Key to
Navjeevan Practice Book

Standard
7

Teacher's Copy

General Science

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Topic 1 : The Living World : Adaptations and Classification

Q.1. (A) **(1)** Air spaces in **stems** and **petioles** of aquatic plants help them to float in water.

(2) The leaves of desert plants are modified into **thorns** to prevent evaporation of water.

(3) Climbers have **tendrils** on their stems to grow to a great height with the support of trees.

(4) Cuscuta has **haustorial (sucking)** roots for absorbing nutrients from its host.

(5) Fishes have **air bladders** within their body which help them to float in water.

(6) Bats fly with the help of **patagium**.

(7) The theory of natural selection was given by **Charles Darwin**.

(8) **Carl Linnaeus** suggested binomial nomenclature.

(9) **29th April** is observed as 'World Frog Protection Day'.

(B) **(1)** Plants like Acacia are found in **deserts**.

(2) Grasses in the **equatorial** regions grow very tall.

(3) **Drosera** grows in soil which is deficient in nitrogen.

(4) Frogs breathe through the **skin** in water.

(C) **(1)** Cuscuta **(2)** Blackbuck **(3)** Camel **(4)** Potato **(5)** Yam

(D) **(1)** Cockroach **(2)** Hen **(3)** Cactus **(4)** Mango

(E) **(1)** *Bos taurus* **(2)** Binomial nomenclature **(3)** vast meadows **(4)** Homo sapiens **(5)** modified root

(F) **(1)** (1) - (d), (2) - (c), (3) - (b), (4) - (a)

(2) (1) - (d), (2) - (c), (3) - (e), (4) - (a), (5) - (b)

(G) **(1)**

Plant	Habitat	Type of root	Characteristics of leaves	Characteristics of stem
Lotus	Aquatic	Fibrous	Large and round with waxy layer	Hollow and flexible
Cactus	Desert	Tap	Leaves are reduced to thorns	Green and fleshy
Banyan	Terrestrial	Tap	Large, glossy green and elliptical	Thick and woody

(2)

Adaptation	Animal	Use of adaptation
Sharp teeth	Lion, tiger	To tear the flesh
Long and pointed beak	Woodpecker	To feed on ants, termites and other insects
Short beak	Coppersmith	To feed on fruits
Long and sticky tongue	Frog	To catch the prey
Long neck	Giraffe	To reach for food (leaves) on top of trees

(H) **(1)** Pine and deodar.

(2) Acacia and cactus.

(3) Bittergourd and grapevine.

(4) *Cuscuta* (dodder) and gall.

(5) Sundew, venus flytrap, pitcher plant.

(6) Yak, polar bear, white fox, silver fox.

(I)

	Mango	Human	Rose
Kingdom	Plantae	Animalia	Plantae
Phylum	Anthophyta	Chordata	Spermatophyta
Class	Dicotyledonae	Mammalia	Dicotyledonae
Order	Sapindales	Primates	Rosales
Family	Anacardiaceae	Hominidae	Rosaceae
Genus	*Mangifera*	*Homo*	*Rosa*
Species	*indica*	*sapiens*	*gallica*

(J)

	Living things	Scientific name
(1)	Dog	*Canis lupus familiaris*
(2)	Cow	*Bos taurus*
(3)	Hibiscus	*Hibiscus rosa-sinensis*
(4)	Jowar	*Sorghum bicolor*

Q.2. (A) **(1) Adaptation :** Gradual changes that occur in the body parts and also in the behaviour of organisms, which help them to adjust to their surroundings is called adaptation.

OR Changes that take place in the various organs and life-processes of organisms, that enable them to live, feed, reproduce to perpetuate and protect themselves from their enemies in specific surroundings, depending upon the habitat and its geographical conditions are called adaptations.

(2) **Hierarchy of classification :** The formation of a hierarchy in classification starts with Kingdom Plantae or Kingdom Animalia. It proceeds further into formation of groups and sub-groups depending upon basic similarities and differences. This is called the hierarchy of classification.

(B) **(1)** (i) Some aquatic plants are entirely afloat, while in some, the leaves and flowers float on the surface.

(ii) The air spaces are an adaptation seen in aquatic plants.

(iii) The air spaces in stems and petioles of aquatic plants help them float on water.

(2) (i) The lotus leaves have waxy coating on their upper surface.

(ii) So the water trickles off the leaves and keeps the leaves water proof.

(iii) Hence, leaves of lotus plant do not rot in water.

(3) (i) The leaf of lotus plant is large, flat and undivided.

(ii) It has a long and flexible stem and petioles with air spaces.

(iii) Due to the air spaces in the stem and petioles of lotus plant, lotus leaf floats on water.

(4) (i) Bitter-gourd and grape vine have weak stems.

(ii) To grow well, they cling to other things for support.

(iii) In order to cling to the support, they develop thin spring-like structures called tendrils.

(iv) These tendrils are modified stems.

(C) **(1) Terrestrial plants and Aquatic plants.**

	Terrestrial plants		Aquatic plants
(i)	These plants grow in places where water is neither too much nor too little.	(i)	These plants grow in water.

(ii)	Root system of these plants is well developed.	(ii)	Due to availability of plenty of water, such plants are either rootless or with poorly developed roots.
(iii)	Stem is solid and branched.	(iii)	The stems may be reduced or long. Slender or spongy nature of stems is due to large air spaces in them which help them to float in water.

(2) Terrestrial animals and Aquatic animals.

	Terrestrial animals		**Aquatic animals**
(i)	Terrestrial animals are found on land like deserts, wetland, forest, grasslands etc.	(i)	Aquatic animals are found in water bodies.
(ii)	The body of terrestrial animals is generally covered with hair, fur.	(ii)	Their body is generally covered with scales.
(iii)	They breathe through nose.	(iii)	They have gills for breathing.
(iv)	Their toes are generally not webbed, they have legs or limbs to move from one place to the other.	(iv)	They have fins or webbed toes to swim in water.

Q.3. (A) (1) Diversity in living things is seen with respect to their shape, size, body parts, life cycle, mode of obtaining food and habitat.

(2) The leaves of lotus have a waxy coating on their upper surface. This keeps the leaf waterproof and hence water trickles off the lotus leaves.

(3) Lotus is an aquatic plant which floats on water. It has short and fibrous roots so that it remains firmly rooted in the soil at the bottom of the water bodies.

(4) Lotus, hydrilla, water lily and duckweed are four aquatic plants.

(5) Sloping branches give a conical shape to the plants found in the snowy region. This conical shape prevents the snow from accumulating on the tree during heavy snowfall and helps the plant to withstand extreme cold.

(B) (1) (i) Camels are adapted to survive in the desert.

(ii) Their thick skin prevents loss of water from their body.

(iii) They have folds of skin on their nostrils and long eyelashes to protect their eyes from sand.

(iv) They also have long legs with flat and cushioned soles to walk easily on sand without sinking into it.

(v) These characteristics help camels to move across the desert sand easily, providing a mode of transportation for people living in the desert. Hence, camel is called the ship of the desert.

(2) (i) Plants like cactus and Acacia have special characteristic features which help them to live in deserts with scarcity of water.

(ii) In cactus, the leaves are modified into thorns to prevent loss of water by evaporation.

(iii) Since the leaves of cactus are modified into thorns, their stems are green in colour and perform photosynthesis. They also store water and food, so they are fleshy too.

(iv) In Acacia, the leaves are small with waxy coating to prevent loss of water.

(v) Both the plants have long tap roots that penetrate deep into the soil in search of water.

(3) (i) Organisms are adapted to survive in the conditions in which they live.

(ii) In order to live in a particular type of habitat and geographical conditions, a gradual and continuous change takes place in the various organs and life processes of the organisms, which enables them to live, feed, reproduce and protect themselves from their surroundings.

(iii) So, to survive in a particular type of environment, the organisms must have certain adapted features and this is the reason we find certain kinds of organisms living in a particular climate.

(iv) For example, animals in polar region are adapted to the extremely cold climate and they have special features, such as white fur, strong sense of smell, a layer of fat under the skin, wide and large paws for swimming and walking on snow.

(4) (i) There are innumerable organisms found on earth.

(ii) Similarities, differences and the variety among living things are used as criteria for their classification.

(iii) Different scientists have used different criteria and independently classified plants and animals.

(iv) Under hierarchy of classification, a hierarchy is formed that starts with Kingdom Animalia or Kingdom Plantae and further groups and subgroups are added to the main group depending upon the similarities and differences among the organisms.

Q.4.(A) (1) (a) Penguins have white skin so that it can merge with the white background of the polar region. Also, it has thick skin with a layer of fat underneath to protect itself from extreme cold in the polar region.

(2) Penguins live in flocks sticking close to each other to keep themselves warm.

(3) Penguins live in polar regions. Penguins are adapted to survive in extreme cold climate and hence they are found in polar regions.

(4) (i) In order to live permanently in polar region, an organism must have certain special characteristics such as white skin, furry body, thick skin with fat underneath, strong sense of smell, webbed toes for swimming. These characteristics are necessary to withstand and survive in the extreme cold climate of the polar region.

(ii) Due to the extreme cold climate of the polar region, it is impossible for humans to live permanently in the polar region.

(B) (1) Animals and plants that are found in the desert have to face extreme heat and scarcity of water. So, they have special characteristics to adapt themselves to the surroundings.

Most of the desert plants are either leafless or their leaves are modified into thorns to prevent loss of water from their surface by evaporation. They have an extensive root system that goes deep into the soil in search of water. Their stems are green in colour to

perform photosynthesis and fleshy as they store water and food.

Similarly, the desert animals like camels have thick skin to prevent loss of water from their body, long legs with flat and cushioned soles to walk on the sand, folds of skin on the nostrils to protect them. Certain desert animals like rats, snakes, spiders are active at night, when it is comparatively cool, and during the daytime, they remain in the deep burrows.

(2) Different types of bushes and grasses grow in grasslands. Bushes generally have deep spreading roots, whereas grasses have fibrous roots, which help them to prevent soil erosion and grow well in grasslands. So, grasslands are lush green. In equatorial regions, grasses grow tall which enables animals like tiger, elephant and deer to remain hidden in the grasses and also from their prey or predator. Whereas in cold regions, animals like rabbit are found as the grasses in these regions are very short.

(3) Insects are adapted to different kinds of climatic conditions. They mature fast and lay eggs in large numbers. So, they reproduce very fast and hence are found in large numbers.

(4) Animals like frogs, butterflies, lizards, grasshoppers have typical colours which blend with those of their surroundings. This helps the animals to get camouflaged amidst grasses, parts of plants like stems, leaves, flowers, etc. Animals found in snowy region have white or silver body colour, which merges well with the white background. Such kind of adaptation

either protects the animals from their predators or their prey.

(5) Long ears is an adaptation seen in animals living in the grasslands. This adaptation enables them to hear sounds from long distances and different directions. The long ears also act as a cooling system for the animals. The long ears have thin skin. The large network of blood vessels provides a large surface area for heat exchange.

(C) Animals like garden lizard, crocodile, house lizard, snakes are reptiles. They have very short limbs or are limbless. For example, snake is a limbless reptile. They creep or crawl on the ground since they have short limbs. Animals like house lizard, garden lizard, crocodile use their muscles for creeping. They also show adaptation in skin, soles of feet, body colour, etc. Lizards have clawed toes and thin soles, whereas snakes have a scaly skin.

(D) **(1)** The given plant is a cactus. It belongs to the desert region.

(2) A is thorn, B is stem.

(3) Thorns are modified leaves, so they reduce loss of water by evaporation, whereas stem performs photosynthesis and stores food and water.

Topic 2 : Plants : Structure and Function

Q.1. (A) **(1)** **Root** grows from the radicle.

(2) The part that grows from inside the seed, above the soil is called **plumule**.

(3) Leaf-blade of maize plant has **parallel** venation.

(4) Roots that grow from the stem just above the soil are called **adventitious** roots.

(5) **Androecium** is the male reproductive part of the flower.

(B) **(1)** The stalk of flower is called **pedicel**.

(2) **Corolla** is made up of petals.

(3) **Fertilized ovule** forms the seeds.

(4) **Ovary** develops into a fruit.

(5) **Gynoecium** is made up of carpel.

(C) **(1)** Sorghum **(2)** Pea **(3)** Onion **(4)** Receptacle **(5)** Carpel

(D) **(1)** Leaf margin **(2)** Corolla **(3)** Pollen grains **(4)** Dicotyledonous

(E) (1) - c, (2) - e, (3) - a, (4) - b

Q.2. (A) **(1) Root :** The part of the plant growing below the soil for support is called root.

(2) Tap root : Roots of plants that produce secondary roots which grow obliquely and spread far and wide in the soil are called tap roots.

(3) Reticulate venation : Arrangement of veins in a leaf to form a network of veins is called reticulate venation.

OR Secondary veins arise from the mid-vein in a leaf. They are branched and form a network. Such an arrangement of veins is called reticulate venation.

(4) Parallel venation : When veins are parallel, running from the leaf-base to the leaf apex, such type of arrangement of veins is called parallel venation.

(5) Pollination : Transfer of pollen grains from the anther to the stigma is called pollination.

(6) Fibrous roots : Thread-like or fibre-like roots arising from the stem that do not grow deep into the soil are called fibrous roots.

(B) **Monocotyledonous seeds :** maize (corn), sorghum (jowar)

Dicotyledonous seeds : pea, coriander, mustard

(C) **(a)** Pineapple, jackfruit, spiny gourd

(b) Rose, cactus, bougainvillea

(c) Rose, bougainvillea, hibiscus

(d) Sunflower, marigold, tulip

(e) Mimosa plant, Prayer plant, Tamarind tree

(f) Cashew nut, peach, mango

(g) Jackfruit, pomegranate, custard apple

(h) Morning glory, lotus, poppy

(i) Pineapple, aloe, holy tree

Q.3. (A) **(1)** The parts of a seed are cotyledons, plumule and radicle.

(2) A cap-like structure that covers the tip of a root is called the root cap. The root-cap protects the root-tip from injuries.

(3) Fibrous roots are short, thread-like roots that grow under the soil very close to its surface and also they do not have branches. If plants like tamarind, banyan and mango had fibrous roots, the plants would not have

got enough support, they would have fallen and would not have grown well. These plants have hard, strong and thick stems with many branches which spread out in many directions.

(4) The roots grow from the root tip. If the root tip is injured, the roots will not grow and plants may not grow well or may die.

(5) Fenugreek and spinach have tap roots, whereas onion plants have fibrous root.

(6) Underground parts of plants like radish, carrot, beet and sweet potato are thick, fleshy and swollen as they store food in them. They are the roots of the plants, modified to perform the function of storing food.

(7) Insects flitting about around the flowers of plants help in pollination which further leads to fertilization and formation of fruits. Fruits contain seeds and seeds grow into new plants.

(B) **(1)** (a) The root tip is a delicate part of the root.

(b) It is the region of growth of the root.

(c) A cap-like structure called the root cap protects the root tip from injuries.

(2) (a) Plants like maize, sugarcane, sorghum have fibrous roots which are short, thread like and which do not grow deep into the soil.

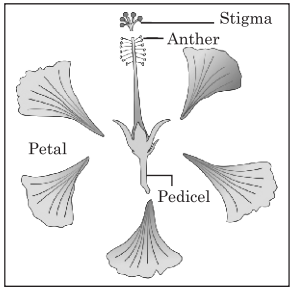
(b) Along with fibrous roots, these plants have roots which grow above the ground from the stem. They are called stilt roots.

(c) These stilt roots give additional support to the stems of the plants and help them to stand erect.

(d) Hence, plants like maize, sugarcane, sorghum have two types of roots.

Q.4. (A) **(1)** Flower is the reproductive part of a plant and it is the most colourful part of the plant.

The flower is attached to the stem with the help of stalk called pedicel. There are four main parts of the flower. They are calyx, corolla, androecium and gynoecium which are supported on the expanded and swollen end of the stalk called the receptacle.

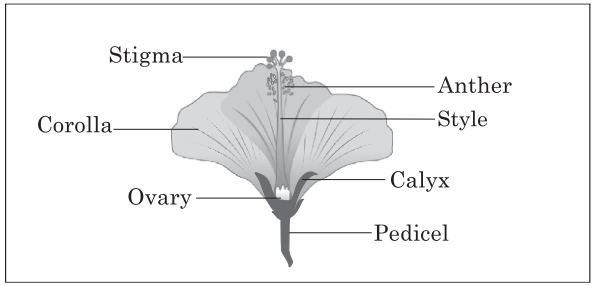


Calyx is the outermost part of the flower, which is made up of sepals. It is green in colour and protects the flower when it is in bud state.

Corolla is made up of petals. They are colourful and have fragrance.

Androecium is the male reproductive part of the flower. It consists of stamen and each stamen is made up of anther and filament.

Gynoecium is the female reproductive part of the flower. It is made up of carpel and carpel consists of stigma, style and ovary.



(2) (i) Root : The main functions of roots are anchoring the plant to the ground and supporting it, absorption of water and minerals from the ground.

Some roots are modified to perform additional functions like storage of food as in case of radish and beetroot.

(ii) Stem : The main function of stem is to provide support to the plant by holding leaves, flowers and buds. It also transports water and minerals absorbed by the roots and supplies food from the leaves to other parts of the plant. Stems of certain plants are modified to perform additional functions like storage of food as in the case of potatoes and photosynthesis as in case of cactus.

(iii) Leaves : Leaves help the plant to prepare their own food with the help of the chlorophyll in them. Some leaves are modified to perform the function of storage of food as in case of Aloe leaf.

(iv) Flower : Flower is the reproductive part of the plant. The main function of flower is to attract insects for pollination, which results in fertilization and formation of seeds.

(v) Fruit : Fruit bears seeds and seeds grow into a new plant.

(3) (a) Similarities : (i) Both the plants bear flowers and their seeds are edible.

(ii) They do not grow very tall.

Differences : Jowar has monocotyledonous seeds and fibrous roots, whereas moong contains dicotyledonous seeds and tap roots.

(b) Similarities : Both onion and coriander are flowering plants.

Differences : (i) Onion is a monocot, whereas coriander is a dicot.

(ii) The roots of onion are fibrous and those of coriander are tap roots.

(c) Similarities : Leaves of both the plants have single undivided leaf blade and a single mid-rib, so they are simple leaves. Their leaf margin is entire.

Differences : Leaves of banana are very big with very thick mid-rib and show parallel venation. Whereas leaves of mango are comparatively very small with thin mid-rib and their leaf-blade has reticulate venation.

(d) Similarities : Both plants are monocots. They have fibrous roots and the leaves have parallel venation.

Differences : Coconut trees grow very tall and have thick and woody stems, whereas jowar stalk plants are short plants with thin and soft stems.

(4) (i) Leaves with smooth surface : Mango is a plant which has leaves with smooth surface. The stem of mango is thick and woody, it has tap roots. It bears flowers and its fruits contain only one seed. The seeds of mango have two cotyledons, so it has dicotyledonous seeds.

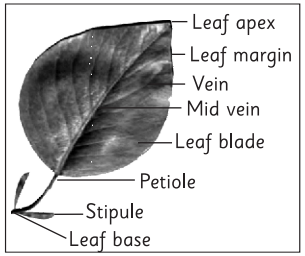
Leaf margin of mango is entire and the leaves are simple leaves.

(ii) Leaves with rough surface : Coconut tree has leaves with rough surface. It has long compound leaves with parallel venation. The coconut tree has thick and woody stem. It has fibrous roots.
It also has adventitious roots to give additional support to the plant.

(iii) Fleshy leaf : Aloe is a plant with fleshy leaf. These leaves are thick, fleshy and juicy as they can store water. There are spines on the margin of these leaves. Aloe grows in desert regions where there is scarcity of water and it has fibrous root system.

(iv) Spines on leaf : Pineapple plant has spines on its leaves. It is a fruit-bearing plant that grows in tropical regions. The leaves of pineapple plant are succulent, that is they can store water. The leaves are closely spaced in rosette on a thick fleshy stem. It is a monocot having fibrous root system.

(B) (1) Leaves grow from the nodes on a stem and they are generally thin, flat and green in colour.



(2) The broad, spread-out part of the leaf is called the leaf-blade or lamina.

(3) The edge of the leaf is called the leaf-margin.
Leaf margins are of different types, like entire, dentate or lobe. The tip of the leaf is called the leaf apex which may be tapering, pointed or rounded.

(4) The stalk by which the leaf is attached to the stem is called petiole. Some leaves may or may not have a stalk.

(C) Image A : It is a maize (corn) seed. It is a monocotyledonous seed. It cannot be divided into two equal parts.

Image B : It is a bean seed. It is a dicotyledonous seed. It can be divided into two equal parts.

Topic 3 : Properties of Natural Resources

Q.1. (A) **(1)** The capacity of air to hold moisture depends upon the **temperature** of the air.

(2) Water does not have a **shape** but has definite **volume** and **mass**.

(3) While freezing, the **density** of water is lowered.

(4) **Neutral** soil has pH 7.

(B) **(1)** Density of water is **greater** than ice.

(2) **Silt** soil contains large proportion of organic material.

(3) The proportion of small particles is maximum in **clay** soil.

(4) To determine the pH of soil, a mixture of water and soil is taken in **1:2** proportion.

(5) **Peanut** crop is cultivated to restore the fertility of the soil.

(C) **(1)** Atmospheric pressure at sea level is **1,01,400** N/m^2 under ordinary conditions.

(2) Atmospheric pressure is measured using an instrument called a **barometer**.

(3) The density of water is **1** gm/cc.

(4) The ratio of mass to the volume of a substance is called its **density**.

(5) Water expands when the temperature falls below **4 °C**.

(6) **Solvent** is the substance in which the solute dissolves.

(7) The proportion of particles of various sizes in the soil determines its **texture**.

(8) Water drains rapidly through **sandy** soil.

(D) **(1)** (i) - (b), (ii) - (a), (iii) - (c)

(2) (i) - (c), (ii) - (d), (iii) - (b), (iv) - (a)

(E) **(1)** True **(2)** False **(3)** True

(4) True **(5)** False

(F) **(1)** Fluidity **(2)** Terracotta soil **(3)** China clay

Q.2. **(1)** Air contains oxygen, carbon dioxide, nitrogen, water vapour and some inert gases. Air is a homogeneous mixture because the gases present in it are in a definite proportion by volume.

(2) No, there is no atmospheric pressure on the moon as there is no air on the moon.

(3) If the temperature over an area increases, the air over that region will expand, become lighter and rise up.

So, the pressure of air at that region will decrease.

(4) When an uncorked empty bottle is dipped into the water in slanting position, the air is seen escaping from the bottle in the form of air bubbles and also there is

increase in the level of water in the bottle as the air escapes from the bottle.

(5) When air is filled into a balloon, its shape changes and its size increases. It shows that air occupies space, has certain volume and also has mass and weight.

(6) The density of ice is less than water, so ice floats on water.

(7) Sea water contains a large amount of salt dissolved in it. Due to the dissolved salts in sea water, its density is more than that of rain water.

(8) Clay soil has the greatest proportion of small particles. This soil is sticky when wet, as it has high water holding capacity but very hard and cloddy when dry. Therefore, it is difficult to plough clay soil.

(9) Sandy soil has a greater proportion of large particles, that is sand and gravel. Sandy soil has the least capacity to hold water, so its particles do not stick together. Hence, it is easy to plough sandy soil. Silt soil has a medium capacity of holding water compared to sandy and clay soils.

(10) Silt soil has a medium capacity of holding water compared to sandy and clay soils.

(11) Silt soil is suitable for cultivation. The particles of silt soil are of medium size. This soil contains a large proportion of organic materials and also its capacity to supply nutrients is much greater, so the plants grow well in this soil. Hence, silt soil is suitable for cultivation.

(12) The advantages of good soil structure are that the roots get sufficient supply of oxygen. Water drainage becomes good and the roots of plants grow well.

(13) Air contains very fine particles of some gases, dust, smoke and moisture. When a ray of light falls on these minute particles, the particles deflect the light in different directions and thus scatter the light.

(14) Soil is a thin layer of material covering the earth's surface. It is made up mainly of organic matter (humus), minerals, small rocks, and various microbes. Soil is formed by a natural process (weathering) in which the bed rock breaks into pieces due to various physical, chemical, and biological factors. The process of soil formation is slow and continuous.

(15) Soil is composed of the following: weathered rock, minerals, organic matter, air, water and living organisms.

Q.3.(1) (i) Air is a mixture of various gases like oxygen, carbon dioxide, nitrogen and inert gases.

(ii) These gases are uniformly mixed throughout the air.

(iii) Also, the properties and the composition of air is the same throughout, so air is said to be a homogeneous mixture of various gases.

(2) (i) Many substances dissolve in water without chemically reacting.

(ii) Since water dissolves many substances, it is called universal solvent.

(3) (i) Water is a universal solvent used for cleaning purposes such as bathing, washing clothes and utensils at home.

(ii) It is also used as a solvent in factories, industries and hospitals.

(iii) Being a universal solvent, water can dissolve more substances than any other liquid.

(iv) Water is capable of dissolving solids, liquids and even gases.

Hence, there is no alternative to water for cleaning purpose.

Q.4. (1) Given :

Mass (m) = 1 kg, volume (v) = 1 litre, Density (D) = ?

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

$$\text{Density (D)} = \frac{1\text{kg}}{1\text{ litre}}$$

$$= 1\text{ kg/litre}$$

The density of water will be 1kg/litre or 1 kg/m^3.

(2) Given :

Mass (m) = 6 gm, volume (v) = 3 cc, Density (D) = ?

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

$$\text{Density (D)} = \frac{6\text{g m}}{3\text{ cc}}$$

$$= 2\text{ gm/cc.}$$

The density of the object is 2 gm/cc.

The object will sink in water as its density is more than that of water.

Q.5.

Sr. No.	Types of soil	Colour	Uses
(1)	**China clay (Kaolin)**	White	To make crockery, bathroom tiles, tanks, laboratory apparatus.
(2)	Shadu soil	**Whitish**	**To make statues and idols.**
(3)	**Terracotta soil**	Red	Decorative articles and pots for growing plants.
(4)	**Multani soil**	Brownish	**Cosmetics**

Q.6. (A) (1)

	Sandy soil		Clayey soil
(i)	The proportion of sand, i.e. large particles is high in sandy soil.	**(i)**	The proportion of small particles is maximum in clayey soil.
(ii)	It has very less capacity to hold water, as water drains rapidly through it.	**(ii)**	It has very high capacity to hold water, as water does not drain easily through it.
(iii)	It is easy to plough sandy soil.	**(iii)**	It is difficult to plough clayey soil.

