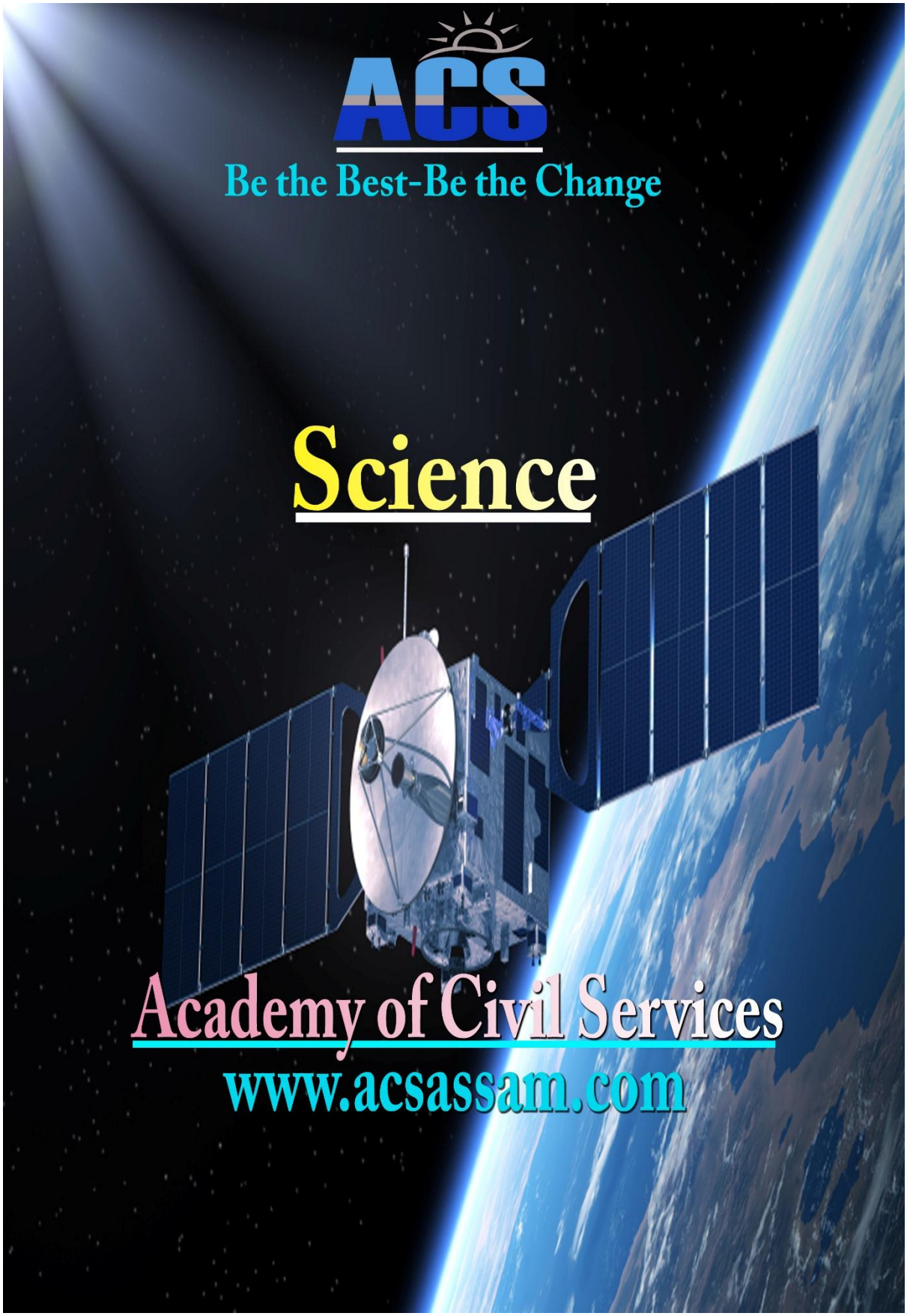

CELL

- The term **"cell"** was coined by **Robert Hooke in 1665**.
- Organisms made of more than one cell are called **Multicellular organisms**.
- The single-celled organisms are called **Unicellular organisms**.
- **The free-living cell** was first discovered by A. B. Leewenhook.
- **Protoplasm** is called as the **"Physical Basis of Life".**
- **Cytoplasm** is a jelly-like substance present between the cell membrane and the nucleus.
- **Nucleus** is an important component of the living cell. It is generally spherical and located in the centre of the cell.
- **Nucleus** is separated from the cytoplasm by a membrane called the **nuclear membrane.**
- The cells having nuclear material without nuclear membrane are termed **prokaryotic cells.**
- The cells like onion cells and cheek cells having well-organised nucleus with a nuclear membrane are designated as **Eukaryotic cells.**
- **Cell membrane** is made of lipid and protein.
- **Lysosome** is called as **Suicidal Bag of the Cell**.
- **Mitochondria** is called as **Powerhouse of the Cell**.

