

COMPACT SCIENCE 8

(Book Solution)

1. Crop Production

Checkpoint 1

1. Crop 2. Cereals 3. Horticulture crops 4. Kharif crop

Checkpoint 2

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

Checkpoint 3

1. Weeds 2. BHC 3. Combine 4. Commercial

Let's Drill Our Skills

- A. 1. (d) 2. (d) 3. (a) 4. (c)
- B. 1. farming 2. loosens; air 3. crumbs 4. weeding 5. threshing
- C. 1. Rearing of animals to obtain milk, meat and eggs is called animal husbandry.
2. Steps involved in agriculture to cultivate crops are called agricultural practices.
3. The process of loosening and turning over of soil is called ploughing.
4. Transplanting of seedlings in the field is called transplantation.
- D. 1. Fertilisers like Urea, Superphosphate of lime, Diammonium phosphate (DAP), NPK and Calcium ammonium nitrate (CAN) are used to increase soil fertility.
2. Drip system of irrigation provides water drop-by-drop to plants at their base.
3. In organic farming, crop is raised by providing organic manure and applying biological control.
4. The overflowing of fields causing accumulation of water for long is called waterlogging.
5. Organisms that attack and damage crops are called pests.
- E. 1. On the basis of growing season, there are two types of crops. These are Rabi and Kharif crops. Rabi crops are sown in October/November and are harvested in March/April, whereas Kharif crops are sown in June/July and are harvested in September/October.
2. The order of agricultural practices is as follows:
(a) Preparation of soil
(b) Application of manures and fertilisers
(c) Selection and sowing of seeds
(d) Irrigation
(e) Weeding
(f) Protection of crops from pests and diseases

- (g) Harvesting
 - (h) Threshing
 - (i) Storage of grains
3. Ploughing has following advantages:
 - (a) It loosens the soil and improves air circulation in it.
 - (b) It increases water-retention capacity of the soil.
 - (c) It mixes manures and fertilisers with soil.
 - (d) It uproots weeds growing in the field.
 4. The two methods of sowing seeds are manual method and mechanical method. The manual method is called broadcasting. It results in unequal distribution and wastage of seeds. In mechanical method, seeds are sown by a seed drill. It prevents wastage and unequal distribution of seeds.
 5. The modern methods of irrigation are as follows:
 - (a) **Furrow irrigation:** In this method, water enters the field through furrows or channels made between two rows of crop plants.
 - (b) **Drip system:** In this system, water is provided to plants drop-by-drop just at their base near the roots.
 6. We get milk, meat, eggs, honey and oil from animals.
- E. 1. Differences between manures and fertilisers

Manures	Fertilisers
1. Manure is a natural substance obtained by the decomposition of animal wastes like cow dung, human wastes and plant residues.	1. Fertiliser is an inorganic salt or an organic compound.
2. Manure is not nutrient specific. It only removes the general deficiency of nutrients in soil.	2. Fertiliser is nutrient specific and provides specific nutrients to the soil.
3. Manure is not very rich in nutrients like nitrogen, phosphorus and potassium.	3. Fertiliser is very rich in nutrients like nitrogen, phosphorus and potassium.
4. Manure is not readily soluble in water. Thus, it is absorbed by the plants slowly.	4. Fertiliser is soluble in water and is easily absorbed by the plants.
5. Manure provides humus to the soil.	5. Fertiliser does not provide any humus to the soil.
6. Manure is prepared in the fields.	6. Fertiliser is manufactured in factories.

2. The removal of weeds from the crop field is called weeding. Weeding is carried out by following methods:
 - (a) **Mechanical method:** In this method, weeding before sowing seeds, is carried out by harrow or rake and from a standing crop by trowel or hoe.
 - (b) **Chemical method:** In this method, different chemicals called weedicides are used for weeding. The common weedicides are 2, 4-D, MCPA and Butachlor.
 - (c) **Biological method:** In this method, the living organisms which feed on weed are released in the field. They feed on and destroy the weed. For example, cochineal insect is used to eliminate prickly pear from the crop field.
3. Sowing seeds with a seed drill has following advantages:
 - (a) Seeds are sown uniformly at proper distance and at proper depth in the furrows only.
 - (b) Seeds get covered with soil and are saved from being picked up and eaten by birds.
 - (c) It saves time and labour and prevents wastage of seeds.
4. Pests in stored grains are controlled by following methods:
 - (a) Fumigation to repel or kill pests without affecting stored grains.
 - (b) Keeping neem leaves with grains.
 - (c) Adding small quantity of vegetable or mineral oil to grains of legumes to prevent pests from laying eggs and to check larval growth.
 - (d) For storing grains at home, powdered neem leaves and black pepper are mixed with grains for checking insects' eggs and larvae.

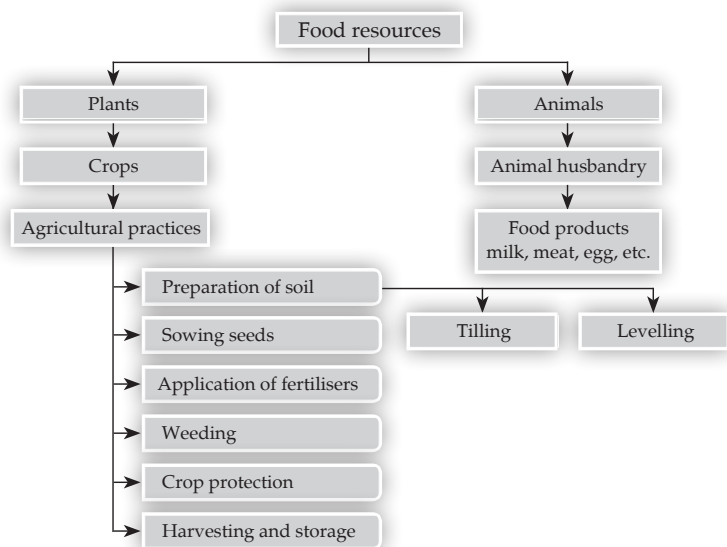
HOTS

1. Algal bloom is excessive growth of algae in a waterbody. It is caused due to enrichment of nutrients in the water. The excess of fertilisers used by farmers are washed away by rain and carried to nearby waterbody. These fertilisers promote the growth of algae causing algal bloom.
2. Manures are more beneficial than fertilisers. They provide humus rich in nutrients to soil and keep the fertility of soil last longer. On the other hand, fertilisers do not provide humus to soil and their use for many years makes the soil infertile.

Value-based Questions

1. Pyrethrin (obtained from *Chrysanthemum* plant) and azadirachtin (obtained from neem plant)
2. Biopesticides and biofertilisers are better than chemical pesticides because they do not cause environmental pollution.
3. Sonu is a concerned, aware and nature lover citizen.

LET'S MEMORISE



2. Microorganisms

Checkpoint 1

1. The tiny organisms which can be seen only with the help of a microscope are called microorganisms.
2. The five groups of microorganisms are Bacteria, Fungi, Algae, Protozoa and Viruses.
3. The bacteria that reside in our intestine synthesise B-complex vitamins.
4. Yeast, mushroom, toadstool, mould, mildew, etc.
5. Algae are simple unicellular or multicellular green plants which have thallus-like structure.
6. Protozoa move with the help of flagella, cilia and pseudopodia.
7. We can see viruses with the help of an electron microscope.

Checkpoint 2

1. *Lactobacillus*
2. alcohol
3. nitrogen compounds
4. *Rhizobium*
5. *Penicillium notatum*

Checkpoint 3

1. The microorganism which causes diseases is called pathogen.
2. Potato blight disease and Rust of wheat are caused by fungi.
3. Communicable diseases are transmitted through air, water, food, insect and animal bites or by physical contact.

4. Common cold and Influenza.
5. Jaundice is caused by consuming water contaminated with hepatitis virus.

Checkpoint 4

1. Pasteurisation is the process of giving heat and cold treatments to milk to make it bacteria-free.
2. Lemon and raw mango are preserved by using salt.
3. Green leafy vegetables like spinach or methi are preserved by drying in the sun.
4. Bacteria and fungi spoil the food.
5. Pasteurisation is used for the preservation of milk.

Checkpoint 5

1. The conversion of free atmospheric nitrogen into useful nitrogen compounds is called nitrogen fixation.
2. *Nostoc* and *Anabaena*.
3. The cyclic movement of nitrogen element between living and nonliving components of the biosphere is called nitrogen cycle.
4. The process of decomposition of proteins and other nitrogen compounds into ammonia is called ammonification.

Let's Drill Our Skills

- A. 1. (c) 2. (d) 3. (c) 4. (a)
- B. 1. acellular
2. Fungi
3. edible
4. microbial
5. *Pseudomonas*
6. protozoan
- C. 1. Pasteurisation is the process of giving heat and cold treatments to milk to make it bacteria-free.
2. Breakdown of sugars into alcohol and carbon dioxide by anaerobic bacteria in the absence of oxygen is called fermentation.
3. The microorganism which causes diseases is called pathogen.
- D. 1. The study of microorganisms is called microbiology.
2. *Nitrosomonas* and *Nitrobacter* are nitrifying bacteria.
3. Pea, cauliflower, fish, meat and leafy vegetables like spinach, fenugreek, etc. are preserved by dehydration.
4. Deep freezing is carried out at about -18°C .
- E. 1. On the basis of shape, bacteria are classified as cocci (spherical), bacilli (rod-shaped), spirilla (spiral) and vibrio (comma-shaped) bacteria.
2. Viruses are active and multiply only inside the living cells. They remain inactive like nonliving things outside the living cells.

Therefore, they are considered as connecting link between living and nonliving things.

3. The diseases which are passed from infected persons to healthy persons are called communicable diseases. These are common cold, flu, malaria, polio, etc.
 4. Protozoa are the most primitive single-celled, microscopic animals. They do not have cell wall like plant cells. The body of some protozoa is covered with pellicle. They swim either by flagella or cilia or move by pseudopodia. Some common protozoa are *Amoeba*, *Paramecium*, *Euglena* and *Entamoeba*.
 5. Vaccines induce formation of antibodies in the body. These antibodies destroy the germs which enter the body.
 6. Food poisoning is the unhealthy condition of the body caused by having food spoiled by microorganisms. Food poisoning causes vomiting, diarrhoea and headache.
- F. 1. Food preservation is the process of treating and storing food to prevent its spoilage either by killing the microbes or inhibiting their growth and making them inactive.

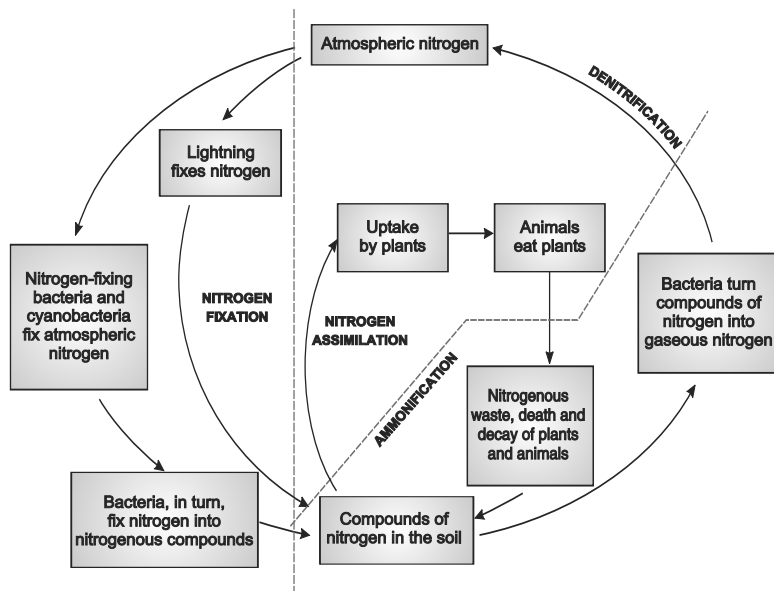
Methods of Food Preservation

- (a) **Dehydration:** In this method, fruits and vegetables are dehydrated either by drying in the sun or by heating. Peas, cauliflower, fish, meat and leafy vegetables like spinach, fenugreek, etc. are preserved by dehydration.
 - (b) **Salting:** In this method, the food items are covered with salt to drain out water by osmosis. Raw mangoes, lemon, amla, etc. are preserved by salting.
 - (c) **Pickling:** In this method, fruits and vegetables are made into pickles by using oil and vinegar. Raw mangoes, lemons, chillies, etc. are preserved by this method.
 - (d) **By chemicals:** Chemicals like citric acid, vinegar, etc. are added to pickles while sodium benzoate and sodium metabisulphite are used to preserve squashes, jams and jellies.
2. (a) **Pneumonia:** It is a bacterial disease and is transmitted through air. It can be prevented by use of antibiotics.
- (b) **Tuberculosis:** It is a bacterial disease and is transmitted through air. It can be prevented by keeping cleanliness and giving BCG vaccine at suitable age.
- (c) **Jaundice:** It is transmitted by consuming water contaminated by hepatitis virus. It can be prevented by drinking boiled water, taking fat-free diet and vaccine against hepatitis.
- (d) **Malaria:** It is transmitted by the bite of female *Anopheles* mosquito. It can be prevented by keeping the surroundings clean and controlling mosquito breeding.

3. The conversion of free atmospheric nitrogen into useful nitrogen compounds is called nitrogen fixation.

The main steps of nitrogen cycle are as follows:

- Nitrogen fixation:** Atmospheric nitrogen is converted into nitrogen compounds by electric discharge and by soil bacteria. These compounds are made available to plants.
 - Nitrogen assimilation:** Nitrogen compounds absorbed by plants are used in the synthesis of amino acids, proteins, etc. Animals eat plant food and synthesise animal proteins.
 - Ammonification:** Soil bacteria and fungi break down proteins and other nitrogen compounds from the waste, dead and decaying plants and animals into ammonium salts and ammonia.
 - Nitrification:** The soil bacteria *Nitrosomonas* and *Nitrobacter* convert ammonia and ammonium salts into nitrates which are absorbed by plants.
 - Denitrification:** The nitrates in the soil are converted into free molecular nitrogen by *Pseudomonas*, a denitrifying bacterium. This molecular nitrogen is released into the atmosphere.
- In this way, nitrogen cycle is completed in nature.



4. Microorganisms have following uses:

- They are used in food industry for making curd, cheese, wine, beer, vinegar; in making beverages, bread, idlis, dosa and bhaturas.
- They have medicinal use. They are used in the preparation of antibiotics, vaccines and vitamin B complex.

- (c) They decompose organic waste and help clean our environment.
- (d) Some soil bacteria help in nitrogen fixation and increase soil fertility.