(2)

	Silt soil		Clayey soil
(i)	The particles of silt soil are of medium size.	**(i)**	Clayey soil has a great proportion of small particles.
(ii)	It has medium capacity to hold water.	**(ii)**	It has the greatest capacity to hold water.
(iii)	It is much more ploughable than clayey soil.	**(iii)**	It is difficult to plough clayey soil

Q.6. (B) (1) (i) Air has certain capacity to hold water vapour.

(ii) This capacity of air to hold water vapour depends upon the temperature.

(iii) During the night, when temperature of the air is low, its capacity to hold water vapour becomes less.

(iv) At such time, the excess vapour condenses to form water droplets on the surfaces of leaves and dew is formed.

(v) Hence, we find dew drops early morning.

(2) (i) In cold countries as the temperature of the surroundings goes down, the temperature of water in the rivers or lakes also decreases.

(ii) When the temperature of water decreases below 4°C, water expands instead of contracting and its density decreases. This is due to anomalous behaviour of water.

(iii) At 0°C water freezes to form a layer of ice at the surface of water, since the density of ice is less than that of water.

(iv) The water below this layer of ice remains at 4°C and hence in cold countries aquatic animals continue to survive even after the rivers or lakes freeze in winter.

Q.6. (C) (1) (i) Air contains water vapour and the level of humidity of the air is determined by its capacity to hold water vapour.

(ii) If the amount of water vapour in the air increases, the humidity of the atmosphere will increase and we will feel dampness.

(2) (i) Soil contains organic and inorganic ingredients in certain amounts, which help plants to grow well in the soil.

(ii) If only one crop is grown repeatedly, it will utilize all the ingredients of the soil for its growth and the fertility of the soil will decrease.

(3) (i) Due to anomalous behaviour of water, as water freezes to form ice, it expands and its volume increases.

(ii) As water expands while freezing, it will exert pressure on the walls of the completely filled glass bottle and the bottle will break.

Q.7. (1) (i) Plant growth : Soil contains various organic and inorganic ingredients, which supply nutrients to the plants and help plants to grow.

(ii) Water conservation : Soil has capacity to hold water. As a result, water becomes available to us throughout the year from deep ponds, lakes, bunds.

(iii) Plasticity : Soil has the property of plasticity i.e. it can be given any desired shape. Due to this property, soil is used to make articles of different shapes. These articles can be baked to make them hard. For example, articles like water storage earthen pots, earthen lamps, idols, bricks, etc. are made from soil.

(2) (i) Sound needs material medium for its transmission.

(ii) Air is a medium through which sound can travel.

(iii) All the sound that we hear, reaches us through the surrounding air.

(iv) Since there is no air in space, sound cannot he heard in space.

(v) Air is a medium that is necessary for the transmission of sound, so that it can be heard.

(3) (i) The proportion of the various ingredients of soil can be determined by soil testing.

(ii) The colour, texture, and the organic matter of the soil are determined during soil testing.

(iii) Soil testing can help a farmer to find out if there is any deficiency of ingredients in the soil and take necessary steps to remove the deficiency, so that he gets a good harvest.

(iv) Soil testing can also help a farmer to find which type of crop will grow well in a particular kind of soil.

(4) The properties of water are :

(i) It is a universal solvent.

(ii) Under ordinary conditions, water occurs in liquid state.

(iii) Water is a transparent fluid substance.

(iv) It is tasteless and odourless.

(v) It does not have its own shape. It takes the shape of the vessel (container) in which it is kept.

(vi) Water is a bad conductor of heat and electricity.

Q.8. Water is a fluid substance, so it can seep through the cracks or crevices in rocks and get collected there, as shown in picture a. According to picture b, when the temperature of the surroundings goes down, water freezes and turns into ice at 0°C. When the temperature goes below 4°C, water starts expanding. As it freezes, it exerts tremendous pressure on the walls of rocks due to anomalous behaviour of water and the rocks crack. The expansion of water after freezing results in widening of the cracks as shown in image (b).

Topic 4 : Nutrition in Living Organisms

Q.1. (A) **(1)** Plants convert light energy into **chemical** energy and store it in the form of food.

(2) The carbon dioxide from the air is absorbed by plants through **stomata** on their leaves.

(3) Leaves contain **chlorophyll**, which absorbs sunlight during the process of photosynthesis.

(4) Root-nodules of leguminous plants contain ***Rhizobium*** micro-organism, which helps in nitrogen fixation.

(5) ***Azotobacter*,** a micro-organism present in the soil, converts atmospheric nitrogen into nitrates.

(6) **Lichen** is an example of symbiotic relationship of algae and fungi.

(B) **(1)** **Vitamin** is a micro-nutrient.

(2) **Oxygen** is not necessary for photosynthesis.

(3) ***Loranthus*** is a partially parasitic plant.

(4) Mushroom and yeast are **saprophytic** plants.

(5) Mushrooms are rich in **iron and vitamins**.

(C) **(1)** Micronutrients **(2)** Phloem

(3) Biological nitrogen fixation

(4) *Cuscuta* **(5)** Saprophytic plant

(D) **(1)** oxygen **(2)** vitamins **(3)** proteins

(4) nutrition **(5)** lion **(6)** deer

(E) **(1)**

Herbivores	Carnivores	Omnivores	Scavengers	Decomposers	Parasites
cow	tiger	human	vulture	bacteria	tick
deer	lion	sparrow	cockroach	fungus	
goat	frog	chameleon			
buffalo		fox			
		parrot			

(2) **Endoparasites** : tapeworm, hookworm, roundworm

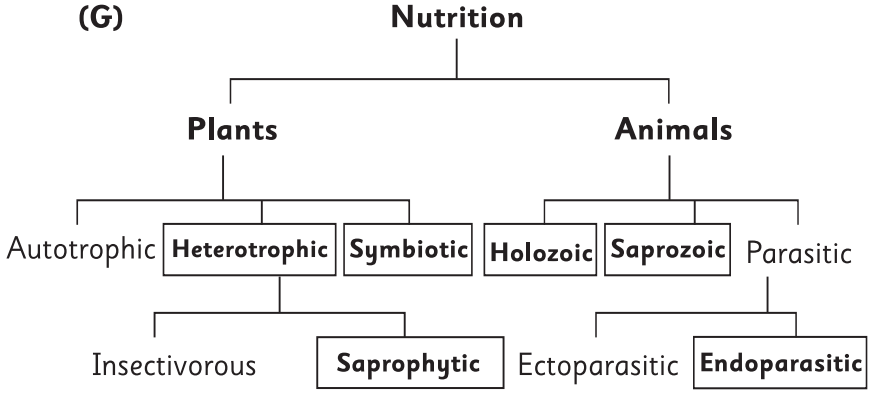
Ectoparasites : louse, bed bug, leech, tick

(F) **(1)** Chloroplast **(2)** *Cuscuta* or Dodder

(3) Magnesium and iron **(4)** Snail

(5) Pseudopodia **(6)** Bobcat or udmanjar

(G)



(H) (i) - (d), (ii) - (c), (iii) - (a), (iv) - (b)

Q.2. (A) **(1)** **Photosynthesis :** The process in which green plants, with the help of sunlight and chlorophyll make their own food in their leaves, using water and nutrients from the soil and carbon dioxide from air is called photosynthesis.

(2) **Symbiotic nutrition :** The type of nutrition in which two or more than two different types of plants live together to fulfil their needs of nutrition, protection, support, etc., with each other's help is called symbiotic nutrition.

(3) **Saprophytic plants :** Plants which obtain their food from dead and decaying bodies of other organisms are called saprophytic plants.

(4) **Nutrition :** The process of taking in and using food, which takes place in living organisms is called nutrition.

Q.2. (B) **(1)**

	Autotrophs		**Heterotrophs**
(i)	Organisms which can prepare their own food are called autotrophs.	**(i)**	Organisms which cannot prepare their own food and depend on plants or animals for their food are called heterotrophs.
(ii)	All green plants are autotrophs.	**(ii)**	Some non-green plants and animals are heterotrophs.

(2)

	Macronutrients		**Micronutrients**
(i)	Nutrients present in foodstuffs, required in large quantities by living organisms for their growth are called macronutrients.	**(i)**	Nutrients present in foodstuffs, required in very small quantities by living organisms for their growth are called micronutrients.
(ii)	Carbohydrates, proteins and fats are macronutrients.	**(ii)**	Minerals and vitamins are micronutrients.

Q.3. (1) (i) Insectivorous plants generally grow in soil or water deficient in nitrogen compounds.

(ii) They do not get enough nitrogen, so they fulfil their nitrogen requirement by capturing and digesting the insects, that is, they feed on insects.

(iii) In order to attract the insects, insectivorous plants are attractively coloured.

(2) (i) Different organisms feed on different types of food.

(ii) Depending upon what they eat, organisms have specific types of mouth parts to ingest their food.

(iii) Butterflies suck nectar from flowers for their nutrition, so they have long tube-like proboscis.

Q.4. (1) When all the nutrients that the body needs are not obtained in the proper proportions in the diet, it is called malnutrition.

(2) Malnutrition can be prevented by eating a healthy, balanced diet. A diet which will include plenty of fruits, vegetables, cereals, pulses, etc.

(3) Chemical reaction of photosynthesis :

$$6CO_2 + 6H_2O \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} C_6H_{12}O_6 + 6O_2$$

carbon dioxide + water ⟶ glucose + oxygen

(4) The leaves of the *Loranthus* plant carry out photosynthesis.

(5) *Loranthus* plant being parasitic obtains minerals and water from the host plant.

(6) *Loranthus* is a partially parasitic plant because it can perform photosynthesis, but is dependent on the host plant for water and minerals needed for photosynthesis.

(7) Amoeba, Euglena, Paramoecium.

(8) A pitcher plant grows in soil which is deficient in nitrogen. Hence, to fulfill the need of nitrogen, a pitcher plant feeds on insects.

(9) The plants that grow on the body of other plants to obtain food are called parasitic plants. Parasitic plants are of two types : Completely parasitic plants e.g., *Loranthus* and Partially parasitic plants e.g., *Cuscuta.*

(10) Living organisms need nutrition to supply the energy required for carrying out various life processes.

Q.5. (1) Autotrophs are organisms that have the ability to produce their own food without depending on anyone else. Even though we prepare variety of foodstuffs and dishes at home, we are not autotrophic organisms since the ingredients for preparing them comes from other organisms.

(2) Autotrophs are greater in number because heterotrophs are dependent on them for food. If the number of heterotrophs would be more than number of autotrophs, there won't be any autotrophs left. This would mean no food for heterotrophs as well. Hence, to maintain the balance in nature, the number of autotrophs are greater than the number of heterotrophs.

(3) The desert region does not have many different types of plants and animals compared to the sea. As autotrophs (green plants) are less, the number of heterotrophs who are dependent on autotrophs are also less. However, in the sea, there are plenty of organisms ranging from aquatic plants to small and big fishes. Since, the sea environment supports survival of heterotrophs, they are found in higher numbers in the sea.

(4) Ectoparasitic animals live outside the body of the host, while endoparasites lives inside the body of the host. Ectoparasities suck blood from the host body, while endoparasites get nourishment from the nutrients of the host body. Both types of parasites can cause infection in the host body.

(5) Preparation of food by plants through the process of photosynthesis requires the presence of chlorophyll pigment. Since, this pigment is only present in the green parts of the plant, food is not produced in any other part of the plant expect the green ones.

(6) Plants can produce their own food through the process of photosynthesis. In this process, plants make food in their leaves using water and nutrients from the soil,

carbon dioxide from air and sunlight and chlorophyll. Photosynthesis is the process by which green plants convert light energy into chemical energy and store it in the form of food. The chloroplasts present in leaves contain chlorophyll, which absorbs sunlight and help convert carbon dioxide and water into food. Oxygen is released in this process.

(7) Nutrition in animals involves various steps. These are :

(i) Ingestion : Food is taken into the body.

(ii) Digestion: Food is converted into simple soluble forms.

(iii) Absorption: Soluble food is transferred to blood.

(iv) Assimilation: Absorbed food is utilized by cells and tissues for energy production, growth and repair.

(v) Egestion : Undigested food and waste products are removed from the body.

(8) The dark red or purple colour in leaves is due to the presence of anthocyanins. Chlorophyll is present in non-green plants as well but in small amounts. Hence, photosynthesis occurs in dark red or purple coloured leaves.

(9) Chemosynthesis is the process in which food is synthesized using energy from chemical reaction. To obtain energy, chemical compounds are broken down. Chemosynthesis does not involve utilization of sunlight like photosynthesis. Eg. Nitrogen-fixing bacteria, iron-oxidising bacteria are chemosynthetic.

(10) The different substances excreted by plants are carbon-dioxide, water, nitrogenous compounds, resins, gum, tannins, organic acids, volatile oils, etc. The metabolic and excretory products produced during photosynthesis and respiration diffuses out of the plant.

(11) [Refer Q. 4. (8)]

(12) Carbohydrates, proteins, and fats are macronutrients, while vitamins and minerals are micronutrients. Carbohydrates provide source of energy for the body, proteins help in the repair of body tissues and energy, while fats provide energy to the body. Vitamins and minerals perform several essential bodily functions.

Topic 5 : Food Safety

Q.1. (A) **(1)** Wrong methods of farming, improper storage and wrong methods of distribution of food lead to **quantitative** wastage of food.

(2) Washing the vegetables after cutting them, excessive use of food preservatives, mishandling of fruits are some causes of **qualitative** wastage of food.

(3) Prevention of food spoilage by microbial growth and infestation by pests is called **food protection**.

(4) Full form of 'FSSAI' is **Food Safety and Standards Authority of India**.

(5) The adulterant **brick dust** is generally added to red chilly powder.

(B) **(1)** Drying the foodgrains from farms under the hot sun is called **dehydration**.

(2) Materials like milk are instantly cooled after heating up to a certain high temperature. This method of food preservation is called **pasteurization**.

(3) Salt is a **natural** type of food preservative.

(4) Vinegar is a **chemical** type of food preservative.

(5) Air tight packets of potato wafers and other food products are preserved by filling **nitrogen gas** in the packets.

(C) **(1)** salt **(2)** turmeric powder **(3)** almond
(4) storing **(5)** beans **(6)** rava

(D) **(1)**

Sr. No.	Foodstuff	Adulterant
(1)	**Turmeric powder**	Metanyl yellow
(2)	Black pepper	**Papaya seeds**
(3)	**Rava**	Iron filings
(4)	Honey	**Sugar syrup**

(2)

Sr. No.	Food/ Source	Nutrients obtained	Functions in body
(1)	Jowar, wheat, millet (bajra), rice	Carbohydrates	Provide energy to the body
(2)	Beans and pulses	Proteins	Help in growth, repairing wear and tear of the body
(3)	Fruits and vegetables	Minerals, vitamins, fibres	Minerals and vitamins improve the body's resistance to diseases and fibres are effective in regulating the process of digestion and prevent constipation.

(3)

Sr. No.	Foodstuff	Adulterant
(1)	Milk	**Water**
(2)	Red chilly powder	**Brick dust**
(3)	**Black pepper**	Seeds of papaya
(4)	Ice cream	**Washing powder**

Q.2. (A) **(1)** **Food protection :** Prevention of food spoilage by microbial growth and infestation by pests is called food protection.

(2) **Food preservation:** Use of various preservatives to prevent food spoilage due to internal factors for a long period of time, is called food preservation.

(3) **Pasteurization:** The method of food preservation in which foodstuffs like milk are heated up to a certain temperature and then cooled instantly, to destroy the microbes present in them and keep them safe for a longer time is called pasteurization.

(B) **(1)** (i) Low temperature retards the growth of food spoiling micro-organisms like bacteria and fungi present in the food materials.

(ii) Low temperature also prevents the action of food-spoiling enzymes present in the food material.

(iii) Since the biological and chemical reactions in food materials are slowed down at low temperature, food remains in good condition for a longer duration.

(iv) Hence, food remains safe at 5° Celsius.

(2) (i) As a result of the tradition (custom) of offering and serving too much food to guests at functions, a large amount of food gets wasted.

(ii) In a buffet style, people generally tend to serve themselves only as much as they can eat, and this prevents wastage of food.

(iii) Thus, in order to avoid wastage of food, nowadays food is served buffet style during large gatherings.

Q.3. (A) **(1)** We should avoid buying sweetmeats from vendors selling uncovered sweetmeats in open places, as uncovered food gets contaminated with disease-causing germs due to flies sitting on them. We can also bring it to the notice of the concerned authorities, so that such practices can be stopped and help in preventing spread of diseases.

(2) We should insist the 'pani puriwalla' to serve hygienically. Better avoid eating from such places. We can also bring it to the notice of the concerned authorities, so that necessary action can be taken against such people. As, when food is served in an unhygienic manner, it causes various diseases.

(3) Fruits and vegetables are perishable items as their shelf life is very short. If you have purchased them in large quantities, then they should be properly stored, by keeping them in refrigerator or certain food items like pickles, sauces, etc., can be made from them. You can also give them to some needy people instead of spoiling and throwing them away.

(4) In order to protect foodstuffs from pests like rats, cockroaches, wall lizards, neem leaves or pesticides can be used, which will keep them away. The food should be stored in air-tight containers and in dry areas.

(B) **(1)** There are various reasons for the qualitative wastage of food. Wrong methods of farming like hand-sowing of seeds, inadequate threshing, improper storage and wrong methods of distribution of foodstuffs results in qualitative food wastage. Food also gets wasted when too much is served to the guests at traditional feasts. Wastage of food can be prevented by adopting modern farming techniques like using machines to sow seeds, for threshing, better storage facilities and proper methods of distribution of foodstuffs. Wastage of food at large gatherings can be avoided if buffet style is used, as people will tend to serve themselves as much as they can eat.

(2) The cooked rice remains underdone when rice is not cooked in the right way. For example, when cooked with less quantity of water or time than required. Instead of throwing the rice, add hot water to it and cook the rice for some more time till it is fully cooked.

(3) This happens if the wheat was not dried properly after harvest to remove the moisture content or

was not stored properly. We should first sun-dry the wheat properly to remove the moisture content in it, then it should be stored properly or ground to make flour, otherwise it will get infested by insects and get spoiled.

(4) Yoghurt tastes too sour or slightly bitter when it is kept for a longer time than its shelf life or if it is made from milk that had not been boiled and cooled. The micro-organisms present in the yoghurt bring about an undesirable change like the decomposition of fat present in the milk into butyric acid, which turns the yoghurt too sour or bitter. We should not consume such yoghurt.

(5) Cut fruits turn black due to oxidation reaction. We should not cut fruits and keep them for a long time. They should be consumed as soon as they are cut. This will prevent fruits from turning black and will help to retain their nutritive value.

(C) In 1954, Parliament passed the 'Prevention of Food Adulteration Act'. It has been amended from time to time and the amendment of 1976 provides for 'life imprisonment' for the person involved in adulterating food with a harmful substance. There are clear directions that food should be properly stored, packing material should not endanger the food or medicines and there should be clear and legible information on it about the manufacturing date, expiry date and instructions for storage.

Q.4. (A) **(1)** (i) Milk is pasteurized by heating it to a temperature of 80°C for 15 minutes and then cooling it quickly.

(ii) This destroys the microbes present in the milk and keeps it safe for a longer duration of time.

(2) (i) Food is adulterated by either removing some important component of food or by mixing low quality, inedible or cheaper materials to it.

(ii) By consuming adulterated food materials, the health of all people, young and old, poor or rich is endangered.

(iii) Different types of adulterants affect our health in different ways.

(iv) Certain adulterants cause abdominal discomfort or poisoning, while some may affect the functioning of some of our organs or may even cause cancer if consumed for a long period of time.

(3) (i) Foodstuffs like milk are boiled at regular intervals, as boiling kills micro-organisms and milk does not get spoiled.

(ii) Cooked food, if it has to be kept safe for a long time, is kept in the refrigerator as a low temperature prevents the growth of micro organisms in the foodstuffs.

(iii) Foodgrains like rice, wheat, pulses are dried well and then stored in air tight containers. Drying reduces the water content in the grains and they do not get infested easily by insects. Sometimes neem leaves are also used.

(iv) While preparing jams, murabbas or sauces, right proportion of sugar, salt or even vinegar is added, as these substances are preservatives and keep the food safe for a long time.

(4) (i) Food spoilage occurs when various kinds of changes occur in food materials like change in its colour, odour, texture, quality, taste or when there is a loss of its nutrient content.

(ii) For example, fruits turn black or change taste, meat becomes sour or peanuts become rancid.

(iii) Various factors that causes spoilage of food stuffs are as follows :

- Improper handling, as when they are overcooked or washed after cutting.
- Improperly stored, that is when they are stored in a damp place, they get contaminated by micro-organisms or insects. Some foodstuffs like meat and milk get spoiled either by turning acidic or alkaline due to chemical reactions on contact with metals.
- Improper transportation, that is, when the foodstuffs are not packed properly, mishandled, or there is miscalculation of time to transport foodstuffs from production place to the consumer causes spoilage of food.

(5) (To be done by students).
Refer textbook page 37.

(B)

Food material	**Milk**	**Red chilly powder**	**Turmeric powder**	**Rava**
Adulterant	Water	Brick dust	Metanyl yellow	Fine iron filings
	Starch			
Test	Take a glass slide. Put a drop of milk on it and slightly incline it to spread the drop.	Take a spoonful of chilly powder in a beaker, add water upto half of the beaker, stir it and leave it undisturbed for a few minutes.	Take a pinch of turmeric powder in a test-tube, add a small quantity of water to it, shake the mixture and add a few drops of conc. HCl.	Pass a magnet through the rava.
	Take some milk in a test-tube, add few drops of iodine to it.			

Conclusion	If the spread mark of milk does not appear milky-white, water must have been added to it.	If a red layer is seen settled at the bottom of the beaker it must have been adulterated with brick dust.	The mixture becomes red on addition of conc. HCl and the red colour does not disappear if metanyl yellow is present.	Iron filings adhere to the magnet if rava is adulterated with iron filings.
	If milk turns dark blue in colour, milk is adulterated with starch.			

Topic 6 : Measurement of Physical Quantities

Q.1. (A) **(1)** To express the **magnitude** of a physical quantity, a value and a unit are used.

(2) A quantity that can be completely expressed by its magnitude alone, is called a **scalar quantity**.

(3) The quantity that is expressed completely only when magnitude and direction both are given is called a **vector quantity** .

(4) The amount of matter contained in a substance is called its **mass**.

(5) Mass is the qualitative measure of the **inertia** of an object.

(6) The **gravitational force** that acts on an object is called the weight of the object.

(7) The unit of time in MKS and CGS system is **second**.

(8) Centimetre is the unit of distance in **CGS** system.

(9) **Speed** is the ratio of the quantities 'distance' and 'time'.

(B) **(1)** **Time** is a scalar quantity.

(2) **Weight** is a vector quantity.

(3) Unit of displacement in MKS system is **m**.

(4) 1 cubic foot is **28.317** litres.

(C) **(1)** False **(2)** True **(3)** False **(4)** False
(5) True **(6)** False **(7)** True

(D) **(1)** Kilometre **(2)** Area **(3)** Speed **(4)** Weight

(E) (i)-(c), (ii)-(e), (iii)-(a), (iv)-(b), (v)-(d).

Q.2. (A) **(1)** **Physical quantities :** Quantities such as mass, weight, distance, speed, temperature, volume, which are measured are called physical quantities.

(2) **Fundamental quantities :** The quantities that need to be standardised and have their own independent existence are called fundamental quantities.

(3) **Standard units :** The units of fundamental quantities are called standard units.

(4) **Vector quantity :** The quantity that is expressed completely only when its magnitude and direction both are given is called a vector quantity.

(B)

	Mass		Weight
(i)	Mass is the amount of matter contained in a substance.	**(i)**	Weight of an object is the gravitational force acting on the object.
(ii)	It does not change from place to place anywhere on the earth.	**(ii)**	It is different at different places on the earth.
(iii)	Mass is a scalar quantity.	**(iii)**	Weight is a vector quantity.
(iv)	Unit of mass in MKS system is kg and in CGS system is gm.	**(iv)**	Unit of weight in MKS system is $kg.m/s^2$ and in CGS system is $gm.cm/s^2$
(v)	Mass is measured using a beam balance or equiarm balance.	**(v)**	Weight is measured using a spring balance.

Q.3. (A) (1) (i) Measurements made by using the parts of the body will differ from person to person, due to the difference in the size of body parts.

(ii) Different results will be obtained when the same thing is measured by different people.

(iii) Since measurements made by using parts of body will neither be accurate nor uniform, it is not proper to measure quantities by using body parts as units.

(2) (i) Many a times when we buy different commodities, we may not get the correct quantity for which we have paid and we are at a loss.

(ii) In order to ensure that we get the correct quantity of the commodity and are not cheated during the transaction, it is necessary to get the weights and measures standardised at regular intervals.

(3) (i) Quantities which are independent of any quantity or are not related to other quantities are called fundamental quantities.

(ii) Speed is a ratio of two quantities, i.e. distance and time.

(iii) Since speed is related to other quantities, it is not a fundamental quantity.

(B) (1) A physical quantity which can be completely described by its magnitude alone is called a scalar quantity.

For example, when we say that the mass of a body is 100 grams, the length of a tunnel is 2 kilometres, only magnitude i.e., their value 100 or 2 and the units grams and kilometres give us the complete idea of mass of the body and length of the tunnel respectively.

(2) The quantity that is expressed completely only when magnitude and direction both are given is called a vector quantity.

For example, suppose an object covers a distance of 20 km. To know where exactly the object is, i.e., its displacement, its direction should be mentioned. If the direction is north, then the displacement of the object will be 20 kilometres towards the north direction.

Q.4. (1) The weight of an object is the gravitational force acting on that object. Gravitational force of different planets is different, therefore gravitational force exerted by different planets on the same object will be different and hence the weight of the same object is different on different planets.

(2) Atomic clocks are the most accurate time and frequency standards known and are used as primary standard for international time distribution services to control the wave frequency of television broadcasts and in global navigation satellite systems such as GPS. In India, it is kept in National Physical Laboratory, New Delhi.

(3) The distance travelled by light in 1/299,792,458 of a second is considered as a metre. Thus, for determining a standard metre, the velocity of light is used.

Q.5. (A) **(1)** (i) Weight of a body is the gravitational force exerted by the earth on the body.

(ii) The shape of the earth is not perfectly spherical. It is slightly flattened at the poles and bulges at the equator.

(iii) So, the radius of earth at the poles is less than that at the equator.

(iv) Gravitational force depends upon the earth's radius and it is inversely proportional to the radius of the earth.

