

# Fundamentals of Science

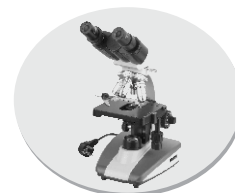


**Help-Kit**



# 1

## The Universe



### A. Answer the following questions in not more than 30 words :

- Ans.**
1. A light year is the distance travelled by light in one year. Light travels 9.46 trillion km in a year. One light year represents this huge distance.
  2. Stars are huge celestial bodies that continuously emit light and heat. Stars are made up of clouds of hydrogen gas, some helium and dust. The Sun is also a star.
  3. Galaxies have different shapes and sizes. Our galaxy is called the milky way. This galaxy is spiral in shape and is wider at the centre. It appears as a huge strip of faintly glowing light from north to south across the sky.
  4. In the night sky, many stars seem to be arranged in a manner forming a recognizable shape. Some look like a bear or hunter. Such groups of stars forming a recognizable shape or pattern is known as constellation. Examples are Ursa Major, Ursa minor, Orion.
  5. Jupiter, Saturn, Uranus, Neptune.
  6. The other four planets— Jupiter, Saturn, Uranus and Neptune are giants in comparison. They are made up mainly of gases. They are called gas giants or Jovian (Jupiter like) planets. All the gas giants have rings around them.

### B. Answer the following questions in not more than 60 words :

- Ans.** 1. Differences between a star and a plant

Star	Planet
(a) It has its own light.	It does not have its own light.
(b) It appears to twinkle.	It does not twinkle.
(c) It is much bigger than a planet.	—
(d) It does not change its relative position in the sky everyday.	It changes its position in the sky on a daily basis.

2. Differences between Galaxy and Constellation

Galaxy	Constellation
(a) It is a cluster of billions of stars.	It is a collection of only a few stars.
(b) There are about 100 billion (10 super senibe) galaxies in the universe.	There are 88 constellations known.
(c) Galaxies do not form recognizable shapes or patterns resembling familiar objects or animals.	Constellations form patterns outlining imaginary figures of animals, human beings or some familiar objects.
(d) Example : Milky Way.	Example : Ursa Major (Great Bear), Orion (Hunter).

3. Meteors are heavenly bodies consisting of small pieces of stones and metallic rocks. Sometimes, meteors are greater in size and reach the Earth without getting burnt. Such meteors are called meteorites. These vary from pebble size to big blocks weighing tonnes.
4. Comets are heavenly bodies which revolve around the Sun in very large elliptical orbits. Comets are made up of gas and dust. As the comets approach the Sun, the gases evaporate to form a long glowing tail with a distinct bright head. The tail of comet always points away from the Sun.
5. Asteroids are groups of small bodies made up of rock and metal pieces which revolve around the Sun mainly between the orbits of Mars and Jupiter. Ceres is the largest asteroid. Most of the asteroids are too small and too far away from the Earth that they cannot be seen with naked eye.

### C. Answer the following questions in not more than 120 words :

- Ans.** 1. It is the third planet in terms of distance from the Sun. It is the only planet on solar system where life

exists. The Earth's atmosphere consists of gases, oxygen and carbon dioxide which are necessary for life. It also has a lot of water in form of lakes, oceans and seas.

Earth has moderate temperature. It is neither too hot and nor too cold which helps in growth and survival of life.

- We see different shapes of the moon as it travels around the Earth.

Sunlight lights up half of the moon. As the moon revolves around the Earth, we see different parts of the sunlit half. The shapes of these parts are called phases of the moon. When the entire side facing the Earth is sunlit, the moon appears as a full disc. We call this the **full moon** or **purnima**. And when the side of the moon facing us gets no sunlight, we do not see the moon. This is called the **New moon** or **Amavasya**. After the new moon, the moon appears as a thin **crescent**.

#### D. Fill in the blanks :

- Ans.**
- A planet appears bright because it **reflects** sunlight.
  - Sirius** is the brightest star.
  - A **comet** has a distinct head and a glowing tail always directed away from the Sun.
  - The moon completes one revolution around the Earth in **27 1/3** days.
  - The explosion that created the universe is called the **big ban**.
  - The stars seem to move across the sky from **east** to **west**.

#### E. Write 'T' for True and 'F' for False for the following statements :

- Ans.** 1. False      2. True      3. True      4. False      5. True      6. True      7. False

#### F. Differentiate between :

- Ans.**
- Meteors are heavenly bodies consisting of small pieces of stones and metallic rocks. They sometimes get displaced from their orbit and enter the Earth's atmosphere at a very high speed. Meteors enter the Earth's surface at very high speed, it is heated by the friction with air.

Meteors are seen as bright streaks of light in the sky and therefore, referred to as 'shooting stars'.

Sometimes, meteors are greater in size and reach the Earth without getting burnt. Such meteors are called meteorites. These vary from pebble size to big blocks weighing tonnes.

- Celestial bodies revolving around a planet are called satellites. Moon is the only satellite of the Earth.

Artificial satellites are man-made vehicles launched by rockets into orbit around the Earth. They are fitted with cameras and other gadgets to do research.

- Differences between a star and a planet

Star	Planet
(a) It has its own light.	It does not have its own light.
(b) It appears to twinkle.	It does not twinkle.
(c) It is much bigger than a planet.	—
(d) It does not change its relative position in the sky everyday.	It changes its position in the sky on a daily basis.

- (a) It is made up of hot gases such as hydrogen and helium.

It is made up of rock and metal particles.

- (b) It has its own light.

It emits light due to the heat produced by friction on entering the Earth's atmosphere.

- (c) Its size is very big.

Its size is very small.

- (d) It lasts for billions of years.

Its lifespan is very short (a few seconds).

#### G. Write Shot notes on :

- Ans.**
- Our solar system has eight planets. They are : Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune.
  - Artificial satellites are man-made vehicles launched by rockets into orbit around the Earth. They are fitted with cameras and other gadgets to do research.
  - Geostationary Satellite** : A satellite which appears to be stationary at a fixed point relative to the Earth is called geostationary satellites. They are also called communication satellite.

4. **Sun-synchronous satellites :** A satellite in the Sun synchronous orbit crosses over a point on the Earth at about the same local time everyday.

**H. Name the following :**

- Ans.** 1. Venus                      2. Jupiter                      3. Mars                      4. Jupiter  
5. Ceres                      6. Sputnik I                      7. Halley's comet                      8. Milky way

**I. Tick (3) the correct option in the following :**

- Ans.** 1. (ii)              2. (iii)              3. (iii)              4. (i)              5. (iv)              6. (iv)

## 2 Soil



**A. Answer the following questions in not more than 30 words :**

- Ans.** 1. Soil forms the uppermost layer of the Earth. It covers most of the Earth's surface that is above the sea. It consists of fragments of rocks, humus, air and water.
2. A slow process of breaking down of huge pieces of rocks into smaller pieces by action of natural forces such as water, glacier, wind, root of plants, etc., is called **weathering**.
3. The last stage in formation of soil is addition of organic matter from dead and decomposed plants and animals. Along with them, lichens, bacteria, fungi, algae, etc., also get added to them. Such organic matter is called humus and makes the soil fertile.
4. Soil is made up of various components like mineral particles, organic matter, solution of various inorganic salts in water, air and living organisms.
5. A section through different layers of the soil constitutes the soil profile. Each layer is different in texture, colour, depth and chemical composition. These layers are called horizons. Soil profile consists of following horizons.  
A-Horizon, B-Horizon, C-Horizon
6. The undesirable change in physical, chemical or biological characteristics of soil thus lowering its fertility is called soil pollution.
7. Strong winds and water currents carry soil particles with them and deposit them elsewhere. The process of carrying away of the top soil by various agents like rain, rivers and wind is called soil erosion.  
Some of the main factors leading to soil erosion are as follows :  
Deforestation, overgrazing, pre-farming methods.

**B. Answer the following questions in not more than 60 words :**

- Ans.** 1. Soil is a valuable resource. The existence of mankind is greatly influenced by this resource. It is useful to us in the following ways :
- |  |                                   |
|--|-----------------------------------|
| (a) Source of food, clothing and shelter | (b) Source of minerals            |
| (c) Source of building material          | (d) Source of water               |
| (e) Natural habitat                      | (f) Limiting the damage by floods |
2. Soil is made up various components like mineral particles, organic matter, solution of various organic salts in water, air and living organisms. The important components of soil are : mineral particles, air, water, humus and living organisms.
3. **Soil Profile :** Different layers of the soil constitutes the soil profile. Each layer is different in texture, colour, depth and chemical composition. These layers are called horizons. Soil profile consists of the following horizons.
- (a) A Horizon : The upper most horizon rich in mineral and humus.
- (b) B Horizon : It is also sub soil rich in soluble minerals and iron oxide.
- (c) C Horizon : It is the lowest layers of soil– It contains small pieces of parent rock Beneath the C-horizon is present the solid parent rock called the bedrock.

4. (i) The undesirable change in physical, chemical or biological characteristics of soil thus lowering its fertility is called soil pollution.  
Substances which lead to soil pollution are called pollutants.  
Following are the ways in which soil pollution occurs.  
Toxic chemicals and garbage from industries dumped in landfills.  
Through excessive use of fertilizers.  
Use of plastic bags and many other ways in which soil pollution takes place.
- (ii) Strong winds and water currents carry soil particles with them and deposit them elsewhere. The process of carrying away of the top soil by various agents like rain, rivers and wind is called soil erosion.  
Some of the main factors leading to soil erosion are as follows :  
Deforestation, overgrazing, pre-farming methods.
5. The process of protecting natural resources is called conservation. Thus, protecting soil from getting eroded is soil conservation.  
The following steps can be taken to conserve soil : Afforestation, step farming, constructing river embankment, prevent over grazing planting herbaceous plants in desert.

**C. Answer the following questions in not more than 120 words :**

- Ans.**
1. Soil is made up of various components like mineral particles, organic matter, solution of various inorganic salts in water, air and living organisms. The important components of soil are :  
**Mineral Particles** : Due to weathering mineral particles of various sizes are formed.  
The smallest size is of clay. It is less than 0.002 mm in diameter. Due to its small size it is smooth in touch. Silt has larger particles than clay. Its diameter lies between 0.002 mm and 0.2 mm. It becomes heterogeneous when dissolved in water.  
Sand has the largest size and can be easily seen. Its diameter is greater than 0.2 mm.  
**Air** : Air is present in spaces between the soil particles. It is essential for the survival of living organisms present in the soil.  
**Water** : Water is present in pores between the soil particles, thus helping plants in their growth.  
**Humus** : Humus makes the soil fertile by providing organic nutrients.  
**Living Organisms** : Soil provides home to a large variety of living organisms such as bacteria, fungi, etc.
  2. Soil can be classified on the basis of the following :  
Mode of formation  
Mode of Transportation  
On the basis of mode of formation, it can be classified as
    1. **Residual Soil** : The soil which remains at the place of its formation is called residual soil.
    2. **Transported Soil** : The soil settled at other place as a result of its transportation by gravity, flowing water, wind, and glaciers is called transported soil.
    3. **Mountainous Soil** : This is usually found in depression and valley basins or on low inclination slopes of the mountains. It is called mountainous soil.  
On the basis of mode of transportation, it can be classified as :
      1. **Colluvial** : Soil transported by gravity as in landslides and mudflows in the hilly areas is called colluvial soil.
      2. **Alluvial** : Soil transported by flowing water is called alluvial soil.
      3. **Glacial** : Soil transported by glaciers is called glacial soil.
      4. **Eolian** : Soil transported by wind is called eolian soil.
  3. Types of Soil Found in India  
Different geographical regions in India have different kinds of soil. Six types of soil are found in the country :
    1. **Red Soil** : This soil is red due to the presence of iron oxide in it. The topsoil contains quartz and clay particles in addition to iron oxide. It is, however, poor in humus, but can be made fertile by adding fertilizers and manure. This soil is also called red latosol and is found in the interior regions of Kerala, Tamilnadu, Andhra Pradesh, Orissa, Southern Karnataka and Eastern Madhya Pradesh.



2. **Black Soil :** This soil is rich in iron and magnesium and is particularly suited for cotton and sugarcane cultivation. It is derived from rocks called basaltic rocks. It is found in many parts of Maharashtra, Madhya Pradesh, Andhra Pradesh and Gujarat. It is commonly called **require**.
3. **Alluvial Soil :** This soil is formed by deposition of silt transported by the rivers from mountains. It contains gravel, sand and clay and is rich in humus. It is mainly found in the plains of Haryana, Uttar Pradesh, Bihar, Coastal Orissa and Andhra Pradesh.
4. **Desert Soil :** This soil is sandy and porous with a coarse texture. Its water-holding capacity is low; hence only thorny bushes and cacti can grow in it. It is found in Rajasthan and parts of Gujarat. The Indira Gandhi Canal in Rajasthan has made cultivation of crops possible by providing continuous supply of water for irrigation.
5. **Mountain Soil :** This soil has the highest humus content of all the soils found in India. Hence, it is very fertile, but varies in content from place to place. Mountain soil is found in the Himalayan region and in the North-East.
6. **Laterite Soil :** This soil is reddish, brownish or yellowish in colour, as it contains a high percentage of iron and aluminium oxides. It is mainly found in the Western Ghats and parts of Tamilnadu, Andhra Pradesh, Orissa and Assam.
4. **Soil : A Natural Resource**  
Soil is a valuable resource. The existence of mankind is greatly influenced by this resource. It is useful to us in the following ways :
  1. **Source of food, clothing and shelter :** It supports the plant kingdom, which provides food to man and animals. Plants provide fibres like cotton and fabrics, which are used to make clothes and other useful articles. Plants also provide medicines, rubber, gum, resins and wood for making furniture and constructing houses.
  2. **Source of Minerals :** Soil is the home of our mineral wealth. Minerals like iron, copper, silver and gold are dug out from the Earth's crust and used by industry for several purposes. Coal and petroleum are also present deep in soil.
  3. **Source of Building Material :** Soil is used as a raw material for making bricks and mortar, pottery and porcelain.
  4. **Source of Water :** Rainwater seeps (percolates) through soil particles and collects above the rock bed to form subsoil water. This is pumped out by means of handpumps and other means and used for drinking and irrigation.
  5. **Natural Habitat :** Soil is the habitat for beings like earthworms, insects, rats, moles, rabbits and snakes. Many micro-organisms like bacteria, algae and fungi are found in soil. Some of them decompose the remains of plants and animals and increase soil fertility.
  6. **Limiting the damage by floods :** Soil absorbs rainwater and reduces the damage caused by floods. It also provides water to plants during the dry season and keeps them alive.

**D. Fill in the blanks :**

- Ans.**
1. **Humus** makes the soil fertile by providing organic nutrients.
  2. Water is present in **pores** between the soil particles.
  3. **Loamy** soil is most suitable for plant growth.
  4. Soil which remains at the place of its formation is called **parent rock material**.
  5. Use of excessive fertilizers leads to **damage of crop**.

**E. Tick (3) the correct option in the following :**

- Ans.** 1. (ii)      2. (i)      3. (iv)      4. (i)      5. (i)      6. (iii)      7. (ii)      8. (iv)

**F. Differentiate between :**

- Ans.** (a) The undesirable change in physical, chemical or biological characteristics of soil thus lowering its fertility is called soil pollution.  
Substances which lead to soil pollution are called pollutants.  
Following are the ways in which soil pollution occurs.  
Toxic chemicals and garbage from industries dumped in landfills.  
Through excessive use of fertilizers.  
Use of plastic bags and many other ways in which soil pollution takes place.

- (b) Strong winds and water currents carry soil particles with them and deposit them elsewhere. The process of carrying away of the top soil by various agents like rain, rivers and wind is called soil erosion.  
Some of the main factors leading to soil erosion are as follows :  
Deforestation, overgrazing, pre-farming methods.
- (c) The process of protecting natural resources is called conservation. Thus, protecting soil from getting eroded is soil conservation.  
The following steps can be taken to conserve soil : Afforestation, step farming, constructing river embankment, prevent over grazing, planting herbaceous plants in desert.
- (d) A slow process of breaking down of huge pieces of rocks into smaller pieces by action of natural forces such as water, glacier, wind, root of plants, etc., is called weathering.

**E. Write 'T' for True and 'F' for False for the following statements :**

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

## 3 Air

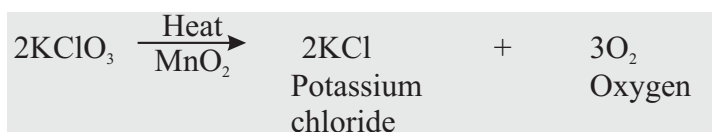


**A. Answer the following questions in not more than 30 words :**

- Ans.** 1. Air is present everywhere on the Earth. It is a mixture of several gases. A thick envelope of air surrounding the Earth is called atmosphere.
2. Different layers of atmosphere are : Troposphere, stratosphere, mesosphere and exosphere.
3. An undesirable change in the physical, chemical or biological characteristics of air is called air pollution.
4. **Harmful Effects of Acid Rain**
1. It is highly corrosive and harmful for both living and non-living things.
2. It damages plants and causes harm to soil, water resources, aquatic life and animals.
3. It damages buildings, monuments, statues, etc.
5. (a) Use improved charcoal, save fuels like wood, coal, kerosene.
- (b) Shift to smokeless energy sources like LPG, biogas, solar energy and electrical energy.
- (c) Do not burn paper, dry leaves, plastic bags and garbage.
- (d) Use unleaded petrol, CNG and other less polluting fuels.
- (e) Switch over to less polluting forms of power generation like solar energy, wind energy and other forms of renewable energy.
- (f) Burning of fossil fuels should be reduced to a minimum.
- (g) More trees should be planted as they remove harmful gases.

