READ INDIA

Our Science

Teacher's Manual

Class VI to VIII

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INDEX

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Lesson –1 : Food : Where does it Come From?

A. 1. carnivores 2. sugarcane 3. nectar
4. parasites 5. producers 6. leaves

B. 1. a 2. b 3. c
4. b 5. a

C. 1. True 2. True 3. True
4. False 5. True

D. 1. Lion 2. Hibiscus 3. Honey
4. Plant source and animal source
5. Scavangers

E. 1. The food items that we eat in major portion on a daily basis.

2. Animals or birds that eat the remains of dead or decomposing animals are called scavangers such as crows, foxes etc.

3. Substances present in food that our body needs to grow, get energy and to be healthy.

4. Butterflies and honey bees have a special mouth part called proboscis that help them to suck nectar from the flowers without damaging them.

5.

Plants	**Parts that we eat**
Potato	Stem
Carrot	Root
Cabbage	Leaves
Cauliflower	Flower

F. 1. Food is something that is taken in by living organisms to provide energy to survive, i.e. to do work, grow and for body maintenance. There are two sources of food: Plant source and Animal source.

Plants as a Source of Food

Green plants are known as producers as they prepare their own food by the process of photosynthesis. We get fruits, vegetables, grains and cereals from plants. Different plant parts like fruits, roots, stems, flowers, leaves and seeds are eaten as food.

Animals as a source of Food : We get various products from animals such as milk, eggs, meat, honey, etc.

2. Bees collect the nectar produced by flowers, convert it into a thick sweet liquid called honey and store it in the honeycomb for use throughout the year. This honey is then obtained from hives by collecting honeycombs and scraping them off.
3. **Herbivores :** Animals that eat only plants are called herbivores such as horses, deer etc. These animals have sharp front teeth, and big and flat side and back teeth for crushing and grinding the plants. Some birds are herbivores. Their beaks are hard enough to break open the seeds nuts and fruits.

   Carnivores : Animals that eat the flesh of other animals are called carnivores such as : tiger, lions etc. They have sharp pointed teeth for tearing the flesh of animals.

   Frogs and chameleons have long, sticky tongue to catch insects. When they see the insect nearby, they shoot out their tongue to catch the insect and roll it back into their mouth.

   Omnivores : Animals that eat both plants and animals are called omnivores such as bears, dogs, etc.
4. **Scavangers :** Animals or birds that eat the remains of dead or decomposing animals are called scavengers such as crows, foxes etc. They help in cleaning the environment.

   Decomposers : Organisms that feed on the dead or decaying plant and animal matter are called decomposers such as kinds of bacteria, fungi etc. They also keep the environment clean.
5. **Edible Leaves :** Leaves of some plants are eaten as food. These leaves are called leafy vegetables. They provide vitamins and minerals to our body. Cabbage and Spinach are used to make sabzi, Coriander added flavor to the food etc. are examples of Edible leaves .

Edible Flowers : Flowers of some plants are eaten as food. Clove is a dried flower, which is used as spice that adds favour to food, Cauliflower is used in salads and curries etc.

Lesson – 2 : Components of Food

A. 1. food 2. fats 3. carbohydrates
4. iron 5. nutrients

B. 1. c 2. b 3. c
4. b 5. a

C. 1. True 2. False 3. True
4. True 5. True

D. 1. Egg yolk 2. Balanced diet 3. Goitre
4. Anaemia 5. Roughage

E. 1. Starch and sugar are the forms of carbohydrates present in the food we eat. Fruits and honey are some sources of sugar. Rice, potatoes etc. are some sources of starch.

2. Roughage helps in easy bowel movement ensuring removal of the undigested food, thereby preventing constipation. Yes, it is useful for our body.

3. A diet that contains all the nutrients in right proportions for us to stay healthy and fit is called a balanced diet.

4. Fats also provide energy to our body. Fats give more energy than carbohydrates. Fats require the proper development and functioning of the brain and the nervous system.

5. The disorders caused due to nutrient deficiency in the diet are called deficiency disorders. The disorder caused by the deficiency of carbohydrates and proteins is Marasmus.

F. 1. Carbohydrates are the main source of energy and are major part of staple diet of people all over the world. Cereals, potatoes etc. are the major sources of carbohydrates. Starch and sugar are the forms of

carbohydrates present in the food we eat. Fruits and honey are some sources of sugar. Rice, potatoes etc. are some sources of starch.

2. Vitamins play a very important role in the growth and development of human body. They help us to develop immunity against many disorders. There are two types of vitamins. Water-soluble vitamins are vitamins B1,B2, B3, B6, B12 and C. These vitamins cannot be prepared or stored in our body. We get these from the different types of nutritious food items that we eat.

   Fat-soluble vitamins are vitamins A, D, E and K. They are stored in fat tissues of organs like kidney, liver and muscles. These vitamins are used for maintenance of the skin and bones or else they remain stored in the tissues.

3.

Nutrients	**Deficiency Disorder**	**Symptoms**
Proteins	Kwashiorkor	Thin limbs, sleeplessness, slow growth
Carbohydrates and proteins	Marasmus	Stunted growth
Minerals	**Deficiency Disorders**	**Symptoms**
Calcium	Bone and teeth decay	Weak bones and tooth decay
Iodine	Goitre	Swollen glands in the neck, mental disability in children.
Iron	Anaemia	Weakness, paleness

4. **Aim :** To test for starch.

   Materials required : A test tube or tissue paper, water, 10 ml of iodine solution, potato slices and apple slices.

   Procedure : Place a slice of potato on a tissue paper and apple on another tissue paper. Add 2-3 drops of iodine solution on the slices.

   Observation : The starch present in the potato slice changes the colour of iodine to blue-black but the

iodine dropped on the slice of apple remains yellow-brown.

Conclusion : The change of colour confirms the presence of starch in potatoes. Starch is not present in apples.

5. **Aim :** To test for protein.

Materials required : A test tube, water, food item, copper sulphate solution and caustic soda.

Procedure : Take a small quantity of food item for testing. If the food you want to test is solid, you first need to make a paste of it or powder it. Grind or mash the small quantity of food item. Put some of this in a clean test tube, add 10 drops of water to it and shake the test tube. Now using a dropper add two drops of cooper sulphate and 10 drops of caustic soda to the test tube. Shake the test tube and let stand it for few minutes.

Observation : The colour of the solution in the test tube changes to violet.

Conclusion : The change of colour to violet indicates presence of proteins.

Lesson – 3 : Fibre To Fabric

A. 1. fibre 2. cotton bolls 3. Black
4. handlooms 5. jute

B. 1. b 2. d 3. b
4. a 5. b

C. 1. True 2. False 3. False
4. False 5. True

D. 1. Plant fibre – cotton Animal fibre – wool
2. Gujarat and Maharashtra 3. Knitting
4. Ginning 5. Mats and ropes

E. 1. **Fibre :** A thin, hair-like or thread-like strand from which yarns are made.

Yarn : A continuous strand of twisted threads of fibres obtained from plant and animal sources.

Fabric : The material that we use for making cloth.

2. **Ginning:** The process of removing cotton fibres from the cotton seeds by combing.

   Retting : The process of separating jute fibres from jute fibres after immersing the stems in water.

3. Long time ago, human beings used leaves, barks of trees, animals skin and fur to cover themselves.

4. Cotton plants are grown in the fields. They are usually grown at places having black soil and warm climate. In India, cotton is mostly grown in Maharashtra, Gujarat and Madhya Pradesh.

5. The looms that can be operated manually are handlooms and the looms that run on electricity are power looms.

F. 1. Cotton plants are grown in the fields. They are usually grown at places having black soil and warm climate. In India, cotton is mostly grown in Maharashtra, Gujarat and Madhya Pradesh.

   The fruits of the cotton plants (cotton bolls) are about the size of lemon. After maturing the bolls burst opened and the seeds covered with cotton fibres can be seen. From these bolls cotton is usually picked by hand. Fibres are then separated from the seeds by combing. This process is called ginning. On a large scale, ginning is done by machine called gins. The ginned cotton is made into compact bundles known as bales. Once the bales are shifted to factories, cotton yarn is spun from them. The yarn is then woven to make cotton fabric.

2. Jute fibres are obtained from the outer part of the stem of jute plants. When the jute plant is in the flowering stage, it is cut and the roots from the stems are removed. The stems are then tied in bundles, immersed in water and allowed to rot. Once the stems become soft, the fibres are removed by hand. This process is known as retting.

3. Two processes used to produce fabric from yarn are

weaving and knitting.

Weaving : It is the process in which two sets of yarn are arranged together to make a fabric. Weaving is done on looms. The looms that can be operated manually are handlooms and the looms that run on electricity are power looms.

Knitting : It is the process in which the single yarn is used to make a piece of fabric. Manually, knitting is done by knitting needles. Nowadays, machines are used to make the process of knitting easier and faster. Knitting fabrics can be made from cotton, wool, silk, jute etc.

4. **Aim :** To identify plant and animal fibres using burn test.

   Materials Required : Cut pieces of fabrics such as silk, cotton, wool and jute, tongs, spirit lamp and matchbox.

   Procedure : Pull out 6-8 yarns from each of the fabrics. Hold one end of the yarn with a tong and slowly bring it to the flame of a spirit lamp. Observe as it burns completely.

5. **Natural Fibres**

   Fibres that are obtained from plants and animals are called natural fibres. Natural fibres can be of two types :

   Plant Fibres : Fibres obtained from plants are called plant fibres such as cotton is obtained from the fruits of cotton plants, flax is obtained from the stalk of flax plants etc.

   Animal Fibres : Fibres obtained from animals are called animal fibres such as silk is obtained from the cocoons of silk moth, wool is obtained from the hair of sheep.

Lesson – 4 : Sorting Materials Into Groups

A. 1. soft 2. float 3. magnet
4. insulator 5. water

B. 1. (a) 2. (c) 3. (b)
4. (b) 5. (d)

C. 1. False 2. True 3. False
4. False 5. True

D. 1. Copper 2. Paper 3. Plastic
4. Immiscible liquid 5. Silver

E. 1. The process of putting things or materials in a group or category is called classification.

2. It is defined as the property of a material to shine. Materials that are shiny in appearance are known as lustrous materials. Examples are metals like gold, silver etc. Materials that are dull in appearance or lack shine are known as non-lustrous materials. Examples are paper, cardboard etc. Some lustrous materials can lose their shine when they are exposed to air or moisture for a long duration.

3. The mass per unit volume of a substance is known as density. Materials may float or sink, depends on their density. Some materials like paper boat, it is less denser than water so it floats on water but some materials like iron is heavier or denser than water , so it sinks.

4. A magnet is a material that attract pieces of iron and materials made of iron. The materials that get attracted towards a magnet are known as magnetic materials. For example, iron. Materials that donot get attracted towards a magnet are known as non magnetic materials. For example - rubber.

5. Because copper is good conductor of electricity. But these wires have an outer covering of plastic, which is an insulator, to prevent us from getting an electric shock.

F. 1. Solids have a definite shape and occupy a definite volume. A solid has no or least compressibility and maintain its shape even when subjected to external force. For example : When we transfer a chair from one room to another, its shape and volume does not change.

Liquids have a definite shape but occupies a fixed volume. It takes the shape of the container in which it is kept. Liquids can be compressed to a small extent as compared to solids. For example : If we transfer milk into a cup, it takes the shape of cup.

Gas do not have a definite shape or occupy a definite volume. A gas can expand to fill any available space in a container. Gases are highly compressible as compared to solids and liquids. For example : When we pump air into a balloon the air expand to fill the balloon and takes its shape.

2. Materials that allow light to pass through them completely are called transparent materials. We can see clearly things through transparent materials such as water, air etc. Materials that do not allow light to pass through them are called opaque materials such as cardboard etc. Materials that allow light to pass through them partially are called translucent materials. For example : If we look through a sheet of paper towards a lihted bulb we can see clearly but when we drop 2-3 drops of oil on paper so we cannot see clearly, so it is translucent.
3. Conductivity is the property or power of conducting heat, electricity or sound. Based on the property of materials to pass heat or electricity through them, they can be classified as conductors and insulators.

   Materials that allow heat or electricity to pass through them are called conductors such as copper etc. and materials that do not allow heat or electricity to pass through them are called insulators such as plastic, wood etc.
4. **Lusture :** It is defined as the property of a material to shine. Materials that are shiny in appearance are known as lustrous materials. Examples are metals like gold, silver etc. Materials that are dull in appearance or lack shine are known as non-lustrous materials. Examples are paper, cardboard etc. Some lustrous materials can lose their shine when they are exposed to air or moisture for a long duration.

Texture : Texture of material refers to how it feels when touched. Based on the texture there are two categories of materials:

1. Rough materials like stones, wood, body scrubbers and sand paper.

2. Smooth materials like a piece of cloth, cotton, wool, sponge, soft toys and foam.

Hardness : When you press different materials with your hands, some of them may be hard to compress while others can be easily compressed.

Materials which can be scratched or compressed easily are called soft materials while some other materials which are difficult to compress are called as hard materials. For example : cotton and sponge is soft while iron is hard.

5. The property of the material to float on water is called flotation. The mass per unit volume of a substance is known as density. Materials may float or sink, depends on their density. Some materials like paper boat, it is less denser than water so it floats on water but some materials like iron is heavier or denser than water , so it sinks.

Activity

1. Take a beaker and fill it about two-third with water.
2. Drop a small piece of wood in water. The wood piece starts floating on water. It does not sink in water because it is lighter than water.

Materials which are lighter than water always float on water.

Lesson – 5 : Separation of Substances

A. 1. Wind 2. gas 3. sieve
4. filteration 5. saturated

B. 1. (c) 2. (b) 3. (c)
4. (c) 5. (a)

C. 1. False 2. True 3. True
4. False 5. True

D. 1. Oil 2. Winnowing
3. Gold 4. Soil and sand
5. Saturated solution

E. 1. A pure substance is a substance that is made up of only one kind of atoms or molecules.

Pure substance are of two types :

Elements : These are pure substances made of same kind of atom. For example- copper, gold etc.

Compounds : These are pure substances made of two or more elements combined together in fixed ratio. For example: sodium chloride etc.

A mixture is a substance that contains two or more different substances mixed together. The different types of substances present in a mixture are called its components or constituents.

2. **Homogeneous Mixtures :** The mixtures in which the components that make up the mixture are distributed uniformly and cannot be seen clearly are called homogeneous mixtures. Example – mixture of sugar and water.

Heterogeneous Mixtures : The mixture in which the components that make up the mixture are not distributed uniformly and can be seen clearly are called heterogeneous mixtures. Example – a mixture of oil and water.

3. This method is used for separating fine insoluble solid particles from the liquid. In this process, the mixture is passed through a filter. The solid particles do not pass through the filter and clear liquid is collected.

4. Salt is prepared from sea water by evaporation and condensation. Sea water is collected in shallow pits and allowed to evaporate. The water evaporates and crystals of salt are obtained in the pits. The salt is then sent to factories for further purification.

5. To separate two different but useful components.

F. 1. **Evaporation :** The process in which a liquid changes into its gaseous state is called evaporation. This method is used to separate a soluble solids from a solid-liquid mixture. In this method, the liquid component is allowed to evaporate from the mixture leaving behind only the solid component.

Condensation : The process of conversation of water vapour into its liquid called condensation. You might have seen tiny water droplets(dew) on the leaves of plants and on the mirrors of vehicle. These water droplets are the result of the condensation process. This occurs when the water vapour present in air comes in contact with a relatively cold surface of any object and then cools down to form dew.

2. **Handpicking :** It is the simplest method of separation of substances. This method is used only when unwanted material is in small quantity. Moreover, shape, size, or colour of the unwanted material is different from that of the useful materials. For example; pebbles, broken grains and insects are separated from rice, wheat and pulses; by handpicking.

Threshing : Threshing is used for separating seeds from the harvested stalks.

Manual Threshing : When the quantity is small, threshing is done manually. Small bundles of the harvested stalks are thrashed on a hard surface. This helps in separating the grains.

Threshing Machine : Now-a-days, threshing machines are used for the purpose. It can be powered by either a diesel engine or an electric motor. It helps in saving time and labour.

Sieving : When the size of particle it too small to be picked by hand or when the quantity is too large, sieving is used for separating substances. A sieve; having holes of proper size is used. The bigger particles are retained by the sieve whereas the

smaller ones pass through it. For example; this method is used for separating bran from flour, sand from gravel, pearls of different sizes, etc.

Winnowing : The process of separation of lighter particles from heavier particles; with the help of wind; is called winnowing. This method is used for separating grains from husk. Farmers drop the mixture of wheat and husk from a height. The husk is carried by the wind and form a heap at a small distance away. The wheat grains being heavier fall vertically to form a separate heap.

3. **Sedimentation :** Insoluble particles settle down at the bottom and the process is called sedimentation. For example; muddy water contains soil and sand in water. Soil and sand; being insoluble in water; settle down at bottom if water is allowed to stand for some time.

   Decantation : This process is used after sedimentation. The upper layer; which contains water is slowly poured out from the container. It leaves the sediment behind.

   Filtration : This method is used for separating fine insoluble solid particles from the liquid. In this process, the mixture is passed through a filter. The solid particles do not pass through the filter and clear liquid is collected.

   Evaporation : The process in which a liquid changes into its gaseous state is called evaporation. This method is used to separate a soluble solids from a solid-liquid mixture. In this method, the liquid component is allowed to evaporate from the mixture leaving behind only the solid component.

   Condensation : The process of conversation of water vapour into its liquid called condensation. You might have seen tiny water droplets(dew) on the leaves of plants and on the mirrors of vehicle. These water droplets are the result of the condensation process. This occurs when the water vapour present in air

comes in contact with a relatively cold surface of any object and then cools down to form dew.

Evaporation and condensation are used for separating a soluble solid from water. For example; salt can be separated from a solution of salt and water; by using the combination of evaporation and condensation.

Salt is prepared from sea water by evaporation and condensation. Sea water is collected in shallow pits and allowed to evaporate. The water evaporates and crystals of salt are obtained in the pits. The salt is then sent to factories for further purification.

4. A solution in which no more solute can dissolved at a given temperature is called saturated solution.

   Aim : To prepare saturated solution.

   Materials Required : A beaker, spoon, salt and water.

   Procedure : Add one teaspoon of salt in the water in beaker and stir well. Go on adding salt, one teaspoon at a time and stir. After adding some teaspoon of salt, we find that some salt started settling down in the beaker.

   Observation : No more solute can be dissolved in water.

   Conclusion : The solution is now said to be saturated.

5. **Sedimentation :** Insoluble particles settle down at the bottom and the process is called sedimentation. For example; muddy water contains soil and sand in water. Soil and sand; being insoluble in water; settle down at bottom if water is allowed to stand for some time.

   Decantation : This process is used after sedimentation. The upper layer; which contains water is slowly poured out from the container. It leaves the sediment behind.

Lesson – 6 : Changes Around Us

A. 1. irreversible 2. physical 3. chemical
4. physical 5. chemical

B. 1. (a) 2. (d) 3. (b)
4. (b) 5. (a)

C. 1. False 2. False 3. True
4. True 5. False

D. 1. Irreversible 2. Reversible
3. Irreversible 4. Reversible

E. 1. **Change in Shape :** Folding clothes, cutting fruits etc.

Change in Position : A bus moves along different streets, ball moves along the field when hit by a bat.

Change in Size : A puppy grows up and become dog etc.

Change in Colour : Leaves change colour with season etc.

2. A physical change is a temporary reversible change wherein no new substance is formed. There is no change in the composition of original substance although some specific properties might change.

Melting of butter, formation of dew, are examples of physical change.

3. A chemical change is a permanent, irreversible change in which a new substance is formed. The new substance has different composition as well as different properties. Burning of wood, burning of paper are examples of Chemical change.
4. The increase in size of a substance on heating.
5. The decrease in size of a substance on cooling.

F. 1. **Reversible changes :** Reversible changes are the changes in which we can get back the original substance after changing the conditions. In this there might be a change in the appearance of the substance but it does not form any new substance during or after the change. Properties of the substance do not change. This change is temporary.

For example : Melting of ice is a reversible change as the melted ice can be converted back to its solid form by cooling.

Irreversible changes : Irreversible changes are the changes in which we cannot get back the original substance. Such changes form new substance after the change. Properties of the substance change. This change is permanent.

For example : Curdling of milk is a irreversible change as we cannot get the milk.

2. a. In solids, expansion and contraction is least. For example : **Expansion :** Iron tools are heated before they are fitted with wooden handles. Due to heating, iron tools expand and the ring present at the centre of such tools increase in diameter. Thus, the wooden handles can be easily fixed into the ring.

Contraction : As the iron tools cool, the ring contracts to its original diameter and fits firmly onto the wooden handle.

b. In liquids, expansion and contraction is less. For example: **Expansion :** When milk boils, it spills out of the container if the burner is not turned off. This is due to expansion.

Contraction : When the burner is turned off, the heat supply is cut and the expansion stops. The milk begins to cool down. Due to cooling, the milk contracts and comes back to its previous level.

In gases, expansion and contraction is most. For example :

Expansion : Inflated balloon burst when kept in bright sunlight for a long time. This is because air absorbs heat from the sunlight and expands. The expansion of air in the balloon causes it to burst.

Contraction : If the inflated balloon is placed in a bowl containing cold water, the gases present inside the balloon will contract and he balloon will shrink in size.

3. . Blacksmiths make iron tools by heating iron as it becomes soft on heating and can be beaten into desirable shapes.

. Railway tracks are laid with gaps in between them . If the railway tracks are fixed without any gap, then (picture of railway tracks) during summer due to expansion, they will expand and bend and may cause accidents.

. Tightly jammed metal lids of food jars can be opened easily by pouring hot water over the lid or by dipping on the lid portion of the jar into the hot water. As metal lid expands and open easily.

4. Railway tracks are laid with gaps in between them . If the railway tracks are fixed without any gap, then (picture of railway tracks) during summer due to expansion, they will expand and bend and may cause accidents.

Lesson – 7 : Getting to Know Plants

A. 1. underground 2. tender 3. transpiration
4. stem 5. pistil

B. 1. (b) 2. (c) 3. (c)
4. (c) 5. (a)

C. 1. True 2. True 3. False
4. False 5. False

D. 1. Root system and shoot system 2. Apical bud
3. Leaf tendrils 4. Starch
5. Water and mineral salts

E. 1. The most important function of root is to fix the plant firmly into the soil.

The roots help to absorb water and mineral salts from the soil which are sent up to be used by every part of the plant.

2. Plants with weak stems that cannot stand upright and spread on the ground are called creepers, e.g. melons.

Plants that take support on neighbouring structures and climb up are called climbers, e.g gourds. These are different from the herbs, shrubs and trees.

3. **Reticulate Venation :** The net like arrangement of veins as seen in the leaves of rose and hibiscus plants is called reticulate venation. These leaves have a broad lamina and a petiole.

   Parallel Venation : The parallel arrangement of veins as seen in the leaves of maize and wheat plants is called parallel venation.

   These leaves have a smooth and long lamina but do not have a petiole.

4. **Food Storing Roots :** Tap roots like carrot and radish and fibrous roots like sweet potato.

   Prop Roots : Plants like banyan and maize.

   Climbing Roots : Weak stemmed plants like money plant, betel etc.

   Breathing Roots : Mangroves

5. The transfer of pollen grains from anther to the stigma of a flower is called pollination. It is mainly bring about by insects, wind or water. Insects always move from one flower to another looking for nectar. When they sit on flowers, pollen stick to their body and legs. These pollens then get dropped onto other flowers, thereby aiding pollination. In the same way, wind and water currents carry pollens from place to place and transfer them to stigma of flowers.

F. 1. **Tap Root System :** This type of root system has a primary root , with the lateral roots(roots that grow from the main root in the soil) coming out from it.

   A single root emerges from a seed when it germinates. Tap root grows deep into the soil. Some examples of plants with tap root system are Mango, pea, carrot etc.

   Fibrous Root System : In this system the root that emerges from the seed during germination dies. It is replaced by several roots that emerge from a

common point on the lowermost tip of the system.

Fibrous roots do not grow very deep into the soil. As they have the appearance of fibres, this root system is called the fibrous root system.

Some examples of plants with fibrous root system are maize, wheat, sugarcane etc.

2. **Petiole :** The part of a leaf by which it is attached to the stem is called petiole. It is the stalk of leaf which may not be present in some leaves.

   Lamina : The broad, green part of the leaf is called lamina.

   Veins : The thin lines on the leaf are called veins.

   Midrib : The central vein or the main vein of the leaf is called midrib. The arrangement of the veins on the lamina of a leaf is called venation.

   (For diagram see Page 55)

3. **Leaf Tendrils :** In some plants, leaves are modified into slender, often closely called structure known as tendrils. Whenever they come in contact with a neighbouring object, they coil around it and help the plant to climb, e.g. pea plant and glory lily.

   Leaf Spines : Leaves of some plants become wholly or partially modified into sharp, pointed structures known as spines. These spines may reduce the rate of transpiration, e.g cactus.

   Scale Leaves : These are typically thin, dry, stalkless and membranaous structures, usually brownish in colour and sometimes colourless. Their function is to protect the young leaf bud that they enclose, e.g onion(scale leaves are thick and fleshy, their function is to store water and food.)

4. **Storage of Food :** Stems of potato, onion, ginger grow under the ground and store food. For storing food, underground stems get modified into three main types : tuber, bulb and rhizome.

   Vegetative Propagation : Stems bear buds that give rise to new shoots. Underground stems can give rise

to new plants. Some plants creep on the ground or on water. They have horizontal stems that strikes roots at nodes and new shoots grow from these nodes. These then separate from mother plant to grow independently.

Protection : Some plants like bougainvillea and rose have thorns growing on their stems. These thorns protect the plants from predators.

Support : Plants like grapevine have stems that are unable to stand erect on their own. Such plants depend on walls, other strong plants or trees for support to grow erect or they simply spread on the ground.

5. **Pollen grains :** Fine powdery particles found inside the pollen sac of the stamen.

   Stamens : The male reproductive organ of a flower made up of a thin stalk with pollen sacs at its tip.

   Petals : The brightly coloured parts that protect the inner structures of a flower and attract insects for pollination.

   Stigma : The sticky part at the tip of the style which makes the pollen grains from the pollen sac of the stamen stick to it and aids in fertilization of the flower.

   Style : The extended stalk that connects the ovary to the stigma.

   Ovary : The swollen base of the pistil consisting of the ovules.

   Sepals : The small leaf like structures that protect the flower bud before it develop into a flower and later protect fruits.

   Pistil : The female reproductive part of a flower. It consist of three parts: stigma, style and ovary.

   (For diagram see Page 60)

Lesson – 8 : Body Movements

A. 1. many organ systems

2. movement 3. skeleton
4. hinge 5. muscle

B. 1. c 2. a 3. d
4. b 5. a

C. 1. False 2. False 3. False
4. True 5. True

D. 1. Vertebrates 2. Invertebrates 3. 206
4. Floating ribs 5. 6

E. 1. The act of moving from place to place is known as locomotion. It involves the movement of whole body, as in walking, running etc. Movement is the change in position of only a part of the body, as movement of stem towards light in plants.

2. Fish are vertebrates that live in water and naturally move in it. The head and tail of the fish are smaller than middle portion of the body- the body tapers at both ends. This body shape is called streamlined. The shape is such that water can flow around it easily and allow the fish to move in water.

3. Arms and legs are called the limbs.

Functions of the Limbs:

- The forelimbs help in performing several functions such as holding, lifting and gripping.
- The hindlimbs help to bear the weight of the body at rest as well as during the movement of the body from one place to the other.
- Several muscles are attached to the bones of the limbs, which facilitates movement.

4. Snails have a hard rounded structure on its top. This is its outer skeleton called shell but is not made up of bones. The shell helps to protect the snail from cold and danger. The thick structure may come out of an opening in a shell. The thick structure is its foot, made of strong muscles which helps them to move. Snails glide along the ground using their foot.

5. X-rays are the rays that can pass through muscles

and tissues but not through bones. Therefore, they are used to obtain images that show the shape of bones in our body. It helps the doctor to determine an injury on bones.

F. 1. **Fixed Joints :** The joints where no movement of bones is possible are called fixed joint. The joints in the skull bone (cranium) are examples of fixed or immovable joints.

