (or Amarkantak Plateau).
- The **Satpura Range** is formed by a series of scarped plateaus on the south, generally at an elevation varying between 600-900 m above the mean sea level. This forms the northernmost boundary of the Deccan plateau. It is a classic example of the relict mountains which are highly denuded and form discontinuous ranges.



- **Hence option (a) is the correct answer.**

Q 31.B

- Wind and water are powerful agents of soil erosion because of their ability to remove soil and transport it. Wind erosion is significant in arid and semi-arid regions. In regions with heavy rainfall and steep slopes, erosion by running water is more significant. Water erosion, which is more serious and occurs extensively in different parts of India, takes place mainly in the form of sheet and gully erosion.
- **Sheet erosion takes place on level lands** after a heavy shower, and the soil removal is not easily noticeable. But it is harmful since it removes the finer and more fertile top soil. **Hence statement 2 is not correct.**
- **Gully erosion is common on steep slopes.** Gullies deepen with rainfall, cutting the agricultural lands into small fragments and making them unfit for cultivation. **Hence statement 1 is not correct.**
- A region with a large number of deep gullies or ravines is called a badland. Ravines are widespread in the Chambal basin. Besides this, they are also found in Tamil Nadu and West Bengal. **Hence statement 3 is correct.**

Q 32.A

- A climatic region has a homogeneous climatic condition which is the result of a combination of factors. Temperature and rainfall are two important elements that are considered to be decisive in all the schemes of climatic classification. The classification of climate, however, is a complex exercise. There are different schemes of classification of climate.
- Koeppen based his scheme of Climatic classification on monthly values of temperature and precipitation. **He identified five major climatic types**, namely:
  - Tropical climates, where the mean monthly temperature throughout the year is over 18°C.
  - (Dry climates, where precipitation is very low in comparison to temperature, and hence, dry. If dryness is less, it is semiarid (S); if it is more, the climate is arid(W).
  - Warm temperate climates, where the mean temperature of the coldest month is between 18°C and minus 3°C.
  - Cool temperate climates, where the mean temperature of the warmest month is over 10°C, and the mean temperature of the coldest month is under minus 3°C.
  - Ice climates, where the mean temperature of the warmest month is under 10°C.
- Each type is further subdivided into sub-types on the basis of seasonal variations in the distributional pattern of rainfall and temperature. Koeppen used letter symbols to denote climatic types. He used S for semi-arid and W for arid and the following small letters to define sub-types: f (sufficient precipitation), m (rain forest despite a dry monsoon season), w (dry season in winter), h (dry and hot), c (less than four months with mean temperature over 10°C), and g (Gangetic plain).
- Koeppen divided India into nine climatic regions. **Hence, statement 1 is not correct.**
- The details of Indian climatic regions based on this classification are given in the below table.

Type of Climate	*Areas*
Amw Monsoon with short dry season	West coast of India south of Goa
As – Monsoon with dry summer	Coromandel coast of Tamil Nadu
Aw – Tripical savannah	Most of the Peninsular plateaus, south of the Tropic of Cancer
Bwhw – Semi-arid steppe climate	North-western Gujarat, some parts of western Rajasthan and Punjab
Bwhw – Hot desert	Extreme western Rajasthan
Cwg – Monsoon with dry winter	Ganga plain, eastern Rajasthan, northern Madhya Pradesh, most of North-east India
Dfc – Cold humid winter with short summer	Arunachal Pradesh
E – Polar type	Jammu and Kashmir, Himachal Pradesh and Uttarakhand

- **Hence, statement 2 is correct.**

Q 33.C

- **Recent Context: The Supreme Court said the Constitution does not allow nominated members (aldermen) of a municipality the right to vote in meetings. Hence statement 2 is correct.**
  - "Alderman" refers to a member of a city council or municipal body, with exact responsibilities depending on the location of its usage. It is derived from Old English. **Hence statement 1 is correct.**
- **Historical Linkages**
  - It originally referred to elders of a clan or tribe, though soon it became a term for the king's viceroys, regardless of age.
  - Soon, it denoted a more specific title – "chief magistrate of a county," having both civic and military duties.
  - As time passed, it became particularly associated with guilds with chiefs/leaders being referred to as alderman.
  - In the 12th century CE, as guilds became increasingly associated with municipal governments, the term came to be used for officers of municipal bodies. This is the sense in which it is used to date.
- **The Scenario in Delhi**
  - As per the Delhi Municipal Corporation Act, of 1957, ten people, over the age of 25 can be nominated to the corporation by the administrator (the Lieutenant Governor).
  - These people are expected to have special knowledge or experience in municipal administration. They are meant to assist the house in taking decisions of public importance.

Q 34.D

- The Himalayan ranges show a succession of vegetation from the tropical to the tundra, which changes with altitude.
- **Deciduous forests are found in the foothills of the Himalayas.**
- It is succeeded by the **wet temperate type of forests between an altitude of 1,000-2,000 m.**

- In the higher hill ranges of northeastern India, hilly areas of West Bengal and Uttaranchal, **evergreen broad leaf trees such as oak and chestnut are predominant.**
- Between 1,500-1,750 m, pine forests are also well-developed in this zone, with Chir Pine as a very useful commercial tree.
- Deodar, a highly valued endemic species grows mainly in the western part of the Himalayan range.
- Deodar is a durable wood mainly used in construction activity.
- Similarly, the chinar and the walnut, which sustain the famous Kashmir handicrafts, belong to this zone.
- Blue pine and spruce appear at altitudes of 2,225-3,048 m.
- **At many places in this zone, temperate grasslands are also found.**
- But in the **higher reaches there is a transition to Alpine forests and pastures.**
- Silver firs, junipers, pines, birch and rhododendrons, etc. occur between 3,000-4,000 m.
- However, these pastures are used extensively for transhumance by tribes like the Gujjars, the Bakarwals, the Bhotiyas and the Gaddis.
- The southern slopes of the Himalayas carry a thicker vegetation cover because of relatively higher precipitation than the drier north-facing slopes.
- At higher altitudes, mosses and lichens form part of the tundra vegetation.
- **Hence, option (d) is the correct answer.**

Q 35.B

- Our Solar system consists of eight planets. Out of the eight planets, mercury, venus, earth and mars are called as the inner planets as they lie between the sun and the belt of asteroids the other four planets are called the outer planets.
- Alternatively, the first four are called Terrestrial, meaning earth-like as they are made up of rock and metals, and have relatively high densities. The rest four are called Jovian or Gas Giant planets. Jovian means jupiter-like. Most of them are much larger than the terrestrial planets and have thick atmosphere.
- The difference between terrestrial and jovian planets can be attributed to the following conditions:
  - The terrestrial planets were formed in the close vicinity of the parent star where it was too warm for gases to condense to solid particles. Jovian planets were formed at quite a distant location.
  - The solar wind was most intense nearer the sun; so, it blew off lots of gas and dust from the terrestrial planets. The solar winds were not all that intense to cause similar removal of gases from the Jovian planets.
  - The terrestrial planets are smaller and their lower gravity could not hold the escaping gases.

	Mercury	*Venus*	*Earth*	*Mars*	*Jupiter*	*Saturn*	*Uranus*	*Neptune*
Distance*	0.387	0.723	1.000	1.524	5.203	9.539	19.182	30.058
Density@	5.44	5.245	5.517	3.945	1.33	0.70	1.17	1.66
Radius#	0.383	0.949	1.000	0.533	11.19	9.460	4.11	3.88
Satellites	0	0	1	2	16	about 18	about 17	8

- **Hence option (b) is the correct answer.**

Q 36.C

- **Temperate continental climates (Steppe)** are located in the heart of continents meaning they have **little maritime influence.** Their climate is thus continental with **extremes of temperature** - summers are very warm and winters are very cold. **Hence, statement 1 is correct.**
- **The presence of deciduous trees** is a feature of **Tropical grasslands (short trees and tall grasses)**, whereas, in the steppes, trees are very scarce, because of the scanty rainfall, long droughts, and severe winters. Tall, fresh, and nutritious prairie grass are found, thus, they are often referred to as **'Granaries of the world'. Hence, statement 2 is not correct.**
- **Fohn (Switzerland)** and **Chinook (Canadian praries)** are names of **local winds** that play an influential role in the pastures of temperate grasslands. **Hence, statement 3 is correct.**

Q 37.B

- Cloud is a mass of minute water droplets or tiny crystals of ice formed by the condensation of the water vapour in free air at considerable elevations. As the clouds are formed at some height over the surface of the earth, they take various shapes. According to their height, expanse, density and transparency or opaqueness clouds are grouped under four types :
  - Cirrus
  - Cumulus
  - Stratus
  - Nimbus
- **Cirrus clouds** are formed at high altitudes (8,000 - 12,000m). They are thin and detatched clouds **having a feathery appearance.** They are always white in colour. **Hence statement 1 is correct.**
- **Cumulus clouds look like cotton wool**. They are generally formed at a height of 4,000 - 7,000 m. They exist in patches and can be seen scattered here and there. **They have a flat base. Hence statement 2 is correct.**
- **Stratus clouds are layered clouds covering large portions of the sky**. These clouds are generally formed either due to loss of heat or the mixing of air masses with different temperatures.
- **Nimbus clouds are black or dark gray. They form at middle levels or very near to the surface of the earth. These are extremely dense and opaque to the rays of the sun. Hence statement 3 is not correct.**
  - Sometimes, the clouds are so low that they seem to touch the ground. Nimbus clouds are shapeless masses of thick vapour.
- A combination of these four basic types can give rise to the following types of clouds: high clouds – cirrus, cirrostratus, cirrocumulus; middle clouds – altostratus and altocumulus; low clouds – stratocumulus and nimbostratus and clouds with extensive vertical development – cumulus and cumulonimbus.

Q 38.C

- According to the India State of Forest Report 2021:
- The Total Forest and Tree cover is 24.62% of the geographical area of the country. **Hence statement 1 is correct.**
  - The Total Forest cover is 7,13,789 sq km which is 21.71% of the geographical area of the country.
  - The Tree cover is 2.91% of the geographical area of the country.
- Forest cover: Includes all lands having trees of more than one hectare in an area with a tree canopy density of more than 10%, irrespective of ownership, the legal status of the land, and species composition of trees.
  - **Very Dense Forest**: All lands with tree canopy density of 70% and above. The relative composition of **forest cover under this category is 3.04%.**
  - **Moderately Dense Forest**: All lands with tree canopy density of 40% and more but less than 70%. T**he forest cover under this category is 9.33%.**
  - **Open Forest**: All lands with tree canopy density of 10% and more but less than 40 %. **The forest cover of 9.34% falls under this category. Hence statement 2 is not correct.**
- **Lakshadweep has zero per cent forest area;** Andaman and Nicobar Islands have 86.93 per cent. **Hence statement 3 is correct.**
- Most of the states with less than 10 per cent of the forest area lie in the north and northwestern part of the country.
- These are Rajasthan, Gujarat, Punjab, Haryana and Delhi.

Q 39.B

- **Recent context:** A paper was published by the Indian Academy of Sciences peer-reviewed journal Current Science on the meteorite that fell in Gujarat's Banaskantha district on August 17 last year.
  - It states that it was a rare specimen of an **aubrite** seen in India for the first time since 1852.
- **Diyodar Meteorite** streaked over India, breaking apart as it descended through the air to scatter over two villages in Banaskantha, Gujarat. This is the second recorded crash of an aubrite in India. The last was on December 2, 1852, in Basti, Uttar Pradesh.
- Worldwide, aubrites have crashed in at least 12 locations since 1836, including three in Africa and six in the U.S.
- **Aubrites:** are a type of achondritic (or achondrite) stony meteorite, which means they do not contain chondrules, or small spherical grains of mineral that are common in other types of meteorites. They are named after the Aubres meteorite, which fell in France in 1836 and was the first known example of this type of meteorite.
- **Hence option (b) is the correct answer.**

Q 40.C

- **Soil erosion** refers to the **removal of soil at a greater rate than its replacement by natural agencies.** Topography, rainfall, wind, lack of vegetation cover, land use practices, etc. are the causes of soil erosion.
- **Water erosion** means that **soil particles are detached** either by **splash erosion** (caused by raindrops), or by the **effect of running water.** It is mainly categorized into the **following types:**
  - **Sheet Erosion -** This means when a fairly uniform layer of soil is removed over an entire surface area.
  - **Rill Erosion -** It occurs where water runs in very small channels over the soil surface, with the abrading effect of transported soil particles causing incision of the channels into the soil surface.
  - **Gully Erosion -** It occurs when rills flow together to make larger streams (gully formation).
  - **Bank Erosion -** It is caused by water cutting into the banks of streams and rivers. It can cause large floods and major destruction to property.
- **Hence, option (c) is the correct answer.**