	PLANT CELL	ANIMAL CELL
1)	Cell wall is present.	1) Cell wall is absent
2)	Plastids are present	2) Plastids are absent
3)	Centrosome is absent	3) Centrosome is present
4)	Vacuoles are large and prominent	4) Vacuoles if present are very small.

TISSUE

- Too many cells form a tissue.

	PLANT TISSUE	ANIMAL TISSUE
1)	They are dead tissues.	1) They are mostly living.
2)	They don't have to locomote	2) Animals need to perform various

functions.

3) Growth of plants is unequal. 3) The growth is equally distributed.

- A tissue is a group of cells that perform specialized function in an organism.
- The vascular tissue for the transport of water and nutrients in the plant is called the **xylem.**
- The food has to be transported to all parts of the plant. This is done by the vascular tissue called the **phloem**.
- **Animal tissue** is of four types. They are:
  1) Epithelial tissue
  2) Connective tissue
  3) Muscular tissue
  4) Nervous tissue

EPITHELIAL TISSUE

- It is the protective tissue that covers most of the body organs and cavities within it.
- **Squamous** – lining of oesophagus
- **Cuboidal** – lining of intestine
- **Columnar** – lining of kidney tubules

CONNECTIVE TISSUE

- **Blood, Lymph, Cartilage, Areolar** and **Adipose** are the connective tissues.

BLOOD

- There are **three components of blood**. They are:
  1) RBC
  2) WBC
  3) Platelets

LYMPH

- It flows through the nodes.
- The function is to provide defense mechanism within the body.

BONE

- **Tendon** – It binds bone to muscle
- **Ligament** – It bonds bone to muscle

CARTILAGE

- It is a solid matrix composed of proteins and sugar and it is found in ear pinna, nose, larynx, trachea.

AREOLAR

- These are found between the skin and the muscles.
- Main function is that it fills the space inside the organs that provides support to the internal body organs.

ADIPOSE

- Main function is to **store fats and heat insulation**.

MUSCULAR TISSUE

- **Voluntary** – It is in control of our will.
- **Involuntary** – It is not in control of our will.

NERVOUS TISSUE

- Its unit is called as **Neuron**.
- The main function of Neuron is to transmit information from central nervous system and peripheral nervous system with different parts of the body.

RESPIRATION

- The process of breakdown of food in the cell with the release of energy is called **Cellular Respiration**.
- **Cellular respiration** takes place in the cells of all organisms.

- When breakdown of glucose occurs with the use of oxygen it is called **aerobic respiration.**
- Food can also be broken down, without using oxygen. This is called **Anaerobic respiration.**

EXCRETION

- The process of removal of wastes produced in the cells of the living organisms is called **Excretion.**
- The parts involved in excretion forms the excretory system.

NERVOUS SYSTEM

- Brain is divided in three parts. They are:
  1) Fore brain
  2) Mid brain
  3) Hind brain
- **Parts of fore brain** – cerebrum, thalamus and hypothalamus.
- **Parts of mid brain –** tectum and tegumentum.
- **Parts of hind brain –** cerebellum, pons varoli and medulla oblongata.

ENZYMES

- They are a type of protein which is very essential to accelerate the rate of biochemical reaction which is done by enzymes.

NUTRIENTS IN THE FOOD AND THEIR FUNCTIONS

- **Carbohydrates and Fat**: Provide energy for the body
- **Protein:** it is needed for growth **repair of damaged part** in the body. Hence, it is called **body Building foods**
- **Vitamin:** Protects against **diseases**
- **Vitamin A:** Keeps **skin and eyes** healthy
- **Vitamin B1: Empower muscles** and provide energy to work
- **Vitamin C:** helps body to **fight against diseases**

- **Vitamin D:** helps body to **use calcium for bones and teeth**
- **Dietary Fibers:** helps body to **get rid of undigested food**
  It is mainly provided **by plant products** in food. It is also known as roughage.

DISEASES CAUSED BY DEFICIENCY OF NUTRIENTS

- **Vitamin A:** Loss of **vision**
- **Vitamin B1: Beriberi** (Weak muscles and little energy to work)
- **Vitamin C: Scurvy** (bleeding gums and wound takes more time to heal)
- **Vitamin D: Rickets** (Bones become soft and bent)
- **Calcium:** Bone and teeth decay
- **Iodine: Goiter** (swollen neck and mental disability in child)

ROOT

- **Tap root** – It is the main root. E.g. Raddish, Turnip, Carrot etc.
- **Lateral root** – The smaller roots are called lateral roots.
- **Prop root** – Banyan tree has prop root
- **Pneumatophores –** E.g. Mangroves
- **Stilt Root –** It originates from the internodes.

GYMNOSPERMS

- The plants of this group bear naked seeds and are usually perennial, evergreen and woody. E.g. Pine and Deodar.

ANGIOSPERMS

- **Angiosperms** are plants of a large group that comprises those that have flowers and produce seeds enclosed within a carpel, including herbaceous plants, shrubs, grasses, and most trees.