Moveable Joint : Movement is possible in these joints. There are two types of movable joints: Freely movable joints and partially movable joints.

Freely Movable Joints : Such joints allow free movement in one or more directions. Their main function is to allow the body to perform a variety of movements. They are of four major types : There are four types of movable joints in the body; which are as follows:

Ball and Socket Joint : In this joint the rounded end of one bone fits into the cavity (hollow space) of another bone. It permits movement in all directions. The joints between shoulder and the upper arm is an example of ball and socket joint. Similarly, the joint between thigh and hip is an example of ball and socket joint.

Pivot Joint : This type of joint allows movements in many planes, viz. up and down, side to side movements. The joint between the skull and the vertebral column is an example of pivot joint.

Hinge Joint : This joint is similar to the hinges in a door. This joint allows movement only in one plane and only up to 1800. The knee joint and elbow joint are examples of hinge joint.

Gliding Joints : The movement in this joint happens due to sliding of bones over one another. Joints between the rings of the backbone are examples of gliding joint. The wrist joint is also an example of gliding joint.

2. Muscles are of three types:

a. Skeletal muscle or voluntary muscle is attached to bone, mostly in the legs, arms, abdomen, chest, neck, and face. Skeletal muscles are called striated because they are made up of fibers that have horizontal stripes when viewed under a microscope. These muscles hold the skeleton together, give the body shape, and help it with everyday movements (they are known as voluntary muscles because you can control their movement). They can contract (shorten or tighten) quickly and powerfully, but they tire easily and have to rest between workouts.

b. Smooth or involuntary muscle is also made of fibers, but this type of muscle looks smooth, not striated. Generally, we can't consciously control our smooth muscles; rather, they're controlled by the nervous system automatically (which is why they are also called involuntary). Examples of smooth muscles are the walls of the stomach and intestines, which help break up food and move it through the digestive system.

   Smooth muscle is also found in the walls of blood vessels, where it squeezes the stream of blood flowing through the vessels to help maintain blood pressure. Smooth muscles take longer to contract than skeletal muscles do, but they can stay contracted for a long time because they don't tire easily.

c. Cardiac muscle is found in the heart. The walls of the heart's chambers are composed almost entirely of muscle fibers. Cardiac muscle is also an involuntary type of muscle. Its rhythmic, powerful contractions force blood out of the heart as it beats.

   Muscles are connected to bones with the help of band like tissues called tendons. One end of the muscle is attached to a movable bone and other end is attached to a fixed bone. When the flexor muscle contracts, it pulls the movable bone and the extensor muscle relaxes. When the extensor muscle contracts, it pulls back the movable bone and the flexor muscle relaxes.

3. **Skull :** The skull is the bony structure present in the head. The upper part of the skull is made up of eight bones in the head region that are completely fused and are immovable; the face and the jaws together contain 14 bones. The lower jaw is movable.

   The Chest bones (Rib Cage) : The ribcage is present in the chest region of the body. It is made up of 12 pairs of bones called ribs. The ribs are joined to the chest bone in front and the backbone behind to form a cage like structure. The ten pairs are attached to the chest bone, with the help of cartilages. Two lower ribs are free not attached with the chest bone. Hence they are called floating ribs.

4. **Movement in Birds :** Birds fly in the air and walk on the ground. Some birds like ducks and swans also swim in water but some birds such as ostrich and kiwi cannot fly but are good runners. The birds can fly because their bodies are well suited for flying. Their bones are hollow and light. The bones of the hind limbs are typical for walking and perching. The bony parts of the forelimbs are modified as wings. The shoulder bones are strong. The breast bones are modified to hold muscles of flight which are used to move the wings up and down.

   Movement in Snake : Snakes do not have legs or arms. Snakes have a long backbone. They have many thin muscles. They are connected to each other even though they are far from one another. They also interconnect the backbone, ribs and skin. The snake's body curve into many loops. Each loop of the snake give its forward push by pressing against the ground. Since its long body makes many loops and each loop give its this push, the snake moves forward very fast and not in a straight line.

5. The main bones in the human skeleton include those found in the skull, backbone, ribcage, girdles and the bones of the upper and lower limbs.

   Functions of the Skull

. The skull encloses the brain and protects it from injury.

. The eye sockets of the skull provide support and protection to the eyes.

. The lower jawbone enables chewing of the food and talking.

Functions of Backbone :

. It acts as the central support for the body.

. Along with the hip gridle, it helps us in standing upright and provides support during locomotion.

. It protects the spinal cord.

Functions of the Ribcage :

i. It protects the lungs, heart and major blood vessels.

ii. It anchors the muscles that help in breathing.

Lesson – 9 : The Living Organisms and Their Surroundings

A. 1. adaptation 2. terrestrial 3. aquatic
4. abiotic 5. stimulus

B. 1. (b) 2. (c) 3. (c)
4. (c) 5. (b)

C. 1. True 2. False 3. True
4. False 5. True

D. 1. Biotic component – plants, Abiotic component – soil

2. Lion

3. Frog

4. . Padded feet help it in easily walking.
   . Eyelashes prevent the sand from getting into its eyes.

5. Submerged and floating plants

E. 1. The components in a habitat are broadly classified into two types. They are biotic and abiotic components. The living things such as plants and animals, in a habitat, are its biotic components. They contribute in many useful ways to the composition of

a habitat. Green plants provide food for whole of the living world by the process of photosynthesis. Animals are also useful biotic components in providing food, transportation etc.

Various non-living things such as rocks, soil, air and water in the habitat constitute its abiotic components. Sunlight and heat also form abiotic components of the habitat.

2. Plants grow towards light. Roots in plants grow away from the light. The response in plants to stimulus can be observed easily. e.g. Touch-me-not plant, mimosa. Some animals like cockroach, maggots respond to the environmental stimuli like light.
3. The plants and animals that live on land are said to live in terrestrial habitats. Some examples of terrestrial habitats are forests, grasslands.
4. The habitats of plants and animals that live in water are said to live in aquatic habitats. Ponds and swamps are some examples of aquatic habitats.
5. The streamlined body of a fish enables it to easily move in water. Fish have gills through which they take in oxygen from water.

F. 1. **Living Things**

- Living things need food, air and water.
- Living things grow.
- Living things can move on their own.
- Living things respond to stimuli.
- Living things reproduce themselves.
- Living things respire. They release energy from food.
- Living things excrete.
- Living things have a definite life-span after which they die.

Non-living Things

- Non living things do not need food, air or water.
- Non living things do not grow.

- Non living things cannot move on their own.
- Non-living things do not respond to stimuli. They are not sensitive.
- Non Living things do not reproduce themselves.
- Non Living things do not respire. They release energy from food.
- Non Living things do not excrete.
- Non Living things do not have a definite life-span after which they die.

2. Respiration is the process of breathing in oxygen and giving out carbon dioxide. Respiration takes place in every cell and is called as cellular respiration. Oxygen is necessary to break up food and produce energy from it. Different animals possess different organs for respiration.

   Even plants respire only in the night through small pores called as stomata.

3. The animals like frog have ponds as their habitat. Frogs are found in shady, damp conditions near ponds. Frogs can live inside water as well as on land near the pond. Actually, frogs spend most of their time on land but comeback to water to lay their eggs. Frogs are adapted to live life in water as well as on land in the following ways :
   a. Frogs have webbed back feet which help them to swim in water.
   b. Frogs have strong back legs for hopping and catching their prey.

4. All living organisms prefer to live in those places which are best suited to their needs. The place where a plant or animal lives is called its habitat.

   A camel shows many adaptations which help it to live in the hot desert. The padded feet of camels help it in easily walking on the sand. A camel has long eyelashes which prevent the sand from getting into its eyes. A camel can drink lots of water at one go and can go on for many days without drinking water.

The camel produces dry dung and very little urine in order to conserve water.

5. Many animals live in the grasslands and in forests. The climate is warm and food is available in good amount. But because of heavy population, the competition for food and other resources is tough in the grasslands and forests. Let us take the example of some animals to understand adaptation for grasslands.

   Lion : A lion is a ferocious hunter. It is strong because of muscular body. The sharp claws of lions help them in killing a prey. These claws retract inside when they are running and thus a lion can walk without making a noise. The colour of lion is pale yellow which mixes with the colour fo dry grasses and rocks. Thus the body colour of lion helps it in hiding from its prey.

   Tiger : A tiger is as good a hunter as a lion. The black stripes on the body of tiger look like grasses to its prey.

   Deer : A deer is a fast runner. It can sprint very fast to save its life from a predator. A deer has very good hearing ability which helps it in hearing the steps of an approaching predator. The eyes of the deer are on the side of its head. The position of a deer's eyes helps it in seeing a predator coming from behind.

Lesson – 10 : Motion and Measurement of Distances

A. 1. 100 2. oscillatory motion
3. meter 4. periodic motion
5. circular motion

B. 1. (b) 2. (b) 3. (a)
4. (c) 5. (c)

C. 1. False 2. False 3. True
4. False 5. True

D. 1. Centimeter 2. Pound
3. Movement of moon around earth

4. Motion of a fan
5. 2.5 km

E. 1. If the motion of an object is repeated along the same path at regular intervals of time, such a motion is said to be periodic motion.

Example : Movement of moon around earth, human heart beat etc.

2. When the body moves along a circular path about a fixed axis, it exhibits rotational motion.

Example : Motion of a potter's wheel, motion of a spinning top, motion of a fan etc.

3. People used arbitrary units of measurement. Handspan, finger-length, cubit (length between the elbow and finger tips), foot-length and arms-length are some examples of arbitrary units of measurement.

Arbitrary units are made up of lengths of different body parts. These lengths can vary from one person to another. This can create lot of confusion as there would be no uniformity in measurement. To maintain uniformity in measurement, standard units of measurement were introduced in different parts of the world at different places.

4. **Direct Measurement :** When we measure some quantity directly, it is called direct measurement. For example; when you are using a ruler to measure a length, you are doing direct measurement.

Indirect Measurement : When we measure some quantity indirectly, it is called indirect measurement. For example; when you have to measure the girth of a tree or the length of a curve, you cannot use a ruler. You can use a rope to find the length of a curved line and then compare the length on a ruler.

5. Do yourself

F. 1. The movement of the object is called motion. There are four kinds of motion :

i. **Transnational Motion**

(a) Rectilinear Motion – Motion of a car on a

straight road, an athlete running on a straight track.

(b) Curvilinear motion : A car moving on a curved road.

ii. **Rotational Motion :** Motion of a potter's wheel, motion of a spinning top, motion of a fan etc.

iii. **Period Motion :** Movement of moon around earth, human heart beat etc.

iv. **Oscillatory and Vibratory Motion :** Moving pendulum of a clock, motion of a swing etc.

2. **Rectilinear Motion :** If the motion of an object is along a straight line, it is called rectilinear motion. In this, direction of the motion of the object remains same.

Example : Motion of a car on a straight road, an athlete running on a straight track.

Rotational Motion : When the body moves along a circular path about a fixed axis, it exhibits rotational motion.

Example : Motion of a potter's wheel, motion of a spinning top, motion of a fan etc.

3. We just have experienced something like this when we are travelling by train. If the speed of our train is same as the one next to it, in the same direction both the trains seems to be at rest.

Also all our fellow passengers who are seated are at rest respect to the compartment but all are in motion in relation to everything outside.

This shows that the same objects are in a state of rest with respect to one point, may be in a state of motion with respect to the other. Therefore, motion is regarded as relative motion.

4. . We use measurement when sewing a dress.

. We buy fruits and vegetables in a grocery store by weight.

. Measurement skills are extensively used in every kitchen, every recipe.

. To measure our weight.

. To measure our height.

5. The scale should be placed along the length of the object to be measured.

   The zero mark of the scale should be taken as the beginning point. If zero mark is broken or invisible, then any other mark should be selected and final adjustment should be made accordingly.

   For example : if you begin from 1 and the final reading is 14 then actual reading would be 14 – 1 = 13.

   . Correct eye position should be maintained. The eye position should be just above the point to be measured. Incorrect eye position leads to parallax error and gives incorrect reading.

Lesson – 11 : Light, Shadows and Reflection

A. 1. energy 2. Laser 3. electrical
4. luminous 5. natural source of

B. 1. (b) 2. (a) 3. (b)
4. (d) 5. (b)

C. 1. True 2. False 3. True
4. False 5. False

D. 1. Sun 2. Polythene
3. The Earth 4. Glass
5. Shadows of objects just opposite to the source.

E. 1. When a ray of light falls on the surface of a plane mirror, it bounces back in the same medium (like air). If it falls into our eyes, it creates image.

2. Mirrors are smooth, polished surfaces which reflect the light.

   Clean images are formed when the light rays fall on a plane mirror. If we ever visit a shop having mirrors on walls, we may see people or objects which are behind us.

   This is due to laws of reflection. The light rays from

the things or people behind fall on the mirror in front which are reflected into our eyes and images are created.

3. It is only when light rays fall on our eyes, that we are able to see different things.
4. The objects that do not emit their own light are called non luminous objects, the objects that emit light of their own and thus are called the luminous objects of light.
5. When we consider a single and very narrow path of light, it is usually called a light ray. It is represented by a line with an arrow to show the direction of the movement of light. When we consider a broad path of light it is usually called a light beam. A light beam consists of a number of light rays.

F. 1. Shadows are formed by the obstruction of light due to the presence of an opaque object whereas images are created due to reflection of light rays into the eyes.

The shadows do not give any details of color, structure etc. whereas the images formed due to reflection, show all the details of objects.

A shadow is usually very dark where as an image has the same colour as that of the object.

2. We can demonstrate this by using a torch with its face covered with black paper having a small hole in the centre. Hold an opaque object like a small ball between the torch and white screen. We will see umbra shadow being formed on the screen.

If the source of light is broader and bigger the shadow umbra will have another hazy shadow around it called the penumbra.

Let light from a torch fall on a white screen having a ball in between. We will see a shadow formed on the screen having two parts. The central darker part is surrounded by lighter region-penumbra. As the distance between the object and the screen becomes

bigger, the penumbra goes on increasing in size.

(For diagram see page 95)

3. **Transparent Objects :** We are able to see through them all the things which are behind it. Such objects are called as transparent objects. For example, water, air, glass, cellophane paper etc.

. **Opaque Objects :** When the light does not pass through objects, called opaque objects. For example : stone, wood, hard-board etc.

Translucent Object : When only a part of light is allowed to pass through an object i.e. we may see hazy images of things behind it, objects are called as translucent object. For example : Butter-paper, (wax-paper), cartilage, frosted glass, polythene etc.

4. **Objective :** To show that light travel in a straight line material required. Three card-sheets, a lighted candle and moulding clay.

Produce : Make holes in the centre of all the three card-sheets. Fix them on a table vertically at equal intervals and levels with the moulding clay. Fix a lighted candle at one end of the whole arrangement so that the flame of the candle and three holes of the card sheets are all in a straight line. Now, peep through the hole at the other end.

Observation : The flame is visible to you. Next shift the middle card-sheet a little and now try to see in the same manner. The flame will not be seen now.

Conclusion : This shows the light needs a straight unhindered path to travel to the eyes to be seen.

5. The construction and working of the pinhole camera is based on the principle of rectilinear propagation of light.

Take a card-board box. Make a pinhole on one of its smaller faces and fix a translucent glass or waxed paper screen at the back. When the pinhole of the camera faces bright objects, their image is formed on the screen. This image is real and inverted.

We can change the distance between the pinhole and screen by having two boxes, one sliding into another as shown in the figure and observe differences in the sharpness and size of the images. All this can only if rays of light from the object allowed to fall on the screen straight.

The pinhole camera does not give details of image which cannot be stored.

We must have observed dark shadows being formed on the ground when we are standing under the trees on a sunny day. The nature provides small gaps between the leaves and branches of the tree acting as pinholes.

We may look at the sun through a pinhole camera, we should never view sun directly. Solar eclipse can also be watched through pinhole camera.

Lesson –12 : Electricity and Circuits

A. 1. electric

2. an Italian Scientist, Allessandro Volta

3. dry 4. closed 5. one

B. 1. b 2. c 3. b

4. a 5. a

C. 1. False 2. True 3. False

4. False 5. True

D. 1. Bulb 2. Battery 3. Solar cell

4. Dry cell 5. Switches

E. 1. Copper allows electric current to pass through them. The tester used by the electrician has a metal part to test the flow of electricity.

2. To avoid electric shocks or short circuit, the wires should be carefully tested and that they are covered with insulating coverings made up of plastic or rubber.

3. A fused bulb has its filament broken, thus it will not glow.

4. The bodies of the plugs, switches, sockets, handles of electrical appliances are all made up of insulating materials like Bakelite, PVC etc. The insulating materials avoid electric shocks.

F. 1. The complete path of flow of electricity through various components from one terminal to the other terminal of the cell makes an electric circuit.

The current passes from the positive terminal (+) of the cell to the negative terminal (–) is called as a closed circuit.

When the circuit is broken at some place between any two components, it is called as an open circuit.

Bulb will glow or any other article will work only when electric current passes through a closed circuit. Fused bulbs shows an open circuit as the filament gets broken.

A simple electrical circuit will have at least a battery or a cell, connecting electric wires, a key, a bulb to show its working.

2. Place a solution of dilute sulphuric acid in a beaker. Place a zinc plate and a copper plate dipping in the acid. Connect the metal plates to two ends of the battery cells. We will observe that the bulb glows.

The Volta cell was invented by an Italian scientist, Allessandro Volta, thus such cells are named Volta cells.

3. Circuit diagram represents an electric circuit using symbols for its various components.

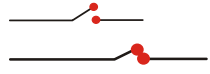
Symbols of some electrical components :

. Cell 

. Battery 

. Connecting wires — or 

. Lamp  or 

. Switch  Open

Closed

4. We have so many switches in buildings like homes,

offices, factories and almost every where electricity is consumed. The arrangement for on/off mechanism is controlled by switches.

We can make a simple switch using a thermocol sheet, two thumb-pins, two wires, a cell and a safety pin or paper clip. Fix one thumb-pin holding one end of the safety-pin on the thermocol. Fix the other thumb pin a little away from the previous one on the thermocol in such a way that the safety pin can touch both the thumb pins. Attach wires with both the pins and connect with the two terminals of the cells as shown in the figure. Place a bulb in the circuit.

When the safety pin touches both the thumb pins, the bulb glows whereas on moving it away from the free thumb pin, bulb does not glow.

It is thus clear that the material of the safety pin allows the electric current to flow through it when it touches both the thumb-pins, the electric current starts flowing from one terminal of the cell to the other making a closed circuit. This makes the bulb glow. In the other situation, the safety pin does not complete a circuit (open circuit), not allowing the electric current to flow. The former is ‘on’ and the latter is ‘off’ switch.

Thus, switches are devices which break or complete a circuit. Different kinds of switches are made on the simple principle shown above.

A torch can be used when the light goes off suddenly by switching it on.

5. We must have seen many equipments, clocks, toys etc. run with the help of batteries. The battery cell is called as dry cell which acts as a source of electricity and generate directs current (DC). The principle of working is based on that of Volta cell.

Construction of a dry cell : It consists of an outer covering made up of zinc. There is a carbon rod having a brass cap in the centre of the container. The carbon rod is surrounded by a mixture of manganese

dioxide (MnO_2) and powdered charcoal. Thick paste of ammonium chloride is filled in the remaining space. The cell is sealed at the top with pitch. The whole of the cell is covered by a card-board cover.

The carbon rod acts a positive terminal and zinc container as the negative terminal. When electric circuit is passed, the electricity starts flowing from the carbon electrode to zinc electrode.

Lesson –13 : Fun with Magnets

A. 1. magnets 2. early 800 3. repel
4. non-magnetic 5. alloys

B. 1. b 2. a 3. c
4. c 5. c

C. 1. False 2. False 3. True
4. True 5. False

D. 1. (e) 2. (d) 3. (a)
4. (f) 5. (b) 6. (c)

E. 1. The materials which attract iron are called as magnetic materials. For example : iron, nickel.

The materials which do not attract iron are called as non-magnetic materials. For example : wood, rubber, plastics.

2. **Natural Magnets :** Magnets are types of rocky materials having the power to attract iron metal. A natural magnet is a magnet that occurs naturally in nature. The strongest natural magnet material is lodestone also called magnetite.

Artificial Magnets : The magnets which are made by man in factories and laboratories are the artificial magnets. These are made in different shapes for convenience like bar magnets, horse-shoe magnets, cylindrical or a rod shape having balls at the terminal ends.

F. 1. In early 800 B.C., a shepherd named Magnes in ancient Greece use to take his herd of sheep and goats for grazing with a stick having an iron piece at

one end. Once his stick got stick in a rock. It is said that this rock had a force of attraction towards iron materials and later was called as magnetite may be on the name of Magnes or a place where it was first discovered called as Magnesia.

2. The materials which attract iron are called as magnetic materials. For example : iron, nickel.

   The materials which do not attract iron are called as non-magnetic materials.

   For example : wood, rubber, plastic.

3. **Objective :** To identify the magnetic and non-magnetic materials.

   Materials Required : Mixture of sulphur powder, iron filings, charcoal powder and common salt.

   Procedure : Mix all the substances in small quantities on a sheet of paper. Move a bar-magnet over this mixture.

   Observation : You will find that out of the four substances only iron filings were attracted to the magnet and stick to it.

   Conclusion : The magnetic material attracted magnet.

   (For diagram see Page 109)

4. To keep them safely, the bar magnets should be placed in pairs with their unlike poles on the same side. Soft iron should be placed across their ends and the two magnets be separated by a piece of wood. The soft iron pieces are called as keepers. The horse-shoe magnet should have a piece of iron placed across the poles.

   It is unsafe to keep magnets or magnetic objects near cassettes, television, mobiles, CDs, music system etc.

5. . Magnets are used in electronic devices such as television and radio.
   . They are used in loud speakers and microphones.
   . Electric motors and power generators have strong magnets inside them.

. Magnetic strips are used to store information on credit cards, ATM cards etc.

. Magnets are used in magnetic storage devices such as hard disk of a computer, tape recorder etc.

. Magnets are used in many medical devices such as MRI scanning machine and CT scanning machines.

6. **Objective :** To demonstrate that the property of attraction is more at two ends of magnet.

Material Required : Iron fillings, paper, bar magnet. Spread a few iron filings on a sheet of paper placed on a table. Place a bar magnet in the centre of the paper. You observe that most of the iron filings stick to the two extreme ends of the bar magnet. There are no iron filings attracted to the centre of the magnet. These areas where the iron filings are attracted most are called as the two poles of the magnet. One is called as the north pole and the other, the south-pole. All the magnets have two poles, whatever be the shape. On breaking a magnet into parts, each part will again attain its own north and south poles. You can try the same activity with differently shaped magnets.

Observations : The iron fillings get attracted to the magnet, they are concentrated at ends.

Conclusion : The iron filings will be attracted towards the poles. North pole and south pole are marked on every magnet.

G. 1. Magnetite 3. Hammering and heating
2. Magnet 4. North Pole and South Pole

Lesson –14 : Water

A. 1. evaporation 2. condensation 3. drought
4. floods 5. transpiration

B. 1. (d) 2. (c) 3. (b)
4. (d) 5. (d)

C. 1. True 2. False 3. True
4. True 5. True

D. 1. The water that is found below the ground is called groundwater.
2. Water that falls from the clouds towards the ground. For example – rain or snow.
3. When we pour water in an ice tray and keep it inside a fridge, the water turns into ice cubes. The conversion of liquid into solid is called freezing.
4. The absorption or movement of water through the space between soil particles is known as infiltration.

E. 1. During precipitation, the water droplets may carry dust particles and gases present in the air. Due to too much pollution in the cities, the air is full of harmful substances such as gases from vehicles and factory chimneys. Raindrops combine with the harmful gases such as oxides of sulphur and nitrogen to form acids like sulphuric acid and niric acid. Rainwater having these acids form acid rain. It has a bad effect on soil, plants and monuments.
2. The sources of freshwater are streams, lakes, ponds, rivers, groundwater etc.
3. Drought is a continuous period of dry weather, when an area gets less than its normal amount of rain, over months or even years. Crops and other plants need water to grow, and animals need it to live. Droughts can become dangerous to people and other land animals; causing famine and even creating deserts.

Effects of Droughts

Droughts are caused due to lack of rains.

Drought condition results in drying up of wells, lakes, ponds and thereby creating water scarcity.

4. The storage of rainwater collected in sumps or underground to recharge the ground water or for domestic use.
5. The level under the ground where all the spaces between soil particles are saturated with water is called the water table.

F. 1. **Bodily Functions :** Plants, animals and human beings need water for their survival. They require water for their bodily functions.

Domestic Purposes : We use water for drinking, bathing, washing utensils, clothes etc.

Generating Electricity : In many parts of the world, water from rivers is used to produce electricity, which is known as hydroelectric power. The water from rivers is stored by constructing dams and reservoirs. The stored water is then used to generate electricity.

Industrial Use : Water serves as a raw material, ingredient and solvent in preparing various products in several industries. Water is used in various industrial activities as cooling, heating etc.

Transportation and Recreation : Huge cargo ships transport goods such as oil, petroleum products etc. Water is used in swimming pools, water parks and water games for recreation.

2. Floods are caused by rise in the water level in ponds and lakes due to heavy rainfall. The excess rain water flows on to land causing floods. Floods make the soil water-logged.

Effects of Flood

- Floods affect normal life by disturbing everything which comes in its way.
- Floods wash out the living beings such as plants, fish and other animals etc.
- Floods create water-logging in the soil bringing out stored air from the spaces. Organisms like earthworms, ants, insects rats, rabbits, snakes living under soil get disturbed by floods.
- Floods cause heavy loss to human life.

3. - Excess rain water running in the river is stored in huge and special structure called as dam.
   - Dams are huge structures built on rivers to hold back excess water. Dams prevent areas from flooding by storing large amount of water.

Dams provide water for irrigating fields, domestic use and also drinking water for some areas.

- Drinking water should not be wasted to water the plants.
- Water bodies should not be polluted in order to get pure water.
- Water should not be wasted during irrigation of fields. Modern methods like spraying, sprinkling or drip irrigation should be used.

4. The evaporated water is carried away by warm air. As the warm air moves higher from the surface of the Earth, it starts to cool down. This water vapour condenses to form tiny water droplets which float in air to form clouds or fog.
5. The cyclic movement of water from the atmosphere to the Earth and back to the atmosphere through various processes is called as water cycle.

   Evaporation : The water present on the surface of oceans evaporates by the sun's heat. This process of conversion of water from liquid state to vapour state is called evaporation. Evaporation also takes place from wet clothes, fields, ponds, lakes and rivers.

   Transpiration : Plants take in water from the soil to prepare their own food and also for other life processes. They release excess water into air in the form of water vapour by the process of transpiration.

   Condensation : The evaporated water is carried away by warm air. As the warm air moves higher from the surface of the Earth, it starts to cool down. This water vapour condenses to form tiny water droplets which float in air to form clouds or fog.

   Precipitation : All these droplets collect to form bigger drops of water. Bigger water drops come down ads rain by the process of precipitation. If the air is too cold, the water drops can become snow or hail and may settle on the top of a mountain. When these snow or hail melts, they can become part of a river or a stream.

Surface run-off : Some amount of rain water is absorbed by the soil and settles down as ground water. Most of the rain water flows down the hills and mountains to collect into rivers, lakes or streams. Rain also washes away the topmost layer of the soil into water bodies.
(For diagram see Page 119)

Lesson –15 : Air Around Us

A. 1. air 2. composition 3. atmosphere
4. carbon dioxide 5. gills

B. 1. (b) 2. (a) 3. (a)
4. (b) 5. (b)

C. 1. True 2. False 3. True
4. True

D. 1. Pair of lungs with air sacs
2. 0.03% 3. Absolute humidity
4. 21% 5. Oxygen

E. 1. The burning of fuel produces smoke. Smoke contains a few gases and fine dust particles and is often harmful. That is why we see long chimneys in factories. This takes the harmful smoke and gases away from our noses, but bring it closer to birds flying in sky.
2. Oxygen in air supports burning.
We take oxygen for breathing.
3. The sun heats up the water in seas and oceans. This water evaporates and forms water vapour. We can verify the presence of water vapour in air by observing wet clothes drying on a clothesline. The water from the wet clothes forms water vapour and mixes with air.
4. It contains mainly nitrogen and oxygen. It also contains carbon dioxide, noble gases, water vapour, dust particles, and traces of other gases.

