GENIUS BEE
A GREAT LEARNER

Teacher's Help Book (6-8)

FUSION SCIENCE

A Textbook of Science & Technology

1 Chapter Food: Where Does it Come From?

A. **1.** (d); **2.** (c); **3.** (a); **4.** (a); **5.** (d)

B. **1.** flesh; **2.** Rice; **3.** omnivores; **4.** spices; **5.** ingredients

C. **1.** Photosynthesis.

2. **Producers :** Plants are producers. This is because they produce energy for the ecosystem.

3. **Consumers :** Animals are consumers. This is because they don't produce energy, they just use it up. Animals that eat plants are called primary consumers or herbivores.

4. Decomposers eat decaying matter (like dead plants and animals). They help put nutrients back into the soil for plants to eat. Examples of decomposers are worms, bacteria and fungi.

5. We call carnivores those animals which eat only the flesh of other animals.

D. **1.** All living things need energy to do work. They get this energy from the food. The material which we eat is known as food. Food is also essential to build and maintain our body. We get milk, eggs, honey and meat from animals. from Buffaloes, cows, goats, we get milk. We get honey from bees and we get meat from hen, goat etc.

2. Any animal that sustains itself solely on meat is classified as a carnivore. They often have sharper teeth or even fangs to help tear up flesh.

3. Every living plant and animal requires energy to survive. Plants rely on the soil, water and the sun for energy. Animals rely on plants as well as other animals for energy. In an ecosystem, plants and animals all rely on each other to live. Scientists sometimes describe this dependence as a food chain or a food web.

4. Cereals such as wheat, maize, rice, oat, etc., are energy rich grains, obtained from grasses. They are rich in carbohydrates along with some proteins, vitamins and minerals.

5. Any animal that eats only plants will be classified as herbivore. Just because they don't eat meat doesn't mean all herbivores are small. Guinea pigs, rabbits, bees and butterflies are all good examples of small herbivores

E. **1.** Food is also essential to build and maintain our body. So food is the basic necessity of our body just as air and water. We need food for growth and development, to get energy, to carry out different functions, for repair and maintenance of body and to fight against various diseases.

2. Animals fall into three distinct groups based upon what they eat. This is a natural way to group animals. Plant eaters are herbivores, meat eaters are carnivores and animals that eat both plants and animals are omnivores.

Herbivores : Any animal that eats only plants will be classified as herbivore. Guinea pigs, rabbits, bees and butterflies are all good examples of small herbivores, but horse, cow, zebra, deer and elephant are herbivores as well.

Carnivores : Any animal that sustains itself solely on meat is classified as a carnivore. Carnivores often have sharper teeth or even fangs to help tear up flesh. Most of the time in their ecosystem, carnivores will prey on herbivores. Small carnivores can include spider, frog and bat.

Omnivores : Any animal that can eat both plants and animals is an omnivore. Humans are omnivores, containing flat and sharp teeth. Bear is an example of omnivores.

3. Consumers or heterotrophs have different eating habits. Humans and animals can be divided into following three main categories based on their eating habits.

1. Herbivores, 2. Carnivores, 3. Omnivores

As human beings are omnivores they are classified as vegetarian and non-vegetarian.

Vegetarian	Non-vegetarian
People who eat only plant products or parts of plants known as vegetarians.	People who eat plant products as well as animal products like fish, meat, etc., are called non- vegetarians.

4. Plants are the primary source of food. Green plants are known as autotrophs or producers because they make their food by the process of photosynthesis. All other living organisms including humans depend on plants for their food. These organisms are called heterotrophs or consumers.

There is a large variety of plants on Earth. Many of these provide us a large number of edible substances which come from different parts of plants. Some of them are given below.

Fruits : Fruits generally contain carbohydrates, minerals, vitamins and antioxidants. They are usually consumed raw but are also used in making a lot of sweet dishes.

Vegetables : Vegetables include stems, roots, leaves and fruits of different plants. Some vegetables are eaten raw while others are cooked before consuming. They generally provide carbohydrates, vitamins, minerals and roughage.

Oils : Oils are fat-rich food obtained from seeds of different plants such as sesame, groundnut, sunflower, coconut, etc.

5. Animals are also some important sources of food for us. We get milk, eggs, honey and meat from animals.

Milk Products : Milk is an important part of our diet. The main sources of milk for us are buffaloes and cows along with goats and sheeps. Different foods made from milk are known as dairy products. These include butter, cheese, ghee and cream.

Fish or Seafood : Fish meat is a rich source of proteins and vitamins. There is a vast variety of fish available in freshwater bodies and seas. Rohu and hilsa are common freshwater fish eaten in India.

Egg and Meat : Egg is a rich source of proteins and vitamins. Eggs are obtained from hens and ducks. Meat is obtained from poultry (hen, duck, goose, chicken) and animals like goat, sheep, fish, prawns, etc.

Poultry : Poultry is a place where domesticated birds like, duck, chicken, hen, turkey and geese are kept by humans for the eggs they produce, their meat, feathers, or sometimes as pets.

Honey : Honey is a sweet food which is a rich source of sugar and minerals. It is produced by honeybees from the nectar of flowers.

2 Chapter Components of Food

A. **1.** (d); **2.** (b); **3.** (d); **4.** (d)

B. **1.** energy-giving; **2.** Vitamin B; **3.** indigestible plant; **4.** Iron; **5.** Pulses

C. **1.** Chlorophyll

2. Iodine

3. Balanced diet is the diet containing all the nutrients in proper amount.

4. Obesity

5. Rickets

D. **1.** Fats are the richest source of energy to our body, but they are more expensive than carbohydrates. Fats can also be stored in the body for subsequent use. The fats present in our food cannot be absorbed by our body as such because they are complex organic molecules which are insoluble in water.

2. A condition of disease caused by deficiency of a specific vitamin, mineral, or macronutrient such as protein, resulting from inadequate dietary intake is called deficiency disease.

Nutrient deficiency diseases occur when there is an absence of nutrients which are essential for growth and

health. Lack of food leads to either malnutrition or starvation gives rise to these diseases.

3. A balanced diet is made up of foods from the five food groups : carbohydrates, fruits and vegetables, protein, dairy and healthy fats. Each provides the range of vitamins and minerals our bodies need to function efficiently.

4. A diet is all that we consume in a day. And a balanced diet is a diet that contains an adequate quantity of the nutrients that we require in a day. A balanced diet includes six main nutrients, i.e. fats, protein, carbohydrates, fibre, vitamins and minerals.

All these nutrients are present in the foods that we eat. Different food items have different proportions of nutrients present in them. The requirement of the nutrients depend on the age, gender and health of a person.

5. Nutrient deficiency diseases occur when there is an absence of nutrients which are essential for growth and health. Lack of food leads to either malnutrition or starvation gives rise to these diseases.

E. **1.** Water is an inorganic substance which helps in preparing food for assimilation by the body. Water is present in the cell protoplasm, blood plasma and in the intercellular fluid in the tissues. In fact, about two third of a man's body weight is the water in the tissues of his body. Water plays an important role in a large number of processes like digestion, transport and helps in regulation of body temperature.

Water is the solvent for all the salts in the body and it is the medium in which all chemical reactions take place in the body. Water is a good solvent so it dissolves the food nutrients which can then be absorbed or digested by the body. Water acts as a solvent for transporting dissolved food materials from the digestive tract to the blood. Water also dissolves the waste material of our body and hence

provide a good medium for excreting body wastes. An important role of water in our body is to regulate the body temperature, the process of sweating and evaporation. The survival time without water is very short. Without water, the body cells can not function and they die.

2. Overeating causes fatty body, tiredness, drowsiness, acidity, gas problems, metabolic problems, increasing risk of chronic diseases.

3. Proteins are highly complex organic compounds made up of carbon, hydrogen, oxygen and nitrogen. Some of the proteins also contain elements such as sulphur and phosphorus. Proteins are very important in our food for growth and repair of the body. Proteins are needed for maintenance of the wear and tear of body tissues in adults. In addition to all this, proteins also supply some energy to the body. Proteins are made up of nitrogen containing compounds called Amino Acids. Amino acids link through peptide bonds to form protein molecules. There are more than 20 of these amino acids and they all occur in almost all proteins. But the relative amount of each amino acid present differs in different proteins.

Some of important types of proteins required by our body are; enzymes, hormones, transport proteins, contractile proteins, structural proteins and protective proteins.

4. **(a) Scurvy (Vitamin C) :** It delayed wound healing, internal bleeding, abnormal formation of bones and teeth.

(b) Goitre (Iodine) : It enlarged thyroid gland, poor growth in infancy and childhood, possible mental retardation, cretinism.

(c) Beriberi (Thiamin) : It nerve degeneration, altered muscle coordination, cardiovascular problems.

(d) Iron-deficiency or Anaemia (Iron) : It decreased work output, reduced growth, increased health risk in pregnancy.

5.

Vitamin	Function
Vitamin A	Forms and maintains teeth, bones, tissue, and skin.
Vitamin B1	Part of an enzyme needed for energy metabolism; important for nerve functions.
Vitamin B2	Part of an enzyme needed for energy metabolism; important for normal vision and skin health.
Vitamin B12	Part of an enzyme needed for making new cells; important for nerve functions.
Vitamin C	Antioxidant; part of an enzyme needed for protein metabolism; important for immune system and health; aids in iron absorption.
Vitamin D	Needed for proper absorption of calcium; stored in bones.
Vitamin E	Antioxidant; protects cell walls.
Vitamin K	Needed for proper blood clotting.

3 Chapter Fibre to Fabric

A. **1.** (b); **2.** (c); **3.** (b); **4.** (c); **5.** (b)

B. **1.** Fibre; **2.** Jute; **3.** synthetic; **4.** Clothes; **5.** Cotton; **6.** Cotton; **7.** Cotton; **8.** Woolen

C. **1.** Wool is obtained from the fleece of sheep.
2. Shearing is the process of removing the wool from sheep.
3. Fibre is used to make clothes.
4. Mulberry silkworm make around itself.
5. India is the leading producer of jute.
6. Fruit of the cotton plant gives fibre.

D. **1.** Fibre is a long hair-like structure which is the basic unit of a fabric.

2. Spinning is the process of twisting together of single strands of fibres to from yarn, and is a major part of the textile industry.
3. Every part of the cotton plant can be used. The long cotton fibres are used to make cloth, the short fibres can be used in the paper industry. You can make oil or margarine out of the seeds of the cotton plant. The leaves and stalks of the cotton plant are plowed into the ground to make the soil better. Other parts of the plant are fed to animals.
4. Retting is separation of jute fibre from jute stems.
5. Shearing is cutting off fleece from the skin of a sheep.
6. A fabric is made up of two sets of yarns arranged together. The process of arranging two sets of yarns together to make a fabric is called weaving.

E. **1.** After people began to settle in agricultural communities, they learnt to weave twigs and grass into mats and baskets. Vines, animal fleece or hair were twisted together into long strands. These were woven into fabrics. The early Indians wore fabrics made out of cotton that grew in the regions near the river Ganga. Flax is also a plant that gives natural fibres. In ancient Egypt, cotton as well as flax were cultivated near the river Nile and were used for making fabrics.

In those days, stitching was not known. People simply draped the fabrics around different parts of their body. Many different ways of draping fabrics were used. With the invention of the sewing needle, people started stitching fabrics to make clothes. Stitched clothes have gone through many variations since this invention.

2. **Cotton :** Cotton is a plant that produces fibres, which are used to make clothes and other products, like towels, carpets or sheets. Clothes made out of cotton are especially light and comfortable .

Every part of the cotton plant can be used. The long cotton fibres are used to make cloth, the short fibres can be used

in the paper industry. You can make oil or margarine out of the seeds of the cotton plant. The leaves and stalks of the cotton plant are plowed into the ground to make the soil better. Other parts of the plant are fed to animals.

Cotton plants are usually grown at places having black soil and warm climate. The fruits of the cotton plant (cotton bolls) are about the size of a lemon. After maturing, the bolls burst open 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 of cotton. Ginning was traditionally done by hand. These days, machines are also used for ginning.

3. We should wear light coloured clothes in summer because light coloured clothes keeps us cool as they insulate the heat and cotton clothes makes us comfortable in summers and cotton clothes absorb the sweat which we get mostly in summers and we wear woolen clothes in winter.

4. **(a) Weaving :** A fabric is made up of two sets of yarns arranged together. The process of arranging two sets of yarns together to make a fabric is called weaving.

(b) Spinning : Spinning is the process of twisting together of single strands of fibres to from yarn, and is a major part of the textile industry.

(c) Knitting : In knitting, a single yarn is used to make a piece of fabric. A single yarn gets pulled out continuously as the fabric gets unravelled. Socks and many other clothing items are made of knitted fabrics. Knitting is done by hand and also on machines.

5. The most popular kind of silk is obtained from the mulberry silk worm. The silk that is obtained from other varieties of silk worms is called wild silk. China, India, Nepal and Europe have been traditional producers of good quality silk on a large scale. Silk fibre has a unique sheen. It

is very smooth to the touch, at the same time being strong. These qualities made it the fabric of choice for sarees and dress materials. Apart from this, silk is also used for nightwear, bed linen, underwear as well as home furnishings.

Sorting Materials into Groups

A. **1.** (a); **2.** (c); **3.** (d); **4.** (a); **5.** (d)

B. **1.** gasous; **2.** sink; **3.** Classification; **4.** chemical properties, physical properties; **5.** Lustre

C. **1.** Alcohol, Acetone

2. Water, glass

3. The maximum amount of solute that can be dissolved in a known quantity of solvent at a certain temperature is its solubility.

4. The process of grouping things on the basis of similar properties is called grouping.

5. Transparent object allows light to pass through them.

D. **1.** The way that objects reflect light differently can be attributed to a property called 'luster.'

2. The maximum amount of solute that can dissolve in a known quantity of solvent at a certain temperature is its solubility.

3. There are three states of matter–solid, liquid and gas.

4. Flotation is the property to stay on the surface of a liquid.

5. Solution is a uniform mixture prepared by mixing two or more substances.

E. **1.** Matter can exist in one of three main states: solid, liquid or gas.

- Solid matter is composed of tightly packed particles. A solid will retain its shape; the particles are not free to move around. Solid substance retains its size and shape without a container, its molecules cannot move freely

except to vibrate. Examples: wood, metals (iron, gold, silver).

- Liquid matter is made of more loosely packed particles. It will take the shape of its container. Particles can move about within a liquid, but they are packed densely enough so that its volume is maintained. It takes the shape of its container but maintains constant volume. Examples: water, milk, oil, honey.
- Gaseous matter is composed of particles packed so loosely that it has neither a defined shape nor a defined volume. Gaseous substance can only be contained if it is fully surrounded by a container. Examples: air, nitrogen, hydrogen, helium.

2. **Transparent Object :** These allow light to pass through them. We can look through them. Such as glass, water, acrylic sheet and cellophane paper are transparent objects.

   Translucent Object : These object allow light to pass through them partially. So we cannot see clearly through them. Butter paper, oily paper, frosted glass and thin muslin cloth are translucent objects.

   Opaque Objects : These objects do not allow the light to pass through. So we cannot see anything through them. Such as, leaf, wood, stone, metal and cardboard are opaque objects.

3. The general properties of matter such as appearance, lustre, state, texture, hardness, transparency, etc., are examples of physical properties.

   Appearance : Materials usually look different from each other. Wood looks very different from iron. Iron appears different from copper or aluminium. At the same time, there may be some similarities between iron, copper and aluminium that are not there in wood.

Lustre : When you look at materials, you will notice some are shiny and some are not so shiny. That's because these substances reflect light in different ways. There are some that do not really reflect light well, so they can be described as 'dull.' The way that these objects reflect light differently can be attributed to a property called 'luster.'

State : Matter can exist in one of three main states: solid, liquid or gas.

Texture : Texture means how a material feels to touch. Run your hand over the stem of a tree in the playground and also on a TV screen at your home. The stem of the tree is rough whereas the TV screen is smooth. Rough substances have uneven surface with ridges.

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

4. **Soluble and Insoluble Substances :** Collect samples of some solid substances such as sugar, salt, chalk powder, sand and sawdust. Take five glasses or beakers. Fill each one of them about two-thirds with water. Add a small amount (spoonful) of sugar to the first glass, salt to the second and similarly, add small amounts of the other substances into the other glasses. Stir the contents of each of them with a spoon. Wait for a few minutes. Observe what happens to the substances added to water. You will notice that some substances have completely disappeared or dissolved in water. We say that these substances are soluble in water. Other substances do not mix with water and do not disappear even after we stir for a long time. These substances are insoluble in water.
5. The liquids which disappear into water are called miscible in water. Few examples of miscible liquids are milk, vinegar, lemon juice, etc. The liquids which do not dissolve in water are called immiscible in water. Few examples of immiscible liquids are mustard oil, coconut oil, paint etc.

A. **1.** (c); **2.** (a); **3.** (b); **4.** (a); **5.** (a); **6.** (c); **7.** (c)

B. **1.** animals; **2.** filter; **3.** varying physical and chemical properties **4.** filteration; **5.** threshing; **6.** evaporation; **7.** Winnowing; **8.** condensation

C.
1. Handpicking is used to separate stones from pulses.
2. Filteration is used to separate tea leaves.
3. Mixture
4. Filteration is used for separation.
5. Filteration is used to separate the fine solid particles from water.
6. Evaporation is used to obtain common salt from sea.
7. Thresher is used to separate large quantities of grains at a time.
8. Condensation.

D.
1. It involves throwing the mixture into the air so that the wind blows away the lighter chaff. The heavier grains fall back down for recovery. This method is called "wind-grading".
2. When a substance is formed by two or more simple substances, it is known as a mixture, whose properties remain constant but its composition is variable.
3. It is the process of conversion of water vapour into its liquid form. For example, the water vapour condenses and we receive the same water in the form of rain.
4. It is the process of conversion of water into water vapour by heating it to its boiling point.
5. Threshing is the process of separating the grain from the straw. It can be either done by hand, by using a treadle thresher or by threshing machine.
6. Filtration is a process used to separate solids from liquids or gases using a filter medium that allows the fluid to pass, but not the solid.

E. **1.** Sedimentation and decantation methods are used for the separation of insoluble substances which are heavier than liquid. In the sedimentation process, heavier components of the mixture settle on the bottom, due to gravity. Sedimentation is followed by Decantation. The decantation process involves pouring clear, upper liquid out of the container, without disturbing the sediment.

2. It is the process by which a pure liquid is obtained from a solution by evaporating and then condensing the vapour. In distillation the mixture is heated to evaporate the liquid. The vapour of the liquid is collected and condensed to obtain pure water. The water obtained after distillation from a solution is called distilled water. Distilled water is used in laboratory and in the car batteries. To carry out this process, a special apparatus known as condenser is used.

3. Components of a mixture are separated for many reasons. Some of them are as follows :

- To obtain useful substances from a raw material.
- To remove undesirable or harmful substances
- To separate different useful components of a mixture. For example, cream is separated from milk by churning it.

4. **(a) Difference between Pure Substance and Mixture**

Pure substances cannot be separated into any other kinds of matter, while a mixture is a combination of two or more pure substances.

A pure substance has constant physical and chemical properties, while mixtures have varying physical and chemical properties (e.g., different boiling point and melting point).

A pure substance is pure, while a mixture is impure.

(b) Evaporation : It is the process of conversion of water into water vapour by heating it to its boiling point.

For example, the salt can be easily obtained from the salty water by the process of evaporation. If we boil this water,

the water evaporates completely, leaving behind only the salt.

Condensation : It is the process of conversion of water vapour into its liquid from. For example, the water vapour condenses and we receive the same water in the form of rain. If you pour cold water in a glass, you will observe the formation of water droplets on the outer surface of the glass. This is due to the condensation of water vapour present in atmosphere.

5. Components of a mixture are separated for many reasons. Some of them are as follows :

- To obtain useful substances from a raw material. For example, metals such as gold and silver are obtained in the form of mixtures from the Earth's crust and are then separated from it.
- To remove undesirable or harmful substances. For example, before cooking your mother separates the small stones or husk particles from the rice. A strainer is used to remove tea leaves before drinking tea.
- To separate different useful components of a mixture. For example, cream is separated from milk by churning it.

6 Chapter Changes Around Us

A. **1.** (a); **2.** (d); **3.** (b); **4.** (c); **5.** (d)

B. **1.** natural; **2.** slow; **3.** man-made; **4.** reversible; **5.** physical change

C. **1.** Natural changes cannot be controlled by man.
2. Desirable changes
3. Exothermic
4. Earthquake
5. Reversible changes

D. **1.** **Slow change :** Those type of changes which take more time to undergo change is called slow change.
For example: Increase in height in humans.

2. **Difference Between Reversible Changes and Irreversible Changes**

Reversible changes	Irreversible changes
• A substance can return to its original state. • The chemical properties of the substance do not change. • Mostly physical changes are reversible changes.	A substance cannot return to its original state. The chemical properties of the substance change. All chemical changes are irreversible changes.

3. Desirable change is observed when raw mango is ripened.
4. In 1959, Charles Darwin gave the theory of evolution in organisations.
5. **Slow change :** Those type of changes which take more time to undergo change is called slow change.

   For example: Increase in height in humans.

E. 1. **Desirable and Undesirable Changes :** Desirable changes are those changes which we want to occur. These changes are useful for us.

   For example : ripening of fruits, germination of seeds, change in season, etc.

   Non-desirable or undesirable changes are those changes which we do not want to take place. For example : rusting of iron, souring of milk, rottening of fruits and vegetables , global warming, etc.

2. Natural changes are changes that occur naturally and man has no part to play in these changes. Man-made changes are changes that occur due to man and man plays a role in these changes.

   Examples of natural changes are growth in man and seasonal changes and examples of man-made changes are burning of fuels and chemical reactions.

   Natural Change–heartbeat

   Man-made Change–pollution

3. **Periodic and Non-periodic Changes :** Changes which are repeated after regular intervals are called periodic changes. The occurrence of day and night and even the change of periods in your school, flooding due to annual monsoons, the tides, solar emissions, ocean heating, meteor showers are examples of periodic changes. Changes which do not take place periodically, such as freezing of water to form ice, earthquakes, tornadoes and hurricanes, pollution of the environment through human activity are non-periodic changes.
4. **Difference Between Reversible Changes and Irreversible Changes**

Reversible changes	Irreversible changes
• A substance can return to its original state.	A substance cannot return to its original state.
• The chemical properties of the substance do not change.	The chemical properties of the substance change.
• Mostly physical changes are reversible changes.	All chemical changes are irreversible changes.

5. In tearing of paper, no new substance. is formed. Therefore it is a physical change. Whereas in burning of paper, a new substance called ash is formed. this new substance differs from the original substance (paper) in its appearance and properties.

7 Chapter Getting to Know Plants

A. **1.** (b); **2.** (c); **3.** (a); **4.** (b); **5.** (d)

B. **1.** venation; **2.** Plumule; **3.** Pumpkin, watermelon; **4.** Roots; **5.** climbers

C. **1.** Climbers and Creepers
2. Chlorophyll
3. Tendrils coil themselves around any neighbouring object and help the plant to climb.

4. Mango tree, Banyan tree
5. Pistil

D. 1. Mustard and china rose have tap roots. Rice and Wheat has fibrous roots.

2. A leaf is the green, flat lateral outgrowth in plants. They come in different shapes, sizes and colours, and are generally dorso-ventrally flattened and thin. They are the main organs responsible for photosynthesis as they contain chlorophyll.

3. Herbs are small plants having a green and delicate stem. Herbs have a short lifespan. They live for one or two seasons; for examples– grasses, mint, tomato, spinach, wheat, rice, etc.

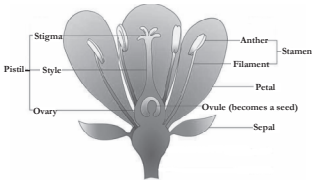
4. **Petals :** This is the brightly coloured part which attracts bees, insects and birds. Colour of petals varies from plant to plant; some are bright while some are pale colored.

   Sepals : Sepal is the green colored part beneath the petals to protect rising buds. Some flowers have fused petals-sepals but some have separated petals-sepals.

E. 1. **Functions of Stem**

- It supports and holds leaves, flowers, and fruits.
- The stem allows the leaves to arrange in a way that they are able to receive direct sunlight in order to efficiently perform photosynthesis.
- The xylem and phloem present in the vascular bundles of stems conduct water and minerals across the plant.
- Stems bear flowers and fruits in a position that facilitates the processes of pollination, fertilization and dispersion of seeds.
- Some stems undergo modification to store food and water. Example: succulents.
- Few green stems contain chloroplasts and are capable of carrying out photosynthesis as well.

2. Parts of a Flower



Parts of a Flower

Petals : This is the brightly coloured part which attracts bees, insects and birds. Colour of petals varies from plant to plant; some are bright while some are pale colored.

Sepals : Sepal is the green colored part beneath the petals to protect rising buds. Some flowers have fused petals-sepals but some have separated petals-sepals.

Stamen : This is the male reproductive organ and consists of two parts namely: anther and filament which are usually yellow. Anther is a sac that produces and stores pollen whereas filament supports the anther.

Pistil : This is the innermost part of the flowers. The female reproductive organ of a flower comprises of three parts : stigma, style and ovary which are collectively known as pistil. Stigma is the topmost part; style is the long tube which connects stigma to the ovary. The ovary has lots of ovules. It is the part of the plant where the seed formation takes place.

Functions of a Flower

- It accommodates the sex organs of plant, i.e. stamens and carpels (pistil).
- It attracts insects and other animals in prior to pollination.
- It gives nectar.
- It is the beauty of the plant.
- Each part of a flower has a direct or indirect role in the overall development and survival of the plant.
- If there is no flower, there are no plants.

3. A root is the part of the plant responsible for anchoring it down to the ground and absorbing essential nutrients, minerals and water from the soil. It is also used to store food. But not all plants have their roots underground, for

instance, plants such as Ivy have roots that are present entirely off the ground.

Functions of the Root

Roots perform various functions that are necessary for the survival of the plants. They are an integral system that help the plant in:

Anchoring : Roots are the reason that the plants remain attached to the ground. They support the plant body, ensuring that it stands erect.

Absorption : Primary function of roots is to absorb water and dissolved minerals from the soil. This is crucial as it helps in the process of photosynthesis.

Storage : Plants prepare food and store in the form of starch in the leaves, shoots and roots. Prominent examples include carrots, radish, beetroot, etc.

Reproduction : Even though roots are not the reproductive part of plants, they are vegetative parts. In some plants, roots are means of reproduction.

Ecological Function : They check soil erosion, provide sustenance and also habitat to various organisms.

4. Plants are mainly grouped on the basis of their size, the type of stem and branches.

Based on these properties, plants are grounded into three main categories : herbs, shrubs and trees. Beside these, creepers and climbers are the other categories.

Herbs

- Herbs are small plants having a green and delicate stem.
- Herbs are short-sized plants and usually do not grow more than one metre in height.
- They are also called non-woody plants.

Shrubs

- Shrubs are medium sized plants with a hard and woody stem; for example– jasmine, lemon, rose, henna, etc.

- The lifespan of shurbs is less than that of trees but more than that of herbs.

Trees

- Trees are tall and big plants with a hard and woody stem; for example– mango, neem, sandalwood, palm, banyan, eucalyptus, etc.
- Trees have one main stem known as trunk which usually gives out branches and leaves.

Creepers : A creeper is a plant which has a thin, long and weak stem and cannot stand upright, and spread on the ground. Such as cucumber, pumpkin and watermelon.

Climbers : A climber is a plant which has a thin, long and weak stem and cannot stand upright but readily climbs up a neighbouring support like a tree, wall railing, fence, etc. Such as pea plants, bottle gourd, grapevine, money plant, etc.

5. (a) Creepers and Climbers

Creepers : A creeper is a plant which has a thin, long and weak stem and cannot stand upright, and spread on the ground. Such as cucumber, pumpkin and watermelon.

Climbers : A climber is a plant which has a thin, long and weak stem and cannot stand upright but readily climbs up a neighbouring support like a tree, wall railing, fence, etc. Such as pea plants, bottle gourd, grapevine, money plant, etc. A climber has special organs for climbing, known as tendrils. Creepers do not have it.

(b) Stamen and Carpel

Stamen : This is the male reproductive organ and consists of two parts namely: anther and filament which are usually yellow. Anther is a sac that produces and stores pollen whereas filament supports the anther.

Carpel : Carpel is the ovule-bearing female reproductive organ of flowering plants and is required to ensure its protection an efficient fertilization and the development of diversified types of fruits.

(c) Herbs and Shrubs

Herbs

- Herbs are small plants having a green and delicate stem.
- Herbs are short-sized plants and usually do not grow more than one metre in height.
- They do not have a woody stem but they are strong enough to stand erect on their own. They are also called non-woody plants.
- Herbs have a short lifespan. They live for one or two seasons; for examples– grasses, mint, tomato, spinach, wheat, rice, etc.

Shrubs

- Shrubs are medium sized plants with a hard and woody stem; for example– jasmine, lemon, rose, henna, etc.
- The lifespan of shurbs is less than that of trees but more than that of herbs.
- Though the stem of a shrub is hard, it is not very thick. Branches arise from the base of the stem giving it a bushy appearance.

(d) Tap roots and Fibrous roots

Tap roots : These roots have a main central root upon which small, lateral roots called root hairs are attached. e.g., Mustard, China rose.

Fibrous roots : These roots, are bushy roots in which thin, moderately branching roots grow from the stem. e.g., Rice, Wheat.

Body Movement

A. **1.** (c); **2.** (c); **3.** (d); **4.** (c); **5.** (a)

B. **1.** hinge; **2.** foot; **3.** Fish; **4.** Skeleton; **5.** Snail; **6.** two

C. **1.** Joints are classified by their range of movement :

- Immovable, or fibrous joints,
- Partially movable, or cartilaginous
- Freely movable, or synovial

2. Earthworm move by hind.

3. Three kinds of freely movable joints play a big part in voluntary movement.
4. The curved bones present in our chest are known as Ribs.
5. The forelimbs are modified into wings and the hindlimbs are used for walking and perching (sitting) on tree branches.

D. 1. The ribcage is part of the Axial skeleton. It's important functions is to protect vital organs such as the heart and lungs.
2. Immovable, or fibrous joints don't move. The dome of the skull, for example, is made of bony plates, which move slightly during birth and then fuse together as the skull finishes growing. Between the edges of these plates are links, or joints, of fibrous tissue. Fibrous joints also hold the teeth in the jaw bone.
3. The function of the skull is both structurally supportive and protective. The skull will harden and fuse through development to protect its inner contents : the cerebrum, cerebellum, brainstem and orbits.
4. Humans have three different kinds of muscles:

   Skeletal muscle is attached by cord-like tendons to bone, such as in the legs, arms 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 help hold the skeleton together, give the body shape and help it with everyday movements (known as voluntary muscles because you can control them).

