



Dr. Jayachandran's

INSTITUTE FOR CIVIL SERVICE EXAMS

SOUTH INDIA'S PREMIER INSTITUTION FOR
PUBLIC POLICY AND CIVIL SERVICE EXAMS

**NCERT
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**NCERT CONDENSED / SUMMARISED
CLASS 6**

Chapter 1 Food Where Does It Come From

Chapter 2 Components of Food

Chapter 3 Fibre to Fabric

Chapter 4 Sorting Materials into Groups

Chapter 5 Separation of Substances

Chapter 6 Changes Around Us

Chapter 7 Getting to Know Plants

Chapter 8 Body Movements

**Chapter 9 The Living Organisms and Their
Surroundings**

**Chapter 10 Motion and Measurement of Distances Chapter 11
Light, Shadows and Reflection**

Chapter 12 Electricity and Circuits

Chapter 13 Fun with Magnets

Chapter 14 Water

Chapter 15 Air Around Us

Chapter 16 Garbage in Garbage Out

Chapter 1 Food Where Does It Come From

All living beings need food.

Food is needed by all living beings for four main purposes:

- for their growth.
- to provide energy for doing work.
- for the repair and replacement of the damaged tissues.
- to provide resistance and protection against diseases from infections.

If a person does not get food, she/he feels weak and is likely to fall ill. Different people have different choices of food.

There is a wide range of food items eaten across various states of India.

Different organisms eat different kinds of food.

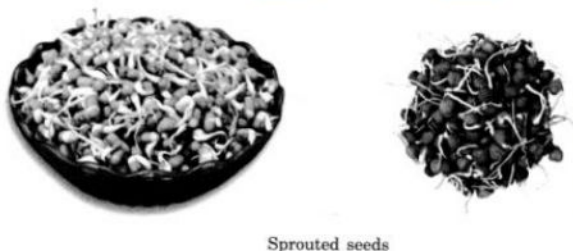
Human beings are omnivores. Our food comes from different sources.

We get food from plants as well as animals.

We eat animals (as meat) as well as their different products like milk, eggs and honey.

Cooked food can be easily consumed and absorbed by our body. Cooking also kills the harmful germs.

We should have sprouted seeds every day. Sprouted seeds are rich in nutrients.



Sprouted seeds

Domesticated animals are classified as meat yielding, milk yielding and drought animals.

Ingredients: Materials needed to prepare a dish or food are called its ingredients.

Edible parts: Those parts (of a plant) which are eatable are called Edible parts

Nectar: Sweet juices found in flowers are known as nectar.

Sprouted seeds: Seeds which grow white thread like structures when soaked in water are called sprouted seeds.

Herbivore: Animals which eat plants and plant products like fruits,



flowers, seeds, nectar, etc., are called herbivores.

Carnivore: Animals which eat other animals are called carnivores.

Omnivore: Animals which eat both plants and their products, as well as other animals, are called omnivores.

Let us see what Mrs Iyer and Mrs Kapoor have prepared. Have they prepared the same kind of food? List out the six food items that you see on their table.

- Need for food
- Food from plants
- Food from animals
- What do animals eat



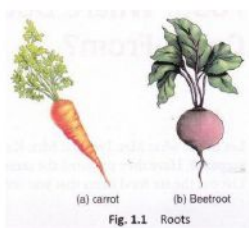
We get all these food from both plants and animals. Thus, plant parts and animal products are our sources of food.

- vada
- idli
- chapathi
- chicken curry
- Fish curry
- Rice

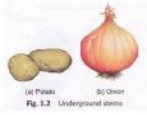
Food From Plants:

Green plants are known as producers because they prepare their own food. They use light, air (carbon dioxide), water, and chlorophyll (present in their leaves) to prepare their food by the process of photosynthesis.

Different plant parts serve as sources of food for us. Fruits, vegetables, cereals, and pulses that we eat are obtained from different parts of a plant. Roots of plants like carrot, radish, turnip, sweet potato, and beetroot are eaten (Fig. 1.1).