(v) Since the radius of earth is minimum at poles and maximum at equator, the gravitational force at poles will be maximum and minimum at the equator.

(vi) Hence, weight of an object is maximum at poles and minimum at equator.

(2) (i) Weight of an object is the gravitational force acting on the object by the earth.

(ii) Gravitational force is inversely proportional to the distance from the centre of the earth.

(iii) At higher altitudes, the distance from the centre of earth is more than that at the sea-level. Hence, the gravitational force at higher altitude is less than that at the sea-level.

(iv) Therefore, the weight of an object at a high altitude is less than its weight at the sea-level.

(3) The precautions to be taken to make accurate measurements in everyday life are :

(i) The device used for measurement must be properly functioning.

(ii) For achieving high accuracy in measurement, 3-4 readings should be taken.

(iii) The device must have the stamp of standardisation by the Department of Weights and Measures.

(iv) The appropriate device must be used.

(B) Wrong methods of measurement are shown in figures 1, 2 and 3. In fig.1, a 'hand-span' is used for measurement. The measurement would differ from person to person, as the size of span of a hand is different for different persons and the measurement will not be accurate.

In fig. 2, there is no scale marked on the glasses, so we will not know the exact volume of liquid transferred.

In fig. 3, the measurement is not taken from the initial or zero marking of the scale, so the person may take a wrong measurement.

(C) **(1)** Accuracy in measurement of a thing depends upon its purpose and value.

(i) The mass of things like cloves, cardamoms, gold and silver which are costly and are used in small quantities is measured with great care and accuracy.

(ii) To measure such things, small units and very sensitive instruments like a sensitive electronic balance are used. If they are not measured accurately, it will result in great loss.

(iii) During chemical analysis or preparation of medicines, when proportions of constituents have to be determined as accurately as possible, sensitive devices are required like standard measuring flask or measuring cylinders or sensitive balance.

(iv) While drawing a geometrical figure, drawing a map or while making machine parts that must fit into one another, a difference of even a single millimetre cannot be tolerated, as even a small error will hinder the functioning in case of machines. Similarly, while drawing geometrical figures and maps, we will not get the exact figures.

(v) During prestigious sports events, difference of a time interval of even a fraction of a second is important when deciding the winner of a neck and neck race. In such cases, the measurement of time should be very accurate, which requires a sensitive timer which can give the accurate time.

(2) The main causes of errors in measurements are :

(i) Not using the appropriate device.

(ii) Not using the device properly.

Things to be observed while buying from grocery shops or at vegetable markets, so that you don't get cheated.

(i) Whether the balance carries the stamp of standardization by the department of weights and measures.

(ii) Whether the balance is stable and whether the pointer of the balance is upright or not.

(iii) Whether the weight is made up of a metal and the balance is held properly.

(iv) Whether the underside of the pan of the balance has been tampered or not.

Topic 7 : Motion, Force and Work

Q.1. (A) (1) If a body traverses a distance in direct proportion to the time, the speed of the body is **constant**.

(2) If a body is moving with a constant velocity its acceleration is **zero**.

(3) **Speed** is a scalar quantity.

(4) **Velocity** is the distance traversed by a body in a particular direction in unit time.

(B) (1) A change in the shape or motion of an object occurs if **force** acts on it.

(2) When a body returns to the starting point, then its displacement will be **zero**.

(3) Velocity is a **vector** quantity.

(4) The shortest distance between the initial and final point of movement of an object is called **displacement** of the object.

(5) The velocity of an object at a particular moment of time along a path in which it moves is called **instantaneous** velocity.

(C) (1) The CGS unit of energy is **Erg**.

(2) Force = **mass × acceleration**

(3) Acceleration = change in velocity/time.

(4) If no force of friction is acting on a moving body, it will keep on moving with a **constant velocity**.

(5) If a body of mass 1000 gm moves with an acceleration of 2 m/s^2, then the force acting on the body is **2 N**.

(D) **(1)** False **(2)** True **(3)** True **(4)** False

(E) **(1)** Displacement **(2)** Erg **(3)** Speed

(F) **(1)**

Group A	Group B	Group C
Work	Joule	erg
Force	Newton	dyne
Displacement	Metre	cm

Q.2. (A) **(1)** **Work :** Work is defined as the product of force and displacement.

(2) **Displacement :** The minimum distance traversed by a moving body in one direction from the original point to reach the final point, is called displacement.

(3) **Velocity :** Velocity is the distance traversed by a body in a specific direction in unit time.

(4) **Acceleration :** The rate of change of velocity is called acceleration.

(OR) The change in velocity per unit time is called acceleration.

(B) **(1)**

	Distance		Displacement
(i)	Distance is the length of the path actually traversed by a moving body.	**(i)**	Displacement is the minimum distance traversed by a moving body from the original point to the final point.
(ii)	Distance is a scalar quantity.	**(ii)**	Displacement is a vector quantity.

(2)

	Speed		Velocity
(i)	Speed is the distance covered by a body in unit time.	**(i)**	Velocity is the distance traversed by a body in specific direction in unit time.
(ii)	Speed is a scalar quantity.	**(ii)**	Velocity is a vector quantity.

(3)

	Velocity		Acceleration
(i)	Velocity is displacement of a body in unit time.	**(i)**	Acceleration is the change in velocity per unit time.
(ii)	The formula for velocity is given as $\text{Velocity} = \frac{\text{Displacement}}{\text{Time}}$	**(ii)**	The formula for acceleration is given as $\text{Acceleration} = \frac{\text{Change in velocity}}{\text{Time}}$
(iii)	Unit of velocity in MKS system is m/s and in CGS system is cm/s.	**(iii)**	Unit of acceleration in MKS system is m/s^2 and in CGS system is cm/s^2.

Q.3. (1) (i) According to Newton's first law of motion, if no force is acting on a body, the body will continue to move with a constant velocity and in the same direction.

(ii) When talcum powder is applied on a carrom board while playing, the friction between the carrom board and the coin reduces.

(iii) As force of friction acting on the moving coin reduces, it continues to move for a longer time if talcum powder is applied on the carrom board.

(2) (i) Displacement is the minimum distance traversed by

a moving body from the original point to the final point of movement.

(ii) When a body comes back to its original position after covering certain distance, the displacement between the original point to its final point of movement is zero.

(iii) Hence, displacement of an object can be zero even if its distance is not zero

(3) (i) Vector quantities are quantities which can be described only if both magnitude and direction are mentioned.

(ii) To move anything, we should know how much force is required i.e., the magnitude of the force.

(iii) Moreover, to move the object to a specific position, we should also know in which direction force has to be applied.

(iv) Thus, to describe force completely, both magnitude as well as direction are required.

(v) Hence, force is a vector quantity.

Q.4. (A) (1) Motion is the continuous change in the position of an object with respect to the observer.

(2) Force acting on an object causes a change in its motion, as it can change the speed, direction or can even bring the object to rest.

(3) Speed is the distance covered by a body in unit time.

(4) Formula for calculating speed is :

$$\text{Speed} = \frac{\text{Distance traversed}}{\text{Total time}}$$

(5) When a body is moving along a straight line, velocity of the body can change. The velocity of the body at a particular moment of time is called instantaneous velocity.

(6) Yes, force is also a vector quantity as it requires both magnitude and direction to be described.

(B) (1) **Force :** A football placed on a ground will not move until and unless it is kicked i.e. a force is applied to the ball. The moving football after some time will come to rest due to force of friction between the ground and the ball. The direction of the moving ball can be changed if it is hit from a different direction. When its direction changes, the velocity of the ball also changes. When the velocity changes, the body is said to have acceleration. The interaction that brings about the acceleration is called force. Force is a physical quantity which changes or tends to change the state of rest or uniform motion of an object in straight line.

(2) **Work :** By sitting and completing the homework for a long time, we may become tired and feel that we have done a lot of work. In this case no work is said to be done, as there is no displacement. But while playing football, work is done as there is displacement seen in the football due to the force applied. So work is said to be done only if the object to which force is applied is displaced. Work done depends on both force and displacement. Hence, work is a product of force and displacement.

(3) **Displacement :** When we have to reach a particular destination, there can be different routes to reach that place. The length of the route will be

either short or long. In this case, the shortest distance to reach the destination has to be considered as displacement. Now if we come back to the original place from where we started, then the displacement will become zero.

So, displacement is the minimum distance traversed by a moving body in one direction from the original point to reach the final point.

(4) **Velocity :** If a car is moving with a speed of 80 km/hr, after certain time, it will be difficult for us to know where exactly the car is. But if it is mentioned that the car is headed towards Pune, we can know the location of the car. If speed is mentioned with direction, we can find the velocity.

So, velocity is the distance traversed by a body in a specific direction in unit time.

(5) **Acceleration :** While riding a bicycle with certain velocity, you start pedalling the bicycle faster to attain a maximum velocity, if the road is clear. But if there is traffic, then you have to slow down the bicycle or may have to stop the bicycle. Here the velocity of the bicycle does not remain same. As the velocity goes on changing, we say that acceleration takes place.

So, acceleration is the change in velocity per unit time.

(6) **Distance :** Suppose your school is at a distance of 2 km. from your home. The total length of the path you have travelled from your home to school and then back home will be 2 km + 2 km = 4 km. So, the distance covered by you will be 4 km.

Hence, distance is the length of the route actually traversed by a moving body irrespective of the direction.

(C) The total distance travelled by the bird is the length of the complete circular path that it takes. Whereas its displacement is zero as the bird comes back to its initial position from where it took its flight.

Q.5. (A) **(1)** The actual distance traversed by Sachin and Sameer = AB + BC + CD + DE

= 3 km + 4 km + 5 km + 3 km

= 15 km

Displacement from A to E = AB + BD + DE

= 3 km + 3 km + 3 km

= 9 km

Total time taken = 1 hr.

$$\text{Speed} = \frac{\text{Total distance}}{\text{Total time}} = \frac{15 \text{ km}}{1 \text{hr}} = 15 \text{ km/hr.}$$

$$\text{Velocity from A to E} = \frac{\text{Total displacement}}{\text{Total time}} = \frac{9 \text{ km}}{1 \text{ hr}} = 9 \text{ km/hr.}$$

∴ The total distance traversed by Sachin and Sameer = 15 km.

Displacement = 9 km, speed = 15 km/hr and velocity = 9 km/hr.

Yes, the velocity is average velocity.

(2) Speed of the ball at B (Initial velocity) = 2 cm/s

Speed of the ball at C (Final velocity) = 4 cm/s

Time taken = 2 seconds

$$\text{Acceleration} = \frac{\text{Change in velocity}}{\text{Time taken for change}}$$

$$\text{Acceleration} = \frac{\text{Final velocity - Initial velocity}}{\text{Time taken}}$$

$$= \frac{4 \text{ cm/sec} - 2 \text{ cm/sec}}{2 \text{ sec}}$$

$$= 1 \text{ cm/s}^2$$

Ans. The acceleration of the ball as it goes from B to C is 1 cm/s^2.

(B) **(1)** **(i)** Total distance travelled = 120m + 120m = 240 m

(ii) Displacement = 0 (as the body returns to its initial position)

(iii) Average speed = $\frac{\text{Total distance travelled}}{\text{Total time taken}}$

(iii) Average velocity = 0
(since the displacement is zero)

$$= \frac{240}{10} \text{ m/s} = 24 \text{ m/s}$$

(2) **Given :** Mass (m) = 25 kg
Acceleration (a) = 1.2 m/s^2
Force (F) = ?
Force = mass × acceleration
F = ma
= 25 kg × 1.2 m/s^2
= 30 kg.m/s^2
= 30 Newton

Ans. Force applied on the object is 30 Newton.

(3) **Given :** Force (F) = 1000 N
Displacement (s) = 10 m
Work done (W) = ?
Work = Force × Displacement
W = F × s
= 10000 N × 10 m
= 10000 N.m
= 10000 Joule

Ans. The work done to stop the moving car is 10000 Joule.

(4) **Given :** Mass of cart (m) = 20 kg
Force (F) = 2 N
Displacement of cart (s) = 50 m
Work done (W) = ?
Work = Force × Displacement
W = F × s
= 2 N × 50 m
= 100 N.m
= 100 Joule

Ans. Work done by the force was 100 Joule.

Q.6 **(A)** **(i)** Acceleration is the change in velocity per unit time.

(ii) The formula of acceleration is

$$\text{Acceleration} = \frac{\text{Change in velocity}}{\text{Time}}$$

(iii) The unit of velocity in MKS system is m/s, whereas that of time is second.

(iv) So, the unit of acceleration will be

$$\frac{m}{s} : s \quad \frac{m}{s} \times \frac{1}{s} \quad \frac{m}{s^2}$$

(v) Therefore, unit of acceleration is m/s^2.

(B) (i) The force due to the weight is applied on the wooden block.

(ii) Force can be increased by increasing the weight.

(iii) On applying more force, the displacement of the wooden block will increase.

(iv) When there is displacement in the wooden block due to the applied force, work is said to be done.

Topic 8 : Static Electricity

Q.1. (A) **(1)** There is **always repulsion** between like charges.

(2) **Displacement of negative charge** is responsible for generation of electric charge in an object.

(3) A lightning conductor is made of a **copper** strip.

(4) **Steel** does not get electrically charged easily by rubbing.

(5) There is **always attraction** when opposite electric charges come near each other.

(6) A **charged object** can be detected with an electroscope.

(B) **(1)** An atom is electrically **neutral**.

(2) When glass rod is rubbed against silk, **positive** charge is developed on glass rod.

(3) **Unlike** electric charges attract each other.

(4) The ozone gas protects us from the harmful **ultra violet** rays coming from sun.

(C) (1) - (c), (2) - (a), (3) - (d), (4) - (b).

(D) **(1)** copper rod **(2)** ebonite rod **(3)** silk cloth

(E) **(1)** Electroscope **(2)** Lightning conductor

(3) Atoms

(4) Protons (positive charged particles), electrons (negative charged particles), neutrons (neutral particles)

Q.2. (1) **Repulsion :** When two similar charged objects are brought near, they move away from each other. This is called repulsion.

(2) **Attraction :** When two oppositely charged objects are brought near, they get pulled towards each other. This is called attraction.

(3) **Frictional electricity :** The electric charge generated by friction is called frictional electricity.

Q.3. (A) **(1)** When the positive charge and the negative charge in the object are not balanced, i.e. they are not equal in number, then the object is said to be charged.

(2) If the objects carry similar charges (like charges), they will repel and if the objects carry opposite charges (unlike charges), then they will show attraction.

(3) No, all objects do not get charged by rubbing.

Most of the insulators, which are bad conductors, can be charged by rubbing. E.g., glass rod, ebonite rod, plastic scale.

(4) A charged object can attract an uncharged object. Since the balloon is charged, it attracts the uncharged wall when it is brought near the wall. So the charged balloon sticks to the wall.

(5) Lightning strike can set trees on fire and shatter buildings. It can kill people and animals.

(6) Tall buildings are fitted with lightning conductor to prevent the possible damages caused by lightning.

(7) The lightning conductor is a device used for protection from a lightning strike. Its upper end is pointed so that the charge gets concentrated at a particular place when lightning strikes and can be easily and quickly carried towards the ground. This prevents any damage to the property.

(8) Coal is porous and absorbs the salt water. It keeps the surrounding area conductive. This helps to spread the electric charge during lightning strike

quickly into the ground and prevents damage. So, coal and salt are added to the pit in the ground where the lightning conductor is fitted.

(9) Yes, we can use leaves of other metals like aluminium instead of gold in the electroscope. The metal should be such that it can be beaten into extremely thin leaves, so that it can detect even a very small charge.

(B) **(1)** A plastic comb or ruler rubbed on dry hair develops charge. Due to the charge developed on a plastic comb or ruler, they attract pieces of paper.

(2) When we pass near a polyester curtain again and again, opposite charges are developed on our body and the polyester curtain due to rubbing. So, the curtain gets attracted towards us.

(3) When we rub a blanket with our hands, the blanket develops negative charge. When this charged blanket is taken near a metal object, the negative charge from the blanket flows to the metal. That is why a spark is seen in the dark when a charged blanket is brought near a metal object.

Q.4. (A)

	Charging by contact		**Charging by induction**
(i)	The process of charging a body by actually touching a charged body is called charging by contact.	**(i)**	The process of charging a body by keeping it near (without touching) a charged body is called charging by induction.
(ii)	In this, charge moves from charged body to the uncharged body.	**(ii)**	In this, no charge flows from the charged body to the uncharged body.
(iii)	In charging by contact, some charge is lost by charged body.	**(iii)**	In charging by induction, no charge is lost by the charged body.
(iv)	Charge developed on the uncharged body by contact remains even when the charged body is removed.	**(iv)**	Charge developed on the uncharged body by induction is lost as soon as the charged body is removed.

(B) **(1)** (i) All substances are made up of particles and these particles are made up of very tiny atoms.

(ii) An atom contains stationary positively charged and moving negatively charged particles.

(iii) These two charges are equal in number, so they are balanced in an atom.

(iv) As the charges are balanced in an atom, no net charge is there on the atom.

(v) Hence, an atom is electrically neutral.

(2) (i) Charge cannot be developed on metals as they are good conductors.

(ii) If the objects are good conductors of electricity, the charges will spread over their entire body and attraction will not be seen, when they are brought near uncharged objects.

(iii) Since copper is a metal and a good conductor, charge cannot be developed on a copper rod.

(3) (i) If an electrically charged object attracts another object, then the other object may be either uncharged or oppositely charged, as unlike charges attract each other.

(ii) Whereas if an electrically charged object shows repulsion, then surely the other object

will be having charge similar to the electrically charged object, as like charges repel each other.

(iii) Since repulsion is seen between like charges, it is a sure test of electric charge.

Q.5. (A) (1) When thermocol balls or mustard seeds in a bottle are shaken vigorously, the seeds try to move away from each other, and stick to the bottle.

Reason : When thermocol balls or mustard seeds in a bottle are shaken, they develop like charges, whereas the bottle develops opposite charge. Hence, thermocol balls or mustard seeds try to move away from each other, but stick to the bottle. This is because like charges repel each other and unlike charges attract each other.

(2) When a spent tubelight kept in dark is rubbed vigorously with a thin polythene bag, sparks are seen.

Reason : As the tubelight is rubbed vigorously, it develops static electricity and gets charged. Tubelight and polythene bag develop opposite charges. As they get charged and attract each other, sparks are seen in the dark.

(3) When an uncharged aluminium ball is brought near a negatively charged balloon, it gets attracted to the balloon and comes in contact with it. Then after some time, the aluminium ball and balloon repel each other.

Reason : When an uncharged aluminium ball is brought near a negatively charged balloon, an opposite charge is developed and both get attracted to each other. On touching, both become

similarly charged and repel each other as like charges repel each other.

(B) (1) (i) All objects are electrically neutral.

(ii) But due to certain reasons like rubbing, the balance of electrically neutral atoms gets disturbed.

(iii) When certain objects are rubbed against each other, the negatively charged particles on one object are transferred to the other object.

(iv) The objects to which the charges are transferred become negatively charged due to an excess of negative charged particles.

(v) Similarly, the object from which the negatively charged particles get transferred become positively charged due to deficiency of negatively charged particles.

(vi) Therefore, when two substances are rubbed, one becomes positively charged and the other, negatively charged.

(2) The following steps should be taken for protection from lightning :

(i) As far as possible one should try to remain indoors during lightning.

(ii) When you are inside your house, avoid using corded landline phones.

(iii) Do not use appliances that are plugged to the wall like television, air conditioner, computer.

(iv) Avoid standing on wet surfaces.

(v) Do not stand near windows or in a balcony having metallic railings.

(vi) If you are outside your house, do not stand under tall trees, isolated trees, on open ground, near an electric pole or a telephone pole.

(vii) If you are on a two-wheeler, a bicycle, a tractor or a boat, get off immediately and go to a safe place.

(3) (i) A lightning conductor is a device used for protection from a lightning strike.

(ii) It consists of a long copper strip with one end forked, which is placed at the highest part of the building and the other part is connected to a plate of cast iron.

(iii) A pit is dug in the ground, coal and salt are filled into the pit and the iron plate is placed upright in the pit.

(iv) There is also a provision for pouring water into it.

(v) All the above provisions help to spread the electric charge quickly into the ground and prevent damage.

(4) (i) During rainy seasons, there are chances of lightning.

(ii) In open fields, lightning can prove to be dangerous for a person, if it strikes.

(iii) Iron staff stuck in the ground by the farmers while working in fields in rainy conditions acts as a lightning conductor.

(iv) If lightning strikes in the field, the electric charge will pass through the iron rod to the ground quickly and thus can prevent any injury to the farmer.

(v) Therefore, farmers stick an iron staff into the ground while working in the field in rainy conditions.

(5) (i) Lightning occurs only when the negative charge developed on the bottom of the cloud is much larger than the charge on the ground.

(ii) This charge starts flowing towards the ground in very fast stages and heat, light and sound energy are produced along with the electric current.

(iii) This condition does not occur everyday during the rainy season, and hence lightning is not seen everyday in the rainy season.

(6) The characteristics of a static electric charge are :

(i) Electrically charged objects attract uncharged objects.

(ii) Like electric charges repel each other.

(iii) Unlike electric charges attract each other.

(7) Damage caused by lightning :

(i) Lightning, if it strikes a person, can cause permanent injuries, severe burns and can also be fatal.

(ii) It can destroy buildings, monuments, trees and can cause fire and damage property.

(iii) Telephones, computers, television and other electric devices can be damaged by lightning.

To create awareness, people should be told about the various damages caused by lightning and the precautions to be taken through various media like television, newspapers, etc.

(8) I will take the following measures to prevent the damages caused by lightning :

(i) On hearing a thunder, I will avoid standing near a tall tree, electric pole, high-rise building or any metallic structure.

(ii) I will rush to a safe place such as low-rise house or a building.

(iii) If I am travelling by a bus or a car, I will stay inside and will shut the windows of the vehicle.

(iv) If I am inside the house, I will unplug the electronic devices like television set, computer etc. and will not use the corded phone.

(v) I will avoid contact with running water.

(vi) I will not stand near windows or in balcony having metallic railings.

(vii) I will also see to it that the building/house where I stay is fitted with a lightning conductor.

(9) (i) When air and clouds rub against each other, clouds get charged and when a large amount of charge is developed in the clouds, it starts flowing towards the ground, which is seen as lightning.

(ii) During heavy rain, there is generally lightning or thunder.

(iii) When we go out with an umbrella during heavy rain, if there is lightning or thunderstorm, an umbrella can increase the chances of being hit by lightning.

(iv) The electric discharge can pass through the metallic rod of the umbrella and can give a severe shock to the person carrying it.

(v) So, it is not safe to go out with an umbrella when there is heavy rain, lightning or thunder.

(10) (i) When there is lightning in the sky, the negative charge that is developed on the bottom of the clouds in large amount starts flowing towards the ground in stages.

(ii) This happens very fast and heat, light and sound energy are produced along with the electric charge.

(iii) During lightning strike, when an electrically charged cloud comes over a tall building or a tree, it generates opposite charge on the roof of the building or on the top of the tree by induction.

(iv) If the charge built up is large, it leads to an electric discharge in the form of light streak towards the building.

(v) This can shatter buildings or set a tree on fire.

Topic 9 : Heat

Q.1. (A) **(1)** Maximum heat is absorbed by a **black** coloured object.

(2) **Radiation** of heat does not require a medium.

(3) Conduction of heat takes place through a **good conductor** substance.

(4) The shining surface in a thermos flask decreases the outgoing heat by **reflection**.

(5) Cooking utensils are made from metals due to their property of **conduction**.

(6) The earth receives heat from the sun by **radiation**.

(B) **(1)** Temperature of a substance is measured by a **thermometer**.

(2) Mode of transfer of heat from the hot part of an object to the cold part is called **conduction** of heat.

(3) Heat is conducted quickly through **copper** than through iron.

(4) The density of water **decreases** due to heating.

- **(C)** (1 - c); (2 - d); (3 - b); (4 - a); (5 - e)

(D) **(1)** Reflection **(2)** Glass **(3)** Mercury **(4)** Lead

(E) **(1)** Thermometer **(2)** Black **(3)** Thermos flask **(4)** Thermoware **(5)** Radiation **(6)** Infrared camera

Q.2. (A) **(1)** **Temperature :** The degree of hotness or coldness of a substance is called temperature.

(2) **Good conductor :** A substance which allows heat to flow easily through it is called a good conductor.

(3) **Bad conductor :** A substance which does not allow heat to flow easily through it is called a bad conductor.

(4) **Infrared camera :** A camera that has been developed to use heat radiations from objects to making the surroundings visible at night is called an infrared camera.

(5) **Conduction :** The mode of transfer of heat from the hot part of an object to the cold part is called conduction of heat.

(B) **(1)**

	Conduction		Convection
(i)	Mode of transfer of heat from the hot part of an object to the cold part of the object is called conduction of heat.	**(i)**	Mode of transfer of heat by means of convection currents set because of movement of particles is called convection of heat.
(ii)	It generally takes place through solids.	**(ii)**	It takes place through liquids and gases.

(2)

	Convection		Radiation
(i)	In convection, medium is necessary.	**(i)**	In radiation, no medium is necessary.
(ii)	Convection currents set due to the movement of particles.	**(ii)**	Particles are not involved in transfer of heat.
(iii)	It takes place through liquids and gases.	**(iii)**	It takes place through vacuum.

Q.3. (A) **(1)** Solar heat reaches the earth by radiation.

(2) The flow of heat from a hot body to a cold body is called transfer of heat.

(3) Once the water heated to boiling is taken off the flame, the supply of heat to the boiling water stops. So the temperature of the water starts decreasing i.e. the heat in the water heated to boiling slowly decreases. This heat goes to the surroundings which are at a lower temperature, as transfer of heat takes place from hot body to cold body.

(4) The modes of heat transfer are conduction, convection and radiation.

(5) The ability of a substance to absorb heat radiation depends on its colour and also its intrinsic properties.

(6) During fever, a patient's body temperature goes up. When a cold compress is placed on his forehead, heat is transferred from his body to the cold compress. So fever gets lowered by putting a cold compress on the forehead of a patient.

(7) The houses in Rajasthan are painted white because the climate of Rajasthan is very hot. White colour reflects maximum heat radiation, so it does not become very hot inside the house.

(8) The penguins of Antarctica have black outer coat because black colour absorbs maximum heat radiations, which keeps them warm and protects them from the severe cold climate of the region.

(B) **(1)** (i) Glass is a poor conductor of heat and its inner and outer walls expand unequally when they are heated.

(ii) So, when boiling water is poured into an ordinary glass bottle, the inner walls of the glass expand rapidly as compared to the outer walls due to unequal distribution of heat and the glass bottle cracks.