Q 41.B

- There are many different kinds of rocks which are grouped under three families on the basis of their mode of formation. They are:
  - Igneous Rocks — solidified from magma and lava
  - Sedimentary Rocks — the result of deposition of fragments of rocks by exogenous processes
  - Metamorphic Rocks — formed out of existing rocks undergoing recrystallisation
- **Igneous rocks** are classified based on texture. Texture depends upon size and arrangement of grains or other physical conditions of the materials. If molten material is cooled slowly at great depths, mineral grains may be very large.
  - Sudden cooling (at the surface) results in small and smooth grains. Intermediate conditions of cooling would result in intermediate sizes of grains making up igneous rocks.
  - Granite, **gabbro**, pegmatite, basalt, volcanic breccia and tuff are some of the examples of igneous rocks.
- **Depending upon the mode of formation, sedimentary rocks are classified into three major groups:**
  - mechanically formed — sandstone, conglomerate, limestone, shale, loess etc. are examples
  - organically formed— geyserite, chalk, **limestone**, coal etc. are some examples
  - chemically formed — chert, limestone, halite, potash etc. are some examples
- **Metamorphic rocks** are classified into two major groups — foliated rocks and non-foliated rocks. Gneissoid, granite, syenite, slate, schist, **marble**, quartzite etc. are some examples of metamorphic rocks.
- **Hence option (b) is the correct answer.**

Q 42.C

- The northern part of India lies in the sub-tropical and temperate zone and the part lying south of the Tropic of Cancer falls in the tropical zone. The tropical zone being nearer to the equator experiences high temperatures throughout the year with small daily and annual ranges. The area north of the Tropic of Cancer, being away from the equator, experiences an extreme climate with a high daily and annual range of temperature. **Hence, statement 1 is correct.**
- With a long coastline, large coastal areas have an equable climate. Areas in the interior of India are far away from the moderating influence of the sea. Such areas have extremes of climate. That is why the people of Mumbai and the Konkan coast have hardly any idea of extremes of temperature and the seasonal rhythm of weather. On the other hand, the seasonal contrasts in weather at places in the interior of the country such as Delhi, Kanpur, and Amritsar affect the entire sphere of life. **Hence, statement 2 is correct.**

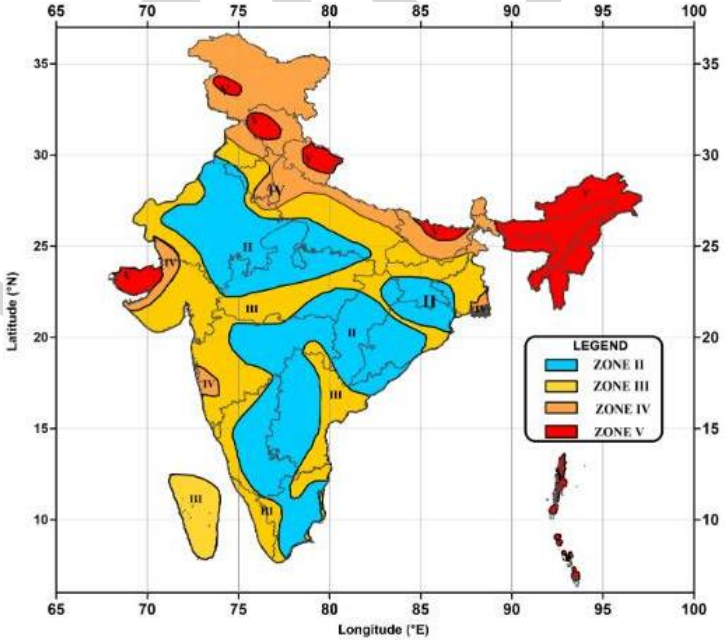
Q 43.D

- **Northern Ireland Protocol: The Northern Ireland Protocol is a post-BREXIT agreement that created a trade border between Northern Ireland and the rest of the United Kingdom (UK).**
  - The protocol was an integral part of the 2019 BREXIT agreement signed between the UK and the European Union (EU).
  - **Under the protocol:**
    - ✓ Northern Ireland remains in the EU single market.
    - ✓ Trade-and-customs inspections of goods coming from Great Britain take place at Northern Ireland ports along the Irish Sea.
- **The United Kingdom (UK) is made up of England, Scotland, Wales, and Northern Ireland. Hence option (d) is the correct answer.**

- Apart from England, These countries have their own devolved governments, each with varying powers.
- **Ireland (also known as the Republic of Ireland) is a sovereign state which is a part of the European Union (EU) and is not a part of the UK.**
- During Brexit Voting, England and Wales voted in favor of exit from the EU. Scotland and Northern Ireland voted in favor of staying in the EU.
- Geographically, the United Kingdom includes the island of Great Britain, the northeastern part of the island of Ireland, and many smaller islands. Northern Ireland is the only part of the United Kingdom that shares a land border with another sovereign state—the Republic of Ireland.

Q 44.D

- **The Indian sub-continent is highly prone to multiple natural disasters including earthquakes,** which is one of the most destructive natural hazards with the potentiality of inflicting huge loss to lives and property. Earthquakes pose a real threat to India with 59% of its geographical area vulnerable to seismic disturbances of varying intensities including the capital city of the country.
- The varying geology at different locations in the country implies that the likelihood of damaging earthquakes taking place at different locations is different. Thus, a seismic zone map is required so that buildings and other structures located in different regions can be designed to withstand the different levels of ground shaking. **The current zone map divides India into four zones – II, III, IV and V.**
- Regions that fall under the Earthquake (seismic) Zones in India
  - **Zone-V covers the entire of northeastern India,** some parts of Jammu and Kashmir, some parts of Ladakh, Himachal Pradesh, Uttarakhand, Rann of Kutch in Gujarat, some parts of North Bihar and Andaman & Nicobar Islands. **Hence statement 2 is not correct.**
  - **Zone-IV** covers the remaining parts of Jammu & Kashmir, Ladakh and Himachal Pradesh, Union Territory of Delhi, Sikkim, northern parts of Uttar Pradesh, Bihar and West Bengal, parts of Gujarat, and small portions of Maharashtra near the west coast and Rajasthan**. The Koyna region of Maharashtra is also in this zone. Hence statement 1 is not correct.**
  - **Zone-III** comprises of Kerala, Goa, Lakshadweep islands, remaining parts of Uttar Pradesh, Gujarat and West Bengal, parts of Punjab, Rajasthan, Madhya Pradesh, Bihar, Jharkhand, Chhattisgarh, Maharashtra, Odisha, Andhra Pradesh, Tamil Nadu and Karnataka. A large part of the country **stretches from the North including some parts of Rajasthan to the South through the Konkan coast, and also the Eastern parts of the country. Hence statement 3 is not correct.**
  - **Zone-II** These two zones are contiguous, covering parts of Karnataka, Andhra Pradesh, Orissa, Madhya Pradesh, and Rajasthan, known as low-risk earthquake zones.



Q 45.B

- **Mammatus clouds**
  - Mammatus is a cellular pattern of pouches hanging underneath the base of a cloud, typically a cumulonimbus raincloud, although they may be attached to other classes of parent clouds. **Hence statement 2 is correct.**

- **How are these formed?**
  - ✓ Mammatus clouds are usually formed in association with large cumulonimbus clouds. Typically, turbulence within the cumulonimbus cloud will cause Mammatus to form. **Hence statement 1 is not correct.**

Q 46.C

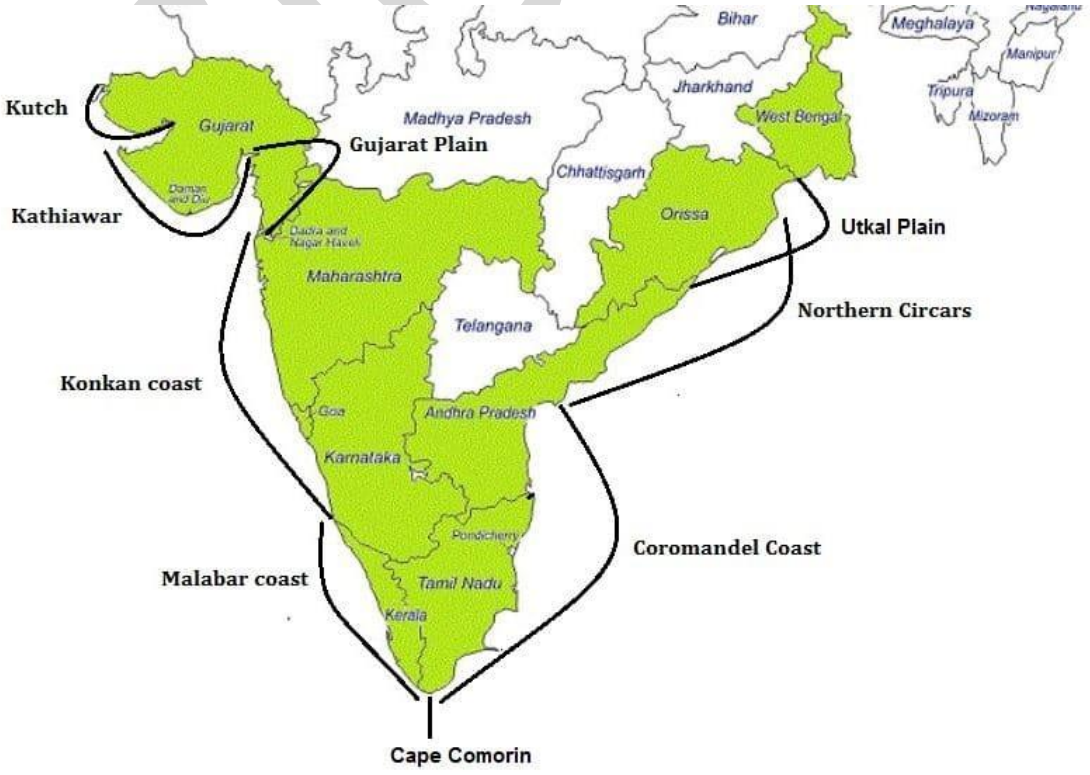
- The earth is composed of various kinds of elements. These elements are in solid form in the outer layer of the earth and in hot and molten form in the interior. About 98 per cent of the total crust of the earth is composed of eight elements like oxygen, silicon, aluminium, iron, calcium, sodium, potassium and magnesium, and the rest is constituted by titanium, hydrogen, phosphorous, manganese, sulphur, carbon, nickel and other elements.
- **Major elements of earth's crust**

Sl. No.	*Elements*	*By Weight(%)*
1.	Oxygen	46.60
2.	Silicon	27.72
3.	Aluminium	8.13
4.	Iron	5.00
5.	Calcium	3.63
6.	Sodium	2.83
7.	Potassium	2.59
8.	Magnesium	2.09
9.	Others	1.41

- The elements in the earth's crust are rarely found exclusively but are usually combined with other elements to make various substances. These substances are recognised as minerals.
- **Hence option (c) is the correct answer.**

Q 47.A

- Extending from the Gujarat coast in the north to the Kerala coast in the south, the west coast may be divided into the following divisions – the **Kachchh and Kathiawar coast** in Gujarat, **Konkan coast** in Maharashtra, **Goan coast** and **Malabar coast** in Karnataka and Kerala respectively.
- The western coastal plains are narrow in the middle and get broader towards the north and south. The rivers flowing through this coastal plain do not form any delta. The **Malabar coast** has got certain distinguishing features in the form of '**Kayals**' (backwaters), which are used for fishing, and inland navigation and also due to its special attraction for tourists. Every year the famous Nehru Trophy Vallamkali (boat race) is held in Punnamada Kayal in Kerala.



- **Hence, option (a) is the correct answer.**

Q 48.C

- The Savanna or Sudan Climate is a transitional type of climate found between the equatorial forests and the trade wind hot deserts. It is **confined within the tropics and is best developed in the Sudan where the dry and wet seasons are most distinct , hence its name the Sudan Climate. Hence statement 1 is correct.**
- The Savanna type of climate is characterized by an alternate hot , rainy season and cool , dry season.
- Days are hot and during the hot season noon temperatures of over 100° F are quite frequent . When night falls the clear sky which promotes intense heating during the day also causes radiation in the night . Temperatures drop to well below 50°F and night frosts are not uncommon at this time of the year.
    - **This extreme diurnal range of temperature is another characteristic feature of the Sudan type of climate. Hence statement 2 is correct.**
- The prevailing winds of the region are the Trade Winds, which bring rain to the coastal districts. They are strongest in the summer but are relatively dry by the time they reach the continental interiors or the western coasts of the continents, so that grass and scattered short trees predominate.

Q 49.D

- **Expunction is the removal of certain words, sentences, or portions of a speech from the records of Parliament by the orders of the Speaker. Hence statement 1 is correct.**
    - Expunction is a fairly routine procedure in the Parliament and is carried out in accordance with laid down rules.
    - **Deciding Authority -** The **Presiding Officer of the House** (Speaker in Lok Sabha under Rule 380) has the discretion to expunge the word or usage. The presiding officer decides which parts of the proceedings will be expunged. **Hence statement 2 is correct.**
    - **Rule 380 of the Rules of Procedure and Conduct of Business in Lok Sabha provides for 'expunction'. Hence statement 3 is correct.**
    - **Unparliamentary Expressions -** The words or expressions that would likely be considered rude or offensive in most cultures and found 'unparliamentary' by Presiding officers over the years.
    - 'Unparliamentary Expressions' is a bulky volume of books published by the Lok Sabha secretariat containing unparliamentary expressions. It also contains content that would appear to be fairly harmless and innocuous.
    - **Basis -** The context in which a word or sentence is used is key to making the decision on whether to expunge.
    - Expunged portions of the proceedings cease to exist in the records of Parliament.
    - They can no longer be reported by media houses, even though they may have been heard during the live telecast of the proceedings.
    - **NOTE:** Under **Article 105(2)** of the Constitution no Member of Parliament shall be liable to any proceedings in any court in respect of anything said in Parliament or any committee thereof. However, the MPs cannot use 'defamatory or indecent or undignified or unparliamentary' words inside the House.