   Smooth or involuntary muscle is also made of fibers, but this type of muscle looks smooth, not striated. We can't consciously control our smooth muscles; rather, they're controlled by the nervous system automatically (which is why they're also called involuntary). Examples of smooth muscles are the walls of the stomach and intestines.

   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.

5. Joints are where two bones meet. They make the skeleton flexible. Without them, movement would be impossible.
Joints allow our bodies to move in many ways. Some joints open and close like a hinge (such as knees and elbows), whereas others allow for more complicated movement–a shoulder or hip joint, for example, allows for backward, forward, sideways and rotating movement.

6. There are some additional parts of the skeleton that are not as hard as bones and which can be bent. These are called cartilages. They are semirigid yet flexible. They form parts of the body where more flexibility is required.

7. Joints are classified by their range of movement :
- Immovable, or fibrous joints,
- Partially movable, or cartilaginous
- Freely movable, or synovial

E. **1.** Fish have streamlined body which offers least resistance to the flow of water and makes it easier for them to swim. Fish has various types of fins and tail that help it to swim.
Fins provide stability and direction while swimming and prevent the body from rolling. Thus, the fish can swim easily in water.
While swimming, forward movement takes place as follows :
a. Muscles make the front part curve to one side and the tail part to the other side.
b. After that, the front body part and the tail part quickly curve to the other side.
These movements produce a jerk and push the body forward. A series of these jerks help the fish to swim forward.

2. The body of an earthworm is soft and segmented, having no bones. Its body shape is maintained by the fluid present

inside its body. It is known as a liquid skeleton. Its body consists of muscles. An earthworm moves by stretching out its body in the front, keeping the hind end fixed to the ground. Then it fixes the front end and releases the hind end. It then shortens the body and pulls the hind end forward. Its movement is slow due to slow contractions and expansions of its body muscles. Under its body there are hair like bristles that project outside the body. These bristles hold the ground and help the earthworm to fix itself.

3. Most birds are capable of flying. Birds can also walk, hop or run on the ground. Some birds float on water by using their webbed feet.

The bird's body is suited for flying because of its shape, hollow bones and light, strong and powerful flight muscles. These muscles are attached to the breastbone.

The forelimbs are modified into wings and the hindlimbs are used for walking and perching (sitting) on tree branches.

4. Muscles are found around the bones. They are connected to the bones by another tissue called tendons.

When we bend our arm, our muscles contract and bulge so we can feel them. When we straighten our arm they expand again. Muscles work in pairs. When one of them contracts, it pulls the bone in that direction. The other muscle of the pair relaxes. When the bone has to move in an opposite direction, the relaxed one contracts while the first one relaxes. So, it takes two muscles to move a bone because a muscles can only pull and not push. When we bend our arm, the bicep muscles contract and triceps expand. When we straighten our arm, the reverse happens. Such muscle pairs are called antagonistic muscles.

5. Bones are the hard, inelastic and a tough organ that forms part of the vertebral skeleton. Cartilage is a soft, elastic and flexible connective tissue that protects the bone from rubbing against each other.

The Living Organisms and their Surrounding

A. **1.** (a); **2.** (c); **3.** (a); **4.** (c); **5.** (d)

B. **1.** abiotic; **2.** birds; **3.** Terrestrial; **4.** Camel; **5.** desert plants.

C. **1.** Reproduction
2. Habitat
3. Aquatic plants
4. Coniferous tree, Pine tree, Devdar tree etc.
5. Phototropism

D. **1.** To live in a particular kind of surrounding, organisms develop special features or make functional adjustments that help them to survive in their habitat. This is called adaptation.
- The stems of aquatic plants are soft, hollow and light having large spaces filled with air, they help them to stand and float.
- The aquatic plants have very small and short roots whose main function is to hold the plant in place and not to absorb water.

2. The place, where every organism live naturally, is known as its habitat or dwelling place. For example, the habitat of a zebra is the dry grassland whereas that of a whale is the ocean.
Different types of plants and animals live in different habitats. Habitats can be divided into two main types :
Terrestrial habitat, Aquatic habitat

3. A land-based habitat is known as a terrestrial habitat. The plants and animals which live on land are said to live in terrestrial habitats such as deserts, mountains, forests and grasslands. Examples of terrestrial organisms include the camel, elephant, deer, bear, human, horse, etc.

4. **Biotic Components :** Biotic components can be divided into producers, consumers and decomposers. Green plants are called producers.

Abiotic Components : Abiotic components like temperature, amount of water and sunshine, nature of soil, etc., are dependent on the weather and climate of a place.

Water bodies likes seas, oceans, lakes, rivers and ponds cover about 71 % of the surface of the earth. These water bodies support a wide variety of life, such as microogranisms, fish, whales, crabs and seaweeds.

5. (a) Floating plants and Submerged plants

Floating plants : Some aquatic plants float on water surface. Such as the water hyacinth.

Submerged plants :

Some aquatic plants are completely submerged in water, for example, the hydrilla and the vallisneria.

Some aquatic plants are partly submerged in water; for example the water lily and the lotus.

(b) Coniferous trees and Succulents

Coniferous trees : Coniferous trees have leaves which are very thin and in the shape of needles. These trees don't bear flowers but produce cones and hence are called coniferous trees.

Succulents : Succulents are the plants with thick fleshy tissues adapted to water storage. Some succulents store water only in the stem and have no leaves or very small leaves, whereas others store water mainly in the leaves.

E. 1. Adaptations in Mountainous Plants

Trees like pines or conifers found at higher altitudes survive in extremely cold and windy mountain habitats with the help of the following adaptations :

- The broad-leaved mountain trees shed their leaves before the onset of winter.
- They are usually conical in shape having sloping branches, which allow rainwater and snow to slide off easily without damaging the branches and leaves.
- Most mountain trees have needle-like leaves which are covered with waxy coating. This prevents loss of water due to transpiration.

Adaptations in Mountainous Animals

Animals living in mountain habitats are also adapted to the extremely cold environment. They have the following adaptive features :

- Animals like yak have thick hair on their body to protect them from cold and keep them warm.
- Snow leopards and polar bears have thick fur on their body which protects them from cold.
- A mountainous goat has strong hooves for climbing up the rocky slopes of mountains for grazing. Its body is also covered with long hair.

2. **Adaptations of aerial animals**
   - Birds have well-developed flight muscles.
   - The forelimbs of birds are modified into wings.
   - Birds have hollow bones that help them to fly by making their bodies lightweight.
   - Tail in the birds helps in changing directions during flight.
3. **A Camel :** Camel is called the 'ship of the desert'. It is adapted to live in the desert and has the following adaptations :
   - A camel can drink a large amount of water at a time (100-120 litres) that can last for a long time.
   - A camel has long and thick eyelashes that prevent sand from entering its eyes.
   - It can close its nostrils to stop sand from entering the nose.
   - A camel has long legs which help to keep its body away from the hot sand in the desert.

A Deer : The deer, a prey is also adapted to live in grasslands. It has the following adaptive features :

- It is a fast and agile animal which helps it to run away from the predators.
- The eyes are placed on the sides of its head to look cautiously in all directions and be alert.

- It has big ears that help it to hear the movements of predators like lions very easily.
- It has strong teeth for chewing hard plant stems properly.

A fish :

- The fish has slippery scales over its body which protect the body from water decay and also help in easy movement through water.
- The fish has flat fins to change direction and to keep its body balanced in water.
- The fish has a strong tail for swimming.

4. Adaptations are slow changes which take place in the bodies of organisms. However, there are some changes which can occur in organisms over a short period of time to help them adjust to some sudden changes in their environment.

Acclimatisation process is becoming accustomed to a different environment (such as high altitude of mountains) over short periods.

Motion and Measurement of Distances

A. **1.** (c); **2.** (d); **3.** (d); **4.** (b); **5.** (c); **6.** (d); **7.** (d); **8.** (c); **9.** (a); **10.** (b)

B. **1.** quantity; **2.** oscillatory; **3.** periodic; **4.** fathom; **5.** straight; **6.** parallax ; **7.** Handspan; **8.** uniform; **9.** Cubit; **10.** second

C. **1.** Metre is the unit of length.

2. Stationary objects are in state of rest.

3. Random motion.

4. Cubit

5. 1 m = 100 cm

6. The length covered in one step by a person is a pace.

7. Ruler, Inchtape, Scale, etc.

8. Unit

9. The standard unit which is universally accepted is called the International System of Units.
10. Small and rapid oscillations are known as vibrations. Small and rapid to and fro movement of a body or a part of it from its original position is known as vibratory motion.

D. 1. In ancient times, people used different body parts such as the arm, hand and foot as units of measurement. The measurement by such body parts are called handspan, cubit, finger, fathom and pace.
2. To keep your eye in front of the ruler at the same level to get the correct reading.
3. Measurement is a method of comparing a given physical quantity with a standard quantity.
4. In ancient time the man did not have any means of transport. He walked on foot and carried load on his back. Later, he trained animals to carry his loads. He started domesticating animals. The sight of floating object gave him the idea of making a simple boat or raft using tree trunks.

   After the invention of wheel and continuous changes in the wheel made transportation quicker, easier and more comfortable.
5. If an object changes its position continuously with respect to the stationary object around it, it is said to be in motion.
6. **Linear Motion :** When an object moves along a straight line, it is said to be in linear motion. Such as a car moving in a straight line.
7. When an object undergoes both translatory as well as rotatory, it is used to be in rolling motion, Such as motion of a bicycle wheel, motion of a drill, motion of cylinder on an inclined plane, etc.
8. To guess the dimensions of an object without actual measuring is known as estimation.
9. Ancient methods of measurement use body parts for taking measurements. As different people have different

shapes and sizes of their body parts, the ancient units of measurements vary from person to person. These methods can't be used to measure half or a quarter of some. length accurately.

10. The distance between the tip of the middle finger (outstretched) and the elbow is called a cubit.

E. 1. The length of a curved object or line can be measured with the help of a string.

2. Generally errors are classified into three types : systematic errors, random errors and blunders.

3. The History of Transport

In ancient time the man did not have any means of transport. He walked on foot and carried load on his back. Later, he trained animals to carry his loads. He started domesticating animals. The sight of floating object gave him the idea of making a simple boat or raft using tree trunks.

After the invention of wheel and continuous changes in the wheel made transportation quicker, easier and more comfortable.

Later on, trains and automobiles carried both people and goods and reduced the time of travelling. In 1903, Wright brothers invented the aeroplane. With this invention travel time was furthur reduced and larger distance could be covered in shorter time period.

4. When object moves to and fro from its original position. It is said to be in oscillatory motion. For example, the movement of a pendulum. In oscillatory motion, the motion is repeated after a fixed interval of time.

Small and rapid oscillations are known as vibrations. Small and rapid to and fro movement of a body or a part of it from its original position is known as vibratory motion.

5. For accurate measurement, we need some standard representation of every physical quantity. Such a chosen standard is called a standard unit.

A standard unit is a standard measure that has some definite and convenient quantity in it, so that it remains the same, whenever, by whoever and wherever it is used.

11 Chapter Light, Shadows and Reflections

A. **1.** (b); **2.** (c); **3.** (b); **4.** (a); **5.** (c); **6.** (b); **7.** (b); **8.** (d); **9.** (a); **10.** (a)

B. **1.** screen; **2.** translucent; **3.** refraction; **4.** natural source of light; **5.** luminous; **6.** incident; **7.** Propagation; **8.** Beam; **9.** reflected ray; **10.** natural, artificial

C. **1.** Table lamp is a man-made source of light.

2. Glass is a transparent object.

3. The objects which emit light are known as luminous objects. The different luminous objects are the tube light, electric bulb, lamp, burning candle, etc.

4. Propagation is a process by which a sound or light rays travel.

5. The natural sources of light are provided by nature. On the earth, the sun is the main source of light. The stars, lightning and fireflies are also natural sources of light.

6. The substances which allow only a part of light to pass through them are known as translucent substances. Ground glass, frosted glass, our blood, wax-paper and skin are the examples of translucent substances.

D. **1.** The objects which emit light are known as luminous objects. The different luminous objects are the tube light, electric bulb, lamp, burning candle, etc. You can see a luminous object in its own light. At night when it is dark, in the absence of the sun, the electric bulb and tube-light give us light and enable us to see the things around.

2. Propagation is a process by which a sound or light rays travel. Ray is a line with an arrow that shows the direction of propagation of light and such a diagram is known as a ray diagram. Beam is a group of light rays moving in an organized manner.

The property of light to travel in a straight line explains some interesting phenomena related to light, like formation of shadows by opaque objects and formation of images in a pin hole camera.

3. We see shadows only when :
- The light is unable to pass through an object, i.e. the object is opaque.
- Light is available
- There is a screen, wall or ground present behind the opaque object on which shadow will be formed.

4. Light is a form of energy. Light itself is not visible, but in the presence of light, other objects become visible.

5. Table, chair, trees and books are the examples of non-luminous objects. You can see these objects only when light from a luminous object falls on these objects.

6. The phenomenon of returning of light into the same medium after it falls on a surface is known as reflection.

7. The man-made sources of light are known as artificial sources of light. Such as bulbs, tube lights, candles, torches, etc., are artificial sources of light.

8. A shadow is a dark area where light from a light source is blocked by an opaque object.

9. A ray of light travelling from an object towards the mirror is called an incident ray.

10. The pinhole camera is a simple device. Its working is based upon the rectilinear propagation of light.

E. 1. A solar eclipse occurs when the moon comes in between the sun and the earth. The moon blocks the sun's light. The shadow of the moon falls on the earth. A total solar eclipse can be seen in the part of the earth where the light from the sun is completely covered by the moon.

2. Characteristic of a Shadow
- The shape of a shadow depends upon the shape of the object.
- The shadow of an object is formed on the opposite side of the light source.

- A shadow gives an idea about the shape of the object but not other details such as colour, size, etc.

3. The pinhole camera is a simple device. Its working is based upon the rectilinear propagation of light.

Lets Make a Pinhole Camera

Take a rectangular cardboard box. Make a small hole at the centre of one side of the box. Remove the opposite side of the box and fix a tracing paper or screen in its place. The pinhole camera is ready for use.

4. Based on this, all the materials can be classified into three categories– transparent, opaque and translucent.

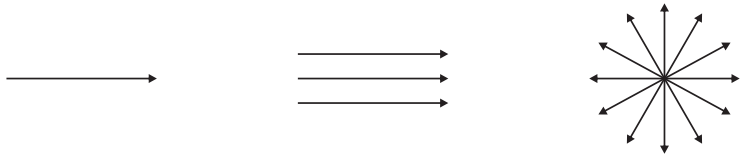
Transparent Substances : The substances which allow light to pass through them are known as transparent substances. Glass, acrylic sheets, water, cellophane paper and air are examples of transparent substances.

Opaque Substances : The substances which do not allow light to pass through them are known as opaque substances. Wood, metals, cardboard, most rocks and stones are the examples of opaque substances.

Translucent Substances : The substances which allow only a part of light to pass through them are known as translucent substances. Ground glass, frosted glass, our blood, wax-paper and skin are the examples of translucent substances.

5. Ray is a line with an arrow that shows the direction of propagation of light and such a diagram is known as a ray diagram.

Beam is a group of light rays moving in an organized manner.



a. A ray of light b. A beam of parallel rays c. A beam of rays coming out from a point source of light

6. **Aim :** To test that light rays travel in a straight line.

   Procedure : 1. Take a candle and light it.
   2. Put it on a table.
   3. Take the drinking straw.
   4. Close one eye and look at the candle flame through the straw with the other eye.

   Now bend the straw in the middle and again look at the candle flame through the straw.

   Observation : When the straw is straight, the flame (light) is clearly visible but when the straw is bent, the flame is not visible at all.

   Conclusion : We can conclude from this observation that light rays travel in a straight line.

7. **Characteristics of a Shadow**
   - The shape of a shadow depends upon the shape of the object.
   - The shadow of an object is formed on the opposite side of the light source.
   - A shadow gives an idea about the shape of the object but not other details such as colour, size, etc.
   - Shadows change in length and direction. Shadows are long in the morning and evening. They become short in the midday.
   - The size of the shadow depends upon the distance between the source of light and the opaque object.

8. As the moon moves around the earth, it sometimes comes in a straight line with the sun and the earth. When the earth, the moon and the sun are in a straight line, and the earth is in between the sun and the moon, the shadow of the earth falls on the moon and this is called lunar eclipse. During an eclipse of the moon, the moon cannot be seen at all or it can be only partially seen.

   A partial lunar eclipse is seen when the moon is partially in the umbra and partially in the penumbra region of the earth's shadow.

A total lunar eclipse is seen when the moon is in the umbra region of the earth's shadow. Then the moon cannot be seen at all.

9. Difference between an image and a shadow

Image	Shadow
1. It gives all the details as well as the outline of the object.	1. It gives only the outline with dark shade in the area inside it.
2. It undergoes lateral inversion, i.e. left-right reversal.	2. It does not undergo lateral inversion.
3. It has the same colour as the object.	3. It is always black irrespective of the colour of the object.
4. It is formed due to the reflection of light from a shiny surface.	4. It is formed due to blocking of light by an opaque object.

10. Working of the Pinhole Camera

Place a luminous object like a lighted candle (AB) in front of the pinhole camera. You would get an inverted image (A'B') of the candle on the tracing paper. This image is inverted because of the rectilinear propagation of light. The light ray from the upper end (A) of the candle passes through the pinhole and strikes the tracing paper at A'.

Similarly, the ray from the lower end (B) of the candle passes through the pinhole and strikes the tracing paper at B'. The rays from all other points between A and B on passing through the pinhole strikes the tracing paper in between A' and B'. As a result, an inverted image of the candle is seen on the tracing paper

Electricity and Circuits

A. 1. (a); **2.** (b); **3.** (b); **4.** (c); **5.** (b); **6.** (a); **7.** (a); **8.** (d); **9.** (d); **10.** (d)

B. **1.** positive (+); **2.** battery; **3.** conductor; **4.** Metals; **5.** Power station; **6.** conductors; **7.** insulator; **8.** positive (+) terminal, negative (–) terminal; **9.** key; **10.** Electricity

C. **1.** When a group of cells are combined together, it is known as a battery. Batteries are used in trucks, invertors, cars, etc.

2. Electric lamp

3. Electricity is the form of energy.

4. Filament

5. Power station is the main source of electricity.

6. Cell, Battery

7. Switch

8. Primary cell

9. Filament

10. A cell is the most common device used to generate electricity. It is used in radios, tape recorders, remote controls, toys, torches, clocks, etc. A cell has two terminals : the positive (+) terminal and the negative (–) terminal. The end of a cell where you see a metal cap is the positive (+) terminal. The other end of the cell is the negative (–) terminal.

D. **1.** **Electric Cell :** A cell is the most common device used to generate electricity. It is used in radios, tape recorders, remote controls, toys, torches, clocks, etc. A cell has two terminals : the positive (+) terminal and the negative (–) terminal. The end of a cell where you see a metal cap is the positive (+) terminal. The other end of the cell is the negative (–) terminal.

2. Electric switch is used to either break the electric circuit or to complete it.

3. A switch in an electronic device is used to interrupt the flow of electricity or electric current. Electrical switches are binary devices, they can be either completely off or

completely on. In simple English, a switch is an electronic device which is used to break or make the electronic circuit.

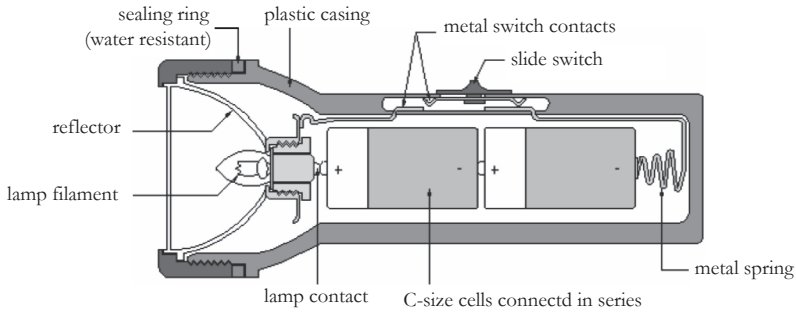
4. Electricity is a form of energy usually supplied as electric current through wires.
5. Fuses are the protectors, these are the safety devices which are used to protect the home appliances like televisions, refrigerators, computers, etc., from damage by high voltage.
6. An electric circuit has various electrical components. An electrical circuit has :
   A cell or a battery, A bulb, A key/switch, Connecting wires
7. Materials such as plastic, glass, wood and rubber do not allow electricity to pass through them. These are called bad conductors or insulators.
8. Secondary cells are used in a torch and a laptop.
9. A torch has an electric bulb that lights up when it is switched on. The electricity to the bulb in a torch is provided by the cylindrical objects present in it known as electric cells.

E. 1. **Torch :** A torch has an electric bulb that lights up when it is switched on. The electricity to the bulb in a torch is provided by the cylindrical objects present in it known as electric cells.

How does a Torch Work?

Batteries generate electricity that flows to the bulb of a torch as soon as it is switched on. As a result the bulb lights up. The bulb of a torch is more or less similar to an electric bulb. The only difference is that it lights up with a low current of a few volts. The batteries supply this current. As soon as the torch is switched on, the chemical present inside the batteries produces an electric current. These batteries are connected to the bulb with the help of

a switch. A curved mirror is situated behind the bulb which reflects the light of the bulb in the form of a beam.



2. An electric circuit is closed path along which the electric current flows. An electric circuit has various electrical components. An electrical circuit has :

A cell or a battery : A source of current.

A bulb : A bulb is connected in the circuit to indicate the flows of current. When it glows, it means that current is flowing in the circuit. If it does not glow, it indicates a broken circuit.

A key/switch : A switch is used to regulate the flow of current in a circuit. It is known as the key in a circuit. When the switch is 'Off ', there is a break in the circuit and the current stops flowing. When the switch is 'On', the circuit is completed and current flows.

Connecting wires : Wires are used to connect all the components of the circuit to enable the flow of current.

3. Electricity is very important and widely used form of energy. It is an integral part of our day to day life. Electricity is the flow of electric charge. Electricity is a form of energy which is converted from other sources of energy like coal, natural gas and nuclear power. These sources of energy are said to be the primary sources of energy. Some common electricity producing devices are cell, battery, generators, etc. The sources required to make electricity may be renewable or non-renewable but electricity is non-

renewable. Electricity can be transformed into other types of energy when required. Electricity is supplied from power stations to different areas.

4. Light bulbs have a very simple structure. At the base, they have two metal contacts, which connect to the ends of an electrical circuit. The metal contacts are attached to two stiff wires, which are attached to a thin metal filament. The filament sits in the middle of the bulb, held up by a glass mount. The wires and the filament are housed in a glass bulb, which is filled with an inert gas, such as argon.

   When the bulb is hooked up to a power supply, an electric current flows from one contact to the other, through the wires and the filament. Electric current in a solid conductor is the mass movement of free electrons from a negatively charged area to a positively charged area.

5. **Uses of Insulators and Conductors**
   - Insulators are safety devices, as they prevent us from shock and electric fire.
   - Conductors allow electricity to flow through them, thus they provide a passage to electricity.
   - Switches, electric plugs and sockets are made of conductors.

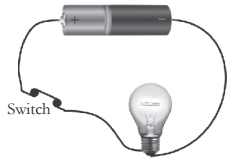
6. **Electric Cell :** A cell is the most common device used to generate electricity. It is used in radios, tape recorders, remote controls, toys, torches, clocks, etc. A cell has two terminals : the positive (+) terminal and the negative (–) terminal. The end of a cell where you see a metal cap is the positive (+) terminal. The other end of the cell is the negative (–) terminal.

7. A circuit with all the connections intact is a complete circuit.

   Closed circuit : When the key is switched 'On', the current flows in it. This is indicated by the glowing of the bulb. Such a circuit is known as a closed circuit.

   Open circuit : When the key is switched 'Off ', the bulb

does not glow, indicating that the current is not flowing in the circuit. Such a circuit is known as an open circuit. This happens due to broken wires or if the wires of other components of the circuit are not connected properly.



Closed circuit (The bulb glows.)

Open circuit (The bulb does not glow.)

8. **Conductors and Insulators :** So far, we have created circuits in which we have used cells with metal containers and wires. These materials allow electricity to pass through them. Such material are called conductors. All metals are conductors of electricity.

   Materials such as plastic, glass, wood and rubber do not allow electricity to pass through them. These are called bad conductors or insulators

9. **Sources of Electric Current :** A power station is the main source of electricity. These power stations are mostly situated away from the city. Electricity generated in these power stations is brought to our houses through thick wires. There are a variety of ways in which electricity is produced in these power stations. Following are five ways by which electricity is generated in various power stations–1. from natural gas, 2. from wind power, 3. by burning coal, 4. from water by building dams in rivers, 5. from solar energy.
10. Same as 4

13 Chapter Fun with Magnets

A. **1.** (b); **2.** (b); **3.** (a); **4.** (d); **5.** (c); **6.** (c); **7.** (b); **8.** (b)

B. **1.** repal; **2.** warehouses; **3.** their unlike poles; **4.** cassettes, televisions; **5.** North, South; **6.** Attracting materials; **7.** permanent magnets; **8.** poles

C. **1.** Non-magnetic objects
2. Magnetic compass
3. Magnetic objects
4. Permanent magnet
5. Compass
6. Paperclips
7. Radio and television
8. Magnetic force

D. **1.** The regions of a magnet where the magnetic force is strongest are called the poles of the magnet.
Every magnet has two poles–the North Pole and South Pole.
2. Iron, nickel and cobalt are the materials used in making permanent magnets.
3. Magnetic force is the pull exerted by a magnet on magnetic substances.
4. A shephard Magnes discovered magnet.
5. Magnets which are used in special trains are called Maglev. These trains float on the track instead of running on wheels.
6. Magnets are substances that have the property of attracting materials.
A magnet does not attract all kinds of objects. It attracts only a few and leaves the rest. On the basis of attraction by magnets, the materials can be classified as :
Magnetic materials, Non-magnetic materials.
7. The materials that are not attracted by a magnet are called non-magnetic materials.
8. Attraction is maximum at the poles of a magnet. On moving towards the centre, the magnetic force keeps on decreasing and becomes negligible in centre.
9. Same as 7

E. **1.** Magnets have several uses :
- Magnets are used in making magnetic stickers.
- Electromagnets are used to lift heavy loads in warehouses.

- Electromagnets are used for separating iron from scrap in junk yards.
- Electromagnets are used in the door bells, electric motors, generators, television sets, computers, telephones, etc.
- Magnet is used in cassettes, ATM cards, credit card and debit cards to store information.
- You can use a magnet to find a pin/needle dropped on the floor.
- Magnet is used in speakers, microphones, computer monitors and pictures tubes of television.

2. While handling magnets, we should be careful about a few things. They are :
- We should not hammer them.
- Magnets should be stored with magnetic keepers.
- We should never throw them.
- Magnets should be kept away from cassettes, mobiles, television, music system, computer and CDs.
- Heating of the magnets should be avoided.

3. A magnet Shows N-S Direction : A freely suspended magnet always comes to rest in the north-south direction.

4. The materials that are easily attracted by a magnet are called magnetic materials. And the materials that are not attracted by a magnet are called non-magnetic materials.
Not only iron, but cobalt and nickel also show magnetic properties. Steel, an alloy of carbon and iron, also shows magnetic properties. But stainless steel, made from steel, nickel and chromium does not show magnetic properties.

5. Any piece of iron or steel can be magnetised if you are stroking it with a strong magnet.
You can do this as follows :
Mark one end of a piece of steel and place it on a wooden table.
- Place one pole (say N-pole) of a strong bar magnet at the marked end of the steel (or iron) piece.

- Rub (or stroke) the bar magnet over the steel piece along its length and lift it up from the other end. Bring the same pole of the magnet to the same end of the steel piece and repeat the process for 20-25 times.

6. The poles always exist in pairs. If a bar magnet is broken into two equal parts, it is found that each part has a North Pole and a South Pole and is a magnet by itself.

7. Magnets were probably discovered by the Greeks about 2500 years ago. A shephard named Magnes lived in ancient Greece. He used to take his sheep to the nearby mountains for grazing. The stick he carried with him to control his sheep had an iron tip on one side. One day, he noticed that the iron tip of his stick got stuck to a large black rock. On further investigation, the Greeks found that the rock had the property of attracting iron. This black rock was named magnetic. It is also said that magnets were first discovered in Magnesia. The pieces of magnetite were known as magnets. It has now been established that magnetite is a naturally occurring magnets made of iron.
Magnets are substances that have the property of attracting materials.

8. **Aim :** To study the poles of a bar magnet.
Procedure : Take two bar magnets. Now keep them, end to end on a flat surface. Bring one end of the first magnet to one end of the second magnet. Do they stick together or do they push each other away?
Now turn one of the magnets and again bring their ends close. You will find in one case the ends stick to each other whereas in the other case they push each other. This happens because the same poles of two magnets repel each other while the opposite poles of two magnets attract each other. Thus the north pole of one magnet will repel the north pole of the other magnet but will attract its south pole.
Observation and conclusion : You can also say that like poles repel each other but unlike poles attract each other.

9. Same as 2

10. A magnet has two poles and it attracts materials containing metals such as cobalt, iron and nickel and their alloys.

The pull exerted by a magnet on a magnetic substances is known as Magnetic Force.

The regions of a magnet where the magnetic force is strongest are called the poles of the magnet.

Every magnet has two poles–the and North Pole and the South Pole.

The poles always exist in pairs. If a bar magnet is broken into two equal parts, it is found that each part has a North Pole and a South Pole and is a magnet by itself.

14 Chapter Water

A. **1.** (d); **2.** (c); **3.** (c); **4.** (d); **5.** (d); **6.** (a); **7.** (c); **8.** (b); **9.** (d)

B. **1.** essential; **2.** the shortage of water; **3.** portable water; **4.** Rainwater harvesting; **5.** 70; **6.** water cycle; **7.** solid, liquid, gas; **8.** 87; **9.** 0°C, 100°C; **10.** condensation

C. **1.** About 2 per cent of the planet's water is fresh.

2. Water turbines

3. In India, about 70% of the total water available is used for agriculture.

4. Epidemic

5. Water exists in three states in nature–solid, liquid and gas.

6. Rain

7. Rainwater harvesting

8. Almost all rivers eventually flow into the oceans. Although ocean water makes up nearly 97% of the entire water present on the earth, it is not fit for drinking.