(iii) But borosil glass bottles are made in such a way that they can withstand high temperature.

(iv) So, they expand very little when boiling water is poured into them and thus do not crack.

(2) (i) Telephone wires are made up of metal.

(ii) During summer, they absorb heat from the

surroundings and expand, so they sag in summer.

(iii) In winter, when the temperature of the surroundings goes down, the wires contract.

(iv) Hence, due to contraction, the wires which sag in summer become straight in winter.

(3) (i) Atmosphere contains water vapour.

(ii) Its capacity to hold water vapour depends upon the temperature of the surroundings.

(iii) During winter, the temperature of the surroundings goes down.

(iv) So, the water vapour in the atmosphere condenses to form water droplets which settle on the cold surface of the grass.

(v) Hence, dew drops form on the grass, in winter.

(4) (i) Iron is a good conductor of heat and wood is a bad conductor of heat.

(ii) When iron pillar is touched in winter, iron being a good conductor of heat conducts away heat from our hand and therefore it appears to be cold.

(iii) But wood being bad conductor of heat does not conduct heat away from our hand and therefore the wooden pole appears not to be as cold.

(5) (i) Glass or China clay are bad conductors of heat, whereas steel or copper are good conductors of heat.

(ii) Therefore, glass tumbler or China cup full of hot tea does not transfer the heat to our hand, whereas steel or copper cup transfers the heat

from the hot tea and hence we can hold a glass tumbler or China cup full of hot tea easily in our hand, but not a steel or copper cup with hot tea.

Q.4. (1) (i) Spoons are generally made up of metals and metals are good conductors of heat.

(ii) While stirring hot substances, the heat is slowly transferred from the hot end of the spoon to the cold end.

(iii) This can burn the hand of the person holding it.

(iv) So, in order to prevent getting burned, the halwai wraps up cloth around the end of his slotted spoon while stirring the boiling milk in his large kadhai.

(2) (i) The moment hot milk is poured into the steel glass, it becomes very hot as steel is a good conductor of heat.

(ii) This can burn the hand of the person holding it.

(iii) Handkerchief is a bad conductor of heat, it prevents the transfer of heat to our hands and thus protects us from burning our hand.

(iv) Hence, we hold a steel glass in a handkerchief while drinking hot milk from it.

Other examples : The handles of cooking utensils are made up of wood or ebonite, we use cloth or a tong to remove hot vessel from the stove etc.

(3) (i) White coloured clothes reflect most of the heat that falls on them and we feel more comfortable wearing them in summer.

(ii) Whereas dark or black coloured clothes absorb more heat, so we feel comfortable with dark or black coloured clothes in winter.

(4) (i) Woollen clothes have fine pores filled with air.

(ii) Wool and air both are bad conductors of heat.

(iii) In order to prevent the transfer of heat from our body to the surroundings and to keep our body warm, we wear woollen clothes in winter.

(5) (i) When a railway track is laid, a small gap is always left between two sections of a railway line, so as to give some space for them to expand during summer.

(ii) The rails of railway tracks are made up of steel and they expand due to the considerable rise in the atmospheric temperature during summer.

(iii) If no gaps are left, the lines may bend and cause derailment of trains.

(iv) Similarly in case of cement concrete bridges, a gap is left as it may crack due to contraction in winter or expansion in summer.

(6) (i) Mercury is used in a thermometer for the following reasons:

(a) It is a shining, silvery white liquid which can be seen easily. It does not stick to the walls of the thermometer.

(b) It has uniform contraction and expansion.

(c) Its freezing point is -39°C and boiling point is 357°C. So it can be used to measure a fairly wide range of temperature.

(ii) Alcohol is used due to following reasons.

(a) Alcohol freezes at -117°C, so it is used for measuring very low temperatures.

(b) Expansion and contraction of alcohol are also regular.

(c) It is less hazardous than mercury.

(7) (i) Thermoware are containers used for keeping food hot.

(ii) These containers are made up of two boxes fitted one inside the other.

(iii) The outer box is made up of plastic, a bad conductor and the inner box is made up of a shiny metal.

(iv) There is air between the two boxes, which is a bad conductor too.

(v) Therefore, heat is neither transferred by conduction nor by convection.

(vi) Heat is reflected by the shiny inner surface and heat loss due to radiation is also prevented.

(vii) The lid of the container is made up of plastic, which prevents any transfer of heat.

(viii) So the food placed in a thermoware container remains hot for a long time.

(8) Properties of heat are :

(i) Heat is a form of energy.

(ii) Heat can be transferred from a hot body to a cold body.

(iii) It can change the state of matter.

(9) (i) The mode of heat transfer that causes sea breezes and land breezes in convection.

(ii) During the day, the air over the land gets heated up faster than that over the sea.

(iii) So, the air over the land becomes lighter and rises up.

(iv) Hence, the cold air from above the sea moves towards the land. This sets up the convection current which forms sea breeze.

(v) During the night, land cools more quickly than the sea water.

(vi) Therefore, the air above the sea being warmer rises up and the cold air from land moves towards the sea.

(vii) So the convection currents of cool air from land towards the sea form the land breeze.

(10) (i) Heaters are fitted near the floor so that the warm air near the heater rises up as it is lighter and the cold air from above the room comes down to take its place.

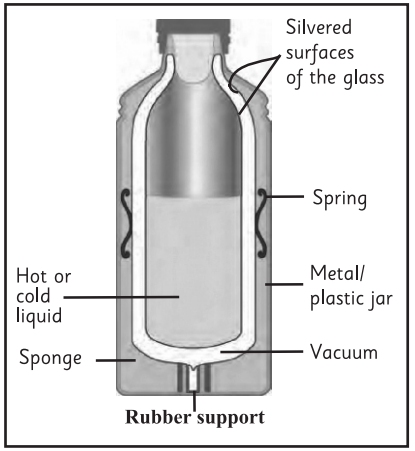
(ii) Thus, convection currents are set up, which warm up the entire room.

(iii) Similarly, air conditioners are fitted near the ceiling of a room, so that the cooled air from the air conditioner being heavier moves down, while the hot air from below rises up.

(iv) Thus, a convection current is set up and the whole room is cooled quickly.

Q.5. Structure of the thermos flask :

The thermos flask is double-walled. It consists of two glass tubes, one inside the other with a sealed gap. A silver coating makes the surfaces of both tubes shiny. Vacuum is created by removing the air between the two tubes. There is a protective metal or plastic jar outside the tubes. Pieces of sponge or rubber are fixed between the outer jar and the flask.



Function of the thermos flask :

When a hot liquid is kept in a thermos flask, the heat moving out gets reflected due to the shining silver surface of the inner glass tube. Hence, heat is not radiated. Conduction and convection of heat does not occur due to vacuum. As a result, heat is not transferred to the outer cool region and is retained inside for a long time. However, the hot substance does not remain as hot after 2-3 hours.

Q.6. Steel spoon, glass vessel, iron griddle (tava), glass, water and wax will absorb heat.

Topic 10 : Disaster Management

Q.1. (A) **(1)** The condition that arises due to long term and severe scarcity of foodgrains and water is called **famine**.

(2) A majority of the famines occurred in **drought** prone and affected regions.

(3) A wave generated by an earthquake or volcano occurring on the ocean floor is called a **tsunami**.

(4) An **earthquake** is a sudden violent shaking or movement of part of the earth's surface caused by the abrupt displacement of rock masses.

(5) 13th October is the International Day for **Disaster Reduction**.

(B) **(1)** Drought can cause **all of these**.

(2) What is not required for the severe storms to develop? **Rainfall**.

(3) Disaster management includes **all of these**.

(4) What is drought? **Shortage of water for an excessive period of time**.

(5) Which of the following is a man-made disaster? **Road accidents**.

(C) **(1)** Railway accident **(2)** Drought

(3) Locusts **(4)** Volcano

(D) **(1)** False - Because storms are natural disasters and can occur due to changes in the weather.

(2) True - Because lightning may sometimes strike the water and since water conducts electricity, nearby lightning may harm or injure the person in water, it can also be fatal.

(3) False - It is not possible to prevent the eruption of a volcano as it is a natural event or natural disaster, it takes place when the interior of the earth is very hot.

(4) False - Heavy rains result in flood. Famine is the condition created by some human activities besides some natural events.

(E) (1)-(d), (2)-(c), (3)-(b), (4)-(a).

Q.2. (A) **(1)** **Disaster :** A disaster is a sudden calamity, either natural or man-made, which causes great damage to life and property on an overwhelming scale. Normal life living is affected, and immediate assistance and relief measures are needed.

(2) **Disaster management :** It is an applied science which seeks by the systematic observation and analysis of a disaster to improve measures relating to prevention, mitigation, preparedness, emergency response and recovery.

(B)

	Earthquake		Volcano
(i)	Earthquakes are caused by interaction of tectonic plates.	**(i)**	Volcanoes are caused by movement of magma.
(ii)	Earthquakes are vibrations or tremors that shake the earth.	**(ii)**	Volcanoes are fissures or vents in the earth which allow molten lava and gases to escape out on to the earth's surface.
(iii)	Earthquakes can cause damage by triggering tsunamis and landslides.	**(iii)**	Volcanoes can cause damage by ash flow, release of gases, mud flows, lava flows, etc.

(C) **(1)** Landslides are caused by disturbance in the natural stability of a slope. Landslides may occur at the foot hill, when masses of rock, earth or debris move down a slope. This can happen after heavy rains. Mud slides, also known as debris flows or mud flows are a common type of fast moving landslide. When we wait at the foot-hill while it is raining heavily, mudslides may sweep down a slope or we may be trapped in mudslides and this can be dangerous. Sometimes it can be fatal. Hence, we shouldn't wait at the foot-hill while it is raining heavily.

(2) Sometimes in cities, the rains may not be very heavy, but the drainage system is blocked with plastic bags due to which water-logging takes place. The water does not find any escape route, the levels start rising and the area gets submerged. Hence, the use of non-biodegradable waste like plastic bags contributes to flood in cities.

(3) As volcanoes erupt, they build up layers of lava that may eventually break the water's surface. When the top of the volcano appears above the water, an island is formed. While the volcano is still beneath the ocean surface, it is called sea movement. Thus, due to eruption of volcanoes, some islands are formed.

(4) Swimming during thunderstorm may increase the chance of getting struck by lightning. When lightning strikes the water, and since water may conduct electricity, a nearby lightning strike could kill or injure the person swimming in pool. Hence, it is dangerous to swim in a pool during thunderstorm.

Yes, it is possible to prevent the loss of life caused by lightning.

Q.3. (A) **(1)** (i) The best way to avoid being struck by lightning is to stay away from storms.

(ii) Always check the weather forecast before heading outdoors.

(iii) If you notice that it may rain, be sure to arrive home as soon as possible.

(iv) Even if there are no predictions of a storm, keep an eye on the clouds, as the forecast is not always accurate.

(v) Avoid open areas and tall objects.

(vi) Stay away from objects that may conduct electricity.

(vi) Take shelter in a car or nearby places.

(2) Sometimes the water coming down from rain clouds does not reach the land in the form of rain.

Instead due to very high temperature near the land, it vapourizes and goes back into the same cloud. As a result, the amount of vapour in those clouds becomes very high. Due to rapid condensation, it rains suddenly over a specific and small region at a rate of 100 mm per hour or more. This is known as cloud burst.

(3) The following steps can be taken to ease the severity of a famine:

(i) Planned usage of water and reuse of water.

(ii) Proper planning of water conservation and harvesting at the local level.

(iii) Large scale plantation of trees and prevention of deforestation.

(iv) Making appropriate changes in plans taking into account the weather forecasts.

(v) Compose a variety of slogans and use them during 'Environment Awareness' rallies or programmes.

(4) Following are the effects of volcano:

(i) The chemical substances such as lava, vapour, hot mud, sulphur, etc., get collected on the surface of the earth and thereby mountains and hills are created.

(ii) The atmosphere gets polluted due to ash and gases due to volcanic eruption.

(iii) Often it rains as a result of volcanic eruption.

(iv) Temperature rises due to hot gases.

(v) Forests and settlements get buried under the hot mud.

(5) The measures to prevent loss of life due to lightning are :

When outdoors : Avoid taking shelter below a tree. Not standing near an electric pole.

When indoors : Not using plugged in electrical appliances. Avoid taking a bath or using the shower.

(6) The following measures can be taken to prevent the bunds on a farm from getting washed away in the rainy season: Growing more trees near bunds, growing grass strips, stone lining or sand bagging near bunds.

(7) The water vapour present in air rises in the sky, gets cooled, and the condensed water vapour forms clouds. The clouds get further cooled to form rain clouds. Droplets of water produced due to condensation fall down on the earth in the form of rain.

(8) Flood is a natural disaster that causes overflow of large amount of water on the earth's surface resulting in destruction.

Effects of floods :

(i) Huge loss of life and property.

(ii) Soil erosion

(iii) Destruction of standing crops.

(iv) Spread of diseases and epidemics.

(9) Lighter positively charged particles are formed on top of the cloud, while the heavier negatively charged particles are at the bottom of the cloud. When both charges grow large enough, a giant spark (lightning) is produced between them.

(10) The formation of high and low air pressure belts in the atmosphere causes change in weather resulting in storms (strong winds).

Effects of storms :

(i) Tremendous loss of life and property.

(ii) Disruption of electric supply.

(iii) Disruption of transport and communication.

(iv) Uprooting of trees.

(B) (a) Remedial measures for storm:

(i) Cut trees or branches that are likely to fall and cause damage.

(ii) If we are outside take shelter in a safer place.

(iii) Do not use plugged in electrical appliances.

(iv) Listen to the radio or check for regular updates on weather conditions.

(v) Protect yourself from lightning by keeping away from metal objects, switching off the electricity supply, T.V., telephone, etc.

(vi) Keep calm and do not panic, do not spread rumours, check to see if there are people nearby who are wounded or in difficulty and assist them.

(vii) Collaborate with the rescue and assistance service and help vital priority repairs and rehabilitation work if required.

(b) Remedial measures for lightning strike :

(i) Avoid electronic equipment of all types. Lightning can travel through electrical systems like radios, televisions and other electronic gadgets.

(ii) Do not try to walk or swim in flowing water, ponds, etc.

(iii) Stay away from windows and metal doors.

(iv) Stay away from concrete floors or walls. Lightning can travel through metal wires or bars in the concrete walls or floorings.

(v) Wear rubber boots, as they are made of rubber material which is a bad conductor of electricity.

(c) Remedial measures for famine :

(i) Planned usage of water and reuse of water.

(ii) Proper planning of water conservation and harvesting at the local level.

(iii) Large scale plantation of trees and prevention of deforestation.

(iv) Making appropriate changes in plans, taking into account the weather forecast.

(d) Remedial measures for cloudburst:

(i) Keep the first aid kit and emergency food supplies ready.

(ii) Pay careful attention to the warnings issued by the India Meteorological Department.

(iii) Keep a torch with you with some spare batteries.

(iv) Move to a safe place and help others to relocate as well.

Q.4. (1) A peculiar type wave generated by an earthquake or volcano occurring on the ocean floor is called a tsunami. Tsunami is a Japanese word that means 'harbour wave'.

If an earthquake or volcanic eruption occurs at the bottom of the ocean, the energy released pushes the water upwards in the form of water columns. As a result of this, a peculiar type of waves are formed. These waves are not very high near the source, but they start

spreading very fast to long distances. The velocity of the waves is 800 to 900 km per hour. When they reach the coastal area, their velocity is reduced, but their height is found to have increased to about 30 metres.

(2) An earthquake is a sudden, violent shaking or movement of a part of the earth's surface caused by the abrupt displacement of rock masses, below the earth's surface.

A severe earthquake can destroy roads and buildings and cause the sea to rise in huge waves.

If an earthquake and volcanic eruption occurs at the bottom of the ocean or sea, the energy released pushes the water upwards. As a result of this, a peculiar type of wave is generated that gives rise to a tsunami.

(3) Measures taken to deal with calamities like floods :

(i) Construction of small dams in mountainous region. A dam is a barrier that stops or restricts the flow of water or underground streams and thus prevent, flooding.

(ii) Construction of percolation tanks.

(iii) Making river beds flat.

(iv) Cultivation of new forests.

(v) Connecting rivers.

(vi) In cities, use of non-biodegradable items should be minimised and garbage disposal should be well managed.

(vii) Improve flood warning mechanism.

(viii) Government of Maharashtra introduced Disaster Management training programme in 100 schools and every district to deal with calamities such as floods.

(ix) Disaster Management programme in Maharashtra lays down uses of ICT (Information Communication Technology), digitisation of the disaster management and the use of GIS (Geographic Information System) in hazard risk mapping.

(x) Information about floods is generally given by the Government well in advance. People should be mentally prepared to relocate immediately, if necessary.

Measures taken to deal with calamities like landslides :

(i) Vegetation cover protects land from landslides, and soil erosion.

(ii) Afforestation - trees should be planted on slopes to prevent soil erosion.

(iii) Groundwater can be drained from soil using trenches filled with gravel and perforated pipes or pumped water wells.

(iv) Landslide mitigation refers to construction and other man-made activities on slopes with a goal of reducing the effect of landslides.

(v) During constructing buildings on a slope, designs that suit the natural slope should be adopted. Vegetation and large trees should not be removed.

(vi) Provisions should be made at community level to prevent people from excavating, removing materials from the soil or cutting down trees.

(4) With reference to disaster management, the following things should be checked in house :

(i) Location : Check the location of your electrical

switchboard, gas connection, water supply, solar inverter and any other relevant sources.

(ii) **Potable water :** Check for drinking water, keep atleast 3 gallons each per person at home.

(iii) **Food :** Check your food supply and store non-perishable foods like canned food, biscuits, etc which do not require refrigeration.

(iv) **Medicines:** Keep some extra medicines with you for times when disaster strikes and you cannot leave your home to buy them.

(v) **First aid kit :** It should have latex gloves, gauze pads, a thermometer, bandages, band-aids, antiseptic ointment, hand sanitizers and instant cold packs, etc.

(vi) **Tools and supplies :** This includes items such as candles, matches, scissors, tweezers, a sewing kit, a flash light, extra batteries, a small fire extinguisher, a knife, etc. Be sure to also have a map of the area in case you need to look for a shelter.

(vii) **Hygiene products :** Toilet paper, soap etc.

(viii) **Important documents and items :** Includes cash, passport, identity card, bank account numbers, and a list of important and emergency phone numbers.

(ix) **Miscellaneous items :** Baskets, sleeping bags, paper cups, paper plates and plastic utensils.

Topic 11 : Cell Structure and Micro-organisms

Q.1. (A) **(1)** The organelle called the **chloroplast** is present in plant cells only.

(2) Garbage is converted into **manure** by micro-organisms.

(3) In the cell, photosynthesis is carried out with the help of **chloroplast**.

(4) An electron microscope is necessary for the study of **viruses**.

(B) **(1)** The **plasma membrane** is the outermost covering of animal cell.

(2) The **plant** cells carries out photosynthesis.

(3) The size of **paramoecium** is about 100 micrometres.

(4) The antibiotic **penicillin** destroys the germs of diphtheria and pneumonia.

(C) (1)-(d), (2)-(c), (3)-(e), (4)-(b), (5)-(a)

(D) **(1)** True **(2)** False **(3)** False
(4) True **(5)** False

(E) **(1)** rice **(2)** snail **(3)** cell wall
(4) vacuole **(5)** virus

(F) **(1)** Algae **(2)** Polygonal shape
(3) Porous double membrane

Q.2. (A) **(1)** **Nucleoid :** An irregularly shaped region in a prokaryotic cell (e.g. bacteria) containing the genetic material is called nucleoid.

(2) Ribosomes : Single walled, dense, spherical bodies composed mainly of RNA. They are present in all active cells. They are either scattered in the cytoplasm or attached to the outside of endoplasmic reticulum. They are the sites where proteins are synthesized.

(3) Antibiotics : Antibiotics are types of medicines that destroy pathogens and retard their growth. They are produced commercially with the help of specific microbes.

(B) (1)

	Plant cell		**Animal cell**
(i)	The cell wall is the outermost covering of the plant cell.	**(i)**	The cell membrane is the outermost covering of the animal cell.
(ii)	The cell wall is present in the plant cell.	**(ii)**	The cell wall is absent in animal cell.
(iii)	Vacuoles in plant cells are larger in size and more in number.	**(iii)**	Vacuoles in animal cells are smaller in size and fewer in number.
(iv)	Chlorophyll is present in plant cell.	**(iv)**	Chlorophyll is absent in animal cell.
(v)	Cytoplasm is not so dense.	**(v)**	Cytoplasm is denser and more granular.

(2)

	Prokaryotic cell		**Eukaryotic cell**
(i)	Cells present in prokaryotic organisms, do not have membrane bound organelles.	**(i)**	Cells present in eukaryotic organisms have well-defined membrane bound organelles.
(ii)	Prokaryotic cells are smaller in size ranging from 1 - 10 µm.	**(ii)**	Eukaryotic cells are comparatively larger in size ranging from 5 - 100 µm.
(iii)	They have one chromosome.	**(iii)**	They have more than one chromosome.
(iv)	They do not have well defined nucleus.	**(iv)**	They have well defined nucleus.
(v)	Membrane bound organelles such as mitochondria are absent in prokaryotic cell.	**(v)**	Membrane bound organelles such as mitochondria are present in eukaryotic cell.

(3)

	Cell wall		**Cell membrane**
(i)	Cell wall is found only in plant cells.	**(i)**	Cell membrane is found predominantly in all animal cells.
(ii)	It is the outermost covering of a plant cell.	**(ii)**	It is the outermost covering of an animal cell.
(iii)	Cell wall gives definite shape to the plant cell as it is rigid.	**(iii)**	Since cell membrane is not rigid, it gives flexibility to the cells.
(iv)	It is made up of cellulose.	**(iv)**	It is made of proteins, lipids, etc.

(C) **(1)** The 'cell' is the basic structural, functional and biological unit of all living organisms. It is the smallest unit of life that can replicate independently. Cells are often called the 'building blocks of life'.

(2) The different organelles in a cell mainly include the nucleus, endoplasmic reticulum, cytoplasm, golgi bodies, lysosomes, mitochondria, vacuoles, plastids, ribosomes, etc. Cell wall and plastids are present in plant cells only.

(3) The organisms which cannot be seen with our eyes but can only be observed under a microscope are called microorganisms. They may be unicellular or multicellular. Algae, fungi, protozoa, bacteria and viruses are classified as micro-organisms.

(4) The different types of micro-organisms are classified as algae, fungi, protozoa, bacteria and viruses.

(5) The infants are vaccinated according to a fixed time schedule in order to maximize benefits for disease control and infant health. Immunization is done to protect children against diseases and build up their immunity against them. Since the immunity for some diseases wears away with time, a scheduled vaccination time period is recommended so that the child is protected against diseases such as polio, tetanus, diphtheria, chickenpox, hepatitis, rubella, etc.

(6) Vaccine is an antigenic preparation produced in a laboratory with the help of microbes to provide immunity (resistance) against a particular disease.

(7) Each cell type has its own role to play in helping our bodies to work properly. Cells acquire definite shape according to the function they need to perform.

(8) Cells are protected by cell wall in case of plants and cell membrane or plasma membrane in animal cells.

(9) Cells form the basis of the structure and function of all living organisms. It is only with the help of cells that living organisms carry out all the different life processes.

(10) **(i)** Change in the colour of the food shows that the food is spoiled. E.g., red meat becomes darker in colour, while food like bread may become yellow, green.

(ii) One of the easy ways to tell that food has spoiled is by smelling. If it is spoilt, it will have unpleasant odour and colour. Odour may change due to mould, fungus and bacteria grown in food.

(iii) Observing it when we see the food closer to the surface, it seems to have a slimy and sticky texture. It means bacteria have started multiplying on its surface and it is getting spoiled.

(11) While purchasing the food, packed food or tinned food, we must check the date on the label. E.g., for bread, milk, etc., check the 'use by' or 'best before' dates when you buy the food.

We must not eat canned or packaged foodstuffs after the expiry date, because canned foodstuffs have to be consumed within a specific period of

time. After this period is over harmful, bacteria like *Clostridium* start growing in it. These bacteria produce toxic substances. If consumed, it can cause diarrhoea and vomiting, and may lead to food poisoning. In order to prevent such hazards, the expiry date or the date which is printed on the food should be checked.

(12) Large quantity of food is prepared during marriage or other community functions. If the food prepared is left over for a long period or food is left uncovered in an unhygenic condition with house-flies sitting on it etc., the microbes like bacteria or disease-causing germs (pathogens) grow in the food. Sometimes water used in cooking the food is not filtered and is contaminated, *Staphylococcus* bacteria are likely to grow in the foodstuffs and produce a poisonous substance like enterotoxin. Eating these foodstuffs causes diarrhoea and vomiting. Hence, food poisoning incidents occur during marriage or other community functions.

(13) Yoghurt is mixed in the batter or dough for making rava-idli, bhature, naan as yoghurt contains Lactobacillus bacteria. When these bacteria are allowed to grow in batter, they break down the substance producing new substances as they multiply in them. Hence, in this process, it acts on sugar of the flour and releases carbon dioxide gas. This gas makes the dough rise and when steamed or fried, the gas escapes leaving idli, bhature, naan soft and spongy.

(14) Yoghurt, idli, dosa are prepared by fermentation.

During this process, complex carbohydrates and proteins are broken down into simpler ones that are easy to digest.

(15) The root nodules of leguminous plants like pea, bean, and fenugreek provide shelter (home) to nitrogen-fixing bacteria like *Rhizobium*.

(16) The materials like purses, wallets, belts, footwear are made of leather. These are made of organic substances of animal origin. During rainy season or moist conditions, micro-organisms like fungi grow on these leather articles and spoil the leather items or get frayed, hence leather articles like purses, wallets, belts, footwear need to be polished. Polishing keeps moisture away from coming in contact with leather. So, to protect the articles from fungal growth, they must be kept dry.

(17) In a humid atmosphere, micro-organisms like fungi in the form of powdery materials are found on old currency notes or old rubber or paper. Fungi grow quickly on organic substances which are made of plant products.

(18) Dry waste includes wood, paper, cardboard, etc. Wet waste includes plant leaves, agricultural waste, cow-dung, etc. The dry and wet wastes are collected separately in order to recycle dry waste easily and to use wet waste as compost. Dry waste is not easily decomposable and needs to be reused and recycled.

(19) Micro-organisms cannot grow at the normal body temperature of human beings, i.e. 37°C. They can only grow between the optimal temperature of 15°C to 35°C.