**B. Answer the following questions in not more than 60 words :**

- Ans.** 1. (a) The Aneroid Barometer : It is the most convenient form of barometer that is almost as accurate as the mercury barometer. It consists of a partially evacuated metal box. The top of box is made up thin so that it is sensitive to small changes in atmospheric pressure.
- (b) The SI unit of pressure is Pascal (Pa).
2. Oxygen can be prepared in the laboratory by using potassium chlorate ( $\text{KClO}_3$ ).  
Set up the apparatus as shown in figure. A mixture of four parts by weight of potassium chlorate and one part by weight of manganese dioxide is heated in the test tube. Bubbles of a colourless gas are formed in the test tube. Allow the first few bubbles to escape and collect the rest of the gas in the air filled with water and inverted over the beehive shelf. The gas begins to collect in the gas jar. When the jar is full, cover it with a greased lid under water. Remove the gas jar. Drop a burning splinter in the jar. The burning splinter begins to burn brightly. This shows that the gas formed is oxygen. This method of collecting oxygen is called downward displacement of water. It is used for the collection of gases which are insoluble in water. The reaction that takes place is :



Manganese dioxide ( $\text{MnO}_2$ ) acts as a catalyst and accelerates the rate of chemical reaction.

To confirm that the gas thus collected is oxygen, drop a burning splinter in the gas jar.

The splinter begins to burn brightly, thus confirming the formation of oxygen gas.

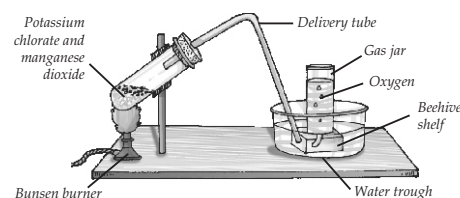
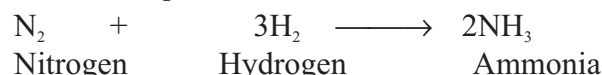


Fig 3.5 : Preparation of oxygen from  $\text{KClO}_3$

### 3. Uses of Nitrogen

- It is used in the production of nitric acid and ammonia. Ammonia is used for manufacturing fertilizers.



This process is called Haber's process.

- Liquid nitrogen is used as a refrigerant for freezing food.
  - Liquid nitrogen is used during skin grafting in burn victims and in nitro fertilization.
  - Nitrogen gas is nowadays being extensively used in food packaging to keep food fresh since it is unreactive.
  - It is essential for the growth of plants and animals.
4. (a) Greenhouse Effect : The increased gradual warming of Earth's atmosphere is called green house effect.  
 (b) The  $\text{CO}_2$  in the air traps the heat of the Sun radiated back by the Earth. This makes the Earth warm and comfortable for living beings. But an increase in level of  $\text{CO}_2$  in the air means that atmosphere has become warmer as more heat is trapped. This increase in temperature worldwide is called global warming.

Effects of Global Warming :

- It leads to change in climatic pattern worldwide.
- Causes frequent floods and cyclones.
- It may lead to the melting of polar ice caps, raising the sea level and submerging many coastal areas.
- (a) Use improved charcoal save fuels like wood, coal, kerosene.  
 (b) Shift to smokeless energy sources like LPG, biogas, solar energy and electrical energy.  
 (c) Do not burn paper, dry leaves, plastic bags and garbage.  
 (d) Use unleaded petrol, CNG and other less polluting fuels.  
 (e) Switch over to less polluting forms of power generation like solar energy, wind energy and other forms of renewable energy.  
 (f) Burning of fossil fuels should be reduced to a minimum.  
 (g) More trees should be planted as they remove harmful gases.

### C. Answer the following questions in not more than 120 words :

Ans.

- (a) Physical Properties
  - It is a colourless, odourless and tasteless gas.
  - It is slightly soluble in water.
  - It is slightly heavier than air.
  - Its melting point is 54.4K and boiling point is 90.2K.
  - It can be liquefied to a pale liquid under pressure.
  - It is absorbed by metals such as silver, gold, palladium and platinum at  $500^\circ\text{C}$ .

#### Chemical Propertis

- It is neutral and has no action on blue or red litmus.
- It reacts with metals to form oxides that are basic in nature.
- (b) Uses of Oxygen
  - One major use of oxygen is for breathing.
  - Oxygen has uses in industry and in the workplace. Matter iron is purified by blowing oxygen into it.
  - Liquid oxygen is used as a rocket fuel.



4. A mixture of oxygen and acetylene known as oxy-acetylene flame is used for welding iron and other metals.
5. Being a supporter of combustion, oxygen is essential for combustion of fuels.
6. Oxygen is used during the process of producing steel from salt and iron to remove carbon which is present as an impurity. Oxygen oxidizes carbon to carbon dioxide which is then easily removed.
7. Manufacture of sulphuric acid from sulphur dioxide by this 'contact process' uses oxygen in the presence of a catalyst for the oxidation of sulphur dioxide. Oxygen is used in the manufacture of nitric acid from ammonia by Ostwald's process.
8. Carbon dust made wet with liquid oxygen is used as an explosive in place of dynamite for blasting rocks in coal mining.

## 2. The Nitrogen Cycle

Nitrogen is essential for all living things. The cyclic process by which nitrogen element is circulated continuously through the living and non-living components of the biosphere, that is, soil, water, plants, and animals is called nitrogen cycle. Nitrogen atoms are cycled between various forms of life by a series of interlinked chemical changes.

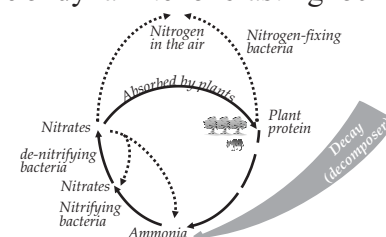


Fig 3.9 : The main stages in the nitrogen cycle

3. (a) An undesirable change in the physical, chemical or biological characteristics of air is called air pollution.

### (b) Air Pollution by Human Activity

1. **Burning of Fuels** : Burning of fuels like wood, coal and kerosene to cook food produces thick smoke which contains carbon monoxide, sulphur dioxide and unburnt carbon.
2. **Automobile Exhaust** : Automobiles use petrol or diesel which produce large amounts of smoke, carbon monoxide, lead, nitrogen oxide and particulate matter on burning.
3. **Thermal Power Plants** : Thermal power plants burn huge amounts of coal to produce electricity. They release smoke and fly ash into the atmosphere. Fly ash consists of minute particles of silica, alumina, lead, arsenic, etc. It can cause irritation and respiratory disorders.
4. **Industries** : Industries emit enormous amounts of smoke and pollutants like oxides of sulphur and nitrogen, lead particles and chloro-fluorocarbons (CFD) into the atmosphere.
5. **Burning of refuse** : Burning of refuse releases a lot of smoke and ash into the atmosphere. Atmospheric air is polluted by the presence of gases like carbon dioxide, sulphur dioxide and oxides of nitrogen.

4. (a) air contains about 78%, nitrogen 21%, oxygen, 0.95%, inert gases, 0.03%, carbon dioxide and traces of several other gases.

### (b) Composition of Air

Constituents of Air	Percentage of Volume of Air
Nitrogen	78%
Oxygen	21%
Inert gases	0.95%
Carbon dioxide	0.03%
Water vapour	Variable
Dust particles	Variable
Other impurities	Variable

### 5. Air Pollution by Human Activity

1. **Burning of Fuels** : Burning of fuels like wood, coal and kerosene to cook food produces thick smoke which contains carbon monoxide, sulphur dioxide and unburnt carbon.
2. **Automobile Exhaust** : Automobiles use petrol or diesel which produce large amounts of smoke, carbon monoxide, lead, nitrogen oxide and particulate matter on burning.
3. **Thermal Power Plants** : Thermal power plants burn huge amounts of coal to produce electricity. They release smoke and fly ash into the atmosphere. Fly ash consists of minute particles of silica, alumina, lead, arsenic, etc. It can cause irritation and respiratory disorders.
4. **Industries** : Industries emit enormous amounts of smoke and pollutants like oxides of sulphur and nitrogen, lead particles and chloro-fluorocarbons (CFD) into the atmosphere.

5. Burning of refuse : Burning of refuse releases a lot of smoke and ash into the atmosphere. Atmospheric air is polluted by the presence of gases like carbon dioxide, sulphur dioxide and oxides of nitrogen.

**D. Fill in the blanks :**

- Ans.** 1. As we go up, the atmospheric pressure **lowered**.  
 2. All weather changes take place in the **troposphere** layer of the atmosphere.  
 3. **Clastridium** and **Azotobacter** are free living bacteria which can fix atmosphere nitrogen.  
 4. Atmospheric pressure is measured by **Pascal**.  
 5. The lowest layer of the atmosphere is the **troposphere**.

**E. Write 'T' for True and 'F' for False for the following statements :**

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

**F. Match the following :**

- Ans.** 1. Stratosphere → (a) Measuring device  
 2. Nitrobacter → (b) For breathing  
 3. Pascal → (c) Nitrifying bacteria  
 4. Barometer → (d) Layer of atmosphere  
 5. Oxygen → (e) Unit of measure atmospheric pressure

**G. Tick (3) the correct option in the following :**

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

**H. Name the following :**

- Ans.** 1. An undesirable change in the physical, chemical or biological characteristics of air is called air pollution. Substances which pollute the air are called pollutants. Air pollution can endanger the health and well-being of all the people in a community.  
 2. (a) **Greenhouse Effect** : The increased gradual warming of the Earth's atmosphere is called Greenhouse Effect.  
 (b) The CO<sub>2</sub> in the air traps the heat of the Sun radiated back by the Earth. This makes the Earth warm and comfortable for living beings. But an increase in level of CO<sub>2</sub> in the air means that atmosphere has become warmer as more heat is trapped. This increase in temperature worldwide is called Global Warming.  
 3. This is the rain which has been formed due to the presence of dissolved pollutants such as sulphur dioxide and oxides of nitrogen. These acidic oxides enter into the atmosphere by combustion of fossil fuels in homes, transport and industry. These gases arise from volcanic emissions also.

**I. Draw a neat and labelled diagram of nitrogen cycle.**

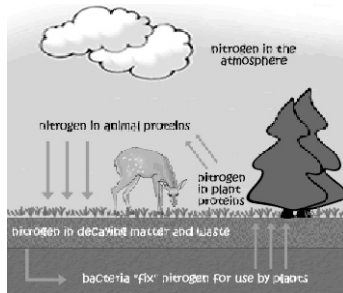


Fig 3.8 : The main stages in the nitrogen cycle

# 4

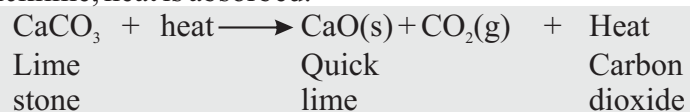
## Transformation of Substances



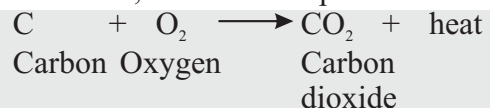
**A. Answer the following questions in not more than 30 words :**

- Ans.** 1. Fractional distillation is used to separate miscible liquids whose boiling points are close together.

- Melting and Boiling Points : Every substance has its own melting and boiling point. The temperature at which solid gets converted into liquid is known as its melting point. The melting point of an impure sample is generally lower than that of the pure substance.
- (i) Endothermic reactions : The reactions during which heat is absorbed when limestone is burnt to obtain quicklime, heat is absorbed.



- (ii) Exothermic Reactions : Chemical reactions in which heat is generated. When carbon is burnt in air to form carbon dioxide, a lot of heat is produced.



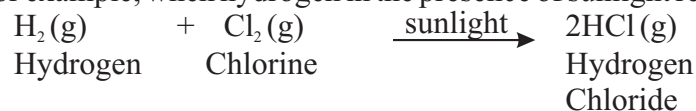
- Oxygen is a highly reactive element. It forms compounds on reacting with a variety of other elements. Whenever an element combines with oxygen it is said to be oxidized. Thus, addition of oxygen is called Oxidation.
- Substance which causes addition of hydrogen or removal of oxygen is called reducing agent.

**B. Answer the following questions in not more than 60 words :**

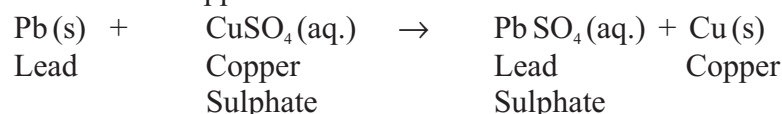
**Ans.** 1. Fractional distillation of crude oil is carried out in a big fractionating tower fitted with perforated shelves. Crude oil is heated upto 400°C. The vapour thus obtained is condensed separately as different fractions.

- (a) Combination Reaction :** A reaction in which two or more substances combine to form a single substance or product is called combination reaction.

For example, when hydrogen in the presence of sunlight reacts with chlorine, HCl is formed.



- (b) Displacement Reaction :** A reaction in which one substance replaces the other substance in a compound. In general, a more reactive element replaces a less reactive element. Such reactions are called displacement reactions. For example, when lead reacts with copper sulphate, lead sulphate solution and copper are formed.

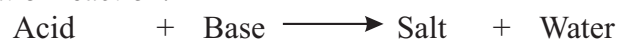


- Oxygen is a highly reactive element. It forms compounds on reacting with a variety of other elements. Whenever an element combines with oxygen it is said to be oxidized. Thus, addition of oxygen is called Oxidation.

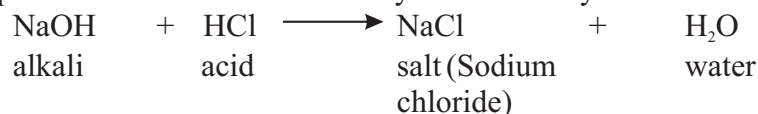
- Also, the addition of hydrogen to a substance is termed as reduction.

For example. Combination of hydrogen and chlorine to form hydrogen chloride.

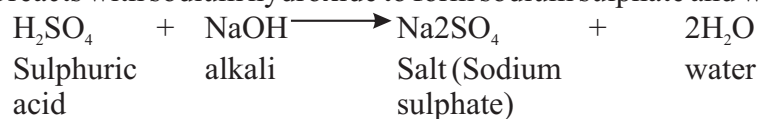
- Neutralization Reaction :** A reaction in which an acid reacts with a base to form salt and water is called neutralization reaction.



For example: Reaction between sodium hydroxide and hydrochloric acid.



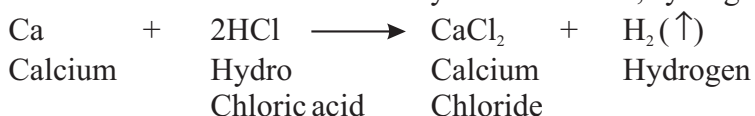
Sulphuric acid reacts with sodium hydroxide to form sodium sulphate and water.



**C. Answer the following questions in not more than 120 words :**

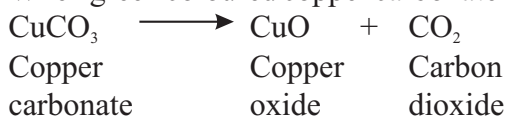
**Ans.** 1. (i) Chemical reactions show one or more of the following characteristics :

**Evolution of gas :** When two substances mix with each other, effervescence (bubbling) starts. It is due to the production of gas during the reactions. The gas evolved is shown by an arrow pointing upwards. When calcium reacts with dilute hydrochloric acid, hydrogen is liberated.



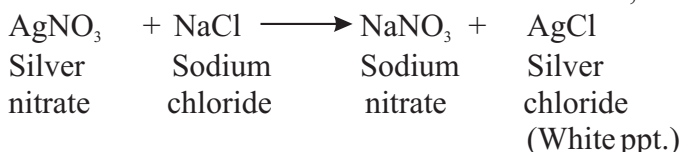
(ii) **Change of Colour :** In some chemical reactions, products formed may have a different colour than the reactant.

When green coloured copper carbonate is heated strongly, a black residue of copper oxide is left.



(iii) **Formation of Precipitate :** In some chemical reaction, the product gets precipitated. The insoluble substance that gets precipitated is called precipitate.

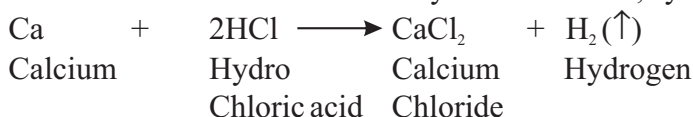
When silver nitrate is mixed with sodium chloride, a white precipitate of silver chloride is formed.



2. (i) **Energy Changes :** During a reaction, energy is either evolved or absorbed. The energy evolved or absorbed may be in the form of light, electricity, sound, etc. Accordingly, reactions are of two types.

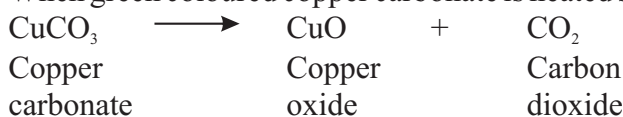
(ii) **Evolution of gas :** When two substances mix with each other, effervescence (bubbling) starts. It is due to the production of gas during the reactions. The gas evolved is shown by an arrow pointing upwards.

When calcium reacts with dilute hydrochloric acid, hydrogen is liberated.



(ii) **Change of Colour :** In some chemical reactions, products formed may have a different colour than the reactant.

When green coloured copper carbonate is heated strongly, a black residue of copper oxide is left.



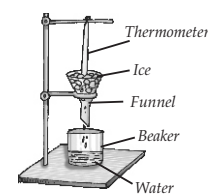
3. Chemical reactions on the basis of their nature can be classified as follows :

- Combination reaction
- Decomposition reaction
- Displacement reaction
- Double displacement reaction
- Neutralization reaction
- Redox reaction
- Precipitation reaction

4. (i) **To determine the melting point of ice.**

Take a funnel, a beaker and a thermometer and set up the apparatus as shown in figure.