9. Agriculture

10. Flood

D. **1.** The place where underground water comes out to the surface of the earth on its own is called a spring.

2. Use water from a bucket to bath.
   Do not keep the water running while brushing your teeth.
3. Evaporation is the process of conversion of water into vapour.
4. Rainwater harvesting is a technique of collection and storage of rainwater in natural reservoirs or tanks.
5. River, rain, wells, ponds, oceans, groundwater etc. are the sources of water.
6. Drought is the continuous absence of rain.
7. Condenstaion is the process of conversion of vapour into water.
8. When clouds (condensed water vapour) become too heavy, they fall to the ground as rain, snow or hail. This process is called precipitation.
9. It helps in reducing the water bill. It decreases the demand for water. It reduces the need for imported water.
10. Besides being essential for life, water is used for many other purposes. In India, about 70% of the total water available is used for agriculture, 20-22% by industries and only 8% is used for personal or domestic needs.

E. 1. When the temperature of air increases, it expands, i.e. its particles move away from one another. This makes the air lighter and it rises in the atmosphere, taking water vapour with it. As the air rises, it begins to cool. The water vapour condenses on dust particles present in the atmosphere to form millions of tiny droplets. Tiny ice crystals will be formed instead if it is very cold. This cluster of tiny water droplets floating in air is what we call a cloud.

2. **Droughts :** Sometimes, it does not rain in a region for a year or more. This leads to the shortage of water in this region causing dryness everywhere. It causes drought.
   The severity of drought is measured by the degree of water deficiency, its duration and the size of people affected. Many states in our country are drought affected each year.
   Floods :
   - Floods disrupt normal drainage system in cities.

- Heavy rains also kill the animals living in soil because these animals do not get air to breathe.
- Heavy rains lead to waterlogged roads which disrupt public and personal transport.
- Floods destroy crops and agricultural land.

3. Agricultural Needs : Our country depends a lot on agriculture. Farmers rely on water to sustain their agricultural crops, e.g. wheat, paddy, etc. Many a times, rainfall is not sufficient to water these crops and farmers have to use artificial watering system, referred to as irrigation.

4. It can be done by :

- Planting trees and other vegetation, as they help in absorption of water by the soil.
- Controlling floods and storing rain water by building dams. However, the construction of big dams has its disadvantages too; it destroys wildlife in large areas. Also, silt gathers in the reservoir over the years and may become less useful.
- Avoiding wastage of water by recycling water in places like factories and even homes.
- Reducing water pollution by treating sewage and industrial wastes before disposing them.

5. Some sources of water are obvious like lakes and rivers, while others, like glaciers, are a bit more removed from everyday experience. With so many people living near water, it sometimes seems unlikely that water shortages could be a serious problem. Understanding the sources of water available for human use reveals how limited freshwater actually is. Despite the overwhelming amount of water on earth, very little of it is suitable for consumption.

6. The severity of drought is measured by the degree of water deficiency, its duration and the size of people affected. Many states in our country are drought affected each year.

The people living in areas having drought conditions face many difficulties in leading a normal life. Some of the problems faced by the people because of drought are as follows :

- The level of groundwater decrease and there is no water left for humans and animals to drink. Agriculture is difficult in such places.
- The soil does not have sufficient moisture to grow crop well. This lead to shortage of food for the people in that region, resulting in hunger and death of people and livestock (animals).

7. Water Cycle

Water is a basic element of nature. It provides life, dissipates heat, drains harmful substances form our bodies and helps in many day to day works. Water need to be replenished, purified and circulated again and again so that it can perform its functions. Nature does this job through a process known as the water cycle. Let us understand the process of the water cycle.

The water cycle includes 4 major stages. It starts with evaporation

Evaporation : Evaporation is a process where water at the surface turns into water vapour. Water bodies like oceans, seas, lakes and rivers are the main sources of evaporation.

Condensation : As water vapour rises in the atmosphere, it cools and condenses to form tiny water droplets. These droplets come close together and form clouds and fog in the sky.

Precipitation : When clouds (condensed water vapour) become too heavy, they fall to the ground as rain, snow or hail. This process is called precipitation.

A. 1. (c); **2.** (c); **3.** (a); **4.** (a); **5.** (c); **6.** (a)

B. **1.** photosynthesis; **2.** 78; **3.** oxygen; **4.** atmosphere; **5.** plants to produce food; **6.** gills; **7.** nitrogen; **8.** Dust

C. **1.** Air is a mixture of nitrogen, oxygen, carbon dioxide, water vapour and a few other gases. Dust particles and smoke are also present in it.

2. Carbon dioxide and Argan

3. 21% (Approx)

4. Nitrogen

5. Atmosphere surrounds our earth.

6. Human beings breathe in oxygen.

7. Air is around us.

D. **1.** Carbon dioxide is required by plants to produce food. Directly or indirectly, plants are the sources of food for the entire animal world. Carbon dioxide thus lies at the very root of the food chain.

Aquatic plants use carbon dioxide dissolved in water for photosynthesis.

2. Humidity is the amount of water vapour present in the air.

3. The thick blanket of air that envelopes the earth completely is called the atmosphere.

4. Nitrogen is the main component of air.

5. Air contains nitrogen, oxygen, argon, CO_2, dust, smoke and water vapour.

6. The contamination of air by undesirable substances called pollutants is known as air pollution.

7. The important properties of air are as follows :

- Air occupies space.
- Air is colourless, tasteless and odourless gaseous substance.

8. At higher altitudes, the oxygen content decreases which makes breathing which makes breathing difficult for mountaineers. That's why they carry oxygen cylinders.

E. **1.** The plants and animals living in water also need oxygen to breathe. Aquatic animals and plants live in the water of ponds, lakes, river and seas.

The water of ponds, lakes, rivers and seas has some air dissolved in it. So, the animals and plants which live in water use this air for breathing.

2. **Aim :** To show that soil has air in it.
   Procedure : Take the lump of the dry soil in a beaker. Add water to the beaker and stir it with the glass rod for a few minutes.
   Observation : We will see the air bubbles coming out of the soil. These bubbles are of the air which was present in the spaces between the soil particles. Actually, when we stir the soil, water enters the spaces between the soil particles and expels the air present there. This expelled air is seen in the form of bubbles coming out from the soil.
   Conclusion : Soil has air trapped in it.
3. Land animals and plants breathe air (oxygen). Green plants take in air (carbon dioxide) which is formed as a result of respiration to prepare their food by the process of photosynthesis. Oxygen evolved during photosynthesis is used by living beings in respiration. Thus, plants help in maintaining the balance of carbon dioxide and oxygen in nature.
4. **Aim :** To show that air contains carbon dioxide gas.
   Procedure : Take a small sample of lime water in a test tube. With the help of air pump, bubble air through it for some time.
   Observation : Lime water turns milky.
   Conclusion : This proves that air contains carbon dioxide gas that turns the lime water milky.
   Aim : To show that air contains water vapour.
   Procedure : Place ice-cold water and a few ice-cubes in a beaker and place it on a table. After some time you will find water droplets on the outer surface of the beaker. This is because of the condensation of water vapour present in the air.
   Conclusion : The content of water vapour in the air is expressed in terms of humidity or relative humidity.

5. **Aim :** To show that air occupies space.
   Procedure : Take an empty tumbler and hold it in an inverted position. Now dip the inverted tumbler into the bucket filled with water. Tilt the tumbler held in water. Observe what happens.
   Observation : In the first case, we observe that the water does not enter the inverted tumbler. But when the tumbler is tilted, water enters it.
6. **Aim :** To show the presence of dust/smoke particles in the air.
   Procedure : Take a clean, dry china dish. Apply a little grease on its inner surface and place it at an open place. After a few hours, clean its inner surface with a white cotton cloth. Observe the piece of cloth.
   Conclusion : Dust/smoke particles on the cloth confirm the presence of dust/smoke particles in the air.

16 Chapter Garbage in Garbage Out

A. **1.** (c); **2.** (d); **3.** (d); **4.** (a); **5.** (c); **6.** (b); **7.** (a); **8.** (c); **9.** (b)

B. **1.** green; **2.** redworms; **3.** biodegradable; **4.** harmful; **5.** composting; **6.** biodegradable; **7.** non-biodegradable; **8.** useless components; 9. inorganic waste; **10.** recycling

C. **1.** Chemicals, Plastics, Metals, Glasses etc.
2. Decomposition
3. Useless components
4. Recycle
5. Blue and Green are the two colours of the dustbins provided by the municipality to collect different kinds of waste.
6. Recycling is the process of recovery and reprocessing of waste materials for use in new products.
7. The waste which cannot decompose in nature is called non-biodegradable waste.
8. Paper and plastics.

9. Redworms
10. Vegetable peels, paper, glasses, metals etc.

D. 1. Waste management or waste disposal are all the activities and actions required to mange waste from its inception to its final disposal.

2. Degradation refers to the loss or depletion and environmental degradation refers to the loss of biodiversity through deplection and exploitation of natural resources.

3. Waste is a material which is no longer useful.

4. **Composting :** Biodegradable wastes like fruit and vegetable peels, leaves and farm wastes contain a variety of nutrients. These nutrients can be recycled back to the soil by allowing the waste to decompose in a compost pit. A pit is dug and the biodegradable wastes are thrown in and covered with soil. The bacteria and fungi that are present in the soil decompose the waste and restore the nutrients to yield manure or compost. This method is known as composting.

   Vermicomposting : Biodegradable wastes can also be converted into compost by using a type of worm known as the redworm. They look like earthworms. The process is known as vermicomposting.

5. **Advantages of Composting :**
   - Improves the structure and health of your soil by adding organic matter.
   - Helps the soil retain moisture and nutrients.
   - Attracts beneficial organisms to the soil and reduces the need for pesticides and fertilizers.
   - Reduces the potential for soil erosion.

6. Advantages of vermicompost include enriching soil, increasing harvest yields and suppressing plant disease.

7. Plastics cause huge damage to marine life.

8. The waste which can decompose in nature to form harmless substance is called biodegradable waste.

E. 1. Types of Waste

Biodegradable wastes, Non-biodegradable wastes

Biodegradable wastes : The wastes which can decompose in nature to form harmless substances are known as biodegradable waste. It is also called organic waste. Waste such as fruit and vegetable peels, leftover food, fallen leaves and animal remains decompose when left in soil for some time. They are decomposed by the microorganisms (decomposers) present in the soil. All the waste from plants and animals is biodegradable.

Non-biodegradable wastes : The waste which cannot decompose in nature is non-biodegradable waste. It is also called inorganic waste. Waste like plastic bags, glass bottles and metal articles do not decompose when left in soil. They are not decomposed by the microorganisms present in the soil. All the waste which is not derived from plants and animals is non biodegradable.

2. Landfill : Landfill are large open areas used for solid waste disposal. These areas are usually low-lying areas and are away from the place where people live. The garbage from the dumps is taken in trucks to landfill area. It is spread in the landfill area and then covered with soil. Once the landfill area is completely full, it is left as such for a long time, about 20 years or so. Such a long time is required as the waste material decomposes very slowly. Finally the area can be converted into a park or a playground.

3. The garbage is dumped into this pit. Then, the garbage is segregated. The useful components are removed from the garbage by people. Rest of it is spread inside of the pit and covered with a layer of soil. Everyday the same process is repeated and the garbage is disposed in a new compartment known as cell. The cells are compressed by bulldozers to create space for more cells in the landfill.

4. It conserves energy, reduces air and water pollution. It reduces greenhouse gases and conserves natural resources.

5. Biodegradable wastes like fruit and vegetable peels, leaves and farm wastes contain a variety of nutrients. These nutrients can be recycled back to the soil by allowing the waste to decompose in a compost pit. A pit is dug and the biodegradable wastes are thrown in and covered with soil. The bacteria and fungi that are present in the soil decompose the waste and restore the nutrients to yield manure or compost. This method is known as composting.
6. Waste is any substance which carries no value to the user and is discarded after primary use. Wastes are produced in our homes, schools, offices, hospitals, markets, industries and agricultural activities, etc. Waste materials, especially household waste are known as garbage. See the dustbin in your home, if kitchen garbage is not removed from our homes and surroundings regularly, they will cause pollution. The garbage will rot and become a breeding place for cockroaches, flies and mosquitoes resulting in spread of diseases as well.
7. In a tub and make a thick paste of paper by pounding it. Take a fine mesh wire fixed to a frame and keep this wire mesh on a table, take paste from tub and spread it on the wire mesh and wait till all the waste from paper paste drains off and a layer is formed.
8. Some of the ways by which we can reduce waste are :
   - Use both sides of paper, use hand bills.
   - Avoid using plastic bags and carry your own cloth bags to market.
   - Buy only necessary things.

1 Chapter

Nutrition in Plants

A. **1.** (d); **2.** (c); **3.** (d); **4.** (d); **5.** (c)

B. **1.** stomata; **2.** saprophyte; **3.** fungus, algae; **4.** starch; **5.** sunlight and chlorophyll; **6.** Leaves

C. **1.** Chlorophyll

2. Solar energy is stored in the form of food in the leaves with the help of chlorophyll.

3. Insectivorous plant

4. Urea Ammonium Sulphate

5. Pulses

D. **1.** Green plants synthesise their food themselves by the process of photosynthesis. They are autotrophs.

2. $6CO_2 + 6H_2O \xrightarrow[\text{chlorophyll}]{\text{light}} \underset{\text{Sugar}}{C_6H_{12}O_6} + \underset{\text{Oxygen}}{6O_2}$

3. Parasites are the plants which exhibit parasitic mode of nutrition. Parasites obtain their nourishment from other living organisms. In this mode of nutrition, plants depend on other plants or animals for their nourishment. Such plants are called parasites and the ones on which parasites depend are called as hoists. For example, Cuscuta Amarbel.

4. Nutrition is the process of consuming food and utilizing it for the body.

5. Saprophytes are the plants which exhibit saprophytic mode of nutrition. Saprophytes are the plants that obtain their nutrition from dead and decaying organic matter. Saprophytes secrete digestive juices called enzymes onto dead and decaying matter to dissolve it and then absorb nutrients from it. For example : Indian pipe.

6. The substances required for photosynthesis are sunlight, chlorophyll, carbon dioxide (CO_2) and water.

E. **1.** A strip of black paper was clipped on the leaf of a potted plant. The plant was kept in the sun for four hours. The strip was removed and the leaf was placed in boiling alcohol in water bath. This shows that light is necessary for photosynthesis.

2. To perform photosynthesis, plants need three things : carbon dioxide, water and sunlight, for photosynthesis. Carbon dioxide enters through tiny holes in a plants leaves, flowers, branches, stems and roots, plants also require water to make their food.

3. **Parasitic Plants :** Parasites are the plants which exhibit parasitic mode of nutrition. Parasites obtain their nourishment from other living organisms. In this mode of nutrition, plants depend on other plants or animals for their nourishment. Such plants are called parasites and the ones on which parasites depend are called hosts. For example, Cuscuta Amarbel.

Symbiotic Relationship or Symbiosis : This type of relationship is unique in which two organisms (two animals or two plants) live together. This is known as symbiosis and the relationship is known as symbiotic relationship. In this, both partners are benefitted.

In leguminous plants (pulses, beans) and some trees, the fungus lives on the roots.

4. Mode of nutrition is of two types : 1. Autotrophic nutrition, 2. Heterotrophic nutrition

Autotrophic Nutrition : Auto = self, Trophic = nutrition. The literal meaning of this term is self-nutrition. Autotrophic nutrition is the process of an organism being able to create/produce its own food.

Common autotrophs include, but are not limited to: microscopic bacteria, certain types of algae and the majority of green plants.

Heterotrophic Nutrition : The term 'heterotroph' consists

of two words 'hetero' and 'troph'. 'Hetero' means 'others' and 'troph' means 'nutrition'. So, in heterotrophic nutrition, the organisms cannot make their own food from carbon dioxide, water and sunlight as they do not have chlorophyll. Such organisms depend on plants directly or indirectly for their food. All the animals, fungi, some protists and bacteria have heterotrophic mode of nutrition.

5. Synthesis of Plant Food other than Carbohydrates

We have already learnt that plants synthesise carbohydrates by photosynthesis. Carbohydrates are made of carbon and hydrogen. Plants need nitrogen. The nitrogen present in the air cannot be used in its elemental form by the plants. Nitrogen is absorbed by plants in the following ways :

- Farmers add manure and fertilisers rich in nitrogen, potassium and other minerals to the soil (e.g. urea). These substances dissolve in water and are taken up by the roots to various parts of the plants for synthesis of proteins. In this way, plants fulfil their requirements of nitrogen along with the other constituents.
- Some bacteria present in the soil convert atmospheric nitrogen into a water soluble form, used by plants. These are known as nitrogen fixing bacteria. The nitrogen in the water soluble compound form is absorbed by the roots of the plants. For example, Rhizobium, a bacterium found in the root nodules of leguminous plants.

Nutrition in Animals

A. **1.** (c); **2.** (a); **3.** (d); **4.** (a); **5.** (c)

B. **1.** esophagus; **2.** four; **3.** Buccal cavity; **4.** holozoic nutrition; **5.** pancreatic; **6.** esophagus

C. **1.** Tongue
2. Bile juice

3. Premolars/Bicuspids
4. Digestion
5. Omasum
6. The tongue is a fleshy and muscular sensory organ and the very first sensory information is received via the taste buds in the papillae on its surface.

D. **1.** The human digestive system consists of the alimentary canal and secretory glands. It consists of the (i) buccal cavity, (ii) oesophagus, (iii) stomach, (iv) small intestine, (v) large intestine ending in rectum and (vi) anus. The main digestive glands which secrete digestive juices are (i) the salivary glands. (ii) the liver and (iii) the pancreas. The stomach wall and the wall of the small intestine also secrete digestive juices.

2. Once in the esophagus, the bolus travels down to the stomach via rhythmic contraction and relaxation of muscles known as peristalsis.

3. Ruminants have one stomach with four compartments or chambers for digestion of food.
- Rumen (First Chamber)
- Reticulum (Second Chamber)
- Omasum (Third Chamber)
- Abomasum (Fourth Chamber)

4. In digestion, the ingested food is converted into simple form with the help of digestive enzymes.

5. **(a) Absorption and Assimilation**

Absorption : It is the process of absorption of the digested food material into the cytoplasm leaving behind the undigested food material. Sometime the amoeba absorbs large quantities of food. The excess food gets stored in the form of glycogen as well as lipids.

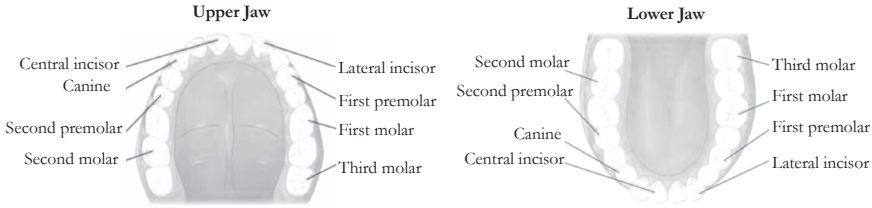
Assimilations : This is the “utilization” process. After this, the absorbed food is utilized for energy production, growth, repair as well as for multiplication.

(b) Ingestion and Egestion

Ingestion : Amoeba takes in its food through this process. Initially, it pushes out its pseudopodia so that it can encircle the food. After this, it engulfs the food, thus forming a bag-like structure called food vacuole. The process is known as "phagocytosis".

Egestion : Finally, the cell membrane gets ruptured so that the undigested food material is thrown out of the body.

E. 1. The teeth are named after their particular roles in the process of mastication.



Incisors : Incisors are often the first adult teeth that grow in after our primary teeth, or baby teeth and make up most of our smile. There are eight incisors in the mouth; four in the top-center of our mouth and four in the bottom-center.

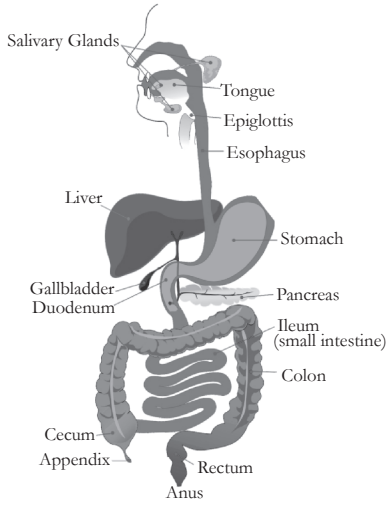
Cuspids/Canines : Cuspids, also known as canines, are sharp, pointed teeth on either side of our incisors that are used to do exactly what they look like, they are meant to do tear into food and rip it apart.

Molars : Molars are our main masticators that is, molars are the teeth we most commonly associate with chewing.

Premolars/Bicuspids : Premolars, or first molars, are our first molar teeth that tend to come in around twelve or thirteen years of age. Premolars sit next to the cuspids in the mouth and are the foremost molars in the mouth.

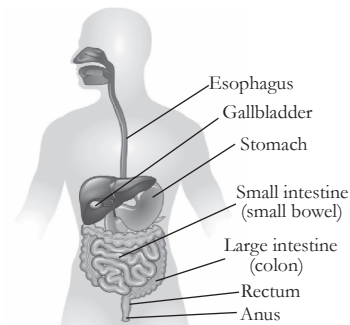
Wisdom Teeth/Third Molars : Wisdom teeth are often referred to as third molars because they are the last teeth to come into the mouth.

2.



3. Grass eating animals (herbivores) like the cow, deer, ox, buffalo and sheep swallow the food without chewing. After feeding, they bring the food from the stomach back into the mouth and chew it. This process is called rumination and such animals are called ruminants. Though their main diet is plants, they are unable to digest, because of lack of cellulose breaking enzymes. For this, they maintain a symbiotic relation with microorganisms. Microbes help in breaking down of cellulose (constituent of plant cell wall). Ruminants have one stomach with four compartments or chambers for digestion of food.

4. The digestion process is a series of reactions of food with the digestive hormones and juices. This starts right from the oral cavity. It is an important process that breaks down the proteins, fats, carbohydrates, vitamins, minerals into simpler forms so that it can be absorbed easily into the body cells. During this process, proteins are



Digestive System

converted into amino acids, carbohydrates are converted into simple sugars and fats are broken down into fatty acids and glycerol. Many digestive enzymes and hormones act on food, at various stages during the process of digestion. The whole process occurs in a sequential manner.

5. Same as 3

Fibre to Fabric

A. **1.** (c); **2.** (c); **3.** (d); **4.** (d); **5.** (d)

B. **1.** shearing; **2.** cocoon; **3.** man-made; **4.** Mulberry; **5.** woolen, worstead

C. **1.** Shearing

2. Cocoon

3. Cleaning and Scouring

4. Anthrax

5. About 2500 silkworms are required to produce a pound of raw silk.

D. **1.** Fibres are thin strands of thread that are woven to make fabric, for example, cotton fabric and silk fabric. There are two types of fibres – One is natural sources and other is synthetic fibres which are man-made for example – rayon, nylon etc.

2. There are many factors, which affect the quality of wool fabric. The kind of sheep from which the wool is obtained, its physical condition, the part of the sheep from which the wool is obtained and the finishing processes are some of the factors, which affect the properties of wool fabric.

Strength : Wool is the weakest of all natural textile fibers. Wool fabric is strengthened by the use of ply yarns.

Elasticity : Each wool fibre is a molecular coil-spring making the fibre remarkably elastic.

Resilience : Wool fabrics resist wrinkles. Wool is the most resilient fiber because it has a natural crimp that helps it keep its shape.

Drapability : Wool's excellent draping quality is aided by its pliability, elasticity and resiliency. Drapability is one of the competitive features of wool fabrics over many man-made fibres.

Cleanliness and Washability : The wool fabrics adheres dirt and requires to be thoroughly cleaned. Care should be taken while laundering as the fibre is softened by moisture and heat which results in shrinking and felting of the fabrics washed.

3. Worsted-spun knitted fabrics are super-soft, incredibly versatile. Knits that are used for baby clothes, underwear, t-shirt and sportswear and other light-weight knitwear. Woolen spun woven fabrics are thicker and heavier and used mostly for outerwear.

4. Karnataka, Andhra Pradesh and Assam are the top silk-producing states in India.

5. Moulting is when one organism sheds something like hair, feathers, shells, or skin to make way for new growth.

6.

Wool	Silk
• Wool is a kind of textile fiber got from sheep.	• Silk is a textile fiber obtained by rearing silk moths.
• It is obtained from the fur of animals.	• It is reared from cocoons of silkworms.
• It doesn't have a shine.	• It has a shiny appearance.
• It has good insulation warmth.	• It cannot retain much warmth.
• It is specially used for winter clothing.	• Silk is often used in formal dresses.

E. 1. Natural fibres, any hair like raw material directly obtainable from an animal, vegetable, or mineral source and convertible into non-woven fabrics such as felt or paper or, after spinning into yarns, into woven cloth.

Natural fibres can be classified into two types – Plant fibre and Animal fibre.

Plant fibre : Fibre obtained from plants is called plant fibres. For example : cotton, jute, flex, etc.

Animal fibre : Fibre obtained from animals is called animal fibres. For examples : Wool, silk etc.

2. Several breeds of sheep are found in different parts of our country. However, the fleece of sheep is not the only source of wool, though wool commonly available in the market is sheep wool. Yak wool is common in Tibet and Ladakh. Angora wool is obtained from angora goats, found in hilly regions such as Jammu and Kashmir.

Wool is also obtained from goat hair. The under fur of Kashmiri goat is soft. It is woven into fine shawls called Pashmina shawls. The fur (hair) on the body of camels is also used as wool. Llama and Alpaca, found in South America, also yield wool.

3. The cocoons are boiled in water, killing the pupae and softening the sericin. The silk filaments are unbound from the cocoon and carefully wound onto a reel. Filaments from several cocoons are wound together to create a single thread of raw silk. About 2500 silkworms are required to produce a pound of raw silk.

4. The life cycle of a silkworm consists of the following stages:
Egg $\rightarrow$ Silkworm $\rightarrow$ Pupa $\rightarrow$ Adult Moth.

The period of the life cycle of silkworms ranges from 6 to 8 weeks. The female silk moth lays about 300 to 400 eggs at once. The caterpillars or silkworms come out as the eggs hatch.

5. Occupational Hazards of Silk Industry

Health risks factors in mulberry cultivation. The dicot weeds are controlled by use of 2, 4, D amine, it is reported that there is a connection between this weedicide and blood cancer. The Dichlorvos (DDVP) and Bavistin used for control of mulberry pests are known to induce neurophysiological and behavioural changes in human beings.

Health Risks during Rearing : (a) In winter season in villages, charcoal stoves are used to raise the room temperature during rearing, the carbon dioxide and carbon monoxide are silent killers which are produced in the ill ventilated rearing houses. (b) Unhygienic conditions that prevail due to left over leaves and litter if unattended not only leads to silkworm mortality but also affects the rearers' health.

4 Chapter Heat

A. **1.** (c); **2.** (b); **3.** (c); **4.** (c)

B. **1.** glass, metal; **2.** thermometer; **3.** –10°Cm, 110°C; **4.** conduction; **5.** energy

C. **1.** Radiation
2. Insulators is used to make the handles of cooking utensils.
3. Sun, fire
4. Mercury is filled inside the glass bulb of a clinical thermometer.
5. Copper is a conductor.

D. **1.** Heat is a form of energy generated due to the movement of molecules that flows from a hot body to a cold body.
2. **Heat** is a form of energy generated due to the movement of molecules that flows from a hot body to a cold body.
Temperature is the degree of hotness or coldness of a body.
3. Conduction is the mode of transfer of heat without the actual movement of particles from one end of the body to another that are kept in contact with each other.
4. Temperature is a measure of the degree of hotness of an object.
5. Convection is the mode of transfer of heat in liquids and gases where the heat transfer occurs by the actual movement of particles of the medium.
6. Radiation is a mode of transfer of heat that does not need any medium.

E. 1. There are primarily three modes of heat transfer : Conduction, Convection and Radiation.

Conduction : The heat gets transferred through the process of conduction in solids. When an iron rod is placed on a flame, the end touching the flame starts heating slowly. This heat travels to the other end and the other end becomes hot too. This process of transfer of heat from the hotter end to the colder end of an object is called conduction.

Convection : It is the process of transfer of heat by the actual movement of the particles of the medium. Liquids and gases are mainly heated by convection as they are insulators (bad conductors) of heat.

Radiation : The heat you receive certainly does not come to you by conduction through the air or the ground, since both of these remain cold; neither you received heat by convection, since hot air rises up. Heat energy can travel in the form of waves just like light. These waves are the third method of transferring heat which does not require a medium between hot and cold bodies and is called radiation.

2. Application of Heat Radiation

- Black and dark coloured clothes are more suitable in winter because they absorb most of the sun's heat that falls on them.
- White and light coloured clothes are more suitable in summer because they absorb very little amount of the sun's heat and this helps in keeping the body cool.

3. Thermometer

The thermometer is an instrument that is used to measure the temperature of an object accurately. There are different kinds of thermometers. These are used for measuring the temperature of different materials or the temperature of different ranges.

Types of Thermometer

Clinical Thermometer : It is used to measure the temperature of a human body. It is based on the principle that liquids expand on heating and contract on cooling. The temperature is measured in degree Celsius (°C). It has markings in the short range between 35°C and 42°C. The normal temperature of a healthy person is 37°C.

The clinical thermometer consists of a capillary tube with one end closed and a cylindrical glass bulb at its other end that contains mercury. There is 'small kink' or 'bend' called constriction present near the bulb.

The Laboratory Thermometer : A laboratory thermometer measures the temperature, generally in the range of –10°C to 110°C. In the laboratory, we use the laboratory thermometer to take temperature reading. They are made of glass or metal. It cannot be used to measure body temperature.

4. Aim : To test the transfer of heat by convection in gases.

Materials required : A cardboard box, transparent polythene paper, a small candle and a pair of scissors.

Procedure : 1. Take the rectangular cardboard box and remove one of its sides.

2. Cover this portion with transparent polythene paper and place the box with this side towards you.

3. Cut a window on another side of the box, as shown in the figure, so that you are able to insert your hand through it.

4. Cut two holes on the top of the box. Roll two pieces of paper and insert one in each hole. They would act as paper chimneys. Mark them as 'A' and 'B'.

5. Now take a small candle and light it. Put it inside the box through the window and keep it just below the chimney 'A'.

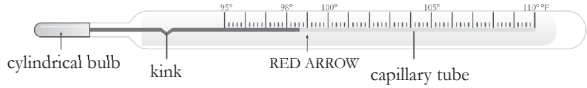
6. Now light an incense stick (agarbatti) and hold it near the mouth of the chimney 'B' as shown in the figure and observe.