(20) If clothes remain damp in the rainy season, microbes like bacteria, fungi and mould may grow over them. The clothes may produce a foul (unpleasant) smell. They may also attract mosquitoes and serve as a breeding ground for them.

(D) **(1)** (i) After heavy rainfall and floods, when the water recedes, the water and landscape can be contaminated with hazardous materials like debris, pesticides, fuels and untreated sewage.

(ii) This water can get contaminated. It may contain harmful and disease-causing viruses, bacteria, fungi or protozoa.

(iii) Infections such as diarrhoea and vomiting can be caused due to such contaminated water.

(iv) As flood water spreads, it causes infectious diseases.

(v) These can lead to outbreaks of diseases like typhoid, cholera, hepatitis and malaria, etc.

(2) (i) Moulds, yeasts and bacteria are some of the important micro-organisms which cause food spoilage or cause food to become stale.

(ii) When food is exposed to moist condition or air, it is contaminated by a number of microorganisms which start multiplying.

(iii) These micro-organisms use nutrients from the food. As a result, the nutritive value of the food decreases.

(iv) Micro-organisms also release certain toxic substances in the food owing to which it becomes unfit for consumption.

(v) The consumption of spoilt or stale food leads to food poisoning which is hazardous to life.

(3) (i) When the land is ploughed deep, the soil is turned up.

(ii) This makes the soil suitable for growing crops.

(iii) Weeding becomes easier.

(iv) Loosening the soil exposes the germs and insects in it to the sun and thus kills them.

(v) Tilling also helps to aerate the soil.

(vi) This improves respiration of the plants and their roots grow stronger and deeper.

(vii) Thus, in order to make the soil even and the land ready for sowing, the soil is turned over during tilling.

(4) (i) The mode of nutrition in fungi is saprophytic.

(ii) Saprophytic means utilising dead and decaying organic food and converting it into organic substances.

(iii) These plants cells do not contain chlorophyll.

(iv) They can grow quickly on any organic matter when the conditions are moist or if there is humidity in the air.

(5) (i) Food items such as milk, meat, fruits and vegetables are preserved by keeping them at low temperature in refrigerator.

(ii) Treatment of food to low temperature in the refrigerator retards chemical and enzymatic reactions and stops the growth and activity of micro-organisms which spoils food.

(iii) Hence, to preserve the food from getting spoilt or to prevent the activity of micro-organisms which contaminate milk, meat, fruits and vegetables, a refrigerator is used in almost every home.

(6) (i) Baking powder and baker's yeast (micro-organisms) is added in the preparation of bread.

(ii) Yeast is a micro-organism that brings about the process of fermentation.

(iii) Fermentation is a chemical process in which yeast brings about the conversion of one type of carbon compound into another type .

(iv) Heat is generated in this process and carbon dioxide and some other gases are released.

(v) These gases cause an increase in the volume of the dough.

(vi) Because of these gases, bread swells or rises during baking.

(7) (i) Cattle are generally fed with fodder like oil cake, gram, jaggery, grain meal, cotton seed, etc.

(ii) The mixture of this fodder is soaked in water.

(iii) When the mixture is soaked in water, it brings about fermentation.

(iv) As it is fermented, the nutritive value of this mixture increases.

(v) This therefore becomes a good supplementary food for cattle which give milk.

(vi) The yield of milk increases due to such food.

(vii) Hence, fodder is soaked in water before offering to cattle.

Q.3. (1) Uses of micro-organisms :

(i) Micro-organisms are used for various purposes.

(ii) They are used in the preparation of curd, bread and cake.

(iii) *Lactobacillus* bacteria promote the formation of curd.

(iv) Yeast cells are used for the process of fermentation in the preparation of bread.

(v) Some bacteria *(Rhizobium)* live inside the root nodules of leguminous plants like pea, bean, etc., and perform the function of nitrogen fixation.

(vi) Several bacteria in the soil carry out decomposition of dead and decaying matter, they in turn make humus from them. Fertility of the soil is thus increased due to bacteria.

(vii) They are also used in cleaning up of the environment. For example, the organic waste (vegetable peels, remains of animals, faeces, etc.) is broken down into harmless and usable substances by bacteria.

(viii) Micro-organisms are also used on a large scale, commercially for the production of alcohol, wine and acetic acid (vinegar). Yeast is used for commercial production of alcohol and wine.

The harmful effects of micro-organisms :

(i) Micro-organisms are harmful in many ways. These micro-organisms include bacteria, fungi, viruses and protozoa.

(ii) Micro-organisms that cause diseases in human beings, animals and plants are called pathogens.

(iii) Some micro-organisms like *Clostridium* spoil food, some micro-organisms like fungi spoil food, clothing and leather. Following table gives information about the harmful effects of micro-organisms causing diseases in plants and animals.

	Micro-organism	Diseases in Plants	Diseases in Animals
(1)	Protozoa	Flagellated protozoa causes disease in phloem tissue, wilt of palm, heart rot of coconut.	Malaria, dysentery, sleeping sickness.
(2)	Fungi	Leaf spot on rice, rust on wheat and ergot on bajra.	Ringworm, eczema.
(3)	Bacteria	(i) Wilt on tomato plant, caused by *Pseudomonas.* (ii) Root rot disease by *Erwinia.*	Typhoid, tuberculosis, cholera, etc.
(4)	Viruses	(i) Tobacco mosaic disease caused by tobacco mosaic virus. (ii) Yellow mosaic virus on lady's finger or okra.	Smallpox, measles, poliomyelitis.

Harmful effects of disease-producing micro-organisms in human beings :

Pathogens enter our body through the air we breathe, the water we drink or the food we eat. They can also get transmitted by direct contact with an infected person of carried through an animal. Microbial diseases can spread from an infected person to a healthy person. Communicable diseases spread through air, water or physical contact. Examples of such diseases include cholera, common cold, chickenpox and tuberculosis.

(2) A Simple Microscope :

(1) A simple microscope is also called magnifying glass that consists of single convex lens for magnification of small focal length.

(2) It is generally used for seeing the magnified images of small objects, usually fixed in a suitable frame with a handle or mounted on a stand. A maximum magnification about 20 times can be obtained by simple microscope.

(3) It is used by watch makers for observing small parts of the watch while cleaning or repairing. It is used by jewellers to examine precious stones to detect any flaws in them. It may also be used for reading small font. It is used by skin specialists to detect various diseases of skin.

A Compound Microscope :

(1) A combination of 2 convex lenses having short focal lengths is used in compound microscope.

(2) Our eyes cannot perceive an object having a size less then 100 micrometre.

(3) Generally, the size of micro-organisms is less than 100 micrometre.

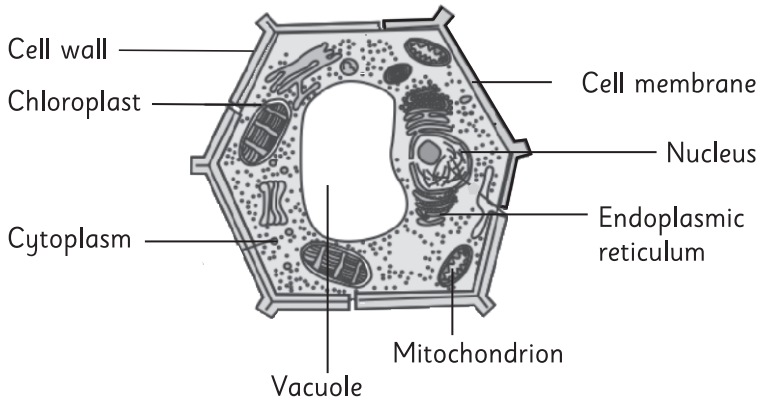
(4) With proper combination of an objective and eye piece, a magnification (40–1000X) can be achieved by a compound microscope. Thus, it can be used to observe bacteria, viruses, cells, micro-organisms, blood corpuscles, plant and animal cells, etc.

(3)

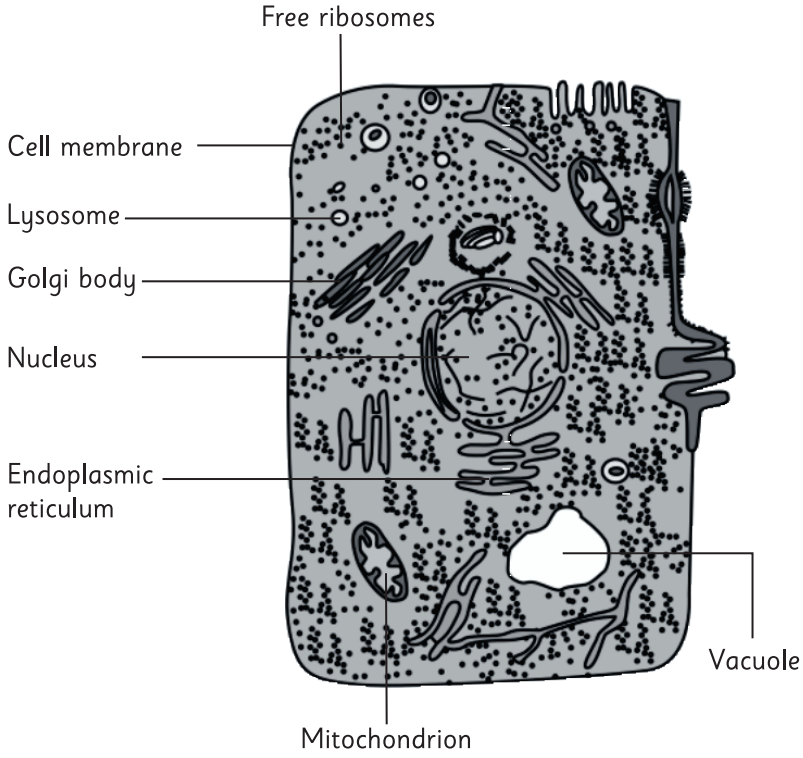
	Parts of the cell	**Structure**	**Occurrence/ Location**	**Functions**
(i)	Cell wall	Outermost covering of a cell. Mainly composed of cellulose.	Plant cells only	(1) Gives rigidity and shape to the plant cell. (2) Provides protection.
(ii)	Cytoplasm	Semi-fluid substance with water soluble organic and inorganic substances. It occupies the space between nucleus and plasma membrane.	Plant cell and animal cell.	(1) Cell organelles are scattered in the cytoplasm. (2) Cellular chemical reactions take place in cytoplasm. It also aids in metabolic activities of the cell.
(iii)	Cell membrane (Plasma membrane)	(1) Outermost covering in animal cell. (2) Extremely thin, delicate and flexible membrane.	Plant and animal cells.	(1) Maintains shape of the animal cell. (2) Regulates entry and exit of substances in and out of the cells.
(iv)	Golgi bodies	(1) Made up of several flat sacs. (2) Consist of tubular vesicles and vacuoles.	Plant and animal cells.	(1) Secretion of hormones and enzymes. (2) Proper distribution of proteins.
(v)	Nucleus	(1) Mostly spherical and dense. (2) There is a porous double membrane around it. (3) Contains network of thread-like structures called chromatin fibre which contains DNA.	Plant and animal cells.	(1) Regulates cell functions or controls all functions of the cell. (2) Contains chromosomes (having of genes that control hereditary characters)

(vi)	Endoplasmic reticulum	(1) Sprawling network of tubular double membrane. (2) May be smooth or rough (attached ribosomes)	Plant and animal cells.	To make necessary changes in protein produced by ribosomes and send them to the golgi bodies.
(vii)	Mitochondria	(1) Double walled, inner wall thrown into folds. (2) Have their own DNA, contains ribosomes.	Plant and animal cells.	Release or produce energy and synthesize respiratory enzymes.
(viii)	Plastids	Double walled structure contains DNA.	Found only in plant cells	(1) Chloroplast : Photosynthesis. (2) Chromoplast: Imparts colour to fruits and flowers. (3) Leucoplast : Stores starch, lipids and protein.
(ix)	Vacuoles	Fluid filled spaces enclosed by a membrane.	Generally present in plant cell. In animal cells, it is small and temporary.	(1) It helps to throw out waste products of the cells. (2) Gives turgidity to the cell.

Plant cell



Animal cell



Topic 12 : The Muscular System and Digestive System in Human Beings

Q.1. (A) **(1)** **Muscles** are bundles of fibres that can contract and relax as required.

(2) Muscles are firmly attached to bones by means of **tendons**.

(3) Muscles contribute almost **40%** to the weight of a healthy adult human body.

(4) The **involuntary** muscles do not depend upon ones will.

(5) The **smooth** muscles are present in the internal organs other than the heart.

(6) The movement in cardiac muscles is **involuntary**.

(B) **(1)** The process of digestion starts from the **mouth**.

(2) Eyelids have **voluntary** muscles.

(3) **Production of blood cells** is not a function of the muscular system.

(4) Muscles of the heart are **cardiac muscles**.

(5) Pushing forward the food that has been chewed is the function of the **oesophagus**.

(6) Muscles of the stomach are **smooth**.

(7) Enzymes formed in the mouth is known as **amylase**.

(8) Mechanical breakdown of food is due to **chewing**.

(9) Partly digested food (in liquid form) goes into the **small intestine** after it leaves the stomach.

(10) Cardiac muscles cause the heart to relax and contract continuously at a rate of about **70** times per minute.

(C) **(1)** Anus **(2)** Bile juice **(3)** Uniceps
(4) Heart **(5)** Lipase

(D) (1)-(b), (2)-(d), (3)-(e), (4)-(c), (5)-(a).

(E)

(1)	Tongue	My taste buds can tell only a sweet taste.	☑
(2)	Liver	I am the largest gland in the body.	
(3)	Large intestine	I am 7.5 metre long.	☑
(4)	Appendix	Digestion is impossible without me.	☑
(5)	Lungs	I play an important role in excretion.	☑
(6)	Stomach	I digest only fats and carbohydrates.	☑
(7)	Oesophagus	I push the food towards the stomach.	
(8)	Anus	I do the major work of throwing undigested material out of the body.	

(F) **(1)** Salivary glands, liver, pancreas, gastric glands
(2) Trypsin, lipase, amylase **(3)** Smooth muscles
(4) Skeletal muscles **(5)** Voluntary muscles

(G) **(1)** Pepsin **(2)** Involuntary **(3)** Enzyme
(4) Biceps **(5)** 1.5 m long

Q.2. (A) **(1)**

	Biceps		Triceps
(i)	They are located on the front of the bone in our upper arm.	**(i)**	They are located on the back of the bone in our upper arm.

(ii)	Biceps are the muscles responsible for the pulling action.	**(ii)**	Triceps are the muscles we exert for pushing action.
(iii)	The biceps are made up of 2 muscle bundles (namely - long head, short head).	**(iii)**	Triceps are made up of 3 muscle bundles (namely - lateral head, long head and medial head).

(2)

	Small Intestine		**Large Intestine**
(i)	It is about 6 m long.	**(i)**	It is about 1.5 m long.
(ii)	It absorbs the digested nutrients.	**(ii)**	It takes part in absorption of water from the undigested remains of food.
(iii)	Most of the digestion takes place in small intestine.	**(iii)**	It has no role in digestion.
(iv)	It secretes a number of digestive juices.	**(iv)**	It does not secrete any digestive juice.

(B) **(1)** There are 3 types of muscles in the human body. They are skeletal muscles, cardiac muscles and smooth muscles.

(2) **Acidity :** Acidity is the term used for set of symptoms caused by increased production of acid by the gastric glands of stomach and when there is no food present to be digested.

Causes of acidity are :

(i) Diet - Increased consumption of spicy food and oily food.

(ii) Irregular meals, like not having meals regularly at a particular time, result in the accumulation of secreted acid in the stomach.

(iii) Stress

(iv) Alcohol consumption

(v) Lack of physical activity

(vi) Indigestion

(vii) Constipation

Effects of acidity on the human body :

(i) Over-production of acid may affect teeth, muscles, joints, various organs and organ systems.

(ii) Bloating (3) Burping (4) Digestion is impaired (5) Flatulence (6) Heart burn (7) Decrease in normal appetite (8) Headache, weakness and fatigue (9) Cardiovascular problems (10) Kidney or liver disease (11) Osteoporosis (12) Dysphagia, etc.

(3) Muscles are bundles of fibres that can contract and relax when required.

Bones don't work alone. They need help from muscles and joints. Muscles are firmly attached to bones by means of tough, cord - like tissues called tendons, which allow the muscles to pull the bones. When muscles contract, there is a movement at the joint and the bones move either nearer to or away from each other.

(4) In the body, muscles always work in groups. When some muscles contract, other muscles of the same group in the body relax.

(5) Tongue, heart, liver, pancreas, stomach and intestines are made up of only muscles.

(6) No, all the food that we eat does not get converted into useful, nutritive substances. Some portion of it remains undigested and is thrown out of the body through the anus.

(7) An organ system is a group of organs that work together to perform one or more functions. The bones in our body are joined to each other by tendons.

(8) The food that we eat is taken inside the body and digested in the alimentary canal. The nutrients obtained through the process of digestion and assimilation are absorbed in the blood. No, the food does not mix with blood.

(9) Cardiac muscles present in the heart bring about contraction and relaxation (beating) of the heart. Cardiac muscles cause the heart to relax and contract continuously at about 70 beats per minute. If the cardiac muscles do not move, the heart will stop beating. Blood supply to vital organs like brain will stop, ultimately leading to death.

(10) The stomach has smooth muscles. They bring about churning movements. If the stomach muscles do not move, food will not get churned and hence food will not be digested. Both mechanical and chemical digestion of food will stop. Food will remain in the stomach and get decayed. It will lead to deterioration of health.

Q.3. (1) (i) Gastric glands are present on the walls of the stomach.

(ii) They secrete gastric juices which contain an enzyme pepsin, dilute hydrochloric acid and mucus.

(iii) The hydrochloric acid is needed to activate the enzyme as it needs acidic environment in order to digest protein.

(iv) Enzyme pepsin digests proteins in acidic medium only. Hence, in order to digest the protein and also to help in killing the microbes, and other disease-causing pathogens which enter the stomach through food and water, food becomes acidic in the stomach.

(2) (i) Various processes like blood circulation, breathing, etc., are vital functions.

(ii) They do not depend upon our will.

(iii) The muscles of heart carry out functions such as pumping blood throughout the body by the contraction and relaxation of the heart.

(iv) These movements are involuntary.

(v) Hence, cardiac muscles are said to be involuntary muscles.

(3) (i) Intoxicating substances like tobacco, alcohol, cigarettes if consumed for a long time, affect the various organs of the body and can lead to dysfunctioning of the system.

(ii) Chewing of tobacco for a long time causes its particles to stick the teeth, gums and skin of the mouth cavity and slowly causes injury to these parts resulting in their dysfunction.

(iii) Mouth, pharynx, intestine become infected and can cause cancer leading to death.

(iv) Consumption of alcohol causes problems like vomiting, nausea and headache, liver damage, kidney failure, etc.

(v) Smoking of cigarette increases the risk of stroke, heart attack, peptic cancer, lung cancer, pancreatitis, etc.

(vi) Hence, to prevent organs from getting damaged and smooth, efficient, optimum functioning of system, intoxicating substances should not be consumed.

(4) (i) Muscles contract and relax as the different body parts move.

(ii) Muscles provide a definite shape and posture to the body.

(iii) Their movements help in carrying out various life processes in the body. From breathing and digestion of food to running and lifting heavy loads, muscles help us perform different functions.

(iv) For performing various strenuous activities and exercises, muscles need to be strong and efficient.

If the muscles are not strong, they will get tired and fatigued easily.

Q.4. (1) The human digestive system consists of alimentary canal beginning with mouth, long muscular tube oesophagus, stomach, small intestine and large intestine. It also consists of associated digestive glands.

(1) Mouth :

(i) In the mouth, food is chewed with the help of teeth.

(ii) This helps in breaking the large food particles into smaller ones.

(iii) Thus, digestion starts in the mouth.

(2) Oesophagus :

(i) It is a large muscular tube connecting the mouth and the stomach.

(ii) It carries the partly digested food into the stomach.

(3) Stomach :

(i) It is a large sac-like muscular organ.

(ii) In stomach, food is churned and thoroughly mixed with gastric juice.

(iii) The gastric juice is secreted by gastric glands. There are three components of gastric juice, namely enzyme pepsin, mucus and hydrochloric acid.

(iv) By the action of the gastric juice, food becomes a semi-solid slurry which is pushed into the small intestine by action of the sphincter muscles located at the lower end of the stomach.

(4) Small Intestine :

(i) The small intestine is about 6 m long. Most of the digestion is completed in the small intestine.

(ii) Three different digestive juices are mixed with food in the small intestine.

(iii) After the process of digestion is completed, absorption of food takes place in the small intestine.

(5) Large Intestine :

(i) It is about 1.5 m long. Absorption of water and salts takes place in the large intestine.

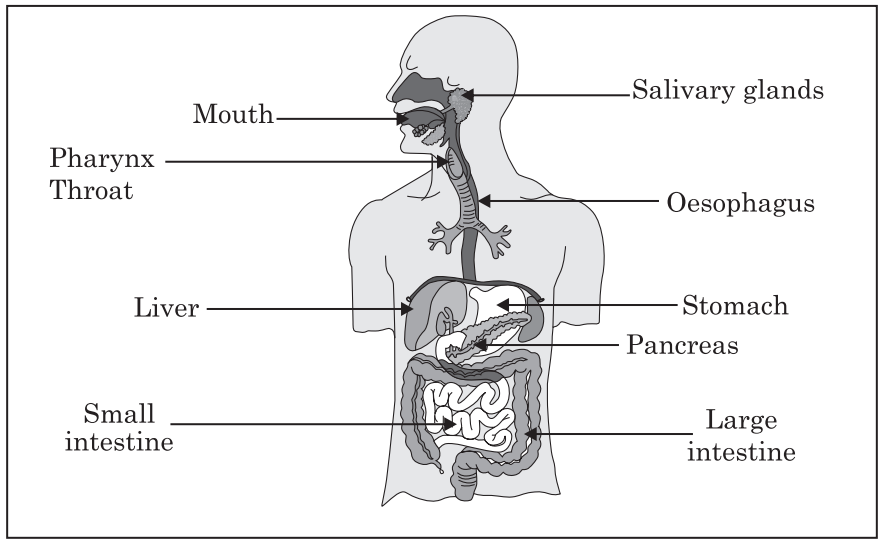
(ii) Undigested remains of the food digested in the small intestine enter the large intestine.

(iii) Large intestine does not have any digestive function.

(6) Anus :

(i) It is the opening of alimentary canal to the outside.

(ii) Undigested material is thrown out of the body through anus.



(2) There are four types of teeth-incisors, canines, pre-molars and molars. Each type of tooth performs a specific function.

(i) **Incisors :** These are 8 teeth located in the front centre of the mouth. (4 on top and 4 on the bottom) We use incisors to bite out food.

(ii) **Canines :** Humans have four canine teeth. They are the sharpest teeth. They are used for tearing food.

(iii) **Pre-molars :** There are eight pre-molars in total. They have a flat biting surface. They are used for tearing and crushing food.

(iv) **Molars :** These are the largest teeth in the mouth. An adult human has 12 molar teeth. They are used to chew and grind food into smaller pieces.

Topic 13 : Changes - Physical and Chemical

Q.1. (A) **(1)** Changes in which only **physical** properties of a substance change are called physical changes.

(2) Changes in which new substances are formed are called **chemical** changes.

(3) In **tinning** method, copper and brass articles are coated with tin.

(4) The process of coating a thin layer of zinc on iron or steel is called **galvanization**.

(5) The process of formation of vapour from a liquid is called **evaporation**.

(B) **(1)** For protecting iron pipes from corrosion they are coated with **zinc**.

(2) Which of the following is a physical change? **Heating of iron**.

(3) Which of the following is a non-periodic change? **Earthquake**.

(4) Fast change is **bursting of balloon**.

(5) Which of the following is a periodic change? **Changing of seasons**.

(C) **(1)** Irreversible change, useful change, chemical change.

(2) Irreversible change, undesirable change, harmful change, chemical change

(3) Non-periodic change, harmful change.

(4) Periodic change, physical change.

(5) Reversible change, useful change, physical change.

(6) Natural change, non-periodic change, harmful change.

(7) Irreversible change, chemical change.

(8) Physical change, man-made change.

(9) Irreversible change, natural change, chemical change.

(10) Irreversible change, chemical change.

(11) Reversible change, physical change.

(12) Irreversible change, man-made change, chemical change.

(D) **(1)** False **(2)** False **(3)** True **(4)** True

(E) (1) - (d), (2) - (c), (3) - (b), (4) - (a)

(F) **(1)** Burning **(2)** Freezing

(3) Changing of seasons **(4)** Rusting

Q.2. **(1)** **Corrosion :** It is the process by which the surface of a metal is oxidized and corroded due to oxygen, moisture and vapours of chemicals in air.

(2) **Slow change :** The changes that take place over a long period of time are called slow changes.

(B) **(1)**

	Physical change		**Chemical change**
(i)	Composition of substance remains same.	**(i)**	Composition of substance changes.
(ii)	No new substances are formed.	**(ii)**	New substances are formed.
(iii)	Chemical properties of substance remain same.	**(iii)**	Chemical properties of substances undergo change.
(iv)	Physical changes are reversible.	**(iv)**	Chemical changes are irreversible.

(2)

	Periodic change		**Non-periodic change**
(i)	Changes that occur again and again after a definite interval of time are called periodic changes.	**(i)**	Changes that do not occur again and again after a definite interval of time are called non-periodic changes.
(ii)	Examples of periodic change : a. Occurrence of day and night. b. Changing of seasons, etc.	**(ii)**	Examples of periodic change : a. Earthquake. b. Volcanic eruption, etc.

(3)

	Natural change		**Man-made change**
(i)	Changes that occur naturally or that have occurred of their own accord are called natural changes.	**(i)**	Changes that occur as a result of human activity or created by humans are called man-made changes.
(ii)	Ripening of fruit, rainfall, spoiling of milk are the examples of natural change.	**(ii)**	Water pollution, deforestation, burning of fossil fuels that have a global impact and disturb natural balance are examples of man-made changes.

(C) **(1)** Canned foodstuffs have to be used within a specific period. After the period is over, harmful bacteria like *Clostridium* may start growing after their date of expiry. These bacteria produce toxic substances as they grow in foodstuffs. If such foodstuffs are eaten, they may cause diarrhoea, vomiting, etc.

So, in order to avoid food poisoning or any health hazards, while purchasing canned food, its expiry date should be checked.

