



### Formative Assessment

**A. Tick (✓) the correct option :**

**Ans.** 1. (a)    2. (b)    3. (a)    4. (b)

**B. Write True or False :**

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

**C. Fill in the blanks :**

- Ans.**
1. The domestication of plant is called **agriculture**.
  2. The growing of same kind of plants is called **crop**.
  3. Levelling is done by **wooden soil leveller**.
  4. Sowing of seeds is done with the help of a **seed drill**.
  5. Unwanted plants which grow along with main crop are called **weeds**.
  6. The machine used for cutting and threshing of crops is called **thresher**.

### Summative Assessment

**A. Very Short Answer Questions :**

- Ans.**
1. **Agriculture** : The branch of science that deals with growing plants and raising live-stock for human use is called agriculture.
  2. Winter season
  3. **Irrigation** : Watering the crop plants.
  4. The most common weeds are Amaranthus (chaulai), Chenopodium (bathua) Convolvulus (hired khuri), wild oat, grass.
  5. The storage of grains on large scale is done in granaries and silos. the storage is necessary to protect the grains from pests, insects and rats.

**B. Short Answer Question :**

- Ans.**
1. A plant derives its nutrition largely from the humus layer and the top soil. Repeated farming depletes the soil of its nutrients supply and reduce crop growth. To prevent this, it is advisable to cultivate two different types of plants alternately. Example–Maize and wheat are grown alternately with Leguminous plants like groundnut. The groundnut plants with its nitrogen fixing bacteria, enriches the soil with nutrients. Rotating different crops thus ensures natural method of replenishment of nutrients. This method is called crop-rotation.
  2. In olden times, due to outdated agricultural implements, the production was less. But, nowadays new agricultural implements have boosted



agricultural practices and crop yielding along with rearing of livestock including poultry called Animal husbandry.

3. Weeding is done either by pulling weeds out with hand or with the help of trowel [Khurpa] or harrow or by using some chemical.
4. Some chemicals called pesticides are sprayed on crops to destroy pests.
5. The depth at which seed are planted is important because if we plant a seed very deeply it will not get sufficient air or water and if it is planted quite close to the surface it may blow out by the wind.

### C. Long Answer Questions :

**Ans.** 1. **Preparation of Soil :** The process of loosening and turning the soil is called ploughing.

Ploughing is done to facilitate ventilation in soil and makes it suitable for the growth of microorganisms and other organisms like earthworm which makes the soil fertile by decomposing the remains of plants and animals.

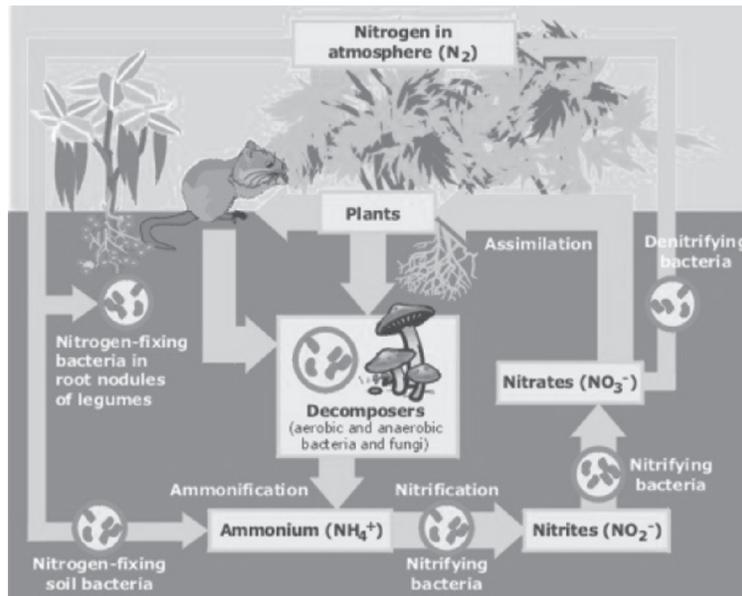
Soil is ploughed with the help of a tool called plough. Plough may be made of wood and iron or of the iron only. For ploughing of the soil, domestic animals like ox, camel are used. Now, in big farms the tractors are used for ploughing with cultivator which saves time and labour of ploughing manually.

2. **Green Revolution :** A general improvement in crop yield and food production occurred in our country between 1960 and 1980. It was a turning point in Indian agriculture. This is commonly referred to as the golden era of agriculture or the **green revolution**. As a result of the green revolution, we have become self-sufficient in food. In fact, we are able to have surplus crop to stock and use in natural calamities like drought and floods. Famine in India, once accepted as inevitable, has not happened since the introduction of green revolution crops. The food security that was a paramount item on free India's agenda was, thus, achieved. The credit for green revolution goes to the great agricultural scientist of our country, **Dr M.S. Swaminathan**. He is the recipient of World Food prize for fighting against hunger.

3. Mixed cropping is growing of two and more crops simultaneously on the same piece of land it is also known as multiple cropping this type of cropping leads to an improvement in the fertility of the soil and increases in crop yield the products and refuse from one crop plant help in the growth of the other crop plant and vice-versa mixed cropping is an insurance against crop failure in abnormal weather conditions. It also helps the farmer to improve its yield and economy and avoid crop failure which was very common in India and Asian country.



4.



5. do yourself

**D. Higher Order Thinking Skills (HOTS) Questions :**

- Ans.** 1. Broad casting is not a very good method of sowing seed because this process a large time and many person and crop is not make good.  
 2. Fertilizers may damage the soil texture and make it more porous.



## Microorganisms

2

### Formative Assessment

**A. Tick (✓) the correct answer :**

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

**B. Correct and rewrite the following statements :**

- Ans.** 1. and non living organism                      2. Funqal                      3. Bacteria  
 4. Female    5. Rhizobium

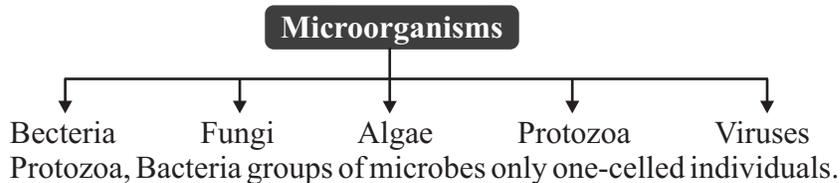
### Summative Assessment

**A. Very Short Answer Questions :**

- Ans.** 1. Lactobacillus                      2. Yeast                      3. Clostridium botulnum  
 4. Tobacco mosaic Virus                      5. Fungus

**B. Short Answer Questions :**

**Ans.** 1. There are five major groups of microorganisms. These are :



2. Viruses are hard to classify as living or non-living as, on their own, they show no signs of life. They (Sing. virus) are the smallest and the simplest a cellular microorganisms.
3. **Food Poisoning** : Certain microorganisms (bacteria and fungi) grow on cooked food kept for long or on stored food. They produce toxic substances and make the food poisonous. Consumption of spoiled food causes vomiting, diarrhea and headache.
4. **Botulism** : A dangerous form of food poisoning caused by a bacterium growing on improperly sterilized foods.  
Clostridium outline is the microbe associated with botulism.
5. **Communicable diseases** : Diseases that can be spread from an infected person to a healthy person are called communicable diseases.  
**Such as** : Measles, Typhoid, cholera, malaria.

**C. Digram Based Questions :**

**Ans. HIV** : is the virus of AIDS disease. It is so tiny that it is seen with the help of an electron microscope only. It spread from one to other by sexual relation and by the blood transfer.

**Yeast** : It is fungus that is used in bakeries for making bread and in the beverage industry for making wine or beer.

The process in which sugar present in the food is converted into alcohol and carbon dioxide with the help of microorganisms is called fermentation. Pickles, bread, cheese, yogurt, wine, vinegar, and beer are prepared by fermentation.

Yeast is added to the dough for making bread. When the dough is left untouched for some hours, the yeast digests the sugar and gives out carbon dioxide. This carbon dioxide forms gas bubbles within the dough and causes it to become fluffy and rise.

**Nostoc** : Nostoc is algae of significance in fixing the atmospheric nitrogen these are found mostly in paddy fields.

**Lactobacillus** : It is a bacterium (Fig. 2.3) that is used in the preparation of food products like curd, yogurt, cheese, pickles, and wine.

In making curd : Under favourable conditions, Lactobacilli present in the milk multiply. They act on the sugars present in the milk and change them to acid. This results in the formation of curd, which has a sour taste.

**Entamoeba** : Entamoeba is protozoa. It is responsible for the different diseases. In amoeba histolytic it infects the human large intestine causing amoebic dysentery in which the faeces are blood stained.

**E. Long Answer Questions :**

**Ans. 1. (a) Microorganisms and Cleaning of Environment**

- The domestic wastes like vegetable peels, rotten fruits, garden wastes, fallen leaves, dung of farm animals, etc., are decomposed by soil bacteria and are converted to manure.



- Microorganisms decompose dead plants and animals, and convert their organic compounds into simple inorganic substances. These substances get mixed with soil and improve its fertility. Thus, microorganisms prevent accumulation of waste and dead organic matter and hence help clean our environment.

**(b) Microorganisms increase Soil Fertility**

- Cyanobacteria, also called blue-green algae, are able to fix free nitrogen from air into nitrogen compounds. This process is called nitrogen fixation. The process of nitrogen fixation enriches the soil with nitrates which are used by plant cells in the synthesis of proteins. Species of Rhizobium live symbiotically in the root nodules of legumes (Peas, Beans and Soyabean) and fix nitrogen for plants. Algae are also used as organic manure to increase soil fertility.

**2. Modes of Transmission of Communicable Diseases**

Communicable diseases get transmitted from the source of infection to a person/animal either directly or indirectly.

These modes of transmission are described below :

**Direct Transmission**

- **By direct contact :** The infection may be caused by direct skin to skin, mucosa to mucosa or mucosa to skin contact. Leprosy, Eczema, Conjunctivitis (eye infection) are transmitted through direct contact.
- **By droplet infection :** An infected person during coughing, sneezing, spitting and speaking may release droplets of moisture carrying the disease-causing microorganism. These droplets when enter another person's body while breathing may make him sick. Diseases like Whooping cough, Tuberculosis etc., are transmitted in this way.
- **By using an infected needle/syringe :** Infection may also get directly transmitted through a bite or blood transfusion. Rabies virus enters the man's body by a dog bite. AIDS virus may enter the body of person during blood transfusion if the blood-donor is an infected person.

**Indirect Transmission**

The disease-causing microorganisms may also enter the body of a person indirectly.

Various modes of indirect transmission are,

- Through infected food and water.
- Through any carrier, such as mosquito, housefly, rat, flea etc.
- Through clothes, towel, handkerchief, and personal utensils of the patient.





5. Blended fibres such as terycot, terywool etc., which are used to make shirts, paints, suits and other dresses.
6. Plastic substances are light weight
  - They are corrosion resistant, so no problems of rusting or decay.
  - They can be made in various colours
  - They are insulators of heat and electricity. Therefore, they can be used to make bodies of electrical appliances, handles of utensils and covering for electrical wires.
7. **Polymerisation** is the process by which both synthetic fibre and plastic are made.
8. Cotton, wool and silk are three **natural fibres**.

**B. Short Answer Questions :**

**1. Give reasons :**

- Ans.**
- (a) We should not burn left over plastic bags because they give out harmful smoke which pollute our environment.
  - (b) Synthetic fibres have become very popular because they are not so expensive and they are also easy to wear and they are last longer.
  - (c) Acrylon fibre is used for making blankets, shawls and to make yarn for knitting sweaters because it is a thick fibre.
  - (d) Polythene is a good insulator of electricity so it is also used for making insulation of electrical wiring.
  - (e) Bakelite is stronger than other plastics and it is a good electrical insulator. So it is used for making electrical switches.
  - (f) Because plastic articles are easy to carry and they are not so expensive. These are easily available at a low cost everywhere.
2. Give two uses each of:
- (a) **Nylon** : It is mainly used to make following items :
    - (i) Fishing nets, nylon ropes, bristles of toothbrush.
    - (ii) Dresses, sportswear, swimwear, stockings, sarees etc.
  - (b) **Polyester** :
    - (i) Polyester is used to make curtains and upholstery.
    - (ii) Polyester is also used to make water hoses for fire fighting.
  - (c) **Bakelite** : Bakelite is stronger than other plastics and is a good electrical insulator. Therefore, it is used for making electrical switches and other electrical fittings.
  - (d) **Polystyrene** : Polystyrene is used in :
    - Fabrication of plastic toys
    - Packaging
    - Delicate objects like cell phones, T.V. etc.
  - (e) **Polyvinyl chloride** : It is light, yet strong and therefore useful in a variety of ways. It is used to make :
    - Soles of shoes and raincoats



- Decorative flooring seen in offices and restaurants known as vinyl flooring.
3. Synthetic fibres have certain features due to which they have become very popular.
- They have a lustre that does not become dull with time.
  - They are stronger and therefore last longer.
  - They are wrinkle resistant and thus need no ironing.
  - They absorb very little water so dry easily.
  - They are both resistant and do not need maintenance like wool and silk.
  - They are less expensive than natural fibres.

However, besides these features which make synthetic fibres very attractive, there is a disadvantage that they do not absorb sweat and thus are uncomfortable to wear in summers. They are also highly inflammable and generally catch fire easily.

4. Do yourself

**C. Long Answer Questions :**

**Ans.**

1. Plastics which soften on heating but once moulded cannot be reshaped are called **thermosetting plastics**. These plastics can be used only once as compared to thermoplastics which can be remoulded by heating.

Examples of such plastics are : Bakelite, formica and melamine. Thermoplastics are synthetic plastics which can be heated and moulded into any required shape. On cooling, they retain that shape but if heated again, they soften and can be reshaped.

A material that can be repeatedly moulded into new shapes by heating is called a **thermoplastic**.

Common examples of thermoplastic are : polythene, polyvinyl chloride (PVC), polystyrene and teflon.

2. Do yourself

3. Some properties of plastics that make it useful are :

- Plastic substances are light weight
- They are corrosion resistant, so no problems of rusting or decay.
- They can be made in various colours
- They are insulators of heat and electricity. Therefore, they can be used to make bodies of electrical appliances, handles of utensils and covering for electrical wires.
- They last longer because they are not affected by moisture, temperature, pests or chemicals. Generally all natural substances such as cotton, jute and wool have smaller shelf lives.
- They have a high tensile strength and therefore strings of rayon and nylon are stronger than strings made of cotton or jute.
- They can be moulded in any shape or form.
- They can be used to make nearly everything that we use in our daily life.



- Plastics have made our life more comfortable and work easier.

**D. Higher Order Thinking Skills (HOTS) Questions :**

- Ans.** 1. Polyester  
2. We should go with the use of paper bags because it saves our environment.