F. 1. **In Aquatic Animals and Plants :** Most aquatic animals like fish, tadpole, crab etc. have special organs for respiration called gills. Gills helps to take in oxygen and give out carbon dioxide. Some aquatic

animals like dolphin and whale come to the surface of the water regularly to take in air, since they breathe with the help of lungs.

In Amphibians : Amphibians like frog need breathing system for both air and water. Frogs have well developed lungs to breathe in air when on land. In water, frogs breathe with the help of their moist skin. We all need air to survive. Air contains oxygen and carbon dioxide useful to plants and animals.

2. The balance of oxygen and carbon dioxide in the atmosphere is maintained through respiration in plants and animals and by photosynthesis in plants. Plants produce oxygen during photosynthesis and utilize oxygen during respiration. They produce much more oxygen during photosynthesis than they consume, during respiration. This is how the oxygen consumed by plants and to a large extent by animals is replenished in the air through photosynthesis.
3. **Objective :** To show that burning occurs in the presence of oxygen.

   Materials Required : Two small candles, two shallow containers, water, inverted glasses.

   Procedure : Fix two small candles of the same size in the middle of two shallow containers. Now fill the containers with some water. Light the candles and cover each of them with an inverted glass (one much taller than the other). Observe carefully what happens to the burning candles and the water level. Do the candles continue to burn or go off ? Does the level of water inside the glasses remains the same ?

   Observation : When most of the oxygen is used up by the burning candle , it can no longer burn and blows off. Also some of the space occupied by the oxygen inside the glass becomes empty and the water rises up to fill or occupy this space.

   Conclusion : We conclude that burning occurs in the presence of oxygen.
4. Plants produce oxygen during photosynthesis and utilize oxygen during respiration. Plants have tiny

pores called stomata, found on the underside of a leaf. Air containing carbon dioxide and oxygen enters the plant through these openings where it gets used in photosynthesis and respiration.

Lesson –16 : Garbage In Garbage Out

A. 1. wet wastes 2. dry wastes 3. daily life
4. plastic boxes 5. earthworm

B. 1. (c) 2. (a) 3. (b)
4. (b) 5. (c)

C. 1. False 2. True 3. False
4. False 5. True

D. 1. The waste that decays and decomposes naturally is called biodegradable waste. This waste can break down and thus leave no residue. Such wastes are also categorised as wet wastes.
Example : Kitchen waste like vegetables and fruit peels, egg shells etc. are biodegradable.
The waste does not decays and decompose is called non biodegradable waste. This waste do not break down completely in the soil and get accumulated. Such wastes can be recycled or reused and are categorised as dry wastes.
Example : Plastic bags, cold drink cans etc. (materials that are artificial and synthetic).

2. Composting is one of the oldest methods of disposal of biodegradable wastes. Instead of littering kitchen waste or animal drug, it can be used to make manure or compost. The main ingredients of compost include wastes from kitchen, hay, straw, saw dust, dried leaves and animal dung. These are buried in compost pit. Microorganisms in the soil decompose them to form manure, which can be used for better growth of plants. Vermicomposting which involves the use of variety of earthworm. It ensures mixing of all the decaying organic matter uniformly due to the movement of earthworms in the soil.
Since it involves the usage of organic wastes, the end products are also natural and serve as non harmful

means for providing nutrients to the soil. It is one of the best ways to dispose biodegradable wastes. Vermicompost act as bio-fertilizer for plants.

3. **Reuse :** We should reuse things like plastic bags can be used to make decorative things.
   Recycle : We should give waste things (which cannot be decomposed) for recycling. like plastic materials.
4. **E-waste or Electronic Waste :** These wastes refers to the discarded electronic materials such as television, computers, phones etc. As large number of people use these products, this has lead to an increase in the generation of e-waste. If it is not properly disposed of, it may lead to contamination of air, water and soil causing pollution. The toxic substances in e-waste causes health problems.
   Biomedical Waste : The wastes from hospital, dispensaries, medical laboratories and nursing homes are called biomedical wastes. The kind of wastes include syringes, used cotton, urine etc. This should be disposed of with care otherwise it may cause infections.

E. 1. Terrestrial worm that burrows into and helps aerate soil. By the process of vermicomposting, the red worms are associated.
2. Disposing of these wastes is a problem because if they are put in landfills, they remain under the soil for a long time. They may also pollute the soil and groundwater.
3. The waste that decays and decomposes naturally is called biodegradable waste. This waste can break down and thus leave no residue. Such wastes are also categorised as wet wastes.
   Example : Kitchen waste like vegetables and fruit peels, egg shells etc. are biodegradable.
   The waste does not decays and decompose is called non biodegradable waste. This waste do not break down completely in the soil and get accumulated. Such wastes can be recycled or reused and are categorized as dry wastes.

Example : Plastic bags, cold drink cans etc. (materials that are artificial and synthetic).

4. **Composting :** The process of converting biodegradable waste materials into compost.
   Vermicomposting : The method of preparing compost with the help of red worms.
5. Excess usage and disposal of polyethene bags leads to large accumulation of plastic due to its non - biodegradable property. Burning of plastics leads to release of poisonous gases, so they stay in the land for many years.

F. 1.
- Reduce the use of polythene and plastics.
- Reuse the plastic bottles, covers and plastic boxes.
- Segregate the waste from our home into biodegradable and non-biodegradable wastes.
- Composting our kitchen waste can give nutrient rich manure.
- Refuse plastic bags.
- Keep our surroundings clean by not littering.

2. Plastic is a curse. I am against to use the plastic. This is the material that we use in our daily life. Packaging of milk, bread etc. are plastic materials. But excess usage and disposal of plastics leads to large accumulation of plastic due to its non-biodegradable property. Burning of plastics leads to release of poisonous gases, so they stay in the land for many years. Plastics can be reused such as bottles can be used to store water or cut open and used as pots for plants etc.
3. Municipalities are the authorities responsible for keeping the towns clean. Corporation are the authorities responsible for keeping the cities clean. Panchayats are responsible for keeping the village clean.
4. Recycling is the method of using the collected waste to make new items. By using the methods of reuse and recycle, the amount of waste generated can be minimized.

Class VII

Lesson –1 : Nutrition in Plants

A. 1. autotrophs 2. starch 3. requirement
4. chlorophyll 5. carbon dioxide, oxygen

B. 1. False 2. False 3. True
4. False 5. True

C. 1. (b) 2. (c) 3. (b)
4. (d) 5. (c)

D. 1. Cuscuta 2. Stomata 3. Chlorophyll
4. Carbon dioxide 5. Saprotrophs

E. 1. **Autotrophs :** The green plants are self sufficient in making their own food. The organisms which can prepare their own food are called as Autotrophs.

Heterotrophs : Non green plants, animals and human beings cannot prepare their own food since they lack photosynthetic pigment – chlorophyll. Therefore they are dependent on others for food. Such organisms are called heterotrophs.

2. **Parasites :** The organisms which derive their nutrition by living in or on other living organisms like cuscuta.

Saprotrophs : The mode of nutrition in which organisms take in nutrients from dead and decaying matter is called saprotrophic nutrition. Such organisms with saprotrophic mode of nutrition are called saprotrophs.

F. 1. The relationship between organisms that live together and share both shelter and nutrients.

2. It provides energy for growth, development and proper functioning of the body. Food also helps to repair or replace the worn out dead cells and tissues.

3. Inside the pitcher there are hair which entangle the trapped insect. The lid closes and the insect is trapped. The insect is killed by the juices secreted in the pitcher and its nutrients are absorbed. Such insect eating plants are called insectivorous plants. Another example of insectivorous plant is Venus fly-trap.

4. Nutrition is the mode of intake of food by an organism and its utilization by the body.
5. The process of preparation of food by the green plants in the presence of sunlight and chlorophyll is called as photosynthesis.

   The necessary components are chlorophyll, sunlight, water, carbon dioxide and air.

G. 1. **Autotrophic Nutrition :** The green plants are self sufficient in making their own food. The organisms which can prepare their own food are called as autotrophs and thus have autotrophic mode of nutrition.

Heterotrophic Nutrition : Non green plants, animals and human beings cannot prepare their own food since they lack photosynthetic pigment – chlorophyll. Therefore they are dependent on others for food. Such organisms are called heterotrophs and have heterotrophic nutrition.

2. Leaves are the food factories of plants. Therefore all raw materials must reach the leaf. Water and minerals present in soil are absorbed by the roots and transported to leaves. Carbon dioxide from air is taken in through the tiny pores present on the surface of leaves. These pores are surrounded by 'guard cells'. Such pores are called stomata.

   Water and minerals are transported to the leaves by the vessels which run like pipes throughout the root, the stem, the branches and the leaves. They form a continuous path or passage for the nutrients to reach the leaf. They are called vessels. The leaves have a green pigment called chlorophyll. It helps leaves to capture the energy of the sunlight. This energy is used to synthesize food from carbon dioxide and water. The process of preparation of food by the green plants in the presence of sunlight and chlorophyll is called as photosynthesis. Thus sun is the ultimate source of energy for all living organisms. In the process of photosynthesis, carbon

dioxide enters the leaf of the plant through tiny holes i.e stomata while water is available from the roots. The solar energy of the sun is trapped by the chlorophyll and converted into chemical energy of carbohydrates i.e sugar. Oxygen is evolved in the process as a by product. Thus the presence of starch (carbohydrate) in leaves indicates the occurrence of photosynthesis.

3. **Objective :** To show that sunlight is necessary for photosynthesis.

   Materials Required : Plant, sunlight, black paper, iodine solution.

   Procedure : Take a potted plant. Keep the pot in darkness for about 2-3 days. Cover one of the leaves partially with a black paper held with clips. Put the plant in sunlight for few days.

   Pluck the leaf which was covered with black paper, remove the paper and perform the starch test as in previous experiment.

   Observation : The covered portion does not turn blue-black whereas the area which was exposed to sunlight turned blue black with iodine solution.

   Conclusion : This shows that sunlight is necessary for the formation of food in green leaves.

4. There are some plants which do not have chlorophyll. They cannot synthesize food. Like humans and animals, these plants depend on the food produced by other plants. They use the heterotrophic mode of nutrition. For example: Cuscuta plant do not have chlorophyll. It takes ready made food from the plant on which it is climbing. The plant on which it climbs is called the host. Since it deprives the host of valuable nutrients, Cuscuta is called the parasite.

   Inside the pitcher there are hair which entangle the trapped insect. The lid closes and the insect is trapped. The insect is killed by the juices secreted in the pitcher and its nutrients are absorbed. Such insect

eating plants are called insectivorous plants. Another example of insectivorous plant is Venus fly-trap.

5. **Objective :** To show that chlorophyll is necessary for photosynthesis.

   Materials Required : Plant, sunlight, test tube, water, ethyl alcohol, iodine solution.

   Procedure : Take a potted plant. Keep the pot in darkness for about 2-3 days so that all the food present in leaf is consumed. This is called as destarching of leaf. Now keep plant in sunlight for few days. Pluck a leaf from the plant. We can see green and yellow patches. Put the leaf in a boiling test tube filled with about 15-20 ml of ethyl alcohol. Place this tube in hot water till the green colour disappears. Alcohol turns green due to removal of chlorophyll from the leaf. Next boil it in hot water then wash it with lukewarm water. Put a few drops of iodine solution over leaf.

   Observation : Green patches turned blue-black and non green remained same.

   Conclusion : This shows that presence of chlorophyll is necessary for the process of photosynthesis. The food is stored in the form of starch in plants. Iodine turns starch into blue black colour.

Lesson – 2 : Nutrition in Animals

A. 1. ingestion, digestion, absorption, assimilation, egestion
2. liver 3. digestive
4. villi 5. food vacuole

B. 1. False 2. True 3. True
4. True 5. False

C. 1. (c) 2. (d) 3. (d)
4. (b) 5. (c)

D. 1. **Ingestion :** The intake of food is called ingestion.

Method of ingestion, i.e. taking of food, varies from one animal to another.

Egestion : Removal of waste materials from the body is called egestion. The faecal matter is removed through the anus from time-to-time. Since the waste of food left after digestion is also called faeces, hence the process of egestion is also known as defecation.

2. **Milk Teeth and Permanent Teeth :** Humans get two sets of teeth in their lifetime. The first set comes out when we are babies, are called milk teeth. Milk teeth last until we are about 8 years old. Milk teeth are replaced by the second set of teeth which are called permanent teeth.

   An adult human has 32 teeth in all; 16 in each jaw.

3. **Incisors :** These are flat and chisel-shaped teeth. They lie in the front of the mouth. There are eight incisor teeth; four in the upper jaw and four in the lower jaw. The incisor teeth are well adapted for cutting and biting of food items.

   Canines : These are round shaped, sharp and pointed teeth. Canines are well adapted to hold and tear the food. There are four canine teeth found in human.

E. 1. Saliva 2. Incisor 3. 32
4. Oesophagus 5. Digestion

F. 1. (c) 2. (d) 3. (a)
4. (b) 5. (e) 6. (f)

G. 1. **Similarity :** The digestive juices in amoeba are secreted into food vacuole and in human beings the digestive juices are secreted in stomach and small intestine. Then the juices convert complex food into simpler soluble and absorbable substances.

   Difference : Amoeba captures the food with help of pseudopodia and engulf it. In human beings food is taken by the mouth.

2. From duodenum the food goes to the lower part of the intestine. There are numerous finger-like

projections on the wall of the small intestine. These projections are called villi. They have fine blood capillaries to absorb the food. After absorption, food mixes in the blood stream and is carried to all the cells of the body. The cells utilize this food to release energy.

3. Bile is produced in liver. It helps in the digestion of fats.
4. Cellulose is the type of carbohydrate. In ruminants like cattle, deer etc., bacteria present in rumen helps in digestion of cellulose. Many animals, including humans, cannot digest cellulose.

   Animals like horses, rabbit etc. have a large sac-like structure called caecum between the oesophagus and the small intestine. The cellulose of the food is digested here by the action of certain bacteria which are not present in humans.
5. Because it easily breaks down in the cell with the help of oxygen which provides instant energy to the organism. Glucose does not need digestion, it is directly absorbed into the blood.

H. 1. There are some plants which do not have chlorophyll. They cannot synthesize food. Like humans and animals, these plants depend on the food produced by other plants. They use the heterotrophic mode of nutrition. For example: Cuscuta plant do not have chlorophyll.

2. **Amoeba :** a unicellular organism uses false-feet-pseudopodia to engulf food particles.

   Paramecium : Cilia (fine hair) on the body of Paramecium helps in squeezing food from water.

   Hydra : kills prey with the help of stinging cells on arm like tentacles on its body.

   Butterfly : sucks nectar with the help of a tube like structure-proboscis.

   Frog : has a long bifurcated tongue to catch prey.

   Cow, horse, buffalo etc : pick food directly with the

help of jaws and tongue.

3. The food which is taken into the body is usually not in soluble form and thus cannot provide instant energy. A step wise chemical change take place so that the food can provide energy. The whole process involves the following steps :

   Ingestion : The intake of food is called ingestion. Method of ingestion, i.e. taking of food, varies from one animal to another.

   Digestion : The process of breaking down of complex component of food into simpler substances is called digestion. The process of digestion is different in human, grass eating animals, amoeba, etc.

   Absorption : The process of passing of digested food into blood vessels in the intestine is called the absorption.

   Assimilation : The conversion of absorbed food in complex substances such as proteins and vitamins required by body is called assimilation. In other words, assimilation is the conversion of absorbed food (nutrients) into living tissues. Through the process of assimilation our cells are supplied with oxygen and nutrients.

   Egestion : Removal of waste materials from the body is called egestion. The faecal matter is removed through the anus from time-to-time. Since the waste of food left after digestion is also called faeces, hence the process of egestion is also known as defecation.

4. Amoeba feeds on some microscopic organisms. When it senses food, it pushes out pseudopodia around the food particle and engulfs it. The food become trapped in a food vacuole. Digestive juices are secreted into the food vacuole. They act on the food and break it down into simpler substances. Gradually the digested food is absorbed.

The absorbed substances are used for growth, maintenance and multiplication. The undigested residue of the food is expelled outside by the vacuole.

5. **Small Intestine :** The food leaves the stomach at certain intervals of time and enters into the small intestine.

   The small intestine is the longest part of the digestive system. It is about 20 feet or seven meters long in an adult human. Small intestine is a highly coiled tube. It consists of three parts: duodenum, jejunum and Ileum.

   Large Intestine : The digested food enters into large intestine after small intestine. The large intestine is wider and shorter than small intestine. It is about 1.5 metre in length.

   In large intestine, excess of water from the materials is absorbed. The semi solid residue is stored in the last part of the large intestine called rectum and finally throw out of the body through the anus from time to time. The throwing out of waste of digested food from rectum is called egestion. Egestion is also known as defecation.

Lesson – 3 : Fibre to Fabric

A. 1. animal 2. plant 3. cocoon, moth
4. fleece (hair) 5. air, conductor

B. 1. True 2. False 3. True
4. True 5. False

C. 1. (c) 2. (d)
3. (d) 4. (d)

D. 1. Shearing 2. Wool 3. Cocoon
4. Cotton 5. Terrylene

E. 1. **Natural Fibre :** Natural fibres are obtained from plants and animals; such as jute, cotton, wool, silk, etc.

Man-made Fibres : Fibres that are synthesized in laboratory are called man-made fibres, such as terrylene, terry-cotton, acrylic, etc.

2. **Reeling :** The process of taking out threads from the cocoon for use as silk.

   Shearing : The fleece (hair) of sheep is shaved off along with a thin layer of skin. In olden days this was done using pair of metal blades. But now-a-days machine is used to cut off the fleece. This is similar to shaving of beards or hair. This process is called shearing.

3. **Shearing :** The fleece (hair) of sheep is shaved off along with a thin layer of skin. In olden days this was done using pair of metal blades. But now-a-days machine is used to cut off the fleece. This is similar to shaving of beards or hair. This process is called shearing.

   Sorting : After scouring, fleece is sorted according to texture. This process is called sorting.

F. 1. **Sericulture :** The rearing of silkworms for obtaining silk.

2. Fibre for wool is obtained from the fleece (hair) of such animals and hence such animals are called wool bearing animals.

3. The fleece (hair) of sheep is shaved off along with a thin layer of skin. In olden days this was done using pair of metal blades. But now-a-days machine is used to cut off the fleece. This is similar to shaving of beards or hair. This process is called shearing.

4. A pile of cocoons is used for obtaining silk fibres. The cocoons are kept under the sun or boiled or exposed to steam. The silk fibres separate out. The process of taking out threads from the cocoon for use as silk is called reeling the silk.

5. White fleece means the white coloured hair of the lamb.

G. 1. Some breeds of sheep bear only a coat of fine hair. Such animals are reared by selective breeding. Selective breeding is the process to obtain animals or plants having special characteristics.

In India, sheep are reared generally in the states of Jammu and Kashmir, Himachal Pradesh, Uttaranchal, Arunachal Pradesh and Sikkim, or the plains of Haryana, Punjab, Rajasthan and Gujarat.

2. **Step 1 : Shearing :** The fleece (hair) of sheep is shaved off along with a thin layer of skin. In olden days this was done using pair of metal blades. But now-a-days machine is used to cut off the fleece. This is similar to shaving of beards or hair. This process is called shearing.

Shearing is generally done in summer so that sheep could get new hair by winter to get protection against cold.

Step 2 : Scouring : Fleece, after shearing, is washed properly to remove dirt and grease. The washing of fleece; after shearing; is called scouring.

Step 3 : Sorting : After scouring, fleece is sorted according to texture. This process is called sorting. The hairy skin is sent to a factory where hair of different textures are separated or sorted.

Step 4 : After sorting, fluffy fibres; called burr, are picked out from hair. Burr is the fibre that gives wool.

Step 5 : Dyeing : After sorting and picking out of burrs, these are dyed in desired colors.

Step 6 : Spinning : The fibres are then straightened, combed and rolled into yarns.

Wool yarn is used in knitting sweaters and woolen clothes, i.e. fabric.

3. The female silk moth lays eggs, from which hatch larvae are called caterpillars or silkworms. They grow in size and when the caterpillar is ready to enter the next stage of its life history called pupa, it

first weaves a net to hold itself. Then it swings its head from side to side in the form of figure of eight (8). During these movements of the head, the caterpillar secretes fibre made of a protein which hardens on exposure to air and becomes silk fibre. Soon the caterpillar completely covers itself by silk fibres and turns into pupa. This covering is known as cocoon. The further development of the pupa into moth continues inside the cocoon. Silk fibres are used for weaving silk cloth.

4. For obtaining silk, moths are reared and their cocoons are collected to get silk threads.

   Rearing Silkworms : A female silk moth lays hundreds of eggs at a time. The eggs are stored carefully on strips of cloth or paper and sold to silkworm farmers. The farmers keep eggs under hygienic conditions and under suitable conditions of temperature and humidity.

   The eggs are warmed to a suitable temperature for the larvae to hatch from eggs. This is done then mulberry trees bear a fresh crop of leaves. The larvae, called caterpillars or silkworms, eat day and night and increase enormously in size.

   The larvae are kept in clean bamboo trays along with freshly chopped mulberry. After 25 to 30 days, the caterpillars stop eating and move to a tiny chamber of bamboo in the tray to spin cocoons. Small racks or twigs may be provided in the trays to which cocoons get attached. The caterpillar or silkworm spins the cocoon inside which develops the silk moth.

   Processing Silk : A pile of cocoons is used for obtaining silk fibres. The cocoons are kept under the sun or boiled or exposed to steam. The silk fibres separate out. The process of taking out threads from the cocoon for use as silk is called reeling the silk. Reeling is done in special machines, which unwind the threads or fibres of silk from the cocoon. Silk

fibres are then spun into silk threads, which are woven into silk cloth by weavers.

Lesson – 4 : Heat

A. 1. temperature 2. clinical 3. celsius
4. radiation 5. dark

B. 1. False 2. False 3. True
4. True 5. False

C. 1. (d) 2. (c) 3. (d)
4. (d) 5. (d)

D. 1. Clinical thermometer 2. Insulator
3. Conductor 4. Sense of touch
5. Celsius scale

E. 1. Dark color absorbs more heat while light color reflects most of the heat. That's why wearing light colored clothes is preferred in summer, dark colored clothes are preferred in winter.

2. Mercury is a metal which is in liquid state at room temperature and it readily expands or contracts at the slightest change in temperature. Hence, mercury is used in thermometer.

3. Air gets heated because of convection, the way water gets heated. Air near the source of heat gets heated and rises above. This leaves a gap, which is filled by the colder air from the surrounding. The convection current thus starts in air which results in heating up of air.

   When we place our palm above a flame we will feel the hotness of the flame. But when we will place our palm below the flame the area will be colder. This shows how the colder air from below moves up; due to convection current.

F. 1. Wool is a poor conductor of heat. In addition to it; air gets trapped in woolen fibre to further increase the poor conductivity of wool. This prevents the radiation of heat of our body to the surrounding and

prevents the cold from surrounding to affect our body. Thus, wearing woolen cloth makes one comfortable in winter season.

2. Mode of transfer of heat without medium.
3. In places of hot climate it is advised that the outer wall of houses be painted white because white colour reflects heat and the houses do not heat up too much.
4. **Conductor :** Materials that allow the flow of heat through them. Example : iron, copper, etc.

   Insulators : Materials that do not allow the flow of heat through them. Example : rubber, wood, etc.
5. **Degree Celsius :** Degree Celsius is written as °C and read as degree Celsius or simply Celsius. For example 20°C; it is read as twenty degree Celsius.

   Fahrenheit : Fahrenheit is written as °F and read as degree Fahrenheit. For example 25°F; it is read as twenty five degree Fahrenheit.

   Kelvin : Kelvin is written as K. For example 100K; it is read as hundred Kelvin.

   To convert temperature from Kelvin to Celsius

   °C= K - 273

   To convert temperature from Celsius to Kelvin :

   K= °C + 273

   For Fahrenheit : F=9/5 C + 32

G. 1. **Laboratory Thermometer :** Laboratory thermometer is used to measure the temperature. The scale of temperature is graduated generally from –10°C to 110°C over the glass tube. Each division of temperature scale is further divided into 10 parts to read fraction of temperature.

Clinical Thermometer : Clinical thermometer is used to measure the body temperature. The scale of temperature is graduated from 35°C to 42°C and or from 94°F to 108°F. The temperature of human body always remains within this range and this is the range on the clinical thermometer. There is a kink near the

bulb of clinical thermometer which prevents the automatic fall of mercury level.

2. . Take a clinical thermometer and hold it horizontally with reading scale towards your eye.
   . Do not hold the thermometer from the bulb.
   . Rotate the thermometer slightly clockwise and anticlockwise. By doing this you will see a shiny thin silvery thread.
   . The end of the silvery thread shows the reading of temperature. If mercury lining ends at 37, the reading is 37°C.
   . Wash the bulb end of thermometer with an antiseptic solution.
   . Give two or three jerks slightly. By doing this the mercury level would fall. When it falls to 35°C or below, put it below the tongue and wait for one minute.
   . Take out the thermometer and read the temperature. Temperature would be near 37°C.
   . The normal body temperature is 37°C. This can differ from person to person.

3. **Clinical Thermometer**
   . Clinical thermometer is scaled from 35°C to 42°C or from 94°F to 108°F.
   . Mercury level does not fall on its own, as there is a kink near the bulb to prevent the fall of mercury level.
   . Temperature can be read after removing the thermometer from armpit or mouth.
   . To lower the mercury level jerks are given. No need to give jerk to lower the mercury level.

Laboratory Thermometer

. Laboratory thermometer is generally scaled from -10°C to 110°C.

- Mercury level falls on its own as no kink is present.
- Temperature is read while keeping the thermometer in the source of temperature, e.g. a liquid or any other thing.
- It is used for taking the body temperature. It is used to take temperature in laboratory.

Similarities :

- Both have a bulb at one end.
- Both contain mercury in bulb.
- Both use celsius scale on the glass tube.

4. **Sea Breeze :** In coastal areas, the breeze that moves from sea surface to the land is called sea breeze. This happens because, during daytime, land gets heated more quickly than water. As a result, warm air from land rises up; leaving a gap. To fill that gap, colder air from the ocean surface rushes towards the land. This phenomenon continues and a continuous flow of cold air keeps coming towards the land. This gives rise to the phenomenon which is called the sea breeze. Because of this, people living in coastal areas prefer to live in a sea facing house.

   Land Breeze : In coastal areas, the breeze which moves from land towards the sea is called land breeze. In the night, the land cools down more quickly than the ocean surface. This makes the air over the water surface warmer than air over the land surface. Warmer air over the water surface rises in the air and air from the land rushes towards the water surface to fill the gap. This phenomenon continues which creates a flow of air from land to the sea. This phenomenon is called land breeze.

5. **Conduction :** The process by which heat is transferred from the hotter end to the colder end of an object is known as conduction. In solids, heat is transferred by the process of conduction. In this process, the transfer of heat takes place through

adjacent molecules.

Example : When one end of an iron rod is put over flame then part which is nearer to the flame is heated first and heat is gradually transferred to the other end of the rod. This happens because particles of iron rod which are nearer to the flame receive the heat and transfer this to the adjacent particles. Subsequently, the adjacent particles transfer the heat to the next adjacent particles. This process continues and heat reaches to the other end of the rod. Thus, heat transfer in solid takes place through conduction.

Convection : The transfer of heat because of movement of the molecules of the medium; via mass transfer; is called convection or convection of heat.

Water and air are bad conductors of heat. But they do become hot, in spite of being bad conductors. Heat transfer in fluids takes place through convection.

Convection in Water : When water is heated in a pan, the particles of water which are near the source of heat; get heated first. Because of heating, they become light; and rise in water. The gap which is created because of rise of hot particles is filled by cold particles of water from the surrounding area. Thus a cyclical movement of particles begins and ends up heating the whole water of the pan. The cyclical movement in fluids because of heating is called convection current.