PHOTOSYNTHESIS

- It is the process of **transforming Carbon dioxide and water into carbohydrate and Oxygen using sunlight and chlorophyll.**
- The mode of nutrition in which organisms make food themselves from simple substances is called **autotrophic**. Plants are called **autotrophs** (those who produce food for self)
- Animals are called **heterotrophs** (consumers)
- Organisms that take nutrients in solution form from dead and decaying matter is called saprotrophic nutrition. Plants which use saprotrophic mode of nutrition are called **saprotrophs.**

ANIMALIA

- These are organisms which are eukaryotic, multicellular and heterotrophic. Their cells do not have cell-walls.
- They are further classified into different types. They are:
  - **Porifera:** These are non-motile animals attached to some solid support. They are commonly called sponges and are mainly found in marine habitats.
  - **Coelenterata:** These are animals living in water. Jellyfish and sea anemones are common examples.
  - **Platyhelminthes:** These are either free-living or parasitic. E.g. of free-living animals like planarians, parasitic animals like liverflukes.
  - **Nematoda:** The Nematoda animals body is cylindrical rather than flattened. Some examples are Ascaris and Wuchereria.
  - **Annelida:** Annelid animals are also bilaterally symmetrical and triploblastic, but in addition they have a true body cavity. These animals are found in a variety of habitats- fresh water, marine water as well as land. Earthworms and leeches are familiar examples.

- **Arthropoda:** This is probably the largest group of animals. These animals are bilaterally symmetrical and segmented. They have jointed legs. E.g. prawns, butterflies, spiders, crabs etc.
- **Mollusca:** There is bilateral symmetry in these animals. The coelomic cavity is reduced. They have an open circulatory system and kidney-like organs for excretion. Examples are snails and mussels.
- **Echinodermata:** These are spiny skinned organisms and free-living marine animals. They have a peculiar water-driven tube system that they use for moving around. E.g. starfish and sea urchins.

DIGESTIVE SYSTEM IN HUMAN BEINGS

GLANDS AND THEIR FUNCTIONS

1. **Liver:** it is **largest** gland in the body
   It produces **Bile Juice** which is important for the **digestion of fats**
2. **Pancreas glands**: It produces **pancreas juice** which acts on **carbohydrate, facts and proteins and changes them into simpler forms**

STOMACH

- The **stomach is a thick-walled bag**. Its shape is like a **flattened U** and it is the widest part of the alimentary canal.
- The inner lining of the stomach secretes mucous, hydrochloric acid and digestive juices. The mucous protects the lining of the stomach.

SMALL INTESTINE

- The **small intestine** is highly coiled and is about **7.5 metres long**. It receives secretions from the liver and the pancreas.

LARGE INTESTINE

- The **large intestine** is wider and shorter than small intestine. It is about **1.5 metre** in length.

- Its function is to absorb water and some salts from the undigested food material.
- The faecal matter is removed through the anus from time-to-time. This is called **egestion.**

BREATHING IN ANIMALS

- Earth worm breaths **through skin**
- **Frogs** have a pair of lungs and they **can also breath through skin**

POLLINATION

- It is the **transfer of pollen from another to stigma of a flower.**
- If the pollen lands on the stigma of the same flower it is called **Self-pollination**.
- When the pollen of a flower lands on the stigma of another flower of the same plant, or that of a different plant of the same kind, it is called **Cross-pollination**.
- **Agents of pollination are water, wind and insects**

FERTILIZATION

- The cell which results after fusion of the gametes is called a **zygote**.
- The process of fusion of male and female gametes is called **fertilization**. The **zygote develops into an embryo.**
- Fertilization which takes place inside the female body is called **internal fertilization**.
- The fusion of the male and female gamete when takes place outside the body of the female is called **external fertilization.**
- The animals which give birth to young ones are called **viviparous animals**.
- Those animals which lay eggs are called **oviparous animals.**

SPEED OF SOME ANIMALS

- **Falcon 320 Km/h is the fastest among living beings**
- **Cheetah 112 KMS.**

- **Snail** is the slowest with **.05km/h**

MICROORGANISMS

- There are four major groups of microorganisms; **bacteria, fungi, protozoa and algae**
- **Virus is a microscopic organism which reproduces only inside the cells of host organism which may be bacterium or plant or animal**

DISEASES CAUSED BY VIRUS.

- Cold, influenza, and most cough, polio, chicken pox, measles, hepatitis A and foot and mouth disease in animals
- Swine Flu is caused by H1N1 Virus
- Ebola was is also due to Ebola Virus

DISEASES CAUSED BY PROTOZOA

- Dysentery, Malaria is caused by protozoa called Plasmodium.

DISEASES CAUSED BY BACTERIA

- Typhoid and TB and Anthrax in animals

OTHER USES OF MICRO- ORGANISMS

- **The bacterium Lacto bacillus** promotes the **formation of curd**
- **Yeast** is added in **baking industry**
- **Yeast** is used production of **alcohol and wine**
- **Fermentation** is the process of conversion of sugar into alcohol
- **Louis Pasteur** discovered fermentation in 1857
- **Anti-biotic medicines** are produced from **bacteria and fungi**
- **Penicillin** was founded by **Alexander Fleming**
- **It against the disease caused by virus which cannot be treated by anti-biotic**
- **Vaccines** produce anti-biotic to increase immunity towards **cholera, TB, Small Pox and hepatitis**

CARRIERS

- **Mostly mosquitoes** are carriers of microorganisms which cause diseases
- **Female Anopheles** mosquito carries parasite of malaria
- **Female Andes mosquito** carries virus of dengue fever

REPRODUCTION

BOY OF GIRL?