Q 50.B

- The Crust is the outermost solid part of the earth. It is brittle in nature. The thickness of the crust varies under the oceanic and continental areas.
- **Oceanic crust is thinner as compared to the continental crust. The mean thickness of oceanic crust is 5 km whereas that of the continental is around 30 km. Hence statement 1 is not correct.**
- The continental crust is thicker in the areas of major mountain systems. It is as much as 70 km thick in the Himalayan region.
- It is made up of heavier rocks having density of 3 g/cm^3. **This type of rock found in the oceanic crust is basaltic.** The mean density of material in oceanic crust is 2.7g/cm^3. **Hence statement 2 is correct.**

Q 51.B

- Stromboli is an island in the Tyrrhenian Sea, off the north coast of Sicily, containing Mount Stromboli, one of the four active volcanoes in Italy. It is one of the eight Aeolian Islands, a volcanic arc north of Sicily.
- **The volcano has erupted many times and is constantly active with minor eruptions, often visible from many points on the island and from the surrounding sea, giving rise to the island's nickname "Lighthouse of the Mediterranean".**
- Mount Stromboli has been in almost continuous eruption for the past 2,000–5,000 years, its last serious one occurred in 1921. **A pattern of eruption is maintained in which explosions occur at the summit**

craters, with mild to moderate eruptions of incandescent volcanic bombs, a type of tephra, at intervals ranging from minutes to hours. This pattern of Strombolian eruption, as it is known, is also observed at other volcanoes worldwide.

- Eruptions from the summit craters typically result in a few short, mild, but energetic bursts, ranging up to a few hundred meters in height, containing ash, incandescent lava fragments, and stone blocks. Stromboli's activity is almost exclusively explosive, but lava flows do occur at times when volcanic activity is high.
- **Hence option (b) is the correct answer.**
- **Mt. Fuji:** Japan's Mt. Fuji is an active volcano about 100 kilometers southwest of Tokyo. Commonly called "Fuji-san," it's the country's tallest peak, at 3,776 meters.
- **Mount Vesuvius** is a somma-stratovolcano located on the Gulf of Naples in Campania, Italy, about 9 km east of Naples and a short distance from the shore. It is one of several volcanoes forming the Campanian volcanic arc.
- **Chimborazo** is a currently inactive stratovolcano in the Cordillera Occidental range of the Andes. Its last known eruption is believed to have occurred around 550 A.D. Chimborazo's summit is the farthest point on the Earth's surface from the Earth's center, given that it is located along the planet's equatorial bulge.

Q 52.B

- Climate plays a major influence in governing the rate and type of soil formation, particularly through precipitation in terms of its intensity, frequency, and duration; and temperature in terms of seasonal and diurnal variations.
- **The soil of the hot tropical regions shows deeper profiles** as **compared to the soils of the cold tundra regions.** Although the leaf fall in tropical forests is great, much of this is consumed and translocated down the soil profile. **Hence, statement 1 is not correct.**
- The effect of temperature is to influence the rate of chemical and biological reactions. **In cool climates, bacterial action is relatively slow while in the tropics, bacteria thrive. Hence, statement 2 is correct.**

Q 53.D

- The Importance of Temperature
  - Temperature influences the actual amount of water vapour present in the air and thus decides the moisture-earning capacity of the air.
  - It decides the rate of evaporation and condensation. and therefore governs the degree of stability of the atmosphere.
  - As relative humidity is directly related to the temperature of the air, it affects the nature and types of cloud formation and precipitation.
- **Factors Influencing Temperature**
  - **Latitude**
    - ✓ Due to the earths inclination, the mid-day sun is almost overhead within the tropics but the sun's rays reach the earth at an angle outside the tropics. Temperature thus diminishes from equatorial regions to the poles.
  - **Altitude**.
    - ✓ Since the atmosphere is mainly heated by conduction from the earth, it can be expected that places nearer to the earths surface are warmer than those higher up. Thus temperature decreases with increasing height above sea level. This rate of decrease with altitude (lapse rate) is never constant, varying from place to place and from season to season.
  - **Continentality**
    - ✓ Land surfaces are heated more quickly than water surfaces, because of the higher specific heat of water. In other words, it requires only one-third as much energy' to raise the temperature of a given volume of land by 1 °F as it does for an equal volume of water. This accounts for the warmer summers, colder winters and greater range of temperature of continental interiors as compared with maritime districts.
  - **Ocean currents and winds**
    - ✓ Both ocean currents and winds affect temperature by transporting their heat or coldness into adjacent regions. Ocean currents like the Gulf Stream or the North Atlantic Drift warm the coastal districts of western Europe keeping their ports ice-free.
  - **Slope, shelter and aspect.**
    - ✓ A steep slope experiences a more rapid change in temperature than a gentle one. Mountain ranges that have an eastwest alignment like the Alps show a higher temperature on the south-facing 'sunny slope' than the northfacing 'sheltered slope'.

- Natural vegetation and soil.
  - ✓ There is a definite difference in temperature between forested regions and open ground. The thick foliage of the Amazon jungle cuts off much of the in-coming insolation and in many places sunlight never reaches the ground. It is, in fact, cool in the jungle and its shade temperature is a few degrees lower than that of open spaces in corresponding latitudes.
- **Hence option (d) is the correct answer.**

Q 54.B

- An earthquake in simple words is shaking of the earth. **It is caused due to release of energy, which generates waves that travel in all directions.**
- The release of energy occurs along a fault. A fault is a sharp break in the crustal rocks. Rocks along a fault tend to move in opposite directions. As the overlying rock strata press them, the friction locks them together. However, their tendency to move apart at some point of time overcomes the friction. As a result, the blocks get deformed and eventually, they slide past one another abruptly. This causes dissipation of energy, and the energy waves travel in all directions.
- **Types of Earthquakes:**
  - **Tectonic Earthquakes:** These are generated **due to sliding of rocks along a fault plane.** This movement causes imbalance in the crustal rocks which results in earthquakes of varying magnitude, depending upon the nature of dislocation in the rock strata.
  - **Volcanic Earthquakes:** Volcanic activity is considered to be one of the main causes of earthquakes. In fact, volcanic activity and seismic events are so intimately related to each other that they become cause and effect for each other. **Each volcanic eruption is followed by an earthquake and many of the severe earthquakes can cause volcanic eruptions.**
  - **Collapse Earthquakes:** In areas of **intense mining activity,** sometimes the roofs of underground mines collapse causing minor tremors.
  - **Explosion Earthquakes:** Ground shaking may also occur due to the **explosion of chemical or nuclear devices.**
  - **Reservoir induced seismicity:** The earthquakes that occur in the areas of large reservoirs are referred to as **reservoir induced earthquakes.**
- **Hence option (b) is the correct answer.**

Q 55.C

- **Recent Context: On the back of the Hindenburg revelations, many of Adani Group companies' stocks have hit the lower circuits in subsequent trading sessions.**
- The term "circuit breaker refers" to an **emergency-use regulatory measure that temporarily halts trading on an exchange. Hence statement 1 is correct.**
- Circuit breakers function automatically by stopping trading when prices hit predefined levels in exchanges around the world.
  - Circuit breakers are triggered to stop the sell-off by stockholders. They curb panic-selling of stocks and prevent markets from crashing.
- **Effectively,** circuit-breakers **cap how much the value of a stock can fall in a single day/trading session. Hence statement 2 is correct.**
- These circuit breakers bring about a coordinated trading halt in all equity and equity derivative markets nationwide, when triggered.
- **Method** - The Stock Exchange computes the Index circuit breaker limits on a daily basis based on the previous day's closing level of the index.
  - This index-based market-wide circuit breaker system applies at all 3 stages of the index movement, at 10%, 15% and 20%.

Q 56.C

- **Recent Context:** Apple is reportedly working on a new display technology called micro LEDs, which is considered the next big thing in the display industry.
  - MicroLED is **a self-illuminating diode** that has brighter and better color reproduction than Organic Light Emitting Diode (OLED) display technology. **Hence statement 1 is correct.**
  - **Principle:** The **basis of microLED technology is sapphires, which can shine on their own forever. Hence statement 2 is correct.**
  - A microLED screen is filled with such small but strong light.
  - The picture in a microLED screen is generated by several individual light-emitting diodes.
  - **Working:** Each of these micro LEDs are semiconductor that receives electrical signals.

- Once these micro LEDs are gathered, they form a module. Several modules are then combined to form screens.
- **Advantages:** MicroLED displays are brighter, have better color reproduction, and provide better viewing angles.
- MicroLEDs are resolution-free, bezel-free, ratio-free, and even size-free.
- They have limitless scalability and the screen can be freely resized in any form for practical usage.
- In addition to being self-emissive, MicroLEDs also individually produce red, green, and blue colors without needing the same backlighting or color filters as conventional displays.

- **OLED Displays**
  - In this, each pixel has its own lighting, so this is an emissive technology.
  - This allows the screen to have granular control over, which pixel is supposed to show more light and which one is not.
  - OLEDs typically have a better contrast ratio compared to LCDs.

Q 57.C

- EI-Nino is a complex weather system that appears once every three to seven years, bringing drought, floods, and other weather extremes to different parts of the world.
- The system involves oceanic and atmospheric phenomena with the appearance of warm currents off the coast of Peru in the Eastern Pacific and affects weather in many places including India. EI-Nino is merely an extension of the warm equatorial current which gets replaced temporarily by the cold Peruvian current or Humbolt current. This current increases the temperature of the water on the Peruvian coast by 10°C. **Hence, statement 1 is correct.**
- **This results in:**
  - the distortion of equatorial atmospheric circulation
  - irregularities in the evaporation of seawater
  - reduction in the amount of plankton which further reduces the number of fish in the sea. **Hence, statement 2 is not correct.**
- The word EI-Nino means 'Child Christ' because this current appears around Christmas in December. December is a summer month in Peru (Southern Hemisphere).
- EI-Nino is used in India for forecasting long-range monsoon rainfall. In 1990-91, there was a wild EI-Nino event and the onset of the southwest monsoon was delayed over most parts of the country ranging from five to twelve days. Trade winds coming from South America normally blow westward towards Asia during Southwest Monsoon. Warming of the Pacific Ocean results in the weakening of these winds. Therefore, moisture and heat content get limited and result in the reduction and uneven distribution of rainfall across the Indian subcontinent. **Hence, statement 3 is correct.**

Q 58.C

- **Recent Context**: Aadi Mahotsav, the mega National Tribal Festival at Major Dhyan Chand National Stadium in Delhi.
  - It is an annual initiative of the Tribal Cooperative Marketing Development Federation Limited (TRIFED) under the Ministry of Tribal Affairs.
  - Many tribal crafts, dances etc were displayed.
- **Longpi (Nungbi) Pottery: Manipur. Hence pair 1 is not correctly matched.**
  - It i**s black earthenware crafted by Tangkhul tribe of Manipur** who resides in Nungbi village.
  - The technique of this art is said to be handed down from the Neolithic period.
  - A unique feature of this craft is that it is crafted without a potter's wheel.
  - Clay and black rock are the two main ingredients used for this craft.
  - Basically a male-oriented handicraft, this craft requires a high degree of skill and attention.
- **Dhokra Craft: Chhattisgarh. Hence pair 2 is correctly matched.**
  - Exquisite dull gold figurines and objects de art are crafted **in the Bastar & Raigarh region of Chhattisgarh** out of bell metal, brass, and bronze.
  - The Ghadwas of Bastar and Jharas of Raigarh practice the dhokra art with lost wax technique or hollow casting. It involves intricately patterning a clay core with wax ribbons and then coating it carefully with a mix of clay and hay.
  - The wax is subsequently melted off and the cavity formed is filled with molten metal. When this solidifies, the craftsman reveals the beauty of his creation by cautiously breaking open the outer clay shell.
- **Pattachitra paintings: Odisha. Hence pair 3 is correctly matched.**
  - Pattachitra is a picture painted on a piece of cloth.
  - This form of art is closely related to the cult of Shri Jagannath and the temple traditions in Puri.

- It is believed to have originated as early as the 12th century. Some of the popular themes represented through this art form are Thia Badhia– a depiction of the temple of Jagannath; Krishna Lila – an enactment of Jagannath as Lord Krishna displaying his powers as a child; Dasabatara Patti – the ten incarnations of Lord Vishnu; Panchamukhi – depiction of Lord Ganesh as a five-headed deity.
- Most of the materials used in this painting are natural substances.
- A floral border is a must around the paintings, and so is the use of natural colors.
- The paintings are executed primarily in profile with elongated eyes, as well.
- With the use of such prominent solid shades, the paintings end up depicting stark emotional expressions with great detail.