(2) When an iron article rusts, a reddish brown layer is formed on it due to corrosion. The corrosion is caused by oxygen, moisture, vapours of chemicals in air. But when iron articles are coated with a paint, it will not allow moisture or oxygen, vapours of chemicals in air to come in contact with the iron surface. Hence, to prevent the iron articles from getting rusted, they should be given a coat of paint.

(3) When wooden articles are exposed to air, moisture or direct sunlight for long period, they will wear out or fade away and sometimes due to prolonged use, they form cracks. Sometimes due to moisture in rainy season, mould may grow on the surface of wooden articles and damage the wood. By polishing the wooden articles, we can protect the surface from moisture, air and also increase its resistance to moisture. Thus, to prevent the wooden articles from getting damaged, they should be polished.

(4) The process of coating a thin layer of tin (molten tin) on copper and brass is called tinning. Cooking utensils made of copper and brass get a greenish coating due to corrosion. The greenish substance is copper carbonate and it is poisonous. Therefore, copper and brass utensils are tinned to prevent corrosion.

(5) A dry handkerchief gets wet at once when dipped in water because it readily absorbs the water through the pores in it as a result of capillary action. This change takes place in short period of time. Hence,

wetting of handkerchief is a quick change. But when the handkerchief becomes wet, it takes a long time to dry it. As drying of handkerchief is due to evaporation of water from its surface which is a slow process, a dry handkerchief gets wet at once on dipping in water, but it takes long for a wet handkerchief to dry.

Q.3. (A) **(1)** The changes that occur in the surroundings are caused due to various natural and human factors.

Natural factors: Rainfall, temperature, light, wind, etc.

Human factors: Pollution, deforestation, desertification, etc.

(2) The changes that are done by the action of humans and their activities are called man-made changes. Eg. burning of fossil fuels, constructing a dam, etc.

(3) Corrosion is degradation or destruction of metal due to its reaction with oxygen, moisture, vapours of chemicals in the air. When an iron article rusts, a reddish brown layer is formed on it. A greenish layer is seen to form on copper article. This process is called corrosion of metal.

Corrosion is caused by oxygen, moisture, vapour of chemicals in the air.

(4) Different methods to prevent corrosion of metals are :

(i) **Galvanization :** Iron articles are given a thin coat of zinc to prevent corrosion. This coating of zinc on iron articles is called galvanization.

(ii) **Tinning:** Copper and brass articles are coated with thin coating of tin. This process is called tinning.

(iii) **Coating :** A layer of oil or paint or grease is applied on the surface of a metal to prevent corrosion.

(iv) **Electroplating**, **anodising** and **alloying** are the other methods to prevent corrosion of metals.

(5) The kind of change seen in the falling of tree in a storm is a natural change.

(6) The kind of change seen in the conversion of milk into yogurt is a chemical change.

(7) (a) **Fast change :** Changes that take place in short period of time are called fast changes.

Examples : burning of paper, bursting of crackers, glowing of bulb, etc.

(b) **Slow change :** Changes that take place over a long period of time are called slow changes.

Examples : Germination of seed from a plant, digestion of food, the growth of child into adult, rusting of iron, etc.

(8) An irreversible change is a type of change that cannot be reversed and is a permanent change.

Examples : (i) Ripening of mango. (ii) Burning of wood to obtain ash. (iii) Conversion of milk into curd. (iv) Digestion of food.

(9)

Physical change	Chemical change
Making a table from wood	Burning of wood
Breaking of a glass object	Ripening of a tomato
Heating of platinum wire	Rusting of iron

(10) The change of seasons from summer to rains to winter is a periodic change.

(11) The minute, second and hour hands all show periodic motion. If 1 period = 360° (1 complete circle), hour hand will show periodic change 1 time, minute hand 12 times and seconds hand 720 times.

(B) (1) The following characteristics / properties are taken into account while identifying : (a) A physical change in a substance and (b) A chemical change in a substance.

(a) Physical change in a substance :

(i) The substance which has undergone a physical change can be recovered by easy means.

(ii) No new substance is formed.

(iii) Physical properties such as colour, size and state of the original substance may change.

(iv) A physical change is temporary.

(v) In this, heat may or may not be released or absorbed.

(b) Chemical change in a substance :

(i) The substance which has undergone a chemical change cannot be recovered by easy means.

(ii) A new substance or substances are formed having different properties than the original.

(iii) Physical properties and chemical properties undergo a change.

(iv) A chemical change is permanent.

(v) The heat may be released or absorbed.

(2) It was nearing six o' clock in the evening (Periodic change). The sun was setting (Periodic change). A breeze was blowing (Natural change). Leaves on the tree were shaking (Natural change). Sahil was sitting in the courtyard, rolling balls of wet soil and

shaping them into various toys (Man-made change, Physical change, Reversible change). Then he felt hungry and went into the house (Natural change). Mother made a dough from wheat flour and fried pooris (Chemical change, Irreversible change). While eating hot pooris, his attention was drawn outside the window. It had started raining (Natural change, Physical change). There was lightning, too (Natural change, Chemical change). Sahil was enjoying his dinner in the dim light (Man-made change, Physical change).

Q.4. (1) (i) In the first picture, we observe the milk has changed into curd. It is a chemical change and an irreversible change.

(ii) In the second picture, we observe the ice melting. It is a physical and reversible change.

(iii) In the third picture, we observe the germination of a seed. The kind of change is chemical change and irreversible change.

(iv) In the fourth picture, we observe that from the flower pot cracker sparkles emitting out from the chemicals stored in it. The kind of change is chemical change and irreversible change.

(v) In the fifth picture, we observe the liquid is boiling in a sauce pan and getting converted into water vapour. the kind of change is physical change and reversible change.

(vi) In the sixth picture, we observe the logs of wood burning, giving out the flames. The kind of change is chemical change and irreversible change.

(vii) In the seventh picture, we observe the bursting of crackers. The kind of change is chemical change and irreversible change.

(2) (i) Change shown in picture (C) is temporary.

(ii) The changes shown in pictures (A) and (B) are permanent.

(iii) The changes shown in pictures (A) and (B), the original matter has undergone change.

(iv) The original matter in the pictures (C) and (D) remains unchanged.

(v) The changes shown in picture (A) and (B) show new substances, with a new property formed.

Topic 14 : Elements, Compounds and Mixtures

Q.1. (A) **(1)** Matter is composed of tiny **particles**.

(2) Matter which is made of only one constituent is called **substance**.

(3) The molecular formula of carbon dioxide is **CO_2**.

(4) 2 atoms of oxygen are joined to form a **molecule** of oxygen.

(5) The chemical symbol of potassium is **K**.

(B) **(1)** Naturally occurring elements are **92**.

(2) Symbol of tungsten is **'W'**.

(3) Which of the following is an element by NOT a metal? **Oxygen**.

(4) Which of the following is a metal? **Iron**.

(5) Which one of the following substances is not a mixture? **Water**.

(6) **Aurum** is the Latin name from which gold is derived.

(C) (1 - e), (2 - f), (3 - c), (4 - b), (5 - a), (6 - d)

(D) **(1)** Selenium **(2)** Brass **(3)** Water
(4) Silver **(5)** Carbon

(E) **(1)** False **(2)** False **(3)** False
(4) True **(5)** False

(F) **(1)** Copper **(2)** Distillation **(3)** Oxygen

Q.2. (A) **(1)** **Substance :** A substance is matter made of only one constituent which has specific composition and properties.

(2) **Element :** A substance whose molecules are made of one or more atoms which are exactly alike, is called an elem ent.

(3) **Metalloid :** An element that shows some properties of metals and some properties of non-metals is called a metalloid. Eg. arsenic, silicon, etc.

(B) **(1)**

	Metals		**Non-metals**
(i)	Metals have lustre.	**(i)**	Non-metals lack lustre.
(ii)	Metals are malleable.	**(ii)**	Non-metals are not malleable.
(iii)	Metals are ductile.	**(iii)**	Non-metals are not ductile.
(iv)	Metals are good conductors of heat and electricity.	**(iv)**	Non-metals are poor conductors of heat and electricity.
(v)	At room temperature, metals are in the solid state (Exception: Mercury is in liquid state.)	**(v)**	At room temperature, non-metals are in the liquid or gaseous state (Exception carbon, sulphur are solids)
(vi)	Generally, metals have high density.	**(vi)**	Non-metals have lower densities in the solid state.

(2)

	Mixtures		**Compounds**
(i)	A mixture is formed by mixing different elements or compounds.	**(i)**	A substance formed by a chemical combination of two or more elements is a compound.
(ii)	The proportion of various components in a mixture is not fixed.	**(ii)**	The proportion of various components in a compound is always fixed.
(iii)	No chemical change takes place during the formulation of mixture.	**(iii)**	There is always a chemical change that takes place during the formation of compound.
(iv)	No new substance is formed as constituents do not react chemically.	**(iv)**	A new substance is formed due to chemical reaction.
(v)	The constituents can be separated easily by physical method.	**(v)**	The constituents can be separated only by chemical or electrochemical processes or reactions.

(3)

	Atoms		**Molecules**
(i)	Atoms are the smallest particles of a chemical element.	**(i)**	Molecules are the smallest particles in a chemical element or compound that has chemical properties of element or compound.
(ii)	They may or may not exist in free state.	**(ii)**	They exist in free state.

(iii)	Atoms are indivisible.	(iii)	Molecules are the divisible into individual atoms.
(iv)	They take part in chemical reaction.	(iv)	They do not take part in chemical reaction.

(4)

	Separation by Distillation		**Separation by Separating Funnel**
(i)	This method of separation is used for separating a mixture containing two miscible liquids.	(i)	This method of separation is used for separating a mixture containing two immiscible liquids.
(ii)	It will separate the two miscible liquids by boiling without decomposition and having sufficient difference in their boiling points.	(ii)	It will separate the two immiscible liquids into two distinct layers depending on their densities.
(iii)	A solution of common salt in water or potassium permanganate in water can be separated by distillation.	(iii)	Kerosene and water can be separated by separating funnel.

Q.3. (A) (1) Buttermilk is a mixture of residual fat, proteins, sugar and minerals. The particles of buttermilk do not settle when left undisturbed. This is because the particles in it are very tiny and light and remain evenly distributed in the liquid. These particles cannot be separated from the buttermilk even by the methods like filtration or settling. But when the buttermilk is churned, a force is generated which pushes the particles away from the centre. As a result, the solid particles i.e., the butter separates out from the buttermilk. Butter being lighter rises up and settles over the buttermilk. Hence, buttermilk is churned to get butter.

(2) In the method of separation of components from a mixture by chromatography, two properties of substances are taken into consideration. These are the solubility of the substance in the solvent that moves up and the ability of the substance to stick to the stationary filter paper. Since these properties are mutually opposite and different for different substances, all the ingredients of a mixture do not rise all the way to the upper end of the filter paper but remain behind at different heights, when solvent, i.e., water rises up to the upper end of the paper.

(3) When a wet cloth is wrapped around a storage container like an earthen pot during summer, due to the heat, the water from the wet cloth evaporates and the cloth becomes dry. Earthen pot being porous, the outside heat draws out the water from it, which is taken up by the dry cloth and makes it wet. As this cycle of wetting and drying of the cloth continues, the water in the storage container remains cool. Hence, in order to keep the water in the storage tank cool, a wet cloth is wrapped around it in summer.

(B) (1)

Symbol	Name of the element
Zn	Zinc
Cd	Cadmium
Xe	Xenon

Br	Bromine
Ti	Titanium
Cu	Copper
Fe	Iron
Si	Silicon
Ir	Iridium
Pt	Platinum

(2)

	Compound	Molecular formula
(1)	Hydrochloric acid	HCl
(2)	Sulphuric acid	H_2SO_4
(3)	Sodium chloride	NaCl
(4)	Glucose	$C_6H_{12}O_6$
(5)	Methane	CH_4

(3)

Elements	Compounds	Mixtures
iron	water	soil
copper	thermocol	coal
	rubber	paper
	plastic	coir

(4) There are three states of matter - solid, liquid and gas. *[Note : Two more states are known, they are plasma and Bose-Einstein condensate.]*

(5) The properties of matter are :

(i) Matter is made up of tiny particles.

(ii) Matter has mass and volume. It occupies space.

Heat or change in temperature bring about change of state of matter.

(6) Air contains 78.09% of nitrogen, 20.95% of oxygen, 0.93% argon, 0.04% carbon dioxide and small amounts of other gases. It also contains variable amounts of water vapour.

(7) No, carbon dioxide is not an element, it is a compound.

(8) The properties of elements are due to the atoms they are made up of.

(9) The atoms of different elements are dissimilar.

(10) The elements like sodium, magnesium, iron, gold, silver, platinum, etc., are metals. The elements like hydrogen, oxygen, nitrogen, carbon, etc., are non-metals. Arsenic, silicon, selenium, antimony are examples of metalloids.

(11) Oxygen helps in combustion.

(12) No, water does not help combustion.

(13) Cement, alloys like steel, bronze, brass, coffee, tea, soda, salad, milk, sherbet, bhel, etc., are used in everyday life.

(14) All mixtures may not be useful to us. e.g., Mud puddle (dirty water) is not useful to us.

(15) From the mixture of semolina, salt and iron filings, the iron filings can be separated by using magnet, as the iron filings get attracted to the magnet. The mixture of semolina and salt can be separated by sieving, as they differ in size.

(16) The water that falls from clouds is naturally pure.

(17) The property of difference in the boiling points of liquids are seen in the distillation method.

(18) The distilled water is pure water. It is commonly used to top off lead acid batteries used in cars and

trucks. It is also widely used in brewing wine, desalinating water, refining oil, etc.

Q.4. (1) The components of mixtures are separated by simple methods like straining (filtering), sifting, picking, sorting, winnowing, combing with a magnet and sublimation, etc.

(i) Straining (filtering) : It is used to separate the compound or mixture like filtration, i.e. pouring (mainly liquid substance) through a porous or perforator device or material in order to separate out any solid matter. E.g., tea leaves can be separated by straining while making the tea.

(ii) Sifting : It is a method to separate the components of mixture by separating out or putting through a sieve. E.g., flour and husk can be separated by sifting.

(iii) Sorting : It is the process of separating the components of mixture by separating the particles according to size or shape. E.g., in a sediment sample, pieces of gravel, sand, silt can be separated by sorting.

(iv) Winnowing : It is the method used to separate the chaff from grain, especially by throwing it into the air and allowing the wind or a forced current or air to blow away impurities. E.g., Husk is separated from heavier seeds of grain by winnowing.

(v) Combing with magnet : Mixture containing iron filings can be separated by combing with a magnet, since magnet shows the property of attracting iron filings. E.g., mixture of iron and sulphur can be separated by combing with magnet.

(vi) Sublimation : It is the process in which solid on heating changes to gaseous state without going

into liquid state and vice-versa. E.g., we can separate the components of the mixture of common salt and ammonium chloride by the process of sublimation.

(2) Use of metals :

(i) Metals like copper, aluminium, iron are used for making cooking utensils.

(ii) Copper wires are used as conducting wires in electrical gadgets, radios, refrigerators, etc.

(ii) Iron and aluminium sheets are used to make roofs of houses.

(iv) Gold, silver and tin are used to make coins and ornaments.

(v) Mercury is used in thermometers.

Use of non-metals :

(i) Graphite, a form of carbon, is used as the core in pencils.

(ii) Graphite, (carbon) is used as electrodes in an electro-chemical cell.

(iii) Silicon dioxide, the oxide of the metalloid silicon, is used in making glass and cement.

(iv) Silicon is used in the solar cell.

(v) Red phosphorus is used in making safety matches, crackers, germicides, explosives, etc.

(vi) Sulphur is used for producing acids and also in some medicines, gun powder, etc.

Uses of compounds :

(i) Sodium chloride (salt) : It is an essential constituent of our daily diet. It is used in the preparation of baking soda and washing soda.

(ii) Sodium bicarbonate (baking soda) : It is used in the preparation of bread, cakes, dhokala, etc. It is used as antacid, which helps to reduce acidity in stomach. It is useful in preparing CO_2 gas and is one of the constituents of a fire extinguisher.

(iii) Water : It is used as a universal solvent. It is used to extinguish fire.

(iv) Sodium carbonate (washing soda) : (i) It is used as a cleansing agent in washing clothes. (ii) It is used in the manufacture of detergent power, paper and glass.

(v) Bleaching powder : (i) It is used in the preparation of chloroform. (iii) It is used for bleaching cotton in the textile industry.

Uses of mixtures :

(i) Cement is a mixture of limestone, clay and sand. When cement is mixed with water, it can bind sand and gravel and form solid hard mass called concrete which imparts strength to the building.

(ii) Wood is a mixture of a number of compounds such as lignin cellulose, water, hemicellulose, etc. It is used for construction work including beams, walls, doors and floors.

(iii) Alloys are mixtures containing two or more metals or a metal and a non-metal. E.g., stainless steel is an alloy of iron, carbon, chromium, nickel, carbon. It is used in cooking utensils, cupboard, machinery parts, tools, etc. Brass is an alloy of copper and zinc used in hinges, electrical plugs, etc.

(iv) Coal is a mixture of carbon and other traces of compounds. It is used as fuel.

(v) Beverages like tea, coffee, milk are mixtures used in day-to-day life. These beverages are used as stimulants.

(3) Applications of centrifugation :

(i) Centrifugation is used in diagnostic laboratories - separation of urine components and blood components in forensic and research laboratories and also for blood and urine tests for providing information to assist in the diagnosis, monitoring and treatment of a wide range of diseases.

(ii) Used in dairies and homes to separate butter from cream.

(iii) Used in washing machines to squeeze out water from wet clothes.

(iv) Centrifugation is a common procedure in microbiology and cytology used to separate certain organelles from whole cells.

(v) Centrifugation aids in separation of protein using purification techniques such as salting out in industrial chemistry. e.g., ammonium sulphate precipitation.

(4) (A) Distillation :

(i) Simple distillation is the primary method used for purifying water of unwanted chemicals and minerals such as salt.

(ii) It is used for separating acetone and water.

(iii) It is used in distillation of alcohol.

(iv) Distillation is used in many commercial processes such as production of alcohols, distilled water, and many other liquids.

(v) Desalination plants also use distillation to turn seawater into drinking water.

The method of distillation is used for separating the components of mixtures because this separation technique involves two miscible liquids that boil without decomposition and having sufficient difference in their boiling points. The process of distillation is used to obtain liquid substances in their pure state.

(B) Separating funnel :

(i) It is used to separate a mixture of oil and water.

(ii) It is used to separate a mixture of kerosene oil and water.

(iii) In the extraction of iron from its ore, the lighter slag is removed from the top by this method to leave the molten iron at the bottom of the furnace.

This method of separating funnel is used for separating the components of mixture because this separation process involves two immiscible liquid phases. One phase is the aqueous phase and the other phase is an organic solvent. This separation is based on the differences in the densities of the liquids. The liquid having more density forms the lower layer and the liquid having less density forms the upper layer.

(5) Precautions to be taken while using the method of distillation :

(i) Before any distillation process starts, ensure that apparatus is set properly, and there is no obstruction in the piping that could lead to excessive pressure build up causing it to burst.

(ii) The flammable organic solvents such as alcohol, acetone, etc., are highly volatile. They require careful handling. Otherwise, they may catch fire, if not handled properly.

(iii) The laboratory should be well-ventilated to prevent alcoholic vapour.

(iv) Use proper disposal of all waste.

(v) Monitor the temperature constantly. Don't allow the liquid to overheat.

(vi) The heat source should be at high strength at the beginning of the distillation to start off and reduce when approaching the boiling point.

(vii) Control the temperature of the condensation of liquid so that no vapour exits the condenser.

(viii) See to it that the fire extinguisher is installed.

Precautions to be taken while separating compounds of mixture by separating funnel :

(i) Use the glassware carefully.

(ii) Open the stopcock of the separating funnel after shaking, to release the pressure inside the funnel.

(iii) The top should be vertical to allow the water to run out and must be closed before the oil reaches the bottom of the funnel.

(iv) Organic solvents should be handled carefully.

(v) Fire extinguisher should be installed.

Topic 15 : Materials We Use

Q.1. (A) **(1)** **Fluoride** is essential for the strengthening of bones and the enamel covering of teeth.

(2) A **detergent** is a substance that cleans or wipe away dirt.

(3) The natural detergents contain a chemical named **saponin**.

(4) Soft soap contains **potassium** salt of fatty acids.

(B) **(1)** The substance that helps water to remove dirt from the surface of materials is called **detergent**.

(2) Fluoride is used in toothpaste to prevent **tooth decay**.

(3) Soap is a salt of **fatty acid** and sodium hydroxide.

(4) Synthetic detergents can be used in **hard** water as well.

(5) For construction purposes, **portland** cement is the most commonly used cement.

(C) (1)-(b), (2)-(c), (3)-(d), (4)-(a)

(D) **(1)** False **(2)** True **(3)** False

(E) **(1)** fluoride **(2)** soap **(3)** volcanic ash

(4) sodium hydroxide **(5)** ash

Q.2. (A) **(1)** Clothes become dirty mostly because particles of dirt and dust cling to the fibres. A molecule of a detergent holds on to a water molecule at one end and an oil molecule at the other. As a result, the molecules of oil mix with water. Thus, when soiled clothes are immersed in such a solution, the greasy matter is surrounded by detergent molecules and are removed from the clothes. The dirt is detached from the fabric.

(2) Take a clear empty bottle with a cap. Fill one third of the bottle with tap water. Add 10 drops of pure liquid soap or soap powder to the bottle. Shake the bottle vigorously for few seconds. Stir vigorously until the soap is thoroughly mixed into the water. Observe the soap solution in the bottle carefully.

If we observe, there is a distinct lack of fluffy bubbles, lather or soap foam and the water appears to be cloudy, precipitate or milky and forms a scum (a filmy or frothy layer of matter that forms on the surface of water). Thus, the water sample suggests it is hard water.

(3) The principal ingredients of a toothpaste are calcium carbonate, calcium hydrogen phosphate and certain proportion of fluoride.

(a) The functions of each ingredient are :

(i) Calcium carbonate and calcium hydrogen phosphate remove the dirt on teeth.

(ii) These ingredients also polish the teeth.

(b) Fluoride : A certain proportion of fluoride in the toothpaste helps prevent tooth decay. Fluoride is essential for the strengthening of bones and of the enamel covering the teeth.

(4) Cement is a dry, greenish grey powder with fine particles. It is made from raw material which consists of 60% lime (calcium oxide), 25% silica (silicon dioxide), 5% alumina. The rest is iron oxide and Gypsum (calcium sulphate.)

(5) Cement is an important material in construction. Cement is the principal ingredient in preparation of concrete. Concrete is prepared by mixing cement, water, sand and gravel. Concrete is formed when cement creates a paste with water that binds with sand and rock to harden. Concrete is the most

common material used for construction due to its properties such as binding, strength, durability and easy availability. Hence, without cement, concrete cannot be made.

(6) A detergent is a substance that cleans or wipes away dirt.

List of detergents that we use are ritha, shikakai, soap, washing soda, washing powder, liquid soap, shampoo, etc.

(7) Fabrics made from silk, wool, raw silk, chiffon, satin are made of delicate fibres. These delicate garments are very fragile. Alkali damages the fibres of silk or wool. Care has to be taken to protect the fabric from shrinking, damping, fading, stretching. Hence, for washing these delicate garments, detergents containing mild alkali should be used. Mild detergents are formulated for washing delicate garments in order to prevent the delicate garments from getting spoiled.

(8) The property possessed by certain solid substances of spreading on a surface to influence the surface tension of liquid is called surface activity.

The chemicals responsible for the surface activity of various detergents are sodium lauryl sulphate, sodium dodecylsulfate, dioctyl sodium sulfosuccinate, ammonium lauryl sulphate, sodium tripolyphosphate, sodium silicate, sodium carbonate, sodium carboxymethyl cellulose, etc.

(9) In olden times in India, acacia, neem twigs, coal powder, ash, tooth powder, salt, pomegranate rind were used for cleaning teeth.

Today, a variety of toothpastes and toothpowders are used for this purpose.

(10) Natural materials are any products of matter that come from organic substances which are of plant and animal origin e.g., silk, cotton, wool, etc.

Man-made materials are new substances produced by chemical processing of natural substances. e.g., detergent, rayon, polyester, cement, plastic, tooth paste, etc.

(11) Sodium fluoride is the source of fluoride which is used in most of the toothpastes or tooth powders.

(12) Roads are made of concrete as they are highly durable, last longer, easy to maintain, and also cost less than other materials like Asphalt.

(13) The presence of soluble bicarbonates, chlorides, and sulphates of calcium and magnesium causes the hardness of water.

Q.3. **(1)** Soap is a mixture of sodium or potassium salts of fatty acid. Hard water contains magnesium and calcium salts. Soap reacts with calcium and magnesium salts to form water insoluble calcium and magnesium salts of the fatty acids. No froth (lather) is formed with soap if hard water is used. Thus, soap is wasted and the cloth gets spoiled due to these insoluble salts. Hence, soap cannot be used in hard water.

(2) A synthetic detergent works in both soft as well as hard water. However, soaps work only in soft water. As compared to soap, a small quantity of a synthetic detergent is enough for effective cleaning action. A synthetic detergent can be effectively used at ordinary temperature. The solubility of synthetic detergents is higher than soaps. A synthetic detergent does not damage the delicate fibres of woollen and silk garments as soap does. Hence, synthetic detergents are superior to soaps.

(3) Clothes, when washed in hard water, become dull or get discoloured. In hard water, minerals like calcium and magnesium prevent water from mixing with detergent to form a solution. As a result, soap scum is formed. Sometimes the soap scum and mineral residue in the cloth may form yellow or reddish brown stains or spots on clothes during washing. Hence, coloured spots are often formed on clothes during washing.

(4) (i) When oil and water are mixed, oil floats to the top of water because oil is less dense that water.

(ii) Oil and water are immiscible liquids.

(iii) However, when sufficient quantity of detergent is added to a solution of oil and water, it becomes homogeneous, due to the detergent molecule.

(iv) A detergent molecule has two end. One end holds on to a water molecule and another end holds on to the oil molecule.

(v) The two opposing forces help in dissolving the oil in water, thus creating a homogeneous mixture.

(5) The main compounds present in tobacco masheri are tar, nicotine, etc. When tobacco masheri is used in cleaning teeth, the nicotine or tar settle into the oral cavity while brushing the teeth. These substances are able to leach their way into microscopic openings in the enamel, resulting in yellow or brown discolouration of the teeth surface. Thus, tobacco stains cannot be removed easily. Prolonged use of tobacco masheri can damage the oral tissues or cause inflammation of tissues. Sometimes it can be fatal and may lead to oral cancer. Hence, tobacco masheri should not be used for cleaning teeth.