## Metals and Non-Metals

4

### Formative Assessment

**A. Answer the following questions orally :**

- Ans.** 1. Malleability : Malleability is the quality of being malleable.  
Ductility : Ductility is the quality of being ductile. Metals are ductile, i.e. they can be drawn into thin wires.  
2. Copper is a good conductor of electricity and is ductile. Therefore, copper is used electrical cables.  
3. Sodium can be cut by a knife.  
4. Uses of carbon :  
(i) Carbon as coke is used in the extraction various elements from their ores.  
(ii) Carbon as graphite rod is used as electrodes in electrolysis.  
Use of Iron :  
(i) Iron is used to make pipes.  
(ii) It is also used in making automobile.  
Use of Silver :  
(i) Silver is used in making ornaments.  
(ii) It is also used to make Utensile.

**B. Tick (✓) the correct answers :**

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

**C. Fill in the blanks :**

- Ans.** 1. The elements whose atom loosens electrons to form positively charged ions are called **metals**.  
2. A metal can replace another metal placed **above** it in the reactivity series.  
3. The space occupied by an object is called **volume**.  
4. Magnesium burns with a dazzling **white** light on heating.  
5. Helium, neon and argon are called **noble** or **inert** gases.

**D. Write True or False for the following statements :**

- Ans.** 1. False                      2. False                      3. False                      4. False                      5. True

**E. Tick the odd-one out giving reason :**

- Ans.** 1. Malleability, Ductility, Sonorous, **Brittle**  
2. Sodium, Magnesium, **Sulphur**, Aluminium  
3. MgO, Na<sub>2</sub>O, **CaO**, CO<sub>2</sub>  
4. Phosphorus, Carbon, **Oxygen**, Calcium



## Summative Assessment

### A. Define the following terms :

- Ans.**
1. **Malleability** : Malleability are generally malleable, i.e. they can be beaten into sheets.
  2. **Ductility** : Metals are ductile, i.e. they can brawn into thin wires.
  3. **Reactivity Series** : Some metals are highly reactive and some are less reactive. Metals are arranged in a series called reactivity series.
  4. **Noble metals** : Metals like silver, gold and platinum do not react with steam and are also called noble metals.
  5. **Metalloid** : The element which have properties of both metals and non-metals.

### B. Short Answer Questions :

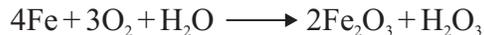
- Ans.**
1. Metals are good conductors of heat and electricity. While Non-metals are bad conductors of heat and electricity.
  2. Gold and silver are suitable for making jewellery because they do not react with stream and water. They are noble metals.
  3. Mercury is a metal but is liquid at room temperature Bromine is a non-metal which is liquid.
  4. Metals are generally malleable, i.e. they can be beaten into sheets. However, zinc, antimony and arsenic are exceptions as they are not malleable.
  5. Metals are ductile, i.e. they can be drawn into thin wires. Gold is a highly ductile metal. Zinc, arsenic and antimony do not possess this property.
  6. Reactive metals are mostly found in compound forms because more reactive metal replace a less reactive metal.
  7. Gold is the least reactive metal and potassium is the most reactive metal.

### C. Long Answer Questions :

- Ans.**
1. To show that metals conduct electricity.  
Procedure : Set up a simple electric circuit with the help of an electric cell, bulb and some materials like a key or iron rod, a copper wire, a piece of coal, a rubber, etc.  
Now observe in which case the bulb glows.  
The bulb glows when the connecting wires are attached to metallic key, copper wire and iron rod, whereas it does not glow when the wires are connected to coal or rubber.  
Things made of metals are good conductors of electricity whereas coal and rubber do not conduct electricity.
  2. Metals like copper react with oxygen when they are strongly heated, but silver and gold do not react. Metals like iron, magnesium, aluminium, zinc and copper rust by prolonged exposure to moist air. Copper acquires a dull green coating when exposed to moist air for a long time.  
$$2\text{Cu} + \text{H}_2\text{O} + \text{O}_2 + \text{CO}_2 \longrightarrow \text{Cu}(\text{OH})_2 + \text{CuCO}_3$$
  
Iron rusts slowly in moist air as iron react with oxygen in the air to form



iron oxide and water.



During the process of corrosion, the metals are eaten away.

The chemical reaction between a material, usually a metal and its environment is called corrosion. It produces a deterioration of the material and its properties. Corrosion of iron is commonly called rusting.

### 3. USES OF NON-METALS

Uses of Sulphur

1. Sulphur is used in making medicines called sulpha drugs.
2. It is used in making skin ointments as it has special anti-fungal properties.
3. It is used in making chemicals like sulphuric acid.
4. It is used in vulcanisation of rubber, which makes natural rubber hard and tough.
5. It is used to make insecticides.
6. Sulphites, derived from burning sulphur, are heavily used to bleach paper. They are also used as preservatives in dried fruit.
7. It is used in photography to fix negatives.

Uses of Phosphorous

1. It is used in making phosphoric acid and superphosphate fertilizers.
2. It makes an alloy with bronze which can resist corrosion.
3. It is used in the preparation of matches, fireworks and smoke screens.

Uses of Nitrogen

1. Nitrogen gas is widely used as an inert replacement for air where oxidation is undesirable.
2. It is used to preserve the freshness of packaged or bulk foods (by delaying rancidity and other forms of oxidative damage).
3. It is used in ordinary incandescent light bulbs as an inexpensive alternative to argon.
4. It is used in the manufacturing of stainless steel.

Uses of Silicon

1. Silicon is used to make silicon-steel alloy and in the preparation of silicones, which have a wide variety of uses.
2. Silicon is used in making semiconductor devices such as transistors.
3. Silicones are ingredients in many hair conditioners, shampoos and hair gel products.
4. Silicone is used to create a variety of toys.
5. The gel form of silicone is used in bandages and dressings.

Uses of Carbon

1. Carbon as coke is used in the extraction of various elements from their ores.
2. Graphite (carbon) fibre is used in carbon fibre-reinforced plastics. Products made from carbon fibre-reinforced plastic include fishing rods, golf clubs, bicycle frames and pool sticks.



3. Carbon as graphite rod is used as electrodes in electrolysis.
4. Carbon as graphite is used in making pencils.

#### Uses of Chlorine

1. It is used as a bleaching agent in paper and textile industries.
2. It is used in the preparation of bleaching powder.
3. It is used in the preparation of gammaxene, a pesticide.
4. It is used to disinfect water in municipal water treatment plants.

#### 4. Displacement Reactions

Generally, metals are reactive and that is why they mostly occur in the combined state in nature as minerals. Metals in general react with air and water. Sodium if left in open immediately combines with oxygen; magnesium reacts with oxygen when ignited but iron and copper do not, even on heating for a long time. This is because metals have different reactivity. Some metals are highly reactive and some are less reactive. Metals are arranged in a series called reactivity series according to their decreasing reactivity from highest to lowest the reactivity series.

Notice that a more reactive metal can replace a less reactive metal from its salt solution. Such a reaction in which one metal replaces another from its salt solution is known as a displacement reaction.

Some displacement reactions are shown below :



A less reactive metal, on the other hand, cannot displace more reactive element from its salt solution as shown below. As a result, there is no reaction between iron and zinc sulphate, copper and magnesium sulphate, etc.



5. (a) Metals react with water to form metal oxide or metal hydroxide and hydrogen gas is also formed. In general, non-metals do not react with water.
- (b) When a metal reacts with an acid, effervescence or bubbles of hydrogen gas are formed with the evolution of heat energy.  
Non-metals generally do not react with acids.
- (c) Metals do not react with oxygen non-metals react with oxygen to form acidic oxides which dissolve in water to form acids.
6. (a) Metals are found in free and combined state in the Earth's crust. Highly unreactive metals like gold are found in free state, whereas those which are highly reactive, are found as bauxite and iron as haematite in the Earth's crust.



- (b) Sodium react vigorously with cold water and form soluble hydroxides and hydrogen gas that burns with a pop sound.



Red hot iron reacts with steam to form its oxide and hydrogen.



- (c) Copper can not replace iron from its salt solution because copper is less reactive metal than iron.
- (d) Copper is used for making electrical wire because it is a good conductor of electricity.
- (e) Cooking utensils are made of metals because metals are good conductor of heat which help in making food while their handles are wooden because wood is a bad conductor of heat which help to hold.

**D. Higher Order Thinking Skills (HOTS) Questions :**

- Ans.** 1. Iron
2. Silver is a good conductor of electricity is not used for making electric wires because it is very expensive.



## Combustion and Fossil Fuels

5

### Formative Assessment

**A. Choose the correct option :**

- Ans.** 1. (a)                      2. (d)                      3. (b)

**B. State whether the following statements are True (T) or False (F):**

- Ans.** 1. F    2. F    3. F    4. F

### Summative Assessment

**A. Very Short Answer Questions :**

- Ans.** 1. Rapid combustion, Spontaneous combustion and Explosive combustion are the three types of combustion.
2. The minimum temperature at which a combustible substance starts burning is called **ignition temperature**.
3. Using water and carbon dioxide fire can be extinguished.
4. Inexhaustible natural resources do not deplete over a period of time, i.e., their supply is limitless. Examples are water, wind, and sunlight.
5. Fossil fuels are formed from the buried remains of plants and animals over a long period of time. Natural gas petroleum, and coal are examples of **fossil fuels**.

**B. Short Answer Questions :**

- Ans.** 1. A combustible substance which on burning produces a large amount of heat and light is called a **fuel**. Fuels can be classified as solid, liquid, or gaseous depending on their physical state at normal temperature.
- Solid fuels :** Charcoal, coal, paraffin wax, wood, and cow dung cakes are solid fuels. Solid fuels mostly produce a lot of smoke.



**Liquid fuels :** Kerosene oil, diesel, and petrol are liquid fuels. These are obtained from petroleum which is found under the Earth's crust.

**Gaseous fuels :** Natural gas, petroleum gas, and biogas are gaseous fuels. Petroleum gas and natural gas are kept as liquids under high pressure. On releasing the pressure, the liquid is converted into gas and ignites readily giving out a huge amount of heat. Cooking gas cylinders contain LPG.

2. **Characteristics of an ideal fuel :**

- It undergoes complete combustion.
- It has a low ignition temperature which is generally above room temperature.
- It burns at a moderate rate with controlled release of heat.
- It does not leave residue after burning.
- It is readily available, safe to handle, store, and transport.
- It has a high calorific value. The amount of heat produced in kilojoules when one gram of a fuel is completely burnt in excess oxygen is called the **calorific value** of a fuel. It is usually expressed as kJ/g (Joules (J) is the SI unit of heat).

3. Hydrogen has the highest calorific value but it is not considered the best fuel. This is because it is highly inflammable, difficult to handle, and store.

4. **Useful Products from Coal**

Coal is heated at a temperature of about 1000°C in a closed container to produce useful products such as coke, coal gas, and coal tar.

**Coke :** It is a porous, hard, dry fuel and almost a pure form of carbon. It is mainly used in the steel industry and in the extraction of iron.

**Coal gas :** It is a mixture of methane, hydrogen, carbon monoxide, and other gases. It is used as a fuel for domestic as well as industrial purposes in areas around coal mines. It is not good for health and therefore not in much use these days although industrial use still continues.

**Coal tar :** It is a thick, greasy, black liquid which is solid at room temperature. It is used in making explosives, pesticides, dyes, and paints. Earlier, it was also used to produce electricity.

**C. Long Answer Questions :**

**Ans.** 1. A flame can be mainly divided into three zones, namely, the *outer zone*, *inner zone*, and the *middle zone*.

**Outer zone :** At the base of the wick, the wax vapourises due to heat. This gaseous hydrocarbon burns with a blue flame. The presence of air is sufficient in this zone to allow for complete combustion to take place. It is the hottest part of the flame and gives out very little light.

**Inner zone :** This zone is just above the wick and is formed by unburnt wax vapour given off by the molten wax. This zone is completely cut off from the supply of air, and so, no combustion takes place in this zone. It gives no light and is the coldest part of the flame.



**Middle zone :** Incomplete combustion takes place in this zone due to an insufficient quantity of air. Unburnt carbon particles are present in the flame which become very hot and give a yellow light. This part of the flame is hotter than the inner zone.

2. Main polluting substances formed due to burning of fossil fuels and their harmful affects are as follow. Burning of fossil fuels gives out several polluting gases into the atmosphere. Diesel and petrol used in vehicles undergo combustion, giving out gases that are harmful. Coal gives out smoke containing unburnt carbon particles on burning. Some of the common polluting substances and their harmful effects are as follows :

**Carbon dioxide :** Carbon dioxide gas is released mostly on complete combustion of fuels. Due to much use of fuels, the level of carbon dioxide in the atmosphere is increasing which, in turn, is leading to a rise in atmospheric temperature.

**Carbon monoxide :** Carbon monoxide is given out due to incomplete combustion of fuels. It is a harmful gas and, when inhaled in major quantities, causes nausea, vomiting, and unconsciousness. In severe cases, it can cause death.

**Oxides of sulphur and nitrogen :** Sulphur dioxide gas is released by burning coal. Oxides of nitrogen are released on burning petrol, diesel and coal. These gases combine with atmospheric moisture to form dilute solutions of sulphuric and nitric acids. These acids cause irritation, watering of eyes, and respiratory health problems. They also damage crops, buildings, and affect marine life when they come down as a phenomenon called **acid rain**.

**Soot :** Carbon particles in the form of soot are released on burning wood, coal, and fuel oil. These solid particles are present in the smoke released due to incomplete combustion of these fuels. When inhaled, they can lead to asthma and other respiratory health disorders.

**D. Higher Order Thinking Skills (HOTS) Questions :**

- Ans.** 1. Because sulphur is present on the top of match stick.  
2. CNG increasingly being used as an automobile fuel these days. Because it is pollution free.



## The Study of Biodiversity

6

### Formative Assessment

**A. Answer the following questions orally :**

- Ans.** 1. The Wildlife Act 1972.  
2. International Union for the Conservation of Nature and Natural Resources.  
3. Deforestation results in soil erosion. Deforestation destroys the habitants of many living organisms.

**B. Tick (✓) the correct answer :**



Ans. 1. (a)                      2. (a)                      3. (a)

**C. Fill in the blanks :**

- Ans. 1. Biodiversity includes **plants, animals** and **microorganisms**.  
2. The species of plants taken together are known as **flora**.  
3. The endangered species are listed in the **Red** book.  
4. Other than the wildlife sanctuaries and national parks, there are also 17 **Biosphere** in India.  
5. Illegal hunting of animals is called **poaching**.  
6. **Poaching** is a prime reason for the extinction of hundreds of animals species and the endangerment of many more.

**D. Write True or False for the following statements :**

Ans. 1. F    2. F    3. F    4. T    5. T

**E. Match the following :**

- Ans. 1. Deforestation — (iv) Planting new trees  
2. Reforestation — (i) Areas meant for conservation of biodiversity  
3. Desertification — (v) Clearing of forests  
4. Biosphere reserve — (ii) The plant found in a particular area  
5. Flora — (iii) The animals found in a particular area  
6. Fauna — (vi) Conversion of fertile land into deserts

## Summative Assessment

**A. Define the following terms :**

- Ans. 1. **Flora and Fauna** : All the plants and animals of a specific area or period of time respectively.  
2. **Endemic Species** : The species prevalent in a particular geographic region is called an endemic species. In other words, an endemic species is found in a particular area. It becomes endemic either due to geographical isolation or biologically isolated areas. Hawaii and Baikal Lakes have plenty of such species.  
3. **Extinct Species** : The species which existed on the Earth at some point of time in the past but no longer exist at present on any part of the Earth are called extinct species. In other words, the extinct species are the species which have disappeared from the face of the Earth. The Earth was once inhabited by dinosaurs which have now become extinct. The dodo, a bird, has also become extinct.  
4. **Endangered Species** : A species that is in danger of extinction due to the destruction of its habitat, poaching or some other reason is called an endangered species. Such species will be unable to survive in the near future if the causes of their destruction continue to prevail. The Asiatic lion, the great Indian bustard and the blue whale are some endangered



species of animals. Given below is a table containing some endangered species of animals in India.