Observation : The smoke of the incense stick comes out from the chimney 'A'. You will be able to see the convection currents moving from the chimney 'B' to 'A' through and transparent polythene paper.

Conclusion : Gases are heated by the process of convection.

5.

(A) Clinical thermometer graduated in °C



(B) Clinical thermometer graduated in °F

6. Aim : To demonstrate that black surface absorbs more heat.

Materials required : Two identical thermometers, two stands and a small piece of black paper.

Procedure : 1. Take both the thermometers and mark them as 'A' and 'B'.

2. Wrap bulb of the thermometer marked 'B' in black paper.

3. Clamp both the thermometers on the vertical stands.

4. Keep them in the sun close to each other.

5. Note the temperature recorded by the two thermometers after every five minutes.

Observation : You will observe that the temperature in thermometer 'B' (that has a black paper wrapped around its bulb) rises more rapidly than that in thermometer 'A'.

Conclusion : This shows that the black surface absorbs more heat.

5 Chapter Acids, Bases and Salts

A. **1.** (d); **2.** (d); **3.** (d); **4.** (c); **5.** (a)

B. **1.** red; **2.** Bases; **3.** soluble; **4.** Vinegar; **5.** explosives

C. **1.** Indicators are the substances used for testing acids and bases.

2. Sodium Chloride (Nacl) is the chemical name for common salt.
3. Bases turn red litmus blue.
4. Sodium Chloride (Nacl)
5. Magnesium Hydroxide

D. 1. **China Rose :** It is obtained from a shrubby Chinese rose. Petals of China rose are used as natural indicators.

2. The word 'acid', comes from the Latin word acire which means sour, so the substances that are sour in taste contain acid in them. These substances are acidic substances.

   The solutions of substances like sodium hydroxide (NaOH), potassium hydroxide (KOH), etc. are bitter in taste and soapy to touch. They are known as bases. They are found in soaps, baking soda, washing soda, etc.

3. Scientists have made it very easy to know the strength of an acid or a base. Different strength have been given, which is called pH number. This number is measured using a universal indicator.

4. **(a) Calcium Hydroxide**
   - Calcium hydroxide or slaked lime is used in whitewashing.
   - Bases are widely used for neutralising the effect of acids in the soil. For example, farmers add slaked lime (calcium hydroxide) to the soil.

   (b) Sodium Hydroxide
   - Sodium hydroxide is found in some household cleaners, such as drain cleaners.
   - Sodium hydroxide is also used as a reagent in the laboratories.

5. **(a) Nitric acid :** Nitric acid is used for manufacturing explosives and also for the purification of silver and gold.

   (b) Sulphuric acid : Sulphuric acid is also used in the manufacturing of drugs, textiles, paper, leather, plastics, detergents, paints, etc.

E. **1.** When an acidic solution is mixed with a basic solution, both the solutions neutralise the effect of each other. In neutralisation reaction a new substance is formed. This is called salt. Salt may be acidic, basic or neutral in nature. Thus, neutralisation can be defined as follows:

The reaction between an acid and a base is known as neutralisation. Salt and water are produced in this process with the evolution of heat.

$$\text{Acid} + \text{Base} \rightarrow \text{Salt} + \text{Water} + \text{Heat}$$

For example—

Hydrochloric acid (HCl) + Sodium hydroxide (NaOH) $\rightarrow$ Sodium chloride (NaCl) + Water (H_2O)

2. **Acidic Salt :** Acidic salts are a class of salts that produce an acidic solution after being dissolved in a solvent. The salts produced when a strong acid is Ammonium Chloride (NH_4Cl) is an acidic salt.

Basic Salt : Those salts that are formed by the partial neutralization of a strong base by a weak acid are known as basic salt, for example, copper nitrate is a basic salt.

Neutral Salt : When a strong acid reacts with a strong base, the formation of neutral salt takes place, NaCl is an example of neutral salt.

3. Acid and base when reacts, a salt is formed. One part of salt comes from acid and the other part from base. Most of the salts are solids. Many salts are soluble in water. Solutions of these salts are good conductors of electricity.

Uses of Salts

- Sodium and potassium salts are necessary for the proper functioning of our nervous system. We normally consume sodium chloride in our diet.
- Sodium bicarbonate is used as baking soda in cooking. It is also used in fire extinguishers.
- Copper sulphate is used in electroplating of copper.
- Few salts are very useful for us.

- Sodium carbonate is called the washing soda. It is added to detergents to improve their cleaning action.
- Potassium nitrate is used in making fireworks and gun powder.

4. Some Properties of Acids

- Acids are colourless.
- Acids have a sour taste.
- Acids turn methyl solution pink.
- They are good conductors of electricity.
- Most of the acids are soluble in water.
- Acids change the colour of blue litmus solution to red.
- Strong acids are corrosive in action.
- They are corrosive in water.

Calcium carbonate + sulphuric acid $\rightarrow$ Calcium sulphate + carbon dioxide + water

$CaCO_3 + H_2SO_4 \rightarrow CaSO_4 + CO_2 + H_2O$

Some Properties of Bases

- They turn red litmus paper blue.
- They may or may not be soluble in water.
- Solutions of bases are soapy or slippery to touch.
- They are corrosive in nature.
- All bases have a bitter taste.
- They turn phenolphthalein solution pink.
- Bases react with acids to give salt and water.
- Bases are compounds that contain hydroxyl (OH) group.

5. Neutralisations in Everyday Life

Our stomach contains hydrochloric acid. It helps us to digest food. But too much of acid in the stomach causes indigestion. Sometimes indigestion is painful. To relieve indigestion, we take an antacid such as milk of magnesia, which contains magnesium hydroxide. It neutralises the effect of excessive acid.

Ant Bite : When an ant bites, it injects the acidic liquid (formic acid) into the skin. The effect of the acid can be neutralised by rubbing moist baking soda $NaHCO_3$ (sodium hydrogen carbonate) or calamine solution, which contains zinc carbonate.

Soil Treatment : Excessive use of chemical fertilisers makes the soil acidic. Plants do not grow well when the soil is either too acidic or too basic. When the soil is too acidic, it is treated with bases like quick lime (calcium oxide) or slaked lime (calcium hydroxide).

Factory Wastes : The wastes of many factories contain acids. If they are allowed to flow into the water bodies, the acids will kill fish and other organisms. The factory wastes are, therefore, neutralised by adding basic substances.

6 Chapter Physical and Chemical Changes

A. **1.** (d); **2.** (d); **3.** (a); **4.** (c); **5.** (c)

B. **1.** Physical; **2.** reverse; **3.** galvanization; **4.** Rusting; **5.** hydrogen

C. **1.** Physical change
2. Chemical change
3. Reversible change
4. Galvanization
5. Displacement Reaction

D. **1.** Salt is obtained from sea water by evaporating it under the heat of the sun in shallow ponds.

2. Galvanization : This is a process of depositing a layer of zinc on iron. It is used to make roofing, buckets, boxes and other articles.

3. Conditions Necessary for Rusting : There are two conditions that are necessary for the rusting of iron :
- Presence of water
- Presence of air (Oxygen)

4. Digestion of Food is a Chemical Change : During digestion, the food undergoes many chemical changes. Proteins, carbohydrates, fats, etc. get broken down into simpler molecules. These molecules have entirely different chemical structure. It is not possible to obtain the original food from these molecules. Therefore, digestion of food is a chemical change.

5. **Electroplating :** In this method, metal surfaces are covered with another superior metal by using electric current and thus, corrosion is stopped. Gold or silver are plated electrolytically.

E. **1.** When a substance undergoes a change in its physical properties, that change is said to be a physical change. During a physical change, no new substance is formed. As a result of physical change, a substance changes its physical state but not its chemical composition.

Melting of Solid and Freezing of a Liquid are Physical Changes : When a solid substance is heated, it gets changed to its liquid form. When a liquid is cooled, it gets changed back to its solid form. Thus, melting and freezing are physical changes.

2. When one or more new substance with entirely new properties are formed by the reaction of two or more substances, it is known as chemical change.

$$\text{Reactant-1} + \text{Reactant-2} \xrightarrow[\text{reaction/change}]{\text{chemical}} \text{Product-1} + \text{Product-2}$$

(+) means addition/reaction, ($\rightarrow$) means change.

During chemical changes, chemical reactions take place. These changes are mostly permanent and irreversible.

Example of the chemical change is :

- Curdling of milk in which curd is formed.

3. Magnesium burns in the air, emitting a bright white flash, and then combines with oxygen to form basic magnesium oxide. MgO is a basic element. The experiment shows that burning magnesium ribbon in air is a direct combination reaction. The formation of magnesium oxide is a chemical change.

4. **Burning of a Candle is a Chemical Change :** Candles are made from wax and a cotton thread (called wick of the candle). During burning of a candle, the molten wax (melting of wax is a physical change) rises through the cotton thread and undergoes combustion to produce carbon dioxide and water vapour. The cotton thread gets charred to a black mass. Heat and light are given in this

process. Also, it is not possible to recover the burnt wax and to recover the thread in the original form from the charred thread. Therefore, the burning of candle is a chemical change.

5. Rusting of metals can be prevented if the contact between metals and air is cut off. This is done in the following ways :

Coating Iron Articles with Paints : Applying a coat of paint on iron articles prevents them from coming in contact with air and moisture.

Coating with Other Metals : Sometimes metals are coated with non corrosive metals.

(i) Galvanization : This is a process of depositing a layer of zinc on iron. It is used to make roofing, buckets, boxes and other articles.

(ii) Electroplating : In this method, metal surfaces are covered with another superior metal by using electric current and thus, corrosion is stopped. Gold plated or silver plated electrolytically.

(iii) Alloying : Alloy is a homogeneous mixture of two or more metallic solids solution. Some metals when alloyed with other metals, become more resistant to corossion. For example, stainless steel which is made by mixing metals such as manganese, chromium and magnesium with iron.

Coating with oil and Grease : Iron and steel instruments, parts of various machines and agricultural tools are kept smeared with oils when not in use and this prevents rusting.

Weather, Climate and Adaptation

A. **1.** (a); **2.** (d); **3.** (d); **4.** (b); **5.** (b)

B. **1.** Penguins; **2.** incisors; **3.** Northern Temperate; **4.** Toucan; **5.** Paddles

C. **1.** The climate of tropical rainforests is hot and humid.

2. A camel's hump stores fat in it which helps it to survive without food for several days.
3. A thick layer of fat called blubber is present below their skin.
4. Eyelashes

D. 1. The distance of a place from the equator is called the latitude. The equator is the region which receives the maximum heat of the sun. Thus, the areas near the equator are very hot. As we move farther from the equator, the temperature starts to reduce and the climate becomes moderate. Further on moving towards the poles, the temperature reduces so much that the climate starts to become cold.

2. In winter, penguins huddle together to keep their bodies warm. Its forelimbs are modified into paddles. These paddles are useful while swimming.
3. Humidity is the amount of moisture in the air. Water exists in the air in gaseous form, called water vapour. Warm air can contain more vapour than cold air can. The maximum amount of vapour possible at a specific temperature is known as its saturation value.
4. They are adapted to climb trees with the help of sticky pads on their feet. Their green colour helps them to stay hidden among the leaves of trees, waiting for insects to come their way.
5. A polar bear can remain under water for hours. For this, it has another interesting feature. It can close its nostrils for long durations. Its smelling power is very strong that helps it to detect its prey from a long distance.

E. 1. The factors which decide the climate of a place are as follows :

Latitude : The distance of a place from the equator is called the latitude. The equator is the region which receives the maximum heat of the sun. Thus, the areas near the equator are very hot. As we move farther from

the equator, the temperature starts to reduce and the climate becomes moderate.

Winds : Climate of a place is also decided by the direction and speed of winds. If winds are hot and dry, like those which blow from Rajasthan to Delhi in summer, the place becomes very hot.

Altitude : The height of a place above the sea level is called Altitude. Like latitude, as the altitude of a place increases, it becomes colder. That's why we usually feel cold as we go higher on a mountain.

2. **Adaptation in Desert Animals :** The areas charaterised by extremely hot days and extremely cold nights are called deserts. Deserts have to face excessive heat of the sun, scarcity of water and sandy winds. Animals residing in such areas are specially adapted to conquer these situations.

   The animals found in deserts are lizard, camel, jackal, hedgehog, anteater, shrew, fox, etc.

3. Sunlight reaching earth can heat the land, ocean, and atmosphere. Some of that sunlight is reflected back to space by the surface, clouds, or ice. Much of the sunlight that reaches earth is absorbed and warms the planet.

   During the summer, the sun's rays hit the earth at a steep angle. The light does not spread out as much, thus increasing the amount of energy hitting any given spot. Also, the long daylight hours allow the earth plenty of time to reach warm temperatures.

4. Elephants have long trunks which serve as noses. They also help elephants pick up food and water and put them into their mouth. They have large ears which help them hear very efficiently. The ears are used as fan to keep the body cool. Their incisors are modified into tusks. These help them to tear the barks of trees, they eat. The tusks also help for their protection. They have broad and strong feet which not only give support to their bulky bodies but also help them run fast. They can also swim with their feet.

5. A well recognised animal of the polar region is the penguin. It is a flightless and carnivorous bird. The main adaptations of its body are :


Penguin


A huddle of Penguins


Feet of a Penguin


Swimming Penguin

The penguin has a thick layer of furry skin that keeps it warm. The fur is white. In winter, penguins huddle together to keep their bodies warm. Its forelimbs are modified into paddles. These paddles are useful while swimming. A thick layer of fat (blubber) is also present beneath its skin which protects it from extreme cold. The penguin is a good swimmer and has a streamlined body. Its feet have four webbed toes that help it to swim.

8 Chapter Winds, Storms and Cyclones

A. **1.** (a); **2.** (c); **3.** (b); **4.** (a); **5.** (d)

B. **1.** unequal change; **2.** hurricane and typhoon; **3.** the help of a barometer; **4.** lighter, rises; **5.** Depression

C. **1.** Atmosphere
2. Weathervane
3. Cyclone
4. Tornado

D. **1.** The regions close to the equator get the maximum heat from the sun. The equator is a region of low pressure and the poles are regions of high pressure. The air in these regions gets heated and rises and the cooler air from the surrounding regions moves in. Thus, winds blow from the North and South towards the equator. High air pressure at the poles and low air pressure at the equator cause

tremendous amounts of air to circulate throughout the atmosphere. At the poles, the air is cooler than that at latitudes about 60 degrees.

2. The warm air rises and causes a low pressure area. In summer, the land mass of northern India is much hotter than the surrounding water in the oceans most of the times. This causes winds to blow from the sea into land. These winds come from the southwest direction and bring moisture with them from the Indian Ocean. Cool sea breezes then begin to grow from the Oceans towards the Land.

3.

Windvane	Anemometer
• A windvane is important to measure the wind direction. • Mostly these vanes are consisting of an arrow attached to a spindle.	An anemometer is important to measure the wind speed. Most anemometers consist of 3 or 4 spinning cups mounted on a shaft.

4. A tornado is a special kind of storm. It is a whirling and twisting funnel of wind. It is formed when a funnel like column of cold air sinks down from a storm cloud. A tornado is a column of wind rotating violently and extending from the surface of earth to a thundercloud. Air is sucked out of the centre of the column and high speed winds start blowing around this low pressure centre.

5. The summer monsoon fills wells and aquifers for the rest of the years. Rice and tea are some crops that rely on the summer monsoon. Dairy farms, which help make India the largest milk producer in the world, also depend on the monsoon rains to keep cows healthy and well-fed.

6. The combined force of the water, waves and wind results in trees getting uprooted, houses collapsing and telecommunication lines getting disrupted. There is a heavy loss of life and property. The high speed winds of

tropical cyclones are accompanied by heavy rains and huge sea waves, several metres high. This is further worsened by flooding.

E. 1. If the earth's surface in a region is heated up by the strong sun, the air over it becomes lighter and rises up. This produces a region of low pressure on the earth's surface. Winds are caused by the movement of air from a region of high pressure to a region of low pressure. Wind currents are generated due to uneven heating of the earth. The speed of winds depends on the difference in pressure. They are generated in the following situations:

Due to Uneven Heating of Land and Water : Land and sea winds blow because the land heats up more during the day but cools faster at night. During the day, the land near equator get heated more rapidly than water, causing the air above the land to be warmed by conduction. The warm air rises and causes a low pressure area.

Due to Uneven Heating between the Equator and the Poles : The regions close to the equator get the maximum heat from the sun. The equator is a region of low pressure and the poles are regions of high pressure. The air in these regions gets heated and rises and the cooler air from the surrounding regions moves in.

2. On heating the air expands and occupies more space. When the same thing occupies more space, it becomes lighter. The warm air is therefore, lighter than the cold air. That is the reason that the smoke goes up.

To show that air expands on heating :

- Take a bottle containing air. Attach a balloon to its neck. Initially, the balloon is deflated. Place the bottle in a water bath containing boiling water.
- After some time has passed, balloon will inflate. Now, take the bottle out of the water bath and allow it to cool by itself.
- The balloon will deflate and eventually collapse. So, the

balloon inflate on heating and contract on cooling. That observation shows that air expands on heating.

3. **Precautions for Cyclone Prone Regions**
   - Listen to the TV and radio weather bulletins regularly.
   - Prepare an emergency kit containing a portable transistor/radio set, battery torch, extra batteries, hurricane lamp, first aid box, dry food, drinking water and other minimum essentials.
   - Do not venture into the sea.
   - Keep an emergency kit ready at home.
   - Beware of fallen power lines, loose wires hanging from poles to avoid electrocution, damaged bridges, building and trees.
   - Avoid driving on roads through sandy water.
   - In case of a cyclonic forecast, enough provision for medicine and food should be maintained.
   - Co-operate and help your friends and neighbours.
   - During and after a cyclone, check for gas leaks. Do not use electric appliances if wet.
   - Do not touch wet switches or electric lines.

4. Thunderstorms are storms accompanied by heavy rains, lightning, thunder and sometimes even hail. Thunderstorms are very common in India. Heat of the sun, moisture and sea breeze are the essential needs that lead to the formation of a thunderstorm.

   The air near the land rises up on heating as it becomes light. This air is lifted vertically into the atmosphere due to which the pressure drops. If the air carries moisture (water vapour), it condenses on coming in contact with cooler air leading to formation of clouds.

   During condensation, water vapour lose heat making the air around the clouds warm. The air column with clouds rise further and the pressure decreases. Finally, the raindrops from clouds start falling.

5. The movement of air is mainly caused due to the differences in pressure and temperature. Warm air is lighter and it rises upwards, meanwhile, cold air is denser and hence it moves down to replace the warm air. This phenomenon creates wind.
6. Cyclones are also known as hurricanes or typhoons. It is a storm which develops in the sea and has high speed winds. Swirling around a low pressure centre known as the eye of the storm. The low pressure area is known as the . Cyclones are huge and are very powerful storms. They can be hundreds of kilometers wide. The results of this mixture of heat and moisture is often a collection of thunderstorms, from which a tropical storm can develop due to the heat of the sun, the warm air rises up causing the cold air to rush and take its place. So a current of air is developed when water from the sea evaporates; taking up heat from the atmosphere to change into water vapour. Cool air rushes in to fill the void that is left, but due to the rotation of the Earth on its axis, the air is bent inwards and then spirals upwards with great force.
7. **Effects of Thunderstorm :** Thunderstorm causes severe damage to life and property. Lightning strikes and damages building, causes fire and kills people. At times, flash floods are caused due to heavy rain. Telephone and electric lines get snapped. Roofs of huts, hoarding and sheds get blown away. Many people are killed or severely injured. Trees and electric poles get uprooted.

   Precautions during the Thunderstorm : Do not lie on the ground. Taking shelter in a car or a bus is safe. If you are in a water pool get out and take shelter in a nearby building. Do not take shelter under an isolated tree. If in a forest, take shelter under a small tree. The best place to stay during a thunderstorm is indoor with all the doors and windows shut. Do not take shelter under a metal shed. Do not sit near an open window.

8. **Cyclones :** Cyclones are also known as hurricanes or typhoons. It is a storm which develops in the sea and has high speed winds. Swirling around a low pressure centre known as the eye of the storm. The low pressure area is known as the storm centre. Cyclones are huge and are very powerful storms. They can be hundreds of kilometers wide.

   Tornadoes : A tornado is a special kind of storm. It is a whirling and twisting funnel of wind. It is formed when a funnel like column of cold air sinks down from a storm cloud. A tornado is a column of wind rotating violently and extending from the surface of earth to a thundercloud. Air is sucked out of the centre of the column and high speed winds start blowing around this low pressure centre.

9 Chapter Soil

A. **1.** (b); **2.** (a); **3.** (c); **4.** (b); **5.** (c)

B. **1.** soil; **2.** Topsoil or A-; **3.** topsoil; **4.** Deforestation; **5.** weathering

C. **1.** Sandy soil absorbs least water.
2. Manganese, copper
3. Clayey soil is smooth to touch.
4. Sandy soil
5. Topsoil, Subsoil, Bedrock

D. **1.** Soil profile is a section through different layers of the soil. Various layers are called horizons.
2. Soil consists of the following horizons :
- Horizon-A or Topsoil
- Horizon-B or Subsoil
- Horizon-C or Bedrock

3. The water table is the boundary between the unsaturated zone and the saturated zone underground.
4. Soil holds water in it, which is called soil moisture. The capacity of a soil to hold water is important for various crops.

5. It is a process in which the top fertile layer of soil is lost. Due to soil erosion, the soil becomes less fertile. The top layer of soil is very light which is easily carried away by wind and water. The removal of topsoil by the natural forces is known as soil erosion.
6. Earthworms help break down organic matter and aid decomposition and thus, increases fertility of soil.
7. **Sandy soil :** The first type of soil is sandy. It consists of small particles of weathered rock. Sandy soils are one of the poorest types of soil for growing plants because it has very low nutrients and poor in holding water, which makes it hard for the plant's roots to absorb water.

   Clay soil : Clay is the smallest particles amongst the other two types of soil. The particles in this soil are tightly packed together with each other with very little or no airspace. This soil has very good water storage qualities and making hard for moisture and air to penetrate into it. Clay is the densest and heaviest type of soil which do not drain well or provide space for plant roots to flourish.

E. 1. Some of the agents of weathering are as mentioned below :
- The broken pieces of rock travel down due to the forces exerted by flowing water and wind. These forces further break down these rocks, thus converting them into very fine particles that mix with humus to form soil.
- Water plays an important role in breaking down of large piece of rock into smaller pieces. Rain water enters the small crevices of rocks. In the winter, this water freezes to form ice. When the ice in the crevices of these rocks expands, it causes the crevices to open up further.
- Mosses and lichens produce certain acids which are capable of dissolving the minerals in rocks. The acid they produce seep into rock and dissolve some of the minerals. Gradually the rocks break down into smaller pieces.

- The minerals present in certain rocks may oxidize and hence, result in weathering.
- The sun heats up the rocks during the daytime, causing them to expand. The heated rocks cool very slowly by the night and they contract.
- Roots of trees growing through rocks exert great pressure on the rocks. This causes cracks in the rocks leading to weathering.

2. Causes of Soil Pollution

Agriculture : Chemicals such as herbicides and pesticides are an integral part of our agricultural process. These chemicals, cannot be broken down in nature.

Industry : Mining and manufacturing continues to be a major cause of soil pollution. Industrial waste, whether as part of the job, improper disposal, or due to accidents, wreaks havoc on the soil.

Human Waste : We also damage the soil as part of our everyday lives. It can be through improper disposal of toxic waste that ends up in landfills or bodies of water, or human waste that goes through our sewer system and ends up in our soil.

Deforestation : Deforestation has an indirect effect on soil pollution. As trees are cut down, the exposed soil is easily carried away during soil erosion.

Acid Rain : Acid rain occurs when pollutants in the air such as sulfur dioxide and nitrogen oxide mix with rain.

Prevention of Soil Pollution

Although laws and regulations have been put in place, there are additional steps that we can take to curb soil pollution.

Address Farming Practices : The effects of pesticides and other chemicals for farming purposes is well-documented. What is less discussed is the impact of overcropping and overgrazing.

Recycle : The old adage remains true– recycle, reduce, reuse. Develop the habit of using paper, plastic, aluminium and glass products.

Limit Pesticides : While pesticides and fertilizers have positive benefits, their use should be limited because of their impact on the soil.

Reforestation : Regulations against cutting down trees are great. However, reforestation can also have a tremendous effect.

3. **Sandy soil :** The first type of soil is sand. It consists of small particles of weathered rock. Sandy soils are one of the poorest types of soil for growing plants because it has very low nutrients and poor in holding water, which makes it hard for the plant's roots to absorb water. This type of soil is very good for the drainage system.

   Clay soil : Clay is the smallest particles amongst the other two types of soil. The particles in this soil are tightly packed together with each other with very little or no airspace. This soil has very good water storage qualities. Clay is the densest and heaviest type of soil which do not drain well or provide space for plant roots to flourish.

   Loamy soil : Loamy is the third type of soil. It is a combination of sand, silt and clay such that the beneficial properties from each is included. For instance, it has the ability to retain moisture and nutrients, hence, it is more suitable for farming.

4. **Percolation Rate of Soil :** The property of soil by which it allows water to seep through it is known as and the amount of water that percolates through soil in a minute is called the rate of percolation.

   $$\text{Percolation rate (ml/min)} = \frac{\text{amount of water (ml)}}{\text{percolation time (min)}}$$

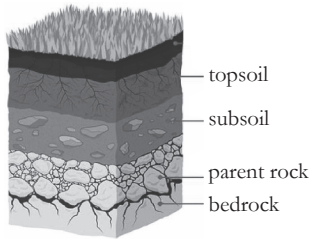
   This rate is different for different types of soils. Some soils allow water to percolate through them very easily while some do not. For example, sandy soil allows percolation more easily then clayey soil.

5. The soil is found in layers, which are arranged during the formation of soil. These layers are called horizons, the sequence of layers is the soil profile. The layers of soil can easily be observed by their colour and size of particles. The main layers of the soil are topsoil, subsoil and the parent rock. Each layer has its own characteristics.

Horizon of the Soil

Soil consists of the following horizons :

Horizon-A or Topsoil : It is also called the humus layer, which is rich in organic material. This layer consists of decomposed material and organic matter. This is the reason, the topsoil has a dark brown colour. The humus makes the topsoil soft, porous to hold enough air and water.



Soil Profile

Horizon-B or Subsoil : Just below the topsoil lies another layer called subsoil or horizon-B. It is comparatively harder and compact than topsoil. It is lighter in colour than the topsoil because there is less humus in this layer. This layer is less organic but is rich in minerals brought down from the topsoil. It contains metal salts, especially iron oxide in a large proportion.

Horizon-C or Bedrock : Bedrock is also known as parent rock and lies just below the subsoil. It contains no organic matter and is made up of stones and rocks, so it is very hard. This layer represents a transition zone between the earth's bedrock and horizon A and B.

10 Chapter Respiration in Organisms

A. **1.** (c); **2.** (a); **3.** (b); **4.** (a); **5.** (a)

B. **1.** pleura; **2.** $C_6H_{12}O_6$; **3.** energy; **4.** stomata; **5.** windpipe

C. **1.** Exhaling

2. pharynx
3. Anaerobic respiration
4. Lungs
5. The nasal cavity has hairy lining. The hair act as a filter to dust particles.

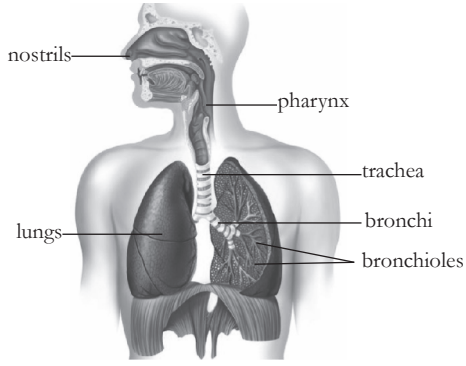
D. 1. External respiration, also known as breathing, involves both bringing air into the lungs (inhalation) and releasing air to the atmosphere (exhalation). During internal respiration, oxygen and carbon dioxide are exchanged between the cells and blood vessel.

2. Respiration is essential for survival of living organisms. It releases energy from the food.
   Respiration is breaking down of food to release energy.

3. **Through Skin :** Multicellular organisms like earthworms, frogs and leeches exchange oxygen and carbon dioxide through their moist skin.
   Through Lungs : Most mammals such as Human beings, Monkeys, Cats, Dogs, Horses, etc. respire through special saclike spongy organs known as lungs.
   Through Cell Membrane : Unicellular organisms like amoeba and paramecium take in oxygen and give out carbon dioxide through their cell membrane or general body surface.

4. Anaerobic respiration is a type of respiration that takes place in the absence of oxygen to release energy.

5.



Human Respiratory System

E. **1.** Breathing involves two steps :

(a) Inhalation or breathing in air (oxygen)

(b) Exhalation or breathing out air (carbon dioxide)

Inhalation involves the intake of oxygen rich air, while carbon dioxide rich air is released during exhalation.

Breathing Process

- Air from the atmosphere enters through the nostrils. It then passes through the nasal cavity. The nasal cavity has hairy lining. The hair act as a filter to dust particles. Nasal cavity is also moistened with mucus. Germs and dust particles stick to the mucus. So, clean air enters the pharynx. It lies parallel to the food pipe.
- The air then passes through the trachea or the windpipe in the neck region. The windpipe gets divided into two parts called bronchi in the chest region. Each bronchus (singular) enters the lung and air also enters into it. Lungs are two big balloon-like structures located in the ribcage or chest cavity. The ribcage protects the lungs.
- Inside the lungs, each bronchus further divides into many smaller branches known as bronchioles. On the end of each brochiole, small air sacs or alveoli are present like a bunch of grapes. Alveoli are filled with air and have very thin wall. These are surrounded with a large number of blood capillaries. So, air finally reaches up to blood capillaries where oxygen from it diffuses into blood.

2. **Role of Diaphragm :** The process of breathing is controlled by the movement of diaphragm. Diaphragm is a membrane present between the chest and abdomen. The movement of diaphragm is controlled by a group of muscles called intercostal 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 (breathing in).

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 (breathing out).

3. The table summarises some differences between the two types of respiration.

	Aerobic	**Anaerobic**
Oxygen	Needed	Not needed
Glucose breakdown	Complete	Incomplete
End product(s)	Carbon dioxide and water	Animal cells: lactic acid. Plant cells and yeast: carbon dioxide and ethanol
Energy released	Relatively large amount	Relatively small amount

Aerobic respiration releases 19 times more energy than anaerobic respiration from the same amount of glucose.