Q 59.C

- **The major hot deserts of the world** are located on the **western coasts of the continents** between latitudes **15 and 30 degrees north and south.**
- The aridity of the hot deserts is mainly due to the **effects of off-shore Trade Winds**, hence they are also called **Trade wind Deserts. Hence, option 1 is not correct.**
- The **mid-latitude deserts** are mainly found on plateaux and at a **considerable distance from the sea** (location in interior continental location). **Hence, option 2 is correct.**
- Deserts like the **Patagonian desert** are more due to their **rain-shadow position on the leeward side** of the lofty Andes than to continentality. **Hence, option 3 is correct.**

Q 60.A

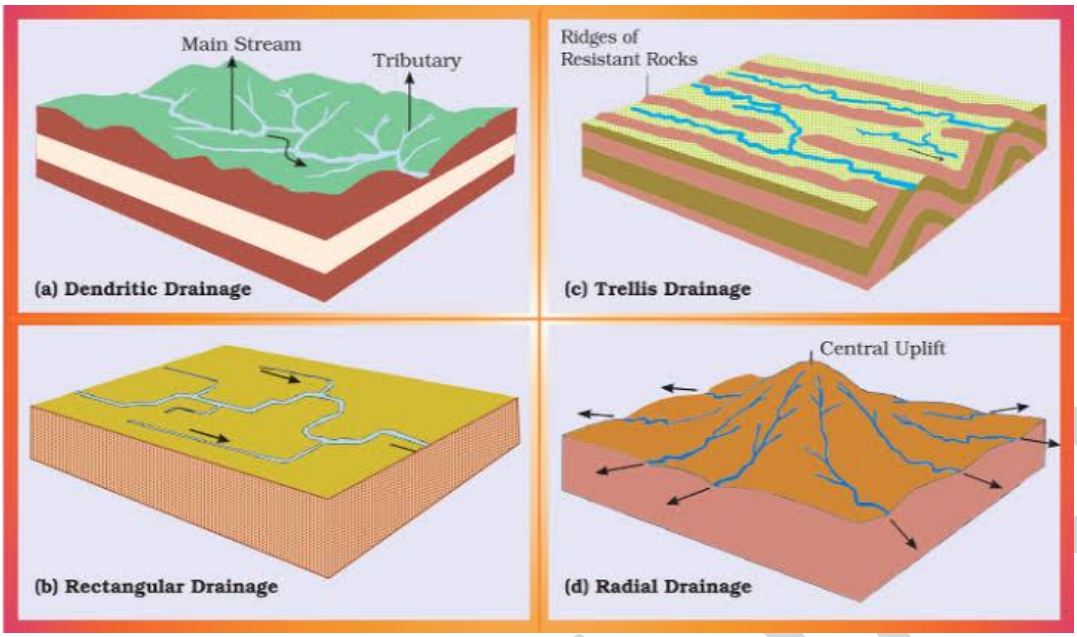
- **Google's Bard**
  - **Bard is Google's own conversational articficial intelligence (AI) chatbot. Hence option (a) is the correct answer.**
  - Bard is based on Google's AI model, Language Model for Dialogue Application or Lambda.
  - Google introduced LaMDA in 2021 as its generative language model for dialogue applications which can ensure that the Google Assistant would be able to converse on any topic.
  - Bard is an experimental conversational AI service that draws on information from the web to provide fresh, high-quality responses.
  - Bard will give in-depth, conversational and essay-style answers just like ChatGPT does right now.
  - Technology - Bard is built on Transformer technology, which is also the backbone of ChatGPT and other AI bots.
  - **Transformer technology** is a neural network architecture, which is capable of making predictions based on inputs. It is primarily used in natural language processing and computer vision technology.
- **Voice Deepfakes**
  - A voice deepfake is one that closely mimics a real person's voice.
  - The voice can accurately replicate tonality, accents, cadence, and other unique characteristics of the target person.
  - Creating deepfakes needs high-end computers with powerful graphics cards, leveraging cloud computing power.
  - AI can use this data to render an authentic-sounding voice, which can then be used to say anything.
  - Attackers are using such technology to defraud users, steal their identity, and to engage in various other illegal activities like phone scams and posting fake videos on social media platforms.
  - **OpenAI's Vall-e, My Own Voice, Resemble, Descript, ReSpeecher, and iSpeech are some of the tools that can be used in voice cloning.**
  - Detecting voice deepfakes needs highly advanced technologies, software, and hardware to break down speech patterns, background noise, and other elements.

Q 61.B

- The flow of water through well-defined channels is known as 'drainage' and the network of such channels is called a 'drainage system'. The drainage pattern of an area is determined by the geological time period, nature and structure of rocks, topography, slope, amount of water flowing, and periodicity of the flow.
- Some of the important drainage patterns are:
- **Dendritic:** The drainage pattern resembling the branches of a tree is known as "dendritic," the examples of which are the rivers of the northern plain. It develops where the river channel follows the slope of the terrain. **Hence statement 1 is not correct.**
- **Radial:** When the rivers originate from a hill and flow in all directions, the drainage pattern is known as "radial." The rivers originating from the Amarkantak range present a good example of it. **Hence statement 2 is correct.**
- **Trellis:** When the primary tributaries of rivers flow parallel to each other and secondary tributaries join them at right angles, the pattern is known as a "trellis." It develops where hard and soft rocks exist parallel

to each other. The right bank tributaries of the Brahmaputra River make a trellis pattern, while the left bank tributaries exhibit a dendritic pattern.

- **Centripetal:** When the rivers discharge their waters from all directions into a lake or depression, the pattern is known as "centripetal." It is the reverse of radial and occurs in areas of karst topography.



Q 62.B

- Biodiversity Heritage Sites are areas that are unique, ecologically fragile ecosystems having a rich biodiversity.
  - Under **Biological Diversity Act (BDA) 2002**, the State Governments are empowered to notify BHS, in consultation with 'local bodies', of areas of biodiversity importance as Biodiversity Heritage Sites. **Hence, statement 1 is not correct.**
  - There are 36 BHS in India, Mahendragiri hill (Odisha) is the last BHS added in 2022.
- **Yaya Tso recently was proposed to be made Ladakh's first biodiversity heritage site. Hence, statement 2 is correct.**
  - Yaya Tso is a nesting habitat for a large number of birds and animals, such as the bar-headed goose, black-necked crane, and brahminy duck, adding it also has the distinction of being one of the highest breeding sites of the black-necked crane in India.

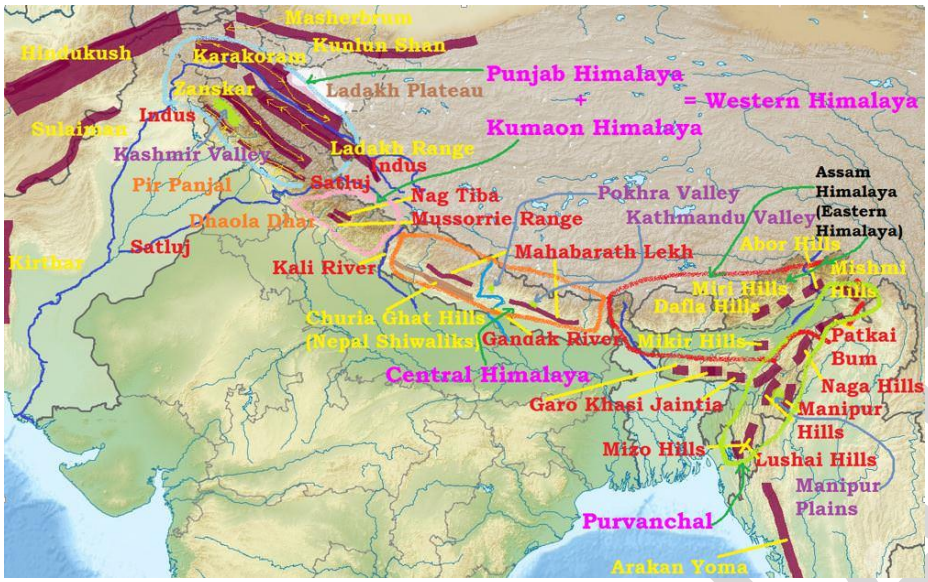
Q 63.C

- Usually, the cold weather season sets in by mid-November in northern India. December and January are the coldest months in the northern plain. The mean daily temperature remains below 21°C over most parts of northern India. The night temperature may be quite low, sometimes going below freezing points in Punjab and Rajasthan.
- There are three main reasons for the excessive cold in north India during this season:
  - States like Punjab, Haryana, and Rajasthan are far away from the moderating influence of sea experience continental climate.
  - The snowfall in the nearby Himalayan ranges creates a cold wave situation; and
  - Around February, the cold winds coming from the Caspian Sea and Turkmenistan (not Tibetan Plateau) bring cold waves along with frost and fog over the northwestern parts of India.
- **The Tibetan plateau impacts the monsoon season in India by acting as a heat engine and initiating monsoons. The vast Himalayan mountain range acts as a tall barrier, preventing cold, dry air in the northern latitudes from entering the subcontinent. Excessive cold over North India in the month of December-January is not impacted by the Tibetan plateau. Hence, option (c) is the correct answer.**

Q 64.D

- Besides the longitudinal divisions, the Himalayas have been divided on the basis of regions from west to east. These divisions have been demarcated by river valleys.
- For example, the part of the Himalayas lying between the Indus and Satluj has been traditionally known as **Punjab Himalaya** but it is also known regionally as Kashmir and Himachal Himalaya from west to east respectively. **Hence, statement 1 is correct.**

- The part of the Himalayas lying between the Satluj and Kali rivers is known as **Kumaon Himalayas**. **Hence, statement 2 is correct.**
- The Kali and Tista rivers demarcate the Nepal Himalayas and the part lying between Tista and Dihang rivers is known as **Assam Himalayas**. **Hence, statement 3 is correct.**



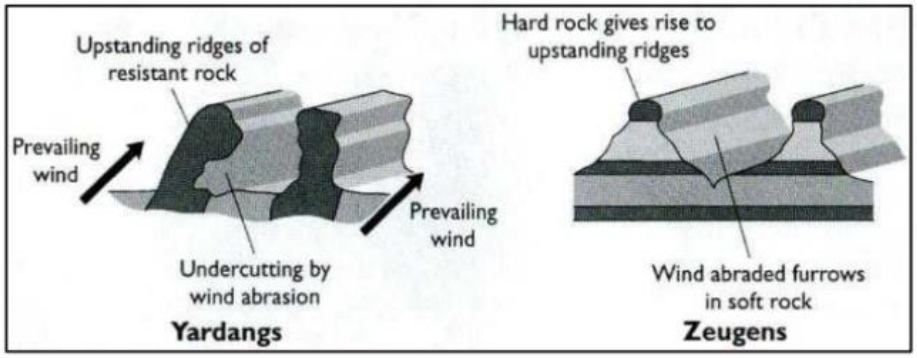
Q 65.A

- According to the variations in relief features, the Northern plains can be divided into four regions. The rivers, after descending from the mountains deposit pebbles in a narrow belt of about 8 to 16 km in width lying parallel to the slopes of the Shiwaliks. It is known as **bhabar**. All the streams disappear in this bhabar belt. **Hence, statement 1 is correct.**
- South of this belt, the streams and rivers re-emerge and create a wet, swampy, and marshy region known as **terai**. This was a thickly forested region full of wildlife. The forests have been cleared to create agricultural land and to settle migrants from Pakistan after the partition.
- The largest part of the northern plain is formed of older alluvium. They lie above the flood plains of the rivers and present a terrace-like feature. This part is known as **bhangar**. **Hence, statement 2 is not correct.**
    - The soil in this region contains calcareous deposits locally known as **kankar**. The newer, younger deposits of the flood plains are called **khadar**. They are renewed almost every year and so are fertile, thus, ideal for intensive Agriculture. **Hence, statement 3 is not correct.**

Q 66.B

- The wind though not the most effective agent of erosion , transportation and deposition, is more efficient in arid than in humid regions. Since there is little vegetation or moisture to bind the loose surface materials, the effects of wind erosion are almost unrestrained.
- Wind erosion is carried out in the following ways
    - Deflation
    - Abrasion
    - Attrition
- **Landforms of Wind Erosion in Deserts**
    - Rock pedestals or mushroom rocks.
        - ✓ The sand blasting effect of winds against any projecting rock masses wears back the softer layers so that an irregular edge is formed on the alternate bands of hard and soft rocks. Grooves and hollows are cut in the rock surfaces, carving them into fantastic and grotesque looking pillars called rock pedestals. This process of under cutting produces rocks of mushroom shape called mushroom rocks or gour in the Sahara
    - **Zeugen.**
        - ✓ **These are tabular masses which have a layer of soft rocks lying beneath a surface layer of more resistant rocks. The sculpting effects of wind abrasion wear them into a weird-looking 'ridge and furrow' landscape.**
        - ✓ Mechanical weathering initiates their formation by opening up joints of the surface rocks. Wind abrasion further 'eats' into the under lying softer layer so that deep furrows are developed.
        - ✓ The hard rocks then stand above the furrows as ridges or zeugen and many even overhang. Such tabular blocks of zeugen may stand 10 to 100 feet above the sunken furrows.

- Yardangs.
  - ✓ Quite similar to the 'ridge and furrow' landscape of zeugen are the steep-sided yardangs. Instead of lying in horizontal strata upon one another, the hard and soft rocks of yardangs are vertical bands and are aligned in the direction of the prevailing winds.



- **Mesas and buttes.**
  - ✓ **It is a flat, table-like land mass with a very resistant horizontal top layer, and very steep sides. The hard stratum on the surface resists denudation by both wind and water, and thus protects the underlying layers of rocks from being eroded away. Mesas may be formed in canyon regions e.g. Arizona, or on fault blocks e.g. the Table Mountain of Cape Town, South Africa.**
- Inselberg.
  - ✓ This is a German word meaning island-mountain'. They are isolated residual hills rising abruptly from the level ground. They arc characterised by their very steep slopes and rather rounded tops.