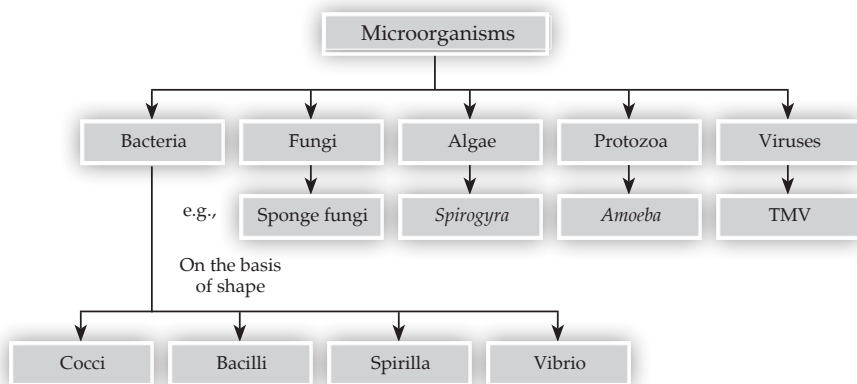
HOTS

1. Drain water contains sewage which has organic components including nitrogenous compounds. The decomposition of nitrogenous compounds in limited supply of air called putrefaction causes formation of foul smell.
2. The luxuriant growth of vegetation in polluted water does not provide extra oxygen to aquatic animals. Polluted waterbody is rich in organic and mineral nutrients which promote the growth of algae and other microorganisms. They deplete the oxygen supply of the waterbody. The shortage of oxygen causes death of aquatic animals living in it.

Value-based Questions

1. The food sold on street in unhygienic conditions by roadside vendors is called street food.
2. Food poisoning is a disorder of digestive system which arises due to consuming food spoiled by microorganisms. It leads to vomiting, headache and diarrhoea.
3. Krishna learns that having healthy food leads to good health.

LET'S MEMORISE



3. Synthetic Fibres and Plastics

Checkpoint 1

1. Monomers.
2. Acrylic fibre.
3. Natural fibres are obtained from plants and animals.

Checkpoint 2

1. Plastics are synthetic materials made of polymers of different types of chemicals.
2. Plastics which can soften and get deformed when heated are called thermoplastics.
3. Differences between thermoplastics and thermosetting plastics

Manure	Fertiliser
1. Thermoplastics can be reshaped (remoulded) as many times as desired.	1. Thermosetting plastics are polymers which once set cannot be reshaped even on heating.
2. They are polymers which soften and get deformed on heating.	2. They do not soften or melt on heating.
3. Examples include polyethene, PVC, polystyrene.	3. Examples include melamine and bakelite.

4. Plastics are durable and last for long. They can take wear and tear of daily life and do not get broken easily. Therefore, plastics are used to make a number of objects.

Let's Drill Our Skills

- A.** 1. (b) 2. (c) 3. (b) 4. (d)
- B.** 1. monomers 2. Rayon 3. Acrylic 4. PVC; bakelite
5. nonbiodegradable
- C.** 1. The plastic which does not get deformed on heating is called thermosetting plastic.
2. Polymer is a substance made of smaller units called monomers.
3. Monomer is a unit of a polymer.
- D.** 1. The synthetic fibre is also called man-made fibre.
2. Nylon is the first fully synthetic fibre.
3. Bakelite is a thermosetting plastic.
4. The full form of PVC is polyvinyl chloride.
- E.** 1. The process of joining together a large number of monomers to form a polymer is called polymerisation.
2. **Properties of rayon:** Rayon has silk-like appearance. It does not shrink. It is a good absorbent and hence, cool to wear.
Uses of rayon: Rayon is used in making cloths, bedsheets, carpets and bandages.
3. Bakelite is a thermosetting plastic. It does not soften or melt on heating. Therefore, it is used for making handles of kitchen utensils.

- The fibres made by chemical processes are called synthetic fibres. Their examples are rayon, nylon, polyester and acrylic.
- Properties of nylon:** Nylon is a strong, shiny, elastic and lightweight synthetic fibre having high tensile strength. It absorbs less water and dries quickly. It is soft, smooth and does not require ironing.
Uses of nylon: Nylon is used in making clothing like track suits, socks, swim wears, raincoats, etc.; curtains, bedsheets; ropes, tyres, umbrellas, parachutes, fishing nets, toothbrushes, seat belts, etc.
- Synthetic clothes catch fire easily. They melt and stick to the body of person wearing them. Therefore, it is not advisable to wear synthetic clothes in the kitchen.
- Differences between thermoplastics and thermosetting plastics

Thermoplastics	Thermosetting plastics
1. Thermoplastics can be reshaped (remoulded) as many times as desired.	1. Thermosetting plastics are polymers which once set cannot be reshaped even on heating.
2. They are polymers which soften and get deformed on heating.	2. They do not soften or melt on heating.

F. 1. Properties of plastics:

- Plastics are made of polymers of different types of chemicals.
- Plastics are durable, do not break easily and last for long.
- Plastics are resistant to weather conditions. They do not get rusted or corroded.
- They are recyclable and reusable. They are inexpensive and can be used to make a wide variety of products.
- Plastics are nonbiodegradable substances.
- They are resistant to chemicals and release poisonous gases on burning.

Uses of plastics: Plastics are used in making combs, chairs, tables, buckets, mugs, containers, bottles, toothbrushes, lunch boxes, pencil boxes, etc.

- Harmful effects of using plastics:** Plastics are nonbiodegradable substances. They remain unchanged in garbage and therefore, keep accumulating. On burning, they release harmful and poisonous gases into the air causing air pollution.

Measures to reduce plastic pollution: We can reduce plastic pollution by

- using shopping bags made of jute, cotton or paper instead of plastic.
- reusing plastic articles such as boxes, bottles, bags, etc.

- (c) buying the products which have less plastic packaging.
- (d) proper disposal of plastic bags, etc. in the dustbins instead of throwing on the roads, rivers, sea and soil.
- (e) minimising the use of plastic articles.

3. Advantages of synthetic fibres: Synthetic fibres are stronger, durable, wrinkle-free and moth resistant. They dry up quickly. They are less expensive and easy to maintain.

Disadvantages of synthetic fibres: Synthetic fibres catch fire easily and release poisonous gases on burning.

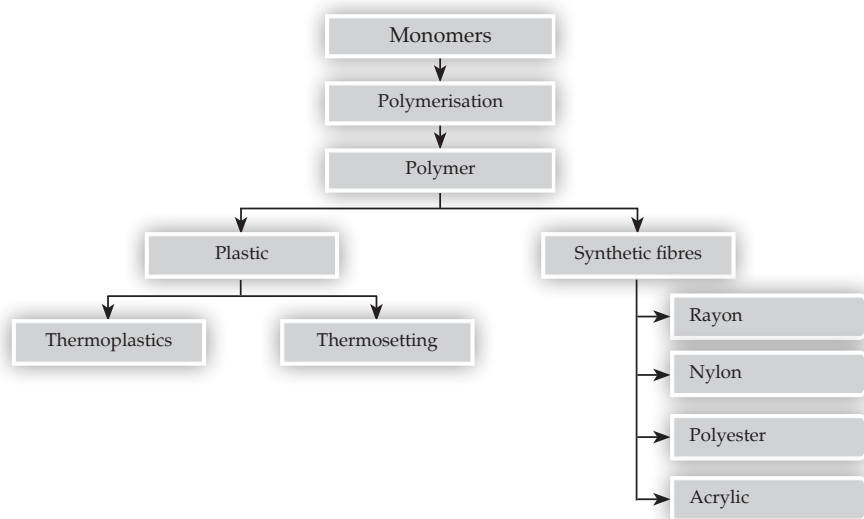
HOTS

1. Electric plugs do not melt because they are made of bakelite which is a thermosetting plastic. This type of plastic does not soften or melt on heating.
2. (a) Anu and Manu should keep empty packets of chips with them and wherever they find dustbin on the way, they can throw in it or in the bin at their home.
- (b) Yes, using jute bags is environment friendly as jute is a natural fibre. It is biodegradable when thrown as waste.

Value-based Questions

1. Plastic is a nonbiodegradable substance. It is not decomposed by microorganisms. Therefore, it remains unchanged in garbage and keeps accumulating and causes soil pollution. Also, on burning, it releases poisonous gases, hence, causes air pollution.
2. Shyam is a responsible, aware and a kind person.

LET'S MEMORISE



4. Metals and Nonmetals

Checkpoint 1

1. It is a nonmetal.
2. (a) Mercury (b) Oxygen (c) Gold
3. (a) Ductility (b) Malleability

Checkpoint 2

1. Rust is an oxide of iron.
2. Hydrogen gas burns with popping sound.
3. The reactions in which a more reactive metal displaces a less reactive metal from its salt solution are called displacement reactions.
4. Carbon is essential for life because it takes part in the formation of food nutrients which are carbohydrates, fats, proteins and vitamins.

Let's Drill Our Skills

- A.** 1. (d) 2. (d) 3. (c) 4. (b)
- B.** 1. oxygen; moisture 2. nonmalleable 3. Diamond 4. Hydrogen
5. acidic; basic
- C.** 1. The property of a metal by which it can be hammered or beaten into very thin sheets without breaking is called malleability.
2. The property of a metal by which it makes a ringing sound when struck is called sonority.
3. The property of a metal by which it can be drawn into thin wires is called ductility.
4. The mineral from which a metal can be extracted conveniently and profitably is called ore.
5. A reaction in which a more reactive metal displaces a less reactive metal from its salt solution is called a displacement reaction.
- D.** 1. Silver metal is the best conductor of electricity.
2. Bromine is the nonmetal which is liquid at room temperature.
3. Diamond is the hardest substance found on the earth.
4. Iodine is a nonmetal which is lustrous.
5. Graphite is the only nonmetal which is a good conductor of electricity.
- E.** 1. Mineral is a compound of a metal found in nature with many impurities, whereas ore is the mineral from which a metal can be extracted conveniently and profitably.
2. Phosphorus is a very reactive nonmetal. It catches fire when exposed to air, therefore, to avoid its contact with oxygen of air, it is stored in water. On the other hand, sodium reacts violently with moisture present in air. Therefore, it is kept immersed in kerosene.
3. **Uses of metals:**
(a) Metals are used in construction of houses, buildings, bridges, etc.
(b) Metals such as gold, silver and platinum are used in making jewellery.

Uses of nonmetals:

(a) Chlorine is used for water purification.

(b) Iodine has antiseptic property, so, it is applied on wounds.

- Silver, gold and platinum are very ductile metals. They can be drawn into fine wires. Therefore, they are used in making jewellery.
- A more reactive metal displaces a less reactive metal from its salt solution. Zinc metal is more reactive than copper. Therefore, it displaces copper from copper sulphate solution.
- Metals on coming in contact with oxygen of air, acquire a layer of metallic oxide on them. Therefore, vessels made of metals lose their shine with time.

F. 1. Comparison of properties of metals and nonmetals

Property	Metals	Nonmetals
Ductility	Ductile (can be drawn into fine wires)	Nonductile (cannot be drawn into fine wires)
Malleability	Malleable (can be hammered into thin sheets)	Nonmalleable (cannot be hammered into thin sheets)
Thermal conductivity	Good conductors of heat	Generally poor conductors of heat
Electrical conductivity	Good conductors of electricity	Bad conductors of electricity (Exception: Graphite is a good conductor of electricity.)

- (a) $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$
Sodium Water Sodium hydroxide Hydrogen

(b) $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$
Magnesium Oxygen Magnesium oxide

(c) $\text{Zn} + 2\text{HCl}(\text{dil}) \rightarrow \text{ZnCl}_2 + \text{H}_2$
Zinc Hydrochloric acid Zini chloride Hydrogen

(d) $\text{Mg} + \text{H}_2\text{O} \rightarrow \text{MgO} + \text{H}_2$
Magnesium Water Magnesium oxide Hydrogen

(e) $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$
Iron Copper sulphate Ferrous sulphate Copper

3. (a) Activity to show that metals react with oxygen to form metallic oxides:

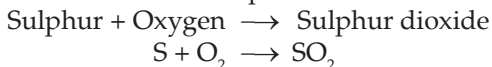
Take a clean magnesium ribbon. Hold it with a pair of tongs and burn it over a flame.

Magnesium ribbon burns with a dazzling white flame to form a white ash. The white ash formed is magnesium oxide.

(b) **Activity to show that nonmetals react with oxygen to form nonmetallic oxides:**

Put a small amount of sulphur powder in a deflagrating spoon and heat it over a burner. Sulphur starts melting quickly and catches fire. Plunge the spoon quickly into a gas jar and cover the jar. This will not allow the gas produced to escape. Remove the spoon after all the sulphur has burnt.

When sulphur is burnt in the presence of oxygen, the new substance formed is sulphur dioxide. This can be represented as:



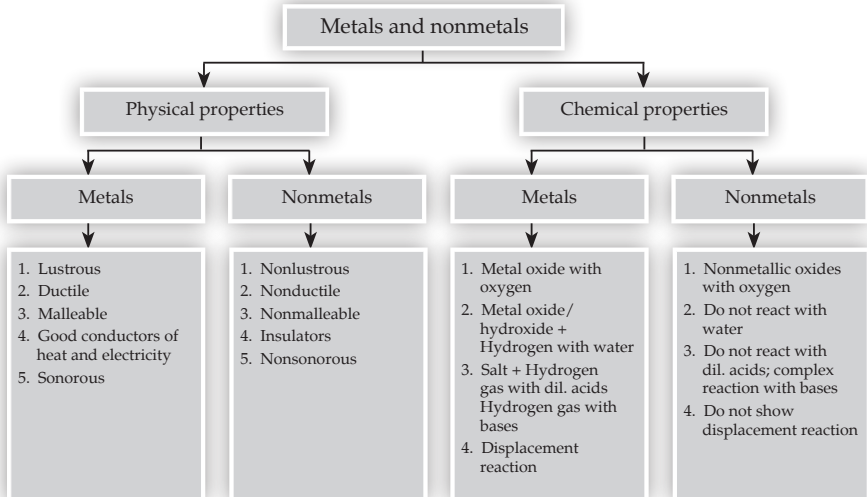
HOTS

1. Wood and plastic do not conduct heat. Therefore, metal pans in the kitchen have either wooden or plastic handles.
2. Copper does not react with water at room temperature. Therefore, Jessica did not find any change occurring in test tube containing piece of copper wire and water.
3. An immersion rod is made of a metal because metals are good conductors of heat and electricity. When electric current is passed through it, its element becomes hot due to heating effect of current. The heat from element is conducted to water by the metal and hence, the water becomes hot.

Value-based Questions

1. Gold is used to make jewellery because it has good ductility. It can be drawn into fine wires.
2. Mohan is an aware person.

LET'S MEMORISE



5. Coal and Petroleum

Checkpoint 1

1. Resources which are available in nature are called natural resources.
2. Air, water and sun are natural resources.
3. Coal is an important fossil fuel.
4. Coal gas is used as industrial fuel.

Checkpoint 2

1. (a) Petroleum gas is used as a fuel for domestic purposes.
(b) Fuel oil is used as fuel in thermal power plants to generate electricity.
(c) Diesel oil is used as fuel in buses, cars, ships, trucks, etc.
2. Petroleum is a fossil fuel formed by the remains of the marine organisms which lived millions of years ago.
3. The process by which various constituents of petroleum are separated is called petroleum refining.