5. **Protected areas** : To protect the flora and fauna and their habitats, our government under the Wildlife (protection) Act, 1972 created protected areas.

Protected areas are the areas dedicated to the protection and maintenance of biodiversity along with natural and cultural resources. Protected areas include national parks, wildlife sanctuaries and biosphere reserves.

**B. Identify the name of each animal based on the given clues :**

- Ans.**
1. My tail resembles that of a lion's tail. I am endemic to the tropical evergreen forests in southwest India. I am the **Lion-tailed macaque**.
  2. I am endemic to Siberia. But during winter, I come to India to escape from the extreme cold. I am the **Sibarian crane**.
  3. You have seen me in the movie Jurassic Park. I was once found on the Earth resembled a lizard. I am the **Dianosour**.
  4. I am a single-horned animal. My horn is believed to have medicinal value. I am **rhinoceros**.
  5. I have small ears, small tusks and an arched back. I am a threatened species of India. I am the **Asian elephant**.

**C. Short Answer Questions :**

- Ans.**
1. Biodiversity is the variety of life on the Earth. It includes the variability of species in different habitats, the diversity of microorganisms, plants and animals. It is an essential component of nature and it ensures the survival of human species by providing food, fuel, shelter, medicines and other resources to mankind.
  2. Deforestation : The process of cutting the trees in the forest is called deforestation. Deforestation naturally occurs due to forest fires, earthquakes, severe droughts and floods.
  3. Wildlife is important to conserve our natural heritage. It can be preserved by making zoological parks and conserving the forests.
  4. National Parks and Wildlife Sanctuaries of India

Bandhavgarh National Park	Madhya Pradesh
Bandipur National Park	Karnataka
Bhitarkanika National Park	Odisha
Buxa Tiger Reserve	West Bengal
Corbett National Park	Uttarakhand
Dudhwa National Park	Uttar Pradesh
Gir National Park	Gujarat
Guindy National Park	Tamil Nadu
Indira Gandhi National Park	Tamil Nadu
Kanha National Park	Madhya Pradesh
Kaziranga National Park	Assam
Neora Valley National Park	West Bengal



Pench National Park	Madhya Pradesh
Rajiv Gandhi National Park	Rajasthan
Kumarakom Bird Sanctuary	Kerala
Thattekad Bird Sanctuary	Kerala
Kaundinya Bird Sanctuary	Andhra Pradesh
Kawal Sanctuary	Andhra Pradesh
Nalsarovar Bird Sanctuary	Gujarat
Overa wildlife Sanctuary	Jammu & Kashmir
Ranganthittu Bird Sanctuary	Karnataka
Nawabganj Bird Sanctuary	Uttar Pradesh

5. Poaching is done for animal's fur and hides. The body parts of some animals are used for making medicine and ornaments.

6. RED DATA BOOK

The IUCN (International Union for the Conservation of Nature and Natural Resources) maintains an international list published as the Red Data Book. It is a group of organisations and scientific experts that work for the protection of sustainable living resources. It is considered to be the best authority about the status of living on the planet.

The Red Data Book is the state document established for documenting rare and endangered species of plants and animals that exist within the territory of the state or country. This book provides central information for studies and monitoring programs on rare and endangered species and their habits.

**D. Long Answer Questions :**

**Ans.** 1. The judicious use of natural resources to preserve and protect the living and non-living resources is called conservation. Conservation of biodiversity essentially implies conservation of forests and wildlife. India is a land of varied and abundant flora and fauna. But, in the last few decades, a steady decrease has been registered in the number of flora and fauna.

Even the biodiversity of the Earth has declined remarkably. The conservation of biodiversity is of paramount importance for any country. To fulfil this purpose, it is necessary to follow certain conservation strategies.

It is very essential to discontinue, and finally prevent, the activities which are causing decline in the biodiversity.

2. THREATS TO BIODIVERSITY

Several species of plants and animals have either become extinct or are on the verge of extinction. Let us study about some of the reasons responsible for their extinction.

**Increase in Human Population**

With the tremendous increase in the human population, human beings have accelerated the transformation of the Earth to meet their various



requirements. About half of the world's forests have been transformed, degraded or destroyed for agricultural and urban development. The transformation is still going on, which has led to a severe loss of habitat.

#### Hunting

Hunting has led to the extinction of hundreds of animal species and the endangerment of many more. Animals are hunted for their fur, tusks, skin, etc. During the period from 1970 to 1992, the percentage of the black rhino reduced to 96 per cent due to over hunting. Fish and other aquatic organisms are threatened because of the use of trawlers, a kind of boat, that uses large nets to catch fishes in large numbers. Consequently, the fish population has reduced drastically.

#### Deforestation

All species have specific food and habitat requirements. The more specific the requirements and localised the habitat, the greater is the vulnerability of the species. With the ever increasing worldwide deforestation, the possibility of habitat loss has increased manifold.

It is alarming that even the tropical forests, which harbour almost 50 per cent of the world's biodiversity, are declining. The original extent of these forests was 15 million square kilometres. But now, only half of the tropical forests survive.

#### Pollution

Pollution of air, water and soil adversely affects the environment. As a result, all plants and animals living in polluted surroundings suffer. Chemical pollutants pose a threat to different species and ecosystems. When harmful chemical pollutants get accumulated in the water bodies, they are consumed by fishes and other aquatic animals, directly or indirectly. Thus, these chemicals enter the food chain and reach higher organisms. Even human beings get affected when they consume such fishes and other aquatic animals.

#### Climate Change

A changing climate also poses a threat to the different species and ecosystems since the distribution of species and ecosystems is largely determined by climate. For a number of reasons, plants and animals may not be able to adjust to new climate changes and this may ultimately lead to the extinction of the species.

#### Natural Disasters

Natural disasters such as earthquakes, volcanic eruptions, floods, droughts, cyclones and hurricanes lead to the destruction of the habitats of various species. Thus, their existence is threatened.

### 3. CAUSES OF DEFORESTATION

Having learnt about the causes for the loss of biodiversity, you can easily understand the causes of deforestation.

Forests are an important natural resource. They are essential for the well-



being and survival of mankind. However, due to various human needs, forests are under great threat of being cut (deforestation).

Various man-made causes of deforestation are :

Construction for houses and industries

Clearing land for agricultural purposes

Using wood as fuel

Using wood to make paper, furniture and other things

Deforestation also occurs naturally due to forest fires, earthquakes, severe droughts and floods.

#### CONSEQUENCES OF DEFORESTATION

Deforestation has an adverse effect on biodiversity and needs to be checked immediately. The result of deforestation.

We already know that plants and animals depend on each other. A number of species of birds and other animals live in forests. It is their habitat. They depend on each other for food and other things. Destruction of forests has affected the food chain and destroyed the habitats of many living organisms. Animals like lions and tigers have become much reduced in number because the forests in which they live have been destroyed. Remember, this is not the only reason for the reduction in number of these animals. Another reason is their hunting by humans.

The level of carbon dioxide in the atmosphere increases on account of deforestation. You know that plants need carbon dioxide for photosynthesis. Reduced number of trees require lesser carbon dioxide. So the level of this gas has gone up in the atmosphere, resulting in global warming.

Deforestation leads to increase in temperature and pollution level on the Earth. This disturbs the water cycle and reduces rainfall. The outcome is the drought.

Deforestation results in soil erosion. Trees prevent soil erosion. Roots of trees bind the soil particles together, preventing them from blowing away by wind or water. Soil erosion removes the top layer of the soil that contains the fertile humus. Removal of top layer, thus makes the soil less fertile, as the lower layers of soil contain less humus. If this goes on, the fertile land gets converted into a desert. The process of conversion of fertile land into a desert is called desertification.

4. Deforestation results in soil erosion. Trees prevent soil erosion. Roots of trees bind the soil particles together, preventing them from blowing away by wind or water. Soil erosion removes the top layer of the soil that contains the fertile humus. Removal of top layer, thus makes the soil less fertile, as the lower layers of soil contain less humus. If this goes on, the fertile land gets converted into a desert. The process of conversion of fertile land into a desert is called desertification.
5. (a) The process of planting areas of land with trees in order to renew a forest.



(b) Project Tiger

In 1973, the World Wide Fund, with the help of the Indian Government, launched Project Tiger to protect tigers. This project has been very successful in preserving the tiger population at the tiger reserve of Bandhavgarh, Pench, Panna, Corbett, Kanha, Ranthambhore, Bandipur, Dudhwa and the Sunderbans.

(c) RED DATA BOOK

The IUCN (International Union for the Conservation of Nature and Natural Resources) maintains an international list published as the Red Data Book. It is a group of organisations and scientific experts that work for the protection of sustainable living resources. It is considered to be the best authority about the status of living on the planet.

The Red Data Book is the state document established for documenting rare and endangered species of plants and animals that exist within the territory of the state or country. This book provides central information for studies and monitoring programs on rare and endangered species and their habits.

**E. Higher Order Thinking Skills (HOTS) Questions :**

- Ans.** 1. Anita wastes a lot of paper. She is Indirectly responsible for the loss of biodiversity because papers are made by wood so many trees would cut. By cut the trees environment will be polluted and soil erosion is start on a lary amount.
2. All species are not suitable to grow in all areas. Sometimes, by introducing a crop that is not sellable to grow in a particular area, we may create an obstacle in the ecological balance of that area. That why we should keep all things in used defore introducing a crop.



## The Cell

7

### Formative Assessment

**A. Choose the correct option :**

- Ans.** 1. (a)                      2. (a)                      3. (b)

**B. State whether the following statements are True (T) or False (F) :**

- Ans.** 1. False    2. False    3. True    4. True    5. True

**C. Fill in the blanks :**

- Ans.** 1. Cells are organized to form **tissue**.
2. Control centre of a cell is the **nucleus**.
3. Largest cell is of a/an **ostrich's egg**.
4. Yeast in a/an **unicellular** organism.
5. Genes are found in the **nucleus**.

### Summative Assessment

**A. Very Short Answer Questions :**

- Ans.** 1. Cell membrane                      2. Cell wall                      3. Slices of cork



- |   |                     |                     |
|---|---------------------|---------------------|
| 4. Cell membrane                          | 5. Nerve cell       |                     |
| 6. Ribosomes, golgibody, mitochondria etc |                     | 7. Chromosome       |
| 8. Chloroplast                            | 9. Prokaryotic cell | 10. Eukaryotic cell |

**B. Short Answer Questions :**

- Ans.**
- Cells were first discovered by **Robert Hooke**, in 1665 in slices of cork.
  - Cells are generally grouped together to make tissues, organs, organ systems and finally organisms. A **tissue** is a group of cells of the same shape, size and function. An **organ** is a structure that have more than one type of tissues. It is normally big enough to be seen with the naked eye. The organs do not work separately. Generally a number of organs work together to carry out a certain function. A group of organs working together is called an **organ system**. Our digestive system is an organ system.
  - Cells differ in their shapes and sizes. All cells however show some similarities in their structure. A typical cell consists of three basic parts :
    - Cell membrane,
    - Cytoplasm,
    - Nucleus.
  - Do yourself
  - Protoplasm** : The living substance of the cell is called the protoplasm. It includes the cytoplasm and the nucleus.
  - In the cytoplasm, organelles are present in a cell.
  - In the cell nucleus, chromosomes are present in a cell.

**C. Long Answer Questions :**

- Ans.**
- Cell membrane** : Cell membrane is also called plasma membrane. It is a thin outer covering of a cell. It is a porous membrane and permits movement of substances both inward and outward.
    - Cytoplasm** : The cytoplasm is a jelly-like liquid which occupies the space between the cell membrane and the nucleus. A number of small components or structures called the cell organelles are ribosomes, golgi bodies, mitochondria and endoplasmic reticulum. All the chemical reactions and functions of life take place in the cytoplasm.
    - Nucleus** : Nucleus is a spherical body present in centre of the cell and is surrounded by the cytoplasm. It is also known as the control centre of the cell. Mostly only one nucleus is present in a cell, but in some cases, more than one nucleus may be present.

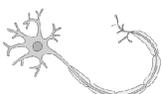
**Functions of Nucleus**

- Helps in the inheritance of characters from parents to the children.
  - Act as a control centre of all the activities taking place in the cell.
- (d) **Cell wall** : In plants cells, one more layer surrounds the cell membrane. This *additional covering layer around the cell membrane is called the cell wall*. A cell wall is made of a tough, non-



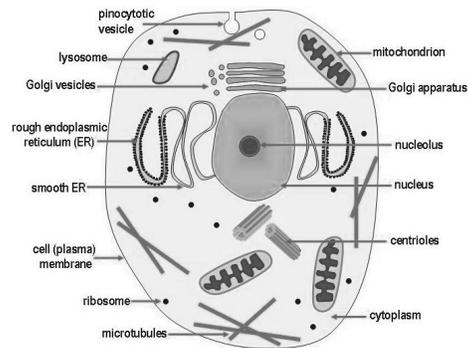
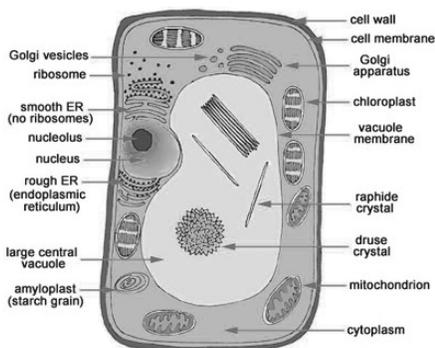
living substance called **cellulose** and provides (i) protection, and (ii) shape and support to the cell.

- (e) **Chromosomes** : Thread like bodies called **chromosomes** are present in the nucleus. Chromosome carry a number of genes. The chromosomes and the genes help in the inheritance of characters from the parent to their offspring.
- (f) **Chloroplasts** : Chloroplast (green plastids) are found only in plant cell and its function is photosynthesis takes place in plant cell and plant cell can make food and store potential energy for us.
- (g) **Mitochondria** : Mitochondrion is a powerhouse of cell.
- (h) **Vacuole** : Vacuole is a non-living structure of the cell. Plant cells have a large central vacuole. Vacuole can transport food material and water to the Neighbouring organalles.

2.  Nerve cells are very long and branched shape with their thread-like projection supports it send messages over long distance in the body.