Lesson – 5 : Acids, Bases and Salt

A. 1. sour, bitter 2. citric
3. digestion of food 4. acidic or basic
5. same

B. 1. False 2. False 3. True
4. True 5. False

C. 1. (c) 2. (b) 3. (b)
4. (a) 5. (a)

D. 1. We take an antacid such as milk of magnesia to neutralises the excessive acid released in stomach.

2. Rubbing baking soda over the skin gives relief from pain due to ant or bee sting. Baking soda, which is a base, neutralizes the effect of acid injected by bee or ant. Another base, such as zinc carbonate (Calamite solution) is also used in case of ant or bee sting.

3. The wastes of factories contain acids. If acids are disposed off in the water body, the acids will harm the organisms. So, factory wastes are neutralised by adding basic substances.

4. The Taj Mahal, which is made of marble; is under threat because of acid rain. Many parts of Taj Mahal and many other historical buildings and monuments have got damaged due to acid rain.

5. Our stomach releases hydrochloric acid to kill bacteria; if any; present in food. Hydrochloric acid released in our stomach also helps in the digestion of food. Sometimes our stomach produces more hydrochloric acid than required. Production of more hydrochloric acid in the stomach manifests as indigestion. This condition can be painful and causes pain in abdomen and burning sensation in chest.

E. 1. Substances that taste sour are called acids.

Properties of Acid

. They have sour taste.

. They turn blue litmus red.

. They are produced when non-metallic oxides react with water.

. They are good conductors of electricity.

. All acids have at least one Hydrogen ion (H^+).

. Acids are corrosive in nature. They cause burns.

Sulphuric acid (H_2SO_4), Hydrochloric acid (HCl), Nitric acid (HNO_3), etc. are commonly used in industries. They are used in making of fertilizers, dyes, pigments, explosives etc.

2. Taste of base is bitter. Substances that contain base taste bitter and feel soapy on touching are known as bases.

   Properties of Bases

   - Bases are hydroxide of metals.
   - Have bitter taste.
   - Turn red litmus to blue.
   - Soluble bases like sodium hydroxide, potassium hydroxide, calcium hydroxide are called as alkalis.
   - They are soapy to touch.

   Bases are used in the manufacture of paper and pulp industry, rayon, textiles, softening of hard water , as cleansing agent, manufacture of fertilizers etc.

3. Bases that dissolve in water are called alkalies. Soluble bases like sodium hydroxide, potassium hydroxide, calcium hydroxide are called as alkalis.

4. Solutions of substances that show different colour in acidic, basic and neutral solutions.

   Indicators can be divided into two types :

   Natural Indicator : Indicators that are obtained from naturally occurring substances are called natural Indicators. Example: litmus, turmeric, China rose, etc.

   Synthetic Indicator : Indicators that are made in laboratory are called synthetic indicators. Example : phenolphthalein, methyl orange, etc.

5. When a solution of acid is mixed with the solution of base, both of them neutralize each other and a third substance; called salt; is formed. Such phenomenon is called neutralization or neutralization reaction.

   Antacids like milk of magnesia (magnesium hydroxide), baking soda, etc. which contain a base are used for reducing acidity in stomach when excessive acid released by glands.

6. **Litmus :** It is the most commonly used natural indicator. Litmus is extracted from Lichens. Lichen is

a composite organism. Lichens consist of fungi and algae living in symbiotic relationship.

Litmus is a purple coloured liquid in distilled water. Litmus comes in the form of strips of two colours. One is called blue litmus paper and another is called red litmus paper. Litmus liquid and litmus paper are used to detect the acidic or basic nature of a substance.

Turmeric : Turmeric is also used as natural indicator. Turmeric is of yellow colour. Turmeric paper turns into red when it is dipped into basic solution. Turmeric paper does not change its colour with acid.

China Rose : China rose is another natural indicator. China rose solution gives dark pink (magenta) colour with acid and green colour with base.

All these indicators can be used to test whether the susbstance is acidic, basic or neutral.

7. **Objective :** To find out if the juice of lemon and antacid tablet and sodium chloride are acidic, basic or neutral.

   Material required : Water, lemon, antacid tablet, sodium chloride, test tubes, litmus solutions.

   Procedure : Make solutions of all three in water. Take about 2 ml of each them in separate test-tubes and add red and blue limus solutions into them.

   Observation : Blue litmus solution turns to red in lemon juice solution, red litmus turns to blue in antacid solution while both the red and blue litmus solution remain unchanged in sodium chloride solution.

   Conclusion : Lemon acid is acidic in nature, antacid is basic in nature and sodium chloride is neutral in nature.

Lesson – 6 : Physical and Chemical Changes

A. 1. chemical 2. physical

3. painting or greasing, galvanisation
4. sodium hydrogen carbonate
5. calcium carbonate

B. 1. True 2. False 3. True
4. False 5. True

C. 1. (b) 2. (b) 3. (b)
4. (b) 5. (d)

D. 1. Chemical change 2. Physical change
3. Chemical change 4. Physical change
5. Physical change 6. Chemical change

E. 1. Burning of wood is a chemical change because in burning new substances are formed as

Wood + oxygen —> Charcoal + carbon dioxide
+ heat + light

But cutting it into small pieces is physical change because no new substance is formed. We can only reduce the size of wood.

2. As content of moisture in the air in coastal areas is higher than in the air in deserts. So, the process of rusting is faster in coastal areas.

3. **Characteristics of Physical Change :**

- Only physical properties of substance change.
- No new substance is formed in this change.
- Most of the Physical changes are reversible.

Characteristics of Chemical Change : Chemical properties of substance change.

- New substance is formed.
- Some of the Chemical changes are irreversible.
- Chemical change cannot be reversed by simple physical means.

Signs of Chemical Change :

- Evolution of heat.
- Production of sound.
- Change in colour.

. Change in smell.

. Evolution of gas.

4. Formation of big and pure crystal of a substance from the saturated solution is called crystallisation.

5. When vinegar reacts with baking soda, it gives carbon dioxide. A hissing sound is produced when baking soda is added to vinegar. This happens because of production of carbon dioxide. When carbon dioxide is passed through lime water (calcium hydroxide), it turns the lime water milky. This happens because of formation of calcium carbonate. Water is also formed; along with calcium carbonate. The reaction involved in this can be written as follows :

$CH_3COOH + NaHCO_3 \rightarrow CH_3COONa + CO_2 + H_2O$

$CO_2 + Ca(OH)_2 \rightarrow CaCO_3 + H_2O$

F. 1. A change in which a substance undergoes a change in its physical properties such as shape, size, colour and state, is called a physical change. A physical change is generally reversible. In such a change no new substance is formed. For example – melting of wax, melting of ice into water.

Changes in which chemical properties of substance change and a new substance is formed are called chemical changes. Some of the chemical changes are irreversible. Even in case of reversible changes in which chemical properties of substance change and a new substance is formed are called chemical changes.

For example – burning of paper, wood, fuel, etc.

2. Deposition of a brown layer on iron is called rusting. In rusting, a new substance is formed. The chemical structures of iron and rust are completely different. Rust is iron oxide. Iron is a grey-black material while rust is reddish brown. Thus, this is a chemical and irreversible change. Reaction in rusting can be written as follows : $Fe + H_2O + O_2 \rightarrow Fe_2O_3$ (rust)

When articles made of iron come in contact with moisture present in air, they get rusted. Iron is converted into iron oxide, i.e. rust. The iron article becomes weak in due course as all the iron slowly turns into rust. This is called corrosion of iron. Rusting gives a huge monetary loss to the people and nation.

3. For rusting, both water and oxygen should come in contact with iron. If anyone of these is prevented to come in contact with iron, rusting can be prevented. So, rusting is prevented using following methods :

   Painting : Articles such as; iron gates, grills, etc. are painted at regular intervals of time.

   Applying of layer of grease : Applying a layer of grease prevents the iron articles from coming in contact with moist air. This prevents rusting. That is why grease is applied over the chain of bicycle and also over many machine parts.

   Galvanisation : In the process of galvanisation; a layer of non-reactive metal, such as zinc is deposited over iron articles. The layer of non-reactive metal prevents the iron articles from coming in contact with moisture. Thus it prevents rusting.

4. Magnesium ribbon burns with dazzling light in air and forms magnesium oxide. The ash of magnesium oxide gives magnesium hydroxide when mixed with water. Solution of magnesium hydroxide turns blue litmus paper red; this shows its basic characteristic. Reaction involved in it can be written as follows:

   $2Mg + O_2 \rightarrow 2MgO$ $MgO + H_2O \rightarrow Mg(OH)_2$

5. When carbon dioxide is passed through lime water (calcium hydroxide), it turns the lime water milky. This happens because of formation of calcium carbonate. Water is also formed; along with calcium carbonate. The reaction involved in this can be written as follows :

   $CH_3COOH + NaHCO_3 \rightarrow CH_3COONa + CO_2 + H_2O$

   $CO_2 + Ca(OH)_2 \rightarrow CaCO_3 + H_2O$

Lesson – 7 : Weather, Climate and Adaptations of Animals to Climate

A. 1. weather 2. humid
3. polar, tropical regions
4. Climate of the place
5. hot, dry

B. 1. True 2. False 3. True
4. False 5. False

C. 1. (b) 2. (c) 3. (b)
4. (a) 5. (d)

D. 1. Camel 2. Polar bear 3. Climate
4. Adaptation 5. Rainforest

E. 1. Rainforests have plenty of food which supports variety of life. Many animals are found in the rainforests, e.g. leopard, elephant, snakes, tigers, monkey, buffaloes, frogs, lizards, many types of birds, insects, etc.

2. Polar bear has a highly developed sense of smell. It helps the Polar bear in finding a fish even from under a thick layer of snow.

   These adaptations help Polar bear to survive in the extreme condition of the Polar Region.

3. Elephants have well developed sense of smell. It helps the elephant in finding the food. The trunk has powerful muscles which help the elephant in uprooting even a big tree. Elephants have good sense of hearing which help the elephant in sensing danger way in advance. An elephant uses its trunk to sprinkle water all over its body so that it can cool down its body temperature.

4. Weather changes frequently.

   Weather : Day to day atmospheric condition.

   Climate : Average atmospheric condition for atleast 25 years.

5. **Temperature :** Temperature depends upon the duration of sunshine. During the summer season, the

duration of the sunshine is longer. Due to this, the temperature is high in summer. The day temperature is minimum in the morning and maximum at noon.

Humidity : Humidity is the amount of moisture present in air. Humidity is generally measured in percentage. Humidity is generally at the highest level, during the rainy season.

Rainfall : Amount of rainfall is measured in terms of mm. For this, an apparatus; called rain gauge is used.

Wind-speed : Speed of wind also affects the condition of weather.

F. 1. In India, Tropical Rainforests are found in the Western Ghats and in Assam. Rainforests are also found in Southeast Asia, Central America and Central Africa.

Rainforests have plenty of food which supports variety of life. Many animals are found in the rainforests, e.g. leopard, elephant, snakes, tigers, monkey, buffaloes, frogs, lizards, many types of birds, insects, etc.

In spite of plenty of food, there is a high level of competition for survival among animals in the rainforest.

2. Polar bears have wide paws with long curved nails, called claws. This helps them to move on the snow. Polar bears keep on swimming to keep them cool. Wide paws work as a rudder, while swimming. They are very good swimmers.

Polar bear has a highly developed sense of smell. It helps the Polar bear in finding a fish even from under a thick layer of snow.

These adaptations help Polar bear to survive in the extreme condition of the Polar Region.

3. Penguins also live in the Polar Region. Penguins are of white colour with black back. They have thick layer of fat under their skin. This protects them from extreme cold.

. They usually remain huddled together. This helps in keeping them warm.

. They have curved claws which help them to walk in snow and to swim in water.

These adaptations help the penguin to survive in the extreme condition of the Polar Region.

Birds : There are many types of birds found in Polar Regions. They fly to the warm regions during winter to survive. Long distance travel; in search of favourable climate; is called migration.

Some migratory birds are known to travel as long as 15000 km to keep them survive in opposite climatic conditions. Arctic tern is known to be the longest traveler among the migratory birds.

Apart from birds, many fish and mammals also migrate to other places in such opposite climatic conditions.

4. **Rainforest :** Rainforest is found generally near the equator. Places near the equator receive more sunshine and hence more rainfall. This makes the place hot and humid. Temperatures vary from 15°C to 40°C near the equator. Rainforests are also present in some tropical areas.

Desert : Temperature in desert is generally higher and it receives less or little rainfall. So deserts are hot and dry.

Polar Region : Polar Region is at high latitude and hence do not receive adequate sunshine. Due to this, temperature is very low in the Polar Regions. The Polar Region is covered with snow, because of the low temperature.

Lesson – 8 : Wind, Storms and Cyclones

A. 1. moving 2. uneven 3. warm, cooler
4. high, low 5. thunderstorm

B. 1. False 2. False 3. False
4. False 5. True

C. 1. (a) 2. (b) 3. (a)
4. (a) 5. (c)

D. 1. (d) 2. (c) 3. (e)
4. (a) 5. (b)

E. 1. . Take a piece of a paper in our hand. Allow it to fall from our hand. It will flow in the direction in which wind is blowing.

. We can also use a wind-pane which helps us to know accurate wind direction.

2. . A car or a bus is a safe place to take shelter.

. If you are in water , get out and go inside a building.

3. On heating the air expands and occupies more space, it becomes lighter. The warm air is therefore lighter than the cold air. This is the reason that the smoke goes up.

4. It can damage houses, telephone poles, electric poles and uproot trees.

Strong wind of the cyclone may push the sea water towards the sea shore in the form of high wave. These high waves may damage houses and push water to low land which may be accompanied with loss of life and properties.

5. **Wind :** Moving air is called wind.

Monsoon : The flow of air from ocean towards land in summer.

F. 1. Fast moving air towards a centre; usually with heavy rain; is known as cyclone. Wind direction, wind speed, humidity and temperature together create cyclone.

Cyclone Forecast and Warning Services : With the advances in technology, cyclone can be forecast in about 24 to 48 hours in advance. This becomes possible because of satellites and computers. When a cyclone is nearer to the coastline, the cyclone warning is forecasted almost at every half an hour.

Rapid Communication to the Government and Concerned People : Communication about the cyclone is given quickly to the Government and the people so that proper safety measures and rescue operations can be carried out.

2. **Uneven Heating Between the Equator and Poles**

The Equatorial region gets the highest amount of sunshine throughout the year. Due to this, the air near the equatorial region gets heated. The warm air rises up and creates an area of low pressure. The cooler air; from the higher latitudes; rushes towards the equator to fill the gap. This results in the wind movement from tropical zones towards the equator. Similarly, wind movement is caused in other parts of earth.

Uneven Heating of Land and Water

Sea Breeze : In coastal areas, the land warms up faster than the ocean surface. Warm air from the land rises up and creates an area of low pressure near the ground. The low pressure zone is filled in by cooler air from the ocean surface. This gives rise to the sea breeze.

Land Breeze : During night, the land cools down faster than the ocean surface. The warmer air from the ocean surface rises up and creates an area of low pressure near the surface. This is filled in by cooler air from the land. This gives rise to the land breeze.

3. Many a times, rain is associated with lightning. Rain with lightning is called thunderstorm. This happens mostly in the summer. Thunderstorm occurs frequently in hot and humid tropical areas, such as India.

In summer, the air rises up along with lot of moisture. After rising up to a certain height water vapour cools down and starts coming down in the form of water droplets. The swift drifting of water droplets creates electricity among clouds. This manifests in the form of lighting and sound. This is known as thunderstorm.

4. **Objective :** To demonstrate that air expands on heating.

Materials Required : Balloons, glass bottle, water bath tub.

Procedure : Slip a deflated balloon in the narrow neck of a glass bottle. Put the bottle in a hot water-bath (trough).

Observation : The balloon starts inflating slowly as the glass bottle gets heated up. Next take out the bottle from the water bath and let it cool.

Observation : Balloon again gets deflated.

Conclusion : The air inside the bottle gets warmed up due to heating and expands. The excess volume of air enters into the balloon inflating it. On cooling, the volume of air decreases and thus deflating the balloon.

5. . Tube of bicycle gets inflated when air is filled in it. This happens because air exerts pressure.
   . We can fly a kite because air exerts pressure from the rear portion of the kite.
   . Aeroplane can fly because air exerts pressure.
   . Birds can fly because air exerts pressure.
   . High speed wind creates area of low air pressure.

Lesson – 9 : Soil

A. 1. humus 2. soil profile
3. rocks particles, sand 4. loamy soil
5. Sandy, clayey

B. 1. False 2. True 3. False
4. True 5. False

C. 1. (c) 2. (b) 3. (a)
4. (a) 5. (b)

D. 1. Wind 2. A-horizon
3. Loamy soil 4. Loamy soil
5. water

E. 1. (b) 2. (c) 3. (a)
4. (e) 5. (d)

F. 1. . It has very good water holding capacity.
. It is rich in organic matter.

2. Soil is formed by weathering. Weathering is the process of breaking down of rocks by the action of wind, water and climate. Formation of even one inch of soil takes many years.

3. Removal of topsoil by weathering agents; such as wind, water and ice is known as soil erosion.

Preventive Measures for Soil Erosion :

. Deforestation should be prevented at all cost to prevent soil erosion.
. Shelter belt plantation of trees is good for preventing soil erosion.
. Terrace farming in hilly areas is effective in preventing soil erosion.

4. **Objective :** To show that soil contain moisture.

Materials Required : Glass tube, soil, burner.

Procedure : Take a boiling tube. Put two spoonfulls of a soil sample in it. Heat it on a flame and observe.

Observation : On heating, water in the soil evaporates, moves up and condenses on the cooler inner walls of the upper part of the boiling tube.

Conclusion : This shows that soil contain moisture.

5. Amount of water drained through water in unit time is known as percolation rate of water in soil.

Percolation rate (mL/min) = Amount of water in mL/Time taken to percolate

G. 1. Different vertical layers of soil are known as soil profile. The feel (texture), colour and chemical compositions of soil are different in each layer.

Horizons : Layers of soil are referred as horizons. Horizons of soil are categorized into four types: A-horizon, B-horizon, C-horizon and Bedrock.

A–horizon : Top layer of soil is called A-horizon. It is also called top-soil. A-horizon is generally dark in

colour. It is rich in humus. The humus makes the soil fertile and provides nutrients to growing plants. A-horizon is generally soft and porous. It retains more water.

Roots of small plants are entirely embedded in topsoil. Topsoil also provides shelter to many living organism, such as worm, insect, moles, rats, snakes, etc.

B–horizon : The next layer of the soil from top is known as B-horizon. This layer is harder and more compact than the top soil. This is generally known as the middle layer of soil. This is less rich in humus but contains most of the minerals present in the soil.

C–horizon : The third layer of soil is known as C-horizon. C-horizon is made of small lumps of rocks with cracks and crevices.

Bedrock : The layer below the C-horizon is known as bedrock. Bedrock is composed of rocks and is hard to dig with spades.

(For diagram see page 72)

2. **Sandy Soil :** Particles of sandy soil are larger in size. Because of being larger in size, sand particles cannot fit close together and hence there is enough space among them. These spaces are filled with air. Water drains quickly through sandy soil. So, sandy soil is called well aerated, light and dry.

Sandy soil is not fit for vegetation as it does not retain water. However, millets can be grown on sandy soil.

Clayey Soil : Particles of clayey soil are very small in size. This makes the particles of clayey soil packed tightly. There is very little space among the particles. Water does not drain quickly through clayey soil because of less space among particles. So, clayey soil is not well aerated and retains more water.

Clayey soil is used in making of toys. Clayey soil is good for growing paddy.

Loamy Soil : Particles of loamy soil are smaller than sand and larger than clay. Loamy soil is the mixture of sandy soil, clayey soil and silt. Silt is the deposit in river beds.

Loamy soil has right water holding capacity and is well aerated. This is considered as the best soil for the growth of plants.

3. **Percolation Rate of Water :** Amount of water drained through water in unit time is known as percolation rate of water in soil. Percolation rate of water can be calculated using the formula given here.

   Percolation rate (mL/min) = Amount of water in mL/Time taken to percolate

   The percolation rate of water in sandy soil is fastest and in clayey soil is slowest.

   Moisture Present in Soil : Amount of water present in soil is called moisture present in soil. The amount of moisture present in clayey soil is highest and that in sandy soil is lowest.

   Absorption of Water : Different soil absorbs different amount of water. Clayey soil absorbs the highest amount of water because of its higher water retention capacity. On the other hand, sandy soil absorbs the least amount of water because of its lower water retention capacity.

4. **Objective :** To show the presence of different constituents in the soil.

   Materials Required : Soil, glass tumbler, water

   Procedure : Take a little soil. Break the clumps with your hand to powder it. Now take a glass tumbler, three quarters filled with water, and then add a handful of soil to it. Stir it well with a stick to dissolve the soil. Now let it stand undisturbed for some time.

   Observation : Different layers are formed in the tumbler. The heavier particles of soil settle at the bottom. The lighter and less dense constituent

particles make layers above in gradual decreasing particle size.

Conclusion : Soil is composed of distinct layers.

(For diagram see page 72)

5. Different types of soil are found are found at different places. A particular soil type may not be suitable for certain types of crop. That's why different types of crop are grown in different parts of the world.

   Sandy Soil : Sandy soil is not fit for any crop as it does not retain water. However, some thorns and bushes do grow on sandy soil. Millets can be grown on sandy soil.

   Clayey Soil : Clayey soil is best suited for paddy, as it can retain water for a longer time. This is also suitable for wheat and grams.

   Loamy Soil : Loamy soil is considered the best for almost all types of crops. It is suitable for lentils and other pulses as this soil drain water easily.

   Sandy Loam : Sandy loam soil is suitable for the growth of cotton plants as it can easily drain water and is well aerated.

Lesson – 10 : Respiration in Organisms

A. 1. carbon dioxide 2. organs
3. gills
4. cellular respiration 5. breathing rate

B. 1. False 2. False 3. True
4. False 5. True

C. 1. (c) 2. (b) 3. (b)
4. (b) 5. (a)

D. 1. Stomata 2. Nostrils 3. Yeast
4. Spiracles 5. Ribs

E. 1. Frogs are adapted to live life in water as well as on land in the following ways :

. Frogs have webbed back feet which help them to swim in water.

. Frogs have strong back legs for hopping and catching their prey.

2. The cramps occur when muscle cells respire anaerobically. The partial breakdown of glucose produces lactic acid. The accumulation of lactic acid causes muscle cramps.
3. When we inhale, the particles get trapped in the air present in our nasal cavity. This may irritate the lining of the cavity, as a result of which we sneeze. Sneezing expels these foreign particles from the inhaled air and a dust free, clean air enters our body.
4. During the run, the demand of energy is high but the supply of oxygen to produce energy is limited. Therefore, anaerobic respiration takes places in the muscle cells to fulfil the demand of energy.
5. Fish also need oxygen to live but their lungs are not designed to extract oxygen from the air. Instead by passing the water through their gills, they can remove the oxygen and eliminate waste gases. Since humans do not have gills, we cannot extract oxygen from water. We cannot survive under water.

F. 1. **Respiration :** The biological process in which food is utilized to produce energy is called respiration.

Breathing : The process of taking in, and giving out air for respiration.

2. Respiration happens inside the cells. As respiration happens inside the cell, it is also called cellular respiration.
3. Yeasts are single-celled organisms. They respire anaerobically and during this process yield alcohol. They are, therefore, used to make wine and beer.
4. Because the amount of air available to a person is less than that available on the ground.
5. Earthworms breathe through their skin. The skin of earthworm always remains moist, which helps in breathing.

G. 1. **Similarities**

- Both takes place inside cells.
- Both produces byproducts.
- Food is broken down to release energy.

Aerobic Respiration : Aerobic respiration takes place in the presence of oxygen. Carbon dioxide and water are the end products of aerobic respiration. Aerobic respiration happens in most of the organisms. When breakdown of glucose occurs with the use of oxygen it is called aerobic respiration.

Glucose (Presence of oxygen) $\rightarrow$ Carbon dioxide + Water + Energy

Anaerobic Respiration : Anaerobic respiration takes place in the absence of oxygen. Anaerobic respiration usually happens in most of the microbes. Alcohol and carbon dioxide are formed at the end of anaerobic respiration. In some cases, lactic acid is formed at the end of anaerobic respiration. Food can also be broke down , without using oxygen. This is called anaerobic respiration.

Glucose (absence of oxygen) $\rightarrow$ Alcohol + Carbon dioxide + Energy

2. When the diaphragm moves down, the ribcage expands. This leads to the expansion inside the lungs. As a result, the air moves into the lungs. This process is called inspiration or inhalation.

   When the diaphragm moves up, the ribcage contracts. This leads to contraction of the lungs. As a result, the air moves out of the lungs. This process is called expiration or exhalation.

3. Amphibians breathe through their skin, when they are in water.

   Breathing in Fish : Fish have a pair of gills. They breathe air; dissolved in water; through gills. Gills are projections of the skin.

   Breathing in Cockroach : Cockroach and other insects have small openings on the sides of its body.

These openings are called spiracles. There is a network of hollow tubes running through the body of an insect. These hollow tubes are called tracheae for gas exchange. Oxygen rich air gushes through spiracles into the tracheal tubes, diffuses into the body tissue, and reaches every cell of the body. Similarly carbon dioxide from the cells goes into the tracheal tubes and move out through spiracles.

4. **Objective :** To demosnstrate that the exhaled air by us has more carbon dioxide.

   Materials Required : test tube, lime water, straw.

   Procedure : Take a test tube and pour some lime water in it. Dip a drinking straw in a test tube. Blow air in limewater through the drinking straw.

   Observation : The limewater turns milky.

   Conclusion : This shows that carbon dioxide is released during exhalation.

5. Normally we take in air through our nostrils. When we inhale air, it passes through our nostrils into the nasal cavity. From the nasal cavity, the air reaches our lungs through the windpipe. Lungs are present in the chest cavity. This cavity is surrounded by ribs on the sides. A large, muscular sheet called diaphragm forms the floor of the chest cavity.

   The breathing is controlled by the movement of diaphragm. Diaphragm is a membrane which is between the chest and abdomen. The movement of diaphragm is controlled by a group of muscles; called intecostalis muscles.

   When the diaphragm moves down, the ribcage expands. This leads to the expansion inside the lungs. As a result, the air moves into the lungs. This process is called inspiration or inhalation.

   When the diaphragm moves up, the ribcage contracts. This leads to contraction of the lungs. As a result, the air moves out of the lungs. This process is called expiration or exhalation.

Lesson – 11 : Transportation in Animals and Plants

A. 1. arteries 2. red blood 3. transpiration
4. urine 5. salts

B. 1. True 2. False 3. False
4. True 5. False

C. 1. (a) 2. (c) 3. (b)
4. (b) 5. (a)

D. 1. Blood 2. Blood capillaries
3. Haemoglobin 4. Heart 5. Platelets

E. 1. There are numerous small pores on the surface of leaves. These pores are called stomata. Water vapour is continuously removed through stomata during daytime. Removal of water vapour in plants is called transpiration. This creates a pull in the underlying xylem tissues. The pull is called transpiration pull. Transpiration pull creates a suction effect on the water column inside the xylem.

2. Place a middle and index finger of your right hand on the inner side of your left wrist. Can you feel some throbbing movements ? This throbbing is called the pulse and it is due to the blood flowing in the arteries.

   Count the number of pulse beats in one minute. The number of beats per minute is called the pulse rate.

3. **Arteries :** Arteries are made of thicker walls. Arteries carry oxygenated blood from the heart to different organs. Pulmonary artery is an exception, because it carries deoxygenated blood from the heart to the lungs.

   Veins : Veins are made of thinner walls. Veins carry deoxygenated blood from different organs to the heart. Pulmonary vein is an exception, because it carries oxygenated blood from the lungs to the heart.

4. While pumping the blood, different chambers of the heart contract and relax in turns. The contraction and relaxation of different chambers produces a thumping sound. This sound can be heard as heart beat.

Stethoscope is the instrument used to provide information about heart heat.

5. It is the carrier of various susbstances. It transports substances like digested food from the small intestine to the other parts of the body. It carries oxygen from the lungs to the cells of the body. It also transport waste for removal from the body.