- It is decided by **chromosomes inside the cell**
- There are **23 pairs of chromosomes inside a cell**
- Out of these **females has 2 X** Chromosomes and **Male has one X and one Y Chromosome**
- **If X of male and X** of female joins together, the child will be **female**
- **If Y of male and X** of female joins together, the child will be **male**
- The gene responsible for Hemophilia is **X Chromosome**
- Then if the father is hemophilic, he cannot pass the disease to Son (For the child to be male, Y Chromosome of the father and X Chromosome of mother are needed)

DISEASES

TURNER SYNDROME

- Under this a female body is born with only one chromosome.

KLINEFELTER DISEASE

- It is a condition when a male child is born with extra chromosome.

DOWN SYNDROME

- Under this there is an addition of one chromosome in the 21st pair.
- Here, the child suffers from mental retardation.

PARKINSON'S DISEASE

- Under this disorder, central nervous system is affected.

ALZHEIMER'S DISEASE

- Under this memory and other important mental functions are destroyed. It is a chronic disease.

CRYDUCHAD SYNDROME

- Under this, basically one strand of DNA is destroyed.

SICKLECELL ANAEMIA

- Under this RBC is mishappened and broken down.

OSMOSIS

- **Osmosis** is the passage of water from a region of high-water concentration through a semi-permeable membrane to a region of low water concentration.
- If the medium surrounding the cell has a higher water concentration than the cell, the cell will gain water by osmosis. Such a solution is known as **Hypotonic solution**.
- If the medium has the same water concentration as the cell, there will be no net movement of water across the cell membrane. Such a solution is known as **Isotonic solution**.
- If the medium has a lower concentration of water than the cell, the cell will lose water by osmosis. Such a solution is known as **Hypertonic solution**.

HEAT

- Normal temperature of human body is **37 decree Celsius**
- Human body temperature does **not be above 42 and below 35 degree Celsius**
- A reliable measure of the hotness of an object is its **temperature**.
- Temperature is measured by a device called **thermometer.**

- The thermometer that measures our body temperature is called a **clinical thermometer**.
- The process by which heat is transferred from the hotter end to the colder end of an object is known as **Conduction**.
- The materials which allow heat to pass through them easily are **conductors of heat**.
- The **best conductors of heat** are silver and copper.
- Lead and Mercury are comparatively **poor conductors of heat.**
- Poor conductors are known as **Insulators**.

MOTION

- Newton gave three laws of motion. They are:
  - **Law of Enertia –** Here, a body will remain in the state of rest or in the state of motion until and unless any external force is applied on it. E.g. getting jerks when a standing bus starts moving or a moving bus comes to stand still.
  - **Second Law of Motion –** According to this law, the force applied on any body is directly proportional to the rate of the charge of momentum.
  - **Third Law of Motion –** To every action there is equal and opposite reaction. E.g. recoiling of the guns, satellite and missile launch and aircraft takeoff.

MAGNETIC LEVITATIONS

- Technology going to be used in **High speed bullet trains** which is expected to come in India in future.
- Unit of magnetic field strength is **Oersted.**
- Unit of magnetic field lines is **Tesla.**
- **Red wire** is a live wire.
- **Black wire** is a neutral wire.
- **Green wire** is an earth wire.

LIGHT

- An image formed on a screen is called a **Real image.**

- The image formed by a plane mirror could not be obtained on a screen. Such an image is called a **Virtual image.**
- The light ray, which strikes any surface, is called the **Incident ray**.
- The ray that comes back from the surface after reflection is known as the **Reflected ray**.
- The angle between the normal and incident ray is called the **Angle of incidence**.
- The angle between the normal and the reflected ray is known as the **Angle of reflection**.
- **CFL**: Compact Fluorescent Lamp
- It gives only light and not heat

MIRRORS AND LENSES

- **Concave mirror:** Looks like **inner part of a spoon**
- **Concave mirrors** are commonly used in torches, search-lights and vehicles headlights.
- Used **by doctors** for examining eyes, ears, nose and throat
- **Reflectors of torches, headlights of cars are made of it**
- **Convex Mirror:** Looks like **outer part of a spoon**
- **Convex Mirrors** are commonly used as rear-view mirrors in vehicles.
- **Spread over a large area**
- **Used as side glass in vehicles.**

LENSES

- Widely used in **spectacles, telescopes, and microscopes**
- **Convex lenses** feel **thicker in middle** than at the edges
- When bright spot of sun comes on convex lens **paper buns**
- **Concave lenses are thinner in middle**

DEFECTS OF VISION AND THEIR CORRECTION

MYOPIA

- Myopia is also known as far-sightedness.