3. As you have already studied, living organisms are made of cells. A cell is the smallest living unit of an organism. Can the cells of an organism be compared to bricks of a building or pages of a book? You know that bricks are used to make a building. Similarly, a number of pages are used and arranged to make a book. In the same way, cells are arranged to make an organism. Can you make a building without bricks or a book without pages? No, it is not possible. Similarly, an organism cannot exist without cells. Bricks or pages or cells are the basic structural units of a building or a book or an organism. Despite this similarity, they differ in one important aspect. While cells are complex living things bricks and pages are non-living.

4.



**D. Differentiate between the following :**

**Ans.** 1. The **cytoplasm** is a jelly-like liquid which occupies the space between the cell membrane and the nucleus. A number of small components or

structures called the cell organelles are ribosomes, golgi bodies, mitochondria and endoplasmic reticulum. All the chemical reactions and functions of life take place in the cytoplasm.

**Protoplasm :** The living substance of the cell is called the protoplasm. It includes the cytoplasm and the nucleus.

2. Differences between a plant cell and animal cell

**Plant cell**

1. It has a rigid, non-living cell wall.
2. It usually has one or two large vacuoles.
3. Plastids are present.
4. Centrosomes are absent.
5. Lysosomes are absent.

**Animal cell**

1. No such cell wall is present.
2. Vacuoles are either absent or are smaller in size.
3. Plastids are absent.
4. Centrosomes are present.
5. Lysosomes are present.

3. A **tissue** is a group of cells of the same shape, size and function. Examples of some tissues are nerve tissues and muscle tissues.

*An organ* is a structure that have more than one type of tissues. It is normally big enough to be seen with the naked eye. Examples of some organs are brain and heart in animals, and stems, roots and leaves in plants.

4. **Cell membrane** is also called plasma membrane. It is a thin outer covering of a cell. It is a porous membrane and permits movement of substances both inward and outward.

**Nuclear membrane** surrounds the nucleus. It is a thin porous membrane that separates the nucleus from the cytoplasm. It is, thus, the outermost covering layer of the nucleus. Being porous, it permits the movement of materials between the cytoplasm and the nucleus.

5. Prokaryotic and Eukaryotic cells

The body of nucleus differs in bacteria and other organisms. In bacteria, the nucleus is not well organized. The nucleus material is not surrounded by a nuclear membrane. Such cells which lack a nuclear membrane are called **prokaryotic cells**. The organisms with prokaryotic cells are called **prokaryotes**. Bacteria and blue-green algae are prokaryotes. All organisms other than bacteria and blue-green algae have a well organized nucleus with a nuclear membrane. These organisms are called eukaryotes and the cells as **Eukaryotic**.

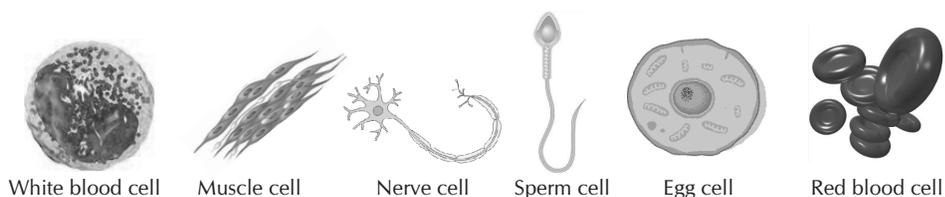
6. **Cytoplasm :** The cytoplasm is a jelly-like liquid which occupies the space between the cell membrane and the nucleus. All the chemical reactions and functions of life take place in cytoplasm.

**Nucleoplasm :** A Jelly like substance called the Nuclear Sap (nucleoplasm) fills up the nucleus.

E. Write short notes on the following :



- Ans.**
- 1. Protoplasm :** The living substance of the cell is called the protoplasm. It includes the cytoplasm and the nucleus.
  - 2. Cytoplasm :** The cytoplasm is a jelly-like liquid which occupies the space between the cell membrane and the nucleus. A number of small components or structures called the cell organelles are ribosomes, golgi bodies, mitochondria and endoplasmic reticulum. All the chemical reactions and functions of life take place in the cytoplasm.
  - 3. Nucleus :** Nucleus is a spherical body present in centre of the cell and is surrounded by the cytoplasm. It is also known as the control centre of the cell. Mostly only one nucleus is present in a cell, but in some cases, more than one nucleus may be present.
  - 4. Organelles :** You have already studied that cytoplasm contains a number of small structures called organelles. These include :
    - Mitochondria (singular mitochondrion)
    - Golgi body or golgi apparatus
    - Endoplasmic reticulum
    - Lysosomes
    - Vacuoles (plant cells have a big central vacuole; mostly absent from animal cells; if present vacuoles are smaller.
    - Plastids (present only in plant cells).
    - Ribosomes.
  - 5. Variations in shapes and sizes of cells :** Cells may be of the following shapes :
    - Irregular, as amoeba and white blood cells.
    - Spindle-shaped (long and pointed at the two ends), as the muscle cells.
    - Round or spherical, as the red blood cells and egg cells.
    - Kidney or bean shaped, as the guard cells.



White blood cell    Muscle cell    Nerve cell    Sperm cell    Egg cell    Red blood cell

- (v) Elongated and branched, as the <sup>Animal cells</sup> nerve cells.
- (vi) Long and rectangular, as the mesophyll cells in the leaf.

**F. High Order Thinking Skills (HOTS) Questions :**

- Ans.**
1. Onion cell
  2. Root, stem
  3. Nucleus





# Reproduction, Growth and Development 8

## Formative Assessment

A. Answer the following questions orally :

- Ans.
1. Animals reproduce to multiply and produce their own kind.
  2. The male gamete and the female gamete fuse to form a structure called the zygote. After fertilization, the zygote divides repeatedly and undergoes growth in size. This is called a foetus.
  3. Testes are the male reproductive system and ovaries are the female reproductive system.
  4. Animals undergoing external fertilization lay large number of eggs and sperms because external fertilization takes place outside the body of the female.

B. Tick (✓) the correct answers :

- Ans. 1. (b)                      2. (b)                      3. (a)

## Summative Assessment

A. Define the following :

- Ans.
1. **Hormone** : Hormones are the chemicals produced by the body that affect various bodily processes.
  2. **Genes** : Chromosomes have units called genes. A gene is the basic unit of inheritance.
  3. **Reproduction** : Reproduction is the life process used by an organism to produce its own kind to maintain its species.

B. Short Answer Questions :

- Ans. 1. **Asexual reproduction** : A mode of reproduction in which only one individual is involved in reproduction such that the offspring is identical to the parent.

**Sexual reproduction** : A mode of reproduction in which male and female are involved in the process of reproduction such that the offspring is similar but not identical to the parents.

Amoeba, a unicellular organism, reproduces asexually by the method of binary fission.

In Hydra, new individuals develop from buds, which are small projections formed on the body. This method is called budding.

2. **Fertilization in Human Beings** : The activities of reproductive systems in males and females are controlled by specialised proteins or hormones (chemicals produced by the body that affect various bodily processes). In males, the testes produce male sex hormones called androgens. Testosterone is the most important of these. Testosterone is produced in the male foetus to stimulate the formation of the male duct system and accessory organs. Its production then declines and does not increase until puberty. At puberty (usually occurring between the ages of 12 and 16 in



boys), it spurs the growth of the male reproductive organs and the production of sperm. In addition, testosterone brings about the male secondary sex characteristics: deepening of the voice; appearance of hair under the arms, on the face, and in the genital area; and increased growth of muscles and heavy bones.

In women, the ovaries secrete two groups of steroid hormones, estrogens and progesterone. The ovaries do not begin to function until puberty (usually occurring between the ages of 11 and 14 in girls). At puberty, the hormones spur the development of the female secondary sex characteristics: enlargement of the breasts, appearance of hair under the arms and in the genital area, and the accumulation of fat in the hips and thighs.

During copulation, millions of sperms are released inside the vagina. Some of these travel towards into the uterus and gradually reach the oviduct. When the ovary releases an ovum, it reaches the oviduct and fuses with the sperm, leading to fertilisation. Only the sperm is capable of fertilising an ovum, the fertilisation results in the formation of zygote (fertilised egg).

The sperm and ovum each carry the genetic material that is necessary to generate and maintain human life. The thread-like structures that carry that genetic material (or genes) are called chromosomes. When the genetic material of a sperm combines with that of an ovum, fertilisation or conception occurs (see figure below). Each of the parents contributes equally to the formation of a zygote. Thus, the new individual that develops from the zygote inherits characteristic features of both the parents.

The zygote once formed travels down the fallopian tube and enters the uterus. By the time it has reached the uterus, the zygote now called an embryo, is a tiny ball of cells that are continually growing and dividing. It divides repeatedly to form a ball of cells. These cells begin to form tissues and organs.

3. A pair of testes (Singular testis) located outside the abdominal cavity in scrotal sac are the male reproductive organs. The male gametes, i.e. the sperms are produced in large number in testes and are stored in epididymis. The sperm duct called vas deferens from each testis carries the sperms to urethra in penis. The penis with erectile tissue is responsible for transferring the sperms into vagina of the female body. In sperm duct, three different glands pour their secretions to neutralize the acidity of urine in urethra and provide a medium for the sperms to swim. The mixture of these fluids from different glands and sperms is called semen.
4. The sex of an individual child is determined at the time of fertilization on the basis of which male gamete has fused with the female gamete.
5. Maintaining Good Health during Adolescence



Good health is very essential during adolescence. To maintain good health, one should  
have proper diet (balanced diet).  
maintain personal hygiene.  
Keep domestic hygiene.  
Undertake physical exercise  
take proper rest and sleep.  
keep away from smoking, alcohol and drugs.

**C. Long Answer Questions :**

- Ans.** 1. All living organisms grow, multiply and produce their own kind by the process of reproduction. Reproduction is one of the characteristic features of living organism. Life would not exist on the Earth if plants and animals did not reproduce to produce their offspring. By reproducing, a living organism can be sure that there is another individual to its kind to take its place when it dies. In this way a species guarantees its survival. A species which cannot reproduce offsprings will disappear forever from the face of the Earth, i.e. it will become extinct. The best known example of animals that have become extinct is the dinosaurs.

**REPRODUCTION IN ANIMALS**

Living organisms reproduce to form individuals of their species by many ways. These are grouped into two categories :

1. Asexual reproduction
2. Sexual reproduction

**Asexual Reproduction**

Asexual reproduction is a common method of reproduction in microscopic and small animals. This is a means of reproduction involving a single individual or a single parent. The offspring produced is identical to the parent. Asexual reproduction can take place by various methods like binary fission, multiple fission, budding, spore formation and fragmentation.

**Binary fission :** It is the simplest and fastest method of asexual reproduction. First, the nucleus of the cell divides into two. This is followed by the division of cytoplasm and then the cell splits into two. Each daughter cell receives one nucleus. These daughter cells gradually grow and develop into adult individuals. Binary fission is the most common type of asexual reproduction in protozoans such as Amoeba, Euglena and Paramecium.

When a cell gives rise to several daughter cells it is termed as multiple fission. This type of reproduction is seen in Plasmodium.

**Budding :** A few animals, such as sponges and Hydra, reproduce by budding. During budding, the body develops some protuberances called buds. These are the developing new individuals which arise from the parent body. These buds may remain attached to the parent and grow as



adults. This results in the formation of a colony. Alternatively, after a certain period of growth, these buds detach from the parent and develop into new individual.

**Spore formation :** These are simply specialised cells that are released from the parent (usually in large numbers) to be dispersed. Each spore can grow into a new individual. This kind of reproduction is seen in bread mould, Rhizopus.

### SEXUAL REPRODUCTION IN ANIMALS

This is the most common method of reproduction in animals. As mentioned earlier, two parents one male and the other female take part in sexual reproduction (see figure below). Two types of reproductive cells (sex cells) called gametes are produced from reproductive organs of the two parents. Male parent produces the male gamete called sperm. Female parent produces the female gamete called ovum (plural ova) or egg.

A male gamete is usually small with a nucleus and little cytoplasm. In humans, the male gamete has a long tail which helps it in movement.

The female gamete is larger with a nucleus and more cytoplasm. This cytoplasm provides nutrition to the growing embryo.

The male gamete and the female gamete fuse (join) to form a structure called the zygote. The process of fusion of male and female gametes is called fertilization. After fertilization, the zygote divides repeatedly and undergoes growth in size. This is called the embryo. Ultimately, a new individual is formed.

#### 2. Female Reproductive System

The female reproductive system is more complex than the male reproductive system because both the fertilization of ovum with sperm and the development of the embryo occurs in the female. The female reproductive organs include a pair of ovaries (Singular ovary) that are located in the lower abdominal cavity. Once a female reaches puberty, the ovary starts producing the egg or ova (singular ovum). The ova produced are brought to uterus by oviduct (also called fallopian tube). However, the fertilization occurs only in the fallopian tube. If the ovum is fertilized, then the zygote comes in the uterus. The uterus (called womb) is a muscular organ where the development of embryo occurs until child birth in gestation period of 9 months. It opens into a muscular tube called vagina. If an ovum fails to get fertilized by a sperm, it becomes dead after a certain period of time, i.e. 24 hour. The dead ovum is expelled from the uterus along with some uterine tissue. The expulsion of dead ovum with uterine tissue is called menstruation that occurs monthly after the onset of puberty in females up to an age of 45 years or so.

#### 3. The Endocrine System

The endocrine system in our body consists of a set of glands which are located in different parts of the body. These glands are of two types



Exocrine glands (2) Endocrine glands. The exocrine glands are also known as ducted glands as their secretions are carried by the ducts. (Eg. salivary gland, tear gland). The endocrine glands or ductless glands do not have ducts and their secretions called hormones and are released in the blood stream.

The hormones are informational molecules and are secreted in response to changes in the environment inside and outside the body. Hormones can bring about drastic changes in the body. While nervous system co-ordinates the activities of the organs by passing nerve impulses, endocrine system co-ordinates the functioning of the body by using chemicals.

The major endocrine glands of our body are pituitary gland, pineal gland, thyroid gland, parathyroid gland, thymus gland, islet of Langerhans of pancreas, adrenal gland, gonads (Testis in males and Ovaries in females).

4. Puberty is the period in life at which sexually immature boy or girl becomes sexually mature and capable of reproduction. It happens to be at the age of 11 or 12 years in girls and 14 to 18 years in boys. Puberty ends when an adolescent reaches the reproductive maturity. At puberty in the males, the testes start producing sperms and in the female ovaries start releasing eggs.

Changes at Puberty

Certain changes are common in both boys and girls.

Increase in height

During puberty, there is sudden increase in height due to the growth of long bones of legs and arms. Initially girls grow faster than boys, but by the age of 18, both boys and girls reach their maximum height. The rate of growth varies in different sexes (i.e., in boys and girls) and also in different individuals.

Changes in body shape

During puberty, boys and girls start looking different due to certain changes.

In boys, the muscles of the body grow and become more prominent. Their shoulders become broad and chest wide.

In girls, the region below the waist becomes wider. The muscles of the body grow to provide an hour-glass appearance.

**Change in voice box and voice**

At puberty, the voice box or larynx begins to grow. In boys, it protrudes out in the throat region as Adam's apple. Appearance of Adam's apple marks the end of adolescence. The larynx is smaller in girls than in boys and is hardly visible from outside.