F. 1. **Transport of Water and Minerals :** For transportation in plants, there are two main tissues, viz. xylem and phloem. These are composed of narrow tube-like structures. Xylem is responsible for transport of water, while phloem is responsible for transport of food.

Transport of Water : Plants take water from soil. Following are the main steps in transport of water in plants.

In Roots : From soil, the water enters the root hairs because of osmosis. The root hair increase the surface area of the root for the absorption of water and mineral nutrients dissolved in water. From root hairs water enters further because of root pressure. Plants have pipe like vessels to transport water and nutrients from the soil. These vessels are made of special cells, forming the vascular tissue. A tissue is a group of cells that perform specialized function in an organism. The vascular tissue for the transport of water and nutrients in the plant is called the xylem.

In Stem : Various factors are at play during transportation of water through xylem in stems. The transport of water through xylem is also called 'Ascent of Sap'.

- Root pressure is responsible for the rise of water to some height.
- Capillary action pushes the water further up. The rise of liquid in a very narrow tube is called capillary action. Capillary action happens because of very small diameter of the tube.

. Adhesion Cohesion : Water molecules stick to each other and make a continuous column inside the xylem tubes.

Transpiration Pull : There are numerous small pores on the surface of leaves. These pores are called stomata. Water vapour is continuously removed through stomata during daytime. Removal of water vapour in plants is called transpiration. This creates a pull in the underlying xylem tissues. The pull is called transpiration pull. Transpiration pull creates a suction effect on the water column inside the xylem.

Transportation of Food

Food is prepared in leaves and needs to be transported to different plant parts for use and for storage. The transport of food takes place through phloem. Some biological force is used in transport of food in plants.

2. The heart is a small muscular organ which is responsible for pumping the blood. The human heart has four chambers, viz. the right auricle, the right ventricle, the left auricle and the left ventricle. The upper chambers are called auricle or atrium. The lower chambers are called ventricle. The following flow chart shows the movement of blood through the heart :

   From the body → Right Auricle → Right Ventricle → Pulmonary Artery → Lungs → Pulmonary Vein → Left Auricle → Left Ventricle → To the body.

   (For diagram see page 88)

3. **Plasma :** Plasma makes the liquid part of the blood. It makes the largest part of the blood. Plasma is pale in colour.

   Blood Cells : There are two main kinds of blood cells in the human blood, viz. Red Blood Cells and White Blood Cells.

   Red Blood Cells or Red Blood Corpuscles (RBC) : These are in the shape of discs. They contain a

pigment; called haemoglobin. Haemoglobin binds with oxygen and thus is mainly responsible for transportation of oxygen in the body. Haemoglobin also transports some amount of carbon dioxide.

White Blood Cells or White Blood Corpuscles (WBC) : These are present in various shapes. WBCs engulf foreign particles and harmful microbes. Thus, WBCs help in fighting the diseases. WBCs make the immune system of the body.

4. The human excretory system is composed of a pair of kidneys, two tubes; called ureter and a urinary bladder.

   The waste which is present in the blood has to be removed from the body. A mechanism to filter the blood is required. This is done by the blood capillaries in the kidneys. When the blood reaches the two kidneys, it contains both useful and harmful substances. The useful substances are absorbed back into the blood. The waste dissolved in water are removed as urine. From the kidneys, the urine goes into the urinary bladder through tube-like ureters. It is stored in the bladder and is passed out through the urinary opening at the end of a muscular tube called urethra.

   An adult human being normally passes about 1-1.8 L of urine in 24 hours. The urine consists of 95% water, 2.5 % urea, and 2.5 % other waste products.

   We all have experienced that we sweat on a hot summer day. The sweat contains water and salts. We also observed that patches are formed on our clothes, especially in areas like underarms. These marks are left by salts present in the sweat.

5. **Diffusion :** Random motion of particles in order to attain equilibrium of concentration is called diffusion. Diffusion can be observed in many aspects of day to day life. The aroma of food comes from the kitchen because of diffusion. A pleasant smell of flowers comes because of diffusion. Bad odour of garbage comes because of diffusion.

Osmosis : Movement of water through a semi-permeable membrane from high water concentration to low water concentration is called osmosis. Osmosis is a type of diffusion. Cell membrane is a semi-permeable membrane. Substances move across the cell membrane because of osmosis. Seeds swell up; when soaked in water; because of osmosis.

Lesson – 12 : Reproduction in Plants

A. 1. vegetative reproduction 2. unisexual flower
3. pollination 4. fertilization
5. wind, water, animals

B. 1. True 2. True 3. True
4. False 5. True

C. 1. (d) 2. (a) 3. (d)
4. (b) 5. (b)

D. 1. Urena 2. Bisexual flower
3. Vegetative propagation 4. Dispersal of seeds
5. Fertilization

E. 1. (c) 2. (e) 3. (b)
4. (a) 5. (d)

F. 1. **Unisexual :** Plants which contain either only pistil or stamens.

Bisexual : Plants which contain both pistil and stamens.

2. Without a mechanism for reproduction, life would come to an end.

3. **Self Pollination :** When anthers of the same flower are transferred to the stigma; it is called self pollination.

Cross Pollination : When anthers from a different flower are transferred to the stigma; it is called cross pollination.

4. Yeast is a fungus and fungi are also known as non-green plants. The yeast cell produces a bud which

gets its own nucleus. The bud develops to certain size and detaches from the mother cell to produce the new yeast. The new yeast cell grows, matures and produces more yeast cells. Sometimes, another bud arises from the bud forming a chain of buds. If the process continues, a large number of yeast cells are produced in a short time.

5. Special spore-bearing organs are present in some plants; especially in fungi and algae. These are called sporangiophores. The sporangiophore bears spores. The spores germinate to develop a new plant.

   Observe the spores in the cotton like mesh on the bread. When spores are released they keep floating in the air. As they are very light they can cover long distances. Spores are asexual reproductive bodies. Each spore is covered by a hard protective coat to withstand unfavourable conditions such as high temperature and low humidity. So they can survive for long time. Under favourable conditions, a spore germinates and develops into a new individual.

G. 1. **Vegetative Propagation :** When a new plant is developed by a vegetative part; such as root, stem or leaf; it is known as vegetative propagation. For example: when the tuber of potato is cut into several pieces and each piece bears an ‘eye’; each piece produces a new plant. The stems of moneyplant, rose, mango, etc. can produce new plants when they are inserted in soil. The leaf of bryophyllum produces new plants through its notches.

   Plants like cacti produce new plants when their parts get detached from the main plant body. Each detached part can grow into a new plant.

   Plants produced by vegetative propagation take less time to grow and bear flowers and fruits earlier than those produced from seeds. The new plants are exact copies of the parent plant, as they are produced from a single parent.

   Budding : This method is used by unicellular plants;

like yeast. Yeast is a fungus and fungi are also known as non-green plants. The yeast cell produces a bud which gets its own nucleus. The bud develops to certain size and detaches from the mother cell to produce the new yeast. The new yeast cell grows, matures and produces more yeast cells. Sometimes, another bud arises from the bud forming a chain of buds. If the process continues, a large number of yeast cells are produced in a short time.

Fragmentation : In some simple plants, the plant body is divided into smaller fragments. Each fragment then develops into a new plant. Example: Spirogyra.

Fragmentation in algae occurs as when water and nutrients are available algae grow and multiply rapidly by fragmentation. An alga breaks up into two or more fragments. These fragments or pieces grow into new individuals. This process continues and they cover a large area in a short period of time.

Spore Formation : Special spore-bearing organs are present in some plants; especially in fungi and algae. These are called sporangiophores. The sporangiophore bears spores. The spores germinate to develop a new plant.

Observe the spores in the cotton like mesh on the bread. When spores are released they keep floating in the air. As they are very light they can cover long distances. Spores are asexual reproductive bodies. Each spore is covered by a hard protective coat to withstand unfavourable conditions such as high temperature and low humidity. So they can survive for long time. Under favourable conditions, a spore germinates and develops into a new individual.

2. Flower is a special organ of flowering plants (angiosperms) which works as the reproductive system. A flower is composed of four distinct whorls.

Calyx : The outermost whorl is called calyx. It is composed of green leaf-like structures; called sepals.

Corolla : The second whorl is called corolla. It is composed of colourful structures; called petals. Petals are colourful so that insects and other animals can be attracted towards them. This is necessary for pollination.

Androecium: The third whorl is called androecium. It is composed of stamens. Stamen has two main parts. The tube-like portion is called filament. The capsule like structure at the top is called anther. The anther produces pollen grains; which are the male gametes.

Gynoecium : The whorl at the center is called gynoecium. It has a swollen base; called ovary and a tube-like structure; called style. The top of the tube is somewhat flattened and is called stigma. Ovary produces the eggs or female gametes.

Flowers which contain either only pistil or only stamens are called unisexual flowers. Flowers which contain both stamens and pistil are called bisexual flowers. Corn, papaya and cucumber produce unisexual flowers, whereas mustard, rose and petunia have bisexual flowers. Both male and female unisexual flowers may be present in the same plant or in different plants.

3. **Calyx :** The outermost whorl is called calyx. It is composed of green leaf-like structures; called sepals.

   Corolla : The second whorl is called corolla. It is composed of colourful structures; called petals. Petals are colourful so that insects and other animals can be attracted towards them. This is necessary for pollination.

   Androecium : The third whorl is called androecium. It is composed of stamens. Stamen has two main parts. The tube-like portion is called filament. The capsule like structure at the top is called anther. The anther produces pollen grains; which are the male gametes.

Gynoecium : The whorl at the center is called gynoecium. It has a swollen base; called ovary and a tube-like structure; called style. The top of the tube is somewhat flattened and is called stigma. Ovary produces the eggs or female gametes.

4. In asexual reproduction plants can give rise to new plants without seeds, whereas in sexual reproduction, new plants are obtained from seeds.

   When a single parent is involved in the process, it is called asexual reproduction.

   When two parents are involved in the process, it is called sexual reproduction. Two gametes, viz. male and female gametes, are formed. The fusion of male and female gametes is called fertilization. Zygote is formed after fertilization. The zygote develops into an embryo and finally into a new individual.

5. **Dispersal by Wind :** Seeds of some plants are light-weight and some hair-like or wing-like structures are present on them. Such seeds float on air and are thus dispersed by wind. Example: Dandelion, maple, drumstick, etc.

   Dispersal by Water : Dispersal by water takes place in some aquatic plants and in some which grow near a water body. Seeds of water lily float and thus dispersed by water. The coconut seed has a tough fibrous covering which has plenty of air inside. This helps the coconut seeds in floating on water.

   Dispersal by Animals : Some seeds have spine like structures on them. They get stuck to the fur of animals and thus get spread to different places. Examples; Beggar tick, Xanthium, Urena, etc. Some seeds are swallowed by birds and animals along with fruits. These seeds get dispersed with bird or animal droppings.

   Dispersal by Bursting : Some fruits burst open when they mature. The force of bursting is enough to spread the seeds. Examples; Ladyfinger, castor, balsam, etc.

Dispersal by Humans : Human beings also help in dispersal of seeds, especially during farming.

Lesson – 13 : Motion and Time

A. 1. rest 2. relative 3. interval of time
4. periodic 5. speedometer

B. 1. True 2. False 3. True
4. True 5. True

C. 1. (a) 2. (d) 3. (b)
4. (b) 5. (a)

D. 1. Odometer 2. Speed 3. Motion
4. Uniform motion 5. Human heart beat

E. 1. It helps in calculating and locating the position of the body more easily.

2. **Uniform Speed :** If an object covers a fixed distance in each unit of time the motion is known as uniform motion or uniform speed.

   Non-uniform Speed : If an object does not cover a fixed distance in each unit of time the motion is known as non-uniform motion or non-uniform speed.

3. Time taken to complete 5 oscillations = 15

   Time taken to complete 1 oscillation = 15/5 s = 3 s

   Time period of a pendulum is time taken by it to complete 1 oscillation.

   Time period of pendulum is 3 seconds.

4. Because they depend on the observer's frame of reference. If an observer is at rest in his or her own frame of reference, but he may be moving in other observer's frame of reference.

5. a. Oscillatory motion b. Linear motion
   c. Oscillatory motion d. Oscillatory motion

F. 1. Distance = 240 km

Time taken = 4 hours

Speed = Distance covered / time taken = 240 km/ 4

Speed of train = 60 km/h

Hammer = 60 km/h.

2. Time taken = 15 min

   Speed = 2 m/min

   Distance = speed × time = 2 × 15 = 30 m

   Distance between Salam's school and her house is 30 m.

3. When an object repeats its motion after every fixed interval of time, the motion of the object is called periodic motion or oscillatory motion.

   In many wall clocks pendulum is used even today. A device having a string suspended with a fixed point with a bob at bottom is called pendulum.

   The motion of pendulum starting from one extreme end to another extreme end and back to the first extreme end is called one oscillation. Similarly, the motion of a simple pendulum from its mean position to extreme left and extreme right and back to the mean position is called one oscillation.

4. In everyday life we seldom find objects moving with a constant speed over long distances or for long durations of time. If the speed of the object moving along a straight line keeps changing, its motion is said to be non-uniform. On the other hand, an object moving along a straight line with a constant speed is said to be in uniform motion.

   Types of Motion

   Rectilinear Motion : Motion along a straight line is known as rectilinear motion or motion along a straight line. For example : Motion of a car along a straight line.

   Curvilinear Motion : Motion along a curve line is known as curvilinear motion. For example: Motion of car or any moving object along a curve line.

   Circular Motion : Motion along a circle is known as circular motion. For example: Motion of cyclist along a circular park.

5. When distance covered by an object and time taken to cover the distance is represented on a graph, the graph is called distance time graph.

   If a vehicle cover a distance of 5 km every hour and travels for 5 hours, the time distance time graph for the given vehicle can be plotted as follows using the table given below :

Time(in hour)	1	2	3	4	5
Distance(in km)	5	10	15	20	25

   Distance time graph of a moving vehicle with a constant speed is a straight slanting line.

   Speed-time graph for the same vehicle will be a straight line parallel to x-axis.

   (For graph see page 107 in book)

Lesson – 14 : Electric Current and Its Effects

A. 1. positive 2. battery
3. becomes red hot and emits heat
4. fuse 5. electromagnet

B. 1. False 2. True 3. False
4. True 5. False

C. 1. (d) 2. (a) 3. (a)
4. (a) 5. (a)

D. 1. Fuse 2. Plastic 3. Battery
4. Tungsten filament 5. Plastic

E. 1. A fuse wire has a low melting point because it contains a thin metal wire which has low melting point if electricity flow more it melt.

2. Because if we will connect the wire, the nail will attract the metal and if we will not connect the wire, the nail will not attract the metal.

3. Because plastic is light weight and electrically insulated. To insulate and to avoid current shock, that's why handle is made up of plastic. Steel is a good conductor of electricity. That's why screw driver is made up of steel.

4. Because CFL's are up to four times more efficient than bulbs. We can replace a 100-watt incandescent bulb with a 22-watt CFL and get the same amount of light.

F. 1. **Electric Current :** The flow of electric charge.

Electric Circuit : It is a continuous conducting path for electric current to pass through various circuit elements connected to a source of electricity.

2. **Open Electric Circuit :** In this circuit, electric path is broken at key. Here bulb will not glow.

Closed Electric Circuit : In this circuit , electric path is complete. Here bulb will glow.

3. A fuse is thus a safety device which prevents damages to electrical circuits and possible fires.

4. A current carrying coil of an insulated wire wrapped around a piece of iron.

5. MCBs have been replacing electric fuse from wirings at most of the places. The electric fuse has a big practical problem. Whenever the wire fuses, one needs to replace the wire to resume electric supply. More often than not, this proves to be a cumbersome task. Miniature circuit breakers break the circuit automatically. One just needs to switch it on to resume the electric supply. Many models of MCBs have a built in mechanism by which the electric supply is automatically resumed.

6. . Heating and lighting effect.
   . Electric current can convert a straight conductor into a temporary magnet.

G. 1. . Thickness of wire of element the thinner wire the more heating effect.
   . Current passing through the wire.
   . Length of the conductor and resistance of that conductor.

2. When electric current flows through a conducting wire, the temperature of wire increases. This is called heating effect of electric current.

Devices Which Work on Heating Effect of Electric Current : Incandescent bulb is an example of a device which works because of the heating effect of electric current. The filament of bulb is made of tungsten. Tungsten has very high melting point and that is the reason it is used in electric bulb. Moreover, argon gas is filled inside the bulb. Argon prevents the filament from catching fire. Electric iron, water heater, geyser, toaster, etc. are some other devices which work on heating effect of electric current.

Elements of Heating Appliances : A heating appliance has a highly coiled wire or a metallic rod. This is called the element of the heating appliance. The highly coiled structure increases the surface area and thus provides more heat. The elements are usually made of constantan which is a metal with very high melting point.

The amount of heat produced in a wire depends on its material, length and thickness. Thus for different requirements, the wires of different materials and different lengths and thicknesses are used.

The wires used for making electric circuits do not normally become hot. On the other hand, the elements of some electrical appliances become so hot that they are easily visible.

Wires made from some special materials melt quickly and break when large electric currents are passed through them. These wires are used for making electric fuses. In all buildings fuses are inserted in all electrical circuits. There is a maximum limit on the current which can safely flow through a circuit. If by accident the current exceeds the safe limit, the wires may become overheated and may cause fire. If a proper fuse is there in the circuit, it will blow off and break the circuit.

A fuse is thus a safety device which prevents damages to electrical circuits and possible fires.

MCBs (Miniature Circuit Breaker) : MCBs have been replacing electric fuse from wirings at most of the places. The electric fuse has a big practical problem. Whenever the wire fuses, one needs to replace the wire to resume electric supply. More often than not, this proves to be a cumbersome task. Miniature circuit breakers break the circuit automatically. One just needs to switch it on to resume the electric supply. Many models of MCBs have a built in mechanism by which the electric supply is automatically resumed.

3. Electric Bell is composed of two rods of cast iron. Coil is made around the iron rods. A metallic strip is placed parallel to the coils. The metallic strip is fitted with a hammer at one end. Another end of the strip is connected to the circuit. A gong is placed in a position so that it can be hit by the hammer. When current flows in the circuit, the cast iron rods become electromagnet and attract the metallic strip. The metallic hammer hits the gong because of that. Once the metallic strip is pulled towards the electromagnet, it gets disconnected from the point and there is a break in the circuit. A spring pulls the metallic strip back because no magnetism is left in the electromagnet. This cycle continues and the electric bell produces a ringing sound.

4. The components of electric circuit are bulbs, wires, key, dry cell, ammeter, resister etc.

   Use of standard symbol makes it easy to understand for anybody. For example; a TV mechanic can identify different components of a TV by looking at its circuit diagram.

   Electric Cell : It is a device which produces electric charge because of some chemical reactions. The cell which is used in a torch is called dry cell. The wet cells are used in car batteries. A normal dry cell gives an output of 1.5 Volt (V).

Battery : A group of cells is called battery. More than one cell is used in most of the devices; because the device needs more than 1.5 V of power.In this the positive terminal of one cell is connected to the negative terminal of the next cell.

(For symbols see Page 112 in book)

Lesson – 15 : Light

A. 1. virtual image 2. mirror 3. plane
4. real 5. lens

B. 1. False 2. True 3. True
4. False 5. False

C. 1. (b) 2. (c) 3. (a)
4. (d) 5. (b)

D. 1. Visible spectrum 2. Concave mirror
3. Convex mirror 4. Rainbow
5. Regular reflection

E. 1. Light always travels in a straight line. The following experiment proves that light always travels in a straight line. When the candle is viewed through a straight tube, its flame can be seen. In case of a bent pipe, the flame cannot be seen.

2. Concave mirror is used by dentists and ENT specialists to focus a beam of light to see inside a patient's mouth or ears.

3. Because when the object is placed between the pole and the focus on one side of the lens, an enlarged, erect and virtual image is produced on the same side of the lens.

F. 1. There are two laws of reflection.

. The incident ray, the reflected ray and the normal at the point of incidence lie in the same plane.

. Angle of incidence and angle of reflection are equal. (<i = <r)

Whenever an image is formed by a mirror or by any reflecting surface; the laws of reflection are obeyed.

2. **Real image :** An image that can be obtained on screen.

   Virtual image : An image that can not be obtained on screen.

3. A concave lens diverges (bends outward) the light and is called as diverging lens.

4. A convex lens converges (bend inwards) the light generally falling on it. Therefore it is called as converging lens.

   Image Formation in Convex Lens : In case of convex lens, the image is usually inverted, real and smaller than the object. When the object is kept too close to the convex lens, the image is erect, virtual and larger than the object. A Convex lens converges (bend inwards) the light generally falling on it. Therefore it is called as converging lens.

   Image Formation Concave Lens : In case of concave lens, the image is erect, virtual and smaller than the object. A concave lens diverges (bends outward) the light and is called as diverging lens.

5. . Concave mirror is used by dentists and ENT specialists to focus a beam of light to see inside a patient's mouth or ears.
   . Concave mirror is used as barber's mirror, because it shows a larger image when object is too close.
   . Convex mirror is used in rear view mirrors, as it shows smaller images from a bigger field of view.
   . Convex mirror is used on hairpin bends, to see the vehicles coming from other side of the bend.

G. 1. **Objective :** To verify laws of reflection.

Materials Required : Plane mirror, white card sheet.

Procedure : Paste a small strip of plane mirror on a white card sheet. Let this stand vertically with the help of some support on a white paper. Fine ray of light fall on the plane mirror through a ray box. You will observe another ray emerging out of the mirror. Mark the positions of both incident ray and reflected ray with points on paper. Remove all the things from paper. Join the points marked. Draw a perpendicular at the point of incidence. This is the normal.

Observation : Now on measuring the angle of incidence and reflection, it is seen that both the angles are equal to each other.

Conclusion :

- Angle of incidence <i= angle of reflection <r
- Incident ray, reflected ray and normal all lie in the same plane.

2. The light ray fall from a luminous object on the reflecting surface (like mirror) at an angle. This is called incident ray and it forms angle of incidence (<i)

   The ray of light after incidence bounces back at an equal and opposite angle to the normal called the angle of reflection (<r), the ray is called as the reflected ray.

3. When the reflection is from smooth and highly polished surface, this is called as regular reflection while when the reflection is from rough surface the reflection is called irregular or diffused reflection.

   Place a lighted candle in front of a plane mirror. Try to see the flame of a candle in the mirror. It appears as if similar candle is placed behind the mirror. The candle which appears behind the mirror , is the image of the candle formed by the mirror. The candle itself is the object. Image is of the same size as object. The distance of image and object from the plane mirror is same. Image is erect and virtual.

4. The white light, or visible spectrum, is composed of seven colours. These colours are VIBGYOR (Violet, Indigo, Blue, Green, Yellow, Orange and Red). When white light passes through a prism, it breaks down into its component colours. This is the reason rainbows show all the colours of the visible spectrum.

Lesson – 16 : Water : A Precious Resource

A. 1. wells, hand pumps 2. liquid, solid, gas
3. aquifer 4. infiltration

B. 1. True 2. False 3. False
4. True 5. True

C. 1. (c) 2. (d) 3. (c)
4. (a) 5. (c)

D. 1. Water cycle 2. Water table 3. Infiltration
4. Aquifier 5. Groundwater

E. 1. Drinking, bathing, washing, cooking

2. Water is the most important natural resource on earth. Life is sustained because of water and air.

3. . Immediately repair any leaking tap in the household.
   . Don't let the tap remain open while brushing your teeth.
   . Water left after washing or bathing can be used for mopping and for watering the plants.
   . Avoid using a shower and use a bucketful of water instead.

4. Water from the surface of the earth keeps on evaporating and turns into vapour. The water vapour also comes from green plants through transpiration. The water vapour condenses to form clouds.

5. Water drawn from under the ground gets restored by seepage of rainwater. The water table does not get affected as long as we draw as much water as is

replenished by natural processes. However, water table may go down if the water is not sufficiently replenished.

Water is used by all the industries. Almost everything we use needs water somewhere in its production process. The number of industries is increasing continuously.

F. 1. **Evaporation :** Water from the surface of the earth keeps on evaporating and turns into vapour. The water vapour also comes from green plants through transpiration.

Condensation : The water vapour condenses to form clouds.

Precipitation : Water from the clouds falls on the land; in the form of precipitation. At higher altitudes, the condensed water from the clouds also falls in the form of ice.

Collection : The rainwater falls on the ground and runs off to the nearest water bodies. Some of this water seeps down the ground to recharge the groundwater. Rest of the water goes to the ocean via rivers.

2. Due to growing human population, there is an increased demand for potable water. There is more need for drinking water and also for water for other purposes; like irrigation, economic activities and recreation. The supply of water either remains the same or has decreased, but demand has been continuously increasing. The mismatch in supply and demand is resulting in depletion of water table and most of the places are facing acute shortage of water.

3. In many places a regular supply of water is provided by a well planned pipe system. When the civic authorities supply water through pipes not all of it may reach the destination. Sometimes the water supply pipes may get leak and a lot of water gushes out of the pipe. It is the responsibility of the civic authorities to prevent such wastage of precious water.

Mismanagement or wastage may take place at the level of individuals also. All of us, knowingly or unknowingly waste water while brushing teeth, shaving, bathing, washing and other activities. Leaking taps is another source of huge water wastage.

We have seen the most of the water that we get as rainfall just flows away. This is a waste of precious natural resource.

4. The water found below the water table is called groundwater.

   The rainwater and water from other sources such as rivers and ponds seeps through the soil and fills the empty spaces and cracks deep below the ground. The process of seeping of water into the ground is called infiltration. The groundwater thus gets recharged by this process.

5. Collection of rainwater for future use is called rainwater harvesting. India has a long history of different rainwater harvesting structures; especially in rain deficient areas. For example; tankas and bawris had been in use in the northwestern part of India; especially in Rajasthan. Tanka is an underground tank to collect rainwater. Bawri is an open tank in which water used to be collected. Steps were made around the bawri so that one can easily access the water.

   Rainwater harvesting can also be done in modern homes. The runoff rainwater from the rooftop should be collected in an underground reservoir. Such reservoirs are usually filled with sand and gravel to filter out impurities from water. The water can either be used directly or can be channelized to recharge the underground water.

   Drip irrigation is a method through which maximum number of plants can be irrigated with minimum use of water. For this, pipelines are laid throughout the rows of plants. Pipes are pierced at strategic points to release resource.

Lesson – 17 : Forests : Our Lifeline

A. 1. water, air 2. lowest 3. soil as humus
4. overstory 5. animals

B. 1. True 2. True 3. False
4. True 5. True

C. 1. (d) 2. (c) 3. (c)
4. (a) 5. (b)

D. 1. Forest 2. Sirex 3. Photosynthesis
4. Herbs 5. Humus

E. 1. The roots of the trees make the soil porous. Rainwater seeps through these pores and recharge groundwater. Forests prevent wastage of rainwater in the form of runoff. Forests also prevent flash floods by slowing down the movement of water.

2. . Firewood and dry leaves are used as kitchen fuel in villages which are close to a forest.
   . Timber is an important raw material; for construction activities and for making furniture and artifacts.
   . Wood pulp is used in manufacturing paper.
   . Honey, kendu leaves, catechu, lac, raisin, etc. are important forest produce.

3. The part of the topsoil which is composed of decomposed remains of plants and animals.

4. Decomposers are the organisms which feed on the dead bodies of plants and animals. They clean the forests decaying dead bodies and replenishing the nutrients back to the forest soil. For example : beetles and grubs.

5. The green plants prepare food through photosynthesis. The herbivores directly take food from the green plants. The carnivores take food from the herbivores. This makes a food chain, which can be shown by following example:

   Grass Ù insects Ù frog Ù Snake Ù Eagle

Many food chains can be found in the forest. All food chains are linked. If any one food chain is disturbed , it affects other food chains.

F. 1. Forest plays an important role in preserving the environment. Green plants take solar energy and convert it into chemical energy while making food. Thus, solar energy is transferred to other living beings through the green plants. Green plants utilize carbon dioxide during photosynthesis and release oxygen. That is how the green plants maintain the balance of carbon dioxide and oxygen in the environment.

2. The droppings of animals and dead leaves of plants are decomposed by the decomposers and converted into nutrients. These nutrients are utilized by the seeds to grow. Thus, forest is full of life and vitality, so it is called a dynamic living entity.