- A person with myopia can see nearby objects clearly but cannot see distant objects distinctly. A person with this defect has the far point nearer than infinity.
- This defect can be corrected by using a concave lens of suitable power.

HYPERMETROPIA

- Hypermetropia is also known as far-sightedness.
- A person with hypermetropia can see distant objects clearly but cannot see nearby objects distinctly.
- This defect can be corrected by using a convex lens of appropriate power.

PRESBYOPIA

- Presbyopia is the defect where people find difficult to see nearby objects comfortably and distinctly without corrective eye-glasses.
- Such people requires bi-focal lenses. The upper portion consists of a concave lens. It facilitates distant vision. The lower part is a convex lens. It facilitates near vision.

FORCES

- If the two forces act in the opposite directions of an object, the net force acting on it is the difference between the two forces.
- The strength of a force is usually expressed by its **magnitude**.
- The force resulting due to the action of muscles is known as the **Muscular force.**
- The force exerted by a charged body on another charged or uncharged body is known as **electrostatic force.**
- The force acting on a unit area of a surface is called **pressure.**
- **Nuclear force** is the strongest force in the world.
- **Gravitational force** is the most widely spread force in the world.

FRICTION

- It is caused by the irregularities on the two surfaces in contact

- When one body rolls over the surface of another body, the resistance to its motion is called **rolling friction**.
- A resistive **force** that opposes a slide is also called **Sliding Friction**.
- It can also **produce heat**. E.g.; **Rub your hands together**, then it will produce heat
- **Applying break** in the vehicles uses friction for stopping vehicles
- The process of transferring of charge from a charged object to the earth is called **earthing.**

SOUNDS

- **Sound** cannot travel in vaccum but in medium through waves.
- **Speed of Light > Speed of Sound**
- Number of oscillations taking place per unit time, is called as **Frequency.**
- Human beings cannot hear sounds with more frequency than **20000 Hz.**
- He cannot hear those are lesser than **20 Hz** also
- **Decibel** is the unit of loudness of sound
- **Hertz** is the unit of frequency.
- There are two types of sound waves-
  1) **Infrasonic sound waves** – waves which are of very low frequency.
  2) **Ultrasonic sound waves** – waves having frequency more than 20,000 hertz.

ACIDS AND THEIR SOURCES

- **Acetic acid:** Vinegar
- **Formic acid:** Ant's sting
- **Citric acid:** Citrus fruits
- **Lactic Acid:** Curd
- **Oxalic Acid:** Spinach **(it is a type of plant used for cooking)**
- **Ascorbic acid:** Amla and citrus fruits
- **Tartaric Acid:** Tamarind, grapes and unripe mangoes
- **The purple colour litmus paper** when added to **acid turn red** and when added **to base turns Blue**
- **Red colour** litmus when added to **base turns blue**

- **Blue colour** litmus when added to **acid turns red**
- The reaction between an acid and a base is known as **neutralization**. Salt and water are produced in this process with the evolution of heat.

CHEMICAL CHANGE

- A change in which one or more new substances are formed is called a **chemical change**.
- A chemical change is also called a **chemical reaction**.

PHYSICAL CHANGE

- Properties such as shape, size, colour and state of a substance are called its **physical properties.**
- A change in which a substance undergoes a change in its physical properties is called a **physical change**.

ACID RAIN

- It is due to:

  1. **Carbonic Acid**- by Carbon dioxide
  2. **Sulphuric acid**: by Sulphur dioxide
  3. **By Nitric acid**: caused by Nitrogen Dioxide

EVAPORATION

- The process of conversion of water into its vapour is called **evaporation.**
- The **process of evaporation takes place continuously wherever water is present**.

CONDENSATION

- The process of conversion of water vapour into its liquid form is called **condensation.**

CHANGES IN SUBSTANCES

- Two types of changes are there:

  1**. Physical change**; it is change in form and **can be reversed** like change of water into ice

2. **Chemical change** which **cannot be reversed** like **milk becomes curd**

- **Rusting of iron** is a **chemical change**. For rusting presence of oxygen and water are compulsory. Then while iron rusts its mass increases.
- **Galvanization** is deposition of **zinc** on iron to prevent rusting.
- Some examples of Chemical change are **ozone layer depletion, digestion and photosynthesis.**

STATES OF MATTER

- The three different states of matter are Solid, Liquid and Gas.
- **Solid state of matter** has a definite shape, distinct boundaries and fixed volumes.
- Solids tend to maintain their shape when subjected to outside force.
- **Liquids** have no fixed shape but have a fixed volume.
- **Liquids** flow and change shape, so they are not rigid but can be called fluid.
- **Gases** are highly compressible as compared to solids and liquids.
- **In the gaseous state,** the particles move about randomly at high speed.
- The temperature at which solid melts to become a liquid at the atmospheric pressure is called its **melting point.**
- Change of solid state into liquid state is also known as **Fusion.**
- The amount of heat energy that is required to change 1kg of solid into liquid at atmospheric pressure at its melting point is known as the **latent heat of fusion**.
- The temperature at which a liquid starts boiling at the atmospheric pressure is known as its **boiling point**.
- A change of state directly from solid to gas without changing into liquid state is called **sublimation.**
- The phenomenon of change of a liquid into vapours at any temperature below its boiling point is called **evaporation**.
- **<u>BOSE-EINSTEIN CONDENSATE</u>**

  In **2001**, Eric A. Cornell, Wolfgang Ketterle and Carl E. Wieman of USA received the Nobel prize in physics for achieving **"Bose-Einstein condensation".** The **BEC** is formed by cooling a gas at extremely low density, about one-hundred-thousandth the density of normal air, to super low temperatures.