Boys develop deep voice (hoarse voice) while girls develop high pitched sweet voice.

**Increased activity of sweat and sebaceous glands**



At puberty, both sweat glands and sebaceous glands become more active specially on the face. This leads to appearance of acne and pimples on the face. This problem can be avoided by reducing intake of fatty food and also keeping the face clean by washing it properly and repeatedly.

### **Maturation of sex organs**

At puberty, the male sex organs like tests, testicles and penis become fully developed in boys. In girls, the ovaries enlarge, and maturation and release of eggs begin. This leads to onset of menstruation cycle.

### **Secondary sexual characteristics**

During the pubertal period, sex hormones bring about changes in the body. These changes help to distinguish male from female or a boy from a girl. The external features in which boys and girls differ from each other are called secondary sexual characteristics.

In boys, secondary sexual characteristics include

Growth of beard, moustaches and pubic hair along with hair on the chest and thighs.

Elongation of hands and feet.

Voice becoming deep and hoarse.

Growth of reproductive organs.

In girls, secondary sexual characteristics include

Development of breasts and the widening of region below the abdomen.

Voice becoming shrill.

Growth of pubic hair.

There is change of behaviour and attitude both in boys and girls.

Mental, intellectual and emotional maturity

Adolescence brings a change in a person's way of thinking.

Adolescents want to be independent.

Mental and physical changes taking place during adolescence cause mood changes.

He/she finds a way to recognise and manage his/her emotion.

Intellectual development takes place and they spend considerable time in thinking.

Maturity in adolescents makes boys and girls interested in the opposite sex.

Sometimes, an adolescent may feel insecure while trying to adjust to the changes in the body and mind.

### **D. Higher Order Thinking Skills (HOTS) Questions :**

- Ans.**
1. Fish and frogs lay hundreds of eggs whereas a hen lays only at a time because hen's egg [only one] be developed but fish and frog eggs [all eggs] not be developed out of 10 eggs only one egg be developed.
  2. **The development of the embryo :** The single-celled zygote divides to form a ball of cells which travel down the oviduct to the uterus and get attached to the uterine wall. At this stage, it is known as the embryo which



continues to grow by deriving nourishment from the mother. The embryo soon develops body parts such as the head, legs, hands, etc. The stage of the embryo where all the body parts can be identified is known as the foetus.

The foetus (Fig. 9.6) continues developing inside the uterus for about nine months, till it is fully formed. As the baby grows, the uterus stretches to accommodate it. When the baby is fully mature and ready for birth, muscles of uterine walls contract, exerting a force which eventually helps pushing the baby out. This is known as parturition. The period for which the baby develops inside the mother is known as the gestation period.



This Figure shows the overview of the human reproductive process.



## Force and Pressure

9

### Formative Assessment

**A. State whether the following statements are True (T) or False (F) :**

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

**B. Fill in the blanks :**

- Ans.**
1. The **pull** or a **push** acting on a body is commonly called force.
  2. A force can change the **direction** and **speed** of an object.
  3. Muscular force is an example of **contact** force.
  4. If the same force is made to act on a larger area, the pressure **zero**.
  5. The pressure exerted by a liquid increases with **depth**.
  6. At the given depth, a liquid exerts **equal** pressure in all directions.

### Summative Assessment

**A. Very Short Answer Questions :**

- Ans.**
1. Force of gravity
  2. Frictional force
  3. Pressure is defined as the force acting on a unit area. In other words,  

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$
  4. Newton
  5. N/m<sup>2</sup>
  6. Magnetic force
  7. Spring balance
  8. Muscular force

**B. Short Answer Questions :**

- Ans.**
1. A push or pull acting on a body which tends to change its state of rest or motion is called a **force**. Force is usually denoted by the letter *F*.  
The direction in which the body is pushed or pulled is called direction of the force. The standard unit of force is called *newton*, denoted by the letter *N*.
  2. The gravitational force exerted by the earth on all other bodies is called



the '**force of gravity**'. This gravitational force makes the earth move around the sun and also makes the moon go around the earth.

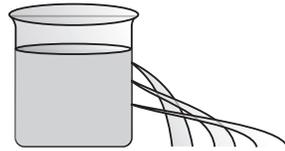
Every object applies a force on every other object. The magnitude of the force depends on the mass of the objects and also the distance between them. Two pens kept on your table also pull each other, but with a negligible force. (Due to their small masses).

Then why are all the things attracted towards the earth? The answer is simple. Due to the HUGE mass of the earth! The weight of an object on the earth is a measure of the gravitational pull on that object.

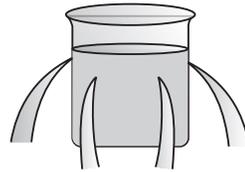
3. A blunt knife decrease the pressure. So it is difficult to cut vegetables with the blunt knife.

4. **Liquid pressure increases with depth**

Take two cylindrical cans. In one of them, make 3-4 holes one below the other. Make 3-4 holes in the other can, at the same height all around the walls of the can. Now apply adhesive tape over the row of holes.



A tin can with holes  
one after other



A tin can with  
holes around it

Once water is filled in the cans, remove the tape. What do you see?

In the first case we see that, water flows from the lowest hole with great force. It flows from the second hole with less force and from the top hole with least force. This shows that *liquid pressure increases with depth*.

In the second case you will observe that water comes out from all the holes with equal force. This shows that at any given depth, the pressure is the same in all directions.

5. Dams are made thicker and stronger at the base to withstand the high pressure at greater depth.

6. It is for the same reason that at higher hills, some people suffer from nosebleeds. It is because at higher altitude, atmospheric pressure is less, and the pressure of air within their bodies is more. This difference in pressure causes the blood capillaries to burst and cause bleeding.

The pressure at the bottom of the sea is much greater than at sea level. Very deep down, the pressure is high enough to crush the human body. That is why deep-sea divers wear specially designed suits to protect their body from such high pressures.

7. One end of a drawing pin is wide while the other end is very sharp and pointed to enable us to hold it properly and press against a surface.

**C. Long Answer Questions :**

**Ans.** 1. A push or pull acting on a body which tends to change its state of rest or



motion is called a **force**. Force is usually denoted by the letter  $F$ . The direction in which the body is pushed or pulled is called direction of the force. The standard unit of force is called *newton*, denoted by the letter  $N$ .

It must be remembered that a force does not always make an object move. *For example*, you can push a large box without displacing it from its position.

### **Effect of Force**

#### **1. Moves stationary object**

When a player kick a stationary ball, it moves. If someone pushes a book lying on a table, it starts moving, i.e., a push makes it move. When someone pulls a chair, it starts moving.

#### **2. Changes the speed of a moving body**

If a football player kicks a moving football with force in the direction of motion i.e., in the direction in which it is moving, the football starts moving faster. When a goalkeeper applies force to stop the ball, he reduces its speed to zero. Similarly, if someone applies brakes to a moving bicycle, it first slows down and then stops.

#### **3. Changes the direction of motion of a moving body**

When a batsman hits a ball with his bat, he applies force to change the direction of the moving ball. In the same way you change the direction of your moving bicycle by applying force to its handle in the desired direction.

#### **4. Change the shape or size of an object**

If you squeeze a lump of a sponge, its shape changes. Have you seen your mother making chapattis? She takes a small ball of dough and completely changes its shape and size by rolling it on the board. We can also break things made of glass very easily by applying force to them.

To conclude, a force may change the state of motion of an object or change the shape of an object.

#### **2. Contact and Non-Contact forces**

Some forces act on objects only when they are in contact with each other. For example, if you want to carry a bucket of water, you apply a force directly to the handle of the bucket. In the same way, if you have to pick up your school bag, you apply a force directly on the handle of the bag.

Forces that act only when there is physical contact between two interacting objects are known as **contact forces**. Muscular force and frictional forces are two examples of contact forces.

However, there are few other forces that can also act on an object even if objects are not in contact. These forces are called **non-contact forces**, e.g., gravitational force, magnetic force and electrostatic force.

### **D. Higher Order Thinking Skills (HOTS) Questions :**



- Ans.** 1. All cutting instruments like knives, blades, axes, etc., are sharpened (thin) at the intersection. This is done so as to increase the pressure applied by these instruments for a given force.
2. To lessen the pressure of tyres.



## Sound

10

### Formative Assessment

**A. Answer the following questions orally :**

- Ans.** 1. The frequency of a sound will be low which is produced when the vocal cords are tight and thin.
2. If we shout on the moon, the sound will slower then the Earth because there is no air.
3. Differences between noise and music :
- | Music  | Noise  |
|--|--|
| (i) It is a pleasant sound.                  | (i) It is an unwanted sound.                 |
| (ii) It is produced by systematic vibration. | (ii) It is produced by irregular vibrations. |

**B. Tick (✓) the correct answers :**

- Ans.** 1. (c)                      2. (a)                      3. (a)                      4. (c)                      5. (a)

**C. Fill in the blanks :**

- Ans.** 1. All unpleasant and undesirable sounds are known as **noise**.
2. The frequency of a sound determines its **pitch**.
3. Sound cannot travel through **vacuum**.
4. Sound above 20000 Hz are called **ultrasonic sound**. They **cannot** (can/cannot) be heard.
5. The SI unit of frequency of sound is **Hertz (Hz)**.

**D. Write True or False for the following statements :**

- Ans.** 1. True                      2. False                      3. False                      4. True                      5. False

**E. Match the following :**

- Ans.**
- |              |   |
|--------------|---|
| 1. Vibration | (i) Maximum displacement of a vibrating body from its mean position         |
| 2. Frequency | (ii) To and fro motion of a vibrating body about its mean position          |
| 3. Amplitude | (iii) Produced sound in humans  |
| 4. Larynx    | (iv) A medium through which sound cannot travel                             |
| 5. Vacuum    | (v) The number of vibrations produced by a vibrating particle in one second |

### Summative Assessment

**A. Define the following terms :**



- Ans.**
1. **Vibration** : The to and fro or back and forth motion of an object.
  2. **Frequency** : The number of oscillations or vibrations made by the vibrating body in one second.
  3. **Vacuum** : Vacuum is an airless tube through which sound cannot travel.

**B. Differentiate between the following :**

- Ans.**
1. **Musical sound and Noise** : Musical sound is a pleasant sound which is produced by systematic vibrations. While noise is an unwanted sound which is produced by irregular vibrations.
  2. **Audible and Inaudible Sound** : Usually audible sound is used to mean the sound which can be perceived by the human ear. Audible and inaudible sounds are relative terms. Audibility of sound depends upon the capability of the ear. The audible range of sound for human beings is from 20 Hz to 20 KHz. The sounds having frequencies above and below this range are inaudible sounds for human beings.

**C. Short Answer Questions :**

- Ans.**
1. **Sound** : Sound is something that produces the sensation of hearing in our ears. We can't imagine of a world without sound because sound makes to communicate easily.
  2. **Frequency** : The number of oscillations or vibrations made by the vibrating body in one second.  
**Amplitude** : The maximum displacement or extent of vibration or oscillation of a vibrating body from its mean position.
  3. Ultrasonic sound waves are used to improve the quality of homogenized milk, to control pests, etc.
  4. When you shout, you can hear the echo of your voice. This happens because of the reflection of sound from a surface. Thus, echo can be defined as reflected sound waves. The reflecting surface must be present at a distance of 17 metre or more for you to be able to hear the echo.  
Sound can also be absorbed. Surfaces like wood, carpets, curtains, etc. absorb sound. Soft surfaces are good absorbers of sound as compared to the hard surfaces. Sound is better reflected by hard surfaces. So we hear more clearly in a furnished room than in empty room.
  5. Differences between noise and musical sounds
 

Sound	Noise
a. It is a pleasant sound.	a. It is an unwanted sound.
b. It is produced by systematic vibrations.	b. Produced by irregular vibrations.

**D. Long Answer Questions :**

- Ans.**
1. **SOURCES OF SOUND** : Sound is produced by a variety of objects around us. In nature, we hear different kinds of sounds. The gale howls, rain patters, trees whisper and running water ripples and gurgles. Various types of sound are produced by human beings also. Crying, laughing, sneezing, snoring, whistling, wheezing, etc. are some distinct human



sounds. Roaring engines, whining jet planes, explosions, etc. produce unpleasant sounds. It is an interesting fact that some animals can also mimic some sounds made by human beings. For instance, the young one of an orangutan cries like a human infant. A hyena laughs like a human being.

Sound helps living beings to communicate. Human beings communicate with each other by way of talking. Even animals communicate with each other by producing different sounds. Birds produce different sounds which help them in communi-cating with other birds of the same species.

2. The ear has three major parts, described as the outer ear, middle ear, and inner ear.

**Outer Ear :** Sound waves enter the outer ear and travel through the ear canal to the eardrum. The eardrum vibrates due to the incoming sound waves and transmits these vibrations to the middle ear.

**Middle Ear :** Three tiny bones called the malleus (hammer), the incus (anvil), and the stapes (stirrup) amplify the sound and send it to the inner ear.

**Inner Ear :** The sound vibrations create ripples in the fluid to the cochlea. Projections from tiny hair cells bend, causing electrical impulses that the auditory nerve, or eighth cranial nerve, sends to the brain. The brain translates these impulses into what we experience as sound.

3. To understand that sound needs a material medium to propagate.

**Procedure :** Take a dry empty, transparent plastic jar or box, with an air tight lid. Remove the lid from the jar. Take a big piston (pichkaari) and carefully make a hole just to fit in the nozzle of the closed piston in the lid, as shown in the figure below. Make the fitting air tight with the help of clay. Now, keep a small radio or an i-pod inside the jar and turn in 'on', with a considerable volume. Replace the lid on the mouth of the jar, taking full care that the fitting of the piston does not get disturbed. You must be able to listen to the sound coming out from the i-pod/radio from inside the jar. Next, pull the handle of the piston outward, to its maximum possibility. Try to listen to the sound of the i-pod. Can you still hear it as clear as earlier?

You can try listening to the i-pod once again, by completely closing the piston. Isn't that wonderful, the sound comes back. There was nothing wrong with the i-pod. Pull the piston out once again, the sound disappears again.

4. **NOISE POLLUTION :** The disturbance produced in the environment by loud and harsh sounds from various sources is called noise pollution.

**Sources of Noise Pollution :** Noise pollution is a by-product of industrialization, urbanization and modern civilization.

Broadly speaking, noise pollution has two main sources, i.e., industrial and non-industrial. Industrial sources include noise from various sirens, hooters and machines in industries. Non-industrial sources of noise



include the noise created by vehicular traffic and the neighbourhood.

Noise pollution can also be categorized as natural and man-made. Some man-made sources of noise pollution are as follows :

**Road traffic :** Road traffic is one of the main and growing sources of noise pollution. Transport mediums are the worst offenders, with trucks, buses, cars, and motorcycles all producing excessive noise.

**Rail traffic :** Rail transport is also not free from noise pollution. However, it affects only a smaller group of population living along the railway lines.

**Air traffic :** Construction of airports within the cities has contributed heavily to the noise pollution. Airplane engines generate a lot of unwanted noise.