Let's Drill Our Skills

- A. 1. (b) 2. (b) 3. (c) 4. (b) 5. (d)
- B. 1. exhaustible; inexhaustible 2. carbonisation 3. petroleum refining
4. carbon; hydrogen; oxygen 5. methane
- C. 1. Fossil fuel is an exhaustible natural resource which is formed from the remains of plants and animals that died millions of years ago.
2. The conversion of dead trees and plants into coal is called carbonisation.
3. The heating of coal in the absence of air is called destructive distillation of coal.
4. The process by which various constituents of petroleum can be separated is called petroleum refining.
- D. 1. Coal gas is formed when coal is heated in the absence of air.
2. The solid residue left behind when coal is heated in the absence of air is coke.
3. The oily liquid formed when coal is heated in the absence of air is coal tar.
4. Petroleum gas, petrol, naphtha, kerosene, diesel oil, fuel oil, lubricating oil, paraffin wax, etc. are obtained after refining of petroleum.
5. Air, sunlight and water are inexhaustible natural resources.
- E. 1. There are following three types of coal on the basis of amount of carbon present in them:
(a) **Anthracite**: It contains 90% carbon.
(b) **Bituminous**: It contains 60% carbon.
(c) **Lignite**: It contains 40% carbon.

2. **Uses of coke:** Coke is used in the extraction of metals. It is used in the preparation of fuel gases like producer gas and water gas.

Uses of coal gas: Coal gas is used as an important industrial fuel. It was previously used for street lighting.

Uses of coal tar: It is used for making inks, dyes, detergents, insecticides and artificial fibres.

3. Coke is a smokeless fuel. It is a greyish-black solid with rough texture. It contains 98% carbon.

Coke is obtained by the process of destructive distillation of coal. In this process, coal is heated in the absence of air due to which volatile impurities and moisture is removed. The solid left behind is coke.

4. Natural gas is called a clean fuel because it does not produce ash and smoke on burning.

F. 1. The various constituents of petroleum and their uses are as follows:

Constituents	Uses
Petroleum gas	<ul style="list-style-type: none">● used as fuel in homes and industries.● in the production of carbon black.
Petrol	<ul style="list-style-type: none">● as a fuel for cars, bikes, scooters, etc.● as an aviation fuel.● as a solvent for dry cleaning.
Diesel oil	<ul style="list-style-type: none">● as a fuel for buses, cars, ships, trucks, etc.
Kerosene	<ul style="list-style-type: none">● as a fuel for stoves and lamps.● as a fuel for jet aeroplanes.
Fuel oil	<ul style="list-style-type: none">● used in some power plants to generate electricity.
Paraffin wax	<ul style="list-style-type: none">● used for making shoe polish, grease, candles, ointments.
Naphtha	<ul style="list-style-type: none">● used for making chemicals.

2. **Coal:** Coal is a fossil fuel which was formed millions of years ago by the process of carbonisation. It is a black, hard solid substance. It contains carbon, hydrogen and oxygen in combined form with small amounts of nitrogen and sulphur.

Types of coal: There are following three types of coal on the basis of amount of carbon present in them:

(a) **Anthracite:** It contains 90% carbon.

(b) **Bituminous:** It contains 60% carbon.

(c) **Lignite:** It contains 40% carbon.

Uses of coal: Coal is used as fuel in houses for cooking, in thermal power plants for generating electricity and in various industries such as cement, paper, steel, iron, etc.

3. (a) **Formation of coal:** The coal was formed millions of years ago by the process of carbonisation on the remains of dead plants and trees which were accumulated in the swamps. By the action of heat and pressure, they were turned into coal.
- (b) **Formation of petroleum:** Petroleum was formed from the remains of dead animals and plants that lived in the sea millions of years ago. They accumulated and got buried in the deeper layers of sand, silt and clay. In the absence of air and by the action of heat and pressure, these dead organisms slowly changed into petroleum.

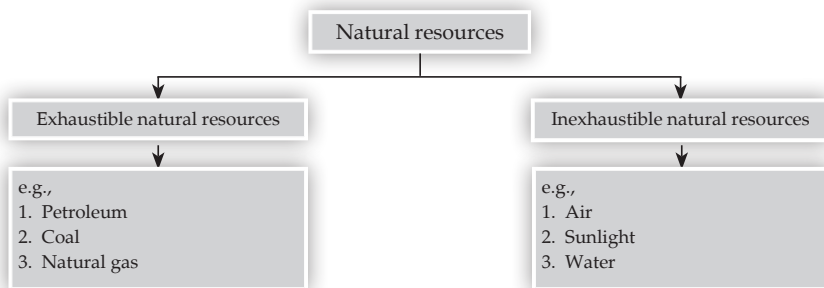
HOTS

1. Coal and petroleum should be used judiciously because they are exhaustible natural resources. They are present only in limited amount in nature. They take millions of years to form, hence, cannot be continually replenished.
2. On burning, fossil fuels release carbon dioxide other gases in the air. Carbon dioxide is the main greenhouse gas causing global warming. On planting more trees, the carbon dioxide will be taken by plants for photosynthesis. In return, they will release oxygen in the air. In this way, the amount of carbon dioxide will be controlled and air pollution will be reduced.

Value-based Questions

1. Car pooling, using public transport and walking down to nearby places instead of using motor vehicles are some other ways to save fossil fuels.
2. Hardik is a concerned and aware person.

LET'S MEMORISE



6. Combustion and Flame

Checkpoint 1

1. Stone, glass, marbles
2. (a) Combustible substance.
(b) Ignition temperature.
(c) Supporter of combustion – air.
3. A substance which can burn or catch fire is called a combustible substance.
4. No, all combustible substances do not have the same ignition temperature.

Checkpoint 2

1. We cannot use water to extinguish fire caused due to oil or petrol because they are lighter than water and hence, float over water and keep burning on the top.
2. If a person's clothes catch fire, a blanket must be wrapped immediately over his body. The wrapping of blanket cuts off the supply of oxygen and helps in extinguishing fire.
3. The sudden combustion of a substance into flames without any external sources of ignition is called spontaneous combustion.

Checkpoint 3

1. 1200°C
2. calorific

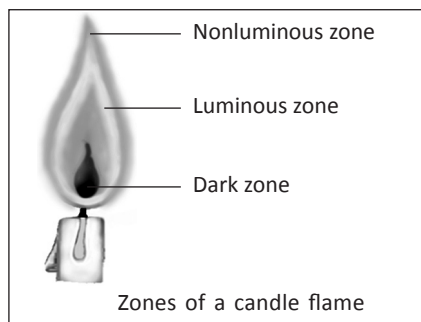
Let's Drill Our Skills

- A. 1. (b) 2. (d) 3. (b) 4. (a) 5. (b)
- B. 1. complete 2. outer 3. Acid 4. combustible substances 5. fuel
- C. 1. The process of burning of a substance is called combustion.
2. Ignition temperature is that minimum temperature at which a combustible substance catches fire.
3. The amount of heat produced by a fuel on burning is called its calorific value.
- D. 1. The minimum temperature at which a substance catches fire is called its ignition temperature.
2. Carbon dioxide gas is used to extinguish fire.
3. Nonluminous zone is the other name for the outer zone of a candle flame.
4. The outer nonluminous zone, the middle luminous zone and the inner dark zone are three different zones of a candle.
- E. 1. The conditions necessary for combustion to take place are as follows:
(a) Presence of a combustible substance.
(b) Ignition temperature.
(c) Supporter of combustion – air.

2. Only those substances which vaporise during burning produce flame.
3. We are advised not to use water to put out fire caused by electric wires because water is a good conductor of electricity and we can get an electric shock.
4. Combustion is of following types:
 - (a) **Rapid combustion:** When a substance burns rapidly on igniting producing heat and light, it is called rapid combustion. For example, burning of LPG and petrol.
 - (b) **Spontaneous combustion:** The sudden combustion of a substance into flames without any external sources of ignition is called spontaneous combustion. For example, white phosphorus gets ignited spontaneously when the temperature rises to about 35°C .
 - (c) **Incomplete combustion:** The burning of a substance in the deficient supply of oxygen is called incomplete combustion. For example, burning of LPG with reddish-yellow flame.
 - (d) **Complete combustion:** The burning of a substance in the sufficient supply of oxygen is called complete combustion. For example, burning of LPG with a blue flame.

F. 1. Different zones of a candle flame are as follows:

- (a) **The inner zone (Dark zone):** This zone is dark-black in colour and consists of unburnt wax vapour. This zone is the least hot zone. It has a temperature of about $800\text{-}1000^{\circ}\text{C}$.
- (b) **The middle zone (Luminous zone):** This is the zone where wax vapour starts burning. Here, the flame is yellowish as oxygen is not available in plenty in this region. The wax vapour does not burn completely. The temperature here is about 1200°C .



- (c) **The outer zone (Nonluminous zone):** This is the zone where wax vapour burns completely as oxygen is available in plenty in this region. The flame is blue in colour and appears nonluminous. The temperature here is very high, i.e., about 1400°C .

2. The amount of heat produced by a fuel on burning is called its calorific value.

Characteristics of an ideal fuel:

- (a) The fuel should have a high calorific value.
 - (b) The fuel should be easy to store and transport.
 - (c) The fuel should not be expensive.
 - (d) The fuel should be readily available.
3. Burning of fossil fuels like coal and petrol in power plants, industries, vehicles and as domestic fuel releases gases like carbon dioxide, sulphur dioxide and oxides of nitrogen.
The carbon dioxide traps heat of the sun. The more amount of carbon dioxide in the air traps more heat. This causes the temperature of atmosphere of the earth to rise which is called global warming. It leads to melting of polar ice caps causing sea level to rise resulting in floods. Sulphur dioxide and oxides of nitrogen when present in air, dissolve in rainwater and form sulphuric acid and nitric acid respectively. They fall to the earth as acid rain. The acid rain destroys soil fertility, trees, monuments, buildings, aquatic animals and plants, etc.
 4. (a) A substance that vaporises during burning gives off a flame. For example, a candle burns with a flame. This is because a candle is made of wax. When the wick of a candle is lighted, it melts the wax. The wax vapours rise higher and eventually catch fire and form a flame. Hence, some materials burn with a flame.
(b) Carbon dioxide gas is a nonflammable gas and is heavier than oxygen. It, therefore, covers the fire like a blanket. This results in cutting off the contact between the combustible substance and oxygen, and hence, the fire gets controlled. Carbon dioxide also works by cooling the combustible substance below its ignition temperature.

HOTS

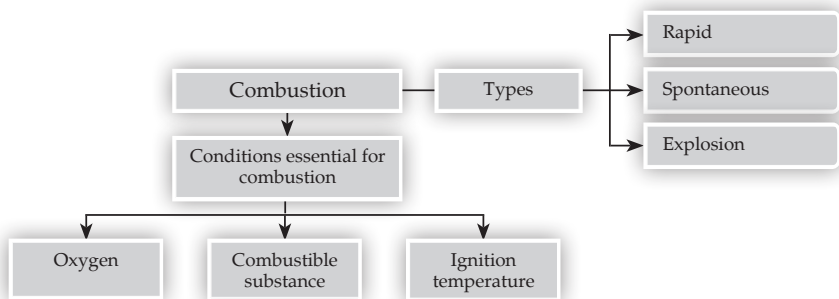
1. To be used as domestic fuel, a fuel should burn at a slow rate. Hydrogen is a highly combustible substance, even a small contact with burning agent may cause explosion. Therefore, it is difficult to handle during transportation and storage, and thus, not safe to be used as domestic fuel.
2. Closing doors and windows during fire accidents, cuts off the supply of oxygen and thus, helps in controlling fire.

Value-based Questions

1. Conditions essential for combustions to occur are:
 - (a) Presence of a combustible substance.
 - (b) Attainment of ignition temperature.
 - (c) Presence of supporter of combustion – air.

- The wrapping of blanket cuts off the supply of oxygen and helps in extinguishing the fire.
- Shail is a brave and aware person.

LET'S MEMORISE



7. Conservation of Plants and Animals

Checkpoint 1

- Cutting of trees in large numbers to clear land for cultivation, urbanisation, factories, timber or mining is called deforestation. Replanting trees in forests to replace the cut trees with the same type of trees is called afforestation.
- The judicious use of available natural resources is called conservation.
- The cutting of trees on a large scale reduces the water holding capacity of soil making the topsoil dry which is removed by strong winds causing soil erosion. This leads to desertification.

Checkpoint 2

- The species that are not likely to survive and will soon become extinct if the causative factors continue, are called endangered species. Vulnerable species are those species which are likely to move to endangered category in near future, if causative factors continue to operate.
- The Red Data Book contains a record of all those species of plants and animals which are under the threat of extinction or are rare and vulnerable to extinction.
- Jim Corbett National Park in Uttarakhand is the first national park of India. It was established in 1936.
- IUCN or World Conservation Union is the international body responsible for wildlife conservation.

Let's Drill Our Skills

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

- B.** 1. less 2. deforestation/desertification 3. endemic 4. habitat
5. Odisha
- C.** 1. The plants found in a particular geographical area form the flora of that area.
2. A wildlife sanctuary is a protected land area reserved for the conservation of wild animals, birds and plants. Hunting is strictly prohibited there. However, private ownership rights for collecting minor forest products, harvesting of timber and cultivation are granted so long as they do not interfere with the life of wild animals.
3. A biosphere reserve is a specified land area in which multiple use of land is permitted for preserving biodiversity. It is divided into three zones for different activities. These zones are core zone, buffer zone and manipulation zone.
4. The animals found in a particular geographical area form the fauna of that area.
5. The Red Data Book is a book which contains a record of all threatened species of plants and animals and provides information about their distribution and conservation programmes.
- D.** 1. The reservoirs of biodiversity are called biodiversity hotspots.
2. In core zone of biosphere reserve, no human activities are permitted.
3. The species on the verge of extinction are called endangered species.
4. The Red Data Book contains information about threatened species.
5. The restocking of destroyed forests by replanting new trees of the same type is called afforestation.
- E.** 1. Biodiversity needs to be conserved because it maintains balance in nature, provides variety of commodities and is needed for breeding programmes in agriculture, horticulture, sericulture, etc.
2. The felling of trees causes change in the physical property of soil. The water-holding capacity of soil changes and level of subsoil water is lowered making the topsoil layer dry. The dried topsoil is removed by strong winds causing soil erosion. Gradually, the fertile land gets converted into a desert.
3. (a) The plants found in a particular geographical area form the flora, whereas animals form the fauna of that area.
(b) The species which is lost forever with no member alive is called extinct species. On the other hand, endangered species is the species which is not likely to survive and will soon become extinct if the same causative factors continue.
4. The seasonal movement of animals in groups from one habitat to other is called migration.
Animals migrate to escape the inhospitable winter conditions, to find plenty of food, and to lay eggs at a warm place where they can incubate early.