- **Crystallization** is a process that separates a pure solid in the form of its crystals from a solution.

ATOMS AND MOLECULES

- An **atom** is the smallest constituent unit of ordinary matter that has the properties of a chemical element.
- A **molecule** can be defined as the smallest particle of an element or a compound that is capable of an independent existence and shows all the properties of that substance.
- The number of atoms constituting a molecule is known as its **Atomicity.**
- Atoms of different elements join together in definite properties to form molecules of compounds.
- Compounds composed of metals and non-metals contain charged species. The charged species are known as **ions.**
- An **ion** is a charged particle and can be negatively or positively charged.
- A group of atoms carrying a charge is known as a **polyatomic ion**.

ATOMIC NUMBER

- The **atomic number** is defined as the total number of protons present in the nucleus of an atom.

MASS NUMBER

- The **mass number** is defined as the sum of the total number of protons and neutrons present in the nucleus of an atom.

ISOTOPES

- **Isotopes** are defined as the atoms of the same element, having the same atomic number but different mass numbers.
- The chemical properties of isotopes are similar, but their physical properties are different.

ISOBARS

- Atoms of different elements with different atomic numbers, which have the same mass number, are known as **Isobars**.

METALS AND NON-METALS

- The property of metals by which they can be beaten into thin sheets is called **malleability**.
- The property of metal by which it can be drawn into wires is called **ductility.**
- Some materials are **hard, lustrous, malleable, ductile, sonorous** and **good conductors of heat and electricity**. The materials which generally possess these properties are called **Metals**.
- The examples of metals are iron, copper, alluminium, calcium, magnesium etc.
- Metals which are not sonorous and are poor conductors of electricity are called **Non-metals.**
- The examples of non-metals are Sulphur, carbon, oxygen, phosphorous, etc.

COMBUSTION AND FLAME

- A chemical process in which a substance reacts with oxygen to give off heat is called **combustion**.
- The lowest temperature at which a substance catches fire is called its **ignition temperature**.
- The substances which have very low ignition temperature and can easily catch fire with a flame are called **inflammable substances**.
- Types of combustion are:
  1) When the gas burns rapidly and produces heat and light then such combustion is known as **Rapid combustion**.
  2) The type of combustion in which a material suddenly bursts into flames, without the application of any apparent cause is called **Spontaneous combustion**.

- A large amount of gas formed in the reaction is liberated. Such a reaction is called **explosion.**

SOME FACTS

- **Purest form of Gold** is **24K**
- Purest form of water can get from a heavy shower of rain
- Age of a tree can be measured by growth of rings on the bark
- **Entomology** is the study of insects
- **Geology** is the study of rocks
- **Oncology** is the study of cancer
- **Ornithology** is the study of birds
- **Zoology** is the study of animals

SCIENTISTS AND DISCOVERIES

- **Ernest Rutherford**: Nucleus
- **Thomas Alva Edison**: Electric Bulb
- **WC Rangton**: X-Ray
- **Albert Einstien**: Photo electric effect, theory of relativity
- **James Chadwick**: Neutron

DEFENSE RESEARCH DEVELOPMENT ORGANIZATION

MISSILES

INTEGRATED GUIDED MISSILE DEVELOPMENT PROGRAMME (IGMDP)

- **APJ Abdul Kalam** is the **father of this mission**

- Five missiles were developed under this mission

➢ PRITHVI

- It is a **surface to surface short range Ballistic Missile**
- Prithvi has three versions. They are:
- Prithvi 1(150Kms), Prithvi 2 (250-350 KMs) Prithvi 3 (350-600 KMs)
- Dhanush missile is a variant of Prithvi developed for Indian navy
- **Range of Dhanush is 350 KMs**
- It can carry both conventional and nuclear weapons
- It can destroy targets both in sea and land surface
- It was successfully test-fired on INS Subhadra in Bay of Bengal

➢ AGNI

- It is one of the most successful missiles of India
- It has large number of variants
- Agni Missiles are long range, nuclear weapons capable surface to surface ballistic missile

Name	Type	Range
Agni-I	MRBM	700 – 1,250 km
Agni-II	MRBM	2,000 – 3,000 km
Agni-III	IRBM	3,500 – 5,000 km
Agni-IV	IRBM	3,000 – 4,000 km
Agni-V	ICBM	5,000 – 8,000 km (Testing)
Agni-VI	ICBM	8,000 – 10,000 km (Under development)

➢ AGNI V

- **Agni-V** is an **intercontinental ballistic missile** developed by the Defence Research and Development Organisation (DRDO)
- It is used by Strategic Force Command or Strategic Nuclear Command of Indian Army
- **Bharat Dynamic Limited is the manufacturer of Agni V**.
- The Engine has 3 stage solid fuel

- It can carry 1500 Kg nuclear warhead
- In future, Agni-V is expected to feature Multiple independently targetable re-entry vehicle (MIRVs) with each missile being capable of carrying 2–10 separate nuclear warheads.
- Each warhead can be assigned to a different target, separated by hundreds of kilometres; alternatively, two or more warheads can be assigned to one target.
- MIRVs ensure a credible second strike capability even with few missiles.