**Construction sites :** Construction of metros, highways, city streets and buildings is a major contributor to noise pollution. The sources of construction noise include pneumatic hammers, air compressors, bulldozers, loaders, dump trucks (and their backup signals), and pavement breakers.

**Industries :** Neighbours of noisy manufacturing plants can be disturbed by sources such as fans, motors and compressors mounted on the outside of the industries. Interior noise can also be transmitted through open windows and doors. These interior noise sources have a significant impact on industrial workers, among whom noise-induced hearing loss is unfortunately very common.

**Building :** Noise in the buildings from plumbing, boilers, generators, air conditioners and fans can be annoying.

**Consumer products :** Certain household equipments, such as vacuum cleaners and some kitchen appliances are noisemakers.

**D. Higher Order Thinking Skills (HOTS) Questions :**

**Ans.** Do yourself



## Chemical Effects of Electric Current 11

### Formative Assessment

**A. Choose the correct answer for each of the following :**

**Ans.** 1. (ii)      2. (i)      3. (ii)      4. (i)      5. (iii)

**B. Complete the table for the electrolysis processes given below :**

**Ans.** Do yourself

**C. State whether the following statements are True (T) or False (F):**

**Ans.** 1.T    2.T    3.F    4.T    5.T    6.F

### Summative Assessment

**A. Very Short Answer Questions :**

**Ans.** 1. **Electrolysis :** A chemical change brought about by the passage of electric



current.

2. Gold and Silver
3. Zinc
4. By tarring there
5. Salt

**B. Short Answer Questions :**

**Ans.** 1. (i) **Electrolysis** : A chemical change brought about by the passage of electric current.

(ii) **Cation** : Positively charged particles.

(iii) **Anion** : Negatively charged particles.

(iv) **Electrolyte** : A compound which conducts electricity in molten and aqueous form.

(v) **Cathode** : Negative electrode.

(vi) **Anode** : Positive electrode.

2. (i) Some substances such as water, dilute hydrogen chloride and sodium chloride which conduct electricity in aqueous (solution) or molten form are known as **Electrolytes**. Other substances which do not conduct electricity in aqueous or molten form are known as Non-electrolytes. Petrol, oil, carbon tetrachloride and distilled water are examples of non-electrolytes.

(ii) Electrolysis is an important industrial process which is used to get metals from their oxides and chloride. Sodium metal is extracted by electrolysis of solution of sodium chloride in a container containing a negative and a positive electrode. On passing electricity, sodium metal is deposited at the negative electrode also known as cathode white chlorine gas is liberated at the positive electrode also known as **Anode**.

(iii) In electroplating, the object to be coated is made the negative electrode (anode). Salt solution of the metal to be coated is the electrolyte. Certain metals like copper, zinc and iron are also purified by the method of electrolysis. It is called **Electrolytic refining**.

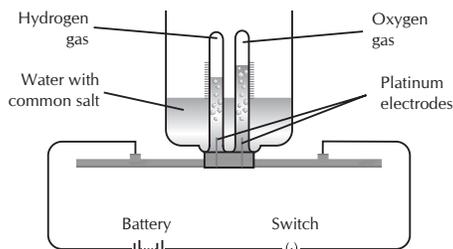
3. **To see the chemical change in water when electricity is passed through it.**

Take a voltameter having two platinum electrodes. Join them to the terminals of a 6 volt battery. Fill up the voltameter about half with water containing dissolved common salt. Take two test tubes, fill them with the same salt solution and invert them over the platinum electrodes. Switch on the circuit. When the electric current starts flowing through the salt solution, you will see bubbles of gas coming out from both the electrodes. But, the gas collected at the negative terminal is twice in volume as compared to the gas collected at the positive terminal.

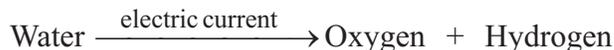
You know that water is made up of hydrogen and oxygen. The gas collected at the negative terminal is hydrogen while at the positive terminal it is oxygen. They can both be checked by taking a burning



matchstick after the test tubes are completely filled with gas and removed. In case of hydrogen, the matchstick will burn out with a pop sound while in case of oxygen, the matchstick will burn brightly, with a flame.



This activity shows that due to the passage of electric current, water is dissociated into its constituents *i.e.* hydrogen and oxygen.



The above process is known as **Electrolysis of water**.

#### 4. Tester Made of LED

When electric current is passed through the filament of the bulb, it gets heated to such a high temperature that it starts glowing. But sometimes if current flowing through the filament of the bulb is very small then it does not get heated to a high temperature. As a result the bulb does not glow. In this case we should replace the electric bulb with LED (light emitting diode). It glows even when a very small current flows through it. LED has two wires called leads attached to it. The longer lead of LED must be connected to the positive terminal of the battery and the shorter one should be connected to the negative terminal.

#### Tester Made of Compass Needle

When electric current flows in a wire, magnetic field is made around it. This is called magnetic effect of current. When even a very small current flows in a wire, a compass needle kept, nearby gets deflected.

#### 5. Activity

**Aim :** To check the conducting properties of distilled water and water containing dissolved salts.

**Materials required :** Two beakers, distilled water, water containing dissolved salt, a tester.

Take one beaker and fill it half with distilled water. Put free ends of the tester into the distilled water. Do not touch the free ends of tester. What do you see? Take other beaker and fill it half with water containing dissolved salt. What do you see?

**Observations :** In the case of distilled water, bulb of the tester does not glow even if the circuit is complete. In the second case the bulb starts glowing as soon as the circuit is completed.

**Conclusions :** Distilled water does not conduct electricity while water containing dissolved salt conducts electricity. Hence it is a good conductor.

### C. Long Answer Questions :

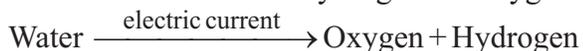


**Ans. 1. To see the chemical change in water when electricity is passed through it.**

Take a voltmeter having two platinum electrodes. Join them to the terminals of a 6 volt battery. Fill up the voltmeter about half with water containing dissolved common salt. Take two test tubes, fill them with the same salt solution and invert them over the platinum electrodes. Switch on the circuit. When the electric current starts flowing through the salt solution, you will see bubbles of gas coming out from both the electrodes. But, the gas collected at the negative terminal is twice in volume as compared to the gas collected at the positive terminal.

You know that water is made up of hydrogen and oxygen. The gas collected at the negative terminal is hydrogen while at the positive terminal it is oxygen. They can both be checked by taking a burning matchstick after the test tubes are completely filled with gas and removed. In case of hydrogen, the matchstick will burn out with a pop sound while in case of oxygen, the matchstick will burn brightly, with a flame.

This activity shows that due to the passage of electric current, water is dissociated into its constituents *i.e.* hydrogen and oxygen.



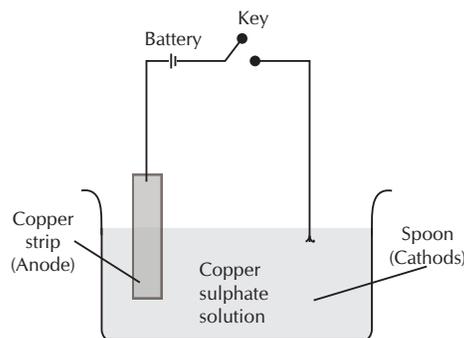
The above process is known as **Electrolysis of water**.

## 2. Activity

### Electroplating a metal spoon with copper.

Take a glass beaker, a metal spoon strip of copper, a battery, connecting wires and copper sulphate solution.

Fill the beaker half with copper sulphate solution. Join the copper strip to the positive terminal of the battery and the spoon to the negative terminal. Dip both of them in the copper sulphate solution such that they do not touch each other. Let the current pass through the electrolyte for about 30 minutes.



You will see that while the copper strip becomes smaller, the metal spoon is plated with a layer of copper.

## D. Higher Order Thinking Skills (HOTS) Questions :

- Ans.**
1. The food remains fresh.
  2. Do yourself



## Formative Assessment

**A. Answer the following questions orally :**

- Ans.**
1. We observe regular reflection in rippling water.
  2. **Beam of light :** Beam of light is a group of light rays coming from the same source in the same direction.
  3. The three necessary conditions for us to be able to see :  
(i) Persistence of vision                      (ii) Accommodation  
(iii) Near point of eye
  4. There are 63 symbols or characters in Braille. Each symbol is represented by a cell which consists of two vertical rows of three dots.

**B. Tick (✓) the correct answers :**

- Ans.** 1. (d)                      2. (b)                      3. (a)

**C. Fill in the blanks :**

- Ans.**
1. The bouncing back of the light in the same medium is called **reflection**.
  2. In regular reflection, the reflected rays remain **equal** to each other.
  3. The leading cause of blindness is **damage of retina**.
  4. The coloured, disc-shaped diaphragm in the eye is called the **iris**.
  5. The set of colours formed on splitting of white light is called the **dispersion** of white light.

## Summative Assessment

**A. Define the following terms :**

- Ans.**
1. **Light :** A form of energy which gives us the sensation of seeing objects.
  2. **Reflected ray :** The ray of light that gets reflected from the mirror.
  3. **Angle of reflection :** The angle formed between the reflected ray and the normal.
  4. **Accommodation :** The ability of the eye to alter the focal length of its lens so that it can clearly see all objects within a certain range.
  5. **Visually challenged people :** People whose vision is extremely poor or they are blind.

**B. Short Answer Questions :**

- Ans.**
1. A shiny metal utensil forms an image, but the image is not as clear as that formed by a mirror because the surface of shiny metal utensil reflects the light irregularly.
  2. **Laws of Reflection :** When light falls on a plane smooth surface, it follows certain laws, called the laws of reflection. There are two laws of reflection :  
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 reflection is just as the angle of incidence.  
The incident ray, the reflected ray and normal always lie in the same plane.

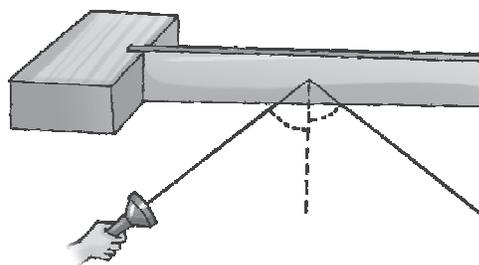


3. The image formed by a plane mirror is virtual, erect, laterally inverted, of the same size as the object, and at the same distance from the mirror as the object.
4. In a plane mirror the left of the object appears to be the right of the image and vice versa. This phenomenon is called Lateral Inversion.
5. The light entering the eye is controlled by the iris.

**C. Long Answer Questions :**

**Ans.** 1. **Aim :** To verify the laws of reflection.

**Procedure :** Take a plane mirror and fix it in a slit made in a small thermocol cube, so that the mirror can stand vertically straight on a table. Take a 5 cm × 5 cm piece of black chart paper. Make a 1 mm wide and 1 cm long slit in the centre of the black paper and use this to cover the front of a torch. Now, when you light the torch, light will come out only from the slit on the black paper. Now, take an A-4 size of white paper, mark a 10 cm long straight line in its centre, with a sharp pencil. Shade one side of the line. This line will represent the mirror. Place the plane mirror just over this line. Keep the torch in front of the mirror, at an angle, as shown in the figure and light it. Very carefully, mark the positions of the incident light and the reflected light. Put off the torch and remove the torch and mirror.



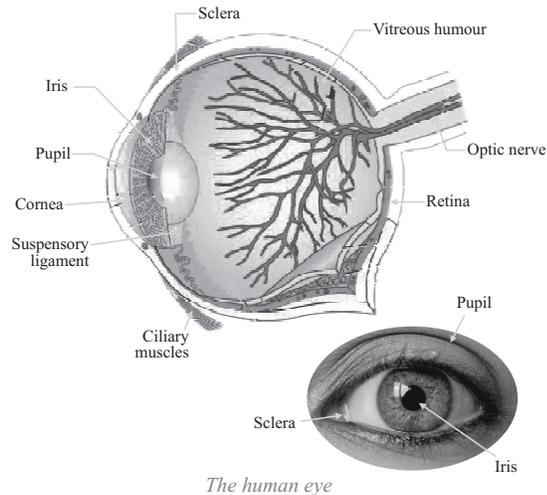
With the help of a scale and pencil, produce the incident ray (position of incident light) and the reflected ray (position of the reflected light) to make them meet at the line representing the mirror. The point where the incident and reflected rays meet at the line representing the mirror, is called the point of incidence and also, the point of reflection. Draw a perpendicular to the line of mirror, at the point of incidence. This is the normal. Take a protractor and measure the angle of incidence (angle between the incident ray and the normal). Also, measure the angle of reflection (the angle between the reflected ray and the normal). Compare the measurements of the angle of incidence and the angle of reflection. Do you find them equal?

The fact that you could trace and draw the incident ray, the normal and the reflected ray on the same sheet of paper, verifies the first law of reflection. The equal measures of the angles of incidence and reflection verifies the second law of reflection.

2. **Structure of the Eye :** The eye is enclosed in a nearly spherical eyeball. A protective white membrane called the sclera covers most of the eyeball. The eyeball has a small bulge at the front, which has a transparent



membrane over it, called the cornea. Behind the cornea lies a coloured, disc-shaped diaphragm called the iris. The iris has a small opening called the pupil. Light entering through the pupil falls on a flexible lens, which is attached to a set of ciliary muscles. The space in front of the lens is filled with a watery fluid called the aqueous humour. And the space behind the lens is filled with a jellylike fluid called the vitreous humour. Light entering the eye finally falls on the retina, which is at the back of the eyeball. There an image is formed.



The human eye

- Vitamin A helps in protecting us against the eye diseases. Milk, butter, curd, egg, carrot, papaya, fish oil, spinach, mango are the good sources of vitamin A. Lack of vitamin A may cause night blindness.

**D. Higher Order Thinking Skills (HOTS) Questions :**

- Ans.**
- Reflection of light from a new steel plate is regular and an old steel plate is irregular
  - Because white light it scattered.



## The Night Sky

13

### Formative Assessment

**A. Choose the correct answer for each of the following :**

- Ans.** 1. (c) 2. (a) 3. (b) 4. (d) 5. (a)

**B. Fill in the blanks :**

- Ans.**
- Cassiopeia** is a constellation with a group of five bright stars arranged in the form of a W or an M.
  - The large red spot in the surface of Jupiter is actually a giant **Storm**.
  - The temperature at the centre of a star ranges from **2 to 5** million degree celsius.
  - Celestial** bodies are also called heavenly bodies.
  - Asteroids can only be seen through a powerful **Telescope**.
  - Neptune has **Eight** known moons revolving around it.

**C. State whether the following statements are True (T) or False (F) :**

- Ans.** 1.F 2.T 3.T 4.F 5.T 6.F



## Summative Assessment

### A. Very Short Answer Questions :

- Ans.** 1. The sun is a medium-sized star. The diameter of the sun is about 1.4 million kilometers. It is a huge ball of gases. Nearly 90 per cent of the sun is made of hydrogen. This hydrogen is constantly converted into helium by a process called **Nuclear fusion**.  
This makes Sun the main source of heat and light for all the planets.
2. The distance travelled by the light in one year is called **light year**. It is used to measure large distances.
3. Venus rotates from east to west. This east to west rotation is called **Retrograde motion**. Venus has no satellite of its own.
4. The name of our galaxy is **Milky Way or Akash Ganga**. It is a broad band of light that looks like a trail of milk spread across the sky.
5. Meteoroids move at a very high speed as they enter the earth's atmosphere. As a result, they burn due to friction and can be seen as a streak of light. This streak looks like a falling star and is called a **Meteor** or a **shooting star**.