5. Paper is manufactured from trees. Paper industry is also one of the causes for deforestation. Therefore, to reduce felling of trees, we should minimise the production of paper by using recycled paper.
- F. 1. Following are the causes for the loss of biodiversity:
- (a) **Deforestation:** It leads to loss of natural habitats of wild plants and animals.
 - (b) **Global warming:** It caused changes in climate pattern which resulted in decreased growth of plants and affected the life cycles of various wild animals and plants.
 - (c) **Desertification:** It resulted in disturbed water cycle. This caused lowering of water table and frequent droughts.
 - (d) **Floods:** They cause death of wildlife.
 - (e) **Forest fire, pests and diseases:** Fire in forest due to human activities, various pests and diseases are also responsible for loss of biodiversity.
2. Destruction of forests has following harmful effects:
- (a) Destruction of forests increases the level of carbon dioxide in the atmosphere causing global warming.
 - (b) It increases temperature and wind velocity and reduces rainfall. This causes change in climate.
 - (c) It lowers water-holding capacity of soil and makes topsoil dry, thus, resulting in soil erosion and desertification.
 - (d) It causes droughts due to disturbed water cycle and lowering of water table.
 - (e) It causes floods due to soil erosion and low water-holding capacity.
 - (f) It results in loss of wildlife due to habitat loss of wild animals and plants.
 - (g) It results in the depletion of forest resources such as food, fodder, firewood, etc. and affects the life of people living in and around forests.
3. The objectives of Wildlife Protection Act are as follows:
- (a) Prohibition of hunting of listed threatened species.
 - (b) Setting up and management of national parks, sanctuaries and biosphere reserves.
 - (c) Control and management of captive breeding.
 - (d) Protection of specific plants and natural habitats of animals.
4. **Project Tiger:** Project Tiger is one of the captive breeding programmes run by Government of India for the conservation of wildlife. Project Tiger was launched in 1973 to save tiger from poaching. Initially, 9 tiger reserves were established in 1973-74. Now, the total number of tiger reserves in India is 50. Total area covered under these projects is 71027.10 km².

Gir Lion Project: It is one of the captive breeding programmes run by Government of India to save endangered species from extinction. Gir Lion project was started by the Government of Gujarat in 1972 to protect Asiatic Lion from poaching and hunting.

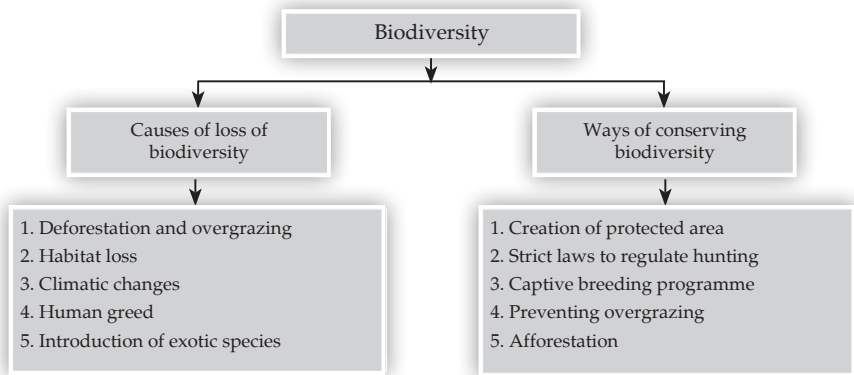
HOTS

1. Large scale exploitation of forests in Cherrapunji left its hills barren. Loss of forest cover to create space for growing population and for industrial development has resulted in altered climatic pattern and reduced rainfall.
2. Overgrazing by cattle and sheep removes grasslands and exposes the soil to the atmospheric air. The soil dries up, its humus cover is lost and slowly the grassland changes into a dry desert.

Value-based Questions

1. Deforestation is done to create space for agriculture and housing for growing population and for industrial development.
2. Deforestation leads to global warming, climate change, soil erosion, desertification, drought, flood, loss of wildlife, etc.
3. Rahim is an aware and concerned person. We learn that we should take initiative to make people aware for the conservation of forests.

LET'S MEMORISE



8. The Cell

Checkpoint 1

1. Robert Hooke
2. Schleiden; Schwann
3. unicellular
4. unicellular
5. tissue

Checkpoint 2

1. More than a metre
2. Egg of ostrich
3. Chloroplast and cell wall
4. Mitochondria
5. Chloroplast

Let's Drill Our Skills

- A. 1. (b) 2. (a) 3. (c) 4. (c)
- B. 1. cytoplasm 2. cellulose 3. Blood 4. cell organelles 5. nucleus
- C. 1. Cell is the smallest unit of life. It is the basic unit of structure and function in all living beings.
2. Plastids are coloured bodies found only in plant cells.
3. Lysosomes are the cell organelles which have tissue dissolving enzymes.
4. Cytoplasm is a thick, jelly-like semifluid substance which lies between the cell membrane and nucleus.
- D. 1. Cell is the basic unit of structure and function in all living beings.
2. Yes, *Amoeba* is a single-celled organism.
3. Nucleus is called the control centre of the cell.
4. Mitochondria is the powerhouse of the cell.
5. Ribosome is called the protein factory of the cell.
- E. 1. Cell theory was given by a German botanist, Schleiden and a zoologist Schwann. The theory states that:
(a) Cells are structural and functional units of living organisms.
(b) Cells arise by the division of pre-existing cells.
2. The organisms formed of one cell only are called unicellular organisms, e.g., bacteria, yeast, all protozoans like *Amoeba*, *Paramecium*, etc. and simple algae like *Chlamydomonas*.
The organisms which are formed of many cells are called multicellular organisms, e.g., algae like pond scum; plants like mango, neem, etc. and animals like dog, cat, man, etc.
3. Different shapes of cells are related to their specific functions. For example, nerve cells have to pass nerve impulses from one end of the body to the other, therefore, they are quite long and are branched at their ends. Similarly, as white blood cells have to move throughout the body to fight germs, they are amoeboid, can change their shape and move like *Amoeba*.
4. Nucleus is control centre of the cell as it controls all the activities of the cell. It stores information of all the hereditary characters and pass them from one generation to the next.
5. Mitochondria are known as powerhouse of the cell because they produce energy for all the activities of cell by the oxidation of food during respiration.
6. The full form of DNA is deoxyribonucleic acid. It is a hereditary material which is organised into genes. It contains all the information of hereditary characters which are passed from parents to their offspring.

F. 1. Plant and animal cells have following differences:

Cell structures	Plant cell	Animal cell
Cell wall	Present	Absent
Nucleus	Present, shifted to one side	Present, centrally located
Plastids	Present	Absent
Centrioles	Absent	Present
Lysosomes	Absent	Present
Golgi bodies	Many, scattered	Only one
Vacuole	Present, one or two large vacuoles	Absent or few and small

2. Plastids are of following types:

- Chloroplasts:** Chloroplasts are green in colour due to the presence of chlorophyll. They carry out photosynthesis and impart green colour to the leaves.
- Chromoplasts:** Chromoplasts are coloured plastids. They have pigments of different colours and give colour to flowers and fruits.
- Leucoplasts:** Leucoplasts are colourless plastids. They store proteins and fats.

3. The cell has following parts:

- Cell membrane or plasma membrane:** It forms the boundary of cell and gives shape to cell. It allows selected substances to enter or leave the cell.
- Cytoplasm:** It is a thick, jelly-like semifluid substance which lies between cell membrane and nucleus. It has all the cell organelles suspended in it and gives space to all the chemical reactions to occur in the cell.
- Nucleus:** It is a small spherical structure. It has porous membrane enclosing fluid-like granular substance called nucleoplasm. It contains hereditary material. Nucleus controls all the activities of cell and passes hereditary material from one generation to the next.

4. Onion peel cells can be observed by performing following activity:
Cut an onion lengthwise into pieces and remove a fleshy leaf. Break it and peel off the thin membrane covering the fleshy leaf. Transfer this peel on a clean slide having a drop of methylene blue. Spread the peel with the help of a brush and needle and cover it with a clean coverslip. Gently, press the coverslip and remove excess of stain with a blotting paper. Examine under a microscope.

Brick-shaped cells are seen lying side-by-side. Each cell has a darkly stained cell wall, a centrally placed vacuole and a thin layer of cytoplasm between the cell wall and vacuole.

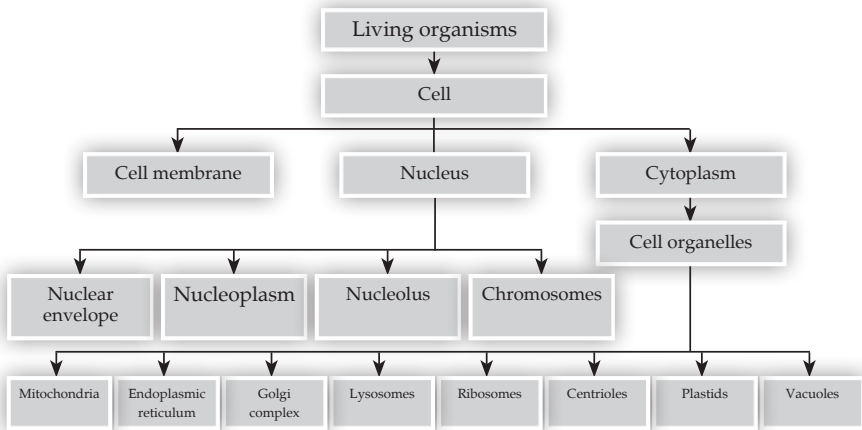
HOTS

1. Chromosomes are called hereditary vehicles because they carry genes and transfer them from parents to the offspring.
2. Cells are too small to be seen with the naked eye. That is why cells were discovered only after the invention of microscope.

Value-based Questions

1. Safranin or Methylene blue
2. Siddharth is a curious person and a keen observer.

LET'S MEMORISE



9. Sexual Reproduction

Checkpoint 1

1. Sexual
2. different

Checkpoint 2

1. Testis
2. Ovary
3. Uterus
4. Vagina
5. Metamorphosis

Let's Drill Our Skills

- A.** 1. (a) 2. (d) 3. (c) 4. (a)
- B.** 1. reproduction 2. gamete 3. sperm; ova 4. internal
5. caterpillar larva
- C.** 1. The ability of living beings to produce new individuals is known as reproduction.
2. The organism which has both male and female sex organs in it is called hermaphrodite.

3. The fusion of male and female gametes is called fertilisation.
 4. Animals which give birth to young ones or babies are called viviparous animals.
- D.
1. Binary fission occurs in *Amoeba*.
 2. Sperm are produced in testis.
 3. The process of fusion of gametes is called fertilisation.
 4. In human beings, fertilisation takes place in oviduct.
 5. The fertilised egg is called zygote.
- E.
1. The animals which lay eggs are called oviparous animals, e.g., insects, fishes, frogs, birds and reptiles. On the other hand, the animals which give birth to young ones or babies are called viviparous animals, e.g., cat, dog, horse, lion, monkey, man, etc.
 2. Reproduction is the ability of living beings to produce new individuals. It is of following two types:

Asexual reproduction: In asexual reproduction, a single parent produces its own kind and offspring produced are identical to parents. They are called clones. Examples: *Amoeba*, yeast, etc.

Sexual reproduction: In sexual reproduction, male and female parents are needed to produce a new individual. Examples: Cat, dog, frog, birds, reptiles, man, etc.
 3. Metamorphosis is the process of transforming larva into an adult through drastic changes. Metamorphosis occurs in many stages. It occurs in frog, butterfly, etc. Frog and butterfly are oviparous animals. Their eggs hatch into larvae.

The tadpole larva of frog changes into adult, whereas the caterpillar larva of butterfly undergoes pupa stage before reaching the adult stage.
 4. Fertilisation is the process of fusion of male and female gametes to give rise to zygote. It is of two types:

External fertilisation: In it, fusion of male and female gametes occurs outside the female body. It occurs in fish, frog and starfish.

Internal fertilisation: In it, fusion of male and female gametes occurs inside the female body. It occurs in insects, birds and mammals.
 5. **Male reproductive organs in human body:** They are a pair of testes, sperm ducts and a penis.

Female reproductive organs in human body: They are a pair of ovaries, a pair of oviducts or fallopian tubes, a uterus and a vagina.
 6. (a) **Butterfly:** Egg → Caterpillar → Pupa → Adult
 (b) **Frog:** Egg → Tadpole → Adult
- F.
1. In human beings, X and Y are two sex chromosomes. A male has one X and one Y-chromosome (XY), whereas a female has two X-chromosomes (XX).

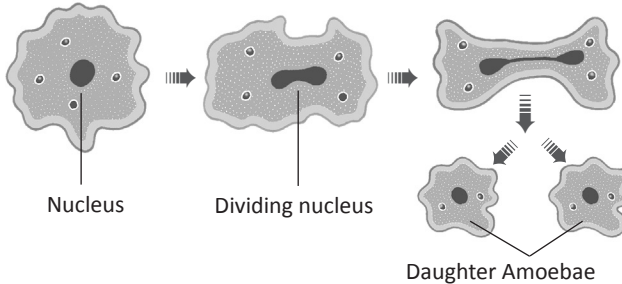
Half number of the male gametes (sperm) carries X-chromosome and the other half carries only Y-chromosome. All the eggs of female carry only one X-chromosome.

When a sperm containing X-chromosome fertilises an egg, the zygote would have two X-chromosomes and develop into a female baby (XX condition). When a sperm containing Y-chromosome fertilises the egg (containing one X-chromosome), the resulting zygote develops into a male baby (XY condition).

2. Asexual reproduction is a type of reproduction in which a single parent produces its own kind. The offspring so produced are identical to the parent and are called clones.

It is of following types:

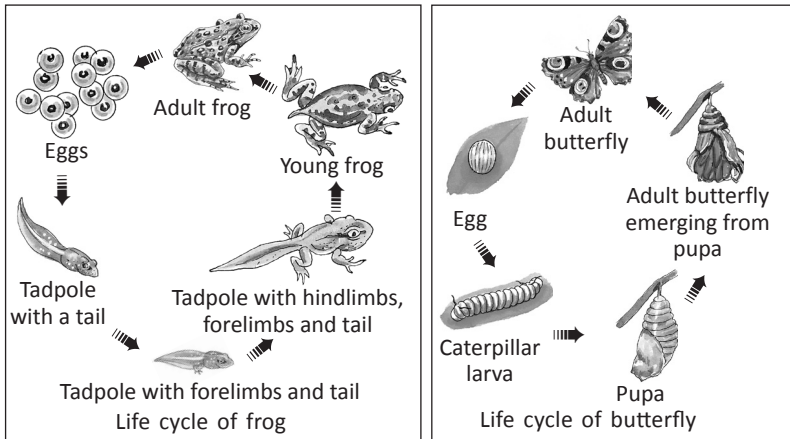
- (a) **Binary fission:** In it, two daughter organisms are formed from one organism by the division of parent organism. It occurs in unicellular organisms like *Amoeba* and *Paramecium*.



Binary fission in *Amoeba*

- (b) **Budding:** In it, a new organism is formed as an outgrowth from the parent body. It occurs in *Hydra*.

3.



4. Sexual reproduction is a type of reproduction in which male and female parents are needed to produce a new individual. It occurs in frogs, mammals, birds, reptile, man, etc.

Asexual reproduction is a type of reproduction in which a single parent produces its own kind. The offspring so produced are

identical to the parent and are called clones. It occurs in unicellular organisms like *Amoeba* and *Paramecium* and multicellular organism like *Hydra*.