3. Animals help in growing and regenerating forests in many ways. Animals work as the cleaning agents in the forest. Microorganisms work on dead bodies of plants and animals and degenerate them. Animals also help in pollination which helps in growing a number of plants.

4. Large scale cutting of trees to clear land for human use is called deforestation. Due to growing human population, vast tracts of forest have been removed. This has created many problems. Some of them are given below:

   - Reduced forest cover has led to soil erosion and loss of soil fertility at many places.
   - Reduced forest cover has disturbed the natural process of recharging of groundwater. This has resulted in shortage of drinking water at many places.
   - Reduced forest cover means there is loss of habitat for many animals. Existence of most of the animals is in danger because of this.

. Reduced forest cover means there is higher percentage of carbon dioxide in the atmosphere. This is leading to global warming. The average temperature of the earth is on the rise.

5. **Deciduous Monsoon Forests :** These forests are found in monsoon areas (100 to 200 cm rain). The common trees are Teak, Sal, Sesum and Sandal. These trees shed their leaves towards the beginning of summer. These forests are mostly found in the Southern Plateau and in the foothills of the Himalayas.

   Evergreen Forests : These are called evergreen as at no particular time they shed their leaves. The trees are 50 to 60 metres tall. They make a canopy of broad leaves on the top. The common trees are rosewood, ebony, and mahogany. They are found in the hot and rainy (more than 200 cm rain per year) parts particularly in the hills of Western Ghats and North East India.

   Mountain or Alpine Forests : The trees of these forests are very tall. They bear cones and have pointed leaves. So these forests are also called coniferous forests. These trees have soft wood. The common trees are chair (pipe) and deodar. These forests are found in the Himalayas above 1500 metres height.

   Dry Forests or Thorny Shrubs : They grow in scanty rainfall areas. Common trees are babool and kikar. These are found in the north western part of the Indian Desert.

Lesson – 18 : Wastewater Story

A. 1. pollutants 2. sewage 3. sludge
4. chemicals, kitchen waste 5. chlorination

B. 1. False 2. True 3. True
4. True 5. False

C. 1. (d) 2. (d) 3. (c)
4. (b) 5. (c)

D. 1. The solid waste separates from sewage.

2. Water is sent to the sedimentation tank. Solids; like faeces settle at the bottom. Floatable impurities; like oil and grease float on the surface. A scraper removes the faeces from the water. The impurity thus collected is called sludge; which is sent to the sludge tank. The sludge can be used to produce biogas or to produce manure. A skimmer removes the floatable impurities. Now, the water is called clarified water.

3. Rich in lather, mixed with oil, black brown water that goes down the drains from sinks, showers, toilets, laundriesis dirty.

4. Air is pumped into clarified water so that bacteria can proliferate. Bacteria consume the human waste. It leaves food waste, soap and other unwanted materials in the water. The microbes settle down at the bottom after several hours. Water is then removed from the top. This water is fit for irrigation and can be used for that purpose.

5. These are the holes made in sewers at frequent intervals, so that timely inspections and cleaning of sewers can be done through them. The manhole is covered with a hard lid so that people and traffic can easily move over it.

E. 1. Do not throw cooking oil and fat in the drain. This can block the drain. The fat and oil clogs the pores in the soil; in open drains. This reduces the filtering capacity of soil.

2. The solid waste separates from sewage is called sludge.

Floatable impurities; like oil and grease float on the surface. A scraper removes the faeces from the water. The impurity thus collected is called sludge; which is sent to the sludge tank. The sludge can be used to produce biogas or to produce manure. A skimmer

removes the floatable impurities. Now, the water is called clarified water.

3. **Filtration :** The wastewater is passed through bar screen. Large objects; like rags, sticks, plastic bags, cans, etc. are removed in this process.

   Grit and Sand Removal : The wastewater is slowly passed through the sedimentation tank. Grit, sand and pebbles settle down at the bottom.

   Sedimentation : Water is then sent to the sedimentation tank. Solids; like faeces settle at the bottom. Floatable impurities; like oil and grease float on the surface. A scraper removes the faeces from the water. The impurity thus collected is called sludge; which is sent to the sludge tank. The sludge can be used to produce biogas or to produce manure. A skimmer removes the floatable impurities. Now, the water is called clarified water.

   Biological Process

   Aeration : Air is pumped into clarified water so that bacteria can proliferate. Bacteria consume the human waste. It leaves food waste, soap and other unwanted materials in the water. The microbes settle down at the bottom after several hours. Water is then removed from the top. This water is fit for irrigation and can be used for that purpose.

   Chemical Process

   Chlorination : Water purified through aeration is not fit for human consumption. It needs to be treated with chlorine. For this, bleaching powder is added to the water. The chlorine kills whatever germs may be left in the water. After chlorination, the water is fit for drinking.

4. Poor sanitation and contaminated drinking water is the cause of large number of diseases. Maintaining overall cleanliness in the home and in surroundings is called sanitation. Sanitation is important for the health of a person and that of the community.

These insects carry the germs of many dangerous diseases; like cholera, typhoid and jaundice. With constant public awareness campaign, the practice of open defecation can be stopped. Poor sanitary conditions also contaminate the groundwater because contaminants percolate down the ground.

Stagnant water is a perfect breeding ground for mosquitoes. Mosquitoes are the carriers of several diseases; like malaria, dengue, chikungunya and filaria.

5. Uncovered human excreta attract flies and other insects. These insects carry the germs of many dangerous diseases; like cholera, typhoid and jaundice. With constant public awareness campaign, the practice of open defecation can be stopped. Poor sanitary conditions also contaminate the groundwater because contaminants percolate down the ground.

6. . Do not throw cooking oil and fat in the drain. This can block the drain. The fat and oil clogs the pores in the soil; in open drains. This reduces the filtering capacity of soil.

   . Do not throw chemicals; like paint, insecticides, medicines, etc. into the drain. They kill the bacteria which otherwise help in cleaning the water.

   . Do not throw used tea leaves, solid food, soft toys or napkins in the drain. They can clog the drain and do not allow oxygen to enter the sewage water. Oxygen is important for the natural process of decomposition.

Class VIII

Lesson –1 : Crop Production and Management

A. 1. crop 2. float 3. rabi
4. winter 5. leveled

B. 1. True 2. False 3. True
4. True 5. True

C. 1. (b) 2. (b) 3. (c)
4. (c) 5. (d)

D. 1. (c) 2. (d) 3. (a)
4. (b)

E. 1. Weeding 2. Seed drill
3. Ploughing 4. Mixed cultivation
5. Fowl pox

F. 1. Leveling helps to smoothen the soil by crushing bigger soil pieces into smaller ones. This prevents erosion and water logging which aids in uniform irrigation.

2. Fish and other sea-foods are rich in proteins and iodine.

3. Weeds are unwanted plants which compete with the crop plants for nutrients, sunlight and water growing along with them. Weeds should be removed to have better quality and yield of crop plants.

4. Because a small quantity gives high yield. They are nutrient specific and can be used for soil difficient in specific nutrients. Easy to store and transport.

G. 1. **Rabi Crops :** Rabi crops are the winter crops which are sown in the beginning of winter (October-November) and harvested at the beginning of summers (March-April). Examples are– wheat, gram, barley, potato, etc.

Kharif Crops : Kharif crops are the summer crops. They are sown in beginning of monsoon season (June-July) and harvested at the end of monsoon (September-October). Examples are – rice, maize, coconut, groundnut, pulses, etc.

2. . Preparation of agricultural land
   . Providing nutrients
   . Seed selection and sowing
   . Watering the crops (Irrigation)
   . Removing unwanted plants growing along with crops
   . Harvesting
   . Storing the produce

   Harvesting : The process of cutting and gathering of matured crop is called as harvesting. The harvested crop is called as the produce or crop yield.

   In our country Rabi and Kharif crops have a set sowing and harvesting time.

   After harvesting, the grains can be separated from the crop by threshing which can be done manually with the help of thresher or using a machine called combine for both harvesting and threshing. Winnowing is the process of separating chaff and hay from grain. When mixture of grains, chaff and hay is allowed to drop on the ground from a height, the heavier seeds fall vertically down and lighter chaff and hay get blown away by the wind.

3. Modern methods of irrigation :

   Sprinkler System : In this method water is sprinkled by pumping through a set of perpendicular pipes that have rotating nozzles at the top. This system is more useful on the uneven land where sufficient water is not available. Sprinkler is very useful for lawns, coffee plantation and several other crops.

   Drip System : In this system the water fall drop by drop directly near the roots. It is a boon in regions where availability of water is poor. It is best technique for watering fruits, plants and trees.

4. The grains are first dried in sun before they are to be stored. They can be stored in homes, in suitable air-tight containers wheat, gram, rice, etc. are stored on large scale in gunny bags or grain silos.

Grains are packed in gunny bags which are stacked one above the other in the godowns. Godowns must be made free of microbes, insects and rodents by spraying chemicals. The reserve stock is called the buffer stock. Government of India plans and manages in building huge reserve buffer stocks of grains by buying and storing them. This ensures the availability of food grains in all seasons even if monsoon fails or in drought conditions in any part of the country.

Cold Storage : The perishable food materials can be safely stored at low temperatures. The food materials can be stored in refrigerators or ice-boxes at home. Deep-freezers are also used at smaller levels on the principle of refrigeration.

Cold-storages are large enclosures maintained at low temperatures to store food materials like potatoes etc.

5. Manures are natural organic substances obtained by the decomposition of animals wastes like cow during or plants wastes like vegetable matter by the action of soil bacteria. The manure obtained by this process is compost.

   Vermicompost is a kind manure or compost obtained by the earthworms. Earthworms also help to aerate the soil by their movement.

   Advantages of Manure :

   - It enhances the water holding capacity of the soil.
   - It makes the soil porous due to which exchange of gases become easy.
   - It increases the number of friendly microbes.
   - It improves the texture of the soil.

   Disadvantages of Manure :

   - It is required in large amounts.
   - It is not nutrient specific. .

   Adding Fertilizers : Fertilizers are chemical substances that are rich in particular nutrient. The

different types of fertilizers are : NPK, Urea, Ammonium Sulphate, etc.

Advantages of Fertilizers :

. A small quantity gives high yield.

. They are nutrient specific and can be used for soil difficient in specific nutrients.

. Easy to store and transport.

Disadvantages :

. They are expensive.

. Fertilizers are harmful as their excessive use can wilt the crops.

. Fertilizers are harmful when consumed by means of unwashed vegetables and fruits.

. The production of fertilizers causes pollution.

Lesson – 2 : Micro-organisms

A. 1. microscope 2. reaction 3. virus
4. peptidoglycan 5. yeast

B. 1. True 2. False 3. False
4. False

C. 1. (d) 2. (a) 3. (c)
4. (c)

D. 1. cooling 2. virus 3. anthracnose
4. typhoid 5. pasteurisation

E. 1. **Pasteurisation :** The milk is heated to 60-65°C to kill the bacteria present in it. Then suddenly it is cooled to kill any remaining bacteria.

By heating and Canning in Vacuum : Heating food to high temperature to about 110°C for half hour and canned under vacuum.

2. Viruses cannot reproduce themselves unless they enter into a living cell. As soon as a virus enters a living cell, it starts multiplying very fast giving rise to numerous new virus particles. The host cell bursts to release these virus particles when it cannot house

any more of the viruses. Released particles may enter new cells. This is how viruses spread so fast.

3. Since fungi are heterotrophs and cannot prepare their own food due to lack of chlorophyll, they depend on others for food. They are saprophytes–depend on decaying organic matter for food, or parasites depending on other living organisms for nutrition. They can convert sugar into carbon dioxide and ethyl alcohol. This process is called as fermentation.
4. Nitrogen-fixing bacteria present in the root-nodules of leguminous plants convert atmospheric nitrogen into useful nitrogenous compounds for plants.

   Bacteria help in decomposition of dead and decaying organic matter, acting as nature's scavengers.

   Lactobacillus bacterium helps to make curds from milk.
5. Insects like mosquitoes carry pathogens from an infected person to a healthy person. Hence they are called carrier of diseases. The female Anopheles mosquito is a carrier of the malaria causing protozoan called plasmodium.

F. 1. A vaccine is a biological preparation that provides immunity against a particular disease. Vaccines can be used to prevent diseases such as typhoid, hepatitis, cholera, chickenpox etc. Vaccines are of two types. They may contain dead or weakened microorganisms, which on administration induce the body to produce substances called antibodies. Administration of vaccine can be oral or injected and the process is called vaccination or immunisation.

   Eg : Vaccines for measles and polio.

2. Useful Algae :
   - Algae produce food and oxygen by photosynthesis.
   - Provide food directly to sea-animals like fish and snails.
   - Blue-Green algae can fix atmospheric nitrogen.

. Used as food for human beings.

. An important product Agar-Agar obtained from brown algae is used in the manufacture of cosmetics, jellies, medicines, foods, etc.

Harmful Algae :

. Some algae like Oscillatory make water unfit for drinking by produce toxins.

. Algae may cause fouling of the beaches.

. Algal growth blocks passage in water channels.

3. Some fungi cause human diseases, especially skin diseases like athletes foot, ring, worms, eczema, etc.

. Mushrooms like Amanita are poisonous, can cause death if eaten.

4. Measles Virus – Causative agent of measles in humans.

   Polio-Virus – Causing polio in children.

   Bacteriophage – Infect bacteria.

   Viruses are found everywhere, water, air, soil but have life only when they enter a living host.

5. **Cooling :** Keeping the cooked food, milk and milk products at low temperature in refrigerators or deep freezers prevents their spoilage.

   . The bacteria and other micro-organisms do not grow at such low temperature.

   . Enzymes present in the food remain inactive.

   Dehydration :

   . The vegetables like cauliflower (Gobhi), spinach (Palak), ginger (Adrak), methi can be sun dried.

   . Meat and fish can be dehydrated by smoking.

   . These methods remove water content in the food materials thereby not allowing micro-organisms to spoil the food.

   Pasteurisation : The milk is heated to 60-65°C to kill the bacteria present in it. Then suddenly it is cooled to kill any remaining bacteria.

By Heating and Canning in Vacuum : Heating food to high temperature to about 110°C for half hour and canned under vacuum.

By treatment of food with salt or sugar : High concentration of salt or sugar removes water from the food materials, thereby not allowing bacterial growth. Vinegar, oil, citric acid, spices also help in food preservation.

Use of Chemical Preservatives : Sodium Benzoate preserves fruit juices and squashes, while potassium metabisulphite helps to preserve jams and jellies.

6. a. **Algae :** Algae are simple coloured plant like organisms having a cell-wall and pigments to prepare food. You must have seen green algae floating on the surface of stagnant water e.g. the water scum- These are spirogyra filaments.

   Fungi : Fungi are non-green heterotrophic plant like organisms. They are single called yeast and multicellular moulds belong to fungi.

   b. Viruses : Viruses are extremely minute microscopic organisms which behave as living and non-living both. They are just like any non-living substance outside the living cell, but have the characteristics of living organisms when inside the living cell (host).

   Bacteria : Bacteria are most common of all the micro-organisms.

   Habitat : Bacteria are found almost every-where, in water, in the soil, inside or outside the body of living and dead organisms.

   Size and Shape : Size varies from 0.2 to 100 micron (m).

   (1 micron = 10–6 metre).

Lesson – 3 : Synthetic Fibres and Plastics

A. 1. non-biodegradable 2. major 3. Natural
4. polythene 5. small units of monomer

B. 1. False 2. True 3. False
4. True 5. False

C. 1. (b) 2. (d) 3. (c)
4. (d) 5. (b) 6. (c)

D. 1. **Thermoplastic :**

- These can be heated to be moulded into different shapes and hardened by cooling.
- Thermoplastics are long chain polymers with no cross linkages.
- These can be processed repeatedly.
- Examples of thermoplastics are PVC (poly-vinyl chloride), polythene, polystyrene, nylon, polyesters, etc.
- Used for making pipes, hand gloves, covering for electric wires, etc.

Thermosetting Plastic :

- These are plastics which are moulded once by heating but cannot be softened or moulded again and again.
- Can be processed only once.
- Cross-linkages are made in chains of polymers.
- Examples of thermosetting plastics are : Bakelite, melamine formaldehyde.
- Used for making the handles of pressure cooker.

2. The fibres that are obtained from plants are called natural fibres like cotton, wool, etc. The fibres that are made by human beings are called synthetic fibres or man made fibres.

E. 1. Cotton 2. Nylon 3. Polyester
4. Terrycot 5. Rayon 6. Wool

F. 1. Bakelite is a bad conductor of heat and has a very high melting point.

2. Synthetic fibres can catch fire easily, they melt and convert into beads which adhere to skin. This causes

burns on the skin, therefore such fibres should not be worn while working near fire like kitchen etc.

3. Since plastics are other synthetic materials that are non-biodegradable, thus remain as such in the soil and cause pollution and other serious hazards. Some of the problems are as follows :
   - Due to improper disposal of plastic materials, they block drains and sewer lines, hindering water absorption by soil.
   - Cause soil pollution.
   - Animals may get killed by eating plastic bags along with food.
   - The harmful dyes of the plastic bags may contaminate food stuffs wrapped in them may cause food poisoning.
4. Synthetic fibres cannot absorb water and sweat. They are uncomfortable to wear during humid and hot weather.
5. Because it is a good insulator and not good conductors of electricity.

G. 1. Cotton is a natural product. Whereas polyester is a man-made product. Cotton fades away much more quickly whereas polyester never fades. Cotton absorbs sweat whereas polyester doesn't absorb sweat.

Uses of Cotton

- Provide comfort
- Control moisture
- Durable fabric

Uses of Polyesters :

- Used as dress materials.
- As bed spreads, curtains either as polyester or mixed with cotton.
- For making sails of boats.
- For manufacture of water hoses for fire- fighting.
- For making conveyer belts etc.

2. **Advantages of Synthetic Fibres :**

   . They are resistant to moths and moulds.

   . They dry quickly and are wrinkle resistant.

   . They are readily available as they are less expensive and easy to maintain.

   . They can be dyed in variety of colours.

   . They are strong and elastic.

   . They are light and durable.

   Disadvantages of Using Synthetic Fibres :

   . Synthetic fibres can catch fire easily, they melt and convert into beads which adhere to skin. This causes burns on the skin, therefore such fibres should not be worn while working near fire like kitchen etc.

   . Synthetic fibres cannot absorb water and sweat. They are uncomfortable to wear during humid and hot weather.

   . Synthetic fibres may sometimes attain static electricity causing sparks during dry conditions, thus can be harmful to the wearer.

   . Synthetic fibres components are non-biodegradable causing soil-pollution.

3. **Cotton :** It is a cellulose fiber. It burns and may flare up when lit.

   Rayon : It burns without flame or melting and may flare up. It smells like burning paper.

   Polyester : It burns quickly and shrinks away from flame, may also flare up.

4. Polythene or (polyethylene) – Thermoplastic, whitish, translucent, strong but flexible, water resistant, not affected by acids or alkalies.

   Polyvinyl chloride (PVC) – Thermoplastic, tougher than polythene, good insulator.

   Polystyrene – Thermoplastic, easily moulded, highly transparent and light.

Perspex (Acrylic) – Thermoplastic, transparent like glass, but strong.

Teflon (PTEE) polymer of tetrafluoro – ethylene – Thermoplastic, heat resistant, not affected by chemicals, have low friction, slippery.

Bakelite – Thermosetting plastic, harder than other plastics, insulator.

Formica or Melamine – Thermosetting plastic, highly polish and hard

5. Perspex (Acrylic)

Properties : Thermoplastic, transparent like glass, but strong.

Uses : used as substitute for glass, for making artificial domes, sky lights, windows in air-crafts, wind screen of cars.

Teflon (PTEE) polymer of tetra-fluoro-ethylene.

Properties : Thermoplastic, heat resistant, not affected by chemicals, have low friction, slippery.

Uses : used for making non-stick coating on utensils, as non-corrosive coating in industries.

Bakelite

Properties : Thermosetting plastic, harder than other plastics, insulator.

Uses : for making electric switches, plugs, laminations for table tops to make fountain pen bodies, combs etc.

Formica or Melamine

Properties : Thermosetting plastic, highly polish and hard

Uses : used to make unbreakable crockery, decorative items

Lesson – 4 : Metals and Non-metals

A. 1. 92 2. good 3. most reactive
4. graphite 5. nature

B. 1. False 2. True 3. True
4. True 5. True

C. 1. (c) 2. (d) 3. (a)
4. (b) 5. (c)

D. 1. Gallium 2. Graphite 3. Gold
4. Potassium 5. Zinc 6. Sodium

E. 1. Silver and copper are best conductors of electricity. All metals are good conductors of heat and electricity, the reason why utensils and electric wires are made from metals.

2. Because it is highly reactive element. It can easily catch fire even when in contact with air.

3. Because of the fear of food contamination. Acids react with metal by dissolving it. It is very harmful for food.

4. Non-metals have less tensile strength, can easily be broken.

5. The corrosion of metals should be prevented because it causes great losses.

F. 1. **Physical State :** Non-metals may occur in solid, liquid or gaseous states at normal room temperature, except bromine which is liquid. For example : Sulphur, Hydrogen, etc.

Appearance : Graphite and iodine have metallic lustre. Normally all other solid non-metals are dull in appearance and do not shine.

Conductivity : Except for graphite, all other non-metals do not conduct heat or electricity, they act as insulators.

Malleability and Ductility : Non-metals are not malleable or ductile.

Tensile Strength : Non-metals have less tensile strength, can easily be broken.

Sound : Non-metals do not produce sound. They are not sonorous.

Hardness : Non metals are soft. Exception :

Diamond is hardest.

Melting and Boiling Point : All non-metals have low melting and boiling points except graphite.

2. The reactions in which metal reacts with a salt solution and displace the metal present in salt solution are known as displacement reactions

$$Zn + CuSO_4 \longrightarrow ZnSo_4 + Cu$$

(Zinc) (Copper Sulphate) (Zinc Sulphate) (Copper)

Aim : To show that more reactive metal can displace less reactive metal from its salt solution.

Materials Required : Test tubes, $CuSO_4$ solution, Zinc granules.

Procedure : Take a test tube and put about 5 ml. of dilute copper sulphate solution which is blue in colour. Place a thin strip of zinc plate or some zinc granules in it. Observe the colour change after some time.

Observation : It is observed that blue colour slowly disappears and red colour deposit of copper settles down in the test tube.

Conclusion : This shows that zinc metal has displaced copper metal from the solution of copper sulphate. If copper wire is put in zinc sulphate solution, no change is observed.

Zinc + Copper sulphate $\longrightarrow$ Zinc sulphate + Copper

$Zn + CuSO_4 \longrightarrow ZnSO_4 + Cu$

For diagram see Page 40.

3. Corrosion is slow destruction of metals layer-by-layer in presence of moisture and air which causes a great loss to metals and thus economy nation-wide. Noble metals like gold, platinum, titanium, chromium, nickel etc. do not get corroded.

The corrosion of metals should be prevented because it causes great losses. Following methods are employed to prevent corrosion of metals by preventing moist air to come in direct contact with metals.

By Applying Paint or Grease : Cleaning the surface of the metal thoroughly. Then painting it or applying grease or oil prevents corrosion.

Galvanization : Coating iron sheets with zinc by dipping them in molten zinc. Such a galvanized iron is used to make iron sheets, pipes etc.

Electro-plating : Chromium or nickel metals are coated on iron to prevent rusting by electrolysis. Used for making auto parts, bathroom fittings etc.

By Alloying : An alloy is a mixture of two or more metals or metal and non-metal like carbon, which has the properties of all the components. Alloying is done to get corrosion resistant and better quality metals for various uses.

4. **Uses of Some Non-metals**

Carbon : Allotrope of carbon-diamond is used in high value jewellery, cutting and grinding, graphite is used in lead pencils, coal is used as fuel and as important reducing agent in chemical reactions.

Sulphur : For the manufacture of gun-powder, sulphuric acid, vulcanization of rubber (hardening of rubber), used to make skin-ointments.

Phosphorus : Used to make match sticks, phosphate fertilizers, in fire works.

Uses of Metals

Silver : For making jewellery, used in photography, silvering of mirrors, electroplating etc.

Gold : For making jewellery, in photography for tonning.

Zinc : Used in dry cells, coating iron sheets to prevent rusting-process called as galvanization, to make important alloys like brass, bronze and german silver.

5. **Reaction with Oxygen :**

Metal react with oxygen to form metallic oxides. These oxides are basic in nature and thus they turn red litmus solution to blue.

Metal + Oxygen $\longrightarrow$ Metallic Oxide

Sodium (Na) + Oxygen / air $\longrightarrow$ Sodium oxide

$4\ Na + O_2 \longrightarrow 2Na_2o$

Sodium catches fire while reacting with oxygen, therefore, it is stored in kerosene oil.

Magnesium (Mg) + Oxygen $\longrightarrow$ Magnesium oxide

$2\ Mg + O_2 \longrightarrow MgO$

(Magnesium burns with dazzling white light)

Zinc (Zn) + Oxygen $\xrightarrow{\text{Strong Heating}}$ Zinc oxide

Zinc burns with a blue-flame.

Copper (Cu) + Oxygen $\xrightarrow{\text{Strong Heating}}$ Copper oxide

Copper does not burn on heating

There is a gradation shown in the reactivity of metals with oxygen/in air

Sodium > Magnesium > Zinc > Iron > Copper

Decreasing Reactivity.

Reaction with Water :

Metals react with water to form metal oxides or metal hydroxides and hydrogen gas.

Metal + Water ———>Metal Oxides or Metal Hydroxides + Hydrogen

Some reactions are given below :

Sodium (Na) + Water ———> Sodium hydroxide+ Hydrogen

$2\ Na + 2H_2O \longrightarrow 2\ NaOH + H_2$

Give off a lot of heat (Exothermic reaction.)

Magnesium (Mg) + Water ———> Magnesium oxide + Hydrogen.

$Mg + 2H_2O \longrightarrow MgO + H_2$

Copper (Cu) + Water —> No reaction even with steam. (hot or cold)

The order of reactivity of metals with water is :

Sodium > Magnesium > Copper

Lesson – 5 : Coal and Petroleum

A. 1. Compressed Natural Gas (CNG)

2. coal, natural gas 3. exhaustible 4. refining

B. 1. False 2. True 3. True

4. False

C. 1. (c) 2. (d) 3. (c)

4. (d)

D. 1. **Inexhaustible Natural Resources :** These sources are present in unlimited quantity in nature and are not likely to be exhausted by human activities.

Examples : Sunlight, air, etc.

Exhaustible Natural Resources : The amount of these resources in nature is limited, they can be exhausted by human activities. These resources can be renewable and non renewable natural resources.

Examples : Forests, coal, petroleum, minerals, wild life, natural gas, etc.

2. Coal is a complex mixture of carbon, hydrogen and oxygen compounds. Nitrogen, sulphur and phosphorus compounds are also present in it. It is found in coal mines deep under the surface of earth.

Coal is processed in industry to get some useful products such as :

Coke : It contains 98 % carbon. It is porous, tough, black and the purest form of coal. Like charcoal, it is a good fuel and burns without smoke. It is largely employed as a reducing agent in the extraction of metals from their ores. It is also used in making fuel gases like water gas and producer gas.

Coal Tar (liquid) : The fractional distillation of coal tar gives many chemical substances which are used in the preparation of dyes, explosives, paints, synthetics fibers, drugs, and pesticides.

Coal Gas : It was used for lighting houses, factories and streets in Mumbai until 1950. It was also used for cooling earlier.

3. The process of separating the various components of petroleum from one another.
4. As a fuel - It has a very high calorific value. As a source of hydrogen & carbon. It is less polluting.

E. 1. It is believed that petroleum is formed by the anaerobic decomposition of extremely small sea animals and plants which got buried in the sea bed millions of years ago. As these organisms died, their bodies settled at the bottom of the sea and got covered with layers of sand and clay. Over millions of years, absence of air, high temperature and high pressure transformed the dead organisms into petroleum and natural gas.

2. Natural gas was formed millions of years ago along with petroleum when microscopic sea plants & animals died & got buried under the sand & mud. These plants & animals under anaerobic conditions changed to gas.