- Barchans are crescent or moon shaped dunes which occur individually or in groups They are live dunes which advance steadily before winds that come from a particular prevailing direction . They are most prevalent in the deserts of Turkestan and in the Sahara .
  - Barchans are initiated probably by a chance accumulation of sand at an obstacle, such as a patch of grass or a heap of rocks. They occur transversely to the wind , so that their horns thin out and become lower in the direction of the wind due to the reduced frictional retardation of the winds around the edges.
  - The windward side is convex and gently-sloping while the leeward side, being sheltered , is concave and sleep
  - **These are depositional landforms due to wind action.**
- **Hence option (b) is the correct answer.**

Q 67.B

- The Western Ghats, which run close to the western coast, serve as a water divide between the major Peninsular rivers, which discharge their water into the Bay of Bengal, and the small rivulets joining the Arabian Sea.
  - **Most of the major Peninsular rivers except Narmada and Tapi flow from west to east.**
- The rivers flowing towards the Arabian Sea have short courses. **The Sharavati is one such river, which originates in the Shimoga district of Karnataka and drains a catchment area of 2,209 sq. km. The total length of the river is around 128 km, and it joins the Arabian Sea at Honnavar in Uttara Kannada district.**
  - On its way, the Sharavati forms the Jog Falls, where the river falls from a height of 253 metres.
- **The Narmada originates on the western flank of the Amarkantak plateau.** Flowing in a rift valley between the Satpura in the south and the Vindhyan range in the north, it forms a picturesque gorge in marble rocks and the Dhuandhar waterfall near Jabalpur. After flowing a distance of about 1,312 km, it meets the Arabian sea south of Bharuch, forming a broad 27 km long estuary.
- There are a number of small rivers that join the Bay of Bengal. **The Subarnrekha, the Baitarni, the Brahmani, the Vamsadhara, the Penner, the Palar, and the Vaigai are important east flowing rivers.**
- **Hence option (b) is the correct answer.**

Q 68.A

- In humid regions, which receive heavy rainfall running water is considered the most important of the geomorphic agents in formation of landforms.
- **Erosional Landforms**

- **Valleys**
  - ✓ **Valleys start as small and narrow rills; the rills will gradually develop into long and wide gullies; the gullies will further deepen, widen and lengthen to give rise to valleys.**
  - ✓ Depending upon dimensions and shape, many types of valleys like V-shaped valley, gorge, canyon, etc. can be recognised. A gorge is a deep valley with very steep to straight sides and a canyon is characterised by steep steplike side slopes and may be as deep as a gorge.
  - ✓ A gorge is almost equal in width at its top as well as its bottom. In contrast, a canyon is wider at its top than at its bottom. In fact, a canyon is a variant of gorge. Valley types depend upon the type and structure of rocks in which they form.
- **Potholes and Plunge Pools**
  - ✓ Over the rocky beds of hill-streams more or less circular depressions called potholes form because of stream erosion aided by the abrasion of rock fragments. Once a small and shallow depression forms, pebbles and boulders get collected in those depressions and get rotated by flowing water and consequently the depressions grow in dimensions.
  - ✓ **A series of such depressions eventually join and the stream valley gets deepened. At the foot of waterfalls also, large potholes, quite deep and wide, form because of the sheer impact of water and rotation of boulders. Such large and deep holes at the base of waterfalls are called plunge pools.**
- Incised or Entrenched Meanders
  - ✓ In streams that flow rapidly over steep gradients, normally erosion is concentrated on the bottom of the stream channel. Also, in the case of steep gradient streams, lateral erosion on the sides of the valleys is not much when compared to the streams flowing on low and gentle slopes.
  - ✓ Because of active lateral erosion, streams flowing over gentle slopes, develop sinuous or meandering courses. It is common to find meandering courses over floodplains and delta plains where stream gradients are very gentle. But very deep and wide meanders can also be found cut in hard rocks. Such meanders are called incised or entrenched meanders.
- River Terraces
  - ✓ River terraces are surfaces marking old valley floor or floodplain levels. They may be bedrock surfaces without any alluvial cover or alluvial terraces consisting of stream deposits.
  - ✓ River terraces are basically products of erosion as they result due to vertical erosion by the stream into its own depositional floodplain. There can be a number of such terraces at different heights indicating former river bed levels. The river terraces may occur at the same elevation on either side of the rivers in which case they are called paired terraces.

- **Depositional landforms**
  - Alluvial Fans
    - ✓ Alluvial fans are formed when streams flowing from higher levels break into foot slope plains of low gradient. Normally very coarse load is carried by streams flowing over mountain slopes. This load becomes too heavy for the streams to be carried over gentler gradients and gets dumped and spread as a broad low to high cone shaped deposit called alluvial fan.
    - ✓ Usually, the streams which flow over fans are not confined to their original channels for long and shift their position across the fan forming many channels called distributaries. Alluvial fans in humid areas show normally low cones with gentle slope from head to toe and they appear as high cones with steep slope in arid and semi-arid climates.
  - Deltas
    - ✓ Deltas are like alluvial fans but develop at a different location. The load carried by the rivers is dumped and spread into the sea. If this load is not carried away far into the sea or distributed along the coast, it spreads and accumulates as a low cone.
    - ✓ Unlike in alluvial fans, the deposits making up deltas are very well sorted with clear stratification. The coarsest materials settle out first and the finer fractions like silts and clays are carried out into the sea. As the delta grows, the river distributaries continue to increase in length and delta continues to build up into the sea.
  - Floodplains, Natural Levees and Point Bars
    - ✓ Deposition develops a floodplain just as erosion makes valleys. Floodplain is thus a major landform of river deposition.
    - ✓ **Natural levees and point bars** are some of the important landforms found associated with floodplains.
    - ✓ **Natural levees** are found along the banks of large rivers. They are low, linear and parallel ridges of coarse deposits along the banks of rivers, quite often cut into individual mounds.

- ✓ **Point bars are also known as meander bars. They are found on the concave side of meanders of large rivers and are sediments deposited in a linear fashion by flowing waters along the bank. They are almost uniform in profile and in width and contain mixed sizes of sediments.**

- **Hence option (a) is the correct answer.**

Q 69.A

- **Recent context:** PlayStation VR2 has recently launched with dozens of games.
  - The term virtual reality refers to a **computer-generated, three-dimensional environment. It is a fully digital experience that can either stimulate or differ completely from the real world. Hence statement 1 is correct.**
  - In order to experience and interact with virtual reality, **you'll need the proper equipment, like a pair of VR glasses or a headset. Hence statement 2 is not correct.**
  - Some examples of VR include experiences generated by gadgets such as Oculus Rift and Samsung Gear VR. Hence, option (c) is the correct answer.
- **Augmented Reality (AR)** does not create a new reality, but it overlays digital images onto the real world with the help of a device like a mobile phone or tablet.
  - Examples include Instagram filters and Snapchat's lenses.
- **The distinctions between VR and AR come down to the devices they require and the experience itself**:
  - AR uses a real-world setting to augment the user's experience while VR is completely virtual;
  - AR users can control their presence in the real world; VR users are controlled by the system;
  - **VR requires a headset device, but AR can be accessed with a smartphone;**
  - AR enhances both the virtual and real-world while VR only enhances a fictional reality.

Q 70.C

- **The Brahmaputra has its origin in the Chemayungdung glacier of the Kailash range near the Mansarovar lake.** From here, it traverses eastward longitudinally for a distance of nearly 1,200 km in a dry and flat region of southern Tibet, where it is known as the Tsangpo. The Rango Tsangpo is the major right bank tributary of this river in Tibet. It emerges as a turbulent and dynamic river after carving out a deep gorge in the Central Himalayas near Namcha Barwa (7,755 m).
- The river emerges from the foothills under the name of Siang or Dihang. It enters India west of Sadiya town in Arunachal Pradesh. Flowing southwest, it receives its main left bank tributaries, viz., Dibang or Sikang and Lohit; thereafter, it is known as the Brahmaputra.
- **The Lohit River rises in the eastern Himalayas of Tibet and flows through Arunachal Pradesh before joining the Brahmaputra in Assam, whereas the Dibang River rises in Arunachal Pradesh's Mishmi Hills. It flows through the Dibang Valley and joins the Brahmaputra near Sadiya, in Assam.**
- The Brahmaputra receives numerous tributaries in its 750-kilometer journey through the Assam valley. Its major left bank tributaries are the Burhi Dihing and Dhansari (South), whereas the important right bank tributaries are the Subansiri, Kameng, Manas and Sankosh.
- **The Subansiri, which has its origin in Tibet, is an antecedent river. It is the largest tributary of the Brahmaputra. It flows through the states of Arunachal Pradesh and Assam before joining the Brahmaputra.**
- The Brahmaputra enters Bangladesh near Dhubri and flows southward. It finally merges with the river Padma, which falls into the Bay of Bengal.
- **On the other hand, the Barak River is not a tributary of the Brahmaputra.** It originates in the Manipur Hills and flows through the states of Manipur, Mizoram, and Assam before entering Bangladesh and joining the Meghna River.
- **Hence option (c) is the correct answer.**

Q 71.D

- A **tsunami** is a series of **enormous ocean waves** caused by **earthquakes, underwater landslides, volcanic eruptions, or asteroids.** As the tsunami attacks the coastline, the wave energy is compressed into a much shorter distance creating destructive, life-threatening waves.
- In an **open ocean**, a tsunami is less than **a few feet high at the surface**, but its wave **height increases rapidly in shallow water.** Tsunami wave energy extends from the surface to the bottom in the deepest waters. **Hence, statement 1 is not correct.**
- **In deep water,** the tsunami moves at **speeds of up to 800 km/h.** When it approaches **shallower coastal areas, it slows down. Hence statement 2 is not correct.**

Q 72.D

- **Azonal** soils are those that are **immature or poorly developed.** It lacks a B-horizon. Thus, A-horizon likes immediately above the C-horizon of the weathered parent material. This may happen because of the characteristics of the parent material or the nature of the terrain or simply the lack of time for development.
- Azonal soils are subdivided into:
  - **Lithosol** - erosion removes soil almost as fast, so they form **on steep slopes. Hence pair 2 is not correctly matched.**
  - **Regosol** - dry and loose **dune sands. Hence pair 1 is not correctly matched.**
  - **Alluvial soils** - regular **supply of sediments. Hence pair 3 is not correctly matched.**

Q 73.A

- The Ganga is the most important river of India, both from the point of view of its basin and cultural significance. It rises in the Gangotri glacier near Gaumukh (3,900 m) in the Uttarkashi district of Uttarakhand. Here, it is known as the Bhagirathi. It cuts through the Central and the Lesser Himalayas in narrow gorges. At Devprayag, the Bhagirathi meets the Alaknanda; hereafter, it is known as the Ganga. **Hence pair 1 is correctly matched.**
- The Alaknanda has its source in the Satopanth glacier above Badrinath. The Alaknanda consists of the Dhauli and the Vishnu Ganga, which meet at Joshimath or Vishnuprayag. **Hence pair 2 is correctly matched.**
- The other tributaries of Alaknanda such as the Pindar joins it at Karnaprayag while Mandakini or Kali Ganga meets it at Rudraprayag. **Hence pair 3 is not correctly matched.**
- The Ganga enters the plains at Haridwar. From there, it flows first to the south, then to the south-east and east before splitting into two distributaries, namely the Bhagirathi and the Padma before emptying into the Bay of Bengal.

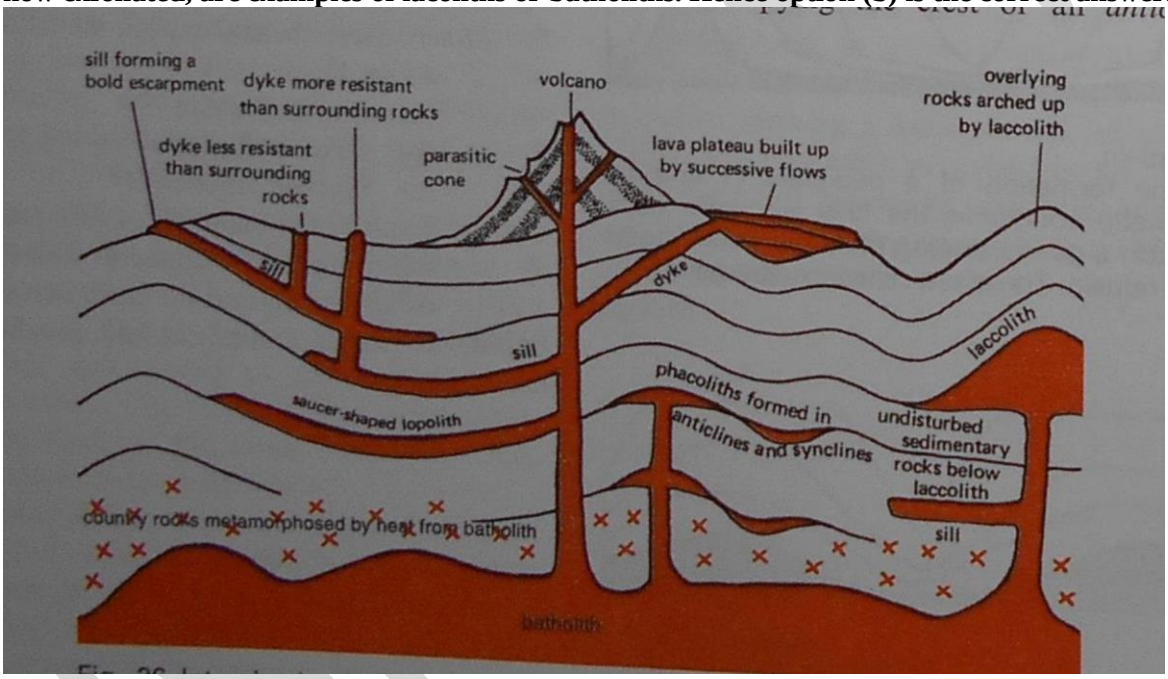
Q 74.A

- **Recent Context: According to Economic Survey 2023 there is a reverse flipping by start-ups**
- Flipping is the process of transferring the entire ownership of an Indian company to an overseas entity. It is generally accompanied by a transfer of all intellectual property and data owned by an Indian company.
- **Reverse Flipping is the process of shifting the domicile of those companies back to India who flipped earlier. Hence statement 1 is correct.**
- Companies reverse flip because of easy access to capital from private equity and venture capital, changes in rules regarding round-tripping, and the growing maturity of India's capital market. **Hence statement 2 is not correct.**
- **Why do Companies flip?**
  - Flipping happens at the early stage of the startup, driven by commercial, taxation, and personal preferences of founders and investors. Some companies decide to 'flip' because the major market of their product is offshore.