➢ AGNI VI

- It is an **intercontinental ballistic missile** being developed by the DRDO for the use of the Indian Armed Forces.
- **Agni-VI** is expected to have Multiple independently targetable re-entry vehicle as well as Manoeuvrable re-entry vehicle(MaRV).

➢ AGNI-VI SLBM (SUBMARINE-LAUNCHED BALLISTIC MISSILE)

- The SLBM version of missile will arm the Arihant class submarines of the Indian Navy.
- This will be a **submarine-launched solid-fuel missile** with a maximum **range of 6,000 kilometres** and a payload of three tonne.

➢ TRISHUL

- It is a **short range surface-to-air missile** developed by India
- Trishul has a **range of 9 km**
- It can also be used as an anti-sea skimmer from a ship against low flying attacking missiles
- Trishul flies at supersonic speed

➢ AKASH

- It is a **medium-range mobile surface-to-air missile**
- The missile system can target aircraft up to 30 km away, at altitudes up to 18,000 m

➢ NAG

- It is a third generation **"fire-and-forget" anti-tank missile**

- The NAMICA version of the missile is a 'lock-on before launch' system, where the target is identified and designated before the missile is launched
- The HELINA (Helicopter-launched Nag) version on the other hand will use a 'lock-on after launch' system extending its range to 7 km.
- In this scenario, the missile is launched in the general direction of the target.
- As it approaches the target, images of the area ahead are sent back to the operator who will be able to identify enemy tanks.
- It has a range of 7–8 km

➢ SAGARIKA MISSILE

- It is a nuclear-capable submarine-launched ballistic missile with a range of 750 kilometres
- Launched on nuclear powered Arihant Class Submarines
- Tests were covered at Vishakapatanam sea

➢ RUSTOM

- It is a Medium Altitude Long Endurance unmanned combat air vehicle (UCAV)
- It will be used by all three divisions of Indian Armed forces
- Rustom 2 has been declared in November 2016

➢ ASTRA

- It is an active radar homing beyond-visual-range air-to-air missile (BVRAAM

➢ SHAURYA MISSILE

- The **Shaurya missile** is a hypersonic surface-to-surface tactical missile
- It has a range of between 750 to 1,900 km

➢ BRAHMOS MISSILE

- It is a **short-range ramjet supersonic cruise missile** that can be launched from submarines, ships, aircraft or land.
- It is a **joint venture between the Russian Federation and India**
- It is the **world's fastest anti-ship cruise missile** in operation
- Range is 290Kms due to MTCR regulations for international cooperation on missiles with range more than 300kms

MEDICINE BY DRDO

- **LUKOSKIN**
  - It was developed by DRDO Bio Energy Research Centre at Haldwani (Uttarkhand) for treating Vitiligo or leukoderma

INDIAN COUNCIL FOR AGRICULTURAL RESEARCH

NEW INITIATIVES

- Fabric from Banana
- Natural Dye from flowers
- Health food from Jowar and Bajra

COMPUTER TECHNOLOGY

TERMS RELATED TO COMPUTER

- **RAM:** Random Access Memory
- **FTP:** File transfer Protocol
- **ROM: Read Only Memory**
- **CPU: Central Processing Unity**
- **UPS: Uninterrupted Power Supply**
- **HTML:** Hyper Text Markup Language
- **LAN: Local Area Network**
- **WAN: Wide Area Network**
- **IC Chip in the processor** of a computer is made of **Silicon**

FIRST COMPUTER IN INDIA

- **Indian got its first computer in 1956** at a cost of 10 lakh Indian rupees
- It was named as HEC-2M
- It was **installed at Indian Statistical Institute, Kolkata**
- It was used for formulating five-year plans and to keep secret information of India regarding the nuclear projects

SUPER COMPUTERS

- **Param 8000** was the first super computer of India
- It was developed by Centre for Development of Advanced Computing (CDAC) in 1991with Russian collaboration
- All elements used in this computer was developed domestically
- It was used for weather forecasting and remote sensing
- **Pratyush (the super computer of Indian Institute of Tropical Meteorology) is the fastest super computer of India in 2017**
- International rank of Aditya is 139
- **Summit (Super Computer of Energy Department of the US)** is the fastest in the world (2018)
- **It was developed by IBM**