Put some ice cubes in the funnel. Note its temperature. When this ice starts melting, note the temperature of that water. You will see that temperature of both ice and water are same i.e., 0°C. Thus we can say that ice melts at 0°C.

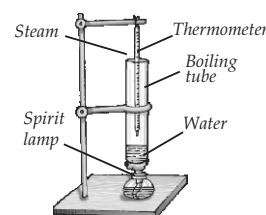


Melting point of ice

(ii) **To determine the boiling point of water.**

Set the apparatus as shown in figure.

Take some water in a test tube. Boil the water with the help of a spirit lamp such that steam is formed. Keep the bulb of thermometer just above the water level. Now, note the temperature of steam at intervals of two minutes. It remains constant, i.e., 100°C. This shows that boiling point of water is 100°C.



Boiling point of water

**D. Write 'T' for True and 'F' for False for the following statements :**

- Ans. 1. False 2. True 3. True 4. False 5. False 6. True 7 False 8. False

**E. Fill in the blanks :**

- Ans. 1. In the laboratory, water is **distilled** to get pure water.  
2. Every **substance** its own has fixed melting and boiling points.  
3. The reactions during which heat is evolved are called **exothermic** reactions.  
4. The reactions during which heat is absorbed are called **endothermic** reactions.  
5. An acid reacts with a base to form **salt** and **water**.  
6. Nitrogen reacts with hydrogen to form **amonia**.

**F. Complete the following reactions :**

- Ans. 1.  $\text{H}_2\text{SO}_4 + \text{Zn} \longrightarrow \text{ZnSO}_4 + \text{H}_2$   
2.  $\text{CuO} + \text{H}_2 \longrightarrow \text{Cu} + \text{H}_2\text{O}$   
3.  $\text{CH}_4 \longrightarrow \text{C} + 2\text{H}_2$   
4.  $\text{Pb} + \text{CuSO}_4 \longrightarrow \text{PbSO}_4 + \text{Cu}$   
5.  $\text{CaCO}_3 \longrightarrow \text{CaO(s)} + \text{CO}_2$

**G. What is the kind of reaction taking place in the following :**

- Ans. 1.  $\text{FeCl}_2 + 2\text{NaOH} \longrightarrow \text{Fe(OH)}_2 + 2\text{NaCl}$  **Precipitate**  
2.  $2\text{H}_2\text{O(l)} \xrightarrow[\text{current}]{\text{electric}} 2\text{H}_2(\text{g}) + \text{O}_2(\text{g})$  **Exothermic**  
3.  $2\text{Mg(s)} + \text{O}_2 \longrightarrow 2\text{MgO(s)}$  **Combination**  
4.  $\text{H}_2\text{S} + \text{Cl}_2 \longrightarrow 2\text{HCl} + \text{S}$  **Redox**

**H. Write short notes on :**

- Ans. 1. Redox Reaction : It includes two types of reaction soxidation and reduction.  
2. **Endothermic reactions** : The reactions during which heat is absorbed when limestone is burnt to obtain quicklime, heat is absorbed.  
$$\text{CaCO}_3 + \text{heat} \longrightarrow \text{CaO(s)} + \text{CO}_2(\text{g}) + \text{Heat}$$

Lime  
stone

Quick  
lime

Carbon  
dioxide

  
3. **Exothermic Reactions** : Chemical reactions in which heat is generated. When carbon is burnt in air to form carbon dioxide, a lot of heat is produced.  
$$\text{C} + \text{O}_2 \longrightarrow \text{CO}_2 + \text{heat}$$

Carbon  
Oxygen

Carbon  
dioxide

  
4. Formation of Precipitate : In some chemical reaction, the product gets precipitated. The insoluble substance that gets precipitated is called precipitate.  
When silver nitrate is mixed with sodium chloride, a white precipitate of silver chloride is formed.  
$$\text{AgNO}_3 + \text{NaCl} \longrightarrow \text{NaNO}_3 + \text{AgCl}$$

Silver  
nitrate

Sodium  
chloride

Sodium  
nitrate

Silver  
chloride  
(White ppt.)

**I. Tick (✓) the correct option in the following :**

- Ans. 1. (iv) 2. (iii) 3. (iv) 4. (ii) 5. (ii)





**A. Answer the following questions in not more than 30 words :**

- Ans.**
- Thus, atoms are ultimate particles of matter and thus serve as building blocks. Thus the smallest particle of an element that displays properties of that element is called an atom.
  - All matter in the nature is made from only a few elements. These elements are composed of atoms or molecules. Molecules are elements made up of atoms of the same type.
  - (i) Atomic Number : The number of protons in the nucleus of an atom of a given element is called the atomic number of that element. It is designated by the symbol Z.  
(ii) Mass Number : Mass number of an atom is defined as the sum of number of protons and neutrons present in the nucleus of an atom.
  - (i) The three isotopes of hydrogen can be written as :
 

${}^1_1\text{H}$	${}^2_1\text{H}$	${}^3_1\text{H}$
1 Proton	1 Proton	1 Proton
0 Neutron	1 Neutron	2 Neutrons
(Protium)	(Deuterium)	(Tritium)
  - (ii) Isotopes : Isotopes are atoms of the same element having the same atomic number but different atomic mass.
  - Number of protons in the nucleus of an atom of the given element is called the atomic number of that element.

**B. Answer the following questions in not more than 60 words :**

- Ans.**
- (i) John Dalton in 1808 gave this theory of atoms based on chemical laws of combination known at that time. The main postulates of this theory are as follows :  
(a) Everything is made up of extremely small components called atoms, which are indivisible and can neither be made nor destroyed.  
(b) Atoms of the same element are alike in every respect and atoms of different elements differ in shape, size, weight and chemical properties.  
(ii) Simple whole numbers of atoms of one element combine with simple whole numbers of atoms of another element to form compounds.  
The latest discoveries about the atom have however proved that some of the postulates of Dalton were incorrect.
  - Mass number of an element is equal to the number of proton (P) and neutron (N) present in the nucleus of an atom of an element.  

Mass number	=	Number of	+	Number of
		protons		neutrons
A	=	P	+	N
Mass number of Element		13	+	14 = 27
  - Radicals : Groups of atoms of different elements which combine as single units, but cannot exist independently are called radicals.  
Each radical carries a fixed electrical charge (positive or negative) on it. These charges over the radicals indicate their combining capacity or valency.
  - (i) If the atom of an element loses or gains electrons, then it becomes electrically charged and is now known as an ion.  
(ii) Sodium atom has 11 protons and 11 electrons and is electrically neutral. Loss of one electron would lead to positively charged sodium ion.  
(iii) Figure

5. Bohr's Model of an Atom

Rutherford's model of an atom was modified by Neils Bohr. According to Bohr, the electrons revolve around the nucleus in definite orbits called shells. Each shell has a different radius. Each orbit or shell corresponds to definite energy. Therefore, these circular orbits are known as energy levels.

6. (i) Valency : The outermost shell of an atom is known as the valence shell. The electrons present in the outermost shell are known as valence electrons (or valency electrons). These electrons decide the valency of the atom.

(ii) Variable Valency : Certain elements show more than one valency. They are said to exhibit variable valency.

For example, Copper exists as  $\text{Cu}_2^+$  and  $\text{Cu}^+$  and iron occurs as  $\text{Fe}_3^+$  and  $\text{Fe}_2^+$ .

**C. Answer the following questions in not more than 120 words :**

**Ans.**

1. Lavoisier in 1789 formulated two laws of chemical combination.

(i) Law of conservation of mass

(ii) Law of constant proportion

(i) **Law of Conservation of Mass :** According to this law, mass can neither be created nor be destroyed. In other words, we can say that, mass of the matter is conserved.

(ii) **Law of Constant Proportion :** This law states that a chemical compound always consists of the same elements combined together in a fixed definite proportion by mass, independent of the method by which it is prepared, or the sources from where it is obtained.

2. (i) Since atoms were electrically neutral and were known to contain electrons, they should contain positively charged material also. From this, Thomson proposed the “plum pudding” model of the atom. In this, the atom was considered to be a sphere of positive charge in which an equivalent negative charge was scattered. The electrons were believed to be spread through positive sphere like raisins in a plum pudding.

(ii) According to Kanad, everything is made up of paramanus (atoms). When matter is divided, then further divided, till no further division is possible, the remaining indivisible entity is called paramanu.

3. Rutherford's Experiment : Rutherford's alpha particle scattering experiment led to the discovery of a small positively charged nucleus in the atom. Alpha particles are emitted by radioactive elements like radium and polonium.

He bombarded a thin gold foil (0.00006 cm thick) with very small positively charged alpha particles in an evacuated chamber. It is found that

1. Most of the alpha particles pass straight through without any deflection from their original path.

2. A few particles deflect through small angles and a very few were deflected through large angles.

3. A very few particles rebound on hitting the gold foil and turn back on their path. From these observations, it was concluded that there was a lot of empty space in the atom.

4. (i) Isotopes : Isotopes are atoms of the same element having the same atomic number but different atomic mass.

Characteristics of an isotope are as follows :

(i) have the same atomic number.

(ii) have identical electronic configuration.

(iii) have same chemical properties.

(iv) have different number of neutrons in their nucleus.

(v) have different physical properties.

(ii) The three isotopes of hydrogen can be written as :



1 Proton

1 Proton

1 Proton

0 Neutron

1 Neutron

2 Neutrons

(Protium)

(Deuterium)

(Tritium)

Carbon (C) has two isotopes, having same atomic number 6 but different mass numbers 12 and 14 respectively.



6 Protons

6 Protons

6 Neutrons

8 Neutrons

5. (i) **Valency** : The outermost shell of an atom is known as the valence shell. The electrons present in the outermost shell are known as valence electrons (or valency electrons). These electrons decide the valency of the atom.
- (ii) **Variable Valency** : Certain elements show more than one valency. They are said to exhibit variable valency.

For example, Copper exists as  $\text{Cu}_2^+$  and  $\text{Cu}^+$  and iron occurs as  $\text{Fe}_3^+$  and  $\text{Fe}_2^+$ . The suffix *ous* is attached to the name of the ion of lower valency and the suffix *ic* is attached to the name of the ion with higher valency. According to the modern notation, such ions are writing their valencies in roman numerals within the parenthesis after the symbol.

$\text{Cu}^+$  Cuprous ion or Cu (I) ion

$\text{Cu}^{2+}$  Cupric ion or Cu (II) ion

$\text{Fe}^{2+}$  Ferrous ion or Fe (II) ion

$\text{Fe}^{3+}$  Ferric ion or Fe (III) ion

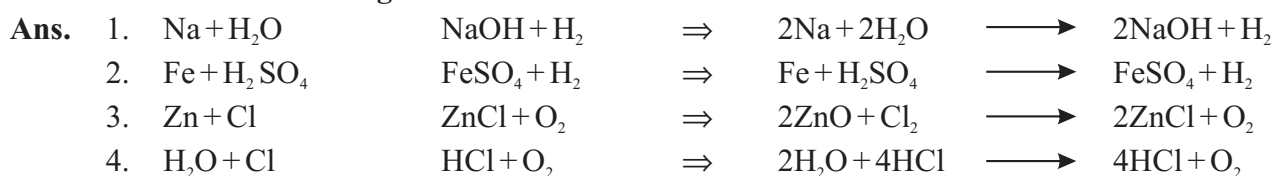
#### D. Fill in the blanks :

- Ans.**
- The three fundamental particles of an atom are **protons, neutrons** and **electrons**.
  - Charge on proton, neutron and electron are **ion, cation** and **anion** respectively.
  - Nucleus of an atom is compound of **protons** and **neutrons**.
  - Compounds which are formed by combination of ions are called **molecules**.
  - Total mass of an atom is concentrated in its **nucleus**.
  - Mass number is sum of total number of **protons** and **neutron**.
  - Mass number** is designated by symbol **A**.
  - Atomic number** is designated by symbol **Z**.
  - Plum-pudding model was given by **Thompson**.
  - Atoms** are ultimate particles of matter and serve as building blocks.

#### E. Write the chemical formula of following compounds by showing the steps involved.

<b>Ans.</b>	<b>Name of compound</b>	<b>Step1</b>	<b>Step2</b>	<b>Step3</b>	<b>Step4</b>
1.	Hydrochloric acid	HCl	$\text{H}_1\text{Cl}_1$	$\text{H}_1\text{Cl}_1$	HCl
2.	Sodium chloride	NaCl	$\text{Na}_1\text{Cl}_1$	$\text{Na}_1\text{Cl}_1$	NaCl
3.	Calcium oxide	CaO	$\text{Ca}_2\text{O}_2$	$\text{Ca}_2\text{O}_2$	CaO
4.	Hydrogen sulphide	$\text{H}_2\text{S}$	$\text{H}_1\text{S}_2$	$\text{H}_1\text{S}_2$	$\text{H}_2\text{S}$
5.	Aluminium oxide	AlO	$\text{Al}_3\text{O}_2$	$\text{Al}_3\text{O}_2$	$\text{Al}_2\text{O}_3$
6.	Aluminium phosphate	AlPO	$\text{Al}_3(\text{PO}_4)_3$	$\text{Al}_3(\text{PO}_4)_3$	$\text{Al}_3\text{PO}_4$
7.	Zinc chloride	ZnCl	$\text{Zn}_2\text{Cl}_1$	$\text{Zn}_2\text{Cl}$	$\text{ZnCl}_2$

#### F. Balance the following chemical reactions :



#### G. Match the following :

	<b>Column I</b>	<b>Column II</b>
<b>Ans.</b>	1. Nucleus	(a) James Chadwick
	2. Electron	(b) Erenest Rutherford
	3. Proton	(c) Neils Bohr
	4. Neutron	(d) J.J. Thomson
	5. Arrangement of electrons	(e) Goldstein

#### H. Write 'T' for True and 'F' for False for the following statements :

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

#### I. Choose the correct option in the following :

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

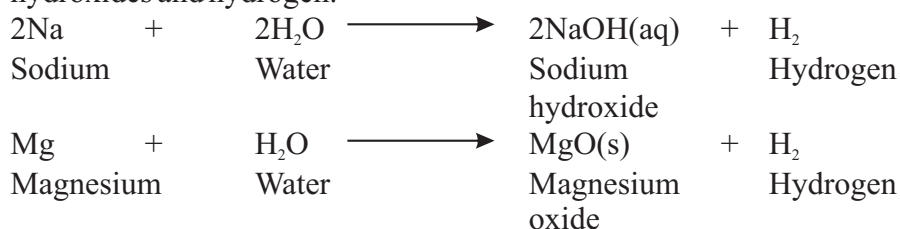
# 6

## Metals and Non-Metals



### A. Answer the following questions in not more than 30 words :

- Ans.**
1. Metallurgy is the science of extracting metals from their ores and purifying them.
  2. The process of heating an ore in absence of air is called calcination. It is used to convert a carbonate ore into its oxide, removes moisture from a hydrated ore and also removes volatile impurities from the ore.
  3. There are also certain elements like boron, arsenic, antimony and germanium which have some properties of metals and non-metals. They are known as metalloids. For example, silicon (Si), germanium (Ge), antimony (Sb).
  4. The process of heating ore strongly, below its melting point, in the presence of an excess of air is called roasting. It is generally used to convert a sulphide ore into its oxide.
  5. Reaction with Water : Different metals react with water under different conditions to form oxides or hydroxides and hydrogen.



6. The metals which show very little chemical reactivity and occur in free state in nature are called noble metals. Silver, gold and platinum are noble metals.

### B. Answer the following questions in not more than 60 words :

- Ans.**
1. Various steps involved in the extraction of metal from its ore are :
    - (a) Concentration of ore : Hydraulic washing, magnetic separation.
    - (b) Calcination or Roasting of ore : Heating of ore in the absence of air, used to convert a carbonate ore into oxide.
    - (c) Refining of metal : The metal so obtained contains impurities. The impure metal is refined by certain suitable methods to obtain pure metal.
  2. Physical property of the metals are as under :
    - (a) Appearance : these are shiny useful to make jewellery and decorations.
    - (b) Physical states : Excepts mercury all metals are found in solid state.
    - (c) Malleability : These can be hammered in sheets.
    - (d) Ductility : Metals can be drawn into thin wire.
    - (e) Conductivity : Metals can conduct both heat and electricity.
    - (f) Density : Metals have high density except sodium and potassium.
    - (g) Sonority : Metals produce ringing sound when struck.
    - (h) Tensile strength : If we pull they will not break.
    - (i) Melting and boiling point : Metals have high melting and boiling points e.g. iron  $1535^\circ\text{C}$  and copper  $1084^\circ\text{C}$ .
  3. 1. Non-metals do not have a metallic lustre. They have a dull appearance.
  2. Non-metals occur as solids, liquids or gases at room temperature. For example under normal conditions, sulphur and phosphorus are solid.
  3. Non-metals are brittle, i.e., they break up into pieces when hammered and hence they are not malleable.
  4. Non-metals are not drawn into thin wires and hence they are not ductile in nature.
  5. Non-metals do not conduct any electricity.
  6. Non-metals usually have low densities and are soft.

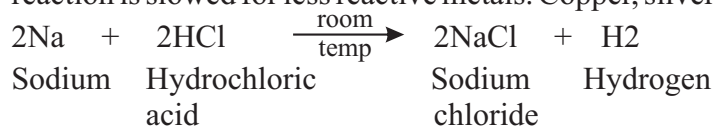
7. Non-metals do not produce a metallic sound when hit with an object.
8. Non-metals have low tensile strength, i.e., they can be easily broken.
9. Non-metals except graphite have low melting and boiling points.
4. **Galvanizing** : This is the process of giving a thin coating of molten zinc on iron or steel to protect it from corrosion. Such iron sheets are used for roofing and for making buckets, drums, etc.  
Galvanizing is an effective method of protecting steel because even if the surface is scratched, the zinc still protects the underlying layer.
5. **Anodizing** : In this method, metals like copper and aluminium are electrically coated with a thin strong film of their oxides. This film protects them from corrosion.