HOTS

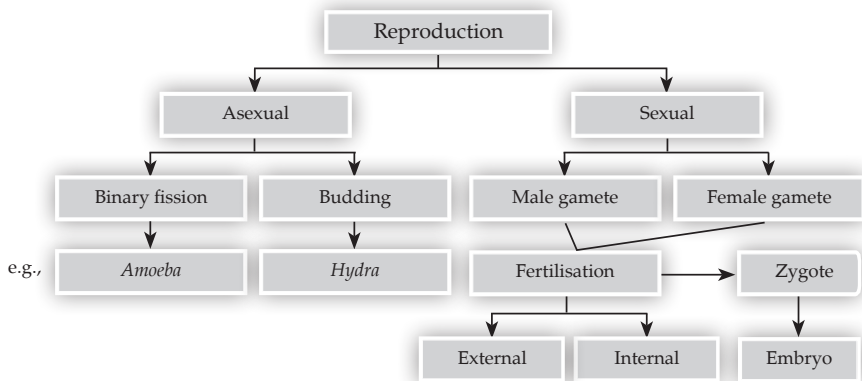
1. Frogs and toads have external fertilisation which occurs in water. They lay eggs in water. Therefore, they move to ponds during rainy season.
2. Yes, the type of sex chromosome from father fertilising the egg determines the sex of a baby.

When a sperm carrying X-chromosome fertilises the egg, the zygote will have two X-chromosomes and will develop into a female baby (XX condition). On the other hand, if a sperm carrying Y-chromosome fertilises the egg, the zygote develops into a male baby (XY condition).

Value-based Questions

1. The killing of an unborn female child is called female foeticide.
2. The female foeticide should be banned because it is a cruel and inhuman practice. Moreover, it has disturbed the male-female ratio which has led to unethical practices and increased crime against females in the society.

LET'S MEMORISE



10. Adolescence

Checkpoint

1. sex 2. testosterone 3. Pituitary 4. puberty

Let's Drill Our Skills

- A. 1. (c) 2. (c) 3. (a) 4. (b)
 B. 1. 11 years 2. endocrine 3. Pituitary 4. testosterone; estrogen
 5. hormone/chemical messenger

- C. 1. The period of life when the body undergoes changes leading to reproductive maturity is termed as adolescence.
 2. The projection of larynx at the front of the neck is called Adam's apple.
 3. The external features occurring at puberty in which boys and girls differ from each other are called secondary sexual characteristics.
- D. 1. Iron is required for the formation of haemoglobin.
 2. The permanent stoppage of menstruation in females is called menopause.
 3. Pituitary is the master endocrine gland.
 4. Adrenaline is called the emergency hormone.
- E. 1. At adolescence, the activity of sweat glands increases in teenagers. This invites bacteria to grow at underarms and groin areas which causes infections and makes the body smelly. Therefore, personal hygiene is important at adolescence.
 2. Endocrine glands are known as ductless glands because they do not have any ducts and release their secretions, i.e., hormones directly into the bloodstream.
 3. Menarche is the start of menstruation or the first menstruation starting at puberty, whereas menopause is the ceasing of menstruation permanently at the age of 45–50 years of age.
 4. The period of life when the body undergoes changes leading to reproductive maturity is called adolescence. It starts around the age of 11 years and lasts up to 18–19 years of age.
- F. 1. (a) **Pituitary gland:** It secretes growth hormone which controls the activities of other glands. Therefore, it is also called master gland.
 (b) **Adrenal gland:** It secretes adrenaline hormone, also called emergency hormone. It prepares the body to fight or flight at the time of danger.
 (c) **Testes:** They secrete testosterone hormone which controls secondary sexual characters in males.
 (d) **Ovaries:** They secrete oestrogen hormone which controls secondary sexual characters in females.
 (e) **Thyroid gland:** It secretes thyroxine hormone which regulates metabolism and growth of the body.
2. (a) In females, at the time of release of ovum from the ovary, the lining of uterus becomes thick to implant the anticipated embryo. If the ovum is not fertilised, the lining of uterus and ovum are shed with bleeding. This results in menstruation.
 (b) AIDS is Acquired Immune Deficiency Syndrome. It is caused by HIV. It is transmitted by using HIV-infected syringes, sexual contact with infected person and by transfusion of HIV-contaminated blood.

3. Following physical changes are observed during adolescence in boys and girls:
 - (a) They grow in height and have changes in their body shape.
 - (b) They have changes in voice. The boys develop hoarse voice, whereas the girls develop high-pitched voice.
 - (c) They develop the problem of acne and pimples on the face due to increased activity of sweat and sebaceous glands.
 - (d) They develop secondary sexual characters by which a male is distinguished from a female.
 - (i) Boys have growth of beard, moustaches, pubic hair and hair on the chest and thighs.
 - (ii) Girls develop breasts, have growth of pubic hair and widening of region below the waist.

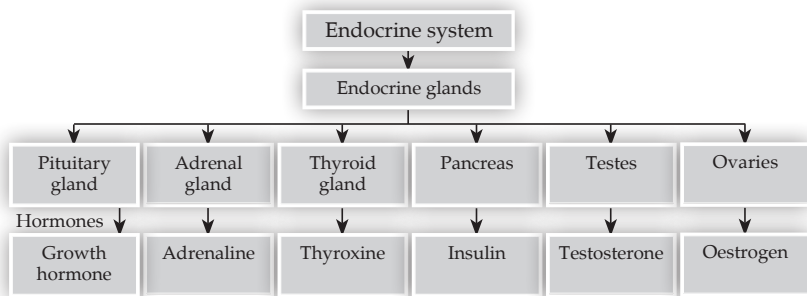
HOTS

1. During adolescence, both sweat and sebaceous glands become more active. If their openings are closed and not cleaned properly, they form acne and pimples.
2. The endocrine glands do not have ducts. They discharge their secretions (hormones) directly in the blood. The blood transports hormones to target organs of the body.

Value-based Questions

1. Testosterone hormone is responsible for secondary sexual characters in males.
2. Sameer is a keen observer and a curious person.

LET'S MEMORISE



11. Force and Pressure

Checkpoint 1

1. force
2. push; pull
3. interaction
4. each
5. more; one

Checkpoint 2

1. When an object is in direct or indirect contact with the source of force applied, the force is called contact force.
2. Friction is a force that comes into play whenever a body tries to move over the surface of another body.
3. Electrostatics is the study of charged objects and their behaviour.

Checkpoint 3

1. pressure
2. broad
3. directions
4. atmosphere

Let's Drill Our Skills

- A.** 1. (c) 2. (c) 3. (c) 4. (d)
- B.** 1. speed; direction/shape 2. interaction 3. contact 4. noncontact
5. pressure
- C.** 1. Force is a push or pull which can change the shape, state of rest or motion, speed or direction of a body.
2. Force acting per unit area is called pressure.
3. The force exerted by a magnet on magnetic materials is called magnetic force.
4. The force exerted per unit area on a surface by the weight of the air above that surface is called atmospheric pressure.
- D.** 1. The force of attraction due to mass of the earth is called gravity.
2. A push or a pull acting on a body is called force.
3. The pressure caused by atmosphere is called atmospheric pressure.
4. The force that acts on a body from a distance is called noncontact force.
- E.** 1. A push or pull is called force. It has following effects:
(a) It can stop a moving object.
(b) It can move an object lying at rest.
(c) It can change the speed of an object.
(d) It can change the direction of a moving object.
(e) It can change the shape of an object.
2. Broadly, there are two types of force:
(a) **Contact force:** The force which acts on an object by direct or indirect contact is called contact forces, e.g., muscular force, mechanical force and friction.
(b) **Noncontact force:** The force which does not need physical contact with the object on which it is acting is called noncontact force, e.g., gravitational force, electrostatic force and magnetic force.
3. The tips and edges of cutting and piercing tools are made sharp so that they can pierce and cut an object easily. It is because sharp edges and tips have less area and hence exert more pressure.
4. A rolling ball stops after moving some distance due to the friction exerted by the ground which opposes the motion of the ball.

5. Pressure depends on the following factors:
 - (a) **Force:** Pressure is directly proportional to force. More is the force applied, more is pressure.
 - (b) **Area:** Pressure is inversely proportional to area. More is the surface area on which pressure is applied, less is the pressure.
6. Pressure due to liquid increases with depth of the liquid. It is highest at the bottom and least at the top of liquid.
- F. 1. **Experiment to show that the pressure in liquids increases with depth:**

Take a tall throwaway soft drink glass. Fill it completely with water and keep it on the floor. Make three holes using a pin, along the height of the glass, one near the bottom, the other near the top and the third in the middle of the glass. Observe the water coming out of these holes. Note that the stream of water from the topmost hole falls nearest to the base of the glass, the stream from the central hole falls a little ahead and the stream from the hole near the bottom of the glass falls the farthest. This shows that the pressure in liquids increases with the depth of the liquid.



2. Atmospheric pressure is utilised in number of ways in everyday life as follows:
 - (a) The rubber air suckers used as hangers are stuck to the wall or almirah due to atmosphere pressure.
 - (b) The atmospheric pressure under parachute acting in upward direction, slows down the rate of falling of the person and helps in safe landing.
 - (c) Drinking through a straw becomes possible due to atmospheric pressure which forces the liquid from outside to rise in the straw.
3. Following are the types of contact force:
 - (a) **Muscular force:** It is the force exerted by muscles of the body to drag or lift objects. For example, lifting a bucket full of water.
 - (b) **Mechanical force:** The force exerted by a machine while doing a work is called mechanical force. For example, hitting a nail into the wall with the help of a hammer.
 - (c) **Frictional force or Friction:** The force which tends to oppose the motion is called frictional force. For example, a moving ball slows down and finally stops due to frictional force exerted by the ground.
4. Following are the types of noncontact force:
 - (a) **Gravitational force:** The force of attraction exerted by the earth on all objects is called gravitational force or gravity. For example,

a ball thrown in upward direction comes back on the earth due to gravity.

(b) **Electrostatic force:** The force which acts between electric charges is called electrostatic force. For example, electrostatic force is used to purify air by electrostatic precipitators installed in chimneys of factories.

(c) **Magnetic force:** The force exerted by a magnet on magnetic materials is called magnetic force. For example, magnetic force is used to separate waste iron objects from garbage.

5. Given, Force = 1000 N, Area = 5 m²

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

$$\text{Pressure} = \frac{1000 \text{ N}}{5 \text{ m}^2} = 200 \text{ Pa}$$

6. Given, Pressure = 450 Pa, Area = 0.5 m² and Force = ?

$$\therefore \text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

$$\therefore \text{Force} = \text{Pressure} \times \text{Area} = 450 \text{ Pa} \times 0.5 \text{ m}^2 = 225 \text{ N}$$

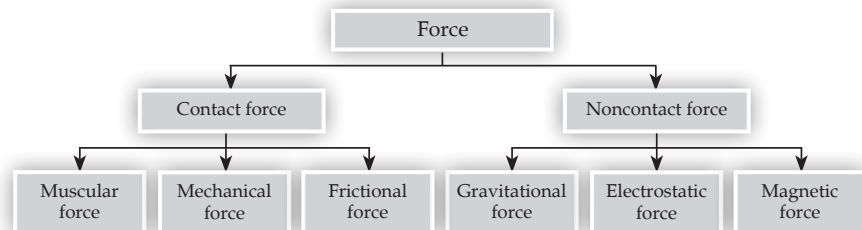
HOTS

1. The pressure applied on needle gets concentrated on its tip which is a very small area and hence, it pierces the cloth easily. But, to make the sword cut a surface, we have to apply much higher pressure due to larger surface area of the cutting edge of the sword. Hence, a sword cannot replace a needle.
2. The wall of a dam has broad base so that the force exerted by water is distributed over a wide area and the pressure on the wall gets reduced and is bearable to the ground.

Value-based Questions

1. The man lying on a bed of nails was not hurt because the pressure applied by all nails distributed all over his body equally.
2. Sahil is an aware person.

LET'S MEMORISE



12. Friction

Checkpoint 1

1. opposes
2. less
3. transforms
4. Friction

Checkpoint 2

1. less
2. reducing
3. lubricants
4. measure

Let's Drill Our Skills

- A.** 1. (d) 2. (d) 3. (a) 4. (d) 5. (a)
- B.** 1. less 2. smoother 3. interlocking 4. stopping; moving 5. drag
- C.** 1. Force of friction offered by fluids is called drag.
2. Sliding friction is the frictional force exerted by a surface on an object when it is actually sliding on the surface.
3. Lubrication is the process of reducing friction by applying oily or greasy substances to a surface.
- D.** 1. Spring balance is used to measure friction.
2. The other name for fluid friction is drag.
3. Ball bearings are kept in between two moving parts of a machine to reduce the friction.
4. Oil and graphite are lubricants.
5. Friction is caused by the interlocking of irregularities in the surface of two objects in contact.
- E.** 1. A ship has streamlined body to reduce friction exerted by the water.
2. Friction depends on the following factors:
(a) **Roughness of the two surfaces in contact:** Friction is more for rough surfaces than smooth ones.
(b) **Mass of sliding object:** Friction is large for sliding object of more mass than the less one.
(c) **Surface area in contact:** Larger the area of contact, more is the friction.
(d) Friction also depends upon the nature of the material of the two surfaces.
3. Static friction is the frictional force which acts when an object is at rest. On the other hand, frictional force exerted by a surface on an object when it is actually sliding on the surface is called sliding friction.
4. Ball bearing is a metal ball made of stainless steel, brass, etc. It is placed between moving surfaces to change sliding friction into rolling friction and thus, to reduce friction.
- F.** 1. Friction is essential in our everyday life. We are able to walk, hold things, write, etc. because of friction. On the other hand, it also gives undesirable results. It causes wear and tear of objects. For example, we walk on a surface comfortably because of friction between the surface and the soles of our shoes. At the same time, the soles of

shoes are worn-out with time by rubbing action on the surface due to friction.

2. Friction can be reduced by following methods:
 - (a) **Lubrication:** By applying lubricants such as oil, grease, graphite, etc. between the two surfaces, friction can be reduced.
 - (b) **Polishing:** It helps to reduce friction by reducing the irregularities and making the surface smooth.
 - (c) **Ball bearings:** Ball bearings reduce the friction between moving surfaces by changing sliding friction into rolling friction which is always less than sliding friction.
 - (d) **Using powder:** The powder forms a layer between the moving surfaces and hence, reduces the friction.
3. Friction can be increased by following methods:
 - (a) **By making the surface rough:** Rough surface offers greater friction which prevents slipping of moving object. For example, the tyres of vehicles and soles of shoes are provided with grooves which increase friction during movement.
 - (b) **By increasing the mass of the sliding object:** The friction is directly proportional to the mass of the sliding object. Therefore, more is the mass, larger is the friction.

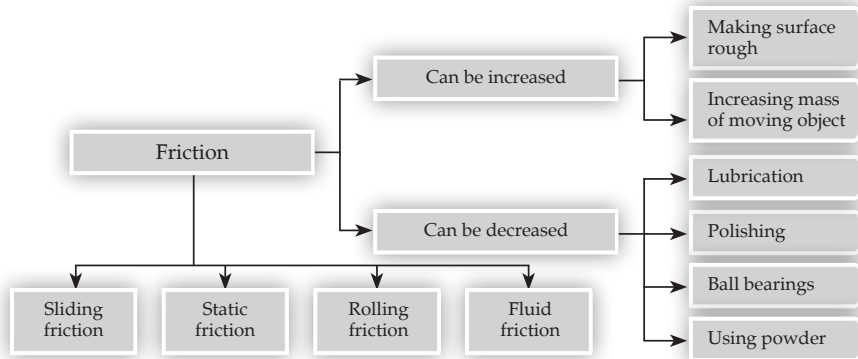
HOTS

1. Aircrafts have powerful engines which provide push to fly in the air. The streamlined body of aircraft reduces the friction offered by air and thus, helps it to move easily through the air.
2. Handles of motorcycles are covered with a rubber sheet having spikes on it so as to provide a good grip to the driver.