   Composition : It consist mainly of methane (about 85%), ethane (about 10%) propane (about 3%) and butane when natural gas is compressed at high pressure then it is called CNG (Compressed Natural Gas). CNG is used for power generation.

3. **Uses of Petroleum :**
   i. Petroleum products are used as fuels.
   ii. Lubricating oils, and vaseline are used as lubricants.
   iii. Paraffin wax, products of petroleum, is used for manufacturing candles, polishes, waxed paper, water proofing, etc.
   iv. Some of the by-products of petroleum after purification are used in the preparation of medicines, ointments, face creams and cosmetics.
4. It is believed that it took millions of years for the dead organisms to change into coal, petroleum or natural gas. Furthermore, their known reserves are limited.

Another problem with fossil fuels is that they are steadily increasing air pollution, their use is linked to global warming. So, it is important that we use fuels only when it is absolutely necessary. This way, we can save these fuels for the manufacture of many substances which are dependent on petrochemicals.

For energy purpose, we must look for alternative sources, such as solar energy, tidal energy, wind energy, etc. Furthermore, fossil fuels will be available to future generations for more useful products.

5. Petrol is exhaustible natural resource because it can be exhausted by human activities. It is limited. Sunlight is present in unlimited quantity. It cannot be exhausted by human activities.

Lesson – 6 : Combustion and Flame

A. 1. energies 2. burning 3. rapid
4. light 5. limited

B. 1. False 2. False 3. True
4. True 5. False

C. 1. (c) 2. (b) 3. (d)
4. (a) 5. (d) 6. (b)

E. 1. 44° to 51°C (111° to 124°F) 2. Petrol
3. Complete combustion 4. Paraffin candle
5. Lowest zone 6. Carbon dioxide

F. 1. LPG is more widely used and for domestic use because LPG releases less carbon when burnt due to its chemical properties. It has non-polluting flame.

2. The outermost zone of the flame undergoes complete combustion and is the hottest part of the flame.

3. Do yourself

4. The rain-water when mixes with oxides of nitrogen and sulphur results in the formation of acid rain. It causes acid rain destroys aquatic life like fishes, plants etc.

G. 1. Substance which are needed to bring about combustion or burning are called as supporters of combustion.

Aim : To show that air is necessary for burning.
Materials Required : Candles, jar.

Procedure : Take two lighted candles and fix them separately on a table. Cover one of them with a bell jar.

Observation : You will observe that the candle covered with the bell jar burns for some times and is put off or extinguished after some time whereas the one which is not covered, keeps on burning.

Conclusion : This is because, till the air within the bell jar is there the candle keeps burning, but flame is extinguished as soon as the air is totally consumed.

2. A candle is a form of column or solid setting of wax having a thread or a wick in the centre throughout the size of the candle. It is the wax that melts when the wick is lighted. The molten wax due to raised temperature rises through the fibres of the wick due to capillarity force and is vaporised at the site of heating and gets burnt to keep the flame burning. The candle flame is yellow and luminous, gives heat and light due to incomplete combustion of wax. (vapours).

The candle which is made up of paraffin wax is a petroleum product and is obtained during fractional distillation of crude oil. Paraffin wax is a mixture of hydrocarbons having low melting and ignition point, vaporises on heating. It has high percentage of carbon, thus, burns to leave black residue (soot).

(For diagram see Page 58)

3. . Presence of a combustible substance like paper, petrol, etc.
. Presence of a supporter of combustion like oxygen (air).
. The temperature of the combustible substance to

be raised till it reaches its ignition temperature when it catches fire.

4. **Rapid Combustion :** Rapid combustion is when certain substances combine chemically with oxygen at a raised temperature (i.e. higher than the ignition temperature) with the evolution of heat and light.

Eg. : LPG, Kerosene, etc.

Combustion of Hydrocarbons : Hydrocarbons are compounds containing hydrogen and carbon, when they burn, carbon dioxide, water, heat and light are produced. For example :

Methane + Oxygen $\longrightarrow$ Carbon dioxide + Water + Heat + Light (of air)

Combustion of Carbon : Charcoal (carbon) burns at high temperature in oxygen or air to give rise to carbon dioxide, heat and light.

Carbon + Oxygen $\longrightarrow$ Carbon dioxide + heat + light (Charcoal) (of air)

Combustion of metals like magnesium which burns in oxygen or air to produce white powder or magnesium oxide with dazzling white light.

Magnesium + Oxygen $\longrightarrow$ Magnesium oxide + heat + light. (of air)

Slow Combustion : Burning of substances at room temperature only, when no light is produced is a slow combustion or spontaneous combustion. The temperature also remains almost the same or rises to negligible degree. For example :

- Combustion of yellow phosphorus at room temperature.
- Breakdown of food with oxygen in respiration. Energy released is used up for the working of the body of living organisms.

Incomplete Combustion : During incomplete combustion, the incomplete burning takes place in limited supply of air. For example, carbon burns in insufficient supply of air to give a poisonous gas carbon monoxide which is a pollutant gas.

Carbon + Oxygen ⟶ Carbon monoxide.

Complete Combustion : In complete combustion, combustible substances get totally burnt up to give rise to end products. Carbon completely burns in sufficient amount of air to give rise to carbon dioxide.

Carbon + Oxygen ⟶ Carbon dioxide

Supporter of Combustion : Substance which are needed to bring about combustion or burning are called as supporters of combustion. For example, air or oxygen which is required to burn substance like carbon. If the supply of air is cut off, carbon will stop burning.

5. a. The substances which burn during combustion are called as fuels or combustable substances such as petrol, coal, diesel, kerosene etc. They give rise to varying amounts of energy on burning, sometimes accompanied with evolution of light. The substances which do not burn even in the presence of oxygen are known as non-combustible substances.

   b. There are two kinds of flames when combustible substances burnt.

   Luminous flame is a obtained when any kind of fuel is partially or incompletely burnt. Such a flame is yellow, gives heat and light, burns in insufficient supply of air. This produces soot such as burning of candle.

   A non-luminous flame is obtained when a combustible substance burns completely in sufficient supply of oxygen or air. For example - burning of LPG in a gas stove.

6. Increase in the concentration of carbon dioxide in the atmosphere causes increase in the temperature of the earth. The infrared radiations are trapped by carbon dioxide which results in heating up of the atmosphere. This is called as Green House Effect. Adverse effects are :

. Melting of polar ice excessively resulting in rise in the level of water bodies like oceans and seas. The low lying areas get submerged and flooding of rivers takes place.

. Results in change in cropping pattern.

. Adversely affect the monsoon rains.

Lesson – 7 : Conservation of Plants and Animals

A. 1. sanctuary 2. endemic
3. reforestation 4. flora

B. 1. (d) 2. (c)
3. (a) 4. (b)

C. 1. True 2. True 3. False
4. True 5. False

D. 1. **Wildlife Sanctuaries :** A wildlife sanctuary is a region that is smaller than a national park. These are the protected areas which provide protection and suitable living conditions to wild animals. Sanctuaries are places where killing (poaching) or capturing of animals is strictly prohibited.

A sanctuary may be a reserved natural area meant for the preservation and development of threatened/ endangered species. For example, there is the Kaziranga Wildlife Sanctuary for Rhinoceros in Assam.

Biosphere Reserves : A larger protected area meant for conservation of biodiversity and culture of that area is called biosphere reserve. A biosphere may consists of other protected areas such as National Parks and Sanctuaries. For example, Pachmarhi Biosphere Reserve consists of one National Park called Satpura and two Wildlife Sanctuaries known as Bori and Ault Marhi.

2. **Extinct Species :** Species that do not have any living representative on Earth. Example: Dinosaur.

Endangered Species : These species are in danger

of extinction due to a decline in their number.

3. The plants found in a particular area are termed as flora. The flora of a region depends on the climatic conditions of the region.

   The animals found in a particular area are termed as fauna of that area. The density and diversity of flora is closely related to the fauna as plants are the source of food for herbivores and indirectly for the carnivores. Thus, flora and fauna are interdependent.

E. 1. It periodically lists the information about the species of plants and animals that face threats of various kinds.

2. The interaction between organisms and their environment in a given region form the ecosystem.

3. The variety in organisms living in a particular region forms the biodiversity of that region.

   Poaching is defined as illegal hunting or capturing of wild animals.

4. A group of individual organisms capable of interbreeding and producing offspring is called species.

   Red Data Book is the source book which keeps a record of all the endangered animals and plants. India also maintain Red Data Book for plants and animals found in India.

   The phenomenon of movement of a species from its own habitat to some other for a particular time period every year for a specific purpose like breeding is known as migration.

F. 1. Biodiversity is getting destroyed due to deforestation, loss of habitat, hunting and poaching of animals etc. Replenishment or getting back the lost forests and wildlife will take a lot of time, hence we need to conserve the forests and wildlife that is left.

2. . Strict wildlife protection laws have to be implemented to prevent hunting and poaching.

   . Captive breeding programmes to increase the

population for the depleting and endangered species.

- Protection of natural habitats, setting up wildlife sanctuaries and national parks.
- Educating people about the importance and methods of conservation of wildlife.
- Creating awareness in people to stop purchasing wildlife products like claws, animal skin etc.

3. The causes of deforestation may be:
   - Procuring land for cultivation. - Building houses and factories.
   - Making furniture, using wood as fuel.
   - Natural causes such as forest fires and droughts.

Consequences of Deforestation

The human activities leading to deforestation have disturbed the balance and nature and has even caused calamities. The main effects of deforestation are :

Desertification : Overgrazing, removal of vegetation from soil and deforestation leads to soil erosion. Soil erosion leads to the removal of fertile, to soil, exposing the soil beneath it. The soil does not support the growth of vegetation, leading to the formation of deserts.

Floods : Due to the removal of vegetation from land, rain does not infiltrate or percolate into the soil. There is excess runoff water that gets collected and leads to flooding.

Droughts : Due to removal of trees, there is in balance in the water cycle causing less rainfall. This eventually leads to the onset of drought.

Increased Greenhouse Gases : Plants absorb carbon dioxide during photosynthesis. Due to less vegetation, the excess carbon dioxide in the atmosphere absorbs the heat radiated from the land and increases the temperature on the earth. This is called global warming.

4. The density and diversity of flora is closely related to the fauna as plants are the source of food for herbivores and indirectly for the carnivores. Thus, flora and fauna are interdependent.

5. . Destruction of habitats by deforestation for construction of roads, railways, dams, etc.
   . Hunting and poaching of animals for their parts like skin, claws and bones.
   . Natural calamities like floods, epidemics and wildfires.
   . Human encroachment on forest land for commercial and agricultural purposes.

Lesson – 8 : Cell Structure and Functions

A. 1. cannot 2. dead plant tissue
3. prokaryotic cells 4. separate
5. animal

B. 1. True 2. False 3. True
4. True 5. True

C. 1. (c) 2. (c) 3. (d)
4. (d) 5. (b)

D. 1. (d) 2. (c) 3. (a)
4. (e) 5. (b)

E. 1. Microscope 2. Chloroplast
3. Vacuole 4. Multicellular organism
5. Cell

F. 1. **Plant Cell**
   . Plant cell has a rigid cellulose cell wall surrounding the plasma membrane.
   . Plastids are present in plant cell.
   . A large vacuole is present in the centre of the cell. The cytoplasm is peripheral.
   . Organelle called centrosome is absent in a plant cell.

. Lysosomes are rarely found or are absent.

Animal Cell

. Animal cell lacks the cell wall.

. Plastids are absent in an animal cell.

. Vacuoles are very small if present, normally central large vacuole is absent in an animal cell.

. Centrosome present.

. Lysosomes present.

2. **Nucleus :** A denser oval or rounded body which controls all the activities of the cell lies in the centre of the cytoplasm in animal cell or near the periphery of the plant cell.

   Nucleolus : A rounded structure present inside the nucleus is the nucleolus. This contains RNA (Ribonuclic Acid) which forms an organelle-ribosome. Thus, is called as 'ribosome - factory'.

   Nucleus and cytoplasm together are called as Protoplasm.

3. **Cell Wall :** A cell wall is an outer layer surrounding certain cells that is outside of the cell membrane. It provides strength and can control to some extent what types and concentration of molecules enter and leave the cell.

   Cell Membrane : Every cell is surrounded by a living membrane called the cell membrane. This membrane provides shape and size to the cell. This is made up of proteins and fats. Cell membrane allows only certain materials to pass through it, in and out. It separates the inner contents of the cells from the outside surroundings.

G. 1. These are oval or rod like bodies found in the cytoplasm of both plant and animal cells. They are bounded by their membrane. Mitochondria breakdown food (oxidise) to release energy. Therefore, they are called as the power house of the cells.

2. The smallest structure and functional unit of an organism is called cell. Cell shapes vary in different unicellular or multicellular organisms. Unicellular organisms like other Amoeba, Paramecium, Euglena, Bacteria all have different shapes.
3. These organelles containing green pigment chlorophyll help in the preparation of food by the green plants.
4. These are small granular structure scattered cytoplasm and are responsible for protein synthesis.
5. These are the largest cell organelles found in the cytoplasm of the plant cells. They are :

   Chloroplasts : These organelles containing green pigment chlorophyll help in the preparation of food by the green plants.

   Leucoplasts : These are colourless plastids which store food (starch) in plant tissues.

   Chromoplasts : Possess different pigments in the cells of fruits and flowers of plants.

H. 1. The organisms which possess only one cell and perform all their functions through that cell only are the unicellular organisms. They may have well-defined nucleus and other organelles or may lack them. They may have some projections over their surface like cilia, flagella or may used pseudopodia for locomotion or feeding.

Multicellular organisms have enumerable cells. Different cells perform different functions to bring about more efficiency in the organisms. The cells vary in size and functions. The cells group to form specific organs and organ systems. For example, nervous cells co-ordinates all the functions of the body, digestive system helps to digest the food in animals.

2. a. **Plasma Membrane :** Every cell is surrounded by a living membrane called the plasma membrane. This membrane provides shape and

size to the cell. This is made up of proteins and fats. Plasma membrane allows only certain materials to pass through it, in and out. It separates the inner contents of the cells from the outside surroundings.

b. **Cell Wall :** A cell wall is an outer layer surrounding certain cells that is outside of the cell membrane. It provides strength and can control to some extent what types and concentrations of molecules enter and leave the cell.

c. **Nucleus :** A denser oval or rounded body which controls all the activities of the cell lies in the centre of the cytoplasm in animal cell or near the periphery of the plant cell.

3. **Plant Cell**

. Plant cell has a rigid cellulose cell wall surrounding the plasma membrane.

. Plastids are present in plant cell.

. A large vacuole is present in the centre of the cell. The cytoplasm is peripheral.

. Organelle called centrosome is absent in a plant cell.

. Lysosomes are rarely found or are absent.

Animal Cell

. Animal cell lacks the cell wall.

. Plastids are absent in an animal cell.

. Vacuoles are very small if present, normally central large vacuole is absent in an animal cell.

. Centrosome present.

. Lysosomes present.

Lesson – 9 : Reproduction in Animals

A. 1. die 2. reproduction 3. variations
4. two 5. zygote

B. 1. True 2. False 3. False
4. True 5. False

C. 1. (c) 2. (a) 3. (b)
4. (d) 5. (a) 6. (b)

D. 1. Amoeba 2. Cow 3. Hen
4. Dog 5. Epididymis

E. 1. **External Fertilization :** Frogs and fishes adopt mode of external fertilization in which the fusion of male and female gametes outside the body of the organism. Usually the gametes are laid in water and fusion between the two gametes takes place in water.

Internal Fertilization : The fusion of gametes takes place inside the body of the female partner. Sexual Reproduction in dogs, cats, cattle, birds, etc. takes place through internal fertilization.

2. Asexual reproduction involves only one parent. For example, binary or multiple fission, budding, fragmentation in organisms like Amoeba, Hydra, Paramecium etc. While sexual reproduction involves two parents. For example : sexual reproduction in human beings.

3. Some animals lays eggs which later develop into young ones. Eg. cow, dog etc. The animals which give birth to young ones are called viviparous animals. These animals which lay eggs are called oviparous animals. For example : hen, frog.

F. 1. . Maintain a particular race or species.

. It helps to multiply the number of existing species.

. It plays a very important role in the evolution of living beings by small variations occurring in every generation.

Following are the male reproductive organs :

Testis : There is a pair of testis present outside the abdomen in bag like structures called the scrotal sacs. Each testis is oval in shape and is responsible to

produce large number of male reproductive bodies, the sperms and hormone testosterone.

Vas Deferens : The sperms which are produced in each of the testis travel upwards into the abdominal cavity through a duct called the vas deferens or sperm duct. The sperms travel in the vas deferens due to the muscular action of its wall upto urethra to be passed out.

Urethra : Vas deferens passes the fluid containing sperms into urethra before receiving secretions from accessory glands called the seminal vesicles, prostrate glands and cowper's glands. Semen is the mixture of sperms and fluid.

Penis : Urethra passes through penis and empties to the exterior. Penis is a muscular organ and becomes stiff due to erectile tissues and blood spaces inside it. Penis helps to pass out urine and male gametes (sperms). The sperms are delivered into the vagina of the female body.

2. Fertilization is the fusion of male and female gametes resulting in zygote.

   External Fertilization : Frogs and fishes adopt mode of external fertilization in which the fusion of male and female gametes outside the body of the organism. Usually the gametes are laid in water and fusion between the two gametes takes place in water.

   Internal Fertilization : The fusion of gametes takes place inside the body of the female partner. Sexual Reproduction in dogs, cats, cattle, birds etc. takes place through internal fertilization.

3. The type of reproduction in which only a single parent is involved is called asexual reproduction.

   In each hydra, there may or more bulges. These bulges are the developing new individuals and they are called buds. In hydra the new individuals develop from a single parents. Since new individuals develop from the buds in hydra this type of asexual

reproduction is called budding. An other method of asexual reproduction is observed in the microscopic organisms, amoeba. Amoeba is a single celled organism. It begins the process of reproduction by the division of its nucleus into two nuclei. Finally two amoeba are produced from one parent amoeba. This type of asexual reproduction in which an animal reproduces by dividing into two individuals is called binary fission.

4. Same as Answer F (1).
5. Soon after fertilization the single celled zygote starts multiplying to form a ball of cells. Zygote then fixes itself into the wall of the uterus where it is nourished and protected for nine months (gestation period) to finally convert the embryo to a fully developed child. After completion of the gestation period, the baby comes out of the mother's womb (uterus).

Lesson – 10 : Reaching the Age of Adolescence

A. 1. 28 to 30 days 2. Puberty 3. Menopause
4. Zygote 5. only one set of

B. 1. (a) 2. (a)
3. (b) 4. (c)

C. 1. True 2. False 3. False
4. True 5. True

D. 1. The period of life, when the body undergoes changes, leading to reproductive maturity is known as adolescence.
2. The human body undergoes several changes during adolescence. These changes mark the onset of puberty.
3. Secondary Sexual Characters in Boys : Facial hairs, deep voice and hair on chest.
4. Hair under armpits, hair in pubic region.
5. The cycle of events which begin from release of an egg and end in shedding off egg is called menstrual

cycle. A menstrual cycle is usually of 28 to 30 days.

E. 1. We have read that sweat and sebaceous glands show increased activity during this period. If proper hygiene is not maintained, it can lead to many skin diseases in adolescents. Girls need to take special care of hygiene during menstrual period.

2. This is a virus which causes AIDS (Acquired Immunodeficiency Disease). Till date, there is no cure for this disease. Hence, prevention is the only way to keep away from this dangerous disease. AIDS can spread through sexual contact, through infected needles and from a mother to her unborn child. This can also be transmitted to an infant through mother's milk.

3. This disease happens due to iodine deficiency. Iodine deficiency results in less production of thyroxin. This may result in a disease called goiter which is manifested by a permanent swelling in the neck.

4. a. Adrenaline b. Growth hormone
   c. Insect hormones d. Thyroxine

F. 1. **Increase in Height :** The most apparent change during puberty is the sudden increase in height. Long bones grow rapidly and hence height of a person increases rapidly during this period. Initially, girls grow faster than boys but ultimately boys are usually taller than girls. The maximum height is attained by 18 years of age.

$$\text{Calculation for full height (cm)} : \frac{\text{Present height (cm)}}{\text{\% of full height at this age}} \times 100$$

Change in Body Shape : The body of a boy becomes more muscular. His shoulders become wide and waist becomes narrow. The body of a girl becomes wider below waist and narrower at shoulder.

Voice Change : A boy's voice becomes deep, and the child like voice is first replaced by a hoarse voice. This happens because the voice is said to crack. Gradually, the voice becomes deep. The change in

voice happens because voice box in a boy becomes larger. Girl's voice is usually high pitched.

Increased Activity of Sweat and Sebaceous Glands : Secretion from sweat and sebaceous glands increases during adolescence. Due to this, some teenagers may suffer from acne and pimples.

Development of Sex Organs : In boys, testes begin to produce sperms. Testis and penis develop completely. In girls, ovaries enlarge and eggs begin to mature. Ovaries start releasing mature egg.

Reaching Mental, Intellectual and Emotional Maturity : These changes also have a profound effect on a person's way of thinking. Teenagers spend more time on thinking than earlier. So many rapid changes in the body may create a sense of insecurity in most of the teenagers. But teenagers should not worry because these are natural changes.

2. A hormone such as testosterone, affecting sexual development or reproduction. The sex hormones are responsible for the fundamental change in growth and development. The testes and the ovaries are the reproductive organs and both are stimulated by the pituitary hormone during puberty.

   These harmones are responsible for the male and female secondary sexual characters. Further, the sex harmones are under the control of harmones from the pituitary gland. The pituitary secretes many harmones, one of which makes ova mature in the ovaries and sperms form in the testes.

3. Inside the fertilized egg or zygote is the instruction for determining the sex of the baby. This instruction is present in the thread like structures, called chromosomes in the fertilized egg. Gender of a child is determined by the combination of chromosomes in the zygote. A normal cell in human beings has 46 chromosomes, i.e. 23 pairs of chromosomes. Out of them, chromosomes in 22 pairs are identical. But chromosomes in the 23rd pair may be identical or different.

There are two types of chromosomes in 23rd pair. They are called X and Y chromosomes. The 23rd pair in a male has XY combination, while that in a female has XX combination.

The gametes (egg and sperm) have only one set of chromosomes. The unfertilised egg always has one X chromosome. But sperms are of two kinds. One kind has an X chromosome, and the other kind has a Y chromosome.

When a sperm containing X chromosome fertilizes the egg, the zygote would have two X chromosomes and develop into a female child. If the sperm contributes a Y chromosome to the egg (ovum) at fertilization, the zygote would develop into a male child.

4. Endocrine glands release harmones into the bloodstream to reach a particular body part called target site. The target site responds to the harmone. There are many endocrine glands or ductless glands in the body. The testes and ovaries secrete sex harmones. These harmones are responsible for the male and female secondary sexual characters. Further, the sex harmones are under the control of harmones from the pituitary gland. The pituitary secretes many harmones, one of which makes ova mature in the ovaries and sperms form in the testes.

Harmones from pituitary stimulate testes and ovaries to release testosterone(in male) and estrogen (in female)

↓

Released in the blood stream and reach parts of the body. (Target site)

↓

Stimulate changes in the body at onset of puberty.

5. **Drugs :** The menace of drugs is spoiling many a life. During this period, one can easily get influenced and carried away by negative stimulations. You need to

have a strong will power to say NO to drugs. Addiction to drugs will destroy your career and life.

HIV (Human Immunodeficiency Virus) : This is a virus which causes AIDS (Acquired Immunodeficiency Disease). Till date, there is no cure for this disease. Hence, prevention is the only way to keep away from this dangerous disease. AIDS can spread through sexual contact, through infected needles and from a mother to her unborn child. This can also be transmitted to an infant through mother's milk.

Lesson – 11 : Force, Friction and Pressure

A. 1. contact 2. can decrease 3. force
4. frictional 5. electrostatic

B. 1. False 2. True 3. False
4. False 5. False

C. 1. (a) 2. (a) 3. (c)
4. (b) 5. (b)

D. 1. (e) 2. (a) 3. (b)
4. (d) 5. (c)

E. 1. Rolling friction 2. Gravitational force
3. Newton 4. Pressure
5. Frictional force

F. 1. **By Lubricating the Surfaces in Contact :** Oiling or greasing the two surfaces in contact helps to reduce friction as the oil or grease forms a slippery smooth layer and thus lessens friction.

By Polishing : Polishing helps to reduce friction by removing 'hills' and 'valleys' on the rough surfaces.

By Sprinkling of Lubricating Powder :

. Lubricating graphite powder is used in refined machine parts where liquid oil cannot be used to reduce friction.

. By using ball-bearings in machines.

2. Pressure can be defined as the combined effect of force and area on which it acts.

That is pressure is force per unit area.

$$\text{Pressure (P)} = \frac{\text{Force (F)}}{\text{Area (A)}}$$

Because the pressure of the water is much greater deeper down and the dam needs to be thick at the bottom.

3. $$\text{Pressure (P)} = \frac{\text{Force (F)}}{\text{Area (A)}}$$

$40\ P = 100\ N/\ Area$

$Area = 100 / 40 = 2.5\ m^2$

4. **Advantages :**

- We are able to walk properly due to the friction between soles of our shoes and the floor. It is difficult to walk on polished floors.
- Brakes in automobiles stop them when required due to the friction between the brake-lining and rim/drum of the wheel.
- Nails and screws offer friction to hold boards together.
- We are able to write with the pen or pencil on the paper due to friction between them and the paper.
- Force of friction offers safe driving.

Disadvantages :

- Friction causes wear and tear of moving machine parts.
- Friction reduces the efficiency of machine parts.

Some example as to how friction helps :

- Tyres of vehicles have corrugated and rough surfaces.
- The boat can be pulled easily on the sea as compared on the land.

5. **Contact Forces**

a. Frictional Force : Frictional force acts between two surfaces in contact with each other. The force opposes the motion of one body over the other.

Frictional force simply is called friction. This is due to the roughness on the surfaces of the bodies in contact. More is the roughness, more will be the friction. Friction can be reduced by lubricating the surface.

b. Electrostatic Friction : If an object like a pen is rubbed another surface, it attains an electrostatic charge due to which it can attract small bits of paper towards it. This is due to the friction between the two surfaces.

c. Muscular Force : The work done by us is due to our hands and legs like lifting objects, walking, kicking etc. This is due to the force exerted by the muscles of the limbs.

2. Non-contact Forces

a. Magnetic Force : Magnets are differently shaped and sized iron objects which have magnetic force of attraction i.e. they can attract iron materials like pins, nails etc.

. They attract the unlike poles of magnets and repel the like poles.

. Magnets exert force from a distance and to lift heavy loads.

G. 1. **Contact Forces**

a. Frictional Force : Frictional force acts between two surfaces in contact with each other. The force opposes the motion of one body over the other.

Frictional force simply is called friction. This is due to the roughness on the surfaces of the bodies in contact. More is the roughness, more will be the friction. Friction can be reduced by lubricating the surface.

A ball moving in a high speed on a grass land slows down and stops due to the friction with the grass.

b. Electrostatic Friction : If an object like a pen is rubbed another surface, it attains an electrostatic charge due to which it can attract small bits of paper towards it. This is due to the friction between the two surfaces.

c. Muscular Force : The work done by us is due to our hands and legs like lifting objects, walking, kicking etc. This is due to the force exerted by the muscles of the limbs.

2. Non-contact Forces

a. Magnetic Force : Magnets are differently shaped and sized iron objects which have magnetic force of attraction i.e. they can attract iron materials like pins, nails etc.

. They attract the unlike poles of magnets and repel the like poles.

. Magnets exert force from a distance and to lift heavy loads.

. These are used to separate scraps from the garbage and to lift heavy loads.

. Magnets are used in toys, electronic gadgets etc.

b. Gravitational Force : Gravitational force exists everywhere in the universe. It is the force of attraction between two bodies possessing mass. The force depends upon the masses and the distances between the objects. For example :

Force between the book and table, between earth and moon etc.

The force of attraction by huge and heavy heavenly bodies like the earth, moon, sun etc. on smaller bodies is called the gravitational force or ‘gravity’. All things fall on the earth due to its gravitational pull.

Weight : The force by which any object is attracted towards the earth is the weight of that object. Heavier is the gravitational force, more is its weight.