**C. Answer the following questions in not more than 120 words :**

**Ans.** 1. Difference between metals and non-metals

<i>Characteristics</i>	<i>Metals</i>	<i>Non-metals</i>
Physical state	Solid at room temperature except Hg, which is liquid at room temperature	Either solid or gaseous, except bromine which is a liquid
Melting and boiling points	High melting and boiling points, except Na and K, which have low melting and boiling points	Low melting and boiling points
Metallic lustre	Lustrous (shiny)	Non-lustrous or dull except graphite and iodine, which are lustrous
Hardness	Hard, except Na and K, which are soft metals	Soft, except diamond, which is hard
Density	Have high density	Have low density
Malleability	Malleable	Non-malleable and brittle
Tensile strength	High tensile strength	Low tensile strength
Ductility	Ductile	Non-ductile
Conductivity	Good conductors of heat and electricity	Bad conductors of heat and electricity, except graphite, which is a good conductor
Sonority	Sonorous	Non-sonorous

2. (i) All metals combine with oxygen to form oxides which are alkaline or basic in nature.  
(ii) Different metals behave differently in their reaction with water.  
(iii) **Reaction with dilute acids** : Most metals react with dilute hydrochloric acid to form the corresponding salt and to liberate hydrogen. The more reactive metals sodium and potassium, react violently. The reaction is slowed for less reactive metals. Copper, silver and gold do not react with acids.



3. The metals which show very little chemical reactivity and occur in free state in nature are called noble metals. Silver, gold and platinum are noble metals.

Some of the uses of noble metals are :

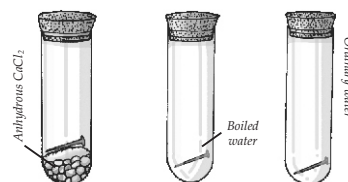
- Gold, silver and platinum are used for making jewellery.
- Silver is also used for making tableware.
- Silver has great ability to reflect light. This property is used in making high quality mirror.
- Platinum is sometimes used in electrical gadgets where excellent conductivity is required.
- Platinum plugs are used in automobiles.
- Salts of silver, gold and platinum are used in high value coins.
- Gold and silver are used in Ayurvedic and Yunani systems of medicines.



- You must have seen a reddish brown coating which forms on unprotected iron and steel. This coating is called rust. It is caused by slow combustion reaction which occurs when iron is contacted with both oxygen and moisture. The layer of rust is attached to metal surface. Hence, the layer easily gets separated from the main body of the object. This wasting away of metals, layer by layer due to formation of metal compound on the surface, is called corrosion.
- Metal Displacement Reaction :** We know that some metals can replace other metals from their salt solution. A reaction in which more reactive metal displaces a less reactive metal from its salt solution is called a metal displacement reaction.

In the reactivity series, zinc is placed above copper. The activity given below proves that a metal can displace another metal placed below it in the reactivity series, but cannot displace a metal placed above in the series. Magnesium, iron, aluminium being above copper in the reactivity series can displace copper from its salt solution.

- To show that for rusting both oxygen and water (moisture) are necessary. Take three test tubes and label them A, B and C. In test tube A, put a few lumps of anhydrous calcium chloride (a good drying agent which absorbs water vapour from the atmosphere) and cover it with cotton. Put a clean iron nail over the cotton and close the tube with a cork.



In tube B, take some boiled distilled water. Distilled water is boiled to remove the dissolved oxygen from it. Drop a clean nail into this water and seal the water surface with wax to keep the air out. Close the mouth of the test tube with a cork.

Half-fill tube C with tap water and put the nail in it. Leave the test tubes for several days and then examine.

You will find that only the nail in tube C gets rusted.

As the tube A contains only dry air and tube B contains water but no air. Tube C contains both water and air. Only the nail present in tube C gets rusted. This shows that for rusting to take place, both air (oxygen) and water are essential.

**D. Tick (3) the correct option in the following :**

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

**E. Give us of the following :**

- Ans.** 1. Iron used for making pipes, stoves, cylinders etc.                      2. Aluminium used to make paints mirrors.  
3. Zinc used for galvanizing drycells.                      4. Silicon used to make gun powders.  
5. Phosphorus used to make match boxes, fireworks  
6. Carbon used in jewellery, making of black lead pencils.

**F. Fill in the blanks :**

- Ans.** 1. The sequence of process for extracting metals from their ores and purifying them is called **metallurgy**.  
2. **Most** metals maintain their lustre for a long time.  
3. The presence of air and moisture is necessary for **oxides** to rust.  
4. Non-metals react with chlorine to form **covalent** chlorides.  
5. Metals react with oxygen to give **metal** oxides.

**G. Write 'T' for True and 'F' for False for the following statements :**

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

**H. Write Shot notes on :**

- Ans.** 1. Arrangement of metals in a vertical column in the order of decreasing reactivity is called reactivity series of metals.  
2. **Ductility :** Metals can be drawn into thin wires. This property is called ductility, Silver, gold, aluminium, copper and iron can be drawn into thin wires.  
3. Corrosion can be prevented by galvanizing, tinning, electroplating, anodizing, and alloying.  
4. The metals which show very little chemical reactivity and occur in free state in nature are called noble metals.



**Fig 6.3 : Ductility of metals**

# 7

## Carbon and its Compounds



### A. Answer the following questions in not more than 30 words :

- Ans.**
- Carbon is a unique element. It is regarded as the most important element in the structure of living world.
  - In free state, carbon is found in nature as diamond, graphite and coal. In combined form, it occurs in large quantities in the Earth's crust as carbonates such as  $\text{CaCO}_3$  (marble),  $\text{CaCO}_3$  (limestone),  $\text{MgCO}_3$  (Magnesite),  $\text{CaCO}_3$ ,  $\text{MgCO}_3$  (dolomite), etc.
  - Diamond and graphite are allotropes of carbon. The property by virtue of which an element exists in more than one form is called allotropy.
  1. It is a greyish-black opaque material having metallic lustre.
  2. It is a good conductor of heat and electricity.
  3. Chemically, it is inactive and somewhat difficult to ignite.
  4. Graphite is lighter than diamond. Its density is  $2.25 \text{ g/cm}^3$  and high melting point of  $3700^\circ\text{C}$ .
  5. It marks paper black, like lead. Pencil lead is mainly of a mixture of graphite and clay.
  5. Charcoal : It is obtained by wood, sugar and bones by heating in the absence of air. It is used as a fuel. This process is known as destructive distillation.
  - (i) Buckminster fullerene can be prepared by the following methods :  
by electrically heating a graphite rod in the atmosphere of helium.  
(ii) by vaporizing graphite using laser.

### B. Answer the following questions in not more than 60 words :

- Ans.**
- Transfer of carbon atoms in nature from the living to non-living is very important. This is not only linked to transfer of energy but also to basic process by which life survives on the Earth. This part of cycle is called carbon cycle.
  - (i) Carbon exists mainly in two allotropic forms :  
(a) Crystalline form  
(b) Non-Crystalline or amorphous form  
Crystalline Form : In the crystalline form, the atoms of carbon are arranged in an ordered fashion. Both diamond and graphite are crystalline form of carbon.
  - (ii) Graphite : Graphite is a crystalline allotropic form of carbon. It is also known as black lead because it marks the paper black.
  - (i) Structure : In graphite, each carbon atom is linked with three neighbouring carbon atoms forming a hexagonal network. These networks are arranged into layers in such a way that they can slide over each other.
  - (ii) Structure : In diamond, each carbon atom is attached to four other carbon atoms by strong forces. This results in a three-dimensional rigid structure.  
The structure is so rigid and stable that it makes diamond the hardest naturally occurring substance. It also has high melting and boiling point and is a bad conductor of heat and electricity.  
Diamond : Diamond is one of the purest crystalline forms of carbon. It is the hardest known substance. Only a diamond can cut another diamond.
  - (i) Wood charcoal is a black porous solid. It has the property of absorbing gases and is therefore, used in gas masks. It is also used in making gun powder, as deodorant and as a fuel.
  - (ii) Lamp Black : Carbon rich substances such as mustard oil, turpentine oil, petroleum and its several products when burnt in limited supply of air form lamp black. It has been found that lamp black consists of extremely small crystals of graphite.

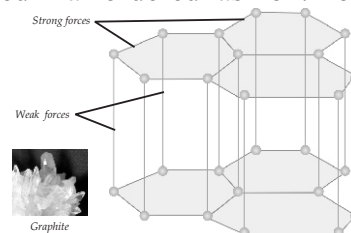


Fig 7.3 : Structure of Graphite

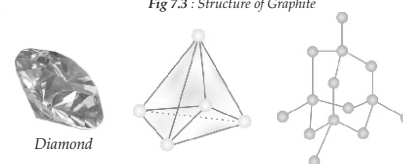


Fig 7.4 : Structure of diamond

- (iii) **Coke** : Coke is obtained by destructive distillation of coal. During heating of coal, coke is left behind as a black residue.
5. (i) They are cage-like structures of carbon atoms. The most important form being buckminster fullerene (C<sub>60</sub>) with 60 carbon atoms arranged in a spherical structure. It consists of 12 pentagonal faces and 20 hexagonal faces giving it 60 corners.  
While diamond and graphite are crystalline in nature, fullerenes form discrete particles.
- (ii) some expected uses of fullerenes and related compounds are :  
superconductors  
semiconductors  
lubricants and catalysts  
electric wires  
fibres to reinforce plastics
6. It is formed when carbon or carbon compounds are burnt in an inadequate supply of air.
- $$2\text{C} + \text{O}_2 \longrightarrow 2\text{CO}$$
- The properties of carbon monoxide are :
1. It is colourless.
  2. It is highly poisonous.
  3. It is slightly lighter than air.
  4. When inhaled, it readily combines with haemoglobin molecules in the blood and forms carboxy haemoglobin.

**C. Answer the following questions in not more than 120 words :**

- Ans.** 1. Carbon dioxide can be prepared by following methods.
- (1) By burning of Carbon : Carbon dioxide can be prepared by burning carbon in sufficient amount of oxygen.  
The chemical equation is :  
$$\text{C} + \text{O}_2 \longrightarrow \text{CO}_2$$
- (2) Laboratory Preparation : Take a Woulf's bottle and put some marble chips (CaCO<sub>3</sub>) in it.  
Then set up the apparatus as shown in figure  
Pour a few drops of dilute hydrochloric acid (HCl) through the thistle funnel. The marble chips react with hydrochloric acid and carbon dioxide gas is produced.
2. (i) **Methane (CH<sub>4</sub>)** : Methane is also known as marsh gas as it is formed in marshy lands.  
Occurrence : Methane is the chief constituent of natural gas trapped from the earth's upper layers. It is also found in coal mines and a flame or spark can explode a mixture of methane and air.
- (ii) **Preparation** : Methane is prepared in laboratory by heating anhydrous sodium acetate (CH<sub>3</sub>COONa) with soda lime. Soda lime is a mixture of sodium hydroxide (caustic soda) and calcium oxide (lime). Set up the apparatus as shown in figure.  
On heating, the following chemical reaction takes place.  
$$\text{CH}_3\text{COONa} + \text{NaOH} \xrightarrow{\text{Heat}}$$
  

Sodium	Sodium		
acetate	hydroxide		
CH <sub>4</sub>	+ Na <sub>2</sub> CO <sub>3</sub>		
Methane	Sodium		
	Carbonate		

The gas being insoluble in water is collected in a boiling tube by displacement of water.

**Physical Properties of Methane :**

  1. It is a colourless, odourless, tasteless gas.
  2. It is lighter than air.
  3. It is insoluble in water.
  4. Soluble in ether, alcohol and carbon tetrachloride.

### Chemical Properties of Methane :

Methane has following chemical properties :

1. Methane burns in air with a blue flame, forming CO and H<sub>2</sub>O. A large amount of heat and light is produced.



3. (i) 1. It is a greyish-black opaque material having metallic lusture.
2. It is a good conductor of heat and electricity.
3. Chemically, it is inactive and somewhat difficult to ignite.
4. Graphite is lighter than diamond. Its density is 2.25 g/cm<sup>3</sup> and high melting point of 3700°C.
5. It marks paper black, like lead. Pencil lead is mainly of a mixture of graphite and clay.
- (ii) 1. Pure diamond is crystalline.
2. Diamond is hard, clear and translucent and has its own brilliance. It sublimates at about 3500°C. Presence of impurities imparts colour to diamonds.
3. Diamond is hardest known substance.
4. It has high density at room temperature and its density is 3.5g/cm<sup>3</sup>.
5. It is insoluble in all solvents

#### D. Tick (3) the correct option in the following :

- Ans. 1. (ii)      2. (iii)      3. (iii)      4. (ii)      5. (iii)

#### E. Fill in the blanks :

- Ans. 1. Carbon is represented by the symbol **C**.
2. Both diamond and graphite are **crystalline** forms of carbon.
3. **Graphite** is also known as black lead.
4. **Bone** charcoal is also known as animal charcoal.
5. Solidified carbon dioxide is also known as **dry ice**.
6. Methane reacts with chlorine in the presence of sunlight to form **Chloromethane and Hydrogen chloride**.
7. **Fullerenes** are considered the third allotrope of carbon.

#### F. Write 'T' for True and 'F' for False for the following statements :

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

#### G. Match the following :

- Ans.
- |                       |   |   |
|-----------------------|---|---|
| 1. Lamp black         | → | (a) MgCO <sub>3</sub>                     |
| 2. Carbon dioxide     | → | (b) Soda Ash                              |
| 3. Sodium bicarbonate | → | (c) CaCO <sub>3</sub> , MgCO <sub>3</sub> |
| 4. Ethanol            | → | (d) CO <sub>2</sub>                       |
| 5. Marble             | → | (e) CaCO <sub>3</sub>                     |
| 6. Dry ice            | → | (f) Carbon black                          |
| 7. Magnetic           | → | (g) Alkane                                |
| 8. Sodium Carbonate   | → | (h) Refrigerant                           |
| 9. Carbon monoxide    | → | (i) CO                                    |
| 10. Dolomite          | → | (j) Baking Soda                           |

#### H. Complete the equations and also balance them :

- Ans. (i)  $\text{Ca(OH)}_2 + \text{CO}_2 \xrightarrow{\text{heat}} \text{CaCO}_3 + \text{H}_2\text{O}$
- (ii)  $\text{CaCO}_3 + \text{H}_2\text{O} + \text{CO}_2 \longrightarrow \text{Ca(HCO}_3)_2$
- (iii)  $2\text{NaOH} + \text{CO}_2 \longrightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O}$
- (iv)  $\text{NaHCO}_3 + \text{HCl} \longrightarrow \text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$
- (v)  $\text{CH}_3\text{COONa} + \text{NaOH} \longrightarrow \text{CH}_4 + \text{Na}_2\text{CO}_3$
- (vi)  $\text{CH}_4 + 2\text{O}_2 \longrightarrow \text{CO}_2 + 2\text{H}_2\text{O} + \text{Energy}$
- (vii)  $\text{C}_{12}\text{H}_{22}\text{O}_{11} \longrightarrow 12\text{C} + 11\text{H}_2\text{O}$

# 8

## Cellular Level of Organization



### A. Answer the following questions in not more than 30 words :

- Ans.**
- There are two types of animal tissue. The cheek cells are a type of epithelial tissue while blood is a kind of connective tissue. There are two other types of animal tissue: muscular and nervous.  
Epithelial tissue : This tissue covers the surface of the body. Its main function is protection. The cells that form the different types of epithelial tissue differ in shape. Some are thin and flat, some cubelike, while others are columnar.
  - Organism that consists of only one cell is known as unicellular and that has more than one cell is known as multi-cellular.
  - The nucleus is the largest and the most important organelle of the cell. It is usually spherical or oval in shape. Inside it there are thread like structures known as chromosomes.
  - They oxidize food to provide energy. That is why they are called power house of the cell. Both animal and plant cells contain mitochondria.
  - Plastids are the largest cell organelle found in the cytoplasm of plant cells only. Plastids are of three types :  
Chloroplasts                                      Leucoplasts                                      Chromoplasts

### B. Answer the following questions in not more than 60 words :

- Ans.**
- Vascular bundles : The distinct groups of cells arranged in a ring are called vascular bundles. They are made up of two types of tissue known as xylem and phloem. The large, thick-walled cells form the xylem. They are responsible for transporting water and minerals from the root.
  - All living organisms are made up of cells. That is why they are known as building blocks of life. Since a cell performs all the biological activities of a living organism, hence a cell is the structural and functional unit of living things.
  - (i) Guard cells : Among the (epidermal) cells in the Rhoeo peel, you will see bean-shaped cells. These are guard cells, which regulate the opening of the stomatal pores in leaves. Perhaps you remember that gases move into and out of leaves through these pores.  
(ii) Rectangular cells separated by rigid walls can be seen. There are the epidermal cells found on the surface of the plant body. These act as a protective layer. A red spot known as nucleus can be seen inside each cell.
  - Cell Membrane (Plasma Membrane) : All cells are bound by a membrane called cell membrane or plasma membrane. Cell membrane gives shape and size to the cell. It separates the cell from its surroundings.
  - Plastids are the largest cell organelle found in the cytoplasm of plant cells only. Plastids are of three types :  
Chloroplasts are green due to the presence of a green pigment called chlorophyll. These help in the synthesis of food by photosynthesis.  
Leucoplasts are colourless plastids. They help in the storage of food.  
Chromoplasts are of different colours. These are responsible for the colour of flowers and fruits produced by the plants. For example, the red colour of tomato is due to presence of red coloured chromoplasts.