4. Respiration in some common animals is described below:

Through Air Holes : In animals like insects, there are several holes known spiracles in the body. Air enters the insects' body through the spiracle and is carried through tracheal tube. Oxygen is absorbed inside the body and carbon dioxide rich air is sent out through these spiracles.

Through Skin : Multicellular organisms like earthworms, frogs and leeches exchange oxygen and carbon dioxide through their moist skin. In amphibians like frogs and salamanders the rich exchange of gases take place through the skin and the lungs.

Through Lungs : Most mammals such as Human beings, Monkeys, Cats, Dogs, Horses, etc. respire through special saclike spongy organs known as lungs.

Through Cell Membrane : Unicellular organisms like amoeba and paramecium take in oxygen and give out

carbon dioxide through their cell membrane or general body surface.

5. (a) Breathing occurs through respiration organs, including the nose, lungs, etc. Respiration takes place in cells and cell organelles, including mitochondria, etc. From the differences given, we can conclude that breathing and cellular respiration are two different processes and cannot be used interchangeably.

(b) Inhalation involves the intake of oxygen rich air, while carbon dioxide rich air is released during exhalation.

Transportation in Animals and Plants

A. **1.** (c); **2.** (a); **3.** (a); **4.** (a); **5.** (d)

B. **1.** RBCs; **2.** valves; **3.** water, minerals, food; **4.** veins; **5.** oxyhaemoglobin

C. **1.** Arteries
2. Transportation
3. Red Blood Corpuscles or Erythrocytes
4. Transpiration
5. Red Blood Cells

D. **1.** **Red Blood Corpuscles or Erythrocytes :** In the cytoplasm of these corpuscles, respiratory pigment haemoglobin compound is found, which combines with oxygen in lungs and forms an unstable compound oxyhaemoglobin. When this compound comes in contact with tissue fluid of low oxygen concentration, it decomposes in oxygen and haemoglobin and sends oxygen to tissue cells.

2. A tube through which the blood circulates in the body. Blood vessels include a network of arteries, arterioles, capillaries, venules, and veins.

3. Due to cellular respiration, a lot of gases and other waste products are produced inside an organism's body. They must be removed properly and periodically. Without their

removal, they can prove harmful to the human body as they can be toxic to the body.

Excretion is this process of removal of wastes that are produced within a body.

4. Three types of blood corpuscles or cells are found in blood. (a) red blood corpuscles or erythrocytes, (b) white blood corpuscles or leucocytes, (c) blood platelets or thrombocytes.

5. Transpiration is the process by which plants release excess water into the atmosphere. Transpiration occurs in leaves through special structures present on them called as stomata. Excess water is lost in the form of water vapour.

Transpiration increases the moisture content of the atmosphere, thus bringing about a cooling effect in the immediate surroundings.

E. 1. Functions of Blood

Transport of Various Substances : It transports various substances such as nutrients, O_2, CO_2, waste products hormones, enzymes, etc, which are dissolved in blood plasma to cells and removes undesired substances from cells which are produced there.

Regulations of Body Temperature : Blood maintains the temperature of all the parts of the body normal.

Blood Clotting : Blood possesses a marvelous capacity of clotting and healing wounds when blood vessels are damaged.

Protection from Infectious Diseases : While cells of blood protect body by infectious disease by destroying or making inactive the pathogen and bacteria which enter the body.

2. A healthy person has 5-6 litre of blood. Heart pumps blood 65-75 times in one minute in the body. It means in the lifetime of a person, blood circulates approximately 25×10^9 times. Contraction of heart is called systole and the reverse is called diastole. One beat has one systole and one diastole.It takes about 0.8 sec time. So the heart beats 70-80 times (75) in a minute. At the time of diastole the

blood comes to both auricles while in systole it comes to ventricle from auricles and then pumped out.

3. Transpiration is the process which helps the plant in many ways. Transpiration removes excess water from the cells of the plant to prevent plant decay. Transpiration maintains salt water balance in the plant. Transpiration cools down all parts of the plant. Transpiration helps in the distribution of dissolved substances to all parts of the plant. Transpiration pull is used to absorb more water and minerals. It is strong enough to draw water even in tall trees.

4. Arteries carry blood away from the heart, and veins carry blood towards the heart. With the exception of pulmonary blood vessels, arteries carry oxygenated blood and veins carry deoxygenated blood. Arteries have thick walls with muscle tissue. Veins have thinner walls and use valves to keep your blood flowing.

5. Heart is a muscular structure. It acts like a pump. Upper two dark coloured chambers are auricles which receive blood from body and the lower muscular chambers are ventricles which pump blood to the body. As it circulates both oxygenated pure blood and CO_2 impure blood so it is necessary to separate pure and impure blood with septa. The right and left auricles as well as ventricles are separated from each other with the help of a septum. Right chamber have impure blood from anterior parts of the body like head, arms, chest, etc., reaches superior vena cava from various veins. The vena cava opens in right auricle. The impure blood from lower parts of the body, e.g. legs, alimentary canal, kidney, etc., reaches to inferior vena cava from the veins which open in right auricle. That means all the impure blood from whole of the body comes to right auricle which when contracts, the valve of vena cava closes and auriculo-ventricular valve opens. The impure blood moves to right ventricle. When right ventricle contracts the auriculo-ventricular valve closes and the blood is pumped to pulmonary arteries which goes

to lungs. In the lungs, the blood receives O_2 and now the pure blood comes to pulmonary veins. These pulmonary veins open in left auricle. From left auricle to left ventricle, from where the systemic aorta takes the blood to all parts of the body.

Reproduction in Plants

A. **1.** (b); **2.** (d); **3.** (a); **4.** (b)

B. **1.** same; **2.** sexual reproduction; **3.** water; **4.** asexual; **5.** Spirogyra

C. **1.** Peramecium **2.** Gamete
3. Bud **4.** Spores

D. **1.** **Sexual Reproduction :** Reproduction which occurs when two parents are involved to give rise to a new individual is the sexual reproduction.

Asexual Reproduction : The type of reproduction which involves simple division of the organism and involvement of only one parent is asexual reproduction.

2. Certain plants having simple body design may break or fragment into different parts. Each part now grows into a new individual. For example, Spirogyra.

3. Seed dispersal helps the plants to (i) prevent overcrowding. (ii) avoid competition for sunlight, water and minerals. (iii) invade new habitats.

4. All living things have a life span beginning from birth, growing into young then into an adult and finally growing old, till death. There is yet another important process that does not help an organism in its own survival but is essential for the continuation of its own kind in nature. The process of producing one of the same kind so that the species may continue on earth, is known as reproduction.

E. **1.** The major methods of asexual propagation are cut-tings, layering, division and budding/grafting. Cutting involves rooting a severed piece of the parent plant; layering involves rooting a part of the parent and then severing it;

and budding and grafting are joining two plant parts from different varieties.

2. In this method, a small piece of tissue (explant) is cut from the growing tip of another plant. It is kept in the nutrient medium in the controllable conditions in the laboratory. The cells of the tissue divide rapidly and form an organised mass of cells called callus.

   Callus transfers into another nutrient medium that helps in the differentiation of the plant and formation of different parts, like root, stem and leaves. After the particular period of growth, the plantlets are transported to the field. Many plants like asparagus, Chrysanthemum, orchids, etc. grow by this method.

3. Fertilization is the fusion of male and female gametes. It results in the formation of single-celled zygote.

   Germination of Pollen Grain : The pollen grain develops pollen tube through the style and reaches the ovary. It enters the ovule from a small opening. Pollen tube carries the male gamete. Male gamete fuses with the female gamete to form the zygote.

   Post-fertilization Change : Following changes take place in the flower after fertilization. The fertilized zygote grows into an embryo. The embryo has two parts– plumule which grows into shoot and radical which grows into the root.

   - The ovary grows into fruit.
   - The other parts of the flower fall off.
   - The ovule develops into a seed.

4. Transfer of pollen grains from the anthers to the receptive stigma is known as pollination. Pollination is of two types:

   Self-pollination : In this process, pollen grains from the anthers pollinate the stigma of the same flower.

   Cross-pollination : In this case, pollen grains of one flower fall on a different flower of either the same plant or another plant.

   Agents of Pollination

   Pollination occurs through some external agents like :

Wind : The pollen grains which are very light in weight can be passed on by wind from one flower to another or to the stigma of the same flower. This is known as wind pollination. Examples of wind pollination are pollination in wheat, rice, maize, etc.

Insects : When an insect sits on the flower to collect the nectar, the pollen grains stick on their legs and wings. When they travel to another flower, they carry the pollens with them. In this way, they carry out pollination. Examples are a sweet pea, orchids, sunflower, buttercup. Insect-pollinated flowers have bright colours, are large and showy, have nectaries, sticky stigma and sticky pollen grains.

Water : Aquatic plants carry out water pollination. In this, the pollen grains are released in water passively and are carried out by water currents to the other flowers for pollination. Examples of water-pollination are seagrass, hydrilla, etc.

13 Chapter Motion and Time

A. **1.** (a); **2.** (d); **3.** (b); **4.** (d); **5.** (c); **6.** (d); **7.** (c); **8.** (b)

B. **1.** hourglass; **2.** increases; **3.** speed; **4.** second; **5.** uniform; **6.** 1 millennium; **7.** oscillatory; **8.** km/hr

C. **1.** Jaipur, Delhi, Varanasi

2. Average speed $= \frac{\text{Distance}}{\text{Total time}} = \frac{60 + 60 + 50}{18 + 18 + 9} = \frac{\cancel{170}}{\cancel{45}}$

$= \frac{34}{9} = 3\frac{7}{9}$ M/S

3. The physical property which gives us both the speed and direction of motion of a body is known as velocity.

4. Speed is the distance travelled by a moving body per unit time.

5. 10 centuries = 1 millennium

6. $S = \frac{D}{t} = \frac{\cancel{200}}{\cancel{100}} = 2$ m/sec

7. km/hr

8. Motion is used to denote the change in position of objects with time.

D. **1.** The device is used when time periods must be measured precisely and with a minimum of complications. Laboratory experiments and sporting events like sprints are good examples.

2. This graph indicates that the moving body is covering equal distances in equal intervals of time irrespective of how long or how short the time interval may be.

3. Time is the on going sequence of events taking place. The past, present and future. The basic unit of time is second. There are also minutes, hours, days, weeks, months and years. We can measure time using clocks.

4. It directly gives the speed of the vehicle in km/h at a certain point of time.

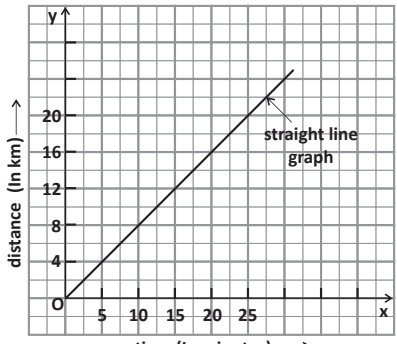
E. **1.** **Oscillation :** One complete to and fro motion of the bob of pendulum is called oscillation.

Amplitude : It is the maximum displacement of the bob from its mean position on either side.

Time period : It is the time taken to complete one oscillation.

2. Nowadays a much improved and innovative system of measuring time is used in watches. These watches run with cells and are called quartz watches. The quartz watches measure time more accurately as compared to pendulum watches.

3.



Distance-time graph for uniform speed

4. People used instruments like sundials and hourglass to keep track of time. The movement of shadow of a rod stuck upright in the ground, whose shadow changed direction with the movement of the sun across the sky, was used to make crude sundials.

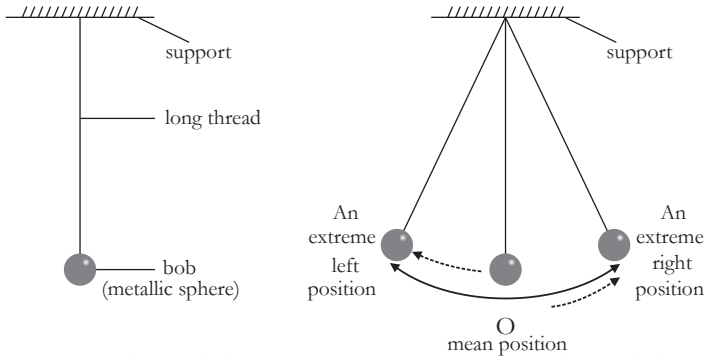
Another commonly used device in the early times was an hourglass, also called as sand clock. It was based on the principal that all the sand from the upper chamber falls into the lower chamber through tiny opening, in one hour. Once the upper chamber of hourglass is empty, it is turned upside down to record the time again. The other devices of time measurement used by the people of older times were candle clocks.

5. Distance between Mathura and Kanpur = 80 km

Time taken = 2 hrs

So, the average speed of the car = $\frac{\cancel{80}}{\cancel{2}}$ = 40 km/hr

6. Simple Pendulum : A simple pendulum can be made by suspending a metal bob (a small metallic sphere) from a cotton or silk thread. The arrangement is such that the bob is free to swing to and fro.



(A) A simple pendulum (B) Motion of a simple pendulum

Simple Pendulum

- The normal or the resting position of the bob is known as the mean position. In the figure given alongside (B), 'O' is the mean position of the bob.

- When the bob is displaced from its mean position and taken to one side and released, the bob makes a to-and-fro motion (known as oscillation) about its mean position.

The time taken by the bob to complete one oscillation is known as the time period of the pendulum. It is expressed in seconds

7. (a) Speed : The distance travelled by an object in unit time is called its speed. The standard unit of distance is metre and that of time is second. So, the SI unit of speed is meter/second. Some speeds may be expressed in the units like km/h, metre/minute or metre/ hour. The speed of an object is defined as the distance covered by a body in a unit time.

$$\text{Speed} = \frac{\text{Distance covered by a body}}{\text{Time taken to cover distance}}$$

Average speed : If a bus is moving with a speed of 60 kilometers per hour, it means that it covers a distance of 60 kilometres in one hour. However, a bus seldom moves with a constant speed for one hour. It starts moving slowly and then picks up speed. So we usually consider only the total distance covered by it in one hour. We do not bother whether the bus has been moving with a constant speed or not during that hour. The speed calculated here is actually the average speed of the bus.

$$\text{Average speed} = \frac{\text{Total distance covered}}{\text{Total time taken}}$$

(b) An object moving along a straight line with a constant speed is said to be in uniform motion. In this case, the average speed is the same as the actual speed.

If the speed of an object moving along a straight line keeps changing, its motion is said to be non uniform.

8. The distance time graph is a line graph that shows how the distance travelled by a moving object changes with time. Look at the graph given alongside. There are two perpendicular lines meeting at the point 'O' which is

known as the point of origin. The two perpendicular lines are known as the axes. We have the x-axis, i.e. the horizontal axis as well as the y-axis, i.e. the vertical axis. The two quantities are represented one on each axis. An appropriate scale is chosen to represent the values of two given quantities.

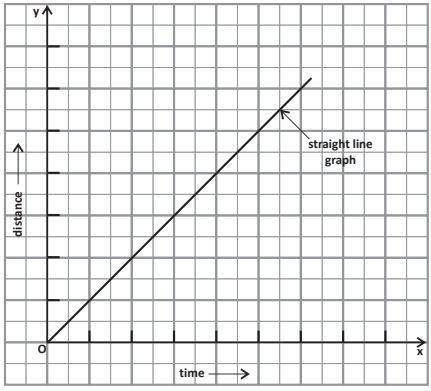
For example,

1 sec = 1 cm (x-axis) and 1 m = 1 cm (y-axis)

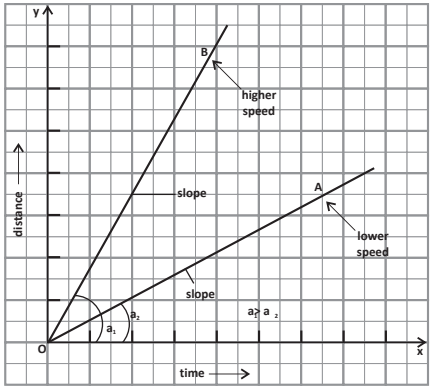
Distance-time Graph for Uniform Motion

The Distance-Time Graph for Uniform Motion is a Straight Line : This graph indicates that the moving body is covering equal distances in equal intervals of time irrespective of how long or how short the time interval may be.

The slope of the graph indicates the speed of the object. If the distance-time graph has a lower slope, it indicates that the object is moving at a low speed. On the other hand, if the distance-time graph has higher slope, it means that the object is moving at a high speed.



Distance-time graph for uniform speed



Distance-time graph for two moving objects

Electric Current and Its Effect

A. **1.** (c); **2.** (a); **3.** (d); **4.** (a); **5.** (d)

B. **1.** solenoid; **2.** heating effect of electric current; **3.** on, off; **4.** Audio, video; **5.** battery

C. **1.** Tungistan
2. Switch
3. fuse
5. Miniature Circuit Breaker (MCB)

D. **1.** Electromagnet is a piece of soft iron having an insulted wire wound around it that acts as a magnet when current flows in the wire.
2. Switch is a device that can break an electrical circuit by diverting the current from one conductor to another conductor or an insulator.
3. Short circuit is simply a low resistance connection between the two conductor supplying electrical power to any circuit. This results in excessive current flow in the power source through the 'short', and may even cause the power source to be destroyed.
4. Fuse is a safety device used to prevent damage in an electric circuit.
5. Solenoid is a cylindrical coil consisting of a large number of turns of insulated wire.

E. **1.** **Uses of Electromagnet**
- Audio and video tapes use the principle of magnetism.
- Electromagnets are used in hospitals by surgeons to remove steel splinters from eyes or wounds.
- Cranes with strong electromagnets are used to lift up large iron objects. When they have to be placed some where the switch is put off.
- They are used in motors that drive fans, mixers, washing machines, etc. They are also used in generators.

2. An electric bell is the direct application of an electromagnet. A horsehoe type of electromagnet is used in an electric bell.

Working of an Electric Bell
- When the switch is pressed, the circuit is completed and electric current flows to the electromagnet.

- The soft iron strip is attracted by the electromagnet. As the hammer is attracted to the strip, it hits the gong. As a result the sound is produced.
- On getting attracted to the electromagnet, the soft iron strip is not able to touch the screw (interrupter) due to which the circuit breaks. Thus, the electromagnet loses its property and is not able to attract the soft iron strip.
  When the soft iron strip goes back to its initial position and touches the screw, the circuit is completed and current flows once again. As long as the switch is 'On', steps 1 to 3 get repeated and we hear the ring of the bell.

3. Components of an Electrical Circuit

Cell : Cell is a device used to power electrical circuits. It has two terminals; positive and negative. The terminal marked negative is the source of electrons, that when connected to a circuit delivers energy.

Switch : Switch is a device that can break an electrical circuit by diverting the current from one conductor to another conductor or an insulator.

Light Bulb : Light bulb is a device that produces light from electricity. Light bulbs turn the electricity to light by sending current through a thin wire called filament. The filament is usually made of tungsten, a material that emits light when electricity is passed through it.

Connecting Wires : Wire is a flexible strand of metal, usually cylindrical in shape. Wires are used for establishing electrical conductivity between two devices of any electrical circuit. They possess negligible resistance to the passage of current. The wires are covered by insulated coating of different colours.

4. An electric fuse also works on the heating effect of the current. A fuse is a piece of thin wire having low melting

point. It is a safety device used to prevent damage in an electric circuit if very high current suddenly passes through it.

When excess current flows in the circuit, the fuse wire gets heated. Due to its low melting point, it melts and breaks the circuit. This stops the flow of current and prevents the electrical appliances from getting damaged.

5. When current passes through a conductor, heat is produced. It is called the heating effect of electric current. Heat is produced because some of the electric current gets converted into heat energy.

15 Chapter Light

A. **1.** (b); **2.** (d); **3.** (b); **4.** (c); **5.** (a); **6.** (b); **7.** (d); **8.** (b)

B. **1.** mirror; **2.** convex mirror; **3.** real; **4.** lateral; **5.** virtual

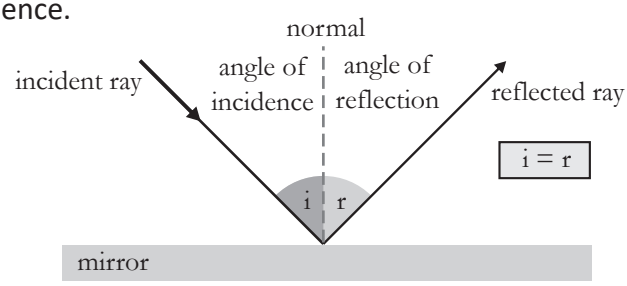
C. **1.** Convex lens

2. Plane mirror

3. Real image cannot be formed on a screen.

D. **1.** **First Law of Reflection :** According to the first law, the incident ray, reflected ray and normal, all lie in the same plane.

Second Law of Reflection : According to the second law, the angle of reflection is always equal to the angle of incidence.



2. Lateral inversion is an interesting phenomenon exhibited by plane mirror wherein there is change of left and right sides.

3. Transparent medium having one flat and one curved surface or both the surfaces curved is called a lens. Lenses that are made up of two curved surfaces are generally spherical. Spherical lenses are of two types :

   1. Convex lens, 2. Concave lens

4. Reflection is the bouncing back of light after striking the surface of an object.
5. Spectrum is the coloured band obtained on a screen when white light is passed through a prism.
6. Virtual image is an image that cannot be obtained on a screen.
7. • Mirrors on our dressing table and bathrooms are plane mirrors and are used to see ourselves.
   • They are fixed on the inside walls of jewellery shops to make them look big.
   • They are fitted at blind turns on the roads so that the driver can see the vehicles coming from other side.

E. 1. Formation of Image in Plane Mirror

The nature of image formed by a plane mirror is:

- Virtual and erect.
- Size of image formed is equal to the size of object.
- Image is formed behind the mirror.
- Image is at same distance behind the mirror as the object is in front of the mirror.
- Image formed in plane mirror is laterally inverted.

2. Uses of Concave Mirror

Satellite Dishes : One of the most important use of concave mirror is satellite dishes. These are used to receive the weaker signals sent from the communication satellites and then amplify it. These signals strike the concave mirror in parallel rays and gets reflected back. These reflected rays are concentrated at the focus of the mirror. The main purpose of this mirror is to gather weaker signals coming from large areas and concentrate them at one point.

Headlight in Car : A powerful source of light is kept at the focus point of the concave mirror in a smaller space at the back of the headlight.

Shaving Mirror : Another use of concave mirror is shaving mirror. The image formed after the reflections of the concave mirrors is helpful for people while shaving.

Dentist's Mirror : The concave mirrors helps the dentist to focus light on the tooth to be examined.

Uses of Convex Mirrors

Rear View Mirror : The side view mirror of car forms a small and erect image with the help of convex mirrors which helps to see the way behind the car.

Security Mirrors in ATM : Security mirrors are kept near the ATM's so that the bank customer can check that somebody is behind them or not.

A convex mirror is used as a reflector in street lamps. As a result, light from the lamp diverges over a large area.

3.
- Magnified, real, inverted and beyond 2F.
- Real, inverted and smaller than the object.
- Virutal and erect.

4. Place a candle on a table and light it. Place three cardboard sheets blocking your view of the candle. In these cardboard sheets make three pinholes at equal heights such that the flame of the candle is visible through the cardboard sheets. Now view the flame through the holes, you'll find it visible.

5. Aim : To test that white light consists of seven colours.

Materials required : A prism and a white paper.

Procedure : Allow the narrow beam of sunlight to enter a dark room through a small hole. Place the prism in the path of the light rays in such a way that the light rays fall on the face of the prism. Allow the light coming out of the prism to fall on the white paper that acts as a screen.

Observation : A band of seven colours would be seen on the screen in the order–VIBGYOR

Conclusion : White light is a mixture or seven colours.

6. **Concave Mirror :** A concave mirror is also known as the converging mirror as in these type of mirrors light rays converge at a point after they strike the reflecting surface of the mirror.

   Convex Mirror : The convex mirror has a reflective surface that curves outward. These mirrors "always" form virtual, erect and diminished images regardless of the distance between the object and mirror.

16 Chapter Water : A Natural Resources

A. **1.** (d); **2.** (d); **3.** (c); **4.** (b); **5.** (d); **6.** (c); **7.** (b); **8.** (a)

B. **1.** solid, liquid, gas; **2.** cycle; **3.** Drip; **4.** 0°C; **5.** Top level; **6.** precipitation; **7.** table; **8.** 35

C. **1.** Ice
   2. Water vapour
   3. Water (oceans, seas, etc.)
   4. Rainwater Harvesting
   5. Water is a renewable resource.

D. **1.** When it rains, a part of it seeps through a layer of soil. This water reaches solid rocks where it gets collected as groundwater. Ground water refers to any source of water that lies beneath the soil layer. Ground water can exist in the soil itself or between rocks and other materials.

   2. Water is the only substance that occurs in all the three forms – solid, liquid and gas at any given time on the earth.

   3. Ground water can exist in the soil itself or between rocks and other materials. Most communities obtain their water from underground aquifers, or rock formations capable of holding large amounts of freshwater. Only 3 per cent of the water on earth is considered freshwater, with a mere 30

percent of that small amount being found as groundwater. Pollution, seawater contamination and overuse threaten this valuable resource.

4. The water table is an underground boundary between the soil surface and the area where groundwater saturates spaces between sediments and cracks in rock. Water pressure and atmospheric pressure are equal at this boundary.

5. Conservation of water means a careful and economical use of water. We should conserve water as it is a precious natural resource. Conservation of water can happen in the following ways:
- Aforestation can help water to penetrate into the soil and replenish the water table.
- Use of efficient watering systems such as drip irrigation and sprinklers to reduce water consumption by plants and help in conservation of water.

6. Water scarcity is the lack of sufficient available water resources to meet the demands of water usage within a region. It already affects every continent and around 2.8 billion people around the world face the problems for at least one month every year. More than 1.2 billion people lack access to clean drinking water.

7. Conservation of water can happen in the following ways:
- Aforestation can help water to penetrate into the soil and replenish the water table.
- Use of efficient watering systems such as drip irrigation and sprinklers to reduce water consumption by plants and help in conservation of water.
- Building Dams and hydropower projects which help in checking flood and regulating the supply of water to agriculture.
- Irrigation hours and frequency can be reduced.

- Treatment of industrial and domestic wastewater in sewage plants before its disposal in water bodies help in conservation of water. It reduces the water pollution.

E. **1.** All nutrients absorbed by the roots are dissolved in water, which are then transported to different parts of the plant. Due to important physical properties of water, it protects plants from hot currents as well as from frost. It also helps in seed germination and maintains soil moisture required for plant growth.

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- Use of efficient watering systems such as drip irrigation and sprinklers to reduce water consumption by plants and help in conservation of water.
- Building Dams and hydropower projects which help in checking flood and regulating the supply of water to agriculture.
- Irrigation hours and frequency can be reduced.
- Treatment of industrial and domestic wastewater in sewage plants before its disposal in water bodies help in conservation of water. It reduces the water pollution.
- **Rainwater Harvesting :** In this system, the rainwater is collected by allowing it to flow from the rooftop through pipes in a storage tank. This water may contain some soil particles from the roof. So it should be filtered before use.

3. We are going to look at the causes, solutions and effects of water shortage. We will also pay special attention to the problems faced at various places and more specifically, California. We shall discuss the drought that is currently

being experienced there, the effects of this and what is being done to solve the problem.

Water scarcity is the lack of sufficient available water resources to meet the demands of water usage within a region. It already affects every continent and around 2.8 billion people around the world face the problems for at least one month every year. More than 1.2 billion people lack access to clean drinking water.

4. The distribution of water on the earth's surface is extremely uneven, only 3% of water on the surface is fresh; the remaining 97% resides in the ocean. Of freshwater 69% resides in glaciers, 30% underground, and less than 1% is located in lakes, rivers and swamps.

5. 70% of the earth's surface is covered by water, yet only 3% is fit for human consumption. The rest is salty or frozen.

With worldwide population increasing at a rate of 1.13% or 80 million people every year, nations need to take action to solve a problem which will only worsen.

Today, we are going to look at the causes, solutions and effects of water shortage. We will also pay special attention to the problems faced at various places and more specifically, California. We shall discuss the drought that is currently being experienced there, the effects of this and what is being done to solve the problem.

17 Chapter Forests : Our Lifeline

A. **1.** (a); **2.** (d); **3.** (c); **4.** (d); **5.** (a); **6.** (c)

B. **1.** quinine; **2.** 24.43; **3.** Deforestation; **4.** Chamoli; **5.** saprophytes; **6.** Onam

C. **1.** The other plants growing below the crown are of different heights. Hence, they make different horizontal layers known as understoreys.

2. Food chain.

D. **1.** Biotic community is an association of a number of different interrelated populations belonging to different species in a common environment.

2. Producers are green plants that make their own food. Consumers are organisms that eat the organisms of their lower levels in a food chain.

3. **Canopy, the Roof :** Different varieties of trees form different floors in forest. The leaves of some tall trees in forest form a roof that does not allow any sunlight to fall on the ground. This roof-type covering of trees is known as a canopy.

Crown, the Branchy Part : The part of branches above the stem of tree is called the crown of the tree.

Horizontal Layers of plants : The other plants growing below the crown are of different heights. Hence, they make different horizontal layers known as understoreys.

4. Afforestation is the plantation of trees on large scale.

5. Amla, Neem, Eucalyptus.

E. **1.** Some of the important forest products of minor nature are described as under :

Grasses, Bamboos and Canes : Different types of grasses grow in different parts of the country. Most of the grasses are used as fodder or for thatching, but some grasses are better used for cordage, matting and as an important raw material for manufacturing paper.

Tans and Dyes : Tannins are secretion products of plant tissues. Tanning materials are used in leather industry. The most commonly used tanning materials are mangrove, amla, oak, hemlock, anwal, wattle, myrobalans, ratanjot, flowers of dhawri, babul, avaram, etc.

Oils : A large number of plants and trees which grow in Indian forests contain several types of oils which are used to manufacture soaps, cosmetics, confectionary, pharmaceutical preparations and many more things.

Gums and Resins : Gums are exuded from the stems or other parts of different trees, partly as a natural phenomenon and partly by injury to the bark or wood or blazing the tree.

Fibres and Flosses : Fibres are obtained from the tissues of some trees. Most of such fibres are coarse and are used for rope making. However, the fibres of Ak (Calotropis spp.) is fine, strong and silky which is used for making fishing nets.