Value-based Questions

1. Grease and graphite can be used to reduce friction.
2. Rajan's grandfather is a knowledgeable person. This incident gives the message that by interacting with old people, we learn valuable things.

LET'S MEMORISE



13. Sound

Checkpoint 1

1. vibrating
2. vibrate
3. stretched skin
4. thickness; tightness
5. wind

Checkpoint 2

1. medium
2. solids; liquids; gases
3. 340 m/s

Checkpoint 3

1. time period
2. 20 Hz; 20,000 Hz
3. infrasounds
4. musical sounds
5. noise

Let's Drill Our Skills

A. 1. (b) 2. (c) 3. (b) 4. (a)

B. 1. vacuum

2. gases
3. below 20 Hz
4. hertz (Hz)
5. larynx
6. pitch

C. 1. The number of vibrations (oscillations) made by a object in one second is termed as frequency.

2. The maximum displacement of a particle or an object from its mean position to its either side is termed as its amplitude.

3. The soothing, pleasant and refreshing sound is called music.

4. The irritating, unpleasant and tiring sound is called noise.

D. 1. The sensation of vibrations is called pitch.

2. Vibrations of frequency above 20,000 Hz are called ultrasound.

3. Sound is produced by the vibrations of a body.

4. The SI unit to measure the level of sound is decibel (dB).

E. 1. Musical instruments are of following types:

(a) **String instruments:** Guitar, violin, sitar and dilruba

(b) **Percussion instruments:** Bass drum, dholak, tabla, bongo and congo

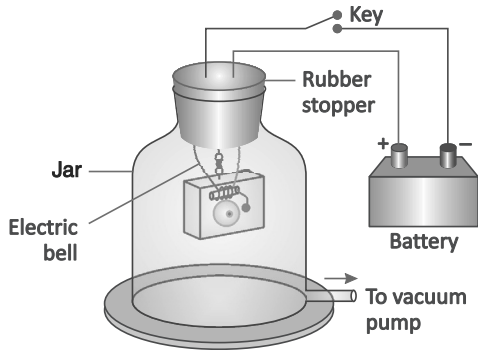
(c) **Wind instruments:** Trumpet, shehnai, flute and bugle

(d) **Keyboard instruments:** Harmonium and piano

(e) **Electronic instruments:** Synthesiser

2. **Activity to show that sound needs a medium to travel:**

Place an electric bell in an air-filled jar fitted with a vacuum pump. Switch the bell on. You can hear the ringing sound of bell. Now, suck out the air from the jar using a vacuum pump. Now, switch on the electric bell. You cannot hear the sound this time because air is removed which is needed by the sound to travel.



3. The loudness of a sound depends on its amplitude. When the amplitude of a sound wave is high, it will produce a loud sound, whereas at low amplitude it will produce soft sound. Also, the loudness of a sound is directly proportional to the square of the amplitude. Therefore, if the amplitude is doubled, the loudness increases four times.

4. The sounds below 20 hertz are called infrasounds, whereas those above 20,000 hertz are called ultrasounds. The infrasounds and ultrasounds are inaudible to human ear. However, a human child at infancy can hear infrasounds.

5. Music refers to soothing and pleasant sounds. They have refreshing effect on our health. On the other hand, irritating, unpleasant and tiring sounds are called noise. Noise causes annoyance, aggression, hypertension, high stress level, hearing loss, sleep disturbance and tinnitus.

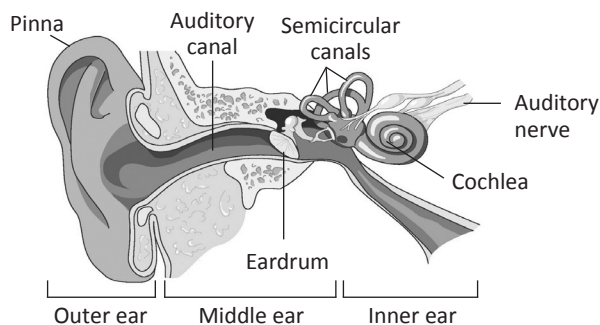
F. 1. Noise pollution is the unwanted and displeasing human created sound that disrupts the environment.

Harmful Effects of Noise Pollution: Noise can cause annoyance and aggression, hypertension, high stress level, hearing loss, sleep disturbance and tinnitus. Tinnitus can lead to forgetfulness, severe depression and at times, panic attacks. High noise pollution can cause cardiovascular disorders.

Measures to control noise pollution: Following measures should be taken to control noise pollution:

(a) The speed and number of vehicles on the roads should be limited.

- (b) The traffic controls should be strictly followed.
 - (c) The sound of the audio entertainment systems should be kept low.
 - (d) The volume of speakers during religious and family functions should be kept low.
2. In humans, the sound is produced by an organ called larynx or voice box. It is located at the upper end of the windpipe. The larynx has vocal cords. When the lungs force out air through the larynx, the vocal cords vibrate and produce sound. The volume of sound produced is controlled by increasing or decreasing the amount of air passing through the vocal system.
 3. **Structure of human ear:** Human ear has following three parts:
 - (a) **The outer ear or pinna:** It is like the shape of a microphone which is connected to auditory canal.
 - (b) **The middle ear:** It is an air-filled cavity which is formed of eardrum and three small bones.
 - (c) **The inner ear:** It is formed of three semicircular canals and cochlea. The cochlea is connected to auditory nerve.



Working of human ear: When the sound waves move in the air, the outer ear collects and directs them into the auditory canal. These sound waves vibrate the eardrum which causes the three small bones to vibrate. The small bones send the vibrations to the inner ear. The inner ear transforms the sound energy into nerve impulses which are carried to the brain by auditory nerve. The brain perceives these impulses as sound.

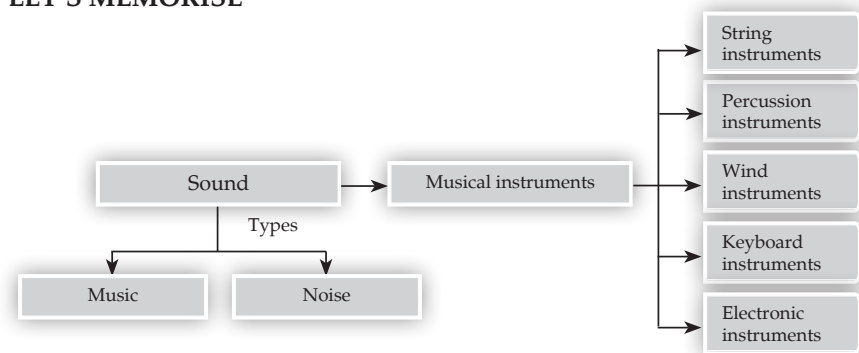
HOTS

1. Astronauts are not able to talk with each other on the surface of the moon because there is no atmosphere on the moon and sound waves need a material medium to travel.
2. Humans are not able to listen very low-frequency vibrations because they are unable to cause vibrations in the eardrum.

Value-based Questions

1. The clean and peaceful area is free from noise pollution.
2. A busy road creates noise pollution which causes many diseases, for example, hypertension, depression, cardiovascular disorders, etc.
3. Noise pollution can be reduced by controlling the number of vehicles on the roads. The sound level of loudspeakers at public places should be kept low. There should be strict laws to control noise pollution.

LET'S MEMORISE



14. Chemical Effects of Current

Checkpoint 1

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

Checkpoint 2

1. The solution or paste which contains the electrodes and conducts the electric current through itself is known as electrolyte.
2. Johann Wilhelm Ritter discovered the process of electrolysis.
3. Depositing a thin layer of a metal on another metallic object with the help of electric current is known as electroplating.
4. Two main reasons for electroplating the objects are:
 - (a) to protect the metal underneath, and
 - (b) to produce an attractive finish.

Let's Drill Our Skills

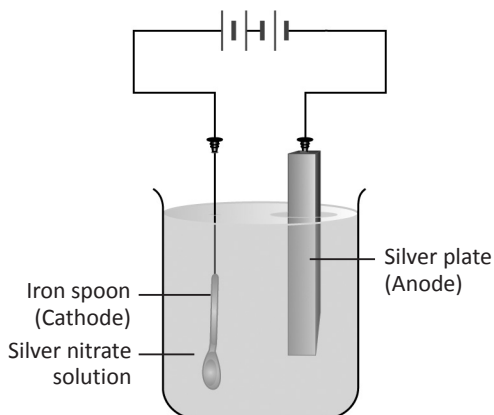
- A. 1. (c) 2. (b) 3. (d) 4. (d)
B. 1. good

2. bad
 3. electrolysis
 4. conductor; electric
 5. negative
- C.
1. The process of causing a chemical change in a solution by passing electric current through it, is called **electrolysis**.
 2. The process of depositing a layer of desired metal on other material by passing electric current is called **electroplating**.
 3. The electrode connected to the negative terminal of the battery is called cathode or the negative electrode.
 4. The electrode connected to the positive terminal of the battery is called anode or the positive electrode.
 5. The solution or paste which contains the electrodes and conducts electric current through itself is known as electrolyte.
- D.
1. The positive electrode used in the apparatus for electrolysis is called anode.
 2. The deposition of metal layer on an object of inferior metal is called electroplating.
 3. The total set up used for electrolysis is called voltameter.
 4. Generally, a salt is dissolved in pure water to make it a conductor.
- E.
1. Nickel and chromium can be used for electroplating.
 2. LED is a light emitting diode which can give light even in case of weak flow of current. It is used in electric testers, toys, computers, music systems, traffic lights, electric lights, street lights, etc.
 3. When electric current is passed through a conducting solution, it causes chemical reactions in it and following phenomenon may occur:
 - (a) Deposition of gas bubbles at the electrodes.
 - (b) Change in the colour of electrolyte.
 - (c) Decomposition of chemical compounds present in the electrolyte.
 - (d) Deposition of metal at cathode.
 4. Pure water is a bad conductor of electricity, whereas impure water is a good conductor of electricity because impure water contains a number of minerals in it which on passing electricity break into their parts and carry electricity.
 5. Electrolysis is used for refining impure metals into pure ones, extraction of metals from their ores and for electroplating.
 6. Chrome plating is done on a large number of objects such as fancy lights, toasters, automobile parts, taps, etc. to produce an attractive finish on them. Therefore, chrome plating is popular these days.
Chrome plating has harmful effects because it is done in chromic

acid which is a cancer-causing chemical. It may cause cancer to the workers employed for chrome plating.

F. 1. The procedure of electroplating can be explained with the help of following activity:

Take a metal spoon which is to be electroplated with silver metal. The metal spoon is connected to the positive terminal of battery and is made negative electrode, i.e., cathode. A plate of silver metal is connected with negative terminal of battery and is made positive electrode, i.e., anode. Silver nitrate solution is taken as electrolyte and is filled in voltameter. On passing electricity, the silver metal gets deposited on spoon and hence, the spoon gets coated with silver.



2. Electroplating is a process of coating a layer of desired metal on an object of other metal with the help of electricity. In electroplating, the desired metal which is coated is made positive electrode, i.e., anode, whereas the metal to be coated is made negative electrode, i.e., cathode. The salt solution of desired metal is taken as electrolyte. Electroplating has following applications:

- It is done to make cutlery items shiny.
- Electroplating of zinc metal called galvanisation protects steel articles from corrosion.
- Nickel and chrome plating on taps, bolts, fancy lights, etc. makes them attractive and shiny.
- Silver and gold plating is done on iron, copper, etc. for making cheaper jewellery.

HOTS

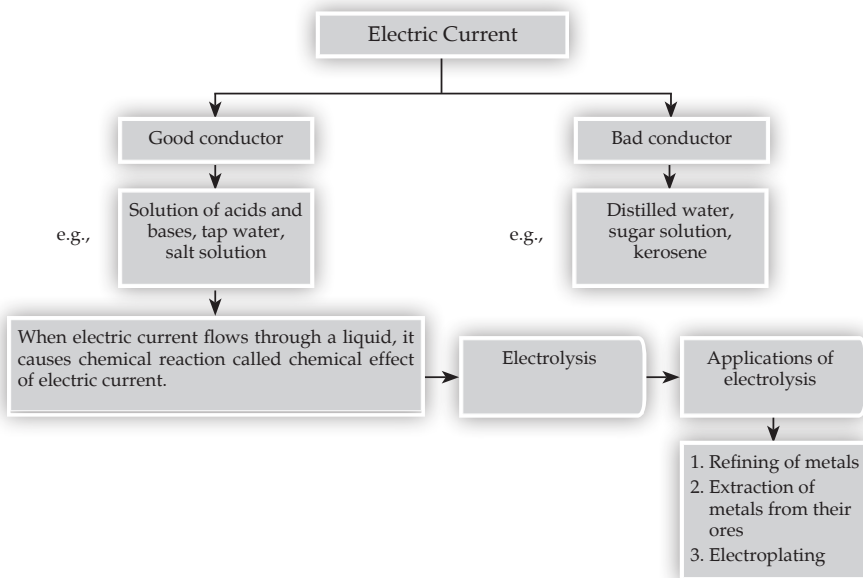
- No, plastic or wooden object cannot be coated with electroplating because plastic and wood are insulators and do not allow electric current to pass through them. Only good conductors of electricity can be electroplated.

- Though silver is the best conductor of electricity, it is not used to make electric wires because it is very costly. On the other hand, copper is cheaper and hence, is used to make electric wires.

Value-based Questions

- On touching electric switches with wet hand, water on wet hands conducts electricity and we may get electric shock.
- Raju is an aware and concerned person.

LET'S MEMORISE



15. Some Natural Phenomena

Checkpoint 1

- electroscope
- repel
- good
- discharging
- negatively
- lower; equal

Checkpoint 2

- (a) upper part (b) expansion (c) away (d) lightning conductor (e) Lightning; clouds
- (a) A huge electric spark taking place among clouds, sometimes between clouds and the earth, is called lightning.

- (b) A safety device fitted on top of high buildings to protect from lightning is called lightning conductor.

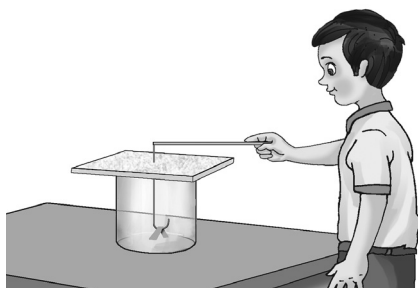
Checkpoint 3

1. seismic waves 2. plates 3. convection currents 4. 5500°C
5. mud; timber

Let's Drill Our Skills

- A.** 1. (a) 2. (b) 3. (d) 4. (c) 5. (b)
- B.** 1. lightning
2. lightning conductor
3. similar charges
4. electrons
5. plate joint
6. seismograph
7. harmless
8. electrons
- C.** 1. An earthquake is a sudden, sometimes, violent movement of parts of the earth's surface due to the release of energy from under the earth's crust.
2. Seismograph is an instrument used to detect and record seismic waves during an earthquake.
3. Richter scale is a scale used to measure the magnitude of an earthquake. On this scale, magnitude of earthquake is measured in whole numbers and decimal numbers. Every whole number has a value equivalent to 10 times the previous whole number.
4. Electroscope is a device used to detect the presence of charge on an object.
5. Removing charge from a charged body with the help of a conductor is called discharging.
6. The point on the surface of the earth, just above the focus where an earthquake originates, is called epicentre.
- D.** 1. The point on the earth's crust is called epicentre.
2. Lightning conductor protects buildings against damage from lightning.
3. An electroscope can detect the presence of charge on a body.
4. Negative charge.
5. An earthquake prone area is called seismic zone.
- E.** 1. An object gets charged by rubbing and touching with a charged body or by taking it near to a charged body. This causes transfer of charge from charged body to uncharged body.
2. The earthquake prone places in India are Central Himalayas, Western Himalayas, Kashmir, whole of North-East India, Kutch, Rajasthan and few areas in South India.