- Sometimes, investor preferences like access to incubators drive the companies to 'flip' as they insist on a particular domicile.
- For easy access to capital from private equity and venture capital, changes in rules regarding round-tripping, and the growing maturity of India's capital market.

Q 75.B

- The lava that is released during volcanic eruptions on cooling develops into igneous rocks. The cooling may take place either on reaching the surface or also while the lava is still in the crustal portion.
  - Depending on the location of the cooling of the lava, igneous rocks are classified as volcanic rocks (cooling at the surface) and plutonic rocks (cooling in the crust). The lava that cools within the crustal portions assumes different forms. These forms are called intrusive forms. Ex. laccoliths, lapolith, phacolith and sills.
- **Laccoliths**
  - **These are large dome-shaped intrusive bodies with a level base and connected by a pipe-like conduit from below. It resembles the surface volcanic domes of composite volcanoes, only these are located at deeper depths. It can be regarded as the localised source of lava that finds its way to the surface. The Karnataka plateau is spotted with domal hills of granite rocks. Most of these, now exfoliated, are examples of lacoliths or batholiths. Hence option (b) is the correct answer.**



- **Hence option (b) is the correct answer.**

Q 76.C

- **Black soil** is formed due to the weathering and denudation of indigenous rocks (basalt) or the **cooling and solidification of lava after the volcanic eruption. Hence, statement 1 is correct.**
- On account of its **high iron content and humus,** it is black in color. **Hence, statement 2 is not correct.**
- These soils are known for their **'self-ploughing' nature** as they swell and become sticky when wet and shrink when dried. So, during the dry season, these **soils develop wide cracks. Hence, statement 3 is correct.**
- The black soil retains moisture for a very long time, which helps the crops, especially, the rain-fed ones, to sustain even during the dry season.

Q 77.D

- The laterite soils develop in areas with high temperatures and high rainfall. These are the results of intense leaching due to tropical rains. **Hence statement 3 is correct.**
- With rain, lime and silica are leached away, and soils rich in iron oxide and aluminium compounds are left behind. Because of their high iron oxide content, nearly all laterites are rusty-red in color. **Hence statement 1 is not correct.**
- The humus content of the soil is quickly removed by bacteria that thrive well at high temperatures. These soils are poor in organic matter, nitrogen, phosphate, and calcium, while iron oxide and potash are in excess. **Hence statement 2 is not correct.**

- Laterites are not suitable for cultivation; however, the application of manures and fertilisers is required to make the soils fertile for cultivation. Red laterite soils in Tamil Nadu, Andhra Pradesh and Kerala are more suitable for tree crops like cashewnut. Laterite soils are widely cut as bricks for use in house construction. **Hence statement 4 is correct.**
- These soils have mainly developed in the higher areas of the Peninsular plateau. The laterite soils are commonly found in Karnataka, Kerala, Tamil Nadu, Madhya Pradesh and the hilly areas of Odisha and Assam.

Q 78.D

- Intrusive landforms are formed when magma cools within the crust. The intrusive activity of volcanoes gives rise to various forms.
- **Sills: These are solidified horizontal lava layers inside the earth. Hence statement 1 is correct.**
  - The near horizontal bodies of the intrusive igneous rocks are called sill or sheet, depending on the thickness of the material. The thinner ones are called sheets while the thick horizontal deposits are called sills. Example: Great whin sill of NE England.
- **Dykes: When the lava makes its way through cracks and the fissures developed in the land, it solidifies almost perpendicular to the ground. It gets cooled in the same position to develop a wall-like structure. Such structures are called dykes. Hence statement 2 is correct.**
  - These are the most commonly found intrusive forms in the western Maharashtra area. These are considered the feeders for the eruptions that led to the development of the Deccan traps. Cleveland Dyke of Yorkshire, England.
- **Batholiths:**
  - **These are huge masses of igneous rocks, usually of granite. These rock masses formed due to the cooling down and the solidification of hot magma inside the earth. Hence statement 3 is correct.**
  - They appear on the surface only after the denudation processes remove the overlying materials and may be exposed on the surface after erosion.
  - Example: Wicklow mountains of Ireland; the uplands of Brittany, France.
- **Laccoliths:**
  - These are large dome-shaped intrusive bodies connected by a pipe-like conduit from below.
  - These are basically intrusive counterparts of an exposed domelike batholith.
  - Example: The laccoliths of Henry mountains in Utah, USA.
- **Lapoliths:**
  - As and when the lava moves upwards, a portion of the same may tend to move in a horizontal direction wherever it finds a weak plane. In case it develops into a saucer shape, concave to the sky body, it is called Lopolith.
  - Example: The Bushveld lopolith of Transvaal, South Africa
- **Phacolith:**
  - A wavy mass of intrusive rocks, at times, is found at the base of synclines or at the top of anticlines in the folded igneous country. Such wavy materials have a definite conduit to source beneath in the form of magma chambers (subsequently developed as batholiths). These are called the Phacoliths.
  - Example: Corndon hill in Shropshire, England.

Q 79.B

- The equatorial, hot wet climate is found between 5° and 10° north and south of the equator. Its greatest extent is found in the lowlands ot the Amazon, the Congo. Malaysia and the East Indies.
- The most outstanding feature of the equatorial climate is its great uniformity of temperature throughout the year. The mean monthly temperatures are always around 80°F with very little variation.
  - There is no winter. Cloudiness and heavy precipitation help to moderate the daily temperature, so that even at the equator itself, the climate is not unbearable.
- **The diurnal range of temperature is small, and so is the annual range.**
  - **Hence statement 1 is not correct.**
- Precipitation is heavy, between 60 inches and 100 inches, and well distributed throughout the year. There is no month without rain and distinct dry season like those of the Savanna or the tropical Monsoon Climates, is absent. Instead, there are two periods of maximum rainfall.
  - **The double rainfall peaks coinciding with the equinoxes are a characteristic feature of equatorial climates not found in any other type of climate. Hence statement 2 is correct.**
- Due to the great heat in the equatorial belt, mornings are bright and sunny. There is much evaporation and convectional air currents are set up, followed by heavy downpours of convectional rain in the afternoons from the towering cumulonimbus clouds. Thunder and lightning often accompany the torrential showers

and the amount of rainfall recorded in one single afternoon may be as much as the deserts receive for the entire year!

- The relative humidity is constantly high (over 80 percent) and makes one feel "sticky and uncomfortable. The monotonous climate, oppressive and enervating, taxes one's mental alertness and physical capability.

Q 80.D

- **Recently at the Aadi Mahotsav, an annual initiative of the Tribal Cooperative Marketing Development Federation Limited (TRIFED) under the Ministry of Tribal Affairs tribal dance performances were held.**
  - **Dance Performances:**
    - ✓ Bagurumba of Assam
    - ✓ Panthi Dance of Chhattisgarh
    - ✓ **Gusadi of Telangana**
    - ✓ **Baiga Pardhauni of Madhya Pradesh**
    - ✓ Tamang Selo of Sikkim
    - ✓ Siddhi Dhamal of Gujarat
    - ✓ Purulia Chhau of West Bengal
    - ✓ **Harul dance of Uttarakhand.**
- **Hence, option (d) is the correct answer.**

Q 81.B

- A volcano is a vent or a fissure in the crust from which lava (molten rock), ash, gases, and rock fragments erupt from a magma chamber below the surface. Volcanism is the phenomenon of the eruption of molten rock, pyroclastics, and volcanic gases to the surface through a vent.
- **Magma is composed of molten rock and is stored in the Earth's crust. Lava is magma that reaches the surface through a volcano vent.**
- **Acidic lava**
  - **These lavas are highly viscous with a high melting point. Hence statement 2 is correct.**
  - They are light-colored, of low density and have a high percentage of silica.
  - They flow slowly and seldom travel far before solidifying.
  - **The resultant volcanic cone is therefore stratified (hence the name stratovolcano) and steep-sided.**
  - The rapid solidifying of lava in the vent obstructs the flow of the out-pouring lava, resulting in loud explosions, and throwing out many volcanic bombs or pyroclasts.
- **Basic lava**
  - **These are the hottest lavas, about 1,000 °C, and are highly fluid.**
  - **They are dark-colored basalt, rich in iron and magnesium but poor in silica. Hence statement 1 is not correct.**
  - They flow out of volcanic vents quietly and are not very explosive.
  - Due to their high fluidity, they flow readily with a speed of 10 to 30 miles per hour.
  - They affect extensive areas, spreading out as thin sheets over great distances before they solidify.
  - **The resultant volcano is gently sloping** with a wide diameter and forms a flattened shield or dome.

Q 82.B

- **Recent Context: The recognition for Vadivel Gopal and Masi Sadaiyan of the Irula community, who are among this year's Padma Shri recipients, has put the focus on the Irula Snake Catchers' Industrial Cooperative Society, one of the major anti-snake venom (ASV) producers in the country.**
  - Irula community is a particularly vulnerable tribal group (PVTG).
  - Irula (people of darkness) **inhabit mostly in the northern Tamil Nadu districts and some parts of Kerala and Karnataka. Hence pair 1 is not correctly matched.**
  - Researches have shown that the tribe have their origin from ethnic groups of and Australia.
  - They speak Irula language that is closely related to Dravidian languages like Tamil and Kannada.
  - Irulas has been traditionally catching snake and rat, but also work as labourers.
- **Recent Context: Dhaniram has recently been awarded Padma Shri and has contributed for creating the Toto language script and Toto alphabet.**
  - The Toto is a primitive and isolated tribal group of population of only 1,632 people.
  - They are **residing only in a small enclave called Toto Para in Alipurduar district in West Bengal. Hence pair 2 is not correctly matched.**

- Toto Para is located at the foot of the Himalayas just to the south of the borderline between Bhutan and West Bengal (on the western bank of Torsa River).
- They speak the eponymous language called Toto language.
- Toto language belongs to Tibeto-Burman family of sub-Himalayan group, as classified by Hodgson and Grierson.
- The Toto language does not have their own script.
- Dhaniram has created the Toto language script and Toto alphabet, for which he received 'Padma Shri'.
- At present, poems and novels are written in Toto.

- **Recent Context: This year's budget launched PM-PVTG (Pradhan Mantri Particularly Vulnerable Tribal Groups) programme.**
  - It is in line with the Odisha government's own PVTG Empowerment and Livelihood Improvement Programme (OPELIP), launched in 2015 for the upliftment of tribals.
  - Of the 75 PVTGs identified in India, **Odisha has 13, namely Birhor, Bondo, Chuktia Bhunjia, Didayi, Juang, Kharia, Dongria Kondh, Lanjia Saora, Lodha, Mankidia, Paudi Bhuyan and Saora. Hence pair 3 is correctly matched.**

Q 83.B

- **Social forestry** means the management and protection of forests and afforestation on barren lands with the purpose of helping in the environmental, social and rural development.
- The National Commission on Agriculture (1976) has classified social forestry into three categories.
- These are Urban forestry, Rural forestry and Farm forestry.
- **Urban forestry pertains to the raising and management of trees on public and privately owned lands** in and around urban centres such as green belts, parks, roadside avenues, industrial and commercial green belts, etc. **Hence statement 1 is not correct.**
- **Rural forestry** lays emphasis on promotion of agro-forestry and community-forestry.
- **Agro-forestry is the raising of trees and agriculture crops on the same land inclusive of the waste patches. Hence statement 2 is correct.**
- It combines forestry with agriculture, thus, altering the simultaneous production of food, fodder, fuel, timber and fruit.
- **Community forestry involves the raising of trees on public or community land** such as the village pasture and temple land, roadside, canal bank, strips along railway lines, and schools etc. **Hence statement 3 is not correct.**
  - Community forestry programme aims at providing benefits to the community as a whole.
  - Community forestry provides a means under which the people of landless classes can associate themselves in treeraising and thus, get those benefits which otherwise are restricted for landowners.