### B. Short Answer Questions :

- Ans.** 1. Despite being further away from the Sun than Mercury, Venus is hotter. This is because it has a high percentage of carbon dioxide which causes heating due to the greenhouse effect.
2. (a) Stars are luminous heavenly bodies. They give out their own light but planets do not have the light of their own.
- (b) **Meteoroids** : These are solid objects that are smaller than comets and asteroids in size. They keep moving in the solar system. The visible streak that occurs when a meteoroid enters the earth's atmosphere is called **meteor**. The unburnt meteoroids that reach the earth's surface are called **meteorites**.
- (c) **Inner planets** : Some planets are nearer to the Sun than the other planets. They are called **inner planets** or terrestrial planets. They are Mercury, Venus, Earth and Mars. Inner planets do not have rings and are mostly of rocks. Due to this, they are very dense.  
**Outer planets** : Jupiter, Saturn, Uranus and Neptune are called **outer planets** or jovian planets. They are larger and much farther away from the Sun as compared to the inner planets. They are mostly made up of gases, are light and have rings around them.
- (d) **Satellites** : These are small celestial bodies that revolve around the planets. The earth has only one satellite—the **moon**.  
**Planets** : All planets revolve around the sun in a definite path called orbit.
- (e) **Constellation** : A group of stars that forms a shape in the sky and has a name.  
**Galaxy** : The system of stars containing the Sun and its planets, seen



as a bright band in the sky.

3. **Dwarf planets** : Very small planets are called *dwarf planets*. Till date three dwarf planets, Pluto, Ceres and Eris have been discovered.
4. (a) Phases of the moon : The shapes of the bright part of the moon as seen from the earth are known as **phases of the moon**. New moon, crescent moon, first quarter, gibbous moon and full moon are the various phases of the moon.  
(b) **Ursa Major (Vrihat Saptarishi)**  
Ursa Major consists of seven bright stars arranged in the form resembling a big spoon. There are three stars in the handle of the ladle and four in its bowl.  
Ursa Major is also termed as '**Big Dipper**' as the word 'dipper' in early days meant a large spoon used for drinking water. Ursa Major is also termed as the Great Bear because along with several other faint stars, it forms the shape of a bear.  
(c) **Earth (Prithvi)**  
The Earth is the only unique planet in the solar system on which life is known to exist. The three things responsible for sustenance of life on the Earth are :
  - right temperature range.
  - right distance from the Sun.
  - presence of water, a suitable atmosphere and a layer of ozone which protects us from the harmful ultraviolet radiations.From outer space, the Earth appears blue-green due to the reflection of light from water and landmass on its surface. Earth has one natural satellite the moon. The Earth rotates on its own axis which is tilted at an angle of  $23.5^\circ$ . This tilting always remains in the same direction and is responsible for change in seasons.  
(d) **Unique feature of Saturn** : One of the special features of Saturn is the presence of rings around it which are actually small lumps of dust and ice moving around the planet at a high speed. Due to very low temperature life is not possible on Saturn.  
Saturn appears yellow in colour. It is the least dense among all planets with density lesser than water.  
(e) **Asteroid** : Asteroids are large pieces of rocks or metals revolving around the Sun in between the orbits of Mars and Jupiter. They can only be seen through a powerful telescope. It is believed that there are a large number of asteroids out of which about 4,000 have been discovered so far. Asteroids are of different size. The largest asteroid Ceres is actually a dwarf planet with a diameter of approximately 950 km.  
(f) **Orion (Vyadha or Mriga)**



Orion looks like a hunter and is one of the most important constellations in the sky. It also has seven or eight bright stars. The three middle stars represent the belt of the hunter. The four bright stars seem to be arranged in the form of a quadrilateral.

The star Sirius, which is the brightest star in the sky, is situated close to Orion. A straight line passing through the three middle stars of Orion lead to the star Sirius. Orion is visible during winter season in the late evenings.

(g) **Planets :** The word 'planet' is taken from a Greek word which means 'wanderer'. All planets revolve around the sun in a definite path called **orbit**. Planets do not have the light of their own. They reflect the sunlight that falls on them. They do not twinkle like stars and keep changing their positions with respect to the star.

(h) **Comets :** Comets are heavenly bodies that revolve around the Sun in very large orbits. They are lumps of rock, dust and ice.

(i) **Jupiter (Brihaspati)**

The distance of Jupiter from the Sun is more than the sum of the distances of the first four planets from the Sun. Thus it receives much less energy as compared to the first four planets. It is the largest planet of the solar system. It is so large that about 1300 earths can be placed inside it. Life is not possible on this planet as it has very low temperature and very high gravitational pull.

### C. Long Answer Questions :

**Ans.** 1. Although all stars appear to move from east to west, there is one star near the earth's axis that appears stationary. This is the **Pole star or Polaris or Dhruv tara**. Let us perform Activity 2 to learn about this.

Activity

**To know why the Pole star appears stationary.**

- Take a black umbrella and open it.
- Paste silver stars of different sizes at different places on its inner side and one big star near the rod.
- Now rotate the umbrella and see the stars.
- You will see that all stars appear to move except the star pasted near the rod. This star can be compared to the Pole star and the umbrella's rod can be compared to the earth's axis.

### 2. The Earth's Moon

The earth has only one satellite. It is large enough in comparison to the other satellites. It is about one-fourth the size of the earth. It is made up of rocks and has craters on its surface. These craters were formed when meteorites hit it. The moon is at a distance of about 3,84,000 km from the earth.

The moon has no light of its own. It reflects the light of the Sun. It rotates on its own axis and also revolves around the earth. That is why only one



side of the moon is visible to us. You must have observed that you do not see the moon with the same shape every night. This is because the Sun lights up different parts of the moon as it revolves around the earth and we can only see the lit side of the moon. These shapes of the bright part of the moon as seen from the earth are known as **Phases of the moon**.

3. The solar system consists of the Sun and all the other celestial bodies that revolve around it. The planets and their moons, comets, asteroids, and other space objects revolve around the sun in definite orbits.
4. Comets appear like a ball of fire with a long tail. The tail always points away from the Sun. The length of the tail of a comet increases while coming towards the Sun. This is because the heat of the Sun melts some of ice turning it into gas. Some dust also comes out forming a cloud of gas and dust around the comet. As the comet comes nearer to the Sun, more dust and gas are given off making its tail visible.
5. Stars are luminous heavenly bodies we regularly notice in the night sky. They give out their own light and are made of mostly hydrogen. The temperature at the centre of a star ranges from 2 to 5 million degree celsius. This high temperature results in melting and combining of hydrogen atoms to form a heavier gas called **Helium**. During this process huge amount of heat and light energy is released. This makes stars emit heat and light.

**D. High Order Thinking Skills (HOTS) Questions :**

- Ans.** 1. Do yourself      2. Because Mercury is the nearest planet to the sun.  
3. Do yourself      4. Do yourself  
5. Due to the light of the sun.



## Lighting

14

### Formative Assessment

**A. Answer the following questions orally :**

- Ans.** 1. The process of transfer of charges from a charged object to the Earth is called earthing or grounding.  
2. We should not stand under a tree during lightning because the tree can catch fire.  
3. Benjamin Franklin is famous for his kite and key experiments.  
4. Lightning conductor is the device which saves building from lightning.

**B. Tick (✓) the correct answers :**

- Ans.** 1. (b)      2. (d)      3. (b)

**C. Fill in the blanks :**

- Ans.** 1. The flow of electricity from clouds to the ground is called **earthing**.  
2. A **lightning conductor** protects a building from the harmful effects of lightning.



3. The metal leaves of an electroscope move away from each other due to **discharge**.
4. The place where two plates of the Earth meet together is called a **focus**.
5. Earthquakes of magnitudes 0-3 on Richter scale are completely **minor**.

**D. Write True or False for the following statements :**

**Ans.** 1. False      2. False      3. False      4. False      5. True      6. True

## **Summative Assessment**

**A. Define the following terms :**

- Ans.**
1. **Lightning** : Sudden electric from one closed to another or from the clouds to the Earth.
  2. **Electroscope** : A device called electroscope which is used to detect and measure electric charge.
  3. **Lightning conductor** : Lightning conductor are installed on tall buildings, poles, etc. to protect them from lightning.
  4. **Epicentre** : It is the point vertically above the seismic focus.
  5. **Richter Scale** : The scale which is used to measure the magnitude of an earthquake.

**B. Differentiate between the following :**

- Ans.**
1. **Electric charge** : Electric charge is the electric energy produced in a body.  
**Electric current** : The flow of charges constitutes an electrical current.
  2. Ground waves caused due to earthquakes may cause landslide and waves caused due to a underground nuclear test cause less damage than earthquakes.

**C. Answer the following question in short :**

- Ans.**
1. In the normal stage, an atom has an equal number of electrons and protons and it carries no charge so it is neutral.
  2. In the activity, the two foils repel each other because they receive the same charge from the plastic scale. Now touch the end of the paper clip slightly with your hand. You will observe that they will come back to their original state. Repeat charging of foil strips and touching the paper clip with your hand. You will find that every time you touch the paper clip, the foil strips lose charge and come back to their original state. This happens because the strips lose charge to the Earth through your body as human body is a good conductor. We can also say that foil strips get discharged on touching. This process of transfer of charges from a charged object to the Earth is called earthing or grounding.
  3. Earthquakes generate seismic waves which can be detected with a sensitive instrument called a seismograph. Advances in seismograph



technology have increased our understanding of both earthquakes and the Earth itself.

4.

Magnitude on the Richter scale	Type	Effects	Frequency of occurrence
< 2.0 2.0-2.9	Micro Minor	Not felt. Not felt, but recorded.	About 8,000 per day About 1,000 per day
3.0-3.9	Minor	Often felt, but rarely causes damage.	49,000 per year (est.)
4.0-4.9	Light	Noticeable shaking of indoor items, rattling noises, significant damage likely.	6,200 per year (est.)
5.0-5.9	Moderate	can cause major damage to poorly constructed buildings over small regions. At most slight damage to well-designed buildings.	800 per year
6.0-6.9	Strong	Can be destructive in areas upto about 100 miles across in populated area.	120 per year
7.0-7.9	Major	Can causes serious damage over large areas.	18 per year
8.0-8.9	Great	Can cause serious damage in areas several hundred miles across.	1 per year
9.0-9.9	Great	Devastating in areas several thousand miles across.	1 per 20 years
10+	Great	Never recorded.	Extremely rare (unknown)

**D. Answer the following questions in detail :**

- Ans.** 1. We already know that atoms are made of protons, neutrons and electrons. Protons are positively charged, neutrons have no charge and electrons are



negatively charged. In the normal stage, an atom has an equal number of electrons and protons and it carries no charge. Hence, it is electrically neutral. However, any disbalance in the number of protons and electrons creates an electric charge. The charge on the body is positive if the number of protons exceeds the number of electrons. If the number of protons is lesser than the number of electrons, the charge on the body is negative.

2. The way to protect a building that is out in the open such as those on farms is to attach a lightning rod to the building. It is a sharp pointed metal rod on the top of a house or building that runs down into the ground.

When lightning strikes near the building, it would hit the highest part of the structure, which is the lightning rod. Since the rod is made of metal, the current would quickly flow through the rod into the ground, where it would be dissipated. In this way, damage to the house would be minimal.

3. Lightning is an electric current. Within a thundercloud way up in the sky, many small bits of ice (frozen raindrops) bump into each other as they move around in the air. All of these collisions create an electric charge. After a while, the whole cloud fills up with electrical charges. The positive charges or protons form at the top of the cloud and the negative charges or electrons form at the bottom of the cloud. Since opposite charges attract, that cause a positive charge to build up on the ground beneath the cloud. The ground's electrical charge concentrates around anything that sticks up, such as mountains, people, or single trees.

The charge coming up from these points eventually connects with a charge reaching down from the clouds and - zap - lightning strikes!

Lightning can occur between a charged cloud and the Earth also. In some neutral clouds the positive charged particles stay light and rise to the top of the cloud. The negative charged particles get heavier and collect at the bottom of the cloud. The negatively charged bottoms of the clouds induce positive charge on the ground below them. When these charges become powerful enough, they discharge, causing a stroke of lightning.

Lightning can be defined as electric discharge between rain clouds or between a rain cloud and the Earth.

4. The Earth consists of three distinct layers. These parts are

(i) The crust                      (ii) The mantle                      (iii) The core

The Crust : It is the outermost layer of the Earth with a non-uniform thickness of 6 kilometres to 40 kilometres. (Under land the thickness of the Earth is 20 kilometres to 40 kilometres, whereas under the ocean the crust is only 10 kilometres thick).

The Mantle : It extends to a depth of 2800 kilometres below the crust, the central region between the core and the crust is called mantle. As the depth increases, the pressure inside the mantle increases. Due to extreme temperature and pressure, some of the rocks near the bottom of the mantle



melt and remain as a thick dense fluid.

The Core : It is the innermost part of the Earth and extends to a depth of around 3500 kilometre. The core itself can be divided into two parts, the outer core (2300 kilometre) of molten iron and nickel and the inner solid core (1200 km) of highly compressed iron and nickel in solid form.

5. The crust of the Earth is throughout not in one layer. In fact, it consists of many layers, one above the other. The layers are fragmented. Each fragment is called a tectonic plate. Earthquakes happen along the edge of the tectonic plates. The plates move and push against each other. Sometimes these plates snap at the weakest point along a fault line. Big shock waves go out from the focus where the shock waves start. This can be up to 700 km underground. The epicentre is on the surface right above the focus. Some of the major earth's tectonic plates are as shown.
6. Steps to protect during earthquake : If you are indoor during an earthquake, drop, cover and hold on. Get under a desk, table or bench. Hold on to one of the legs and cover your eyes. If there's no table or desk nearby, sit down against an interior wall. An interior wall is less likely to collapse than a wall on the outside shell of the building.

Pick a safe place where things will not fall on you, away from windows, bookcases, or tall, heavy furniture.

It is dangerous to run outside when an earthquake happens because bricks, roofing, and other materials may fall from buildings during and immediately following earthquakes, injuring persons near the building.

Wait in your safe place until the shaking stops, then check to see if you are hurt. You will be better able to help others if you take care of yourself first, then check the people around you.

Move carefully and watch out for things that have fallen or broken, creating hazards. Be ready for additional earthquakes called "aftershocks".

Be on the lookout for fires. Fire is the most common earthquake related hazard, due to broken gas lines, damaged electrical lines or appliances, and previously contained fires or sparks being released.

If you must leave a building after the shaking stops, use the stairs, not the elevator. Earthquakes can cause fire alarms and fire sprinklers to go off. You will not be certain whether there is a real threat of fire. As a precaution, use the stairs.