3. Seismograph is an instrument which is used to detect and record seismic waves during earthquake. It has a pendulum which is attached to a pen and has a long strip of paper rolled on a drum under the pen. When an earthquake occurs, pendulum and pen vibrate and the roll of paper moves under the vibrating pen. This leaves the marks of vibrations on the paper. The recorded vibrations are studied thoroughly.
 4. Take a glass rod and rub it with a silk cloth. The glass rod attains positive charge while silk cloth attains negative charge. This shows that when two bodies are rubbed, they get oppositely charged.
 5. The process of removing charge from a charged body with the help of a conductor is called electric discharge. It occurs when a charged body comes in contact with an uncharged or neutral body and electric charge is transferred from the charged body to the neutral body.
 6. (a) During lightning, one should stay away from doors and windows.
(b) One should not stand under a tree for cover.
- F. 1. An electroscope consists of two thin metal strips connected to a metal knob by a rod.
When a charged object is touched with the knob of electroscope, some charge from the object is transferred to metal strips through the metal rod. The metal strips repel each other due to having similar charge.



Detection of charge with an electroscope

2. **Structure of lightning conductor:** It consists of a long metal rod, fixed with a side wall of the building to be protected such that its upper end protrudes much above the top of the building. The upper end of the rod is made into the shape of a trishul or is fragmented into large number of pointed rods. The lower end of the rod runs deep under the earth, where it is joined with an already buried huge copper plate.

Working of lightning conductor: When lightning strikes, the upper pointed ends of the lightning conductor quickly absorb the charges, the long metal rod gives them an easy path to flow down to earth and the copper plate helps in a quick distribution of charge.

3. The lightning is caused when clouds get charged by rapidly moving particles of water and ice inside them. The upper part of clouds gets positively charged while lower part has negative charge. The negative charge of clouds is attracted by positive charge on the ground. When attraction between these opposite charges becomes strong, electricity flows from the clouds to the ground. This causes lightning in the sky.
4. An earthquake is caused by high pressure developed due to convection currents in the mantle of the earth. This high pressure makes two plates slide past each other at plate joint. This causes trembling and shaking of the ground, which is known as earthquake.
5. Following precautions should be taken at home during an earthquake:
 - (a) Attain minimum height by lying or sitting.
 - (b) Cover head with pillow, etc. or take shelter under a strong table.
 - (c) Stand at the corner of a room.
 - (d) Do not stand near the exterior walls of the house.
 - (e) Do not run out of the house.
 - (f) Hold on till the seismic waves are over.
6. Following precautions should be taken when outside during lightning:
 - (a) Do not stand under a tree for cover.
 - (b) Do not use umbrella, lawnmower, bicycle, etc.
 - (c) Do not stand near fences, benches or tall poles.
 - (d) Seek cover indoors quickly or in a car with closed windows.
 - (e) If swimming or boating, seek shelter on land quickly.
 - (f) Crouch low with head bent in between the arms and legs close together.

HOTS

1. The surface of the earth is widespread and contains a huge amount of ions in it. That is why, it does not get charged.
2. Covering under strong objects during an earthquake is not really safe because it cannot save us in case the building collapses. But it can surely save us from the falling objects during the earthquake.

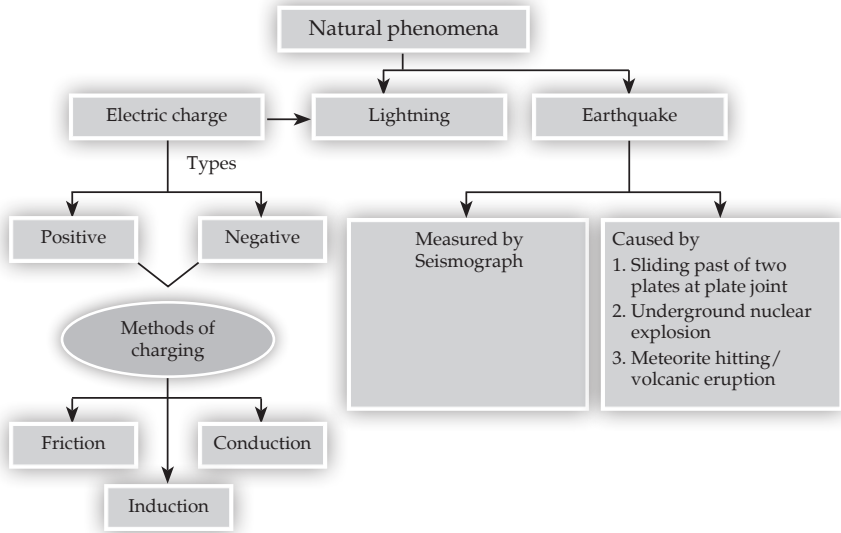
Value-based Questions

1. The speed of light is greater than the speed of sound in air. Therefore, lightning occurs before the sound of thunder.
2. To avoid accidents due to lightning, one seek cover indoors immediately and stay away from doors, windows, plumbing, etc. If caught outside, do not stand under a tree. Do not use umbrella, etc.

and crouch low with head bent in between the arms and legs close together.

3. Drishti is an aware and intelligent person.

LET'S MEMORISE



16. Light

Checkpoint 1

- (a) reflected; plane
(b) equal; angle
(c) regular
- (a) The angle formed between the normal and the reflected ray is called angle of reflection.
(b) A ray of light falling on a surface is called incident ray while a ray of light travelling in a changed direction after reflection from a surface is called reflected ray.

Checkpoint 2

- kaleidoscope; multiple
- infinite
- reflected; multiple
- reflection; heights
- white light

Checkpoint 3

- (a) pupil (b) ciliary muscles (c) relax (d) optic nerve; brain
(e) photoreceptors (f) six (g) e
- (a) The minimum distance at which a normal human eye can read or see without any strain is called least distance of distinct vision.

- (b) The point on the retina where the optic nerve is connected to it, lacks photoreceptors and the image formed at this point is not sensed by the eye. This point is called the blind spot.

Let's Drill Our Skills

- A. 1. (d) 2. (b) 3. (d) 4. (b)
- B. 1. angle; reflection
2. diffused
3. laterally
4. retina
5. cone
6. six; embossed
- C. 1. When a ray of light falls on a smooth surface, it bounces back into the same medium. This bouncing of light in the same medium is called reflection.
2. The ability of the eye to change the focal length of lens to see nearby and distant objects is called power of accommodation of eye.
3. Persistence of vision is the phenomena in which image produced in the human eye is retained for a short period of time after the removal of object. The image retains for $1/16^{\text{th}}$ of a second.
4. A kaleidoscope is a tube of mirrors, containing loose and small coloured objects, to show their multiple images.
- D. 1. The perpendicular drawn to the reflecting surface at the point of incidence is called normal.
2. The angle between the reflected ray and normal is called angle of reflection.
3. Ciliary muscles hold the eye lens in the human eyeball.
4. In farsightedness or hypermetropia, a person can see distant objects clearly, but cannot see nearby objects clearly.
5. The nonuniform reflection from an uneven surface is called diffused reflection.
- E. 1. The laws of reflection are as follows:
(a) When a ray of light falls on a plane smooth surface, it reflects in the same medium in such a way that the angle of incidence is equal to the angle of reflection.
(b) The incident ray, the reflected ray and the normal always lie in the same plane.
2. The characteristics of the image formed by plane mirror are as follows:
(a) Image is erect and of same size as the object.
(b) Image is formed at the same distance behind the mirror as the object is placed in front of it.
(c) Image is virtual and erect.

- (d) Image shows lateral inversion, i.e., the left side of the object appears on the right side of the image and the right side of the object appears on the left of the image.
3. (a) **Regular reflection:** Reflection from a highly polished surface is called regular reflection.
It reflects parallel beam of light in one direction, e.g., reflection from a plane mirror.
- (b) **Irregular reflection:** Reflection from a rough surface is called irregular or diffused reflection.
It reflects parallel beam of light in different directions. Therefore, due to diffused reflection, no image or blurred image is formed.
4. The splitting of light into its constituent colours is called dispersion of light. The white light splits into seven colours which are violet, indigo, blue, green, yellow, orange and red.
5. Myopia is a defect of eye in which a person can see nearby objects but is unable to see distant objects clearly. It can be corrected by using spectacles with concave lenses of suitable focal length.
6. Hypermetropia is a defect of eye in which a person can see distant objects, but cannot see nearby objects clearly. It can be corrected by using spectacles with convex lenses of suitable focal length.

7. \therefore The angle between two mirrors = 60°

$$\therefore \text{The number of images formed will be} = \frac{360^\circ}{\theta} - 1$$

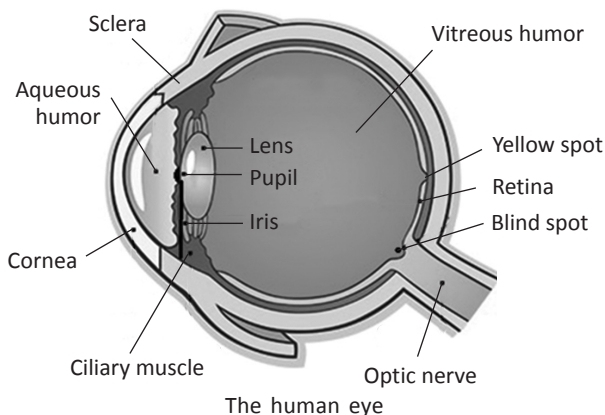
$$= \frac{360^\circ}{60^\circ} - 1$$

$$= 6 - 1 = 5$$

Thus, 5 images will be formed.

8. The least distance for distinct vision is 25 cm. This is the distance at which a normal human eye can read or see objects without any strain.
- F. 1. The eye has following parts:
- (a) **Sclera:** It is the white part of the eye which is filled with a clear watery fluid. It gives shape to the eye and protects inner parts of the eye.
- (b) **Cornea:** It is the clear transparent front part of the eye which is without blood vessels. It allows the light to enter the eye.
- (c) **Iris:** It is the coloured part of the eye which helps pupil to change its size.
- (d) **Pupil:** It is an opening in the centre of iris. It becomes narrow and wide with the help of iris and controls the amount of light entering the eye.
- (e) **Retina:** It is the layer of the eye where image of the object we see, is formed. It has rods and cones photoreceptor cells. These cells help to see in dark and in perceiving the colours respectively.

- (f) **Lens:** It is a biconvex and transparent structure which forms the image of object on the retina.
- (g) **Ciliary muscles:** These are transparent jelly-like muscles. They help in the accommodation of the eye by changing the focal length of the lens.
- (h) **Aqueous humor:** It is a watery fluid filled between the lens and the cornea.
- (i) **Vitreous humor:** It is a transparent jelly-like substance filled in the interior of eye. It maintains the shape of the eye and causes refraction of light before reaching the retina.
- (j) **Optic nerve:** It connects eye to the brain and carries impulses of the image formed on the retina to the brain.
- (k) **Blind spot:** It is the point on the retina where optic nerve is connected. No image is formed here.



2. Following measures and precautions should be taken to maintain healthy eyes:
 - (a) Eyes should be washed every day with fresh and clean water at normal temperature.
 - (b) Do not ever look at very bright sources of light like the sun or a welding spark directly.
 - (c) Do not read or write in too dim or too bright light.
 - (d) Avoid wearing contact lenses for more than 12 hours at a stretch.
 - (e) Never rub the eye if a dust particle or a metal particle gets into it. Instead wash the eye with cold and clean water and go to a doctor.
 - (f) Always keep book at the minimum distance of 25 cm for reading.
 - (e) Take vitamin A rich diet for the nourishment of eyes.
3. Cataract is an old age eye defect in which the eye lens becomes opaque due to deposition of eye fluids on it. Such lens forms a blurred image of an object.

Cataract can be corrected by a technique called phacoemulsification in which defective lens is replaced by an artificial lens.

- 4. Construction of kaleidoscope:** Take three strips of plane mirrors of equal sizes, about 15 cm long and 4 cm wide. Join the long edges of the mirror strips, with an adhesive tape on their outer side, so that their reflecting surfaces face each other and they form a triangular tube. Close one end of the triangular tube with a small triangular sheet of glass. Paste a piece of butter paper on the outer side of the triangular glass sheet. Put some small coloured objects such as coloured beads, stars, broken pieces of bangles or plastic toys from its open end, in the tube. Finally, close the open end of the tube with a piece of cardboard, having a 2 mm wide hole in its centre.

Working of kaleidoscope: Look through the hole of the kaleidoscope with one eye. Rotate the kaleidoscope to see the different and new patterns made by the coloured objects. Kaleidoscope works on the principle of multiple reflection.

- 5. A periscope is a rectangular tube, bent twice at an angle of 90° at its two ends. It has two plane mirrors fitted at an angle of 45° at its joints.**

Working of periscope: The rays of light travelling from the object to be seen, fall on the first mirror, from where they are reflected and sent to the second mirror. The reflected light from the second mirror is received by the eyes of the observer, who is able to see the object.

Application of periscope: It is used in submarines to detect objects at different heights from that of the viewer.

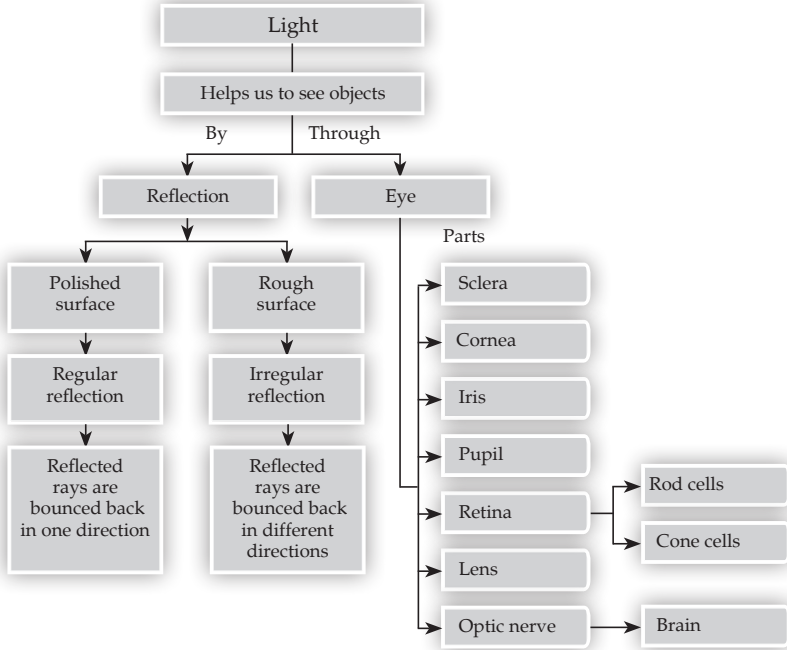
HOTS

- Though the reflection on a rough surface follows the laws of reflection, but the reflected rays never meet or appear to meet at a point due to irregular reflection. Hence, no image is obtained.
- If the light sensitive cells or photoreceptors are completely missing from the retina of a person's eyes, the person will not be able to see at all.
- For a slow motion film, the rate of flashing the stills should be more than 16 stills per second. It is because the image of an object persists on retina for $1/16$ of a second and if the number of flashing is less than 16, it will become a still picture.