Q 84.C

- The Inter Tropical Convergence Zone (ITCZ) is a low-pressure zone located at the equator where trade winds converge, and so, it is a zone where air tends to ascend. **Hence, statement 1 is not correct.**
- In July, the ITCZ is located around 20°N-25°N latitudes (over the Gangetic plain), sometimes called the monsoon trough. This monsoon trough encourages the development of thermal lows over north and northwest India. **Hence, statement 2 is not correct.**
- Due to the shift of ITCZ, the trade winds of the southern hemisphere cross the equator between 40° and 60°E longitudes and start blowing from southwest to northeast due to the Coriolis force. It becomes a southwest monsoon. In winter, the ITCZ moves southward, and so the reversal of winds from northeast to south and southwest takes place. They are called northeast monsoons. **Hence, statement 3 is correct.**

Q 85.C

- **Sardinia** is the second-largest island in the **Mediterranean Sea**, after Sicily. It is located west of the Italian Peninsula, north of Tunisia and immediately south of the French island of Corsica. **Hence pair 1 is correctly matched.**
- **Zanzibar Island**, also known as Unguja, is by far the largest and most famous of the islands that make up the Zanzibar Archipelago located in **Indian ocean. Hence pair 2 is not correctly matched.**
- **Vancouver Island** is an island lying off southwestern mainland British Columbia, Canada in **Pacific ocean. Hence pair 3 is correctly matched.**
  - With an area of 12,079 square miles (31,285 square km), it is the largest island on the Pacific coast of North America.

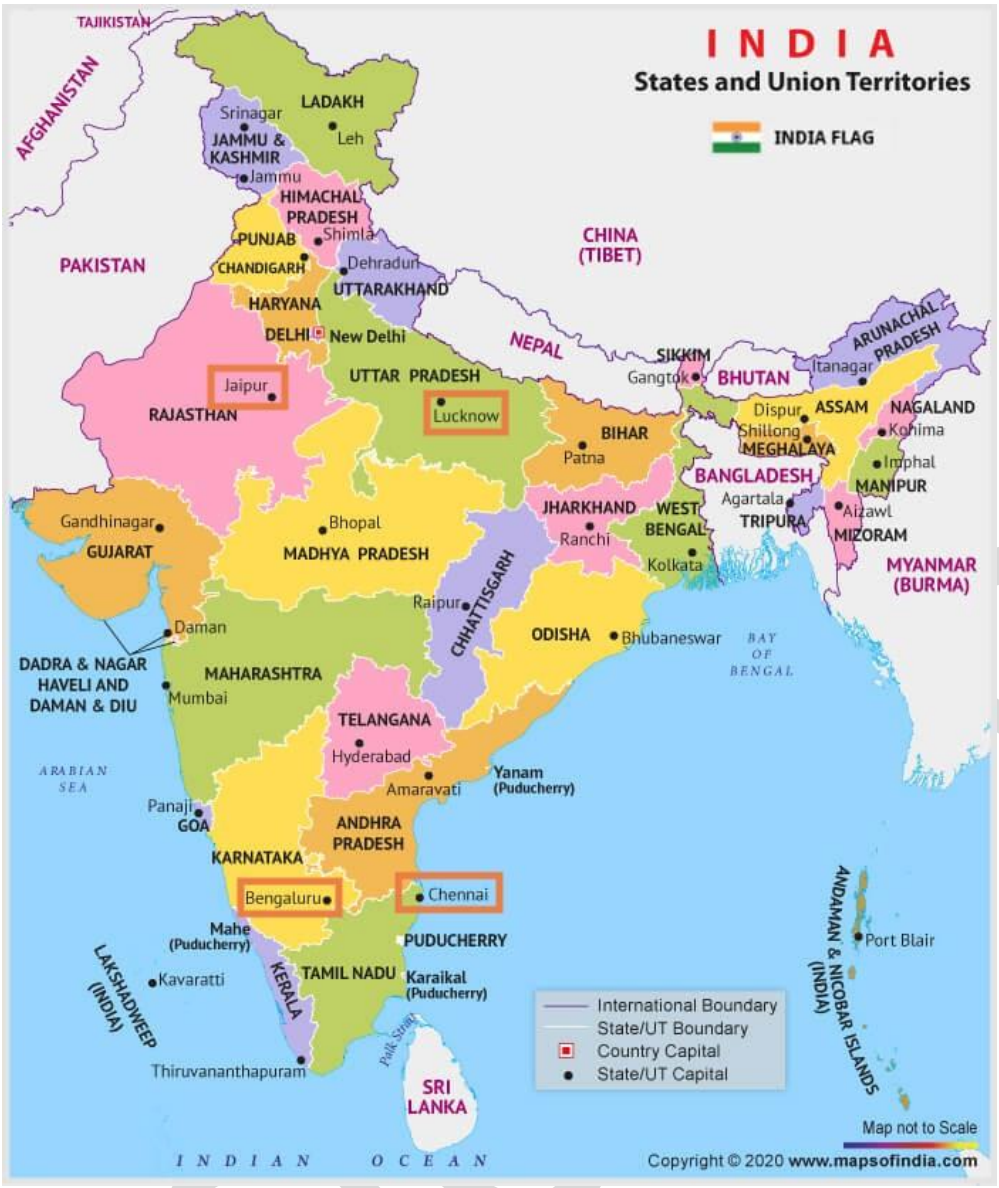
- Vancouver Island is separated from mainland Canada by the straits of Georgia, Johnstone, and Queen Charlotte and from the United States by Juan de Fuca Strait.
- The island, averaging 50 miles (80 km) in width and extending for 285 miles (460 km) along a northwest–southeast axis paralleling the mainland, is actually the top of a partially submerged mountain system.

Q 86.A

- Glaciation generally gives rise to erosional feature in the highlands and depositional features on the lowlands, though these processes are not mutually exclusive because a glacier plays a combined role of erosion, transportation and deposition throughout its course. A glacier erodes its valley by two processe plucking and abrasion. By plucking the glacier freezes the joints and beds of the underlying rock: tears out individual blocks and drags them away by abrasion, the glacier scratches, scrapes, polishes and scours the valley floor with the debris frozen into it.
- **Major glacial landforms are**
- **Cirque**
  - Cirques are the most common landforms in glaciated mountains. The cirques quite often are found at the heads of glacial valleys. The accumulated ice cuts these cirques while moving down the mountain tops. They are deep, long and wide troughs or basins with very steep concave to vertically drop high walls at its head as well as sides.
- **Horns and Serrated Ridges**
  - Horns form through head ward erosion of the cirque walls. If three or more radiating glaciers cut headward until their cirques meet, high, sharp pointed and steep sided peaks called horns form. **The divides between cirque side walls or head walls get narrow because of progressive erosion and turn into serrated or saw-toothed ridges sometimes referred to as aretes** with very sharp crest and a zig-zag outline.
- **Bergschrund**.
  - At the head of a glacier, where it begins to leave the snowfield of a cirque, a deep vertical crack opens up called a bergschrund (in German) or rimaye (in French). This happens in summer, although the ice continues to move out of the cirque. There is no new snow to replace it. In some cases not one but several such cracks occur.
- Hanging valleys.
  - The main valley is eroded much more rapidly than the tributary valleys as it contains a much larger glacier. After the ice has melted a tributary valley therefore hangs' above the main valley so that its stream plunges down as a waterfall. Such tributary valleys are termed hanging valleys and may form a natural head of water for generating hydro-electric power.
- Moraines
  - Moraines are made up of the pieces of rock that are shattered by frost action, embedded in the glaciers and brought down the valley. Those that fall on the sides of the glacier, mainly screes, form lateral moraines. When two glaciers converge, their inside lateral moraines unite to form a medial moraine.
- Roche Moutonnee.
  - This is a resistant residual rock hummock. The surface is striated by ice movement . Its upstream side is smoothed by abrasion and its downstream side is roughened by plucking and is much steeper.
- Drumlins.
  - These are swarms of oval, elongated " whale-back' hummocks composed wholly of boulder clay, with their elongation in the direction of the ice flow, that is on the downstream side. They are low' hills varying from a few' yards to 400 feet in height and may be a mile or two long. They appear a little steeper at the onset side and taper off at the leeward end.
- **Hence option (a) is the correct answer.**

Q 87.D

Cities	**Coordinates**
Jaipur :	26.9°N 75.8°E
Bhopal :	23°15′N 77°25′E
Chennai:	13°4′57″N 80°16′30″E
Bengaluru:	12°58′44″N 77°35′30″E



- **Hence, option (d) is the correct answer.**

Q 88.A

- Earthquake is a natural event. It is caused due to release of energy, which generates waves that travel in all directions.
- The release of energy occurs along a fault. A fault is a sharp break in the crustal rocks. Rocks along a fault tend to move in opposite directions. As the overlying rock strata press them, the friction locks them together.
- However, their tendency to move apart at some point of time overcomes the friction. As a result, the blocks get deformed and eventually, they slide past one another abruptly. This causes a release of energy, and the energy waves travel in all directions.
- **The point where the energy is released is called the focus of an earthquake, alternatively, it is called the hypocentre**. The energy waves travelling in different directions reach the surface. The point on the surface, nearest to the focus, is called epicentre. It is the first one to experience the waves. It is a point directly above the focus.
- **All natural earthquakes take place in the lithosphere**. Lithosphere refers to the portion of depth up to 200 km from the surface of the earth. **Hence statement 1 is correct.**
- Earthquake waves are basically of two types — body waves and surface waves. Body waves are generated due to the release of energy at the focus and move in all directions travelling through the body of the earth.
- The body waves interact with the surface rocks and generate new set of waves called surface waves. These waves move along the surface. The velocity of waves changes as they travel through materials with different densities. The denser the material, the higher is the velocity. Their direction also changes as they reflect or refract when coming across materials with different densities.

- There are two types of body waves. They are called P and S-waves. **P-waves move faster and are the first to arrive at the surface. These are also called 'primary waves'.** The P-waves are similar to sound waves. They travel through gaseous, liquid and solid materials.
- S-waves arrive at the surface with some time lag. These are called secondary waves. An important fact about S-waves is that they can travel only through solid materials.

- **The surface waves are the last to report on seismograph. These waves are more destructive**. They cause displacement of rocks, and hence, the collapse of structures occurs.
- Different types of earthquake waves travel in different manners. As they move or propagate, they cause vibration in the body of the rocks through which they pass. P-waves vibrate parallel to the direction of the wave.
  - This exerts pressure on the material in the direction of the propagation. As a result, it creates density differences in the material leading to stretching and squeezing of the material.
  - Other three waves vibrate perpendicular to the direction of propagation. The direction of vibrations of S-waves is perpendicular to the wave direction in the vertical plane. Hence, they create troughs and crests in the material through which they pass.
  - **Surface waves are considered to be the most damaging waves. Hence statement 2 is not correct.**

Q 89.C

- **The Indus, also known as the Sindhu, is the westernmost of the Himalayan rivers in India. It originates from a glacier near Bokhar Chu in the Tibetan region, at an altitude of 4,164 m in the Kailash Mountain range.** In Tibet, it is known as 'Singi Khamban; or the Lion's Mouth. **Hence statement 1 is correct.**
- **From Tibet, the river enters India through Union territory of Ladakh**. From Ladakh, the river flows through the Union Territories of Jammu and Kashmir. From here, the Indus river flows through the regions of Baltistan and Gilgit. It cuts across the Ladakh range, forming a spectacular gorge near Gilgit in Jammu and Kashmir. It then enters Pakistan near Chilas in the Dardistan region and flows through the provinces of Punjab and Sindh before emptying into the Arabian Sea. **Hence statement 3 is not correct.**
- The Indus receives a number of tributaries, the most significant of which is the 'Panjnad'. The Panjnad is the name given to the five rivers of Punjab, namely the Satluj, the Beas, the Ravi, the Chenab and the Jhelum.
- **The Chenab is the largest tributary of the Indus.** It is formed by two streams, the Chandra and the Bhaga, which join at Tandi near Keylong in Himachal Pradesh. Hence, it is also known as Chandrabhaga. The river flows for 1,180 km before entering into Pakistan. **Hence statement 2 is not correct.**