INDIAN SPACE RESEARCH ORGANIZATION

- It is the space agency of the Government of India headquartered in the city of Bengaluru.
- Vision is to "harness space technology for national development"
- Established on 15th August 1969
- Vikram Sarabhai was the founder scientist who worked close with Jawaharlal Nehru in realizing ISRO
- **AS Kiran Kumar** is the **present Chairman**

SATELLITES

➢ ARYABHATTA

- First satellite developed by ISRO
- Launched on April 19, 1975
- The total duration of the mission was only four days. There is no contact with the satellite after 4 days
- Launched from Kapustin Yar in Russia
- Launching vehicle was u-11 Interkosmos (Russian)

- **BHASKARA I**
  - Was launched on 7 June 1979 from Kapustin Yar
  - First experimental remote sensing satellite. Carried TV and microwave cameras.
  - It was the second satellite developed by ISRO
  - Launching Vehicle was C-1 Interkosmos
- **ROHINI TECHNOLOGY PAYLOAD**
  - **First satellite launched with an Indian Vehicle SLV3**
  - It did not achieve the target
- **INSAT-1A (INDIAN NATIONAL SATELLITE)**
  - It was developed by ISRO in 1982
  - First operational multipurpose communication and meteorology satellite.
  - Procured from USA's Ford Aeorospace.
  - Worked for only six months.
  - Launch Vehicle was Delta 3910 PAM-D
  - Launched Cape Carnival Airforce station of the US
- **IRS 1A**
  - It was the first operational remote sensing satellite of India
  - Launched from Baikanour site in present day Kazakistan
  - Launch Vehicle used was Vostok of USSR
  - Mission was earth observation and remote sensing
- **INSAT 1D**
  - It is the oldest and still functioning communication satellite
  - Launched from Cape Carinical
  - Launch Vehicle was Delta 4925 of the US
- **OCEANSAT-1 (IRS-P4)**
  - Launched in 1999.
  - Launch vehicle used was the PSLV-C2
  - **Earth observation satellite**.

- Carries an Ocean Colour Monitor (OCM) and a Multifrequency Scanning Microwave Radiometer (MSMR).

➢ KALPANA-1 (METSAT)

- **First meteorological satellite** built by ISRO.
- Originally named METSAT.
- Renamed after Kalpana Chawla who perished in the Space Shuttle Columbia.
- **Launched from Satish Dhawan Space Station** in Sriharikkotta
- PSLC C4 was the launch vehicle

➢ EDUSAT

- Launched in October 2004 and deactivated in September 2010
- It was the **first satellite for education purpose**
- Launched from GSLV F01 from Satish Dhawan Space Centre
- **ViCTERS: Versatile ICT Enabled Resource for Students**
- It was the first broadband access programme for schools on Edusat
- A school programme of Kerala Government is based on this programme

➢ CARTOSAT-2

- Advanced remote sensing satellite carrying a panchromatic camera capable of providing scene-specific spot images.
- Launched in 2007 from PSLV-C7
- Launched from SDSC

➢ CHANDRAYAAN-1

- Launched in 2008 using PSLV-C11
- **Unmanned lunar probe.**
- 11 scientific instruments built in India, USA, UK, Germany, Sweden and Bulgaria.
- **First Mission of ISRO to moon**
- Launched from SDSC

➢ RISAT-2

- Radar imaging satellite used to monitor India's borders and as part of anti-infiltration and anti-terrorist operations.

- Launched as a co-passenger with ANUSAT on PSLC C12
- Anusat was a research satellite developed by students of Anna University.

➢ MARS ORBITER MISSION (MOM) MANGALYAN

- Launched in 2013 with PSLV C25
- It is **India's first interplanetary mission**
- ISRO has become the fourth space agency to reach Mars, after the Soviet space program, NASA, and the European Space Agency
- It is the first Asian nation to reach Mars orbit, and the first nation in the world to do so in its first attempt

➢ GSAT SATELLITES

- **GSAT 18** is an **Indian communications satellite**. Built by ISRO and operated by INSAT
- It was **launched in 2016**
- It is for telecommunication
- It carries 24 C-band, 12 extended C-band, and 12 K_u-band transponders.
- Launched by Ariane 5 Vehicle
- **Launched from Guiana Space Centre in France** (at Korou in French Guiana)

➢ CATROSAT 2D

- It is an **Earth observation satellite**
- Launched by PSLV C 37 (104 satellites were launched)
- Launched from SDSC

➢ SCATSAT-1

- Miniature satellite to provide weather forecasting, cyclone prediction, and tracking services to India
- Launched in 2016 from SDSC with PSLV C 37

➢ IRNSS-1G

- IRNSS-1G is the **seventh and final satellite** in the Indian Regional Navigation Satellite System (IRNSS).
- Launched from SDSC with PSLV-C33

MODERN TECHNOLOGIES

- **GPS:** It is attached to Global Navigation Satellite of the US
- **Glonass:** It is the same navigation system of Russia
- **Galelio** is the European System
- **IRNSS:** is the Indian Navigation Satellite system
- **GAGAN:** GPS Aided Geo Augmented Navigation System is the system used for air navigation in India