### C. Answer the following questions in not more than 120 words :

- Ans.**
- In 1838, two German biologists Mathias Schleiden and Theodor Schwann put forward the cell theory of life. Main postulates of this theory are
    - All the living things are made up of cells.
    - New cells are formed when old cell is divided into two.
    - Cells are not identical but are similar in structure and function.
    - Structure of an organism depends on the way its cells are organized.



- Function of an organism depends on the way the cells work.
2. The nucleus is the largest and the most important organelle of the cell. It is usually spherical or oval in shape. Inside it there are thread like structures known as chromosomes. The chromosomes form a dense tangle referred to as chromatin. They carry genes which perform all its functions. That is why the nucleus is known as control room of the cell. A nucleus mainly consists of following parts :

Nuclear membrane

Nucleoplasm

Nucleolus

Plant cell	Animal cell
Plant cell is covered by a rigid cell wall.	A cell wall is absent.
Plant cell has one or two large vacuoles.	Vacuoles are either absent or are smaller in size.
Plastids are present.	Plastids are absent.
Centrosomes are absent.	Centrosomes are present.
Lysosomes are rare or absent.	Lysosomes are present.

3. Inside the stem : If you observe a permanent slide of a section of the stem of a dicotyledonous plant, like sunflower, you will see at least three distinct regions. These regions are formed of different types of tissues.

**Epidermis** : The outermost region formed by a single row of flat, rectangular cells is called epidermis. This is a protective tissue that covers stems, roots and leaves. In green stems and leaves, it bears stomata for the exchange of gases needed for respiration and photosynthesis. In roots, this layer (called epiblema) bears root hairs and helps in the absorption of water and minerals from the soil.

**Ground tissue** : This constitutes the rest of the stem. It is divided into different zones and is actually a tissue system.

**D. Choose the correct option in the following :**

**Ans.** 1. (i) 2. (ii) 3. (ii) 4. (i) 5. (ii) 6. (ii) 7. (ii)

**E. Write 'T' for True and 'F' for False for the following statements :**

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

**F. Fill in the blanks :**

- Ans.** 1. The matrix in which blood cells are suspended known as **plasma**.  
 2. Mitochondria are called the **power house** of cells.  
 3. **Robert Hooke** discovered cells in 1665.  
 4. In a plant cell, the cell wall is made up of **cellulose**.  
 5. Cells can only be seen with the help of a **microscope**.

**G. Match the following :**

- Ans.** 1. Lysosome → (a) store food, water and wastes  
 2. Chromosome → (b) protects and supports the plant cells  
 3. Vacuoles → (c) protein synthesis  
 4. Ribosomes → (d) thread like structure, composed of DNA  
 5. Cell wall → (e) cellular digestion

**H. Distinguish between :**

- Ans.** 1. Organism that consists of only one cell is known as unicellular and that has more than one cell is known as multi-cellular.

Plant cell	Animal cell
Plant cell is covered by rigid cell wall.	A cell wall is absent.
Plant cell has one or two large vacuoles.	Vacuoles are either absent or are smaller in size.
Plastids are present.	Plastids are absent.
Centrosomes are absent.	Centrosomes are present.
Lysosomes are rare or absent.	Lysosomes are present.

3. **Guard cells** : Among the (epidermal) cells in the Rhoeo peel, you will see bean-shaped cells. These are guard cells, which regulate the opening of the stomatal pores in leaves. Perhaps you remember that

gases move into and out of leaves through these pores. The green dots are chloroplasts, which we will discuss a little later.

**Blood Cells :** In the blood smear, you will notice two types of cells. The disc-shaped cells are red blood cells. They will be greater in number than the irregularly shaped white blood cells. The prominent structure inside a white blood cell is its nucleus. Red blood cells do not have a nucleus.

4. Chloroplast	Chromoplast
These are green due to the presence of a green pigment called chlorophyll. These help in the synthesis of food by photosynthesis.	These are of different colours. These are responsible for the colour of flowers and fruits produced by the plants. For example, the red colour of tomato is due to the presence of red coloured chromoplasts.

## 9 Micro-organisms



### A. Answer the following questions in not more than 30 words :

- Ans.**
- (i) Organisms that can be seen only under the microscope are known as micro-organisms or microbes.  
(ii) The study of micro-organisms is known as microbiology.
  - Louis Pasteur of France, (father of bacteriology) discovered that micro-organisms are the cause of fermentation and decay, and also the main causative organisms of diseases.
  - There are five major group of microbes which are as follows :
    - Bacteria (Singular → Bacterium)
    - Fungi (Singular → Fungus)
    - Virus
    - Algae (Singular → Alga)
    - Protozoa (Singular → Protozoan)
  - Reproduction :** Bacteria reproduce asexually. Under favourable conditions of temperature, nutrition, moisture and pH, their rate of multiplication is fast. Bacteria generally reproduce by binary fission.
  - (i) The bacteria which can prepare their own food are called autotrophs. The autotrophs which utilize the energy of the Sun are called photoautotrophs.  
(ii) The bacteria which cannot prepare their own food but utilize the food synthesized by the other organisms are called heterotrophs.
  - Some bacteria are used to make alcohol and vinegar, while others are used to make yoghurt (curd) and cheese from milk.
  - A virus consists of a single strand of nuclear matter (DNA or RNA), surrounded by a protein coat. Viruses cannot be cultured outside the specific host cells. They may be rod-like, spherical, polygonal, etc., in shape.
  - A protozoan named *Entamoeba histolytica* lives in the large intestine of human beings and causes amoebic dysentery.
  - Nutrition :** Fungi are saprophytes which derive their food from dead and decaying organisms. Others are parasites which obtain their food from the host.

### B. Answer the following questions in not more than 60 words :

- Ans.**
- Diatoms are a fascinating group of algae. They are mostly unicellular and have an infinite range of forms. They are found in freshwater and marine habitats. Their cell walls are made of silica. When they die, the silica accumulates at the bottom of lakes, rivers and seas to form siliceous earth. Large masses of diatoms floating in the sea are called plankton.
  - Protozoas are unicellular organisms having animal-like characteristics. Protozoa actually means the first animal. Even protozoans like *Euglena* do not have cell wall. Some live in freshwater, salt water and some of them live in the soil. They also live in the bodies of animals and plants.
  - Some of the fungi are responsible for damaging the crops.

A mushroom called Amanita is poisonous and when consumed may lead to death.

4. **Structure :** Fungi are both unicellular and multicellular. Yeasts are unicellular while many moulds are multicellular. Mushrooms, puff balls and toad balls are multicellular and are bigger in size.  
A yeast cell has a wall made up of cellulose. The nucleus and other organelles remain suspended in the cytoplasm.
5. (i) There are many ways of preserving food. Most of these involve steps to create conditions in which it is difficult for harmful organisms to grow.
- (ii) **Storing food :** Keeping food covered is the most basic way of protecting it from insects and other organisms.
- (iii) **Drying :** Bacteria and fungi need moisture to grow. So drying, or dehydrating, food is one way of preserving it. Sun-drying is a traditional method of preserving food.
- (iv) **Freezing :** Another way of discouraging the growth of bacteria and fungi is to store food at a low temperature. This method, called cold storage, is suitable for perishable food items.

**C. Answer the following questions in not more than 120 words :**

- Ans.** 1. (i) Many plant and animal diseases are caused by bacteria. They can cause diseases by destroying living tissue or by producing poisonous substance, called toxins. Typhoid, cholera, pneumonia, tetanus, tuberculosis, leprosy and whooping cough are some human disease caused by bacteria.
- (ii) Some bacteria are used to make alcohol and vinegar, while others are used to make yoghurt (curd) and cheese from milk. Some bacteria are also used in the production of tea, coffee and tobacco. The action of bacteria (and yeast) on carbohydrates which we use in these processes, is often referred to as fermentation.
2. (i) Anton von Leeuwenhoek of Holland first saw micro-organisms with the help of his newly invented microscope.
- (ii) Micro-organisms are present everywhere. Their habitats are as follows :
- Air :** They are found in the air. Fresh air has less micro-organisms.
- Water :** Water obtained from well, hand pump, etc., has less micro-organisms while water from pond, lake, river, sea has large number of micro-organisms.
- Soil :** Soil also has micro-organisms. Cultivation of soil has a large number of micro-organisms. The more organic matter in the soil, then higher is the number of micro-organisms.
3. Some bacteria are used to process food, they are also responsible for spoiling food. Milk turns sour and butter turns rancid to the action of bacteria. They also spoil meat, fish, vegetables and fruit. Clostridium botulinum, which grows in badly preserved canned food, can cause a very dangerous kind of food poisoning called botulism. Food spoilage can be prevented by storing, drying, freezing etc.
4. (i) Viruses are microscopic organisms that have the characteristics of both the living and non-living things. They have no life until they enter another living cell.
- Viruses are found in air, water, soil and also in the body of living organisms.
- Size :** Viruses are smaller than any known cell. Their size varies from 0.015 to 0.2 microns.
- They can be seen only through an electron microscope.
- Shape and structure :** A virus consists of a single strand of nuclear matter (DNA or RNA), surrounded by a protein coat. Viruses cannot be cultured outside the specific host cells.
- They may be rod-like, spherical, polygonal, etc., in shape.
- (ii) **Harmful Virus :**
- Virus causes diseases like chicken pox, measles, common cold, AIDS, hepatitis, etc.
- A virus that attacks bacteria is known as bacteriophage, meaning bacterium-eater.

**D. Choose the correct option in the following :**

- Ans.** 1. (iii)      2. (i)      3. (ii)      4. (iv)      5. (iii)      6. (iv)      7. (ii)

**E. Fill in the blanks :**

- Ans.** 1. **Antibiotics** are a group of medicines used in the treatment of infectious diseases.
2. **Diatoms** are a fascinating group of algae.
3. Nutrition in bacteria can be **autotrophic** or **heterotrophic**.
4. **Protozoa** means the first animal.

5. **Microbes** cannot be seen with naked eyes.
6. **Chickenpox** and **measles** are two diseases caused by virus.
7. A protozoan named **Entamoeba histolytica** lives in large intestine of human beings.
8. **Saprophytism** is a type of fungus which derives its food from dead and decaying organisms.
9. The process of conversion of sugar into ethyl alcohol and carbon dioxide by yeast is known as **fermentation**.

F. Write 'T' for True and 'F' for False for the following statements :

## 10 Reproduction



A. Answer the following questions in not more than 30 words :

- Ans.**
1. The ability to produce new individuals of the same species is one of the characteristics of living organisms. This process is known as reproduction.
  2. In most plants and animals, two individuals male and a female are needed for reproduction.
  3. Each individual or parent produces a special sex cell known as gamete. In animals the gamete produced by the female is called egg or ovum and that produced by the male is called sperm.
  4. Sperm and Ovum
  5. A large number of animals have two separate individuals— males that produce the sperm, and females that produce the ovum. In such organisms, a male and a female are required for fertilization.
  6. (i) External Fertilization  
In this process the fusion of the gametes takes place outside the body of the organisms.  
(ii) Internal Fertilization  
In this process the fusion of the gametes takes place inside the body of the organisms.
  7. In some organisms such as earthworms and leeches both male and female gametes are present in the same individual. Such organisms are called hermaphrodites.
  8. When the sperm and ovum fuse together they form zygote. This is the first cell of the new organism. It goes through specific changes to form to new organism. The process of fusion of the sperm and ovum is called fertilization.
  9. Zygote
  10. The change of form that an insect undergoes is called metamorphosis (a Greek word; 'meta' means change and 'morphe' means form).
  11. In the male the testes start making sperms and in the female ovaries start releasing eggs due to the release of the sex hormones. This stage is called puberty.
  12. During the period of puberty, the sex hormone's bring about changes. These are called the secondary sexual characteristics.
  13. A child becomes an adolescent when he/she reaches puberty. The period of adolescence continues until the age of 19 when the growth stops.
  14. Metamorphosis means change form. Meta means change in Greek and morphe means form.
  15. The embryo becomes embedded in the lining of the wall of the uterus. This is called implantation.

B. Answer the following questions in not more than 60 words :

- Ans.**
1. The male reproductive organs are called testes (singular : testis). They start producing sperms at puberty. Puberty is further discussed in this chapter. The testes lie in a sac, called the scrotal sac, which is located outside the abdominal cavity.  
They produce sperms in large numbers. The sperms collect and mature in a tube called the epididymis. From here, they travel through a muscular tube, called the vas deferens, into the urethra, which lies inside the penis. As the

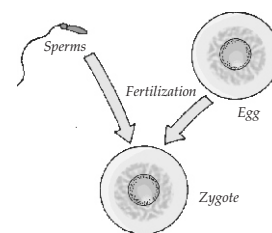


Fig 10.1 : The Structure of the atmosphere

sperms travel through the tube different secretions from various glands pour in. The mixture of secretions and sperms is called semen. The semen (containing sperms) is transferred into the vagina, or the opening of the female reproductive system, by the penis, sperms have a head and a long tail. The tail helps them swim towards the ovum.

2. The ovaries, or the female reproductive organs, lie in lower part of the abdominal cavity. They start producing ova when a girl reaches puberty. Usually, either of the ovaries produces one ovum every month. Each ovary is a muscular tube, which ends in a funnel with finger like projections. This tube carries the ovum from the ovary to the uterus, or womb and is called the fallopian tube, or oviduct. The uterus is a muscular organ. Its lower portion, called the cerix, is connected to the vagina, which opens to the outside. The ovaries are attached to the uterus by ligaments.

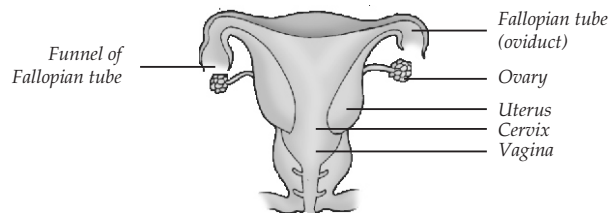


Fig 10.3 : The female reproductive system

3. (i) This system consists of several glands scattered over the body. These glands, called endocrine glands are different from other glands. They discharge the chemicals they produce directly into the blood, unlike other glands, which discharge their secretions through vessels or ducts.
- (ii) Regulates growth and the functioning of the other endocrine glands.  
Controls many activities of the body including the rate at which energy is produced.  
Control the balance of calcium in the body.  
Regulate heartbeat, respiration rate and blood pressure  
Controls glucose level in blood.  
Promote development of secondary sexual characters.  
Control secondary sexual characters and changes related to pregnancy.

### C. Answer the following questions in not more than 120 words :

- Ans.** 1. The embryo becomes embedded in the lining of the wall of the uterus. This is called implantation. It takes nine months for the embryo to grow and develop into a fully-formed baby. This is called gestation period. At two months, the embryo starts resembling the human form and is called foetus. During the period of gestation, the body of the mother provides the foetus with food, breathes for its, excretes its wastes, keeps it warm and protects it from damage and disease.

This process takes place in male and female reproductive system which are as follows

2. (i) External fertilization occurs outside the body of the organisms Internal fertilization occurs inside the body.
- (ii) The male reproductive organs are called tests. They start producing sperm at puberty.  
The ovaries or the female reproductive organs, lie in the lower part of the abdominal cavity. They start producing ova when a girl reaches puberty.
- (iii) A child becomes an adolescent when he/she reaches puberty. This period of adolsence continues till the age of 19 when the growth stops. A part from physical growth, young boys and girls finds themselves changing emotionally and intellectually.

3. In the life cycle of the butterfly, the insect changes its form completely from one to another. When the eggs hatch, the caterpillar, which is worm-like, changes into an adult butterfly. This change of form that an insect undergoes is called metamorphosis (a Greek word; 'meta' means change and 'morphe' means form).

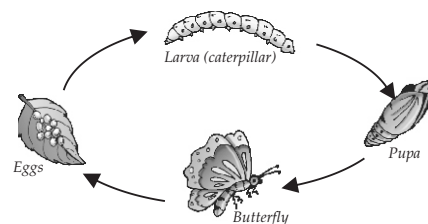


Fig 10.6 : The life cycle of a butterfly

4. (i) The process of fusion of the sperm and ovum is called fertilization.
- (ii) In most aquatic animals, such as the bony fish, the male and the female release their sperms and eggs into the surrounding water. The sperms swim to the eggs and fertilize them. This fertilization takes place outside the parent's body.

In *Hydra*, there are lumps on the side of the body. These are the testes and ovaries. Each testis contains numerous sperms and the ovary contains an egg. When they mature, they burst open. The sperms swim to an open ovary of another. *Hydra* fertilizes the egg. The fertilized eggs become embryo.

- (iii) In reptiles, birds and mammals that usually live on land, sperms are released directly into the body of the female since the sperms are unable to move on land. The males and females mate, and the sperms enter the female body where they fertilize the egg. This is internal fertilization.



5. (i) During the period of puberty, the sex hormone's bring about changes. These are called the secondary sexual characteristics.  
(ii) Boys develop deep voice, beard and moustache and large hands and feet.  
Girls develop breasts and begin to menstruate.  
There is growth of pubic hair in both the sexes.  
Reproductive organs grow and function.
6. Problems associated with adolescence  
The mental and physical changes that occur during adolescence can cause mood swings. At times, these can be difficult to handle.  
The adolescent is unsure of himself/ herself but wants to be independent.  
If at this stage the adolescent does not have adequate parental or home support, there are greater chances of drug abuse and alcohol abuse.  
Medical problems, such as eating disorders and depression, can also affect the adolescent and cause emotional instability. This instability among some adolescents can lead them to the path of crime.  
During this stage, maturity in the body makes young boys and girls become interested in the opposite sex. Some explore their newfound sexuality by indulging in sexual activities.