2. Some animals such as elephant, hippo, langur and rabbit eat only plants. They are known as Herbivores. They may eat grasses, leaves, fruits, grains or the bark of trees. Some animals such as lizard, tiger and vulture eat only other animals. They are known as Carnivores. Some animals like crow, dog, sparrow and ant eat both plants and animals. They are known as Omnivores.

The producers are eaten up by the herbivores. Herbivores in turn are eaten up by carnivores. All animals ultimately depend on plants for their food.

The study of food chains shows us the interdependence of various organisms in the environment. A typical food chain in grassland is :

Grass $\longrightarrow$ Deer $\longrightarrow$ Lion

3. The forests can be conserved in the following manner :

- Introducing afforestation programs.
- Controlling forest fires.
- Proper utilization of forest resources.

4. Green plants make their own food from carbon dioxide and water, using the energy of sunlight. Plants are known as producers as they can produce their own food. They are also known as autotrophs (auto-self, troph-food). Some organisms depend directly or indirectly on the food prepared by plants. They are known as consumers or heterotrophs.

Some organisms derive their food from the dead and decaying animal/plants. They are known as saprophytes. Apart from the animals which are easily seen, there are several organisms and microorganisms that live in the soil. They feed on the dead plant and animal tissues and convert them into a dark-coloured substance known as humus. The humus is added to the soil. The producers again absorb these nutrients from the humus of the soil and the whole cycle is repeated again and again.

5. **Dependence of Plants on Animals**

Like animals, plants are also dependent on animals in various ways :

For Pollen and Seed Disposal : A number of insects and birds help in pollination. Some animals help in dispersal of fruits and seeds.

For Carbon Dioxide : Animals produce carbon dioxide during respiration which is released in the atmosphere. Plants utilize this carbon dioxide for preparing their food. In this way, plants play an important role in maintaining carbon dioxide and oxygen balance in nature.

For Supplying Nutrients : Animals excreta and their dead bodies add nutrients to the soil. They act as manure and provide minerals for plant growth.

18 Chapter Wastewater Story

A. **1.** (b); **2.** (d); **3.** (b); **4.** (c); **5.** (b)

B. **1.** cooking oil, fats; **2.** biogas; **3.** contaminants; **4.** block; **5.** excellent

C. **1.** Sewage
2. Sewage Disposal System.
3. Wastewater Treatment Plant (WWTP)
4. Scum
5. Sludge

D. **1.** Typhoid, Cholera, Dysentery

2. Sewage system is a network of underground pipelines through which sewage is carried from the point of its production to the point of its treatment. In a sewage system, there are two sets of pipes, one for bringing clean water to homes, slaughter houses, tanneries, offices and factories and another to take away wastewater from these places. The pipes carrying wastewater are known as sewers.

3. It is the first stage and is known as primary treatment. This is as mechanical process which involves screening and settling of large particles. First the sewage is passed through screens of vertical bars to remove larger impurities such as metal cans, plastic bags, cloth pieces, etc. The water is then passes through a grit and sand tank to remove small stone and pebbles. The liquid material is then passed through huge sedimentation tanks. Here large solids, rags and plastics are removed by strainers or screens.

4. Solid wastes such as used tea leaves, food remains, plastic bags, soft toys, cotton and sanitary towels should not be thrown down the drains, in the kitchen sink or in the toilet. They clog drains and prevent free flow of oxygen that interferes with the decomposition process. Throw them in dustbins.

5. Sewage is a liquid waste which causes water and soil pollution.

6. Cleaning of water is a process of removing pollutants before it enters a water body or is reused. This process of wastewater treatment is commonly known as “Sewage Treatment”. It takes place in several stages.

E. **1.** The dissolved and suspended impurities that make fresh water unsuitable for drinking are known as contaminants. Contaminants are added to water through many sources

and thus may vary in their physical and chemical nature. The following contaminants might be present in water :

- Inorganic particles like sand, grit, metals, ceramics, nitrates, phosphates, etc.
- Soluble inorganic particles like ammonia, road salt, sea salt, cyanide, hydrogen, sulphide, etc.
- Organic particles in the form of faeces, hair, grass, food, plant materials, humus, urine, oil, chemicals, detergent soap, pesticides, vegetables, animal waste, etc.
- Pathogenic bacteria, viruses and other microbes that cause typhoid, cholera, dysentery, etc.
- Many gases, emulsions like paints, and toxins like pesticides and herbicides.
- Soluble organic matter like urea, sugar, protein, drugs, etc.
- Small animals like protozoans, insects, etc.
- Non-pathogenic bacteria.
- Insoluble materials like metal, grit, sand, plastic, paper, etc.

2. A new method recently tested in India is to use redworms to treat human excreta and convert it into vermicompost. Vermicompost is an excellent manure for plants. It has been found to be a low water use toilet for safe processing of human waste. The cooperation of such a toilet is hygienic and very simple. It is based on an innovative design in which earthworms are used to convert human excreta into compost.

3. A facility that treats waste water, domestic as well as industrial source is called a wastewater treatment plant. There are three steps in the process which are involved in treating wastewater before it is discharged into the water reservoirs. These processes are primary treatment, secondary treatment and tertiary treatment. Wastewater

treatment is the process of removing contaminants from wastewater. It includes removal of physical, chemical and biological contaminants using physical, chemical and biological processes. Given below is a step by step description of process carried out at wastewater treatment plant.

Primary Treatment : It is the first stage and is known as primary treatment. This is as mechanical process which involves screening and settling of large particles. First the sewage is passed through screens of vertical bars to remove larger impurities such as metal cans, plastic bags, cloth pieces, etc. The water is then passes through a grit and sand tank to remove small stone and pebbles. From here it passes on to the settlement tank where most of the suspended solids sink to the bottom. The solid that settles down is known as . The sludge can be used for production of biogas. Large materials float on top and are known as scum. The is removed by slimmer. The water thus obtained is known as secondary clarified water.

Secondary Treatment : It is the second stage and is known as secondary treatment. This is a biological process in which the organic matter in the sludge is broken down with the help of bacteria. This process is known as digestion and as result of it, biogas is produced. Air is blown into aeration tanks to speed up the process. This is done in closed tanks which settle down at the bottom of the tanks as activated sludge. The water at the top is removed. The activated is mostly water.

Tertiary Treatment : It is the third stage and is known as tertiary treatment. Sometimes the water has to be treated more before they are passed into water bodies. Water may be passed through sand filters or man-made ponds with reeds and other organisms like water hyacinth, which can

clean out dissolved chemicals. This is basically a chemical process in which chemicals are used to remove phosphorus and nitrogen from the water.

4. You should be a responsible citizen and take every step to dispose waste properly. A few simple steps at home can minimize the strain imposed on the water supply system in cleaning the water for our use :

- Solid wastes such as used tea leaves, food remains, plastic bags, soft toys, cotton and sanitary towels should not be thrown down the drains, in the kitchen sink or in the toilet. They clog drains and prevent free flow of oxygen that interferes with the decomposition process. Throw them in dustbins.
- Never throw paints, solvents, insecticides and medicines down the drain as they may kill microbes that helps to purify water.
- Do not dispose off cooking oils and fats in the kitchen sink. They can block pipes when they harden. Throw them in dustbins.

5. Same as 3

1 Chapter Crop Production and Management

A. **1.** (a); **2.** (d); **3.** (d); **4.** (b); **5.** (c)

B. **1.** crop; **2.** Fertilisers; **3.** apiculture; **4.** Agriculture; **5.** pests, pesticides

C. **1.** Kharif and Rabi crops.
2. Sprinkle system, Drip system
3. Apiculture is the rearing of honey-bees on large scale.
4. Thresher
5. Rice or paddy

D. **1.** After threshing, we must separate the grains from the chaffs. Winnowing is the process of separating the grains.

2. **Kharif Crops :** The word "Kharif " is Arabic for autumn since the season coincides with the beginning of autumn or winter. Kharif crops also are known as monsoon crops. These are the crops that are cultivated in the monsoon season. The Kharif season differs in every state of the country but is generally from June to September. These crops are usually sown at the beginning of the monsoon season around June and harvested by September or October. Rice or paddy, maize, bajra, ragi, soyabean, groundnut, cotton are all types of Kharif crops.

Rabi crops : The Arabic translation of the word "Rabi" is spring. These crops' harvesting happens in the springtime hence the name. The Rabi season usually starts in November and lasts up to March or April. Rabi crops are mainly cultivated using irrigation since monsoons are already over by November. In fact, unseasonal showers in November or December can ruin the crops. The seeds are sown at the beginning of autumn, which results in a spring harvest. Wheat, barley, mustard and green peas are some of the types of major rabi crops that are grown in India.

3. Excess moisture in the crops promotes the growth of micro-organisms and can rot the crops and cause huge losses. Moisture may also germinate the stored seeds, which has to be avoided. Ineffective drying reduces the grain quality and causes huge losses.

4. Weeds are undesirable plants that rob the crops of their resources. They compete with the crops for sunlight, water and nutrients from the soil.

Weedicides are chemicals which destroy weeds without harming the crops.

5. Fertiliser is the chemical substance which can be added to the soil to increase its nutrient content. It is applied to the soil to increase the yield of crops, like wheat, maize, paddy, etc.

Fertiliser not only improves the fertility of soil but also replaces the chemical substances used by earlier crops from the soil. However, excessive use of synthetic fertiliser can harm the effectiveness of soil.

Examples of fertiliser are urea, superphosphate, potash, NPK (Nitrogen, Phosphorous, Potassium), etc.

E. **1.** A crop is a plant that is cultivated or grown on a large scale. Crops are generally grown so they can be commercially traded, i.e. any plant that is grown and harvested extensively for profit purposes. Most crops are foods such as grain, vegetables, or fruit. Some crops are for drugs, such as quinine, or fibers such as cotton, or other materials such as rubber or wood. Farms are usually made to grow just one kind of crop. When plants of the same kind are grown and cultivated at one place on a large scale for food, clothing and medicines, they are called crops.

Growing crops is a part of agriculture.

There are two major types of crops that are grown in India.

Kharif crops : Kharif crops also are known as monsoon crops. These are the crops that are cultivated in the monsoon season.

Rabi crops : These crops' harvesting happens in the springtime hence the name. The Rabi season usually starts in November and lasts up to March or April. Wheat, barley, mustard and green peas are some of the types of major rabi crops that are grown in India.

2. There are various methods of weeding, some of which are :
   - The traditional method of removing weeds by hand.
   - Ploughing the field to remove the weeds even before sowing the seeds.
   - Manually removing weeds using a trowel and harrow.
3. **Seed Drills :** This is a modern method of sowing seeds. It is better and more efficient method than sowing by hand. It is usually done by attaching iron drills to a tractor. Seed drills ensure that the seeds are planted at equal intervals and at the correct depth in the soil.

   Precautions to be Taken While Sowing Seeds

   Sowing seeds is essentially the most important part of crop production. It is necessary to focus on even the smallest details. The following precautions should be taken when sowing seeds :
   - Seeds must be planted at the correct distance or intervals from each other. This is to ensure that all plants get their fair share of light, water and nutrients for growth and development.
   - Planting seeds at equidistance have been proved to increase the yield of the farm.
   - Seeds must be sown at the correct depth in the soil. If seeds are simply scattered on the top they are likely to be blown away or eaten by animals or birds. If we sow them too deep into the ground, they will not germinate due to lack of air.
   - The seeds that you sow should be of the highest quality. They have to be germ and disease free.
4. **Ploughing :** Ploughing is the process of loosening and turning the soil. It is also known as tilling. Ploughing of soil

allows roots of the plants to penetrate deeply into the soil. This firmly roots the plant. Loose soil also provides better aeration to the roots allowing them to breathe easily. It assists the growth of microbes and worms, which perform decomposing and add nutrients and humus to the soil. Ploughing also removes weeds and other waste materials from the field. It brings nutrient-rich soil to the top, which helps in the growth of plants. The tools we use for ploughing are: plough, hoe and cultivator.

Levelling : Once the field is ploughed, the topsoil is quite loose. There is a strong possibility that strong winds or rain will wash away the topsoil. The soil then needs to be levelled again to ensure its strong foundation. This levelling of soil is done with an implement called the leveller, which is a heavy wooden or iron plank. Levelling of the field also helps in uniform distribution of water during irrigation. This is the final step of soil preparation.

Levelling helps to prevent soil erosion by wind or air. Plants grow uniformly in the field and water is also uniformly distributed throughout the soil. It prevents water logging and loss of moisture from ploughed soil.

5. Drip irrigation is a advanced method of irrigation where the water is released drop by drop just near the roots of plants. It is considered advantageous over other methods or irrigation since it delivers water directly to the plant where it is required, i.e. the roots.

6. Manure is considered very helpful in increasing the fertility of the soil, by enhancing its capacity to retain water, by improving the texture of the soil and by increasing the number of friendly microbes. Moreover, manure makes the soil porous, that facilitates the exchange of gases. On the other hand, is the chemical substance which can be added to the soil to increase its nutrient content. It is applied to the soil to increase the yield of crops, like wheat, maize, paddy, etc.

Fertiliser not only improves the fertility of soil but also replaces the chemical substances used by earlier crops from the soil. However, excessive use of synthetic fertiliser can harm the effectiveness of soil.

Examples of fertiliser are urea, superphosphate, potash, NPK (Nitrogen, Phosphorous, Potassium), etc.

Microorganisms : Friend and Foe

A. **1.** (d); **2.** (a); **3.** (a); **4.** (a); **5.** (b)

B. **1.** Pickles, sauces; **2.** denitrification; **3.** ammonia; **4.** unicellular; **5.** a cellular microorganism.

C. **1.** Microscopic algae were once thought to be plants, but recent studies have shown that algae don't fit into the plant family.
Example : Chlorella is a fresh water algae

2. Microorganisms are too small and are not visible to the unaided eye.

3. Fermentation is the process in which a substance breaks down into a simpler substance.

4. Microscope

5. Pneumonia

D. **1.** Pathogens are the disease-causing microorganisms.

2. Microorganisms have uses and benefits across all aspects of human life. From the bacteria that help humans to digest food to the viruses that help plants resist heat, bacteria, viruses and fungi.
They have uses everywhere, from agriculture to cutting-edge medical technology. Every year, researchers are finding new uses and benefits of microorganisms to be applied in medicine, infrastructure, cooking and other areas.

3. Caecum is the small dead end of large intestine which, in the plant eating animals such as rabbits, harbors mutualistic bacteria. These bacteria help the herbivores to digest the cellulose.

4. We regularly aid the microorganisms in our bodies by adding more. Though certain species of microorganisms can make you sick like strep throat. The flu and measles are nothing to laugh at. Modern medicine would not exist if not for the careful study of microorganisms. Bacteria and viruses are the key components of the vaccines that prevent the spread of once-deadly diseases like smallpox. Today microorganisms allow us to artificially grow helpful substances such as insulin and human growth hormones and reprogrammed viruses are frequently used as drug-delivery mechanisms.
5. There are five principal modes by which bacterial infections may be transmitted : Contact, airborne, droplet, vectors and vehicular.

E. **1.** Mangoes get spoil because of the bacteria present in the environment. But mango jam does not spoil because of the preservatives used in them.

2. The air we breathe contains 78% nitrogen, 21% oxygen and remaining are other trace gases. The nitrogen component of air is inert. So this means plants and animals cannot use it directly. To be able to use nitrogen, plants convert atmospheric nitrogen to nitrates, nitrites and ammonia compounds by a process called the nitrogen cycle. Animals derive their nitrogen requirements from plants.

The Steps Involves In The Nitrogen cycle

Nitrogen cycle consists of four main steps namely:

- Nitrogen Fixation
- Ammonification/Decay
- Nitrification
- De-nitrification

3. Commercial Uses

In addition to their direct environmental benefits, microorganisms are important partners when it comes to the work of creating food. They can be used to increase the fertility of the soil and increase crop yields and they are necessary when making products like bread, beer and

cheese and when growing coffee. At the same time, foods with probiotic properties, such as yogurt and certain types of chocolate, deliver helpful microorganisms to our digestive systems.

Production of Diary products : Bacteria help in fermentation which helps in making different forms of dairy products from milk like curd, buttermilk, butter, cheese. Lactobacillus is the most common genus of bacteria that are used in the commercial production of this product.

Bread Baking : A species of Streptococcus is added to the dough before making bread to bring about the required fermentation.

Alcoholic Drinks : Alcoholic drinks are prepared or manufactured by the process of fermentation. Each drink is derived from a different starting product such as potato and grapes. Then it is fermented, distilled and alcohol is prepared. The commonly used microorganism here is different types of fungus like yeast. Some even use bacteria and fungus. Alcoholic drinks include wine, rum, vodka, etc.

4. **Filtration :** This is done for liquids such as juices. The process applies pressure while the liquid is passed through a very fine sieve. This results in the liquid passing through while the microbes cannot and thus the liquid obtained is sterile.

   Heat Treatments : There are different kinds of heat treatments that can be done such as boiling at 100 degrees Celsius, boiling above 100 degrees Celsius (sterilisation) or pasteurisation (as done in case of milk).

5. **(a)** Bacteria and fungi are required to maintain a healthy environment. Not only do they recycle natural wastes and dead animal and plant matter, they also produce many of the nutrients that plants need to grow. Bacteria, in particular, are the only living things that can fix nitrogen for use in plants.

(b) Certain bacterial and fungal species are used to keep certain insects and pests away from crops.

Certain fungi have been theorized to have anti-cancer properties and the CRISPR Cas9 gene found in certain types of bacteria is currently being used as a gene-editing tool.

(c) Algae are used in wastewater treatment facilities, reducing the need for greater amounts of toxic chemicals that are already used. Algae can be used to capture fertilizers in runoff from farms. When subsequently harvested, the enriched algae itself can be used as fertilizer.

3 Chapter Synthetic Fibres and Plastic

A. **1.** (d); **2.** (b); **3.** (d); **4.** (a); **5.** (c)

B. **1.** Rayon; **2.** thermoplastic; **3.** synthetic fibres;
4. thermosetting plastics; **5.** Rayon

C. **1.** There are four main types of synthetic fibers :
1. Nylon, 2. Rayon, 3. Polyester, 4. Acrylic
2. Polyster, Teflon etc.
3. Polymer Cellulose
4. Synthetic fibres are non-biodegradable.
5. Thermosetting plastics cannot be processed again and again.

D. **1.** **Advantages of Synthetic Firbes**
- Synthetic fibres have good elasticity.
- They don't wrinkle up easily.

2.
- High mechanical strength, stiffness, hardness and toughness.
- Good fatigue resistance.

3. **Thermoplastics :** Thermoplastics are organic materials that melt when heated. They should be differentiated from thermoset materials which cure, or become set, when they are heated.

Thermosetting Plastics : Thermoset plastic or Thermosetting plastics are synthetic materials that strengthen during being heated but cannot be successfully remolded or reheated after their initial heat-forming, called as thermoset material.

4.
- Make uses of bags made of cotton or jute.
- Biodegradable and non-biodegradable wastes should be collected separately and disposed off.

5. Threat To Animal Life : Plastic bags not only have adverse effects on our natural habitats, but have also been found to be responsible for the death of many animals, mainly on account of the suffocation encountered on eating them.

Fumes : Since plastic bags are not bio-degradable, the only way to get rid of them is to burn them up. But, smoldering plastics can release toxic fumes into the environment, in turn taking the air pollution to much higher levels.

6. The most popular and one of the earliest uses of polyester was to make polyester suits. All the rage in the 70s, polyester clothes were very popular. Due to its strength and tenacity polyester was also used to make ropes in industries. PET bottles are today one of the most popular uses of polyester.

E. 1. Properties of Plastics

The properties and characteristics of most plastics (though not always fulfilled in certain special plastics) are these:

Following are the general properties of plastics.

- The plastics are sufficiently strong and can be used for load bearing structural members.
- Plastics, being organic in nature, are combustible. But the resistance to fire temperatue depends upon the plastic structure.
- Plastics generally possess sufficient durability, provided they offer sufficient surface hardness. Thermoplastic varieties are found to be attacked by termites and rodents.

- Plastics easily maintain its shape and do not go under plastic deformations.
- Plastics offer great resistance to moisture, chemicals and solvents. Many plastics are found to possess excellent corrosion resistance. Plastics are used to convey chemicals.
- The plastics have low thermal conductivity and therefore foamed or expanded varieties of plastics are used as thermal insulators.

2. **Advantages :** Thermoplastics have a good range of properties and are energy efficient, both in their manufacture and processing.

   Disadvantages : Thermoplastics melt. Some degrade in direct sunlight or under high U.V. light levels. Many materials have poor resistance to hydrocarbons, organic solvents and highly polar solvents but others have excellent resistance to these materials. Thermoplastics suffer from creep, a relaxation of the material under long term loading. Many thermoplastic materials, especially composites, tend to fracture rather than deform under high stress levels.

3. **Advantages of Synthetic Fibres**
   - Synthetic fibres have good elasticity.
   - They don't wrinkle up easily.
   - Fabrics from synthetic fibres are less expensive, durable and readily available in comparison to natural fibres.
   - Synthetic fibres can handle the heavy load without breaking.
   - They don't shrink.
   - Synthetic fibres blend well with other fibres.
   - They're very absorbent.

   Disadvantages of Synthetic Fibres
   - Synthetic fibres require attention while ironing since they tend to melt away easily.
   - Most of these fibres absorb very little moisture and hence it sticks to the body while sweating on hot

summer days making it uncomfortable to wear during such days.

- Synthetic fibres are prone to catch fire very easily.
- These fibres are non-biodegradable.

4. **Environmental Damage :** Plastic bags have been known to cause a lot of environmental damage. A single plastic bag can take up to 1000 years, to decay completely. This makes the bags stay in environments longer, in turn leading to great build-up on the natural landscape (much more than degradable materials like paper). In other words, the more plastic bags you use, the greater the chances of environmental damage.

   Threat to Animal Life : Plastic bags not only have adverse effects on our natural habitats, but have also been found to be responsible for the death of many animals, mainly on account of the suffocation encountered on eating them.

   Suffocation : Not only animals, infants and young children have also been reported to have lost their life, on account of plastic bags. Since plastic bags are thin and airtight as well, children often end up blocking their mouths and nostrils with them.

   Fumes : Since plastic bags are not bio-degradable, the only way to get rid of them is to burn them up. But, smoldering plastics can release toxic fumes into the environment, in turn taking the air pollution to much higher levels.

   Non-renewable : One of the main disadvantages of plastic bags is that they are not renewable. The reason behind this is that they are made of petrochemicals, a non-renewable source of energy.

Metals and Non-Metals

A. **1.** (a); **2.** (a); **3.** (a); **4.** (c); **5.** (c)

B. **1.** bromine; **2.** oxygen, moisture; **3.** copper oxide; **4.** Copper; **5.** 2 km

C. **1.** Copper is used in household wiring.

2. Tungsten is used in electric bulbs and tubes.

3. Aluminium and Copper.

4. Sodium is kept under kerosene.

D. **1.** **Malleability :** Malleability refers to the property of metals by which they can be beaten into thin sheets. One such example is silver metal beaten to make silver foil used for decorating sweets.

Ductility : Ductility refers to the property of metals by virtue of which they can be drawn into thin wires. Examples of ductility are copper and iron which can be drawn into thin wires.

2. **Physical properties of Metals**

The physical properties of metals are:

Luster : The property of metals which in the pure state usually shines. The shine on the metallic surface is the metallic luster. They shine in light due to the reason that the metals possess free electrons that vibrates on getting in contact with light.

Malleability : Malleability refers to the property of metals by which they can be beaten into thin sheets. One such example is silver metal beaten to make silver foil used for decorating sweets.

Physical properties of Non-metals

Non-metals are Brittle : Non-metals are generally brittle and hence cannot be beaten into sheets or drawn into wires. In other words, non-metals are non-malleable and non-ductile. When stress is applied on non-metals, they shatter into pieces.

Non-metals are Bad Conductors of Heat and Electricity : Non-metals are generally bad conductors of heat and electricity. Carbon (graphite) is an exception. It is a good conductor of electricity and is used in making electrodes.

3. The box can be hit hard and the box which produces sonorous sound is considered as the metal box. This means that metals make a ringing sound when we strike them.
4. **Metals :** Lead, Aluminium
   Non-metals : Iodine, Carbon, Sulphur, Silicon

E. **1.** The non-metals used in different fields :

Uses of Non-metals in Our Daily Life : Oxygen, which is 21% by volume in the atmosphere, helps in the respiration process. It is also used for manufacturing of steel and provides high temperature in metal fabrication process. Oxygen cylinders are used in hospitals.

Chlorine is useful in removing stains and colour patches as a bleaching agent. Various graded plastics and insecticides are made with chlorine. It helps in purification of water. How? Adding chlorine to drinking water kills the bacteria.

Helium is used as inert gas for scientific experiments. It is also used in weather balloons.

Iodine helps in throat infections and is used as antiseptic on wounds and cuts.

Non-metals are used in Fertilisers : Fertilisers contain nitrogen. It helps in plant growth.

2. Chemical Properties of Metals

Metals are also called electropositive elements because the metal atoms form positively charged ion by losing electrons. Following are the important chemical reactions of metals which take place due to the electropositive character of metals.

Reaction of Metals with Oxygen : Almost all metals react with oxygen to form metal oxides. But different metals react with oxygen at different intensities. For example, sodium metal is always kept immersed in kerosene oil.

Reaction of Metals with Water : Metals react with water to produce metal oxide (or metal hydroxide) and hydrogen gas. But, all metals do not react with water at equal intensity.

Reaction of Metals with Dilute Acids : When a metal reacts with a dilute acid, then a metal salt and hydrogen gas are formed. For example : Sodium, magnesium and zinc reacts with dilute hydrochloric acid to form their salts and hydrogen gas.

$$\underset{\text{Sodium}}{2Na} + \underset{\text{Hydrochloric acid}}{2HCl} \longrightarrow \underset{\text{Sodium Chloride}}{2NaCl} + H_2$$

Reaction of Metals with Salt Solutions : If a more reactive metal is put in the salt solution of a less reactive metal, the more reactive metal displaces the less reactive metal from its salt solution. These reactions are called displacement reactions.

Chemical Properties of Non-Metals

Non-metals are also called electronegative elements because the non-metal atom forms negatively charged ion by accepting electrons. Following are the important chemical reactions of non-metals.

Reaction of Non-metals with Oxygen : All non-metals react with oxygen to form acidic or neutral oxides. For example, carbon forms acidic carbon dioxide on reacting with oxygen.

$$\underset{\text{Carbon}}{C} + O_2 \longrightarrow \underset{\text{Carbon Dioxide}}{CO_2}$$

Reaction of Non-metals with Water : Non-metals do not react with water.

Reaction of Non-metals with Dilute Acids : Non-metals do not react with dilute acids and don't displace hydrogen from dilute acids, because non-metals are electron acceptor. So, they cannot supply electrons to H+ ions. So, they do not displace hydrogen from dilute acids.

3. Physical Properties of Metals

The physical properties of metals are:

Luster : The property of metals which in the pure state usually shines. The shine on the metallic surface is the metallic luster. They shine in light due to the reason that

the metals possess free electrons that vibrates on getting in contact with light.

Mallebility : Malleability refers to the property of metals by which they can be beaten into thin sheets. One such example is silver metal beaten to make silver foil used for decorating sweets.

Ductility : Ductility refers to the property of metals by virtue of which they can be drawn into thin wires. Examples of ductility are copper and iron which can be drawn into thin wires.

Conductivity : The metals are a good conductor of heat and electricity as they can pass through them. They are good conductors of heat and electricity.

Sonorous : On being struck hard, the metals produce a ringing sound. Due to this property, they are called sonorous. For example, the school bell produces a loud ringing sound when struck with the hammer hard.

4. Mallebility : Malleability refers to the property of metals by which they can be beaten into thin sheets. One such example is silver metal beaten to make silver foil used for decorating sweets.

Coal and Petroleum

A. **1.** (c); **2.** (c); **3.** (d); **4.** (a)

B. **1.** carbon; **2.** Petroleum; **3.** petrol; **4.** conservation; **5.** carbon monoxide

C. **1.** Natural resources refer to the things that exist freely in nature for human use and don't necessarily need the action of mankind for their generation or production.

2. Coal, Natural gas

3. Anthracite, Bituminous, Sub-bituminous, Lignite.

4. Any substance which upon combustion produces a usable amount of energy is known as fuel. For example wood, coal, biogas, LPG, petrol, diesel, etc.

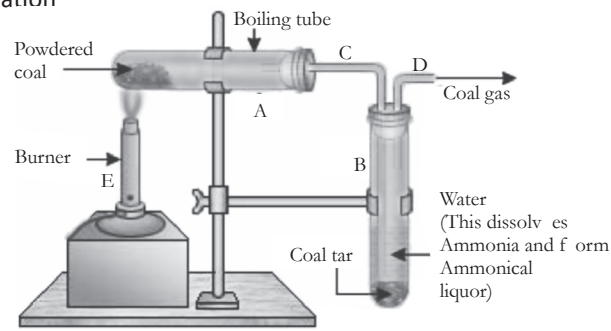
5. Coal is better fuel.

D. **1.** Natural Gas is a fossil fuel. It occurs naturally and approximately consists of 95% hydrocarbon methane, the other 5% consists of nitrogen, carbon dioxide, helium or hydrogen sulphide. It takes millions of years for it to form.
The gas is formed when layers of decaying plants and animals are buried under the earth's surface and are exposed to intense heat and pressure for millions of years. Plants originally obtain energy from the sun and store in the form of chemical bonds in the gas. And thus, the formation of this gas occurs.

2. The other classification of resources is non-renewable resources. Non-renewable resources are those natural resources that are available in limited quantity. These resources cannot be renewed or replenished in short duration. Therefore they are also known as exhaustible resources. Examples : coal, natural gas, petroleum, nuclear energy etc.

3. **Destructive distillation of coal :** When a substance is heated in the absence of air, the process is called destructive distillation. It results in the decomposition of the substance, bearing carbon rich residue.
Destructive distillation of coal produces coke, coal, tar, coal gas and ammonia solution.

$$\text{Coal} \xrightarrow[\text{distillation}]{\text{Destructive}} \text{Coke + Coal tar + Coal gas + Ammonical liquor}$$



The destructive distillation of coal can be carried out in the laboratory. The apparatus is set up as shown in the figure alongside.

4. Products produced in Petroleum Refining Process :

- **Petroleum Gas :** Generally, liquified petroleum gas is useful for domestic fuel.
- **Gasoline :** Procuration of petrol occurs from this fraction.
- **Kerosene :** It is used as domestic fuel and also as fuel in jet engines.
- **Diesel Oil or Light Oil :** It is useful in the automobile industry.
- **Heavy Oil or Light Oil :** This type of oil is used in making lubricating oils.
- **Fuel Oil :** It is essential for ships, central heating and factories.
- **Residue :** We can procure products like paraffin wax, bitumen from this residue. It is useful for making roads and roofing.