If you are outside in an earthquake, stay outside. Move away from buildings, trees, streetlights, and power lines. crouch down and cover your head. Many injuries occur within 10 feet of the entrance to buildings. Bricks, roofing, and other materials can fall from buildings, injuring persons nearby. Trees, streetlights, and power lines may also fall, causing damage or injury.

If you are in a car or a bus, do not come out. Ask the driver to drive slowly



to a clear spot. Do not come out till the tremors stop.

7. Hazards of Earthquakes :

- (i) Earthquake can damage the buildings.
- (ii) It can be destructive for the properties.
- (iii) Earthquake may be the cause of death of many people and animals.
- (iv) It may damage the infrastructure of the area.

**E. High Order Thinking Skills (HOTS) Questions :**

**Ans.** Do yourself.



## Pollution of Air

15

### Formative Assessment

**A. Choose the correct answer for each following :**

**Ans.** 1. (b)                      2. (b)                      3. (a)

**B. Fill in the blanks by choosing the correct option :**

- Ans.**
1. CFCs and plant spores are also causes of air pollution.
  2. **Carbon monoxide** causes irritation in the eyes.
  3. Acid rain makes water bodies **acidic**.
  4. **UV rays** can cause skin cancer and eye problems.
  5. The increase in the carbon dioxide level in the air may be responsible for **global warming**.

**C. Match the following :**

**Ans. Column A**

1. UV rays
2. Acid rain
3. Oil spill
4. Ozone depletion
5. Chlorine tablet

**Column B**

- a. Skin cancer
- b. Damage to buildings
- c. Chemical pollution
- d. Global warming
- e. Disinfecting water

### Summative Assessment

**A. Very Short Answer Questions :**

- Ans.**
1. **Pollution** : An undesirable change in the physical, chemical, or biological characteristics of the natural environment is called pollution.
  2. Air pollution, water pollution and noise pollution.
  3. **Air pollution** : The presence of chemicals in the air in quantities harmful to human health and the environment is known as air pollution.
  4. **Greenhouse effect** : The phenomenon whereby the Earth's atmosphere traps solar radiation because of the presence of gases such as carbon dioxide, water vapour, and methane is called greenhouse effect.
  5. UV rays can cause skin cancer and eye problems.
  6. Chemical pollution and biological pollution.
  7. **Potable water** : The water that is suitable for human consumption is called potable water.



**B. Short Answer Questions :**

- Ans.** 1. The main causes are : Pollutants such as chlorofluorocarbons (CFCs) are released from air conditioners, and refrigerators.
- Burning of fossil fuels releases gases such as the oxides of carbon, nitrogen, sulphur, and solid particulate matter such as soot into the atmosphere.
  - Mining activities, factories, volcanoes, blowing of dust storms, and plant spores are also causes of air pollution.
2. **Effects on health**
- It may cause breathing problems, lung infection, and asthma attacks.
  - Oxides of nitrogen and sulphur combine with the moisture in the air to forms acids such as nitric acid and sulphuric acid, and cause irritation in the eyes. These acids are responsible for acid rain.
3. **Harmful effects of acid rain**
- Soil becomes acidic making it unsuitable for cultivation.
  - Acid rain turns water bodies such as lakes, ponds, and rivers acidic making them unsuitable for aquatic plant and animal life.
  - Buildings, monuments, and sculptures (made of bronze or marble) are gradually damaged from the action of the acids. An example is the Taj Mahal in Agra. Acid rain and pollution from nearby industrialized sector has been turning it yellow.
4. Greenhouse effect is a natural phenomenon without which the Earth would be too cold to support life. However, an increase in the amount of greenhouse gases can raise global temperatures. This, in turn, can change the climate of the world, leading to global warming. Global warming may cause frequent floods, droughts, and also lead to the melting of the polar ice caps, thus raising the sea level and drowning low-lying areas near the coasts.
5. CFCs released in the atmosphere caused the damage to the ozone layer. The ozone layer protects living beings from the harmful ultraviolet (UV) rays, of the sun, which can cause skin cancer and eye problems. Since the late 1970s, the use of CFCs has been reduced drastically. Consequently, the depletion of the ozone layer has been reduced, too.

**C. Long Answer Questions :**

**Ans.** 1. **Prevention of Air Pollution**

Air pollution can be prevented by following the measures given below :

**Proper maintenance of automobiles :** Regular pollution check should be done for all automobiles.

**Planting trees :** Trees absorb carbon dioxide and also help in reducing the dust particles in air.

**Use of proper fuels for automobiles :** Addition of lead to petrol makes petrol burn with less smoke and fumes, but it increases the amount of lead in the atmosphere. So, the use of unleaded petrol or less-polluting fuels



such as CNG (compressed natural gas) must be encouraged. The exhaust gases in vehicles should be passed through a catalytic converter. It converts harmful carbon monoxide and nitrogen oxides to harmless carbon dioxide, nitrogen dioxide, and water.

Gases released from factories and industries should be processed before being released into the atmosphere.

## 2. **Prevention of Water Pollution**

Water pollution can be prevented by following the measures given below :

- Sewage should be treated in sewage treatment plants before being discharged into water bodies.
- Bathing and washing near water bodies should be avoided.
- The use of pesticides and fertilizers should be limited and only eco-friendly products must be used.
- The use of pesticides and fertilizers should be limited and only eco-friendly products must be used
- Industrial wastes should be treated free of toxic chemicals before being discharged into water bodies.

## 3. **Purification of Water at Home**

Water supplied from municipal water corporation needs to be purified further at home. It can be done by some or all of the following processes :

- **Using water purifiers** : The water is passed through domestic water purifiers available in the market. They have microporous filters and activated charcoal along with a source of ultra violet radiations. Impurities such as sand and dust are removed by the filters and the microorganisms are destroyed by UV radiations. Activated charcoal removes undesired odour and absorbs organic impurities.
- **Boiling and filtering** : The water needs to be boiled for 15 to 20 minutes to kill the microorganisms. This is allowed to stand for some time and then decanted and filtered.
- **Chlorination** : Water taken from wells or water tanks used by masses in rural areas is usually disinfected by adding chlorine tablets. Potassium permanganate is also used to kill germs in water taken from wells.

### **D. Higher Order Thinking Skills (HOTS) Questions :**

- Ans.**
1. Because factories cause pollution and it has harmful effects on humans.
  2. Do yourself



## **Formative Assessment**

### **A. Answer the following questions orally :**

- Ans.**
1. **Fossil fuels** : Fossil fuels, primarily coal and petroleum are formed from



the dead remains of plant and animals by the exposure to heat and pressure when buried inside the Earth's crust over millions of years.

2. **Coal** : Coal is called a fossil fuel because it was formed from the remains of vegetation that grow as long as 400 million years ago.
3. Hydrocarbons decomposes into carbon and hydrogen on strong heating.
4. Judicious use of fossil fuels is necessary because these fuels are limited on the Earth.

**B. Tick (✓) the correct answers :**

**Ans.** 1. (c)                      2. (c)                      3. (c)

**C. Fill in the blanks :**

- Ans.**
1. **Coal** is an exhaustible natural resource.
  2. **Sunlight** is an inexhaustible natural resource.
  3. The slow conversion of dead trees and other plants into coal is called **carbonisation**.
  4. The various constituents of petroleum are separated by a process called **fractional distillation**.
  5. The main gas found in natural gas is **hydrogens**.
  6. **Hydrogen** gas was used for street lighting for many years.

**D. Write True or False for the following statements :**

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

## Summative Assessment

**A. Define the following :**

- Ans.**
1. **Natural resources** : The resources provided by the nature are called natural resources.
  2. **Exhaustible natural resources** : On the other hand, some resources are present in limited amount in nature and cannot be continually replenished. Such resources are likely to be exhausted by various human activities and are called exhaustible natural resources. Petroleum, coal, natural gas, minerals, forests are exhaustible natural resources.
  3. **Inexhaustible natural resources** : Some resources are present in unlimited amount in nature and can be continually replenished. Such resources are not likely to be exhausted by various human activities and are called inexhaustible natural resources. Air, sunlight, water and soil are inexhaustible natural resources.
  4. **Fossil fuels** : Fossil fuels are the fuels derived from dead remains of living matter when buried inside Earth for millions of years.
  5. **Conservation of energy** : Saving the fuels and fossil fuels is called conservation of energy.



**B. Short Answer Questions :**

- Ans.**
1. Peat, lignite, bituminous and anthracite are obtained on the destructive distillation of coal.
  2. Renewable resources can be obtained again but non-renewable resources cannot be obtained again.
  3. The benefits of using energy wisely :
    - (i) It saves the fossil fuels or fuels for future use
    - (ii) It saves money
    - (iii) It creates less pollution.
  4. 

<b>Fossil Fuels</b>	<b>Places</b>
(a) Coal	Jharkhand, Odisha, Madhya Pradesh
(b) Petroleum	Mumbai High
(c) Natural Gas	Assam
  5. Recycling of paper is the process of recovering waste paper and remaking it into new paper products.

Paper recycling saves trees and minimizes pollution. It also helps to reduce the problem of waste by utilizing waste material like used paper, cotton rags and unwanted biomass. The major steps in recycling of paper have been summarized below.

    - (i) **Sorting** : Paper is first sorted and any plastic, metallic or other contaminants are removed from it.
    - (ii) **Making pulp** : The sorted paper is sent to the pulper where it is heated with warm water and chemicals. Here the paper breaks down into tiny pieces and strands of cellulose fibres which are free from lignin.
    - (iii) **Filtering and deinking** : The pulp obtained from the pulper has only 1.0 to 1.5% fibre. Kaolin and other additives are added to the pulp to enhance the properties of paper. The pulp is then filtered through a number of sieves to remove impurities such as coatings, contaminants, etc. Sometime, the pulp is then bleached to make the end product white.
    - (iv) **Rolling and drying** : The pulp, now free from any contaminant, is mixed with wood fibre also called virgin fibre to provide strength and smoothness. It is then passed through wire screens where water is drained out and sheets of paper start forming. These sheets are passed through a series of rollers and dryers which squeeze, press and smoothen the watery sheets to get the desired finish.

**C. Long Answer Questions :**

- Ans.**
1. Fossil fuels, primarily coal and petroleum (liquid petroleum or natural gas), are formed from the dead remains of plants and animals by the exposure to heat and pressure when buried inside the Earth's crust over millions of years. Modern large-scale industrial development is based on



the use of fossil fuels as well as the combustion of wood or coal for heat. Fossil fuels are used for various purposes like cooking food, generating electricity in industries, running automobile engines, etc.

The various fossil fuels are coal, petroleum and natural gas.

## 2. **DESTRUCTIVE DISTILLATION OF COAL**

The destructive distillation of coal is done by heating coal strongly at about 1000°C in the absence of air. It breaks coal into its constituents and various useful inorganic and organic products are obtained which include the following.

1. Coke
2. Coal gas
3. Coal tar
4. Ammonium compounds

### **Coke**

The black residue left after the destructive distillation of coal is called coke. It is a tough, porous, black substance and almost 98 per cent pure. It is used as a fuel and burns without smoke. It is also used in the extraction of many metals and for manufacturing steel. It is also used in producing water gas (a mixture of hydrogen and carbon monoxide gases) and producer gas (a mixture of nitrogen and carbon monoxide gases).

### **Coal Gas**

The gas obtained on destructive distillation of coal is called coal gas. It is a mixture of hydrogen, methane, carbon monoxide and other gases. It can be used for domestic cooking and lighting, but is not very widely used nowadays.

### **Coal Tar**

The thick black coloured liquid which is obtained from coal on its destructive distillation is called coal tar. It has an unpleasant odour. It is a mixture of several carbon compounds. Coal tar can be separated by fractional distillation into many chemical substances like benzen, toluene, naphthalene, phenol, etc., which are used to make medicines, dyes, explosives, paints, varnishes, plastics, synthetic fibres, pesticides, perfumes, etc.

### **Ammonium Compounds**

The volatile compounds formed by the destructive distillation of coal, which when dissolved in water forms liquor ammonia and are called ammonium compounds. They are used for making nitrogenous fertilisers.

3. With rapid growth and development, the requirement of energy has increased by many folds. The increasing consumption of energy has a harmful impact on the environment and has led to an energy crisis. Some of the main causes for energy crisis are given below.



1. The tremendous increase in population.
2. The growth and development demands more energy since all big industries, refineries, etc., need energy to run.
3. The new and fast means of transportation like trains, airplanes, ships, vehicles, etc., consume a huge amount of energy.
4. The new shopping malls, IT parks, etc., require more energy.
5. We have developed many gadgets for our comfort like refrigerators, air conditioners, washing machines, televisions, etc., that consume a large amount of energy.
6. The new means of agriculture like tube wells, tractors, saw mills, etc, also consume energy.

All the above and many more are the reasons that are contributing to the energy crisis. Electricity is the main form in which energy is consumed. A large amount of fuel gets consumed for the production of electricity. The world is today facing a huge shortage of electricity which is limiting our growth and development.

4. In India, the Petroleum Conservation Research Association (PCRA) is the agency which takes the responsibility of making people aware about saving petrol, diesel and natural gas/LPG. Since the energy conserved is energy produced, it is very essential for all of us to understand the importance and need of saving fossil fuels from which we obtain our energy.

We can follow the following measures to save energy.

1. Use efficient smokeless chulhas in houses instead of using traditional methods of cooking.
2. Soak pulses overnight or for some time before cooking, and perform cooking with covered vessels.
3. As far as possible, try to use public transport instead of private vehicles.
4. Try to increase the use of pressure cookers for cooking.
5. Use room coolers, air conditioners, heaters, geysers, etc., only when required.
6. Switch off lights, fans and other electrical appliances when not in use.
7. Drive at constant and moderate speed as far as possible. A speed of 45-50 km per hour gives the best fuel economy.
8. Switch off the engine while waiting for somebody and at the traffic signals.
5. Natural gas, a fossil fuel, is often found in association with petroleum. It contains mainly methane and is used as domestic and industrial fuel. Compressed Natural gas (CNG) is also used as motor fuel as it is comparatively clean and does not cause pollution. It is supplied directly from the gas fields through pipelines. Such a network of pipelines exists



in Vadodara, Delhi.

#### Advantages of Natural Gas

Natural gas has many advantages over the traditional fuels. Some of them are listed below :

1. Being a gas, it is a cleaner fuel and causes less pollution.
2. Its calorific value is higher than the other fuels.
3. It can be easily transported through pipelines to homes and industries.
4. Its by-products are not poisonous.
5. It is a starting material for the preparation of many other substances like chemicals and fertilisers.
6. The Compressed Natural Gas (CNG) is used as fuel for generating power and running vehicles.

#### Uses of Natural Gas

1. CNG is used for power generation.
2. CNG is used as a fuel for vehicles, since it causes less pollution.
3. It is used as a domestic and industrial fuel.
4. It is the source of hydrogen gas needed in fertiliser industry and for many other chemicals.

#### **D. Higher Order Thinking Skills (HOTS) Questions :**

- Ans.** 1. Do yourself