**D. Fill in the blanks :**

- Ans.**
1. Reproduction takes place in two ways : **asexual** and **sexual**.
  2. Sex cells are also called **gametes**. In animals, the male sex cell is called a **sperm** and the female cell is called an **ovum**.
  3. An egg can only develop into an adult after **9 months**.
  4. Before the larva develops into a butterfly, the insect forms a hardened case called **chrysalis** around it and rests. This resting stage is called **pupa**.
  5. When an insect changes its form, it is said to have undergone **metamorphosis**.
  6. Between the ages of 12 and 15, the sex organs **mature**. This stage is called **puberty**. At this stage **secondary** sexual characteristics develop.
  7. Sex cells are called **gamete**. An **ovum** and a sperm combine in the process called **fertilization** to form a **egg**.
  8. In butterfly, the egg hatches into a **worm**, which then changes into **larva (caterpillar)**. This is called **life cycle**.

**E. Write 'T' for True and 'F' for False for the following statements :**

- Ans.** 1. True 2. False 3. True 4. True 5. False 6. True 7. True 8. False

**F. Tick (3) the correct option in the following :**

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

**G. Label the following :**

**(a) Male reproductive system**

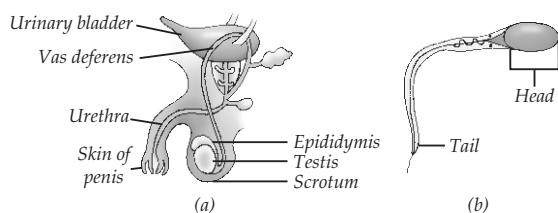


Fig 10.2 : (a) The male reproductive system (b) A sperm

**(b) Female reproductive system**

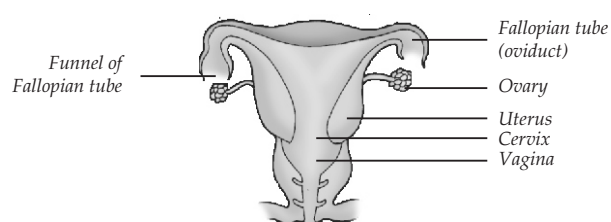


Fig 10.3 : The female reproductive system

# 11

## Force and Pressure



**A. Answer the following questions in not more than 30 words :**

- Ans.**
1. (i) Force is required to change the speed of a moving body.  
(ii) Force is needed to change the direction of the motion of a moving body.
  2. Force changes speed
  3. Gravitational Force
  4. Magnetic force, Electronic force and Gravitational force

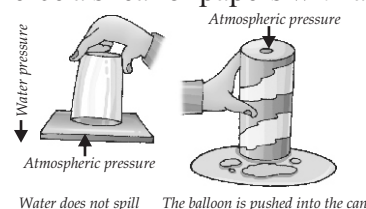
5. Soles of our shoes and tyres of vehicles
6. (i) Friction causes wearing down by rubbing an eraser first over paper and then over sandpaper. The sandpaper will wear down the eraser much faster because it is rougher.  
(ii) Another disadvantage of friction is that it generates heat. When you rub your palms against each other, you can feel the heat generated by friction.
7. The quantity  $F/a$ , or the force per unit area, is called pressure.

Pressure = force/area

The SI unit of pressure is newton per square metre ( $\text{N/m}^2$ ) or pascal (Pa). Thus, if a force of 10 N acts on an area of  $1\text{m}^2$ , the pressure would be  $10\text{ N/m}^2$ .

8. (i) The cutting edges of implements like blades, axes and knives are made sharp and why pins and needles have sharp points.  
(ii) It is easier to (a) cut an apple with the sharp edge of a knife and (b) pierce a sheaf of papers with a sharp pin.
9. Surprise your friends with these activities and try to explain them. See the figures for hints.

Fill a glass with water and cover it with a coaster. Invert the glass. The coaster will remain stuck to the glass and the water will not spill.



10. Unit of force : There is a very close relation between the force of gravity acting on a mass of 100 g and the SI unit of force, called the newton (symbol : N). The weight of a 100-g mass or the force of gravity acting on it is 0.98 N. Therefore,  
The weight of a 1-kg mass = 9.8 N.

**B. Answer the following questions in not more than 60 words :**

- Ans.**
1. Air and water also offer resistance to movement. Nature's fliers (birds) and swimmers (fish) are designed to reduce this resistance. They have what is called streamlined bodies.
  2. Oil reduces friction by filling up the dents on the surfaces that move against each other in a machine (this is why people oil cycles and sewing machines).  
Another way of reducing friction is to use ball bearings or roller bearings. Bearings come in many shapes and sizes and are used to reduce friction especially when a rod rotates inside a hole, as in a bicycle wheel. The ones used between the wheel hub and the axle of a bicycle are small steel balls. The following activity will help you understand how ball bearings help reduce friction.
  3. When a force is applied to move a body, frictional force resists the movement. As the force increases, the frictional force also increases, until the force applied becomes greater than the frictional force. Just as the force applied becomes greater than the frictional force, the body starts moving. And as the body starts moving, the frictional force decreases.
  4. (a) (i) Things made of iron are attracted by a magnet. The force with which a magnet attracts such things is called magnetic force, and the phenomenon is called magnetism. You must have noticed that a magnet does not have to be in contact with something made of iron in order to attract it. Unlike muscular force and frictional force, magnetic force can act from a distance.  
(ii) If you run a comb through your hair (provided it is dry) a few times and then hold the comb over small pieces of paper, they will get drawn to the comb. The force which acts on the pieces of paper is called electrostatic force. This is another type of force that can act from a distance.  
(iii) You know the everything on or near the Earth is attracted towards it by the force of gravity.  
(b) Like magnetic and electrostatic forces, gravitational force too can act from a distance. A body that exerts a force which can act from a distance has a field of influence, which is like an invisible sphere around it. When another body enters this field, it feels the attraction. The Earth, for example, has a gravitational field. If you can leave this field, you will no longer be pulled back to the Earth. That is how rockets do not fall back to the earth. They manage to leave the Earth's gravitational field.
  5. (a) The problem is that gravitational force depends on the masses of the two bodies concerned. And unless one of the bodies is very massive, it cannot be felt. This also explains why the Earth's force of gravitation is much greater than that of the moon. It is because the Earth's mass is much greater than that of the moon.  
(b) The moon too pulls things near it with its own force of gravity. And so do all the other planets, the sun

and all the stars. In fact, any two bodies in this universe attract each other by a force called gravitational force.

**C. Answer the following questions in not more than 120 words :**

- Ans.**
- The spring balance measure mass. We notice that the bigger the stone is, the more the spring gets extended. This is because a bigger stone has a greater mass, so it is pulled by the Earth with a greater force (gravitational force depends on mass, remember). This is the principle on which a spring balance works.
  - This weight, or force, acts downwards on the base of the container which holds the liquid. So the pressure exerted on the base of the container is the weight of the liquid divided by the area of the base. The following activity will give you a better idea of the pressure exerted by a liquid.
    - The pressure exerted by a liquid increases with depth. A liquid exerts the same pressure in all directions at a given depth.
  - Friction wastes energy too. When you ride a bicycle, for example, you use energy to overcome the friction between the moving parts of the bicycle, as well as the friction with the air. As you push your way through air, a frictional force called air resistance opposes your movement. The faster you move, the greater is the resistance, until a point when all your energy is used to overcome this resistance. You cannot speed up beyond this point.

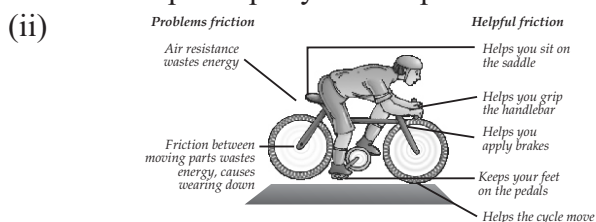


Fig 11.5 : How friction helps and creates problems when you cycle

**D. Fill in the blanks :**

- Ans.**
- Rolling friction is **lesser** than sliding friction.
  - A body has weight because of **Earth's** force.
  - The force which opposes the motion of one body over another is **frictional** force.
  - The smoother the surface, the **lesser** is the frictional force.
  - Kinetic friction is **lesser** than static friction.
  - The smaller the area over which a force is applied, the **greater** is the pressure.
  - The pressure at a particular depth in a liquid is **same** in every direction.

**E. Write 'T' for True and 'F' for False for the following statements :**

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

**F. Choose the correct option in the following :**

- Ans.** 1. (iii)      2. (iv)      3. (ii)      4. (iii)      5. (iii)  
6. (i)      7. (iii)      8. (i)      9. (iv)      10. (i)

**G. Match the following :**

- Ans.**
- |   |                         |
|---|-------------------------|
| 1. Force required to lift 1 kg mass vertically, against the pull of gravity | → (a) muscular force    |
| 2. A force which does not need a connector                                  | → (b) newton            |
| 3. A force which cannot be applied through a non-rigid connector            | → (c) force             |
| 4. A device used for finding weight   | → (d) non-contact force |
| 5. A push or pull which causes motion                                       | → (e) push              |
| 6. Force required to lift 100g mass vertically, against the gravity         | → (f) spring balance    |
| 7. The force produced by the muscles of living beings                       | → (g) kilogram force    |

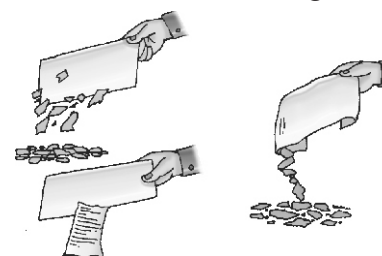


**A. Answer the following questions in not more than 30 words :**

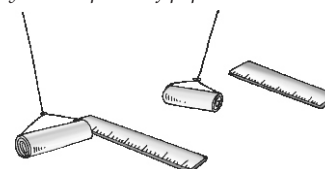
- Ans.**
1. Rub a plastic ruler with a woollen cloth or a piece of flannel and suspend it from a support, with the help of a string. Now rub another ruler similarly and bring it near the first one. The suspended ruler will move away from the ruler in your hand, or it will be repelled.
  2. Rub a glass rod with a piece of silk and bring it near the suspended ruler. The ruler will be attracted to the glass rod. If you bring the glass rod close to another glass rod which you have rubbed with a piece of silk, the two will repel each other.
  3. The cylinder, like any other object, has millions of atoms with an equal number of negative and positive charges. When you bring the ruler close to it, the negative charges in the cylinder move away from the ruler, leaving positive charges near the ruler.
  4. Touching the disc of a positively charged electroscope with a positively charged body increases the charge on the leaves, making them diverge more.
  5. A negatively charged body reduces the positive charge on the leaves and reduces the divergence.

**B. Answer the following questions in not more than 60 words :**

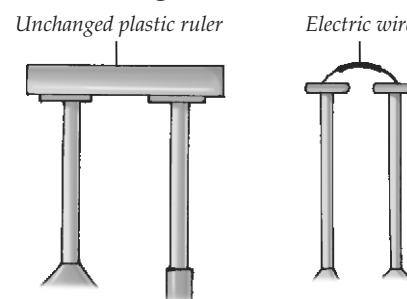
- Ans.**
1. Cut out a rectangular piece from a Styrofoam plate (the white ones used in parties and picnics.) Rub it vigorously with a piece of paper or wool for about a minute. You will find that the pieces of Styrofoam and paper attract bits of paper. This shows that both of them are charged. You will also find that they attract each other. So, they must carry unlike charges. On rubbing Styrofoam with paper, both get charged. They attract pieces of paper as well as each other.
  2. Roll a small strip of paper, and glue its ends together to make a cylinder. Suspend it with the help of a string. Rub a plastic ruler with wool or flannel and bring it close to the cylinder. Initially, the cylinder will be attracted to the negatively charged ruler. But as soon as the ruler touches it, the cylinder will move away with a jerk.
  3. When you bring a charged body in contact with the metal disc of an electroscope, the gold leaves get charged by conduction. They then diverge, indicating the presence of a charge. And the amount they diverge gives you an idea of the magnitude of the charge on the body you are testing.
  4. Charge an electroscope by touching its disc with a charged plastic ruler or glass rod. Its leaves will diverge. Now 'connect' the disc to the disc of an uncharged electroscope, with the help of an uncharged plastic ruler. The leaves of the first electroscope will remain as they were and those of the second will not move.  
Next, remove the insulation (plastic covering) from the ends of a piece of electric wire. Place the ends of the wire over the discs of the two electroscopes. The leaves of the second electroscope will diverge and the divergence of the leaves of the first electroscope will decrease, until the divergence of both is the same. If you remove the wire and touch the disc of either electroscope with your hand, the leaves will collapse.
  5. A lightning conductor is a tall metal rod, which is fixed to buildings to protect them from being damaged by lightning. The top of the rod ends in spikes. The lower end of the rod is connected to a metal plate, which is buried underground. If lightning happens to strike a building which has a lightning conductor, the charge passes harmlessly through the metal rod into the Earth, or gets earthed.



*On rubbing Styrofoam with paper, both get charged. They attract pieces of paper as well as each other.*



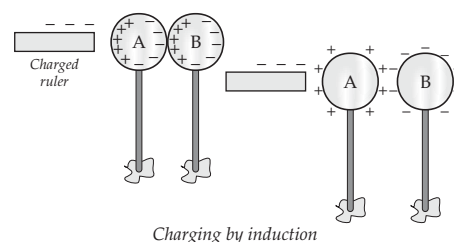
*The uncharged paper cylinder is drawn towards the ruler*





**C. Answer the following questions in not more than 120 words :**

- Ans.** 1. A body can be charged by : Friction, Conduction, Induction. Use some aluminium foil (used to wrap food) to make two metal spheres. Attach them to sticks, and stand them up on a table with the help of modelling clay or atta. Let the spheres touch each other. Bring a negatively charged ruler close to sphere A and then move sphere B away from it. Now move the ruler away. If you test spheres A and B, you will see that the first is positively charged, while the second is negatively charged.

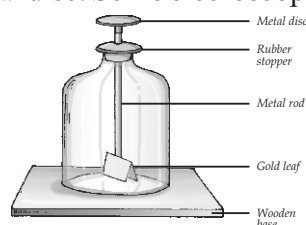


When you bring the negatively charged ruler close to sphere A, the negative charges move as far away as possible. Some of them cross over to sphere B, leaving a net positive charge on sphere A. When you move sphere B away from sphere A in the presence of the ruler, it retains the extra negative charges.

2. (i) Gold-leaf electroscope (G.L.E.)

The gold-leaf electroscope is used to detect, measure and find the nature of a charge. It consists of two thin strips (leaves) of gold attached to a metal rod, which is suspended inside a glass jar. The mouth of the jar is fitted with a rubber stopper, through which the rod passes. The other end of the rod is attached to a metal disc. Some electroscopes have strips of silver, copper or brass instead of gold.

(ii)



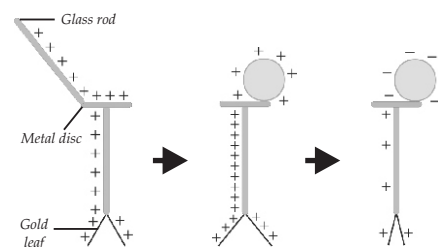
**Fig 12.3 : The Gold-leaf electroscope**

3. (i) The leaves will diverge whether the body you are testing has a positive or a negative charge. To determine the nature of the charge, you have to first charge the electroscope with a known charge. Suppose you charge it with a positively charged glass rod. The leaves will get positively charged and move apart. Then touch the disc of the electroscope with the body you want to test.

The distance between the leaves may increase. This means the body you are testing is also positively charged.

- (ii) The distance between the leaves may decrease, which means that the body you are testing is negatively charged.

4. When the wind brings the clouds close to the Earth during a thunderstorm, the accumulated charge sometimes jumps from the clouds to the ground, through the air, buildings or trees. The energy released can set buildings or trees on fire.



**Fig 12.4 : Touching the disc of a positively charged electroscope with a positively charged body increases the charge on the leaves, making them diverge more. A negatively charged body reduces the positive charge on the leaves and reduces the divergence**

**D. Choose the correct option in the following :**

- Ans.** 1. (i)      2. (iii)      3. (i)      4. (iv)      5. (i)      6. (ii)      7. (ii)

**E. Fill in the blanks :**

- Ans.** 1. Electrons carry **negative** charge.  
2. While testing for charge **repulsion** is used as a proof for charge.  
3. The force with which two similar charges repel each other depends on the **amount** of charge they carry.  
4. The flow of charge through air or a gas is called an **electric charge**.  
5. A lightning conductor allows charge to harmlessly flow to the **Earth**.

**F. Write 'T' for True and 'F' for False for the following statements :**

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



**G. Match the following :**

- Ans.**
- |   |                          |
|---|--------------------------|
| 1. A device which protects tall buildings from the damages caused by lightning. | →(a) Negative            |
| 2. A phenomenon due to which a dazzling white light is produced in the clouds.  | →(b) Repulsion           |
| 3. A kind of force acting between the two similarly charged bodies.             | →(c) Attraction          |
| 4. A charge produced on a glass rod on rubbing with silk.                       | →(d) Positive            |
| 5. A kind of force acting between the two oppositely charged bodies.            | →(e) Lightning conductor |
| 6. A charge produced on an ebonite rod on rubbing with fur.                     | →(f) Lightning           |

# 13

## Electric Current



**A. Answer the following questions in not more than 30 words :**

- Ans.**
- The flow of positive and negative charges constitutes an electric current. This electric current is what lights up the electric bulbs, and makes fans, air conditioners and refrigerators run. The SI unit of electric current is ampere (A). It is measured using an ammeter.
  - We consider the flow of conventional current to be from positive to negative, i.e., opposite to the flow of electrons.
  - The direction of the flow of conventional current is from right to left.
  - 'A'
  - Dry cells, Solar cells, Electric cells.
  - (i) Copper plate (ii) Carbon rod
  - An electric circuit is the closed path in which current flows.
  - We conclude that the electric current breaks up water into its constituent gases hydrogen and oxygen.
  - The chemical decomposition of a liquid or solution on passing an electric current is called electrolysis.
  - The liquid or solution that breaks up during electrolysis is called electrolyte.
  - Electroplating is the process of coating a thin layer of one metal over another by the process of electrolysis.