SI unit of weight is Newton (N) and can be measured by weighing machines or spring balance.

c. **Electrostatic Force :** The force acting between charged particles is called electrostatic force. It can either be a force of attraction or a force of repulsion between the two or repulsion between charged particles. The nature of force depends on the nature of changes. Like charges repel each other and unlike charges attract each other.

In other words, two positively charged or two negative charged particles will repel each other but a negative charge and positive charge will attract each other.

2. **Objective :** To show that force exerted by sliding friction is greater than force exerted by rolling friction.

Materials Required : A flat wooden plank, a small wooden block, a small wooden cylinder and two notebook.

Procedure :

- Place the wooden plank on the table.
- Keep one/two notebook below one end of the wooden plank to make an inclined plane as shown.
- Place the wooden block at the top of the inclined wooden plank. Does it move down by itself? Push the block gently. Does it move at all or move continuously or move a little?
- Next, place the wooden cylinder at the top of inclined wooden plank.

Observation : The wooden block remains stationary, where as the wooden cylinder rolls down.

Conclusion : Sliding friction is greater than rolling friction.

3. The force acting along the two surfaces in contact which opposes the motion of one body over the other is called as the 'Force of Friction'.

   Take an example of an object being pulled or pushed in opposite directions in contact with a surface.

   Where,

   F1 = Force of friction acting along the surface of contact of two bodies x and y.

   F2 = Force applied on the body x to produce relative motion.

4. Friction is mainly classified into two categories :

   a. **Static Friction :** The friction acting between two surfaces in contact when there is no relative motion between them is called static friction. For example : If you push a table gently, the table will not move. The friction acting between the table and the ground prevents the table from moving. Static friction increases with the applied force and reaches the maximum value.

      Limiting Friction : If the applied force is increased further, the state friction does not increase beyond the maximum value. The maximum value of static friction between two surfaces in contact beyond which one surface starts moving over the other is called limiting friction.

   b. **Kinetic Friction :** The frictional force acting between two surfaces when there is a relative motion between them is called kinetic friction. Kinetic friction can be classified into two types :

      i. **Sliding Friction :** The friction acting between the surfaces when an object slides over a surface is called sliding friction.

      ii. **Rolling Friction :** The frictional force acting between the surfaces when an object

rolls over a surface is called rolling friction. For example: Football rolling on the ground.

5. ***Activity 1***

Aim : To prove that the depth of the liquid determines the pressure at a point.

Materials Required : Tall can, water

Procedure : Take a tall can and make three holes on one side at different heights.

Observation : On filling the can with water now record your observation. Water gushes out of the lowest hole farthest with greatest pressure. The water comes out of the highest hole to nearest distance and in between the two holes from the middle hole.

Conclusion : Thus, it shows that the pressure increases with depth from the surface of the liquid.

Activity 2

Take an empty tin can. Fill it half with water and heat to boil. Close the mouth of the can with the cap. Cool it under tap and observe.

It is observed that can gets deformed. The water on boiling inside the can pushes out the air and the can gets filled with steam. On cooling, the steam condenses, thus lowering the pressure. Greater outside pressure presses the can and deforms it.

As one goes up the pressure decreases as the number of gaseous molecules present in air decreases with height with depth.

Lesson – 12 : Sound

A. 1. time period 2. amplitude 3. hertz (Hz)
4. noise 5. frequency

B. 1. True 2. True 3. False
4. False 5. True

C. 1. (d) 2. (b) 3. (a)
4. (b) 5. (c)

D. 1. **Infrasonic Sound Waves :** Sound of frequency less than 20 Hz.

Ultrasonic Sound : Sound of frequency more than 20,000 Hz.

2. **Loudness :** Loudness of sound depends on amplitude of vibration. Loudness of sound is directly proportional to square of amplitude of vibration. Louder sound has higher amplitude, while quieter sound has lower amplitude.

Pitch : The shrillness of sound experienced by the listener is called the pitch of sound. Pitch of sound depends on frequency of vibration. A high pitched sound has high frequency, while a low pitched sound has low frequency.

3. A sound which is pleasant to ears is called music. But any unpleasant sound is called noise.

E. 1. Children and women generally produce sound with high pitch. With increase in pitch, the shrillness increases.

2. Sound needs a medium through which it can travel. Sound cannot travel through vacuum. Sound can travel through solid, liquid. Propagation of sound happens in all directions in a medium.

3. We see the lightning before we hear thunder because light travels faster than sound. The light from the lightning travels to our eyes much quicker than the sound from the lightning.

4. Because there is no atmosphere at moon. Sound needs a medium to travel. Due to absence of air on moon, sound cannot travel.

F. 1. **Sound Produced By Humans :** Sound is produced by voice box or larynx; in human beings. The voice box or larynx is situated in the upper part of wind pipe. There are two vocal cords stretched across the larynx in way that there is a small gap between them. When air is forced through the gap, vocal cords begin to vibrate and sound is produced. Muscles

which are attached to the vocal cord enable us to make the vocal cords tight or loose as per need. Sound quality varies according to tension or slack in the vocal cords.

The vocal cords in men are longer (about 20 mm), but they are shorter in women and children. Due to this, voices of men, women and children are different from each other.

Characteristics of Sound : Sound travels in the form of waves. Sound is characterized by its loudness, pitch and quality. Since sound is caused by vibrations, sound waves too have characteristics such as amplitude, frequency and time period.

2. Human ear; which gives us the sense of hearing is a complex structure. It can be divided into three main parts, viz. external ear, middle ear and internal ear.

   External Ear : The external ear or pinna appears like a funnel. Its function is to catch sound waves and to direct them towards middle ear.

   Middle Ear : The middle ear is composed of a stretched membrane and three small bones. The stretched membrane is called the ear drum and small bones are called bony ossicles. These are named sequentially from outside to inside as; malleus, incus, and stapes (hammer, anvil, and stirrup). When sound wave comes to the middle ear, it sets vibrations in the ear drum. After that, sound waves are transferred from ear drum transfers these vibrations to the three bones.

   Internal Ear : The internal ear is composed of cochlea and semicircular canals. Cochlea appears like a snail from outside. Vibrations from middle ear reach the cochlea. Signals from cochlea reach the brain and we hear a sound. Semicircular canals have no role in sense of hearing, rather they maintain the balance of the body.

3. **Frequency (f) :** Number of oscillations in unit time is called frequency of oscillation. Frequency is

expressed as Hertz (Hz). When an object is vibrating 1 time in a second, its frequency is 1 Hz.

Amplitude (A) : Maximum displacement of a wave on either side from mean position is called amplitude. Thus, amplitude shows how far the vibrating object moves from the mean position.

Time period (T) : The time taken by the object to complete one oscillation.

4. As the prongs of the tuning fork vibrate, they compress the nearby air molecules. This compressed region of air is called compression. The air molecules in the compression region push and transfer their energy to the neighbouring molecules. Hence the neighbouring region will be compressed and becomes a compression. At the same time the air in the previous compression expands. This region is called as rarefaction.

G. 1. Frequency of oscillations is defined as the number of oscillations of a vibrating body per second. It is given by

$$\text{Frequency} = \frac{\text{Number of oscillations}}{\text{total time}} \qquad \frac{40}{4} = 10 \text{ Hz}$$

The time required to complete one oscillation is known as time period. It is given by the inverse of the frequency.

$$\text{Time Period} = \frac{1}{\text{Frequency of oscillation}} \qquad \frac{1}{10} = 0.1$$

2. The time required to complete one oscillation is known as time period. It is given by the inverse of the frequency.

Time Period = 1/ Frequency of oscillation

Frequency of oscillations = 500 Hz

Time Period = 1/500 = 0.0025

Lesson – 13 : Chemical Effects of Electric Current

A. 1. destroyed 2. transformation
3. fused 4. weak
5. neutral

B. 1. False 2. True 3. False
4. False 5. True

C. 1. (c) 2. (d) 3. (b)
4. (b) 5. (b) 6. (d)

D. 1. **Anode :** It is the electrode connected to positive terminal of battery at which electricity enters the solution.

Cathode : It is the electrode connected to negative terminal of the battery at which the electric current leaves the solution.

2. **Electrolytes :** There are chemical compounds which conduct electricity in fused (molten) or aqueous solution when electricity is passed through them and undergo chemical decomposition e.g. solution of copper sulphate.

Non- electrolytes : These are compounds that do not conduct electricity on passage of electric current e.g. distilled water.

E. 1. Prevents corrosion or rusting of base metal.

2. Tap water contains dissolved salts in it. These salts dissociates into ions when electricity passed through it which are responsible for the electricity conductivity of tap water. But distilled water does not contain any dissolved salts, so it does not conduct electricity.

3. Water is a good conductor of electricity. A person with wet hands touching electrical appliances get a shock. So, it is dangerous to touch an electric appliance with wet hands.

4. This electric field comes from a DC supply connected to the electrodes with AC, there will be no net ion flow and no plating with happen because the

electric field direction will keep alternating and ions will oscillate back and forth within the electrolyte.

5. . Prevents corrosion or rusting of base metal.

   Example : Base metal iron plated with nickel or chromium.

   . Makes the article attractive and gives it a valued appearance.

   Example : Brass articles plated with silver or gold.

F. 1. **Electrolytes :** These are chemical compounds which conduct electricity in the fused (molten) or aqueous solution state and undergo chemical decomposition when electric current flows through them.

For Example : Electrolytic solutions of copper sulphate, hydrochloric acid, sodium hydroxide etc.

Electrolytes may be strong or weak in nature.

Non -electrolytes : These are compounds that do not conduct electricity on passage of electric current eg. distilled water.

2. **Anions :** These are negatively charged ions, migrate to anode during electrolysis e.g. all non-metallic ions.

Cations : These are positively charged ions which migrate to cathode during electrolysis e.g. all metallic ions and hydrogen ions.

3. A glass or plastic container having two electrodes and the solution is called as voltameter or electrolytic cell. Voltameter is a non-conducting vessel.

4. Electro-refining is a process by which metals containing impurities are purified electrolytically to give a pure metal. The usual method of reduction does not remove all the impurities of metals. Therefore, metals like copper, zinc, silver, nickel, gold etc. are refined by electrolytic method.

5. Set up the apparatus as shown in the figure -

   . Iron spoon is made the cathode (–).

   . Thin copper strip is made the anode (+).

. . Acidified solution of copper sulphate ($CuSO^4$) is the electrolyte in the beaker.

. . On passage of electricity through the solution, the copper ions (Cu^{++}) move towards cathode to get reduced to copper metal (Cu) which get electroplated on the spoon (cathode).

. Copper sulphate breaks up chemically. Instead of sulphate ions (SO_4)$^{-2}$, copper metal (Cu) of the anode gets converted to copper ions (Cu^{++}) which go into the solution.

. Thus, the Cu^{++} concentration remains unchanged.

Reaction at Cathode :

Cu^{2+} + $2e^-$ ⟶ Cu(s)

from solution from cathode

Reaction at Anode :

Cu(s)	⟶	Cu^{2+}(aq)	+ $2e^-$
impure copper		enters solution	migrate to cathode

Lesson – 14 : Some Natural Phenomena

A. 1. continuously 2. Repulsion 3. repel
4. seismograph 5. Seismic

B. 1. False 2. True 3. True
4. False 5. False

C. 1. (b) 2. (a) 3. (d)
4. (a)

D. 1. Earthquake 2. Richter Scale
3. Lightning 4. Earthing

E. 1. This is a simple device which protects a building from being hit by lightning. It is composed of a vertical metallic rod which usually has a trident at the top. The base of the metallic rod is attached to thick metallic wire; which goes very deep inside the earth. This metallic wire provides a passage for earthing.

2. . Don’t take shower during lightning.
   . Use of phone should be avoided during lightning.
   . Television should be disconnected from the antenna.
3. Take a ball pen refill and rub it against a woolen cloth. Bring this refill near bits of paper. It is observed that the refill attracts the bits of paper. This activity shows that a charged object attracts uncharged object.
4. Sudden shaking and trembling of earth is called earthquake.
5. They can cause immense damage to buildings, dams and people. There can be a great loss to life and property. Earthquakes can cause floods, landslides and tsunamis.

F. 1. In case of an earthquake, you should hide under a table or any other similar structure. If you are in bed, then keep a pillow over your head and do not move out of the bed. If you are in an open area, try to move away from buildings and other structures.
2. Seismograph is a device which records the seismic activities. It is composed of an oscillator, writing device and a roll of paper. The writing device is attached to the oscillator. In case of an earthquake, the oscillator begins to oscillate. This creates oscillation in the writing device; which plots wave-like patterns on the paper. The wave-like pattern is then analysed by seismologist to interpret the various features of an earthquake.
3. Electroscope is a simple device which is used to test the presence of charge in an object. The gold-leaf electroscope was developed in 1787 by a British scientist named Abraham Bennet. Gold and silver are among the best conductors of electric current and hence leaves of these metals are used in electroscope.
4. Until the eighteenth century it was not cleared what

caused lightning and thunder during rainy day. Franklin used a silk cloth kite and tied a metallic key to the silk thread. He received an electric shock whenever there was a flash of lightning in the clouds. The key also got warmed up.

From this simple experiment Franklin understood that the clouds get electrically charged during rainy season. If the kite reached the charged cloud, the charge passed down to the key. On touching the metallic key, he received the charge passing it to the earth.

5. When certain objects are rubbed against another object, electrons may get transferred from one object to another. If an object loses some electron, it is left with surplus number of protons. Thus, this object becomes positively charged. If an object gains electrons, it now has surplus number of electrons. Thus, this object becomes negatively charged. The transfer of charges is responsible for static electricity in various objects. Static electricity(the electricity does not flow continuously) is the main reason of lightning.

Lesson – 15 : Light

A. 1. 2 2. transparent
3. angle of reflection 4. Real
5. less

B. 1. (b) 2. (d) 3. (b)
4. (b) 5. (b)

C. 1. True 2. False 3. True
4. True 5. True

D. 1. Ciliary muscles 2. Braille script
3. Transparent Materials 4. Reflection of light
5. Persistence of vision

E. 1. An object becomes visible when light reaches our eye after being reflected from the object. If there is

no light in the room then the objects inside the room cannot reflect any light.

2. Sunlight is a combination of seven colours. When white light passes through a prism, it breaks up into seven colours called the spectrum. Rainbow is a natural phenomenon showing dispersion.
3. The number of images formed depends on the angle between the two mirrors. This can be calculated by using the following formula:

   Number of Images = (360/Angle) – 1

   So, if the given mirrors are at a right angle to each other, 3 images will be formed. If the given mirrors are at 30° angle, we shall get 11 images. When the mirrors are kept opposite and parallel to each other, there would be infinite number of images formed.
4. There is a hole in the centre of iris. This is called pupil. Light enters the eye through the pupil. When the light is bright, iris contracts and thus allows less light into the eye. When the light is dim, iris dilates and thus allows more light into the eye.

F. 1. Kaleidoscope is based on the principle of multiple reflection using a set of three mirrors inclined at <60 degree to each other.

2. The splitting of white light into its various constituent colours is called as dispersion of light.

   Sunlight is a combination of seven colours. When white light passes through a prism, it breaks up into seven colours called the spectrum. Rainbow is a natural phenomenon showing dispersion.
3. There are two laws of reflection which are as follows:

   First Law of Reflection : The incident ray, the reflecting ray and normal at the point of incidence; all lie in the same plane.

   Second Law of Reflection : Angle of incidence is always equal to the angle of reflection.
4. . Do not read in too bright or too dim light.

- Do not look directly at a bright object or at the sun.
- Do not keep the book too close to your eyes; while reading. Don't keep the book too far either.
- If something gets into the eye, do not rub the eye. Wash it with cold water.
- In case of any problem; like itching or burning sensation; consult an ophthalmologist. A doctor who specializes in the disease of eyes is called an ophthalmologist.

5. An image stays on the retina for about 1/16 of a second. This feature is called persistence of vision.

G. 1. **Objective :** To prove laws of reflection.

Materials Required : Cardboard sheet, white sheet, table, plane mirror, torch

Procedure : Take a cardboard sheet. Make a slit about 1 mm width in it. Make the cardboard stand vertically on a piece of white sheet spread on a table. Place a plane mirror in front of the hole at a distance on the white sheet vertically. Darken the room and throw torch light on the hole.

You will see a ray of light coming from the hole, striking the surface of the mirror. Mark the path of this ray with points or crosses on the white sheet. You will see another ray emerging from the point of incidence on the mirror. Mark the path of this ray with points or crosses on the white sheet. Mark the position of the mirror.

In the figure AO is the incident ray, OB , the reflected ray and PQ, the position of mirror. Now remove all the things from the white sheet. Join all the points. Draw a perpendicular at the point O , the point of incidence of incident ray. This is called the normal.

Observation : Angle of incidence and Angle of reflection are equal. The incident ray, the normal and the reflected ray all lie in the same plane.

Conclusion : Laws of reflection are verified.

2. **Cornea :** The eyeball is covered with a tough layer. This layer is transparent on the front. This transparent portion is called cornea.

   Iris : Iris is a thin circular structure. It works like the shutter of a camera. It controls the amount of light entering the eye. The colour of iris imparts distinct colour to the eyes of an individual. A person with blue iris has blue eyes.

   Pupil : There is a hole in the centre of iris. This is called pupil. Light enters the eye through the pupil. When the light is bright, iris contracts and thus allows less light into the eye. When the light is dim, iris dilates and thus allows more light into the eye.

   Lens : Lens is present behind the pupil. The lens in the human eye is a convex lens. The size and thickness of the lens change as per the distance of an object.

   Retina : Retina is at the back of the eye and marks the inner layer of the eyeball. Images are formed on the retina and thus it works like a screen. There are photosensitive cells in the retina. These cells are of two types, which are as follows:

   Cone Cells : The cone cells are sensitive to bright light. They also give the sense of colour.

   Rod Cells : The rod cells are sensitive to dim light.

   Optic Nerve : The optic nerve emerges from the back of the eye ball. This nerve goes to the brain.

   Blind Spot : The junction of retina and the optic nerve is called the blind spot. There is no photosensitive cell at this spot, and hence no image is formed at this spot on the retina.

3. Some people face with disability of vision. This disability can be partial or complete. Such persons are called visually challenged persons. For a visually challenged person; life can be very difficult. These people usually show a marked development of other

senses; like the sense of hearing and sense of touch. Many aids have been devised to make their life easy. They can be divided into two categories, viz. optical and non-optical aids.

Optical Aids : Optical aids can help a person who is partially visually challenged. These aids enlarge an image or a text so that they could be visible. TV monitors, magnifying devices and telescopic devices come under this category.

Non-optical Aids : Non-optical aids are helpful for a person who is completely visually challenged. These aids rely on the senses of hearing and touch. Aids which rely on the sense of touch are called tactual aids. Tactile buttons on the pedestrian light and in public transport are examples of tactual aids. Tactile strips at the edge of the platforms are also meant for visually challenged persons. Even the currency notes have tactile markings so that a visually challenged person can recognize notes of different denominations.

4. When two or more mirrors are placed at some angles to each other, we get to see multiple images. Let us take an example in which two mirrors are placed opposite to each other. If an object is placed between them, its image is formed in both the mirrors. The image in one mirror would act as an object for another mirror and this sequence would continue. This will result in the formation of multiple images.
5. When light falls on a shiny surface, most of it bounces back. This phenomenon is called reflection of light.

   Regular Reflection : When all the reflected rays are parallel to each other; this case of reflection is called regular reflection. Regular reflection happens from a smooth surface, e.g. a mirror. We get to see clear images when image is formed by regular reflection.

   Irregular Reflection or Diffused reflection : When

the reflected rays are not parallel to each other; this case of reflection is called irregular reflection. Irregular reflection happens from a rough surface. The laws of reflection are obeyed in this case as well but because of the irregularities in the surface, the reflected rays are not parallel. We get to see somewhat blurred images when image is formed by irregular reflection. The relative clarity of an image depends on the relative smoothness of the reflecting surface.

Lesson – 16 : Stars and Solar System

A. 1. Neptune 2. Constellation
3. Satellite 4. Earth
5. Astronomy

B. 1. False 2. True 3. True
4. True 5. False

C. 1. (c) 2. (a)
3. (c) 4. (c)

D. 1. Constellations 2. Earth
3. Stars, moon, sun 4. Moon

E. 1. When a small object from the space reaches the atmosphere of the earth; it enters at a very high speed. The high speed creates so much friction that the object burns off before reaching the earth. Such objects are called meteors.

They are visible as shooting stars in the night sky. Sometimes, an object can be too big to be completely destroyed by burning. Such objects reach the surface of the earth and are called meteorites.

2. **Asteroids :** The asteroid belt is present between the orbits of Mars and Jupiter. This belt extends between 2.3 and 3.3 AU from the sun. Asteroids are made up of rocks, metallic minerals and some ice. They are remnants of formation of the solar system.

Comets : A comet is a celestial body which revolves

around the sun in a highly elliptical path. When a comet passes from near the earth, it becomes visible to us. Halley's Comet and Hale Bopp are some of the famous comets. Halley's Comet appears after every 76 years. It appeared last time in 1986 and is expected to appear again in 2062.

F. 1. **Ursa Major :** This is also known as Great Bear and Big Dipper. It resembles the shape of a ladle. The four stars which appear as four vertices of a quadrilateral make the bowl of the ladle and the remaining three stars make the handle of the ladle. Ursa Major appears in the northern sky. The pole star is in line with last two stars of the quadrilateral. Since this constellation appears quite close to the pole star, it looks as if revolving around the pole star.

Ursa Minor : It is also called as ' Laghu Saptarishi' and Little Bear. Pole star is at the end of the tail of the constellation there it is also called as ' Pole Star Constellation'. Ursa Minor can be seen clearly during spring in the months June-July.

2. **New Moon :** On the new moon day, no moon is visible in the sky. This phase is Amavasya.

Waxing Crescent : Within a few days of the new moon day; the moon appears like a crescent. This is called the waxing crescent.

1st Quarter : Within about a week from the new moon day; the moon appears as a semicircle. This is called the 1st quarter moon.

Waxing Gibbous : Within about 10 days from the new moon day; the moon appears as a circle with some portion cut off. This is called the waxing gibbous moon.

Full Moon : Within about 15 days from the new moon day; the moon appears as a complete circle. This is called the full moon.

Waning Phase : The waxing phase of the moon is followed by the waning phase. During this phase; the

full moon reduces in size and goes through the waning gibbous, 2nd quarter and waning crescent phases. Within about 29 days from the new moon day; the next lunar month begins with the next new moon.

3. Because of the tilt of the Earth's axis. At different times of the year the sun's rays hit different parts of the globe more directly. The angle of the Earth's axis tilts the Northern Hemisphere towards the sun during summer.

4. **Asteroids :** The asteroid belt is present between the orbits of Mars and Jupiter. This belt extends between 2.3 and 3.3 AU from the sun. Asteroids are made up of rocks, metallic minerals and some ice. They are remnants of formation of the solar system.

   Comets : A comet is a celestial body which revolves around the sun in a highly elliptical path. When a comet passes from near the earth, it becomes visible to us. Halley's Comet and Hale Bopp are some of the famous comets. Halley's Comet appears after every 76 years. It appeared last time in 1986 and is expected to appear again in 2062.

5. The solar system is made up of the sun, its planets, satellites, asteroids, comets, dwarf planets, etc. All other members of the solar system keep on revolving around the sun. This is possible because of the gravitational attraction between the sun and these bodies. The solar system is 4.6 billion years old.

   The Sun : The sun is the centre of the solar system. The sun is a huge store of heat and light energy.

   Planet : A celestial body which revolves around a star is called a planet.

   Satellite : A celestial body which revolves around a planet is called a satellite.

   Mercury (Budh) : This is the smallest planet in the solar system and is nearest to the sun.

Lesson – 17 : Pollution of Air and Water

A. 1. water 2. life 3. polluted
4. permissible limits 5. particulate

B. 1. False 2. True 3. False
4. False 5. True

C. 1. (b) 2. (c) 3. (a)
4. (d) 5. (a) 6. (c)

D. 1. Acid fumes 2. Eutrophication
3. Filtration 4. Cholera
5. Nickel

E. 1. . Addition of untreated sewage into the river.
. Discharge of industrial toxic waste in the rivers (e.g. addition of lead, arsenic, mercury etc.)
. Injudiciously using fertilizers and pesticides.
. Presence of acids, alkalies etc. can be very harmful, also give bad taste to water.

2. Pollution is addition of harmful substances into the environment due to natural phenomena and human activities. Air pollution and water pollution are the kinds of pollution.

3. Many diseases like cholera, dysentery, gastroenteritis, hepatitis, typhoid, skin diseases etc. are caused due to intake of polluted water.

Aquatic life is disturbed due to the addition of toxic non-biodegradable metals like lead mercury, arsenic, copper, nickel etc.

4. . Treatment of city-sewage before being discharged into the rivers.
. Using biodegradable fertilizers and pesticide.
. Planting more trees along the banks of rivers.

5. Gaseous pollutants, solid pollutants and non-biodegradable pollutants are the different types of pollutant.

Gaseous Pollutants : Gases like carbon monoxide, oxides of sulphur and nitrogen produced due to

various activities like incomplete combustion, decomposition etc act as gaseous pollutants of the environment.

F. 1. There are three kinds of pollutants.

Gaseous Pollutants : Gases like carbon monoxide, oxides of sulphur and nitrogen produced due to various activities like incomplete combustion, decomposition etc act as gaseous pollutants of the environment.

Solid or Particulate Pollutants : The solid or liquid matter ranging in size from 0.1 micrometre to 10 micrometre cause a lot of air pollution. Inhalation of small particulate over a longer period of time may cause serious diseases like pneumoconiosis (scarring or fibrosis of membrane of lungs).

Some particulate pollutants are smoke, mist, fumes, cement, dust, pesticides insecticides, pollen grains, fungi etc. Lead and mercury pollution can be very damaging.

Non-biodegradable Pollutants : The substances which are added into the environment and do not chemically breakdown by the action of microbes, air, enzymes etc. are called as non-biodegradable pollutants. They can very harmful as they are toxic and remain unchanged for a long time, for example DDT, CFC, insecticides, pesticides etc.

2. **Oxides of sulphur and Nitrogen :** Cause respiratory problems, cause acid rain.

Carbon in Air : Causes global warming by increasing the temperature of earth.

3. The rain water containing dissolved oxides of mainly sulphur and nitrogen is termed as acid rain.

Burning of fuels like coal, petroleum, diesel etc., result in the formation of carbon dioxide, carbon monoxide, sulphur dioxide, hydrogen sulphide, unburnt hydrocarbons which are constantly added into the atmosphere. Oxides of nitrogen and sulphur

produce nitric and sulphuric acid when dissolved in rain water. The rain water now called as acid rain comes down and cause :

- Loss of fertility of soil.
- Promotes corrosion of metallic structures.
- Damage to buildings made up of marble, cement etc. e.g. yellowing of white marble of Taj Mahal.
- Harm to aquatic and plant life.

4. Excess of carbon dioxide produced due to burning of fossil fuels adds to the air. This increases the temperature of the earth's atmosphere, a damaging phenomenon called the Green House Effect causing global warming.

   This has following effects :

   - Monsoon pattern is changing.
   - This affects the crop cultivation cycle.
   - The melting of polar caps resulting in floods, raising the water level in seas and oceans submerging the low lying areas.

5. **Removal of Suspended Impurities :** The river water which is driven from the source (river, lake) is collected in large tanks. Here, the suspended impurities get settled by the addition of alum in it. The upper cleaner layers of water are taken for filtration while the suspended impurities settle down. This is called as sedimentation.

   Filtration : Fine suspended impurities get removed by the process of filtration by passing water through thick layers of sand and gravel.

   Aeration : Aeration is done to kill harmful micro-organisms by pumping air into the filtered water.

   Chlorination : Finally the aerated water is treated with very small amount of chlorine to kill remaining germs and bacteria i.e. it is sterilized. This water is supplied through pipe-lines to the consumers.

Domestic Water Purification : The villages in our country still have water sources like wells, hand pumps, rivers, ponds and lakes which supply water for drinking, cooking, washing and bathing etc. This water if directly taken causes many kinds of diseases, allergies etc.