Q 90.C

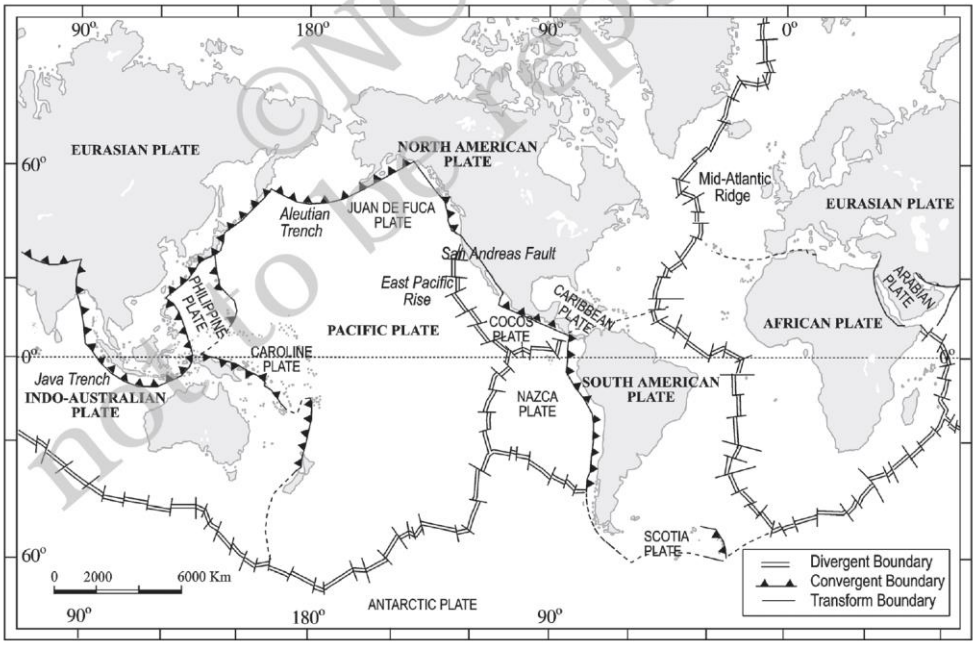
- Arid soils range from red to brown in colour. They are generally sandy in structure and saline in nature.
  - The sandy structure is due to the low levels of clay and organic matter in the soil, which results in poor water holding capacity. The saline nature of the soil is due to the accumulation of salts in the soil, which is a result of the high rates of evaporation and low rates of rainfall in these regions. In some areas, the salt content is so high that common salt is obtained by evaporating the saline water.
- As a result, the soils are often alkaline in nature and require appropriate management practices such as leaching, adding organic matter, and improving drainage to make them suitable for cultivation. **Hence statement 1 is correct.**
- Due to the dry climate, high temperature and accelerated evaporation, they lack moisture and humus. Nitrogen is insufficient and the phosphate content is normal.
- Lower horizons of the soil are occupied by '*kankar*' layers because of the increasing calcium content downwards. The '*Kankar*' layer formation in the bottom horizons restricts the infiltration of water, and as such, when irrigation is made available, the soil moisture is readily available for sustainable plant growth. Arid soils are characteristically developed in western Rajasthan, which exhibits characteristic arid topography. These soils are poor and contain little humus and organic matter. **Hence statement 2 is correct.**

Q 91.A

- **The months of October and November are known for retreating monsoons**. By the end of September, the southwest monsoon becomes weak as the low-pressure trough of the Ganga plain starts moving southward in response to the southward march of the sun.
- **The retreating southwest monsoon season is marked by clear skies and a rise in temperature.** The land is still moist. **Owing to the conditions of high temperature and humidity, the weather becomes rather oppressive.** This is commonly known as the 'October heat'. **Hence, statements 1 and 2 are correct but statement 3 is not correct.**

Q 92.B

- Since the advent of the concept of sea floor spreading, the interest in the problem of distribution of oceans and continents was revived. It was in 1967, McKenzie and Parker and also Morgan, independently collected the available ideas and came out with another concept termed Plate Tectonics.
- A tectonic plate (also called lithospheric plate) is a massive, irregularly-shaped slab of solid rock, generally composed of both continental and oceanic lithosphere. Plates move horizontally over the asthenosphere as rigid units.
- The lithosphere includes the crust and top mantle with its thickness range varying between 5-100 km in oceanic parts and about 200 km in the continental areas.
- A plate may be referred to as the continental plate or oceanic plate depending on which of the two occupy a larger portion of the plate. Pacific plate is largely an oceanic plate whereas the Eurasian plate may be called a continental plate.
- The theory of plate tectonics proposes that the earth's lithosphere is divided into seven major and some minor plates. Young Fold Mountain ridges, trenches, and/or faults surround these major plates. The major plates are as follows
  - Antarctica and the surrounding oceanic plate
  - North American (with western Atlantic floor separated from the South American plate along the Caribbean islands) plate
  - South American (with western Atlantic floor separated from the North American plate along the Caribbean islands) plate
  - **Pacific plate**
  - India-Australia-New Zealand plate
  - Africa with the eastern Atlantic floor plate
  - Eurasia and the adjacent oceanic plate.
- Some important minor plates are listed below:
  - **Cocos plate : Between Central America and Pacific plate**
  - **Nazca plate : Between South America and Pacific plate**
  - Arabian plate : Mostly the Saudi Arabian landmass
  - Philippine plate : Between the Asiatic and Pacific plate
  - Caroline plate : Between the Philippine and Indian plate (North of New Guinea)
  - Fuji plate : North-east of Australia



- **Hence option (b) is the correct answer.**

Q 93.A

- As compared to the western coastal plain, the **eastern coastal plain** is broader and is an example of an **emergent coast**. There are well-developed deltas here, formed by the rivers flowing eastward into the Bay of Bengal. These include the deltas of the Mahanadi, the Godavari, the Krishna, and the Kaveri.
- Because of its emergent nature, it has **less number of ports and harbors**. The continental shelf extends up to 500 km into the sea, which makes it difficult the development of good ports and harbors.
- **Hence, option (a) is the correct answer.**

Q 94.C

- **The cool temperate western margins are under the permanent influence of the Westerlies all round the year. They are also regions of much cyclonic activity, typical of Britain, and are thus said to experience the British type of climate. Hence statement 1 is correct.**
- From Britain, the climatic belt stretches far inland into the lowlands of North-West Europe, including such regions as northern and western France, Belgium, the Netherlands, Denmark, western Norway and also north western Iberia .
    - There is so much oceanic influence on both the temperature and the precipitation that the climate is also referred to as the North-West European Maritime Climate.
- In North America, the high Rockies prevent the on-shore Westerlies from penetrating far inland and the British type of climate is confined mainly to the coastlands of British Columbia.
    - In the southern hemisphere, the climate is experienced in southern Chile, Tasmania and most parts of New Zealand, particularly in South Island.
- The mean annual temperatures are usually between 40°F. and 60°F. The climate is ideal for maximum comfort and mental alertness. People can work for long hours without feeling drowsy and lethargic as they do in the tropics.
- **The British type of climate has adequate rainfall throughout the year with a tendency towards a slight winter or autumn maximum** from cyclonic sources. Since the rain-bearing winds come from the west, the western margins have the heaviest rainfall. The amount decreases eastwards with increasing distance from the sea. **Hence statement 2 is not correct.**
- **There are four distinct seasons in the British climate type.** Light snowfalls can be expected in the winter months normally only of short duration because of the comparatively mild weather. **Hence statement 3 is correct.**
    - Spring is the driest and the most refreshing season when people emerge from the depressing winter to see everything becoming green again.
    - This is followed by the long, sunny summer.
    - With the roar of gusty winds and the fall of 'golden' leaves, autumn is ushered in and the cycle repeats itself.
- This type of climate with its four distinct seasons is something that is conspicuously absent in the tropics.

Q 95.A

- **Recent Context: Adani Enterprises calls off Follow on Public Offer (FPO), shares worth Rs 20,000 crore to be returned to investors**
- **Follow on Public Offer** is an additional issue of a company, which is already listed on an exchange.
    - Under FPO, the company issues new shares to the investors or the existing shareholders, usually the promoters. **Hence option (a) is the correct answer.**
    - A company uses FPO after it has gone through the process of an IPO (Initial Public Offering) to diversify their equity base.
    - An FPO is an additional issue whereas an IPO is an initial or first issue.
    - **Reasons to go for FPO**
        - ✓ To make more of its shares available to the public
        - ✓ To raise capital to expand equity base
        - ✓ To pay off debt.
- **Initial public offering** is the **process by which a private company can go public by the sale of its stocks to the general public.** Companies can raise equity capital with the help of an IPO by issuing new shares to the public or the existing shareholders can sell their shares to the public without raising any fresh capital. **Hence option (b) is not correct.**
- **Book building** is the process by which **an underwriter attempts to determine the price at which an initial public offering (IPO) will be offered.** SEBI guidelines define Book Building as "a process undertaken by which a demand for the securities proposed to be issued by a body corporate is elicited and built-up and the price for such securities is assessed for the determination of the quantum of such securities to be issued by means of a notice, circular, advertisement, document or information memoranda or offer document". **Hence option (d) is not correct.**
- A **buyback,** also known as a share repurchase, is **when a company buys its own outstanding shares to reduce the number of shares available on the open market.** Under the stock exchange route, a company can buy back shares only on the stock exchanges having nationwide trading terminals. The buyback of shares is made only through the order-matching mechanism. In this method, the promoters, or persons in control of a company are not allowed to participate. **Hence option (c) is not correct.**

Q 96.A

- The Peninsular drainage system is older than the Himalayan one. This is evident from the broad, largely-graded shallow valleys, and the maturity of the rivers.
- Three major geological events in the distant past have shaped the present drainage systems of Peninsular India:
  - Subsidence of the western flank of the Peninsula leading to its submergence below the sea during the early tertiary period. Generally, it has disturbed the symmetrical plan of the river on either side of the original watershed.
  - Upheaval of the Himalayas when the northern flank of the Peninsular block was subjected to subsidence and the consequent trough faulting. The Narmada and The Tapi flow in trough faults and fill the original cracks with their detritus materials. Hence, there is a lack of alluvial and deltaic deposits in these rivers.
  - **A slight tilting of the Peninsular block from the northwest to the southeastern direction** gave orientation to the entire drainage system except (Narmada and Tapi) towards the Bay of Bengal during the same period.
- **Hence option (a) is the correct answer.**

Q 97.D

- **Recent Context:** Russia claimed that the USA had not complied with the New START treaty's provisions and had attempted to undermine Russia's national security.
- **About New START treaty**
  - **The New START (Strategic Arms Reduction Treaty) is a nuclear arms reduction treaty between the United States and Russia (signed in 2010). It entered into force in 2011. Hence statement 1 is not correct.**
  - It replaced the previous START treaty that had expired in 2009.
  - It's objective was to limit and reduce the number of strategic nuclear warheads and delivery systems deployed by both countries.
  - It aimed to enhance strategic stability and build mutual trust between the two nations.
- **Under the agreement, both sides are committed to the following:**
  - **Deploying no more than 1,550 strategic nuclear warheads and a maximum of 700 long-range missiles and bombers. Hence statement 2 is not correct.**
  - A limit of 800 intercontinental ballistic missiles in deployment.
  - Each side can conduct up to 18 inspections of strategic nuclear weapons sites yearly to ensure the other has not breached the treaty's limits.
  - **In 2021, United States and the Russian agreed to extend the treaty till 2026.**

Q 98.A

- In India, the mangrove forests are highly developed in the Andaman and Nicobar Islands and the Sunderbans of West Bengal. Other areas of significance are the Mahanadi, the Godavari and the Krishna deltas. As per the **Indian State of Forest Report 2021,** mangrove cover in the states are as follows :
- Andhra Pradesh - 405 sq km
- Gujarat - 1175 sq km
- Maharashtra - 324 sq km
- Odisha - 259 sq km
- West Bengal - 2114 sq km
- Andaman & Nicobar Islands - 616 sq km

Table 3.2 Mangrove Cover Assessment 2021 (in sq km)

Sl. No.	State/UT	Very Dense Mangrove	Moderately Dense Mangrove	Open Mangrove	Total	Change with respect to ISFR 2019
1.	Andhra Pradesh	0	213	192	405	1
2.	Goa	0	21	6	27	1
3.	Gujarat	0	169	1,006	1,175	-2
4.	Karnataka	0	2	11	13	3
5.	Kerala	0	5	4	9	0
6.	Maharashtra	0	90	234	324	4
7.	Odisha	81	94	84	259	8
8.	Tamil Nadu	1	27	17	45	0
9.	West Bengal	994	692	428	2,114	2
10.	A&N Islands	399	168	49	616	0
11.	D&NH and Daman & Diu	0	0	3	3	0
12.	Puducherry	0	0	2	2	0
	Total	**1,475**	**1,481**	**2,036**	**4,992**	**17**

- **Hence option (a) is the correct answer.**

Q 99.D

- **The Warm Temperate Western Margin (Mediterranean) Climate** is caused due to **shifting of wind belts.** They are entirely confined to the western portion of continental masses, between **30° and 45° north and south of the equator.**
- **Characteristics of Mediterranean climate**:
  - a **warm summer** with off-shore trades
  - a **concentration of rainfall in winter** with onshore westerlies
  - bright, sunny weather with hot dry summers and wet, mild winters
  - the **prominence of local winds** around the Mediterranean Sea **(Sirocco, Mistral).**
- Mediterranean regions include areas around the Mediterranean sea, California (around San Francisco), the south-western tip of Africa (around Cape Town), southern Australia (in southern Victoria and around Adelaide, bordering St. Vincent and Spencer Gulfs), and south-west Australia (Swanland).
- **Hence, option (d) is the correct answer.**

Q 100.C

- **An earthquake in simple words is the shaking of the earth.** It is caused due to release of energy, which generates waves that travel in all directions. The release of energy occurs along a fault. A fault is a sharp break in the crustal rocks. Rocks along a fault tend to move in opposite directions. As the overlying rock strata press them, the friction locks them together.
- However, their tendency to move apart at some point in time overcomes the friction. As a result, the blocks get deformed and eventually, they slide past one another abruptly. This causes the dissipation of energy, and the energy waves travel in all directions.
- **The point inside the crust where the pressure is released is called the focus. Hence statement 1 is correct. It is also called the hypocentre.**
- **The point on the Earth's surface above the focus is called the epicenter.** Earthquake energy is released in seismic waves. These waves spread out from the focus. **Hence statement 2 is not correct.**
- **Epicenter is the first one to experience the waves. Hence statement 3 is correct.**
- The waves are felt most strongly at the epicenter, becoming less strong as they travel further away.