E. 1. We use various materials to fulfill our needs. The sources from which we get these materials are known as resources. Air, water, plants and fuels are some of the most common resources. Some of them are natural and some are man-made.

- Renewable resources or non-exhaustive resources
- Non-renewable resources or exhaustive resources

Renewable Resources or Non-exhaustive Resources :

When talking about classification of resources, we will first see the renewable resources. Renewable resources are those resources that can be replenished or renewed naturally over time. Air, water, wind, solar energy, etc. are all renewable resources. Renewable resources can be easily renewed by nature.

Non-renewable Resources of Exhaustive Resources :

The other classification of resources is . Non-renewable resources are those natural resources that are available in limited quantity. These resources cannot be renewed or replenished in short duration. Therefore they are also

known as exhaustible resources. Examples coal, natural gas, petroleum, nuclear energy etc.

2. **Conservation of Fossil Fuels**

   Use of Alternative Sources of Power such as Solar and Wind Energy : These alternative sources of energy are bio friendly particularly because they do not produce harmful gases that damage the ozone layer.

   Plant Trees to Prevent Soil Erosion : This entails planting trees and vegetation to control soil erosion caused by wind and water. Trees and vegetation are essential in the maintenance of the ecosystem. They also act as home for most insects, birds and some symbiotic plants. This creates a habitat for wildlife therefore conserving wildlife altogether.

   Rain Harvesting : This is an important practice of ensuring water conservation. It is done by harvesting of rainwater during the wetter seasons of the year and using it during the dry seasons.

   Use of Biogas in Our Homes : Around the World, Liquefied Petroleum Gas (LPG) is the most rampant source of fuel in our homes today. Continued LPG use results to the depletion of the oil reserves, biogas is therefore an alternative.

   Use of Bio-fuels : For more than a century, fossil fuels have been a major source of energy. However, they are depleting rapidly, this calls for alternative sources of fuel such as bio-fuels which are mainly from plant species.

   Ensure the Recycling of Wastes : These wastes include plastics, paper bags that have resulted to tones of garbage. Recycling entails re-manufacturing of already used materials.

3. **Renewable Resources or Non-exhaustive Resources :**

   When talking about classification of resources, we will first see the renewable resources. Renewable resources are those resources that can be replenished or renewed

naturally over time. Air, water, wind, solar energy, etc. are all renewable resources. Renewable resources can be easily renewed by nature.

Non-renewable Resources or Exhaustive Resources :

The other classification of resources is non-renewable resources are those natural resources that are available in limited quantity. These resources cannot be renewed or replenished in short duration. Therefore they are also known as exhaustible resources. Examples coal, natural gas, petroleum, nuclear energy etc.

4. It takes around millions of years for petroleum to form. It is formed due to the presence of decomposed carcasses of dead animals beneath the surface of the earth. These carcasses of dead animals are subjected to extreme pressure and heat. Over centuries, millions of animals lived and died to become fossilized, just in case of plant-based matter. Similarly, in the ocean, oceanic creatures drowned to the bottom of the ocean and got buried under the sand and rocks. Decayed due to the presence of bacteria, the decomposed organic matter got buried deeper and deeper over the years. Over millions of years, high temperature, high pressure and the absence of air converted the dead animals to petroleum and coal. This liquefied form of dead organic matter is petroleum or crude oil. Crude oil is extracted from oil wells. These wells can be very deep. The oil extracted is later refined to form petrol, diesel, aviation fuel, paraffin wax, lubricating oil, etc.

5. Deposition of petroleum occurs with natural gas in the rocks called oil wells from where it is taken out by drilling. Refining is a process where the separation of various compounds of crude oil occurs. Fractional distillation is a process used to separate its compounds. Crude Oil procured from an oil well is a mixture of many liquids. Different temperature evaporates different liquids. This temperature is the boiling point of that liquid. The crude

oil, heated to a temperature of 400 degree Celcius, is fed in at the bottom of the column and heated further. The liquid with the lowest boiling point changes into vapour first and condenses. At higher temperature, the next volatile liquid changes into a vapour state and rises.

6 Chapter Combustion and Flame

A. **1.** (b); **2.** (b); **3.** (b); **4.** (a); **5.** (d)

B. **1.** Fuel; **2.** CO, CO_2, SO_2, NO_2, N_2O etc.; **3.** calorific value; **4.** air/oxygen, heat, light

C. **1.** Because the LPG is a gas and the molecules of LPG has intermolecular space. So it catch the fire fast.

2. Because the paper cup cannot become appreciably hotter than the water it contains, the cup will not ignite until the water has all turned to steam and risen away.

3. The substances which burn in the air are called combustible substances.

4. The lowest temperature at which a substance catches fire is called its ignition temperature.

5. Outer zone of a candle flame is the hottest.

6. CO_2 and CO

D. **1.** Combustion is the scientific word for burning. In a combustion reaction, a substance reacts with oxygen from the air. Combustion reactions happen at high temperatures and transfer energy to the surroundings as light and heat.

2. **Rapid Combustion :** Rapid combustion needs external heat energy for the reaction to occur. The combustion produces a large amount of heat and light energy and does it so rapidly. The combustion will carry on as long as the fuel is available.

Spontaneous Combustion : As the name suggests, the combustion occurs spontaneously. This means that it requires no external energy for the combustion to start. It

happens due to self-heating. A substance with low-ignition temperature gets heated and this heat is unable to escape.

3. Complete combustion of a fuel yields a high amount of energy whereas incomplete combustion yields a less amount of energy.
4. Magnesium and charcoal are examples of combustible substances.

   Examples of non - combustible materials include Portland cement concrete, gypsum concrete or magnesite.
5. **Flammable substances :** Flammable substances are those substance which can catch fire easily, for example : wood, paper, kerosene etc.

   Inflammable substances : Inflammable materials are those which do not catch fire easily. Some examples are glass, water, etc.

E. 1. Characteristics of good fuel are as follows :

- High calorific value.
- Proper ignition temperature (neither be too low nor too high).
- Cause no pollution to the atmosphere on combustion.
- A controllable rate of combustion.
- Easily available in plenty and cheap in cost.
- Easy to handle and transport.

2. The burning of fuels leads to release of harmful products into the environment. An increase in the consumption of fuel leads to harmful effects on the environment. Following points will clearly depict these effects:

- Carbon fuels such as wood, coal, petroleum release unburnt carbon particles in the environment. These particles are very dangerous pollutants and cause respiratory diseases, for example asthma.
- When fuels are incompletely burnt, they release carbon monoxide gas into the atmosphere. This gas is very dangerous as it is poisonous in nature. If we burn coal in

a closed room, then the person sleeping in that room will be killed by the action of carbon monoxide.

- The combustion of fuels also releases a large amount of carbon dioxide into the atmosphere. Carbon dioxide is a greenhouse gas which is responsible for global warming. Global warming is a rise in the overall temperature of earth's surface.
- Burning of coal and diesel releases sulphur dioxide gas. This gas is extremely corrosive and suffocating in nature.
- Pollution is a major disadvantage of burning fuels. This is because they give off carbon dioxide when burned, thereby causing a greenhouse effect.
- Coal also produces carbon dioxide when burned compared to burning oil or gas.

3. A fire extinguisher is an active fire protection device used to extinguish or control small fires, often in emergency situations. It is not intended for use on an out-of-control fire, such as one which has reached the ceiling, endangers the user (i.e., no escape route, smoke, explosion hazard, etc.), or otherwise requires the expertise of a fire brigade. Typically, a fire extinguisher consists of a hand-held cylindrical pressure vessel containing an agent which can be discharged to extinguish a fire.

There are many types of fire extinguishers: But, commonly used extinguishers are CO_2 extinguishers. They are predominantly used for electrical fire risks and are usually the main fire extinguisher type provided in computer server rooms. They also put out Class B fires (flammable liquids, such as paint and petroleum).

4. When you light a candle, a combustion reaction takes place with the wax of the candle which is the fuel and the air which contains oxygen. The flames are the area in which this combustion reaction is taking place. The release of heat and light energy from this exothermic reaction happens through the flame.

Now if you observe, you will see three distinct colors in the flame. This helps us to classify the parts of a flame which are as following :

Inner Part : This is the innermost part of the flame. It is the part closest to the wick. You might assume that this is the hottest part of the flame. However, it is the least hot.

Middle Part : This is the biggest part of the flame. The colours in this are varying shades of yellow and orange. This is the luminous flame because it emits light. This part is also not extremely hot. This is because this part gets a limited supply of oxygen.

Outer Part : Now this is the hottest part of the flame. This part has an unlimited supply of oxygen. So complete combustion takes place here. Hence it is the hottest part of the flame. Also, this part of the flame burns with a blue color.

5. There are some conditions associated with the process of combustion.

Presence of a Combustible Substance : The substance to be burnt must be combustible (the substance must catch fire easily). Wood, paper, coal, coke, hydrogen, liquefied petroleum gas, natural gas, petrol, kerosene, diesel, alcohol, ether, etc. are some of the combustible substances.

The Presence of a Supporter of Combustion : The presence of a supporter of combustion is another condition for combustion to take place. They are nothing but the substances which help combustion of a combustible substance.

Source of Heat to Provide Ignition Temperature : Another condition for combustion to take place is that the combustible substance should be heated so that its temperature reaches its ignition temperature. No substance can burn below its ignition temperature. The substances having low ignition temperature are called inflammable substances.

A. **1.** (a); **2.** (a); **3.** (c); **4.** (d); **5.** (d)

B. **1.** desertification; **2.** Endemic; **3.** reduced; **4.** Asiatic Cheetah; **5.** biosphere reserves

C. **1.** Logging is the main reason of deforestation.

2. Migration is the phenomenon of movement of a species from its own habitat to some other habitat for a particular time period every year for a specific purpose like breeding.

3. The variety of life on Earth, i.e biological diversity is commonly referred to as biodiversity.

4. Increased rates of crimes, health risks and climate change.

5. Deforestation

6. Extinct species

D. **1.** In 1969, the IUCN declared a national park to be a relatively large area with the following defining characteristics:

- One or several ecosystems not materially altered by human exploitation and occupation, where plant and animal species, geomorphological sites and habitats are of special scientific, educational and recreational interest or which contain a natural landscape of great beauty;
- Highest competent authority of the country has taken steps to prevent or eliminate exploitation or occupation as soon as possible in the whole area and to effectively enforce the respect of ecological, geomorphological, or aesthetic features which have led to its establishment.

2. Oxygen Carbon Dioxide Balance : Reforestation activities promote the gradual depletion of CO_2 from the atmosphere through absorption during photosynthesis. This in turn reduces its concentration in the atmosphere. The process of photosynthesis release oxygen and therefore helps to maintain the CO_2/O_2 balance. Less carbon dioxide means less pollution and less global warming.

Preventing Soil Erosion : Another environmental hazard caused by deforestation is erosion. The trees prevent or reduce soil erosion and water contamination. The roots of trees serve as natural nets spreading extensively into the ground to hold the soil in place. As soil runoff is prevented, essential nutrients are retained and the soil remain fertile. Trees add manure to the soil by falling leaves and dried branches.

3. This includes species which are in danger of extinction, hence called the endangered species. For example, black buck, crocodile, Indian wild ass, etc.

4. Gases such as methane and carbon dioxide trap heat in Earth's atmosphere, leading change in climate. Carbon dioxide adds to the environment and then this lack of the tree creates an absorption deficit. Deforestation leads to the emission of greenhouse gas.

5. Reforestation (Afforestation) is the process of regenerating or replanting forest areas that have been destroyed or damaged for the benefits of mankind. Reforestation and afforestation share the same meaning, i.e. afforestation is another name given to reforestation. Occasionally forests have the capability to regenerate due to the trees in the surroundings or due to the dispersion of seeds. However, forest lands that are badly degraded cannot be regenerated unless plants have been planted by using native methods.

6. The Advantages of the Red Data Book

- It helps in identifying all animals, birds and other species, about their extinct and endangered species.
- It is used to evaluate the total wild animals' population present.
- The data available in this book can be used to evaluate the taxa at the global level.
- With the help of this book, we can estimate the risk of taxa becoming globally extinct.

- The red book has the complete information about all endangered animals, plants and other species.

E. 1. Wildlife species may become totally extinct if no measures are taken to protect them.
- Over exploitation of natural resources.
- Destruction of their natural habitat by deforestation, overgrazing, increased urbanisation, forest fires etc.
- Indiscriminate hunting and poaching of wildlife.

2. The roots of trees hold the soil tightly, when trees are removed from the soil, the soil becomes loose and thus soil erosion and floods increase to manifolds. Thus, deforestation has a major effect on the environment and the water cycle which leads to a decrease in rainfall.

3. Some of the consequences of deforestation are:

Greenhouse Gas Emissions : Gases such as methane and carbon dioxide trap heat in Earth's atmosphere, leading change in climate. Carbon dioxide adds to the environment and then this lack of the tree creates an absorption deficit. Deforestation leads to the emission of greenhouse gas.

Soil Erosion : Cutting down of trees leads to clearance of forests and so soil erosion occurs. Exposure of the soil to the sun's heat dries up the moisture inside the soil. Nutrients evaporate and it affects the bacteria that help to break down organic matter.

Biodiversity Losses : Deforestation alters land and so that many of the plants and animals do not survive. With more deforestation, the entire species can extinct. This is the 'biodiversity loss'.

Floods : Deforestation disrupts the flow of water and leads to floods in some areas.

4. The variety of life on Earth, i.e biological diversity is commonly referred to as biodiversity.

The number of species of plants, animals, and microorganisms, the enormous diversity of genes in these species, the different ecosystems on the planet, such as

deserts, rainforests and coral reefs are all part of a biologically diverse Earth.

Appropriate conservation and sustainable development strategies attempt to recognize this as being integral to any approach to preserving biodiversity. Almost all cultures have their roots in our biological diversity in some way or form.

Biodiversity boosts ecosystem productivity where each species, no matter how small, all have an important role to play. For example;

- A larger number of plant species means a greater variety of crops.
- Greater species diversity ensures natural sustainability for all life forms.
- Healthy ecosystems can better withstand and recover from a variety of disasters.

And so, while we dominate this planet, we still need to preserve the diversity in wildlife.

5. Biodiversity should be conserved to prevent species extinction. It is preserved to maintain a balance in nature. If one organism in the food chain gets extinct it will impact the lives of other organisms.

6. **Endangered Species :** This includes species which are in danger of extinction, hence called the endangered species. For example, black buck, crocodile, Indian wild ass, etc.

Extinct Species : Furthermore, there are some extinct species. This includes species which are not found after searches of known or likely areas where they may occur. For example, the Asiatic cheetah, pink head duck, etc.

Cell Sturcture and Function

A. **1.** (d); **2.** (d); **3.** (b); **4.** (d); **5.** (c)

B. **1.** chloroplast, chlorophyll; **2.** Ovum; **3.** nuclear membrane; **4.** divide; **5.** Nucleus, Cytoplasm

C. **1.** Cells were first observed in cork by Robert Hooke in 1665.

2. A group of cells with similar shape and function are termed as tissues.

3. Nucleus works as the control centre of the activities of the cell. The entire content of a living cell is known as protoplasm.

4. Amoeba

5. Nucleus

6. Mitochondria

D. **1.** Cell membrane offers shape and rigidity to the cell. In the case of the plant cells, besides the cell membrane, there is also an outer thick layer that is known as the cell wall.

2. Our human body has trillions of cells. Surprisingly enough, each of these cells varies in shapes and sizes. There are several different groups of cells which perform a plethora of functions. Every organism that has more than one cell is known as the multi-cellular organism e.g. Mushroom (Fungi), animals and plants.

3. The cell is the basic functional and structural unit of life. All the living organisms are composed of cells.

All cells are formed by the division of the already existing cells which in terms of biology means reproduction. Every cell of our body comprises of genetic material which is passed down during the process.

4. Chromoplast impart colour to flowers which help in pollination.

5. Coloured bodies called plastids are found in the plant cells only. Green plastids containing chlorophyll are called chloroplasts.

6. Nucleus works as the control centre of the activities of the cell. The entire content of a living cell is known as protoplasm. It includes the cytoplasm and the nucleus. Protoplasm is called the living substance of the cell.

E. **1.** In unicellular organisms, cell division is the means of reproduction; in multicellular organisms, it is the means of

tissue growth and maintenance. Survival of the eukaryotes depends upon interactions between many cell types and it is essential that a balanced distribution of types be maintained. This is achieved by the highly regulated process of cell proliferation. The growth and division of different cell populations are regulated in different ways, but the basic mechanisms are similar throughout multicellular organisms.

Most tissues of the body grow by increasing their cell number, but this growth is highly regulated to maintain a balance between different tissues. In adults most cell division is involved in tissue renewal rather than growth, many types of cells undergoing continuous replacement. Skin cells, for example, are constantly being sloughed off and replaced; in this case, the mature differentiated cells do not divide, but their population is renewed by division of immature stem cells. In certain other cells, such as those of the liver, mature cells remain capable of division to allow growth or regeneration after injury.

2. The most basic reason that cells are stained to enhance visualization of the cell or certain cellular components under a microscope. Cells may also be stained to highlight metabolic processes or to differentiate between live and dead cells in a sample.

3.
- The cell is the basic functional and structural unit of life. All the living organisms are composed of cells.
- All cells are formed by the division of the already existing cells which in terms of biology means reproduction. Every cell of our body comprises of genetic material which is passed down during the process.
- All the basic physiological and chemical functions, i.e. the growth, repair, movement, communication, immunity and digestions are performed inside the cells.
- All the activities of the cell depend mainly on the activities of the subcellular structures that lie within the

cell. These subcellular structures comprise of the plasma membrane, organelles and if present, the nucleus.

4. The cell membrane is called selectively permeable as it only allows specific molecules to pass. Only specific molecules like water and gaseous molecules can pass through the cell membrane directly. It stops the flow of other molecules towards the two sides.
5. A small organ-like structure present inside the cell is called a cell organelle. It has a particular structural makeup and performs a specific function. Depending upon the presence or absence of membrane, cell organelles can be classified into three categories, namely:

   Without Membrane : Some cell organelles like ribosomes are not bounded by any membrane. They are present in prokaryotic as well as eukaryotic organisms.

   Single Membrane-bound : Some organelles are bounded by a single membrane. For example, vacuole, lysosome, Golgi Apparatus, Endoplasmic Reticulum, etc. They are present only in a eukaryotic cell.

   Doble Membrane-bound : Cell organelles like mitochondria and chloroplast are double membrane-bound organelles. They are present only in a eukaryotic cell.
6. **Mitochondria** (The Power House of The Cell/Storage Batteries)
   - Double membranous structure.
   - Autonomous body which contains its own DNA.
   - Self-duplicates
   - The main seat of respiration.
   - Stores energy in the form of ATP molecules.

   Ribosomes (Protein Factories)
   - Without a membrane
   - Consist of two subunits 60S and 40S in eukaryote both made up of RNA
   - Synthesis of Proteins

Golgi Bodies (Shipping Department of Cell)

- Discovered by Camillo Golgi in 1898.
- Originates from RER.
- Contains Sac-like Cisternae and Vesicles.
- Has two faces —cis face or receiving face and trans face or supplying face.
- Modification, Packaging and transport of materials.
- Synthesis of lysosomes, plasma membrane.

Lysosomes (Suicidal bags of Cell, natural scavenger, cellular housekeeper)

- Membrane-bound organelles.
- Present in all animal cells and few plant cells.
- Tiny circular single membrane-bound structures filled with digestive enzymes.

Reproduction in Animals

A. **1.** (d); **2.** (c); **3.** (c); **4.** (b); **5.** (d)

B. **1.** zygote, embryo; **2.** Dolly; **3.** Sexual; **4.** Zygote; **5.** abdomen

C. **1.** Fragmentation
2. Fish
3. Reproduction
4. The Fallopian tube
5. Amoeba

D. **1.** The uterus is a hollow muscular organ found in the lower abdomen. The embryo develops inside the uterus.

2. **Viviparous Animals :** Animals that give birth to offspring are called viviparous. In viviparous animals, both fertilization, as well as the development of the embryo, takes place inside the female parent. Once the foetus development is complete, the mother delivers the baby. This condition is referred to as where the embryo obtains the nutrients directly from the mother and not the yolk.

Viviparous Examples : Human beings, dogs, cats, elephants, etc. are few examples of viviparous animals.

3. In frogs, there are three stages. Their appearance in each stage differs. They begin as an egg, then become a larva (tadpole) and later become an adult frog. This type of growth stages can be observed in many insects like a butterfly, silkworm, cockroach, etc. The drastic changes of a larva into an adult are called metamorphism.
4. The female reproductive system consists of the following :
Ovaries, Oviducts (Fallopian Tube), Uterus, Cervix, Vagina
5. External fertilization occurs mostly in wet environments and requires both the male and the female to release or broadcast their gametes into their surroundings (usually water). This process is also called spawning. Amphibians, fish, and coral are examples of organisms that reproduce this way.

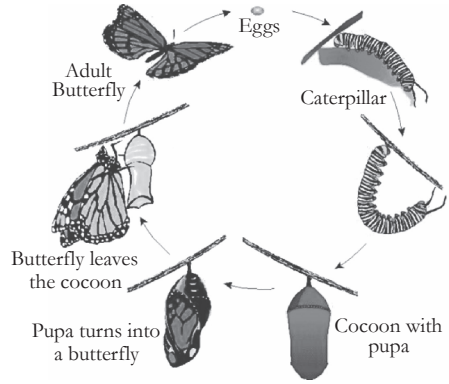
E. 1. Sexual reproduction is a natural way of reproduction in humans, animals and the majority of plants also choose to reproduce sexually. This type of reproduction is more complex and lengthy as compared to asexual reproduction. Moreover, reproducing sexually gives the benefit of variation and offsprings are unique.

Asexual reproduction is a mode of reproduction in which the new offspring arise from a single parent. The offsprings are identical to each other, both physically as well as genetically. They are the exact copies of their parent cell. Hence, they are 'clones'. We observe asexual reproduction in both unicellular and multicellular organisms.

2. During the fertilization, the nuclei of the sperm and the egg fuse together and form a single nucleus that results into the formation of a fertilized egg, also known as zygote.
   - The zygote further divides repeatedly to give rise to a ball of cells that begin to form groups. The groups develop into different tissues and organs constituting a full body. In the process, the developing structure is known as an embryo.

- The embryo continues to develop in the uterus and develops body parts such as head, face, ear, eyes, nose, hands, legs, toes, etc.
- The stage of the embryo in which different parts of the body develop and can be identified is known as foetus.

3. Butterflies undergo complete metamorphosis. The larva (caterpillar) hatches from an egg that the female usually lays on the underside of leaves. Larva (caterpillar) stage hatches from the egg. The larva spends its time in eating, growing and molting (shedding its outgrown exoskeleton). After growing, it enters the seemingly inactive pupal phase during which it forms a protective chrysalis and metamorphoses into a winged insect—the adult butterfly. After mating, the female lays eggs and the cycle begins again.



Life Cycle of a Butterfly

4. The first three days of embryonic development occur in the fallopian tube as the embryo moves from the ovary to the uterus. Cell division continues and forms a hollow ball of cells (the blastocyst). Six days after fertilization, the embryo begins implantation into the lining of the uterus. During the next few weeks, the placenta begins producing the hormones that will cause the mother to supply the embryo with nutrients and oxygen. In addition, the placenta protects the foetus from immune attack by the mother, removes waste products from the foetus, induces

the mother to bring more blood to the placenta, and near the time of delivery, produces hormones that mature the foetal organs in preparation for life outside of the uterus. In humans, this process take place in 9 months or 38 weeks.

1. 2nd-week development
2. 3rd-week development
3. 4th-week development
4. 5th-week development
5. 6th-week development
6. 7th-week development
7. 8th-week development

Embryo Development

5. Male Reproductive Organs

The male reproductive system consists of the following :

Testis : Each testis is a mass of numerous coiled tubes called seminiferous tubules. Each is enclosed within a scrotal sac that suspends them between the thighs.

Seminiferous Tubules : The lining of seminiferous tubules consists of actively dividing cells which give rise to sperms. Between the seminiferous tubules are interstitial cells which produce the male hormones called androgens, e.g. testosterone.

Prostate Gland : Produces an alkaline secretion to neutralise vaginal fluids. Cowper's gland secretes an alkaline fluid.

Urethra : Is a long tube through which the semen is conducted during copulation. It alsoremoves urine from the bladder.

Penis : Is an intromittent organ which is inserted into the vagina during copulation. Is highly vascularised/spongy. It has sensitive glands.

Scrotum : Contains the testes outside the body on whose walls the process of spermatogenesis takes place. The process is favored by lower temperature. It contains sertoli cells which nourish sperms until they are mature.

Epididymis : Long and coiled for the purpose of sperm storage.

Vas Deferens : Muscular. Upon contraction pushes sperms out and allows ejaculation.

Gametes : Produced in large numbers to increase chances of fertilization. The sperms have a tail for swimming/large number of mitochondria to provide energy/allow swimming to reach the egg.

Accessory Glands : Are seminal vesicle, Cowper's gland and prostate gland. They produce seminal fluid to provide a medium/nutrients for sperms to swim.

Reaching the Age of Adolescence

A. **1.** (a); **2.** (d); **3.** (b); **4.** (c); **5.** (b)

B. **1.** Hormones; **2.** Gonads; **3.** Hoarse voice; **4.** menstrual cycle; **5.** Circadian system

C. **1.** Adolescence is The stage between childhood and adulthood.

2. Pituitary gland is known as master gland.

3. A girl

4. Enlargement of voice box is apparent as a prominent protrusion in the neck. This protrusion is called Adam's apple.

5. Androgens, Testosterone

6. Puberty

D. **1.** Secondary sexual characters help in distinguishing a male from a female. Sexual dimorphism is the marked difference between male and female of a species because of apparent physical traits. Some common secondary sexual characters include:

Secondary Sexual Characters in Boys : Facial hairs, deep voice and hair on chest.

Secondary Sexual Characters in Girls : Enlargement of breasts and high pitched voice.

2. Testosterone is the male hormone and estrogen is the female hormone. The uterine wall in females prepares itself to receive the developing fertilized egg. In case there is no fertilization, the thickened lining of the uterine wall breaks down and goes out of the body along with blood. This is called menstruation.
3. **Pituitary Gland (Hypophysis) :** The pituitary gland hangs from the base of the brain by a stalk. It is enclosed and also protected by a bone. It consists of a hormone-producing glandular portion and a neural portion.

   The pituitary gland is the master gland. This is pea-sized and is located at the bottom of the brain. It controls and regulates other glands in the body. Hormones released by this gland are growth hormone, thyroid stimulating hormone, Luteinizing hormone, follicle stimulating hormone and so on.

   Thyroid Gland : The thyroid gland is located in the anterior throat. Thyroid follicles store colloid containing thyroglobulin, a glycoprotein from which thyroid hormone is derived.
4. Adolescence is the period of life when many changes take place in the body; leading to reproductive maturity. Adolescence begins at around 10 years of age and lasts till you are 18 or 19 years of age. The years during adolescence period are counted as 'teen', e.g. thirteen, fourteen and fifteen. Hence, this period is also called teenage.

   The process of changes during adolescence period is what we call puberty. Beginning of puberty marks the beginning of adolescence. The end of adolescence or puberty marks the completion of reproductive maturity.
5. Thyroid hormone

E. 1. The process of changes during adolescence period is what we call puberty. Beginning of puberty marks the beginning

of adolescence. The end of adolescence or puberty marks the completion of reproductive maturity.

2. **Menstrual Cycle :** Menstrual cycle refers to the events which begins with the release of an egg and ends in shedding off the egg. A menstrual cycle is usually of 28 to 30 days.
3. **Increase in Height :** The most apparent change during puberty is the sudden increase in height. Long bones grow rapidly. Hence, the 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.

   Change in Body Shape : The body of a boy becomes more muscular. His shoulders become wide and the waist becomes narrow. The body of a girl becomes wider below waist and narrower at the shoulder.

   Voice Change : A boy's voice becomes deep and the childlike 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. Testes and penis develop completely. In girls, ovaries enlarge and eggs begin to mature. Ovaries start releasing a mature egg.
4. Pituitary gland secretes hormones which include growth hormone and hormones that make other glands such as the testes, ovaries, thyroids and adrenals, secrete hormones. Pancreas secretes insulin, thyroid produces thyroxine and adrenals produce adrenalin.

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6. Sex of the unborn child depends on whether the zygote has XX or XY chromosomes.

11 Chapter Force and Pressure

A. **1.** (b); **2.** (a); **3.** (d); **4.** (a); **5.** (d)

B. **1.** direction; **2.** motion; **3.** same; **4.** Force; **5.** distract; **6.** at a particular level

C. **1.** Contact force

2. Balanced force

3. Muscular force and Frictional force

4. The amount of force exerted (thrust) on a surface per unit area is defined as 'Pressure'.

5. When the arrow moves towards its targets the forces acting on it, is due to gravity and resistive force of air. The resistance force of air is also called as frictional force.

D. **1.** **Gravitational force :** Object or things fall towards the earth because it pulls them. This is the force of gravity. This is an attractive force. It acts on all objects.

2. Muscular and gravitational force.

3. The earth's atmospheric air is surrounded by a layer of gases and so this air surrounding the earth exerts a pressure known as the 'atmospheric pressure'. Its value at sea level is 101325 Pa.

4. • A Force Can Change the Direction of Motion of a Moving Object.

- A Force Acting on Body Can Change its State of Motion or Rest
- A Force Can Change the Shape and Size of an Object

5. It is easier to cut a lemon with a sharp knife rather than with a not so sharp knife, or a blunt knife. This is because, while cutting, the sharp knife has a very small area of contact with the lemon. When using the blunt edge of a knife, the force we apply to cut the lemon is acting over a larger area. So, when we apply a force, the effect of the force depends on both the force and the area of contact.

E. 1. A deflated balloon is tied on the side tube of the container opened at one side. Now fill water in the container, balloon connected inflates due to the pressure of liquid exerted sideways. This shows that liquids exert pressure sideways also.

2. Effects of Force

A Force Can Change the Direction of Motion of a Moving Object : There are many activities where a force can change the direction of motion of a moving object. During the game of cricket, the batsman change the direction of the moving ball by touching or striking it with the bat at a suitable angle.