Q.4. (1) Similarities between Natural and Man-made detergents:

(i) Natural and man-made detergents act as cleansing agents.

(ii) They produce lather or foam when dissolved in water.

(iii) The molecules of both detergents are long and the properties of its two ends are different. A molecule of a detergent holds on to a water molecule at one end and oil molecule at the other. As a result, the molecules of oil mix with water. This is how cleansing action of both the detergents take place.

Differences

	Natural detergents		**Man-made detergents**
(i)	Natural detergents are natural cleansing agents.	**(i)**	Man-made detergents are synthetic detergents which act as cleansing agents.
(ii)	Natural detergents are the substances obtained from plant products or plant origin.	**(ii)**	Man-made detergents are new substances produced by the chemical processing of substances of plant or animal origin.
(iii)	Large scale production of natural detergents is difficult.	**(iii)**	Man-made detergents are available in plenty.
(iv)	Natural detergents are bio-degradable.	**(iv)**	Man-made detergents are non-bio-degradable.
(v)	They are affected by hard water and are made less effective.	**(v)**	Hard water has no effect on them.
(vi)	They do not have harmful effect on skin or silk and woollen threads and cloth.	**(vi)**	They have harmful effect on skin or silk and woollen threads and cloth.

(2) Similarities between Soap and Synthetic detergent.

(i) Soap and synthetic detergent are man-made detergents.

(ii) Soap and synthetic detergent are obtained by subjecting the raw materials to a variety of chemical processes.

(iii) Soap and synthetic detergent are used as cleansing agents.

(iv) The property of surface activity remains the same for both.

(v) Production of lather or foam, emulsifying oil substances, cleansing action taking place with both are same.

Differences

	Soap		Synthetic detergent
(i)	Sodium or potassium salts of fatty acids are the main ingredients of soaps.	(i)	Water soluble, salt-like group attached to a long hydrocarbon chain is the main structure of synthetic detergents.
(ii)	They are affected by hard water and are made less effective.	(ii)	Hard water has no effect on them.
(iii)	Silk and woollen garments are damaged if washed by soap.	(iii)	Silk and woollen garments can safely be washed with synthetic detergents.
(iv)	Their cleansing power is less as compared to that of a synthetic detergent.	(iv)	Its cleansing power is much more than that of soap.

(3) Similarities between Bath soap and Soap for washing clothes.

(i) Bath soap and soap for washing clothes are man-made detergents.

(ii) Both the soaps are used as cleansing agents.

(iii) They produce lather/foam, emulsify fat/oil.

(iv) Cleansing action or purpose of bath soap and soap for washing the clothes remains same.

(v) The property of surface activity in the both soaps is more or less similar.

Differences

	Bath soap		Soap for washing clothes
(i)	Bath soaps are used for bathing.	(i)	Hard soap is used for washing clothes.
(ii)	Bath soap contains potassium salt of fatty acids.	(ii)	Soap for washing clothes contains sodium salts of fatty acids.
(iii)	Bath soap does not cause irritation of the skin.	(iii)	Soap used for washing clothes may cause irritation of skin.
(iv)	Good quality perfumes, oils are used to make bath soap.	(iv)	Cheaper quality perfumes and oils are used to make soap for washing clothes.

(4) Similarities between Modern cement and Ancient cement :

(i) Modern cement and ancient cement are used for construction work. e.g., buildings, monuments, dams, roads, etc.

(ii) Lime is one of the common ingredients in making cement of both the types.

(iii) Properties such as strength, resistance to heat, salt water, durability remain more or less similar.

(iv) Sheets, blocks, pillars, pipes are made from concrete produced from both the types of cement.

Differences

	Modern cement		Ancient cement
(i)	Modern cement of today is called Portland cement.	(i)	Ancient cement of the past is called Roman cement.
(ii)	It is made from raw materials which consist of 60% lime (CaO), 25% silica (SiO_2), 5% alumina, iron oxide and gypsum (calcium sulphate).	(ii)	It is made from mixing of volcanic ash in moistened lime.
(iii)	Modern cement is produced on a large scale.	(iii)	Ancient cement was produced on a small scale.
(iv)	Concrete made from modern cement is less resistant to salt water.	(iv)	Concrete made from ancient cement is more resistant to salt water.
(v)	Manufacturing of modern cement increases carbon emission and causes pollution.	(v)	Manufacturing of ancient cement significantly reduces the carbon emission and causes less pollution.

Topic 16 : Natural Resources

Q.1. (A) **(1)** Minerals that contain a high proportion of metal are called **ores**.

(2) Magnetite is an ore of **iron**.

(3) **Anthracite** is a type of coal of the highest grade.

(4) **Bauxite** is the most important ore of aluminium.

(B) **(1)** The **silver** is classified in metal minerals which is a good conductor of electricity.

(2) The main component of natural gas is **methane**.

(3) Micro-organisms like **fungi** is used for production of antibiotics.

(4) Shark and cod fish are used for producing edible oil rich in vitamin **A, D, E**.

(C) (1) - (d), (2) - (c), (3) - (b), (4) - (a).

(D) **(1)** Bauxite (others are non-metal minerals)

(2) Diamond (others are metals)

(3) Diamond (others are energy minerals)

(4) Platinum (remaining are gems)

(5) Mica (others are good conductors of electricity)

(E) **(1)** Bauxite **(2)** Coal **(3)** C_4H_{10}

(4) Cinchona **(5)** Coal or mineral oil or natural gas

(F) **(1)** True **(2)** True **(3)** True

(4) False **(5)** True

(G) **(1)** Mineral oil **(2)** Gangue **(3)** Potash

Q.2. (A) **(1)** **Ores :** The minerals from which metals are extracted profitably and conveniently are called as ores.

(2) **Iron ore :** Iron occurring in the impure state is called iron ore.

(B) **(1)** Millions of years ago, remains of plants and animals got buried into the earth. They were converted into fossil fuels due to the tremendous pressure of the earth's layers above them and the heat inside. As this process takes millions of years to occur, the deposits of fossil fuels are limited.

(2) The natural materials on the earth in which metal or its compounds occur are called minerals. The minerals from which metals may be extracted profitably are called ores. All materials cannot be ores as they contain unwanted substances other than metals. But, ores can be minerals as metals can be extracted commercially. Hence, all ores are minerals but all minerals are not ores.

(3) Natural gas can be easily transported from its main sources using pipes over long distances. It lights up quickly and its burning can be easily controlled. On burning, it does not leave any solid waste behind. Other pollutants are also not produced when natural gas is used. Hence, natural gas is an eco-friendly fuel.

(4) Millions of years ago, forests got buried underground as a result of certain natural events. Layers of soil kept getting deposited over them. The very high pressure from above and the heat from the earth's interior, slowly transformed the buried plants into fuel. Coal was thus formed from the remains of those plants. Hence, coal is said to be a fossil fuel.

(C) (1)

	Minerals		**Ores**
(i)	Naturally occurring substances of metal present in the earth's crust are called minerals.	**(i)**	Minerals that contain a high proportion of metal are called ores.
(ii)	All minerals are not ores.	**(ii)**	All ores are essentially minerals.
(iii)	E.g., clay is the mineral of aluminium.	**(iii)**	E.g., bauxite is the main ore of aluminium.

(2)

	Compressed Natural Gas (CNG)		**Liquified Petroleum Gas (LPG)**
(i)	Major component of CNG is methane.	**(i)**	It is composed of propane or butane and isobutane.
(ii)	It is lighter than air.	**(ii)**	It is heavier than air.

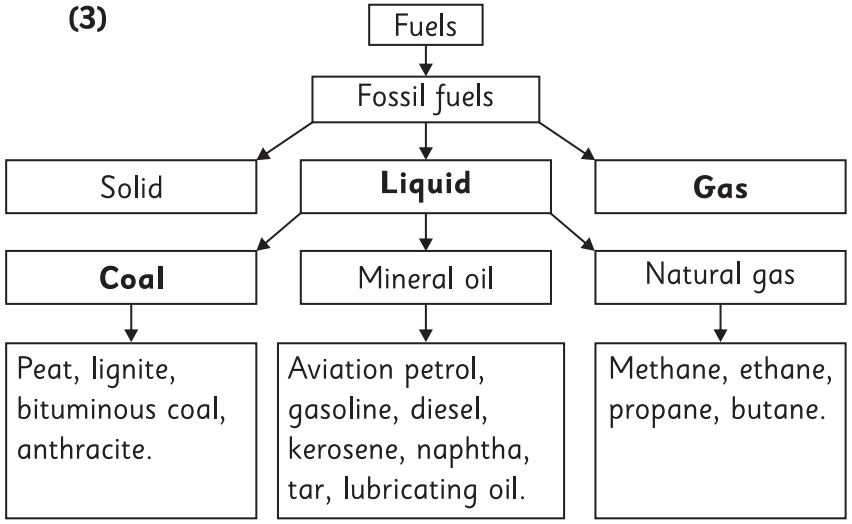
(iii)	It serves as an alternative to gasoline in automobiles.	**(iii)**	It is used for cooking and heating purpose in homes, industries and even as automobile fuel.
(iv)	It releases minimal greenhouse gas.	**(iv)**	It releases greenhouse gases like CO_2.
(v)	It easily gets dispersed, causing minimal risk of ignition.	**(v)**	It is difficult to get dispersed, therefore causing risk of fire.

(D) **(1)** A fuel is a substance that produces or generates energy on burning. The natural resources we use as fuel are coal, mineral oil and natural gas.

The characteristics of CNG are :

(2) (i) It catches fire easily.
(ii) No solid waste remains after combustion.
(iii) Carbon dioxide and water are formed in small quantities.
(iv) Other pollutants are not produced.
(v) It can be transported easily.
(vi) Combustion can be easily controlled.

(3)



(4) (i) Large scale cutting of trees can lead to deforestation.

(ii) Plants create oxygen and absorb greenhouse gases, the destruction of trees may lead to global warming.

(iii) Cutting trees can result in the loss of habitat for animal species which can harm the ecosystem.

(iv) Clearing of forests loosens the soil cover or loosens the ground and causes landslide or flood.

(v) Cutting down the trees will affect the rainfall and also create an unstable atmosphere.

(vi) The loss of trees and other vegetation can cause climate change, desertification, soil erosion, fewer crops, flooding, increased greenhouse gases in the atmosphere.

(5) The different types of coal are peat, lignite (brown coal), bituminous coal and anthracite (highest grade).

Uses of coal :

(i) Coal is used as fuel.

(ii) It is used in thermal power plants as well as to run boilers and railway engines.

(iii) It is used as fuel for cooking and for baking bricks in kilns on a large scale.

(iv) The gaseous fuels, producer gas and water gas, are obtained from coal.

(v) Coal as an energy resource, contributes greatly to industrial development.

(6) Petroleum or mineral oil is called liquid gold because of its high price and value and its economic need by all the countries worldwide. Petroleum is present in abundant quantity in some regions. The people over there are engaged in petroleum factories and industries. It is mainly the source of income for most of the people.

Hence, petroleum provides most of the economic wealth to the people of some regions. So, it is considered as liquid gold.

(7) Coal is called 'black gold' because of its large number of applications in different fields, especially in the generation of electricity and moreover it is also used as fuel. Hence, because of its high price and value, and its economic need by all the countries worldwide, coal is called 'black gold'.

(8) The reserves of fossil fuels, namely mineral resources are limited and the demand is increasing. There is a definite amount of fossil fuels, i.e. minerals available on the earth. Owing to the tremendous increase in the consumption of these mineral resources, it is feared that they would be depleted in the near future causing an energy crisis.

(9) The resources which are obtained from nature are called natural resources. Examples of natural resources are coal, water, wood, cotton, minerals, soil, etc.

(10) Minerals oil and natural gas were formed in the course of millions of years over time, the marine organisms die and are decomposed by microbes. They fall at the bottom of the ocean and get deposited there. This puts pressure on the layers at the bottom to convert hydrocarbons into fossil fuels. With time, layers of rocks, soils and sand are created on top of them.

(11) The extensive area of land covered by a variety of plants is called a forest. Forests are a natural habitat of plants, animals, and microbes. Forests provide us with various useful things like firewood, honey, medicinal plants, biofertilizers, etc. They also protect the environment, reduce soil erosion, control floods, and help maintain ecological balance.

(12) If rubber is not available, we will have to live without rubber toys, footwear, erasers, rubber bands, and other items.

(13) Yes, the minerals that can be found inside the earth can also be found in seas and on seabeds. The seabed is rich in minerals such as chromium, copper, iron, manganese, sulphur, zinc, lead, etc.

(14) The two important stages in the process of obtaining metals from ores are extraction and purification.

(15) A metal mineral is a mineral that contain metallic elements in the chemical formula. e.g. Gold, iron, copper, etc.

A non-metal mineral is one that does not contain metallic elements in its formula. e.g. Diamond, mica, gypsum, etc.

Q.3. (1) (a) Mineral resources : Mineral resources are elements, chemical compounds, minerals or rocks, concentrated in such a form which can be extracted to obtain a usable commodity.

There are many types of mineral resources depending on their nature, uses, processing and production.

(I) They can be classified according to their properties.

(i) Metallic minerals (ii) Non-metallic minerals

(iii) Energy minerals.

(i) **Metallic minerals :** These minerals contain one or more metallic elements. They occur in rare, naturally formed concentrations known as mineral deposits. E.g., Iron, gold, silver, bauxite, manganese, platinum, etc.

(ii) **Non-metallic minerals :** The mineral reserves consist of stone quarries, clay and sand pits. They occur in the form of chemical and fertilizer mineral deposits, salt deposits, natural gemstones, etc. E.g., Mica, diamond, graphite, feldspar, sapphire, gypsum, etc.

(iii) **Energy minerals :** It includes coal, mineral oil, natural gas that are used to produce electricity, fuel for transportation, heating for homes and offices and in the manufacture of plastics.

(II) Minerals on the basis of use.

(i) **Iron :** The most commonly used iron bearing minerals contain iron compound such as hematite, magnetite, limonite and siderite. Iron ore is used to make variety of articles from pins to heavy machinery. E.g., farming implements, rails of railway track.

(ii) **Manganese :** Occurs in the form of carbonate, silicate and oxide. Compounds of manganese are used in the preparation of medicines and for giving a pink tinge to glass. It is also used in electrical appliances.

(iii) **Aluminium :** It is the most abundant metallic mineral in the earth's crust. Bauxite ore is the main source of aluminium. Aluminium is a very good conductor of electricity and heat. It is used in aeroplanes, transport vehicles and to make electric wires.

(iv) **Copper :** It is a metallic mineral found in impure state in the vicinity of iron and other minerals. It is a very good conductor of electricity and hence used to make electric wires as well as in radios, telephones, vehicles and for making kitchen utensils and statues.

(v) **Mica :** They are silicate minerals known as sheet silicates because they form in distinct layers. It is used in ayurvedic medicines, dyes, electric machines and equipments, etc.

(III) Miscellaneous uses of minerals :

Some important minerals like diamond, ruby,

sapphire, emerald, jade, zircon are used as gems. Gems have a great demand.

(b) Forest resources :

"Forest resources" means the various types of vegetation normally growing on forest land, regions, the associated harvested products and the associated residue, including but not limited to bush, grass, logs, saplings, seedlings and trees.

Protective functions of forest :

(i) It reduces the velocity of water flowing over the land.

(ii) To prevent soil erosion.

(iii) To help percolation of water into the ground.

(iv) To control flood.

(v) To reduce the rate of evaporation.

(vi) To protect wild life.

(vii) To maintain the balance of atmospheric gases.

Productive functions of forest : Many products are extracted from forests. Medicinal plants for treatment of various diseases, wood for timber and fuel wood to cook food, etc. Forest wealth includes fibres, paper, rubber, gum and aromatic substances.

Medicinal plants : Medicinal plants include, adulsa, bel, neem, periwinkle, cinnamon, cinchona, ashwagandha, shatavari. They are used in the treatment of cough-cold, diarrhoea, fever, nausea, malaria and cancer.

Wood : Firewood trees like teak, mahogany, neem, acacia, subabul are strong and durable. Wood is used for making furniture, farming implements and various articles used in construction work.

Forest wealth : We get essential oil from lemon grass, vanilla, kewada, vetiver (Khus) and eucalyptus. Sandalwood oil and eucalyptus oil are used for making soaps, cosmetics and incense sticks. In addition we get various fruits, bulbs and roots, honey, sealing wax, catechu, dyes, etc., from forest.

(c) Ocean resources :

It is one of the earth's most valuable natural resources, it provides a treasured source of recreation of humans. It is mined for minerals. (e.g. sodium, potassium, thorium, etc.) and drilled for crude oil, such as mineral oil and natural gas. We get many types of resources such as gems, conches, shells and pearls. Fishes like pomfret, shrimps and prawns are used as sea food.

(I) Mineral resources from ocean :

(i) Thorium - used in the production of atomic energy.

(ii) Magnesium - used in the flash bulb of camera.

(iii) Potassium - The main ingredient in production of soap, glass, fertilizer.

(iv) Sodium - used in the production of cloth and paper.

(v) Sulphate - used in making artificial silk.

(II) Bio-resources in ocean :

(i) Fishes like pomfret, starfish, shrimps, prawns are sources of proteins and vitamins mainly used as sea food.

(ii) Dried shrimp, bombay duck powder-used as poultry food and as a good manure.

(iii) Shells-used in the preparation of medicines, ornaments and decorative articles.

(iv) Fungi - used for the production of antibiotics.

(v) Shark and cod fish - used for producing edible oil rich in vitamin A, D and E.

(vi) Sea cucumbers - used as medicine for treating cancer and tumours.

(2) Fossil fuels are sources of energy that are formed from the accumulated or preserved remains of living organisms that were buried millions of years ago. Pressure, heat, and time allow the organic matter to transform into one of the three major types of fossil fuel.

The major types of fossil fuels are coal, mineral oil and natural gas.

(3) Aviation petrol, gasoline, diesel, kerosene, naphtha, lubricating oil, tar, motor oil, asphalt, etc. are the components we obtain from mineral oil.

(4) (i) Fruits, vegetables, bulbs, roots, honey, sealing wax, catechu, dyes, etc.

(ii) Timber and firewood from trees like teak, mahogany, neem, acacia, subabul (wood for making furniture and other articles in construction work).

(iii) Turpentine, latex (used in manufacturing of rubber).

(iv) Spices, resin and gum, fibres, paper and aromatic substances.

(v) Essential oils from lemon grass, vanilla, kewada, vetiver (khus) and eucalyptus. Sandalwood and oil of eucalyptus used for making soaps, cosmetics and incense sticks.

(vi) Medicinal plants like adulsa, bel, neem, periwinkle, cinnamon, cinchona - used for treatment of cough, cold, diarrhoea, fever, nausea, malaria and cancer.

(5) (i) **Iron**

Magnetite, hematite, limonite and siderite are ores of iron which form the source of mineral iron. It is used to make a variety of articles from pins to heavy industry. For e.g., farming implements, rails of railway tracks, etc.

(ii) **Manganese**

It occurs in the form of carbonate, silicate and oxide. Compounds of manganese are used in the preparation of medicines and giving a pink tinge to glass.

(iii) **Bauxite**

It is an important ore of aluminium. It contains 55% aluminium. It is used mainly in aeroplanes, transport vehicles and to make electric wires.

(iv) **Copper**

It is found in the impure state in the vicinity of iron and other minerals. It is used to make electric wires as well as in radios, telephones, vehicles and for making kitchen utensils and statues.

(v) **Mica**

Mica is found in the form of silicate available in the thickness of its layers. It is used in ayurvedic medicines, dyes, electric machines and equipment, wireless communication equipments, etc.

(6) The natural resources of a country or nation can contribute significantly to its economic development through increasing the production and manufacturing, securing energy supply, increasing export avenues and reducing the cost of local business and households.

Forests are important renewable natural resources that contribute substantially to economic development. They provide raw material to a number of important industries like paper, match box, newsprint, rayon, furniture, construction, tanning, etc.

A nation with large deposits of minerals is provided with a sound base for the development of a large number of industries like iron, steel, petrochemicals, cement, pottery

etc. The discovery of varied mineral deposits provides employment to a large number of people living in that area. Hence, the economic condition of the country can be improved.

Minerals and bio-resources from oceans have a tremendous impact on the nation's economy. The ocean is also valued for the natural resources that lie beneath the ocean floor. These are large scale reserves of mineral oil and natural gas at the bottom of sea.

(7) The explosive rate at which population of our country is growing is the main reason for the decline in the bio-diversity. This rising temperature of the earth is dangerous for some rare and endangered species of plants and animals. Global warming produces large scale changes in the natural habitat of the forest. Environmental pollution increases the temperature of the earth. As a result, there is decline in the diversity of plants and animals. When deforestation occurs, animals lose their habitat due to which they have to adapt to new environment. If they cannot adapt, they become extinct. The housing and industrial development has caused more and more demand for land. This has resulted in clearing of the forests. Some animals are hunted and therefore this diversity is dwindling. All these factors cause decline in diversity of plants and animals in the forest.

(8) We use fuels such as petrol, diesel, gasoline, in running vehicles. These fuels are called fossil fuels. It takes millions of years for the formation of fossil fuels. There is a danger that excessive usage of fuel will lead to their early depletion. There is likelihood of these reserves getting exhausted leading to energy crisis. Usage of fuel in vehicles such as gasoline or diesel also contributes to a number of the environmental problems such as air

pollution, global climate changes, etc. Hence, we should prevent the wastage of fuel used for vehicles.

(9) The various items included under ocean resources category can be categorized as :

Bioresources

(i) **Fishes and prawns :** Sources of proteins and vitamins.

(ii) **Shark and cod fish :** Used in the production of oil rich in vitamin A, D, and E.

Mineral resources :

(i) **Potassium :** Production of soap, fertilizers, and glass.

(ii) **Sulphur :** Vulcanization of rubber.

(iii) **Thorium :** Production of atomic energy.

(iv) **Sodium :** Production of paper and cloth.

(10) The following steps are taken for protection and conservation of natural resources :

Water	Forests	Minerals
Turn off the water when not in use. Practising rainwater, harvesting and drip irrigation. Washing machines should be used only when loaded with full capacity.	Prohibition on deforestation, discouraging excessive grazing in forests, prevention of forest fires.	Recycling of metals, using scrap metals, and substitute, using mineral resources in a planned and sustainable way.

The various medicinal plants that can be grown in the school premises and near your house are :

(i) Tulsi, Adulsa – For cough and cold

(ii) Bel – For diarrhoea

(iii) Cinnamon – Cold, digestion, diabetes

(iv) Eucalyptus – Eucalyptus oil is used in the treatment of blocked nose, and throat infections.

(v) Neem – Treatment of fever and cold.

These plants are easy to grow and maintain. They have natural ingredients used for treating ailments and diseases.

Topic 17 : Effects of Light

Q.1. (A) **(1)** When the beams from the headlights of a car fall on an object in the night, the shadows called **umbra** and **penumbra** can be seen.

(2) Earth appears to be **bluish** in colour from space.

(3) **Blue** colour in the sun is scattered the most by fine particles.

(4) **Eclipse** occurs when the sun, the moon and the earth come in a straight line.

(5) The day on which the sun reaches exactly overhead is called the **zero shadow** day.

(6) During a lunar eclipse, the shadow of the **earth** falls on the **moon**.

(7) During a solar eclipse, the shadow of the **moon** falls on the **earth**.

(8) Various shades of the colour are seen in the sky at sunrise and sunset due to **scattering of light**.

(B) **(1)** Zero shadow day occurs in **summer**.

(2) If the shadow of earth falls on the entire moon, it is called **total lunar** eclipse.

(3) The sky appears blue in colour because **the blue light is scattered the most**.

(4) During solar eclipse **the moon comes between the sun and the earth**.

(C) **(1)** False **(2)** False **(3)** False

Q.2. **(1)** The colours in the band of light seen on the other side of the prism when sunrays pass through it are violet, indigo, blue, green, yellow, orange and red.

(2) When a ray of light is incident on extremely small particles like dust particles and other tiny particles in the air, the particles deflect the light in different directions. This phenomenon is called scattering of light.

(3) Yes. At noon on zero shadow day, the sun reaches exactly overhead. So, the shadow completely disappears on that day.

(4) If there was no atmosphere, the sky would have appeared dark during the day and the sun would be directly seen.

(5) Eclipses are examples of formation of shadow in nature. The moon revolves around the earth and the earth along with the moon revolves around the sun. When the sun, the moon and the earth come in a straight line, the light from the sun is obstructed by the moon or the earth and they cast their shadow. These shadows form eclipses.

Q.3. **(1)** (i) Sunlight is scattered by the molecules of gases like nitrogen, oxygen in the atmosphere.

(ii) The blue colour in the sunlight is scattered the most, therefore the sky appears to be blue when observed from the earth.

(2) (i) There is no atmosphere in space.

(ii) So scattering of light does not take place there.

(iii) Hence, space beyond the earth's atmosphere appears dark.

(3) (i) When a shadow is cast by an extended source of light, two parts of the shadow are seen.

(ii) The dark part is called the Umbra and the fainter part is called the Penumbra.

(iii) Sun is an extended source of light.

(iv) When we sit under the shade, the shade obstructs the light coming from the sun and forms a dark part called the Umbra.

(v) But the Penumbra region of the shadow receives some amount of light from the sun.

(vi) Hence, we are able to read while sitting in the shade.

(4) (i) During a solar eclipse, ultraviolet rays which are harmful to us reach the earth.

(ii) Also, the direct rays of the sun are very strong and they can cause damage to our eyes.

(iii) Hence, solar eclipse should never be watched with the naked eye.

Q.4. (1)

	Point sources of light		**Extended sources of light**
(i)	It is a source of light in which the rays of light emerge from a very small hole or a very small portion of the body.	**(i)**	It is a source of light in which the rays of light come out from all the points on the surface of the source and not through a fine point.
(ii)	The shadow obtained by a point source of light has only umbra, the dark part of the shadow.	**(ii)**	The shadow obtained by an extended source will have two parts, the dark part called the umbra and also the faint part called the penumbra.
(iii)	**For example :** If light from torch, bulb or sunlight is allowed to pass through a slit or tiny hole in a cardboard it acts as a point source of light.	**(iii)**	**For example :** Sunlight, light from a bulb or from a torch act as extended sources of light.

(2)

	Umbra		**Penumbra**
(i)	Umbra is the dark part of the shadow which is formed by an object because the light is totally blocked by it.	**(i)**	Penumbra is the faint part of the shadow which receives some light since the object only partially blocks the light falling on it.
(ii)	Umbra can be obtained by a point source as well as an extended source of light, incident on an opaque object.	**(ii)**	Penumbra can be obtained only when an opaque object is placed in the path of an extended source of light.
(iii)	Umbra becomes smaller in size as the screen moves away from the object.	**(iii)**	Penumbra increases in size and becomes fainter as the screen moves away from the object.