**B. Answer the following questions in not more than 60 words :**

- Ans.**
- Conductors are materials that allow electric current to flow through them. Insulators do not allow electric current to flow through them.
  - (i) The simple voltaic cell  
This cell consists of a plate of copper and a plate of zinc dipped into dilute sulphuric acid contained in a glass vessel. When the two plates are connected externally by a conducting wire, an electric current flows through the wire. The current can be detected by connecting an electric bulb (torch bulb) between the two plates using conducting wires. The bulb glows as long as current flows in the wire.

- (ii) The disadvantage of the simple voltaic cells was that they were difficult to carry around.

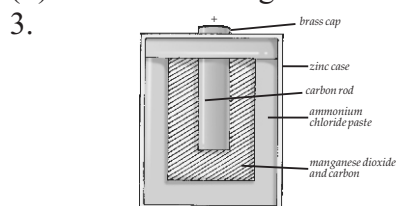


Fig 13.6 : Dry cell

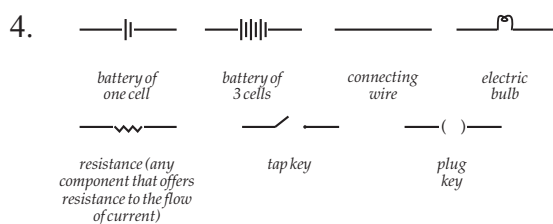


Fig 13.7 : Electric circuits

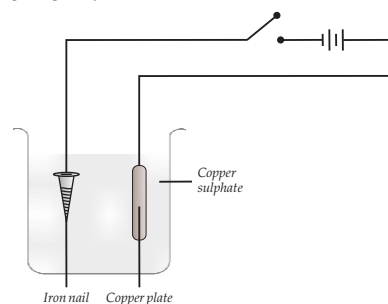
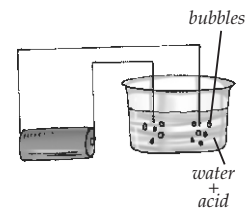
5. To study the chemical effect of current

Connect two copper plates to a cell through wires and dip them into copper sulphate solution in a beaker. Leave the current on for about half an hour. What do you see?

A fresh, shiny, reddish deposit of copper is seen on the negative copper plate. If the plate is weighed before and after passing the current, it is observed that the negative plate weighs more after passing the current. Where does this copper come from?

6. Electroplating

Make copper sulphate solution in a beaker. Connect a clean iron spoon to the negative terminal of a battery. Connect a copper plate or piece of thick copper wire to the positive terminal of the battery. Dip the spoon and copper plate in the beaker. Let the current pass in the circuit for several minutes. Do you see a deposit of copper on the iron spoon.



### C. Fill in the blanks :

- Ans. 1. **Current** is the flow of electric charge.  
 2. **Solar** cells convert sunlight into electricity.  
 3. The SI unit of current is **ampere** and of potential difference is **volt (v)**.  
 4. The flow of conventional current is in the **opposite** direction to the flow of electrons.  
 5. The only non-metal which is a conductor of electricity is **Tap water**.  
 6. If an electric circuit is depicted by using symbols, it is called a **circuit** diagram.  
 7. Current flows in a circuit that is **electric circuit**.  
 8. Electrolytes contain positive and negative mobile **atoms**.  
 9. Electrolysis occurs when the electrolyte is in the **liquid** state.

### D. Write 'T' for True and 'F' for False for the following statements :

- Ans. 1. True    2. True    3. True    4. True    5. False  
 6. False    7. False    8. True    9. True

### E. Choose the correct option in the following :

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

## 14 Light



### A. Answer the following questions in not more than 30 words :

- Ans. 1. When all the parallel rays reflected from a plane surface are not parallel, the reflection is known as diffused or irregular reflection.  
 2. When light of all colours are mixed in a certain proportion, the result is a colourless light, called white light.  
 3. (i) Splitting of light into its (ii) colours is known as dispersion of light. Rainbow is a natural phenomenon showing dispersion.  
 4. The function of retina is to receive the optical image of the object and then convert it to the optical pulses. These pulses are then sent to the brain through optic nerve.

**B. Answer the following questions in not more than 60 words :**

- Ans.**
- (i) If the experiment is carried out carefully, it is seen that the angle of incidence is always equal to the angle of reflection. This is known as the law of reflection.
  - (ii) That the incident ray, the normal at the point of incidence and the reflected ray all lie in the same plane. This is another law of reflection.
  - When the divergent beam formed by AC and BD reaches the eye, it appears to come from point I as shown in the figure. Thus, I is the image of point object O. If we join OI and measure OL and LI, it is found that they are equal. This proves that images are formed as far behind the mirror as the object is in front of it.
  - 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.
  - Blind spot : It is a region of the retina, where the optical nerve enters the eyeball. It has no nerve endings and hence is not sensitive to light. It does not seem to have any function. Any image formed on this spot is invisible.
  - 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 is called accommodation of the eye.

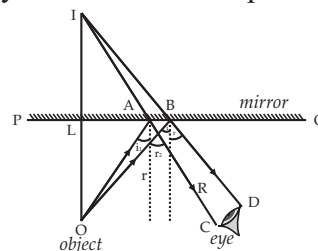


Fig 14.3

**C. Answer the following questions in not more than 120 words :**

- Ans.**
- The construction and working of the human eye is similar to a photographic camera. Human eye is almost a spherical ball, with a slight bulge in the front. The structure and function of each part of the eye is as follows :
  - (i) If the experiment is carried out carefully, it is seen that the angle of incidence is always equal to the angle of reflection. This is known as the law of reflection.
  - (ii) That the incident ray, the normal at the point of incidence and the reflected ray all lie in the same plane. This is another law of reflection.
  - Take two plane mirrors. Set them at right angles to each other with their edges touching as shown in the figure. To hinge them you can use adhesive tape. Place a coin in between the mirrors. How many images of the coin do you see?  
Now hinge the mirrors using the adhesive tape at different angles, say  $45^\circ$ ,  $60^\circ$ ,  $120^\circ$ ,  $180^\circ$ , etc. Place some object (say a candle) in between them. Note down the number of images of the object in each case. Finally, set the two mirrors parallel to each other. Find out how many images of a candle placed between them are formed.

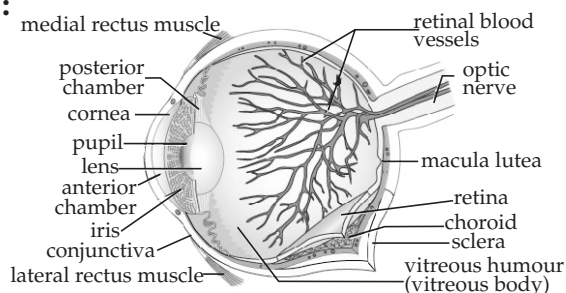


Fig 14.8 : Structure of an eye

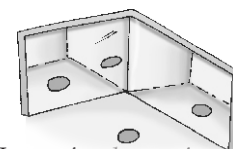


Image in plane mirror at right angle to each other

Image in plane mirror parallel to each other



**D. Fill in the blanks :**

- Ans.**
- Light is an invisible **energy** which causes sensation of vision in us.
  - The angle between the reflected ray and the **normal** is called angle of reflection.
  - Cornea** acts as window to the world.
  - The human eye forms the image of an object at its **retina**.
  - A ray of light which falls on the mirror is called the **incident ray**.

**E. Write 'T' for True and 'F' for False for the following statements :**

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

**F. Tick (3) the correct option in the following :**

- Ans.**
- |         |        |         |
|---------|--------|---------|
| 1. (iv) | 2. (i) | 3. (ii) |
|---------|--------|---------|



**A. Answer the following questions in not more than 30 words :**

- Ans.**
- These types of sources are those which are produced continuously by nature. Hydro-energy, Solar energy, Geothermal energy, Wind energy, Tidal energy, Bio-energy, nuclear energy are some of the examples of renewable sources of energy.
  - At present, most of the energy comes from two non-renewable sources, coal and petroleum. Eighty per cent of energy comes from coal and petroleum 19% from dung, wood and other vegetable wastes, and only one per cent from water, geothermal power, solar power, wind power and nuclear power. The reserves of petroleum are estimated to last for about 30 years and coal reserves may last for a few hundred years
  - (i) An ideal fuel should have a high calorific value and a component ignition temperature.  
(ii) The minimum temperature upto which a substance must be heated before it catches fire is known as ignition temperature.
  - The main gases released are methane, carbon dioxide, hydrogen and hydrogen sulphide.
  - (i) Biogas is made from organic waste matter after it is decomposed, The decomposition breaks down the organic matter, releasing various gases. The main gases released are methane, carbon dioxide, hydrogen and hydrogen sulphide.  
(ii) Biogas is mainly used for cooking and lighting in rural areas.  
Biogas is used as a cooking fuel. It burns without smoke, has a high calorific value, can be taken into kitchens directly from a plant through pipes and is cheap.
  - Advantages of solar energy  
Solar energy is a renewable source of energy.  
It is cheap and easily available for major part of the year particularly in the tropical countries.  
It does not cause any pollution.
  - Water is collected at a certain height in huge reservoirs. This is then made to fall on turbines connected to huge generators, which generate electricity.
  - Hydrogen is not considered a good fuel since it has very high calorific value and it is dangerous to handle as it forms an explain mixture with oxygen.

**B. Answer the following questions in not more than 60 words :**

- Ans.**
- (i) The wise and economic use of energy resources is called conservation of energy. The following steps can be taken to save and conserve energy :  
Using fans, lights, coolers, room heaters, desert coolers, air conditioners, etc., only when needed.  
(ii) Encouraging the use of solar devices.  
Using windmills wherever possible to produce electricity.  
Using biogas for cooking and other domestic uses.  
Using fuel-efficient vehicles and maintaining their engines properly.  
Designing and developing automobiles which can run on electrical energy or solar energy rather than petrol and diesel.
  - Limitation of solar energy  
Solar energy is available to us in a very diffused form, that is a small amount of energy is spread over a large area. This makes the effective utilization of solar energy very expensive.  
To collect and concentrate solar energy, very large surfaces are required.  
Solar energy is not available at all places, all the time.
  - Solar water heater : A solar water heater is a device that is used for heating water with the help of solar energy. Sunlight is allowed to fall on a spiral of thin copper tube fixed on a flat metal sheet. The sheet and the copper tubes are painted black and enclosed in a box with glass cover.

Water enters through the lower end of the tube. As this water passes through the copper tube, it absorbs heat from the sunlight and gets heated.

4. The sources of energy which are not replenished after use are called non-renewable sources of energy. Since these sources of energy are likely to get exhausted over a certain period of time, they are also called exhaustible sources of energy. For example petroleum, coal, natural gas and uranium are some non-renewable sources of energy.
5. (i) Fossil Fuel : The combustible materials formed due to the decomposition of the remains of the prehistoric plants and animals inside the earth under high temperature and pressure in the absence of air (oxygen) are called fossil fuels.  
(ii) Coal : Coal was formed over millions of years ago from dead plants that were buried in the Earth.  
(iii) It is believed that petroleum or crude oil was formed from the dead remains of microscopic marine plants and animals, which settled in muddy sediments at the bottom of the sea millions of years ago.
6. Formation of Coal is a slow chemical process.  
Coal is an important fossil fuel obtained from deep within the Earth's surface.  
The slow conversion of wood into coal by the bacterial action under high temp and pressure is called carbonization.  
Destructive distillate of coal gives coal gas, coke, ammoniacal, liquor and coal tar.

**C. Answer the following questions in not more than 120 words :**

- Ans.** 1. Natural gas is a gas consisting primarily of methane. It is found associated with fossil fuels, in coal beds, and is formed in marshes in the absence of oxygen by organisms that decompose organic matter and form methane as a by-product. It is an important fossil fuel and fuel source and can be transported through pipes. Natural gas is commercially produced from oil fields.
- (a) Being a gas, it is a cleaner fuel and causes less pollution.
  - (b) Its calorific value is higher than the other fuels.
  - (c) It can be easily transported through pipelines to homes and industries.
  - (d) Its by-products are not poisonous.
  - (e) It is a starting material for the preparation of many other substances like chemicals and fertilisers.
  - (f) The Compressed Natural Gas (CNG) is used as a fuel for generating power and running vehicles.

**Uses of natural gas**

- (a) CNG is used for power generation.
  - (b) CNG is used as a fuel for vehicles, since it causes less pollution.
  - (c) It is used as a domestic and industrial fuel.
  - (d) It is the source of hydrogen gas needed in fertiliser industry and for many other chemicals.
  - (e) Natural gas is also used in the manufacture of fabrics, glass, steel, plastics, paint and other products.
2. 1. Using fans, lights, coolers, room heaters, desert coolers, air conditioners, etc., only when needed.  
2. Encouraging the use of solar devices.  
3. Using windmills wherever possible to produce electricity.  
4. Using biogas for cooking and other domestic uses.  
5. Using fuel-efficient vehicles and maintaining their engines properly.  
6. Designing and developing automobiles which can run on electrical energy or solar energy rather than petrol and diesel.
  3. Biogas is made from organic waste matter after it is decomposed. The decomposition breaks down the organic matter, releasing various gases. The main gases released are methane, carbon dioxide, hydrogen and hydrogen sulphide.  
Biogas is mainly used for cooking and lighting in rural areas.  
Biogas is used as a cooking fuel. It burns without smoke, has a high calorific value, can be taken into kitchens directly from a plant through pipes and is cheap.  
It is used in internal combustion engines to power water pumps and electric generators.  
Its sludge is used as a fertilizer.  
It serves as a pollution-free method for the disposal of human and animal wastes in rural areas.
  4. Fossil Fuel : The combustible materials formed due to the decomposition of the remains of the



prehistoric plants and animals inside the Earth under high temperature and pressure in the absence of air (oxygen) are called fossil fuels. These fuels are our most important source of energy today. Coal, petroleum and natural gas are some typical fossil fuels.

**Coal :** Coal was formed over millions of years ago from dead plants that were buried in the Earth. Gradually these were covered with many layers of soil. The intense heat and pressure inside the Earth slowly converted them into coal. This slow process of conversion of wood into coal is called carbonization.

5. Since energy resources are limited, we must use the available energy with utmost care and not waste it. Judicious and economical use can help in overcoming the energy crisis. The wise and economic use of energy resources is called conservation of energy. The following steps can be taken to save and conserve energy :
  1. Using fans, lights, coolers, room heaters, desert coolers, air conditioners, etc., only when needed.
  2. Encouraging the use of solar devices.
  3. Using windmills wherever possible to produce electricity.
  4. Using biogas for cooking and other domestic uses.
  5. Using fuel-efficient vehicles and maintaining their engines properly.
  6. Designing and developing automobiles which can run on electrical energy or solar energy rather than petrol and diesel.
6. **Solar Cooker :** This consists of a box of insulated material. The inner walls and bottom are painted black so as to make them good absorbers of heat. There is a glass lid to retain heat inside the box taking advantage of the greenhouse effect. A plane mirror is hinged so that it can be fixed at any angle. Food items to be cooked kept in small containers with covers and painted black on the outside. These are kept in the box, the glass lid put in place and the reflector (mirror) adjusted at a suitable angle so that a strong beam of light falls on the glass lid. A temperature of about 100-1400°C is reached in two-to-three hours time. The food items kept in the containers get cooked slowly.

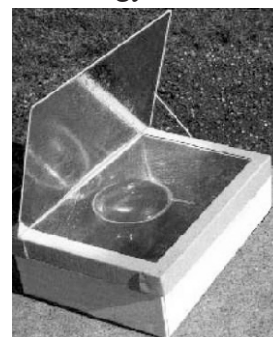


Fig 15.2 : Solar Cooker

**D. Choose the correct option in the following :**

- Ans.** 1. (iv)      2. (iii)      3. (i)      4. (ii)      5. (i)      6. (iii)      7. (iv)      8. (ii)

**E. Fill in the blanks :**

- Ans.** 1. The substance that is to obtain heat energy is known as **combustible**.  
 2. The process of separating petroleum into its fractions is known as **refining of petroleum**.  
 3. Coal, petroleum, and natural gas are known as **fossil** fuels.  
 4. **Sunlight** provides the electric current to power artificial satellites in outer space.  
 5. In the liquid state, hydrogen is used as a fuel in **coal gas**.  
 6. **Fossil** type of fuels are easy to store at atmospheric pressures, as well as being easy to use.  
 7. A good fuel should have a **highest calorific value**.

**F. Write 'T' for True and 'F' for False for the following statements :**

- Ans.** 1. True      2. False      3. True      4. False  
 5. True      6. True      7. True      8. True

## 16 Friction



**A. Answer the following questions in not more than 30 words :**

- Ans.** 1. When an object moves in contact with another object, a force called friction, slows down the motion of the moving objects.  
 2. In short we can say that the more the irregularities on the two surfaces in contact, i.e. the more rough are

the surfaces in contact, the more is the force of friction. On the other hand lesser the irregularities, lesser is the force required.

3. The different types of frictions are given as under :

- (i) Static friction
- (ii) Dynamic or Kinetic friction
- (iii) Rolling frictions

4. The two disadvantages of friction are given below :

- (i) Due to friction, wear and tear of machine parts is increased, reducing the life of the machines.
- (ii) Due to friction undesirable noise is produced.