A Force Acting on Body Can Change its State of Motion or Rest :

- A force can stop a moving body–A fielder catches a moving cricket ball to stop its motion.
- A force can make a stationary body move–when you kick a stationary football, it moves.
- A force can increase the speed of a moving object–When a force is applied on a moving object (say a car) in the direction of motion, its speed increases.

A Force Can Change the Shape and Size of an Object : When a force is applied on a soft object, it changes the size and shape of the object. For example,

- When an inflated balloon is pressed between the two hands, its shape and size change.
- When a spring is pulled, its shape and size change.
- The shape of toothpaste tube changes on squeezing.

3. Forces can be divided primarily into two types of forces:

1. Contact Forces,
2. Non-contact Forces

Contact Forces

Any types of forces that require being in contact with another object come under 'Contact Force'. All mechanical forces are contact forces. Contact forces further divide into following types of forces:

(i) Muscular Forces : Muscles function to produce a resulting force which is known as 'muscular force'. Muscular force exists only when it is in contact with an object.

(ii) Frictional Forces : When an object changes its state of motion, 'frictional force' acts upon it. It can be defined as the resisting force that exists when an object is moved or tries to move over a surface.

Non-contact Forces

The types of forces that can be exerted without requiring any contact with any object are 'noncontact forces'. They further divide into following types of forces :

(i) Magnetic Force : It is the force exerted by a magnet to pull magnetic materials towards it. A magnet attracts materials made of iron, cobalt and nickel.

(ii) Gravitational Force : The force exerted by a magnet on other magnet without contact is known as magnetic force. Object or things fall towards the earth because it pulls them.

(iii) Electrostatic Force : The force exerted by a charged body on another charged or uncharged body is known as electrostatic force.

A. **1.** (b); **2.** (b); **3.** (c); **4.** (b); **5.** (d)

B. **1.** increase; **2.** the roughness; **3.** evil; **4.** drag; **5.** Rolling, static

C. **1.** 'Rolling friction' is the force that resists motion when an object rolls on a surface.

2. Athletes and mountaineers have spikes in their shoes to improve grip on the ground.

3. Not, it is not possible for us to walk without friction.

4. The substances which can flow easily are called fluids.

5. When a body rolls over a surface, the force of friction is much lesser than that on a flat surface. That is why, friction is being reduced by using wheels, ball bearings or roller-bearing in machines.

D. **1.** Friction is said to be a necessary evil because it is useful as well as harmful. Friction helps us to walk, write, hold things, lift object. So it is necessary for our lives. Without friction, many essential processes can not be done.

2. The force of friction depends on the following :

- Nature of the surface (rough or smooth)
- Weight of the body

3. The friction between two surfaces can be reduced by the following methods :

By Applying Oil or Grease on the Surface (or by Lubrication)

Oil/grease forms a thin layer between the two surfaces. Thus, a lubricant (oil/grease) separates the two surfaces. This reduces the chances of interlocking of the two surfaces and thus reduces the friction.

By Using Wheels, Ball Bearing or Roller Bearings

When a body rolls over a surface, the force of friction is much lesser than that on a flat surface. That is why, friction is being reduced by using wheels, ball bearings or roller-bearing in machines.

4.
- Friction can improve our driving experience. It allows us to have control of our vehicles, which means that we can drive and brake as long as there is friction.
- Friction keeps everything in place. As we have said before, friction also applies to static objects. If it wasn't for friction, nothing would have been able to stand still.
- Because friction produces heat and slows things down, there is a need to exert more power, which is not always possible or economically sound. Machinery has to be more powerful, thus consuming more power and resources.
- If you hate the sound of nails on the chalkboard or the noise some of your clothes make, you can blame friction for that. It also makes heavy machinery so loud, you need protection in order to even be in the same vicinity as it.

5.
- 'Rolling friction' is the force that resists motion when an object rolls on a surface.
- 'Sliding friction' is the frictional force between two surfaces that are rubbing against each other.

E. 1.
- Friction is desirable in some situations, for examples, soles of our shoes and tyres of vehicles have grooves to increase friction. If they were smooth, there would be a risk of slipping or skidding.
- Pedals of a bicycle, the steering wheel of a car and the handle of a knife, all have rough surfaces to increase friction.
- Kabaddi players rub their hands with the soil for a better grip on their opponants. Gymnasts apply some coarse substance on their hands to increase friction for better grip.

2. Air also opposes the motion of the object moving through it. The resistance force exerted by air is commonly known as the 'Air drag.'

3. **By Streamlining the Body of an Object**
   Property shaped bodies (called streamlined) experience less friction from air or water. Bodies of aeroplanes, rockets, ships, etc. are streamlined. Birds and fish also have streamlined bodies.

4. • Because friction produces heat and slows things down, there is a need to exert more power, which is not always possible or economically sound. Machinery has to be more powerful, thus consuming more power and resources.
   • If you hate the sound of nails on the chalkboard or the noise some of your clothes make, you can blame friction for that. It also makes heavy machinery so loud, you need protection in order to even be in the same vicinity as it.
   • Friction causes the materials that come into contact with one another to wear out. Thus, you can notice your soles wearing thin after a few years of wearing your favourite shoes. The same way the eraser becomes smaller with each use.

5. **By Applying Oil or Grease on the Surface (or by Lubrication)**
   Oil/grease forms a thin layer between the two surfaces. Thus, a lubricant (oil/grease) separates the two surfaces. This reduces the chances of interlocking of the two surfaces and thus reduces the friction.
   By Using Wheels, Ball Bearing or Roller Bearings
   When a body rolls over a surface, the force of friction is much lesser than that on a flat surface. That is why, friction is being reduced by using wheels, ball bearings or roller-bearing in machines.

Sound

A. **1.** (c); **2.** (b); **3.** (c); **4.** (a); **5.** (a)

B. **1.** vibration of chords; **2.** their membrane; **3.** Pitch;
4. medium; **5.** vocal cords

C. **1.** Violin, Guitar
2. Piano, Harmonium
3. Sound is produced by vibrating objects.
4. Excessive unwanted sounds in environment is known as noise pollution.
5. Fluid, Trumpet

D. **1.** Sound is a crucial aspect of our everyday lives. Sound plays an important role in our life. Sound helps us to communicate with one another. Sound is so important because animals are able to hear events all around them, no matter where their attention is focused or not.
2. Vibration is the rapid to and fro movement of a body about its mean position.
3. Light can travel in vacuum but sound cannot. This's because sound waves are vibrating waves (also called pressure waves) that travel by physical contact of molecules. Sound can travel in air, metals like steel or aluminium. Light speed is constant. But in case of sound, denser the medium, faster the speed. For example, sound travels faster in steel than in air. Because, in case of steel the molecules carrying sound waves are closely packed in comparison to the air. Speed of sound is about 343 m/second in air and 5,960 m/second in steel. Vaccum has no particles and hence sound cannot travel.
4. There is a thin boundary line between music and noise. Some sounds are pleasant to the ear, whereas others are unpleasant. Sound of construction work and sound produced by horns of buses and trucks are unpleasant and are known as noise. On the other hand, we enjoy sound from musical instruments. Musical sounds are pleasing to the ear. Irregular vibrations produce noise. Even loud music causes noise pollution.

5. Sound is produced when something vibrates. The rapid to and fro movement of a body is called vibration. Vibrating body disturbs air and produces sound waves.

To study the production of sound, we require a tuning fork. When the tuning fork is struck, the prongs of the fork begin to vibrate. Each time the prongs vibrate, a new sound wave is produced. The movement or the speed of sound waves depends on the medium by which the sound waves travel. When the tuning fork strikes, you can hear the sound. Thus we have produced the sound by striking the tuning fork. The sound produced in humans is due to the vocal cords.

E. 1. Application of Echo

- Since bats cannot see from their eyes, so they use the technique of echolocation to locate their ways. Bats can understand from the reflected sound if there is any object before it. It hunts its prey by using this technique.
- This technique is also used to find the depth of sea or distance of submarines.
- It also helps to estimate the distance of hills and mountains.
- This technique is also very helpful in the medical field as well. Doctors use this phenomenon in cardiography, sonogram and many other medical diagnosis.

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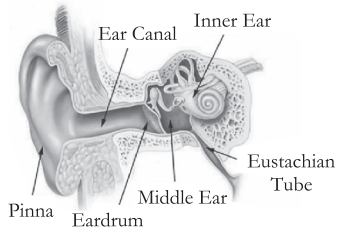
4. Human ear has three parts namely,

- Outer Ear
- Middle Ear
- Inner Ear

The Outer Ear : Whenever the sound waves enter our ear, they travel across the outer ear. The outer ear is known as pinna. The compressions reaching the outer ear, i.e. the pinna directs the compressions to the canal and makes them reach the eardrum or the membrane.



The Middle Ear : Three small bones are located in the middle part and are linked together to each other. Hammer, the Anvil and the Stirrup are the three bones which transmit the sound. The center part of the eardrum is connected to the hammer.

The Inner Ear : The inner ear known as Chochlea is a snail-like structure. As the number of variations is transmitted in the middle ear, cochlea sends the sound to the brain as some amount of fluid is present inside the cochlea. These electrical impulses then go to the auditory nerve. This is exactly what we perceive as sound.

5. $T = \frac{1}{t} = \frac{1}{6}$ = 0.1 sec

and frequency = = 10 Hz

14 Chapter Chemical Effects of Electric Current

A. **1.** (b); **2.** (d); **3.** (c); **4.** (d); **5.** (a)

B. **1.** electrolysis; **2.** cathode, anode; **3.** positive charge; **4.** electroplanting; **5.** dissociate

C. **1.** Electrolyte

2. Electrolysis

3. No

4. The chemical change induced by the passage of electric current through an electrolyte is called electrolysis.

5. Electroplanting is the process of depositing a thin layer of a metal over another by passing electricity.

6. Insulators are the materials which do not allow heat and electricity to flow through them.

D. **1.** The substances which conduct electricity in liquid state or when dissolved in water and breaks up chemically into ions, on passing an electric current is known as electrolytes.

2. It is the process of coating a layer of any desired metal on another material with the help of electricity. However, with the repeated use, the coating wears off, revealing some other metal beneath.

Electroplating is one of the most common applications of chemical effects of electric current. It is widely used in industry for coating metal object with thin layers of a different metal having some desirable properties. Examples-silver is electroplated with gold for making ornaments. A brand new bicycle has shiny handlebar and wheels' rims. It is chromium plating.

Application of Electroplanting

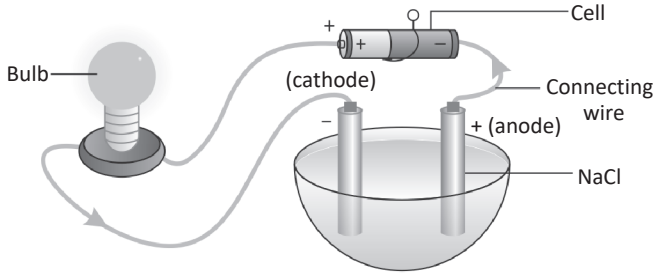
- Zinc is less reactive metal than iron. So, iron objects are coated with zinc to prevent them from rusting. The process is known as galvanisation.

3. All the metals are good conductors.

4. The passage of an electric current through a conducting solution causes chemical reactions. Bubbles of gas may be formed on the electrodes or deposits of metal may be seen on the electrodes. Changes in colour of the solution

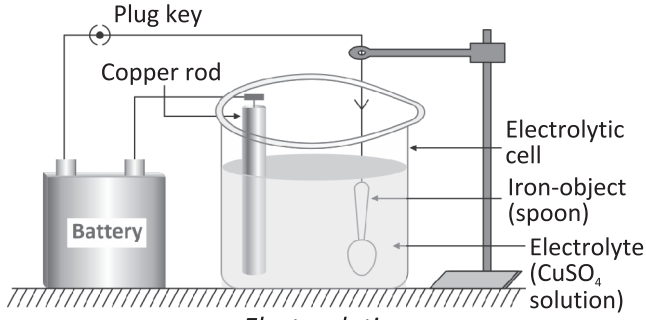
may also be seen. The chemical change induced by the passage of electric current through an electrolyte is called electrolysis.

E. **1.** When we dissolve sodium chloride (NaCl) in water, it dissociates up into Na^+ (cation) and Cl^- (anion) on passing an electric current. These ions move towards the oppositely charged electrodes, i.e. cation (+) move towards negative electrode—cathode, and anions (–) move towards positive electrode—anode. It results in a chemical change.



Dissociation of Sodium Chloride

2. **Aim :** To electroplate the iron spoon with copper.
Materials required : Copper sulphate, a beaker, a spoon, battery.



Electroplating

Procedure : Take copper sulphate in a beaker. Hang a spoon on a stand using a copper wire. The spoon is attached to the negative end of battery. Attach the thick copper rod to the positive end of the battery. Now, immerse both in the copper sulphate solution, and switch on the current from the battery.

Observation : After 20 minutes, iron spoon has been coated with copper.

Conclusion : Copper (anode) keeps on dissolving and spoon (cathode) gets a layer of copper deposited over it.

15 Chapter Some Natural Phenomena

A. **1.** (a); **2.** (b); **3.** (d); **4.** (b); **5.** (b)

B. **1.** rubbing; **2.** outer core, inner core; **3.** Focus; **4.** attracts; **5.** charge

C. **1.** Positive charge and negative charge

2. Benjamin Franklin was the first to prove that clouds build up charge during a storm.

3. Electrical charge is produced in a piece of silk cloth when it is rubbed with a glass rod.

4. The two main types of waves are body waves and surface waves.

5. Electroscope is a device that can be used to detect charge on any body.

D. **1.** The electric charges, generated by rubbing are static, i.e. they do not move. These electric charges have a kind of force which can attract as well as repel objects.

2. **Focus :** The point deep with in the earth's crust, from where the earthquake originate, is known as the focus of an earthquake.

Epicentre : The point on the surface of earth just above the focus of the earthquake, is known as the epicentre. Although, we know the causes of earthquake, yet, so far it is not possible to predict an earthquake.

3. During an earthquake, there is a sudden movement or a fracture in the lithosphere. Lithosphere is not one continuous piece and is divided into numerous small pieces known as the tectonic plates.

4.
- Turn off power supply and gas supply.
- Take shelter under a table and remain there till shaking stops completely.

- Stay away from tall and heavy objects that can fall.
- If in bed, protect your head with a pillow.

5. Stay away from plumbing lines as they are made of metal and are good conductors.

E. **1.** Benjamin Franklin was the first to prove that clouds build up charge during a storm. He flew a silk kite into the clouds during a thunderstorm with a metal key tied to the thread of the kite. He got an electric shock when he touched the metal key.

Charge in the clouds flowed down the wet string to the metal key. When the metal key was touched, heavy charge flowed through Franklin's body to the earth, giving him an electric shock.

Let us know about lightning in terms of the charges produced by rubbing.

During a thunderstorm, the air current moves upwards while the water droplets move downwards. This vigorous movement causes separation of charges. Positive charges collect near the upper edges of the clouds and the negative charges accumulate near the lower edges. When the magnitude of accumulated charges becomes very large, air (which is normally a poor conductor of electricity) is no longer able to resist their flow. Negative and positive charges meet, producing streaks of bright light and sound. This process is known as an electric discharge.

In such a situation, very heavy charge passes through the air in a very short time.

2. **Seismograph :** An earthquake generates seismic waves, which can be detected and recorded by a sensitive instrument known as a seismograph. It is a vibrating rod or a pendulum suspended from a stand. Its lower end is attached to a pen. When an earthquake occurs, the rod or the pendulum vibrates and so does the pen. A roll of a long and thin strip of paper rolled on a drum is allowed to move

under the vibrating pen, so that the pen leaves the marks of the vibration on the strip of the paper. The study of the recorded vibrations help the scientists to map the earthquake.

3. Lightning conductor is a tall, metal rod, fixed to the building to protect them from being damaged by lightning. The top of the rod ends in spikes, lower end of the rod is connected to a copper metal plate which is buried underground.

If lightning strikes the building, it flows harmlessly to the earth through the metal rod and no damage is done to the building.

The metal columns used during construction, the electric wires and water pipes in the building also protect us from lightning to some extent. But we should not touch them during a thunderstorm.

A lightning strike can destroy life and property. It is, therefore necessary to take measures to protect ourselves.

4. Any sudden disturbance below the earth's surface may produce vibrations or tremors in the earth's crust, which last for a very short time. These vibrations or tremors are called earthquakes. Earthquakes occur all the time, all over the earth. Major earthquakes are less frequent but can cause immense damage to buildings, bridges, dams and people. They cause a great loss of life and property. Earthquake can cause floods, landslides and tsunamis.

16 Chapter Light

A. **1.** (c); **2.** (c); **3.** (c); **4.** (c); **5.** (c)

B. **1.** regular; **2.** 1; **3.** curved mirror; **4.** large; **5.** retina; **6.** lateral; **7.** Three; **8.** lateral vision

C. **1.** There are two basic causes of excessive eye blinking. One is a retinal problem or corneal problem.

2. Myopia is a defect of vision wherein far-off objects appear blurred and objects near are seen clearly.
3. Even after the object is removed, the impression of an object seen by the eye remains on the retina for 1/16th of a second. If we see another object before this time, the impressions of the two merge to give us a sense of continuity. This eye property is known as persistence of vision.
4. The reflection of our hair falls onto the mirror at the back which the hair dresser holds and that reflection gets reflected into the mirror infront of us which virtual image again gets reflected into our eyes and we can see the back of our hair.
5. Dispersion
6. An object becomes visible only when the object reflects the light falling on it and the reflected light reaches the eyes of an observer. An image of the respective object is formed inside the eyes of an observer.

D. 1. The amount and direction of light that is reflected depends on the material and nature of the surface on which the light falls. The reflection of light ray at a surface obeys two laws of reflection.

First law of reflection– Angle of incidence = angle of reflection

Second law of reflection– The incidents ray, the reflected ray and the normal at the point of the incidence, all lie in the same plane.

2. **Lateral Inversion**

In an image formed by a mirror, the left of the object appears on the right and the right of the object appears on the left. This is called lateral inversion.

Image of an object formed by a plane mirror is virtual, upright/erect, same size, laterally inverted and at the same distance behind the mirror as the object was in front of it.

3. When two mirrors are kept at some angle to each other and an object is placed between them, then multiple images of the object can be seen on the mirrors. The number of images formed depends upon the angle between the mirrors.

As we go decreasing the angle between the mirrors the number of images go on increasing and when the angle becomes zero, i.e. when the mirrors become parallel to each other, the number of images becomes infinite.

4.
- While reading, keep the reading material at a distance of about 25-30 cm from the eyes. Raise your eyes from time to time while reading, watching TV, etc.
- Protect eyes from extreme sunlight and glare of bright light and from the dust and husk.
- Do not watch television for long hours, particularly in a completely dark room.
- Do not rub your eyes.
- Protect your eyes from any damage/injury during playing, running, etc.

5. Virtual Image

When we hold a pencil in front of a plane mirror, we see its image. Rays of light from the pencil fall on the mirror and get reflected, so, we see the image of pencil.

Lateral Inversion

In an image formed by a mirror, the left of the object appears on the right and the right of the object appears on the left. This is called lateral inversion.

Multiple Reflection Images

When two mirrors are kept at some angle to each other and an object is placed between them, then multiple images of the object can be seen on the mirrors. The number of images formed depends upon the angle between the mirrors.

E. 1. The converging lens system (cornea, eye, lens which is convex lens, and fluids) form the image. Ciliary muscles

contract and relax to change the curvature of lens to which they are attached. This process changes the focal length of the lens. The lens focuses light at the back of the eye and forms a sharp image of the object at retina.

2. **Types of Reflection**

   Some objects have a smooth surface and some have rough. The reflection of a beam of parallel rays of light from a smooth surface are parallel to each other. This is known as regular reflection. Well defined images are formed due to regular reflection as in case of a plane mirror.

   When light falls on a rough surface, the reflected rays scatter in different directions. This is called irregular or diffused reflection. In this case, either there is no image formed or a blurred (hazy) image is formed.

3. Retina has numerous sense receptors (nerve cells) to collect information about an image. Sensation felt by the photoreceptor nerve cells are then transmitted to the brain by the optic nerve. Thus, it connects the eye to the brain.

   There are two kinds of photoreceptor cells–

   (i) Rods : sensitive to dim light and responsible for intensity of light.

   (ii) Cones : sensitive to bright light and sense colour.

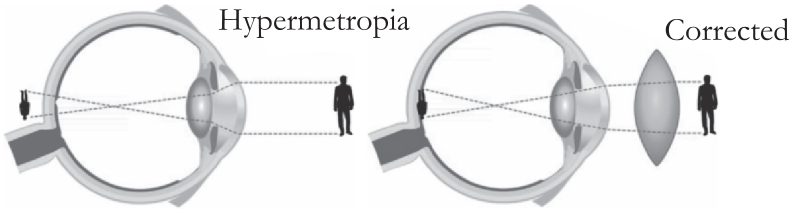
   At the junction of optic nerve and the retina, there are no sensory cells. This is known as the blind spot. No vision is possible at this spot.

4. **Myopia or Near-Sightedness**

   Myopia is a defect of vision wherein far-off objects appear blurred and objects near are seen clearly. Since the eyeball is too long or the eye lens's refractive power is too high; the image forms in front of the retina rather than forming on it. Correction of myopia can happen by wearing glasses/contacts made of concave lenses to help focus the image on the retina.

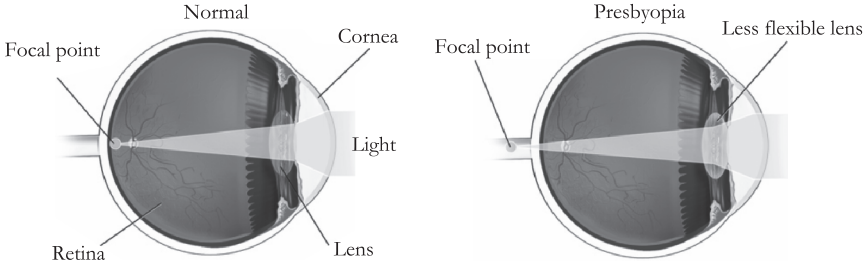
Hypermetropia or Longsightedness

Hypermetropia is a defect of vision wherein there is difficulty in viewing objects that are near but one can view far objects easily. Since the eyeball is too short or eye lens's refractive power is too weak hence the image instead of being forming upon the retina, forms behind the retina. Correction of hypermetropia can happen by wearing glasses/contacts containing convex lenses.



5. **Presbyopia or Old-age Longsightedness**

Presbyopia is a natural defect that occurs with the age. In presbyopia, the ciliary muscles become weak and are no longer able to adjust the eye lens. The eye muscles become so weak that no longer can a person see nearby objects clearly. The near point of a person with presbyopia is more than 25 cm. Correction of presbyopia can happen by wearing bifocal glasses or Progressive Addition Lenses (PALs) wherein the upper portion of the lens contains concave lens and lower portion contains a convex lens. A person with presbyopia can also have just myopia or just hypermetropia.



The lens ages and stiffens, bringing the focal point behind the retina and causing blurry vision

A. **1.** (b); **2.** (c); **3.** (c); **4.** (b); **5.** (a)

B. **1.** Mars, Jupiter; **2.** in the sky; **3.** water vapour, some gases; **4.** 9.46×10^{12}; **5.** Light year

C. **1.** Mercury, Venus, Earth, Mars are known as inner planets as they are nearer to the sun than other planets.

2. Venus is the brightest planet of the solar system.

3. Planets look like stars but they do not have light of their own.

4. Planets revolve around the sun in a definite path called orbits.

5. Mercury is the smallest planet of our solar system.

D. **1. Comets**

- These are small masses of rock-like materials surrounded by water vapour and some gases.
- These are beautiful bodies in the solar system with a distinct head and a luminous tail moving across the sky.
- When a comet approaches the sun, the vapours are forced away from the sun. Due to the light that falls on these vapours, it appears to have an illuminated tail, always directed away from the sun.
- They revolve around the sun and have a very long period of revolution.

2. Saturn—the Jewel Planet

- It is the seconds largest planet as well as the most beautiful planet in the solar system due to its spectacular rings, that are made up of ice and ice covered dust particles.
- It does not have a solid surface. It is made up of gases and had 62 satellites.
- Its density is less than that of water.
- The rings are the brightest and most complex.
- It appears yellowish in colour.

3. • It contains mainly carbon dioxide and small quantities of nitrogen and argon.

• There are so far, no traces of life on Mars.

4. Due to air resistance, they are heated to incandescence and glow. These are meteors or shooting stars.

Most meteors are small and gets completely burnt in the Earth's atmosphere. The larger ones which survive the heat and manage to reach the Earth are known as meteorites. Meteorites help the scientists in investigating the nature of the material from which the solar system was formed.

5. Artificial satellites are made to revolve around the Earth. These are much closer to the Earth than the moon. Orbits of artificial satellites are much smaller than the orbit of the moon.

6. The sun, the eight planets, their moons and other celestial bodies that revolve round the sun form the solar system.

E. **1.** The stars appear to move from east to west because Earth rotates from west to east on its axis.

The stars are huge spinning balls of hot luminous gases, mainly hydrogen and helium. In the centre of the stars, hydrogen atoms combine to form helium atoms and a huge amount of energy is released in the form of heat and light.

2. Ursa Major (Great Bear)

It is also known as the 'Big Dipper '. It contains seven bright stars arranged in the form of a big spoon. Along with several other faintstars, it forms the picture of a bear. In hindi it is called Saptarshi Mandal.

3. • Our Earth is the third planet from the sun. It is the only planet on which life exists. It is a unique planet.

• It has a layer of ozone in its atmosphere which stops the harmful U.V. rays of the sun from reaching the Earth.

- The axis of rotation of the Earth is not perpendicular to the plane of its orbit. The tilt is responsible for the change of seasons on the Earth.
- It has an atmosphere containing the gases, (O_2 and CO_2) and water in liquid from. Its distance from the sun provides appropriate temperature for the survival of life.
- The Earth has only one moon and it is the natural satellite of the Earth.
- From space, it appears blue-green due to reflection of light from water and landmass on its surface.

4. Applications of Artificial Satellites

- Artificial satellites enable our television sets to receive the signals of a live cricket match being played in any part of the world or a live musical concert happening in another city or country.
- Communication with people all over the world through e-mail, fax, ISD calls and internet chatting is possible only because of artificial satellites.
- Remote sensing helps in finding out unseen sources of petroleum, detecting the fish population at a point in a deep ocean or the presence of some mineral deposits in the Earth's crust. The first Indian satellite was named as Aryabhata.

5. It is one such star that appears to be stationary irrespective of the rotation of the Earth. This is because the pole star is situated at the point through which the axis of the earth passes. Since the pole star remains stationary in the sky, it was used of sailors of navigation.

Pollution of Air and Water

A. **1.** (d); **2.** (d); **3.** (d); **4.** (b); **5.** (b)

B. **1.** Carbon monoxide; **2.** Ozone; **3.** Chlorofluorocarbon gases; **4.** Sewage

C. **1.** Asthma, lung cancer
2. Carbon dioxide, Methane
3. Chlorine
4. CO_2 and CO

D. **1.** Global warming is the rise in temperature on the earth due to the greenhouse effect.

2. **Keep Out Oils, Fat, or Grease from the Sink :** Desist from pouring cooking oil, fat or grease down the kitchen sink. Instead, keep a jar that collects all the fats, grease or oil, then discard in solid waste.

Abstain from Flushing Contaminated Liquids, Pills, Drugs, or Medications Down the Drain : These substances contain scores of toxic materials that destroy the quality of natural water systems. Instead, use the recommended disposal methods.

3. **Eutrophication :** Chemicals in a water body encourage the growth of algae. These algae form a layer on top of the pond or lake. Bacteria feed on this algae and this decreases the amount of oxygen in the water body, severely affecting the aquatic life there.

4. **Use of Energy Efficient Appliances :** Whether at the domestic level or at the industrial level, we must push for appliances that use energy efficiently, which result in complete combustion of fuel, as incomplete combustion causes air pollution.

Shifting Industries : Another possible solution to reduce the harmful effects of air pollution is to shift the manufacturing plants, factories and industries to remote areas with a low level of population. By doing so you can ensure that pollution in the urban areas decreases over time.

Using Modern Techniques : With technology making great advancements, there are now technologies available that can help reduce the release of pollutants in the air. Air filters, scrubbers, precipitators are just a few examples.

Shifting to Natural Gases : Instead of using and exhausting fossil fuels, shifting to greener options is a no-brainer. For example, using CNG (compressed natural gas) instead of petrol or diesel is a great option.

E. 1. Air pollution means the presence of chemicals or compounds (called pollutants) in the air which are not naturally occurring, and which lower the quality of air and are harmful to all living things in the atmosphere. Air pollution is majorly caused due to the release of various chemicals into the atmosphere. Air pollution can be both man-made and naturally occurring.

In our current age of industrialisation and modernisation, the biggest source of air pollution is the burning of fossil fuels. For example, when we burn petrol or diesel or coal to run our cars, machines, trains, power plants, etc., this releases harmful pollutants into the atmosphere, endangering all living things around.

2. The greenhouse effect is a natural process that warms the Earth's surface. When the Sun's energy reaches the Earth's atmosphere, some of it is reflected back to space and the rest is absorbed and re-radiated by greenhouse gases.

Greenhouse gases include water vapour, carbon dioxide, methane, nitrous oxide, ozone and some artificial chemicals such as chlorofluorocarbons (CFCs).

The absorbed energy warms the atmosphere and the surface of the Earth. This process maintains the Earth's temperature at around 33 degrees Celsius, warmer than it would otherwise be, allowing life on Earth to exist.

3. Water pollution is the contamination of water bodies (like oceans, seas, lakes, rivers, aquifers and groundwater) usually caused due to human activities. Water pollution is any change in the physical, chemical or biological properties of water that will have a detrimental consequence on any living organism.

Drinking water, also called Potable Water, is the water that is considered safe enough for human and animal consumption. This is the water that is generally used for drinking, cooking, washing, crop irrigation, etc. These days chemicals, bacteria and other pollutants are even affecting our drinking water.

Causes of Water Pollution

Sewage and Waste Water : Sewage, garbage and liquid waste of households, agricultural lands and factories are discharged into lakes and rivers. These wastes contain harmful chemicals and toxins which make the water poisonous for aquatic animals and plants.

Dumping : Dumping of solid wastes and litters in water bodies causes huge problems. Litters include glass, plastic, aluminium, styrofoam, etc.

Industrial Waste : Industrial waste contains pollutants like asbestos, lead, mercury and petrochemicals which are extremely harmful to both people and environment. Industrial waste is discharged into lakes and rivers by using fresh water making the water contaminated.