Q.5. (A) **(1)** Examples of scattering of light are :

(i) Headlight beams are visible when we drive through a thick fog.

(ii) The dust particles are seen in a beam of sunlight entering the house through a small window.

(iii) We see a variety of shades of colours in the early morning and evening sky.

(iv) Sky appears to be blue during the day.

(2) (i) If an opaque object is placed in the path of a light source, light does not reach the space behind the opaque object. This part remains dark and this dark part is called the shadow of the object.

(ii) The shadow of an object is formed only when light does not pass through the object.

(3) (i) The nature of the shadow formed by an extended source is that it will have two parts.

(ii) The faint part is called the penumbra and the dark part is called the umbra.

(4) (i) The laser beam will be scattered by the tiny particles of the gases released by the lighted incense stick.

(ii) These scattered rays enter our eyes and hence the laser beam will be seen if it passes through a glass box which contains a lighted incense stick.

(5) (i) When a small object is placed between an extended source of light and screen, its shadow is cast on the screen, having umbra and penumbra.

(ii) But as the screen moves away from the object, the umbra become smaller and smaller and at a certain point it disappears.

(iii) When a bird flies high in the sky, the sun acts as an extended source of light, the earth as the screen, which is very far away from the object, that is the bird. So, the umbra region of the shadow becomes so small that it disappears.

(iv) Therefore, the shadow of a bird flying high is not seen on the earth.

(6) (i) Light emerging from a fine point, such as a tiny hole, acts as a point source.

(ii) When light from a point source falls on an opaque object, it is completely obstructed by the object to form a dark shadow or the umbra.

(iii) Since no amount of light passes above or below the opaque object, the fainter part of the shadow, the penumbra, is not obtained from a point source.

(7) An eclipse is a natural phenomenon and many superstitions are connected to eclipses which are still prevalent in the society. In order to remove misconceptions about eclipses, following measures can be taken :

(i) Making people aware of the fact that eclipses are natural phenomena, by explaining the science behind the occurrence of the eclipses.

(ii) Making people actually observe the eclipse, by giving them proper instructions or precautions to be taken while observing eclipses, especially the solar eclipse.

(8) (i) The day on which the sun reaches exactly overhead is called the zero shadow day.

(ii) On this day, at noon, the shadows completely disappear.

(iii) This event can only be seen in the region between the Tropic of Cancer (23.5° N) and Tropic of Capricorn (23.5° S).

(iv) It occurs in summer on different days in different places between the Tropic of Cancer and Tropic of Capricorn.

(B) Sun is an important source of energy for all living things. Plants prepare their own food in the presence of sunlight by a process called photosynthesis. If the sun did not rise, plants will not be able to carry out photosynthesis, which in turn will affect all the living things on earth, as all living things depend directly or indirectly on plants for food. We are able to see things around us during the daytime because of sunlight. If sun did not rise, there will be total darkness everywhere and it will become very difficult for us to carry out any of the activities and life will become miserable without sunlight.

(C) The moon revolves around the earth, and the earth along with the moon, revolves around the sun. When the sun, the moon and the earth come in a straight line, an eclipse is said to have taken place. There are two kinds of eclipses, solar eclipse and lunar eclipse.

(i) Solar eclipse :

When the moon comes between the sun and the earth, a shadow of the moon is cast on the earth and the sun cannot be seen from the part in the shadow. This is called a solar eclipse. A solar eclipse is seen only on a new moon day. Sometimes, the solar disc is completely covered by the moon. This is called the total solar eclipse. When the solar disc is not covered fully by the moon, then it is called partial solar eclipse.

(ii) Lunar eclipse :

When the earth comes between the sun and the moon, a shadow of the earth is cast on the moon and a part of the moon is covered. This is called the lunar eclipse. A lunar eclipse is seen only on a full moon night. If the whole moon comes in the shadow of the earth, it is a total lunar eclipse. When the shadow of the earth is cast only on a part of the moon, it is a partial lunar eclipse.

Topic 18 : Sound : Production of Sound

Q.1. (A)

(1) Sound is generated by the rhythmic **vibration** of any object.

(2) Sound needs some **medium** to travel.

(3) Sound from an object can be heard as long as it **vibrates**.

(4) The frequency of sound is measured in **Hertz**.

(5) **Frequency** is the number of oscillations occurring in one second.

(6) If **intensity** of sound is decreased, its loudness also decreases.

(7) A medium is necessary for **propagation** of sound.

(8) Frequency of infrasonic sound is less than **20 Hz**.

(9) The **decibel** is the unit for measuring sound level.

(10) SONAR stands for **Sound Navigation And Ranging**.

(B)

(1) Sound can travel through **all of these**.

(2) The maximum distance that an oscillator moves from its original position is called **amplitude**.

(3) The time period of oscillations depends on the **length** of the pendulum.

(4) The intensity of the sound is proportional to the square of the **amplitude** of vibration.

(5) If the amplitude is doubled, the intensity of sound **becomes four times**.

(C) **(1)** False **(2)** True

(D) **(1)** Infrasonic sound **(2)** Hz **(3)** 130 dB
(4) sec. **(5)** 70 dB

(E) (a)-(3), (b)-(4), (c)-(5), (d)-(2), (e)-(1).

(F) **(1)** Oscillatory motion **(2)** An oscillator
(3) Ultrasonic sound

Q.2. **(1)** **Time period of oscillation :** The time required by an oscillator to complete one oscillation is called the time period of oscillation.

(2) **Frequency :** The number of oscillations occurring in one second is called frequency.

(3) **Frequency of oscillation :** The number of oscillations completed by an oscillation in one second is called the frequency of oscillation (n).

(4) **Periodic motion :** Motion that is repeated again and again at fixed intervals of time is called periodic motion.

(5) **Oscillatory motion :** The back and forth motion of an object on either side of the central position is called oscillatory motion.

(6) **Amplitude :** The maximum displacement or distance moved by the vibrating particles of a sound wave is called amplitude.

Q.3. **(1)**

	Audible sound		**Ultrasonic sound**
(i)	Frequency of the audible sound is between 20 Hz and 20,000 Hz.	**(i)**	Frequency of ultrasonic sound is higher than 20,000 Hz.
(ii)	Human beings can only hear sound in the frequency range of audible sound.	**(ii)**	Human beings cannot hear ultrasonic sound.

(2)

	Infrasonic sound		**Ultrasonic sound**
(i)	A sound with a frequency less than 20 Hz is called infrasonic sound.	**(i)**	Frequency of ultrasonic sound is higher than 20,000 Hz.
(ii)	Animals like elephants, rhinoceros, whales can hear such sounds.	**(ii)**	Ultrasonic sounds are heard by animals like bat, dolphin and dogs.

Q.4. **(1)** (i) Sound travels faster in solid than in gas and metal is an efficient conductor of sound.

(ii) By putting the ear to the rail of the track, sound of the train at a distance could be heard much before it was heard through the air.

(iii) Hence in earlier times, people used to listen for the arrival of a distant train by putting their ear to the rail.

(2) (i) Sound is produced by the vibration of an object.

(ii) Different objects vibrate with different frequencies and produce different types of sounds.

(iii) Sound in a tabla is produced due to the vibration of its diaphragm, whereas in sitar, sound is produced by the vibrating strings.

(iv) Since the diaphragm of the tabla and the strings of the sitar vibrate with different frequencies, sounds generated by the tabla and the sitar are different.

(3) (i) Sound requires a material medium for its propagation.

(ii) It cannot travel through vacuum.

(iii) On moon as there is no air, your friend will not be able to hear you call, if you were both on the moon.

(4) (i) If the frequency of vibration of an object is less than 20 per second, no sound is heard.

(ii) The movement of a mosquito's wings is so fast that its frequency of vibration is more than 20 per second, whereas that of the movement of our hands is much less than 20 per second.

(iii) So, we can hear the movement of a mosquito's wings but we cannot hear the movement of our hands.

(5) (i) Bats produce ultrasonic sound while flying in the dark.

(ii) This sound strikes the obstacles in their path and is reflected.

(iii) From the reflected sound, the bat comes to know about the obstacles in its surroundings and avoids collision with them.

(iv) Thus, bats can find their way in the dark.

Q.6. (1) Sound is produced by the rhythmic vibration of an object.

(2) Intensity of the sound depends upon the amplitude of vibration. It is proportional to the square of the amplitude of vibration.

For example, if the amplitude of vibration is doubled, the intensity of sound becomes four times.

(3) Roaring of a lion has low pitch, whereas the hum of a mosquito has higher pitch.

(4) (i) When the length of the pendulum increases, the frequency of oscillation decreases, as the time period of oscillation of the pendulum increases with increase in the length of the pendulum.

(ii) But if the amplitude of the oscillations made by the pendulum is increased or decreased, keeping its length constant, the frequency of the oscillating pendulum remains the same.

(5) The uses of ultrasonic sound are :

(i) To clean delicate ornaments and tiny parts of a watch.

(ii) To observe internal organs of the body.

(iii) To detect tumors in the brain.

(iv) To detect faults in a metal.

(v) In RADAR system.

(vi) To kill certain microbes and insects.

(vii) SONAR (Sound Navigation And Ranging) is used to locate the seabed or the position of a ship.

(6) (i) When tension in the stretched string is increased, the frequency of vibrations of the string increases, so a shrill sound or a high pitch sound is produced.

(ii) When the tension in the stretched string is reduced, the frequency of vibrations of the string reduces and a less shrill sound or a low pitch sound is produced.

(iii) So, the pitch of the sound generated by a stretched string can be changed by either increasing or reducing the tension in the string.

(7) A sitar is a stringed musical instrument. The strings in the sitar help to produce higher or lower pitched sounds.

(8) When two pupils in the class talk to each other, the sounds of two frequencies produced can heard clearly. However, when all children talk to one another, the sound cannot be heard as there will be multiple frequencies generated.

Topic 19 : Properties of A Magnetic Field

Q.1. (A) **(1)** A freely suspended magnet comes to rest in **north-south** direction.

(2) The alloys called **nipermag** and **alnico** are used for making industrial magnets.

(3) A magnetic field can pass through **solids** and **liquids**.

(4) The intensity of a magnetic field is indicated by the lines of **force**.

(5) Like poles **repel** and unlike poles **attract** each other.

(6) The real test of a magnetism is **repulsion**.

(B) **(1)** Alnico is a magnetic alloy of **aluminium, nickel and cobalt**.

(2) **Aluminium** is not a magnetic substance.

(3) The scientist **William Gilbert** showed that earth itself is a gigantic magnet.

(4) Magnetic lines of forces **repel** each other.

(C) **(a)** 4, **(b)** 3, **(c)** 2, **(d)** - 1

(D) **(1)** False **(2)** True **(3)** False **(4)** True

Q.2. (A) **(1)** **Magnetic field :** The region around a magnet where the magnetic force acts on an object is called a magnetic field.

(2) **Magnetic lines of force :** Imaginary connecting lines that run from the north pole to the south pole of a magnet and show the magnetic field around a magnet are called magnetic lines of force.

(B) **(1)**

	Single touch method		Double touch method
(i)	In this method, only one bar magnet is used to generate magnetism in a magnetic substance like a steel bar.	**(i)**	In this method, two bar magnets are used to magnetise a steel bar.
(ii)	In single touch method the bar magnet is dragged over the steel bar from one end to the other end a number of times.	**(ii)**	In double touch method the two bar magnets are dragged over the steel bar from the centre to either ends of the steel bar.
(iii)	The magnetism created by this method is of low strength and lasts for a short time.	**(iii)**	The magnetism generated by this method lasts longer compared to that generated by the single touch method.

(2)

	Gravitational force		Magnetic force
(i)	The force with which earth attracts objects towards itself is called the gravitational force.	**(i)**	The force with which a magnet attracts objects made up of iron, nickel and cobalt is called magnetic force.
(ii)	Gravitational force is always attractive.	**(ii)**	Magnetic force is attractive as well as repulsive.

(C) **(1)** (i) A magnetic needle is mounted in a compass in such a way that it can rotate freely in the horizontal plane and it comes to rest in the north-south direction.

(ii) The north pole of the magnet points geographic north direction, whereas the south pole points to the geographic south direction.

(iii) Thus, a magnetic needle is used in a compass and helps to find the direction.

(2) (i) When a substance is brought near a magnet and if it gets attracted by the magnet, then either the substance is a magnetic substance or the unlike pole of another magnet.

(ii) So, by attraction it cannot be decided whether the substance is a magnet or a magnetic substance.

(iii) But when a substance brought near a magnet is repelled, it is certainly a magnet because a magnetic substance is not repelled by a magnet, only the like poles of magnets repel each other.

(iv) Thus, only by repulsion and not by attraction, it can be said that the substance is a magnet.

(v) Hence, repulsion is the real test for identifying a magnet.

Q.3. (A) **(1)** The materials to which objects made from iron, nickel and cobalt get attracted are called magnets.

(2) Metals like iron, nickel and cobalt are used for making magnets.

(3) A freely suspended magnet comes to rest in the north-south direction.

(4) Magnetic force is a vector quantity.

(5) The force with which a magnet attracts objects made up of iron, nickel and cobalt is called magnetic force.

(6) The magnetic needle will show the north direction on the geographic north pole.

(7) An electromagnet is a temporary magnet that behaves as a magnet when electric current is used to produce a magnetic field.

(8) The substances used for making electromagnets are an iron nail, copper wire (about 1 metre), a battery and pins.

(B) **(1) Magnets are used in our houses and our surroundings in the following ways :**

(i) Magnets are used in pin holders, magnetic door closers, refrigerators.

(ii) In a pin holder, a thin round magnet is fitted in its mouth. When the pinholder is turned, the pins at its bottom stick to the inside of the mouth of the holder and the pins are easily picked out.

(iii) Magnetic door closers, fitted in the shutters of cupboards, click shut tightly as they are brought close to the frame because the bottom of the shutter is fitted with a magnet and the point exactly opposite to it on the frame is fitted with an iron strip.

(iv) Doors of the refrigerators are fitted with magnet, which gets attracted to the metal on the refrigerators.

(v) Magnets are also used for separating magnetic and non-magnetic substances from the scrap.

(vi) A freely pivoted magnetic needle is used in magnetic compass to find geographical directions.

(2) The characteristics of magnets are as follows :

(i) A freely suspended magnet comes to rest in the north-south direction.

(ii) The magnetic force is concentrated at the two ends or poles of a magnet.

(iii) The two poles of the magnet cannot be separated.

(iv) A magnet can induce magnetism in a magnetic material.

(v) Like poles of magnets repel each other and unlike poles of the magnets attract each other.

(3) (i) The earth itself is a gigantic magnet.

(ii) The magnetic south pole of the earth is situated near its geographic north pole, and its magnetic north pole is situated near its geographic south pole.

(iii) As unlike poles attract each other, when a magnet is freely suspended, the north pole of the magnet is attracted towards the earth's magnetic south pole and the south pole of the magnet get attracted towards the earth's magnetic north pole.

(iv) Therefore, a freely suspended magnet always settles in the north-south direction when it is freely suspended.

(4) (i) The earth itself is a gigantic magnet.

(ii) The shape of the earth's magnetic field resembles that of a bar magnet.

(iii) But the axis of earth's magnetic pole and geographical axis do not coincide.

(iv) The axis of the earth's magnetic field is inclined at an angle of about 15° with the geographical axis.

(v) Due to this, a freely suspended magnet makes an angle of about 15° with the geographical axis and points only approximately in the north-south direction at a place and does not settle parallel to the ground.

(5) (i) Magnetic force is effective around a magnet upto a certain distance.

(ii) The region around the magnet where the magnetic force acts on an object is called the magnetic field.

(iii) Due to the magnetic field of the magnet, the magnetic force acts on objects without direct contact.

(6) (i) Take an iron nail (10 cm long). Wind an insulated copper wire of 1 metre length over the iron nail.

(ii) Connect the two ends of the wire to a source of electricity, that is, a cell or battery through a key.

(iii) When the key is pressed, current flows through the wire and the system starts behaving like a magnet.

(iv) Here, the iron nail behaves like a magnet. If pins are brought near the iron nail, they get attracted to it.

(v) When the key is opened, the flow of current stops through the coil and the iron nail loses its magnetism and the pins get detached from the iron nail.

(7) The strength of an electromagnet depends on :

(i) The number of turns in its coil: A stronger electromagnet can be obtained if the number of turns in the coils of an electromagnet is increased.

(ii) The amount of current passed through the coil: If the amount of current in the coil is increased, a stronger electromagnet can be obtained.

(8) Electromagnets are used at different places :

(i) In electrical appliances such as electric bell, electric fan, electric motors etc.

(ii) In lifting heavy loads of iron scrap, i.e. in a crane.

(iii) To remove tiny particles of iron from wound.

(iv) In the separation of iron ores (magnetic substances) from impurities (non-magnetic substances).

(v) Electromagnets are also used in medical science to cure certain ailments.

(vi) They are used for making strong permanent magnets.

(9) (i) When the property of the magnet of coming to rest in the north-south direction was discovered, a magnet came to be used in the compass to find the directions.

(ii) Chinese and Greek sailors were the first to make a mariner's compass using a magnet.

(iii) At that time, a magnetic needle supported on a wooden block would be floated on water.

(iv) As the needle was free to turn, it would come to rest in the north-south direction.

(10) (i) Place articles like iron, pins near the given articles. If they get attracted to any of the given articles, then that article will be a magnet.

(ii) We can also identify a magnet among the various articles by bringing a magnet near the given articles, if any of the given articles shows repulsion then that article will surely be a magnet as, only like poles of magnets show repulsion.

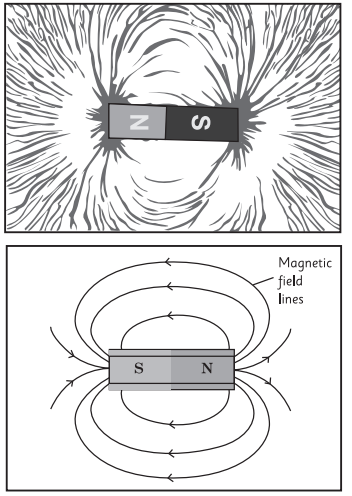
(C) Magnetic field : The region around a magnet where the magnetic force acts on an object is called magnetic field. The magnetic field around a magnet can be shown by means of magnetic lines of force. It was named by the British researcher, Michael Faraday. The intensity of magnetic field at a place can be determined by the number of lines of force that pass through a unit area at the place, perpendicular to that area. The intensity of a magnetic field is low where the lines of force are sparse, and the intensity is high where the lines of force are concentrated.

Q.4. (i) Take a small cardboard. Place a bar magnet at its centre.

(ii) Sprinkle iron filings on the cardboard around the magnet.

(iii) Gently tap the cardboard.

(iv) When the cardboard is gently tapped, the iron filings arrange around the magnet in definite curved lines forming a symmetric pattern, going from one end of the bar magnet to the other.



Magnetic field

(v) These curved lines are close to each other near the poles, whereas they are less crowded in the middle region around the magnet.

(vi) These lines are called the magnetic lines of force.

(vii) The magnetic field around a magnet can be shown by means of these magnetic lines of force.

(viii) The magnetic lines of force run from the north pole to the south pole, so the tangent at any point on a magnetic line of force gives the direction of the magnetic field at that point.

(ix) The intensity of the magnetic field at a place can be gauged by the number of lines of force that pass through a unit area at that place, perpendicular to that area.

(x) So, the intensity of a magnetic field will be low where the lines of force are sparse and the intensity will be high where the lines of force are concentrated.

(xi) Thus, with the help of magnetic lines of force, we can determine the direction and the strength of the magnetic field of a bar magnet.

Topic 20 : In the World of Stars

Q.1. (A) **(1)** Stars are born out of **nebulae**.

(2) Nebulae are clouds made up mainly of **hydrogen** gas and dirt particles.

(3) Solar system is a tiny part of a galaxy called the **Milky Way**.

(4) The continuous empty space between the spheres in the sky is called **space**.

(5) The portion traversed by the moon in one day is called the **Nakshatra**.

(B) **(1)** When seen from a great distance, the sky seems to be touching the ground along a circle. This circle is called the **horizon**.

(2) The **ecliptic** is used while defining the zodiac signs.

(3) Classified according to seasons, one season will have **nine** nakshatras.

(4) The rising of the sun in the east and its setting in the west is the **apparent** motion of the sun.

(C) (1)-(c), (2)-(d), (3)-(b), (4)-(a).

(D) **(1)** False **(2)** True **(3)** True

(E) **(1)** Binoculars and telescope

(2) Saptarshi and Sharmishtha **(3)** Capricorn

(4) Sirius **(5)** Saptarshi

Q.2. (1) **Meridian :** In astronomy, the great circle which passes through both the celestial poles and the observer's zenith and nadir is called a meridian.

(2) **Nakshatra :** The portion transversed by the moon in one day is called a nakshatra.

(3) **Raashi or Zodiac sign :** The ecliptic has been imagined to be divided into 12 equal parts. Thus, each part subtends 30 degrees angle at the centre of the celestial sphere. Each of these parts is called a raashi or zodiac sign.

(4) **Space :** The continuous empty space between the spheres (planets, stars etc.) in the sky is called space.

(5) **Sky :** The portion of the earth's atmosphere and the portion beyond that which can be seen in the form of a roof by our eyes while standing on the earth is called sky.

Q.3. (1) The earth rotates about its axis from west to east. Hence, the sun, the moon and the stars are seen to rise in the east and set in the west.

(2) In reality, the sun does not move, but we perceive it as moving due to the motion of the earth around it. This motion of the sun is called its apparent motion. Thus the rising of the sun in the east and its setting in the west is called apparent motion.

Q.4. (1) On a clear, moonless night we can see thousands of stars in the sky. Some of these stars form beautiful patterns. A group of stars occupying a small portion of the celestial sphere is called constellation.

(2) The following points should be considered before a sky watch.

(i) The place selected for sky watching should be away from the city.

(ii) The night chosen for sky watching should be a new moon light.

(iii) Binoculars or telescopes should be used for sky watching.

(iv) Pole star should be used as a reference point for sky watch.

(v) Sky watching should begin with stars in the west.

(3) Yes, it is wrong to say that the planets, stars and nakshatras affect human life, because astrology is not accepted by science. Science has proved that constituents of the solar system. e.g. planets, satellites and comets as also distant stars and constellations do not have any influence on human life. Man stepped on the moon in the twentieth (20^{th}) century. He is expected to conquer Mars in the twenty first century. Hence, in this age of science, holding on to beliefs which are superstitious, has been proved to be wrong through numerous scientific tests. It is an unnecessary waste of one's time, energy and money. Hence, such issues should be approached with a scientific frame of mind.

(4) As observed from the northern hemisphere, the pole star is nearest to the north celestial pole of the sky and appears practically stationary from the earth. It lies almost along the axis of rotation of the earth. It can be used to find the direction. Hence, pole star should be used as reference point for sky watch.

(5) The constellations of Saptarshi and Sharmishtha are useful in locating the Pole star. Sharmishtha is made up of five bright stars which are distributed along the figure of letter M. The perpendicular bisector of the line joining the third and fourth stars goes towards the Pole star. The Pole star has Saptarshi on one side and Sharmishtha on the other. As Sharmishtha sets, Saptarshi rises. Thus, we can always use either one or the other as reference point on any given night.

(6) A galaxy is a huge collection of gas, dust and billions of stars and their solar systems. A galaxy is held together by gravity. Our galaxy, the Milky Way, also has a super-massive black hole in the middle.

It also includes many other celestial (heavenly) bodies such as clusters of stars, nebulae, clouds of gases, clouds of dust, dead stars, new born stars, etc.

(7) The different types of stars are - (i) Sun-like Stars e.g., stars like Alpha Centauri, Sirius (ii) Red Giant star (iii) Super Nova (iv) Binary (Twin Stars) (v) Variable Stars e.g., Polaris (Pole Star).

Q.5. (1) The sun, the moon and the stars are seen to rise in the east and set in the west because the earth rotates from west to east. The stars rise and set 4 minutes earlier every day. That is, if a star rises at 8 p.m. tonight, it will rise at 7:56 pm tomorrow. In one month the earth revolves $1/12^{th}$ of the way around the sun. The same star will rise at 8 pm at the same time each year. The rotational period of the earth is 23 hours 56 minutes (approximately 24 hours). $1/12^{th}$ of 24 is 2. Therefore, the star will rise 2 hours earlier after one month. The star will rise at 6 pm.

(2) (i) A constellation (nakshatra) is located behind the sun. However, it cannot be seen due to the bright sunlight.

(ii) The observer looking at the sun sees not only the sun but also a constellation behind the sun.

(iii) As the earth changes its position, a different constellation or zodiac sign or raashi appears behind the sun.

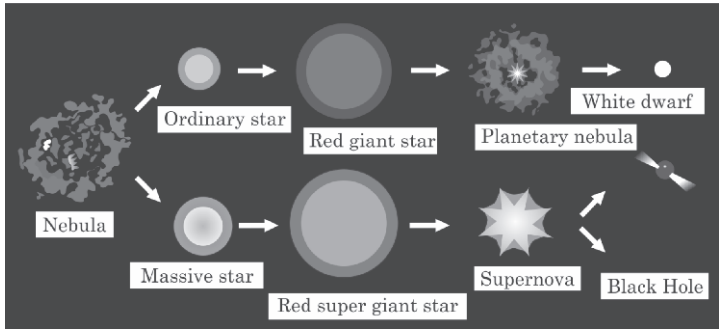
(iv) However, to the observer, it appears that the sun has moved from its position and is entering a new constellation (nakshatra).

(v) The sun entering the Mrug nakshatra means that the nakshatra is behind the sun.

For example, on Makarsankranti we say that the sun enters Makar Raashi (Capricorn zodiac sign or Nakshatra).

(3) Stars are born out of nebulae. Nebulae are clouds made up mainly of hydrogen gas, helium and dust particles. The particles in these clouds are attracted towards one another due to the force of gravity. As a result, the clouds contract and become dense and spherical in shape. At the same time, the pressure of the gas at the core of the cloud increases causing the temperature to rise tremendously and energy generation. Such a spherical cloud of hydrogen is called a 'star'.

Later, processes such as contraction, expansion, rise in temperature, etc., bring about changes in the nature of the star. These changes occur over a very long period of time and constitute the life-cycle of stars. The different forms of the stars at various stages during the life-cycle are identified as different types of stars.



Lifecycle of Stars

Q.6.