Value-based Questions

- Lateral inversion.
- Image formed by a plane mirror is virtual, erect and of same size as the object.
- The people giving space to ambulance are responsible, aware and sensitive citizens.

LET'S MEMORISE



17. Stars and the Solar System

Checkpoint 1

1. seven
2. Ursa minor
3. north star
4. hunter
5. east; west; earth

Checkpoint 2

1. sun
2. eight
3. dwarf
4. Jupiter

Checkpoint 3

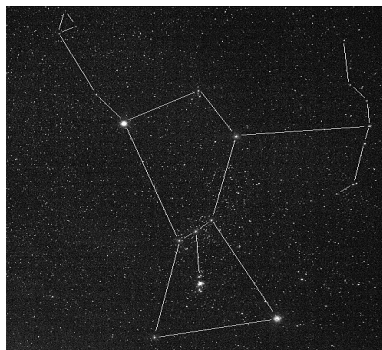
1. (a) phases
(b) full
(c) waning
(d) crescent
2. (a) When the moon appears as a full circular disc, it is known as full moon.
(b) When the moon is not visible at all, it is known as new moon.
(c) The decreasing size of the moon, from a full moon to the new moon, is called waning moon.

Let's Drill Our Skills

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

- B.**
1. near side
 2. temperature
 3. Venus
 4. ice; dust
 5. artificial satellites
 6. ultraviolet
 7. Mars; Jupiter
- C.**
1. Satellite made by man is called artificial satellite.
 2. Light year is a unit of distance. It is the distance travelled by light in one year which is equal to 9.46×10^{12} km.
 3. Constellation is a group of stars which resembles an already known shape, for example, Orion resembles the shape of a hunter.
 4. A wide ring of rocky objects in between the orbits of Mars and Jupiter is called asteroid belt.
- D.**
1. The sun.
 2. The nearest celestial object to the earth is called Moon.
 3. The sun is the nearest star to our earth.
 4. Neptune is the last planet of our solar system.
 5. The sun is located at the centre of the solar system.
- E.**
1. Ursa Major is commonly known as Vrithat Saptrishi or the Great Bear. It has seven prominent stars in it, which are arranged in an outline similar to that of a big ladle.
Ursa Minor is also called Laghu Saptrishi or Small Bear. It has seven prominent stars including the Pole Star.
 2. A heavenly body that revolves around the sun is called planet. There are eight planets in our solar system. They are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.
 3. Asteroids are rocky objects of different sizes revolving around the sun. They are found in a wide ring in between the orbits of Mars and Jupiter called the asteroid belt.
 4. The satellite made by man is called artificial satellite. It is made to revolve around the earth for studying different celestial bodies, weather forecasting, remote sensing, etc.
The first artificial satellite launched by India was Aryabhata. It was launched on 19th April 1975.
 5. Light year is a unit of measuring distance in the universe. It refers to the distance travelled by light in one year.
One light year is equal to 9.46×10^{12} kilometres.
- F.**
1. The moon has following phases:
 - (a) **New moon:** It is the phase of the moon, when its non-illuminated half faces the earth and the moon is not seen at all.
 - (b) **Waxing crescent:** It is the phase, when a part of its illuminated half is seen as curve which goes on increasing.

- (c) **First quarter moon:** This is the phase, when we see only half of the illuminated part of the moon.
 - (d) **Waxing gibbous moon:** It is the phase, when we see bigger portion of the illuminated moon than the first quarter moon.
 - (e) **Full moon:** In this phase, we see the full-illuminated moon in the form of a circular disc. At this time, the position of the sun and the moon is on the opposite sides of the earth.
 - (f) **Waning gibbous moon:** During this phase, the illuminated part of the moon decreases continuously.
 - (g) **Last quarter moon:** During this phase, we see only half of the illuminated part of the moon.
 - (h) **Waning crescent moon:** During this phase, the moon reduces to a thin curve.
2. Following conditions make the existence of life possible on the earth:
- (a) **The distance from the sun:** The earth is at the optimum distance from the sun that it receives just a moderate amount of heat and light from the sun.
 - (b) **Presence of atmosphere:** The earth has a thick cover of atmosphere around it which benefits in following ways:
 - (i) It has oxygen which is an essential component of life.
 - (ii) It maintains a moderate temperature range during day and night.
 - (iii) It has a thick layer of ozone which protects the earth from the harmful ultraviolet rays of the sun.
 - (c) **The appropriate amount of gravity:** The gravity of the earth holds the water and the atmosphere to its surface.
3. Constellation is a group of stars which resembles an already known shape.
- (a) **Orion:** Orion is the constellation which resembles the shape of a hunter. It is visible on late winter evenings. It has eight member stars.



Orion constellation

- (b) **Cassiopea:** Cassiopea resembles to the capital W or an M. It is seen during early winter nights in the northern part of the sky.



Cassiopea constellation

4. Artificial satellites have following applications:
- (a) Artificial satellites are used in radio and TV transmissions, and in telecommunication.
 - (b) They are used for weather forecasting.
 - (c) They are used for remote sensing to locate minerals and to study the surface of the Earth.
 - (d) They are used to study different celestial bodies like the Moon, asteroids, etc.
5. (a) **Meteor:** A meteor is a small rocky object which on entering the earth's atmosphere starts glowing due to friction of air. The moving meteor looks like a streak of light, therefore, called a shooting star or a falling star.
- (b) **Meteorite:** Some of the meteors entering the Earth's atmosphere are big enough and do not get completely evaporated. The unevaporated part of such meteors reaches the Earth's surface and is called a meteorite.
- (c) **Asteroid:** Asteroids are rocky objects of different sizes revolving around the sun. They are found in a wide ring in between the orbits of Mars and Jupiter called the asteroid belt.
- (d) **Comet:** Comets are lumps of ice and dust, which periodically come into the centre of the solar system from somewhere outside. They have a long tail of dust and gases and are always directed away from the sun.

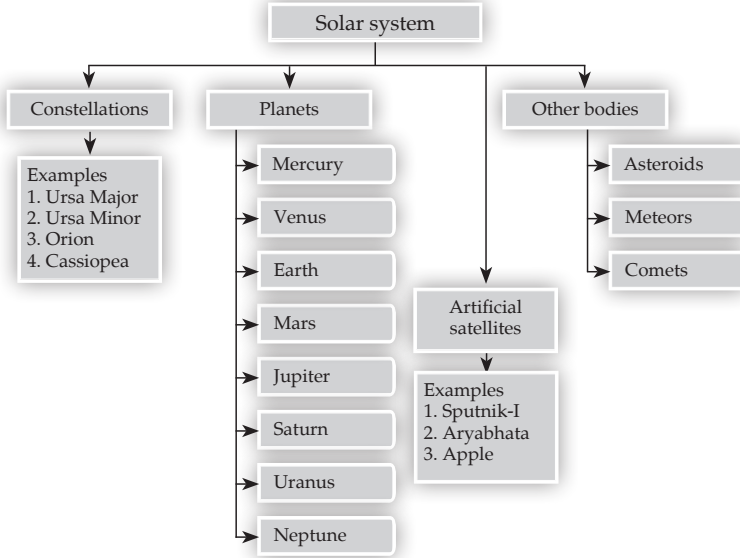
HOTS

1. Pluto was considered a planet till August 2006 because it possesses some of the characteristics of planets. But now, with the discovery of some more objects like it, it is considered a dwarf planet.
2. The tail of comet always points away from the sun because it is made up of hot gases which are released from the evaporating comet.
3. A meteorite is the unevaporated mass of some heavenly object which reaches the surface of the earth. It provides information about the nature of matter present in the outer space.

Value-based Questions

1. The falling of meteors within the atmosphere of the earth is called meteor shower.
2. Sunita's mother has scientific perception.

LET'S MEMORISE



18. Pollution of Air and Water

Checkpoint 1

1. Rain with acids dissolved in it is called acid rain.
2. Burning of dry leaves releases a lot of harmful gases which cause air pollution. Hence, burning of dry leaves should be discouraged.
3. Carbon dioxide and methane.
4. An increase in the earth's average temperature due to trapping of heat in the atmosphere is called global warming.
5. Yes, deforestation is also leading to global warming. As a result of deforestation, more carbon dioxide is being accumulated in the atmosphere. Carbon dioxide allows the sun's rays to reach the earth's surface but prevents the heat given out by the ground from escaping. This results in global warming.

Checkpoint 2

1. third
2. Stubble
3. Compressed Natural Gas (CNG)
4. Pollution Under Control (PUC)
5. lead

Checkpoint 3

1. Water containing wastes and contaminants like soaps, shampoos, detergents, etc., is called sewage.
2. The mixing of harmful substances like sewage, toxic chemicals from industries, animal wastes, human wastes, etc., with water is called water pollution.
3. The fertilisers that get washed away by rain into the waterbodies act as nutrients for algae and help them grow fast and cover the entire water surface of lakes and ponds. This is termed as algal bloom.
4. Dirty water can be cleaned by boiling, using candle filters and by chlorination.

Let's Drill Our Skills

- A. 1. (c) 2. (c) 3. (d)
- B. 1. Carbon monoxide 2. Ozone 3. smoke; fog 4. Sulphur dioxide; nitrogen dioxide 5. Lead
- C. 1. The water which is fit for drinking is called potable water.
2. The rain with acids dissolved in it is called acid rain.
3. Addition of harmful substances to air is called air pollution.
4. The warming of the earth's surface due to the trapping of heat by carbon dioxide present in the earth's atmosphere is called greenhouse effect.
- D. 1. Water fit for drinking is called potable water.
2. Carbon dioxide is a major greenhouse gas.
3. Compressed Natural Gas.
4. Chlorine is used to purify water.
- E. 1. Water can be made safe for drinking by following ways:
(a) **Boiling:** It kills the germs present in water.
(b) **Chlorination:** It is carried out by adding specified amount of chlorine tablets to water. Chlorination kills the germs which cause waterborne diseases.
2. Chlorofluorocarbons damage the ozone layer in the atmosphere which saves us from harmful ultraviolet rays of the sun. Due to damaged ozone layer, we will be exposed to harmful ultraviolet rays and may suffer from skin cancer, eye diseases, etc.
3. Following are the sources of air pollution:
(a) Smoke from forest fires.
(b) Dust from dust storms.
(c) Smoke, ash and harmful gases from volcanic eruptions.
(d) Burning of fossil fuels like coal and petroleum.
(e) Vehicular emission by burning of petrol and diesel in vehicles.
4. The inhalation of ozone causes headache, chest pain, coughing and irritation in eyes. It causes dryness in mouth, nose and throat. It changes visual acuity.

5. Algal bloom is the excessive growth of algae in a waterbody due to presence of fertilisers. Algal bloom decreases the amount of oxygen in the waterbody which affects aquatic life adversely.
- F. 1. Ganga Action Plan is a project which was launched in 1986 to save the Ganga river from pollution. The main objective of this plan was to improve the water quality of river Ganga by interception, diversion and treatment of domestic sewage and industrial chemical wastes entering the river and polluting its water.
2. Addition of harmful substances like dust, smoke, ash, gases, etc. to air is called air pollution.
Air pollution can be reduced by the following ways:
- (a) Using only unleaded petrol which does not release lead on burning.
 - (b) Using CNG (Compressed Natural Gas) in vehicles as it is a cleaner fuel.
 - (c) Commuting to the work place and back by public transport or by car pooling.
 - (d) Getting pollution checked of the vehicles at regular intervals.
 - (e) Using less polluting energy resources.
 - (f) Making compost from dry leaves instead of burning them.
 - (g) Growing more trees near roads and residential areas.
 - (h) Creating awareness among people by organising debates, quizzes, street plays, etc.
3. Water pollution can be reduced by the following ways:
- (a) The wastes from factories and domestic sewage should be treated before disposing them into waterbodies.
 - (b) Fertilisers and pesticides should be used in appropriate amount to prevent them from getting washed away with rainwater.
 - (c) Cattle dung and human excreta should not be allowed to mix with river or lake water.
4. The rain containing acids dissolved in it is called acid rain. The gases like sulphur dioxide and nitrogen dioxide from vehicles, power plants, factories, etc. mix into air. They react with water vapour and form sulphuric acid and nitric acid respectively. These acids dissolve in rainwater and fall on the earth as acid rain.

Harmful effects of acid rain:

- (a) Acid rain contaminates waterbodies and kills aquatic animals.
- (b) It damages the leaves of trees, plants, etc.
- (c) It damages the buildings, monuments and statues made of marble and limestone.
- (d) It makes the soil acidic.
- (e) It corrodes metal work and damages railway lines and bridges made of steel.

- (f) It causes health hazards to humans.
5. Water can be made safe for drinking by the following ways:
- Boiling:** By boiling, the germs present in water are killed and it becomes safe for drinking.
 - Candle filters:** This type of filters are used in homes to clean water.
 - Chlorination:** It is carried out by adding specified amount of chlorine tablets to water. Chlorination kills the germs which cause waterborne diseases.
6. Air pollutants, their sources and harmful effects

Air pollutants	Sources	Harmful effects
1. Carbon monoxide (CO)	Incomplete burning of fuels in industries, factories and vehicles	When inhaled, it combines with the haemoglobin of blood and reduces its oxygen-binding capacity.
2. Sulphur dioxide (SO ₂)	Burning of fossil fuels, refining of petroleum products	<ul style="list-style-type: none"> ● It causes respiratory problems and may even damage lungs. ● It combines with rainwater to form acid rain.
3. Nitrogen dioxide (NO ₂)	Burning of fossil fuels	<ul style="list-style-type: none"> ● It can cause lung congestion. ● It causes acid rain.
4. Excess of carbon dioxide	Combustion of wood, petrol, diesel, etc. and respiration	It increases temperature of the earth and causes global warming.
5. Chlorofluorocarbons	From refrigerators, airconditioners, and spray cans	<ul style="list-style-type: none"> ● They can damage the ozone layer. ● They can lead to skin cancer, disease of eyes, etc.

HOTS

1. Yes, it is a wise precaution to reduce the amount of carbon dioxide being released into the air. We can do this by burning less of coal, petrol and diesel and also by planting more and more trees.
2. CNG is a cleaner fuel as compared to petrol. CNG helps in reducing air pollution.

Value-based Questions

1. We can prevent harmful effects of acid rain by burning less of coal, petrol and diesel.
2. We can spread awareness about harmful effects of acid rain by organising debates, quizzes, street plays, poster making competitions, etc.
3. Mohit is a curious person.

LET'S MEMORISE