**B. Answer the following questions in not more than 60 words :**

- Ans.**
1. (i) Force of friction depends on the nature of surface (i.e., roughness or smoothness) in contact with each other.  
(ii) The force of friction is directly proportional to normal reaction. If  $F$  is the force of friction and  $R$  is the normal reaction then  $F \propto R$  or  $F = mR$ , where  $m$  is the coefficient of force of friction.  
(iii) The force of friction is independent of area of contact.
  2. Laws of limiting friction  
(i) It always opposes the motion of a body and acts in a direction opposite to the direction of the applied force.  
(ii) It depends upon the nature of the surfaces in contact with each other.  
(iii) It increases with the increase in the weight of the body and vice-versa.  
(iv) It is independent of area of contact between two surfaces provided the weight of the body and the nature of the surface do not change.
  3. Friction due to air is so small that we hardly feel it.

Examples :

- (i) The body of the birds is offered least resistance by the air and hence, they can fly with a high speed.
  - (ii) The body of the automobiles is streamlined so that air offers least possible friction.
  - (iii) The meteors (shooting stars) enter the Earth at a very high speed. At such speed the friction due to air is extremely high. Due to this high friction the temperature of meteors rises to such a high degree that they catch fire.
  - (iv) The spaceships are provided with heat shields at their head because, when they enter the atmosphere, then they catch fire, due to friction of air.
4. (i) Due to friction, wear and tear of machine parts is increased, reducing the life of the machines.  
(ii) Due to friction, undesirable noise is produced. The heat can damage machine parts and noise produced besides reducing efficiency of machines can be serious pollutant and affects the people living close to the source of noise.  
(iii) When a body moves over another body a part of energy is used in overcoming the force of friction. This energy dissipates in the form of heat energy.  
(iv) If the engine of a car or scooter is not given a continuous supply of oil, the pistons of cylinders get so hot that they get jammed.

**C. Answer the following questions in not more than 120 words :**

- Ans.**
1. Effects of Friction  
(i) Friction opposes motion.  
(ii) Friction causes wear and tear. For example, the moving parts of machines wear out due to friction.  
(iii) Friction produces heat. For example, rubbing of palms together produces heat due to friction. Also the moving parts in machines get very hot due to friction.  
(iv) When a solid moves in a liquid or a gas, the surface of the solid experiences friction. But, liquid exerts less force of friction as compared to solids and gases exert the least force in comparison to solids or liquids.
  2. (i) Due to friction, wear and tear of machine parts is increased, reducing the life of the machines.  
(ii) Due to friction, undesirable noise is produced. The heat can damage machine parts and noise produced

besides reducing efficiency of machines can be serious pollutant and affects the people living close to the source of noise.

- (iii) When a body moves over another body a part of energy is used in overcoming the force of friction. This energy dissipates in the form of heat energy.
- (iv) If the engine of a car or scooter is not given a continuous supply of oil, the pistons of cylinders get so hot that they get jammed.
- 3. (i) If we push a wooden block on a table with a small amount of force, so that it does not move, then the force of friction developed between the two surfaces is known as the static friction.
- (ii) If we measure the force applied on a wooden block placed on a table, such that the block starts sliding slowly, then the frictional force is termed as dynamic or kinetic friction.
- (iii) Rolling Friction

When a body rolls over the surface of another body, the friction developed between the surfaces is called the rolling friction. The rolling friction is much less than the static or dynamic friction.

- 4. (i) To understand the meaning of static, limiting and dynamic friction.

Take a wooden block provided with a hook and a sensitive spring balance.

Place the wooden block on a smooth table top and attach the spring balance to its hook. Gently pull it towards right side. The gentle pull does not move the wooden block, still, the spring balance records the force applied on the wooden block. This force is equal and opposite to the force of friction offered by the surface of wooden block in contact with the table top.

Now increase the force on the balance a little more. You will notice that the wooden block does not still move but the spring balance records higher magnitude of applied force.

So, we conclude that when the wooden block does not move (remains static) then applied force is equal and opposite to the force of friction offered by the surface of the wooden block in contact with table top. In a way the force of friction in a static situation is self-adjusting.

Such a force of friction is called static friction and only as much is called into play as is necessary to prevent the motion of the wooden block. Go on increasing the pull on the wooden block till it starts sliding. Now, the spring balance will register maximum applied force which is equal and opposite to the friction. The minimum force required to make one body just slide over another body is the limit of static friction. It is called limiting friction. We (ii) notice, that if we apply the pull on the block in such a way that it gently slides over table top then the balance records lesser force than the limiting friction. This lesser force registered keeps the wooden block just sliding on the table top is called dynamic or sliding friction.

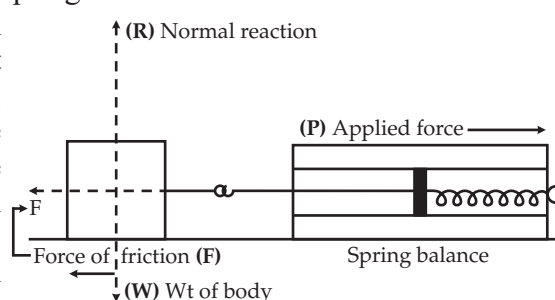


Fig 16.3

#### D. Fill in the blanks :

- Ans. 1. Friction always acts in the direction **opposite** to the direction of applied force.
2. The **sliding** friction is 10 times the rolling friction.
3. The boats and the aeroplanes are **stream lined** to reduce fluid friction.
4. Rolling friction is **lesser** than the sliding friction.
5. Moving parts of a machine get **wear and tear** due to friction.
6. **Static** friction is self-adjusting.
7. Friction helps screws and **nails** to hold in wood.
8. Friction is often called a necessary **evil**.

#### E. Write 'T' for True and 'F' for False for the following statements :

- Ans. 1. False                      2. True                      3. False                      4. True
5. False                      6. True                      7. True                      8. True

**F. Match the statements in column A with those in column B :**

- |             | <b>Column A</b>  | <b>Column B</b>        |
|-------------|--|------------------------|
| <b>Ans.</b> | 1. The friction called into play when two bodies slide over one another at constant speed.                         | →(a) Streamlining      |
|             | 2. The special shape of the body due to which it experiences least fluid friction.                                 | →(b) Sliding friction  |
|             | 3. The friction when two bodies in contact with each other, do not move on the application of force.               | →(c) Static friction   |
|             | 4. The friction called into play when one body just slides over another body.                                      | →(d) Limiting friction |
|             | 5. The friction experienced when a body is made to move over rollers.  | →(e) Friction          |
|             | 6. The opposite force called into play when two surfaces in contact with each other slide relative to one another. | →(f) Rolling friction  |

**G. Give names of the following :**

- Ans.**
1. Nature of the surface and the force of friction.
  2. By polishing, by using lubricants.
  3. Using lubricants.
  4. Reduce the speed of vehicles, damage the machinery.
  5. Static and Dynamic, increase energy consumption.
  6. Tear and wear of machine parts, undesirable noise.
  7. Soap solution and fine powders.
  8. Noise pollution and general undesirable heat.

**H. Give reasons for the following :**

- Ans.**
1. By using ball bearings or roller bearings : Ball bearings and roller bearings are used in the systems to minimize friction as the rolling friction is much less than the sliding friction. In bicycles and scooter, wheels, the shafts are mounted on ball bearing to reduce friction.
  2. Friction between the belt and the pulley helps in the rotation of various parts of a machine.
  3. Increasing friction : In some situations, it is of advantage to us to increase friction. The soles of our shoes and the tyres of vehicles, for example, have grooves to increase friction. If they were smooth, there would be a risk of slipping or skidding.
  4. The spaceships are provided with heat shields at their head because, when they enter the atmosphere, then they catch fire, due to friction of air. Thus, to prevent their burn out a head shield is provided.
  5. Friction produces heat. For example, rubbing of palms together produces heat due to friction. Also the moving parts in machines get very hot due to friction.

**I. Tick (3) the correct option in the following :**

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

# 17

## Food Production and Management



**A. Answer the following questions in not more than 30 words :**

- Ans.**
1. (a) The science which deals with the the growth of plants and animals for human use is called agriculture.

- (b) Some important crops are cereals (rice, wheat, maize, etc.), pulses, root crops (sweet potato), tuber crops (potato, ginger), plantation crops (tea, coffee, rubber and sugarcane crops (sugarcane, beet root, etc.)).
2. The various agricultural practices or tasks used to cultivate crops are :
 

(i) Preparation of soil	(ii) Sowing
(iii) Use of manures and fertilizers	(iv) Irrigation
(v) Weeding	(vi) Crop protection
(vii) Crop improvement	(viii) Harvesting
(ix) Winnowing	(x) Storage
3. (a) The unwanted or wild plants which grow along with a cultivated crop are called weeds. They compete with the crops for water, animals and sunlight, thus reducing the crop yield.
- (b) The process of removing weeds from a crop field is called weeding.
 

Manually, i.e., removal of the weeds by hands.

Removal of the weeds by using a trowel or a harrow.

Removal of the weeds by spraying special chemicals called weedicides.
4. The organisms that harm the crops are called pests. Some common pests are rats, insects, mites and disease-causing microorganisms like virus, bacteria and fungi.
5. Dairy breeds are used to give high yield of milk. Milk is regarded as the second largest agricultural commodity next to rice. Buffalo milk is richer in fat, proteins, sodium, potassium, calcium, vitamin E and cholesterol.
6. The branch of agriculture which deals with the feeding, shelter, health and breeding of domestic animals is called animal husbandry.
7. Cold Storage : Perishable food items like fruits and vegetables have a very short shelf life at room temperature and so they have to be stored at low temperatures (between 0 degree Celsius and 4 degree Celsius). Low temperature does not allow microbes to spoil the food. Fruits and vegetables are usually packed in crates, racks or stacked one on top of the other with plenty of space.

**B. Answer the following questions in not more than 60 words :**

- Ans.**
1. If the same crop is grown over and over again in the same field, the soil in that field will be deficient in a certain nutrient. Crop rotation is the practice of growing two different crops alternately in the same field. Different crops have different nutrient requirements. Hence, it is advantageous to grow one crop in one season and another crop in the next season. Normally a nonlegume crop and a legume crop alternate with each other. The legume crop has nitrogen fixing bacteria in its root nodules and so the soil is enriched with nitrogen and the nonlegume plant benefits from it.
  2. Manures are organic compounds which are biodegradable and hence environment friendly. They are obtained by the decomposition of plants and animal wastes and residues. (e.g. compost., farmyard manure, green manure). On the contrary, fertilizers are inorganic compounds manufactured results, their excessive use has led to soil pollution (e.g. ammonium sulphate, ammonium nitrate, super phosphate, potassium nitrate et.c)

Use of manures of fertilizers is called manuring. Manuring is necessary for good growth of crops plants and high yield.

  3. Control of plant diseases and pests

A lot of plants die due to some diseases and pests which attack and damage them. Generally, plant diseases are caused by fungi, bacteria, and viruses. These diseases are transmitted either through the seed itself (seed-borne) or by air (air-borne) or soil (soil-borne). Rust of wheat and Blast of rice are two common fungal diseases in plants. To control plant diseases and pests, we can spray fungicides and pesticides on the crops or on the soil.

  4. Root nodule is a swelling on root of a leguminous plant containing nitrogen fixing bacteria. It is small rounded lump of matter distinct from its surroundings. Symbiotic bacteria Rhizobium Root nodule is a swelling on root of a leguminous plant containing nitrogen fixing bacteria. It is small rounded lump of matter distinct from its surroundings. Symbiotic bacteria Rhizobium lives in the root nodules of leguminous plants such as beans and peas and converts atmospheric nitrogen into nitrogenous compounds. This process of converting atmospheric nitrogen into nitrogen compounds is known as nitrogen fixation.



5. Water is an essential requirement of any plant. Providing water to plants is called irrigation. Yield of our crop mostly depend on irrigation that is supplying water to the plant at right time. Farmers employ different methods to irrigate the field. The common types of irrigation are :

(i) Flood irrigation

(ii) Sprinkler irrigation

**C. Answer the following questions in not more than 120 words :**

- Ans.**
1. (i) Addition of manures to the soil increases the soil fertility. Manuring can be done by a drill, though most of the time it is done manually. Farmers normally use a combination of manures and fertilizers. Fertilizers are man-made mineral salts. NPK fertilizers are most widely used and contain nitrogen (N), phosphorus (P) and potassium (K). They are easy to handle and store. They are also directly absorbed by plants since they are water soluble.  
(ii) Use of manures and fertilizers  
Manures and fertilizers make the soil fertile.  
Manures : The main functions of manures are :
    1. It improves the physical and chemical properties of the soil as it provides humus.
    2. It restores the water retention and aeration of the soil.
 Uses of manures have some disadvantages :
    1. They are very bulky and voluminous.
    2. They are not nutrient specific. Fertilizers can be classified as  
Nitrogenous fertilizers : Urea, sodium nitrate, ammonium nitrate.  
Phosphate fertilizers : Superphosphate, ammonium phosphate.  
Potassium fertilizers : Potassium sulphate, potassium chloride.  
Mixed fertilizers : NPK (Nitrogen, phosphorus and potassium).
  2. (i) Improvement in the crop plants is necessary to increase the field and quality of crops in order to feed the ever-increasing population in our country.  
Some methods to improve the output are proper irrigation facilities, proper use of manures and fertilizers, better methods of protection from weeds, pests and diseases, increase use of modern agricultural, implements, better storage to reduce wastage, etc.  
Another method to improve the field and quality of crops is plant breeding. In this method, two varieties of crops with different characteristics are crossed.  
(ii) The period between 1960-80 during which occurred a great increase in the production of food grain crops in our country is called the Green Revolution. Food production was enhanced to the extent of becoming self-sufficient in food production by introducing high yielding varieties of wheat and rice.
  3. (i) Manures and fertilizers are added to the soil to add nutrients that crops would need to give a good yield.  
Manure It is an organic substance obtained from the decomposition of plant and animal wastes by the action of microbes. Crop and vegetable residues, cow dung, sludge from the treatment of sewage etc. make a good manure. Manures are of three kinds— farmyard manure, compost and green manure.
    - (a) Farmyard manure : Farmyard manure is prepared by storing cow during, cow urine, waste straw and other dairy wastes in a pit and allowing it to get decomposed by microbes. This manure is rich in nutrients like nitrogen, potassium and phosphorus.
    - (b) Compost : Compost is prepared from vegetable peels, plant residue and animal waste by the action of aerobic and anaerobic bacteria on them. Compost gets ready in 3-6 months.
  - (ii) Green manure : A type of crop grown primarily to add nutrients and organic matter to the soil is green manure. It is grown for a specific period and then ploughed back into the soil.
  - (iii) Fertilizers : Fertilizers are chemically prepared compounds containing nutrients— nitrogen, potassium, phosphorus essential for plant growth. Urea, ammonium sulphate, superphosphates, potash, NPK (Nitrogen, phosphorus, potassium) etc., are some fertilizers. NPK fertilizer contains all the three nutrients.  
Fertilizers are effective as they provide the desired nutrients to the soil. But they also pose environmental hazards. The main disadvantages of using chemical fertilizers are as follows.  
They cause water pollution (excess fertilizers are carried by rainwater to water bodies).  
Overuse of fertilizers causes oil solid pollution, and thus the fertilizers enter the food chain.

4. In animal husbandry four factors need to be considered. These are as follows :

**Breeding** : Selective mating of animals of several generations to obtain the offsprings with desired character is called breeding. Scientists have been able to produce many breeds of different animals to serve different purposes. For example, the mule produced by mating a horse with a donkey is as strong as the horse but can live on a poor diet like the donkey. Many high-yielding varieties of cattle, buffaloes and poultry have also been developed.

**Feeding** : The food eaten by animals is called feed. The type of food, the manner in which the feed has to be given and the time of feeding varies from animal to animal. If they are not fed well they become weak and their yield declines.

**Weeding** : The process of eliminating uneconomical breeds by not allowing them to breed further is called weeding. If they are not eliminated, their undesirable characteristics can be passed on to the next generation.

**Caring** : Animals are required to be properly cared and managed. They should be provided with the right amount of food at the proper time, clean drinking water and well-ventilated and clean shed. They should be constantly inspected and a veterinary doctor should be called if any symptoms of disease is noticed. They should also be vaccinated timely and prevented from pests.

**D. Fill in the blanks :**

- Ans.** 1. The various tasks performed by the farmers to produce good crop yield are called **agricultural practices**.  
 2. **Manuring** is the final step in soil preparation.  
 3. The soil levellers can be driven by **animals** or **tractors**.  
 4. The rearing of honeybees is called **apiculture**.  
 5. The process of removing anthers from plants is called **emasculation**.  
 6. The sowing of seeds manually is called **broad casting**.  
 7. The chemicals used to destroy pests are called **pesticides**.  
 8. The process of removing weeds from a crop field is called **weeding**.  
 9. Ponds and lakes are called **natural** hatcheries.  
 10. Honeybees are reared in the boxes called **apirates**.

**E. Write 'T' for True and 'F' for False for the following statements :**

- Ans.** 1. True      2. False      3. True      4. True      5. True      6. True      7. False      8. False

**F. Tick (3) the correct option in the following :**

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

**G. Match the following :**

- | <b>Column I</b>            | <b>Column II</b> |
|----------------------------|------------------|
| <b>Ans.</b> 1. Marine fish | (a) Tea          |
| 2. Dalapon                 | (b) Weed         |
| 3. Freshwater fish         | (c) Rohu         |
| 4. NPK                     | (d) Salmon       |
| 5. Plantation Crop         | (e) Weedicide    |
| 6. Chenopodium             | (f) Fertilizer   |