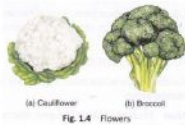
Stems of certain plants are eaten. For example, the stem of sugarcane plant is eaten and is also used to make sugar. The stem and flower of the banana plant is cooked and eaten in different parts of India. Certain plants have underground stems that we eat. Examples are potato, onion, garlic, and ginger (Fig. 1.2).



Leaves of plants like lettuce, spinach, cabbage, coriander, mint, and basil are eaten (Fig. 1.3).



Flowers of certain plants like cauliflower, broccoli, and banana are also eaten (Fig. 1.4).



Seeds/Pulses like mung bean, kidney bean, chickpea, and cereals (wheat, maize, and rice) that we eat are seeds of plants (Fig. 1.5).



Wheat grains are ground to make flour (atta) which is used to make chapattis. Cumin seeds, pepper, and cardamom that we eat as spices are also seeds of different plants.

Sprouted seeds (or sprouts) of mung bean and chickpea (Bengal gram) are very nutritious. Sprouting involves soaking seeds and draining the water and then leaving them till they germinate. Sprouts can be eaten raw as salads or cooked. Fruits and vegetables also provide us fruits and vegetables (Fig. 1.6).



Like different plant parts, animals too serve as sources of food. Let us learn about the main food products obtained from animals.

Food From Animal:

Animal products like meat, egg, honey, milk, cheese, butter, and curd are eaten by human beings. Meat of animals like goat, chicken, fish, and prawns is commonly eaten (Fig. 1.7).

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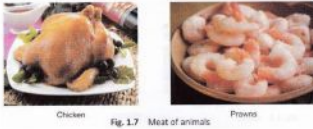


Fig. 1.7 Meat of animals

Egg Hen's egg is the most common bird egg eaten in the world. It is a rich source of proteins and vitamins. Some people also eat eggs of goose and duck.

Honey: Honey is a sweet liquid made by bees from the nectar of flowers (Fig. 1.8).



Fig. 1.8 Honey

Honey is collected from beehives. It is used in cooking and also has medicinal value.

Milk: Milk is obtained from animals like cow, buffalo, and goat. Fig 1-8. Honev It is a very nutritious food item and is a rich source of proteins. Milk also contains calcium, which is required for proper bone growth and nerve function (Fig. 1.9).



Fig. 1.9 Milk and milk products

Products made from milk are known as dairy products. Some common dairy products are discussed below.

Paneer (cottage cheese): Common methods of making paneer include adding lemon juice or vinegar to milk. Then, the liquid portion of milk is drained off and the solid part forms paneer. This process is called curdling.

Cheese: Cheese is made from curdled milk of cow, goat, sheep, or buffalo (Fig. 1.10).



Fig. 1.10 Cheese

Cream: Cream is made by collecting the top fatty layer of the milk.

Butter: Butter is made by churning fresh cream.

Ghee: Ghee is made by gently heating butter and removing the solid matter.

Curd Common methods of making curd include adding a small sample of curd in warm milk. The microorganisms (bacteria) present in the curd sample turn the milk into curd.



Unlike green plants, animals cannot make their own food. They depend on plants and other animals for food.

People living in deserts also drink camel's milk. In ice-cold places, people mostly have yak's milk. Microorganisms Tiny organisms that can be seen only with the help of a microscope

Let's Remember

Write two examples for each of the following.

- Roots that we eat
- Stems that we eat
- Leaves that we eat
- Flowers that we eat
- Seeds that we eat

What Do Animals Eat:

Different animals have different feeding habits. Based on their feeding habits, animals can be divided into three groups: herbivores, carnivores, and omnivores.

Herbivores

Herbivorous animals (Fig. 1.11) or herbivores (herbi, plant; vore, eater) are those that eat only plants and plant products. Cow, deer, horse, giraffe, squirrel, and butterfly are examples of herbivores.



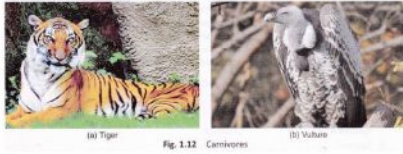
Special Characteristics of Herbivores

- Herbivores like cow, horse, and goat have wide, blunt teeth. Such teeth are suitable for pulling plants off the ground and grinding them.
- Herbivores like cow and camel have the ability to bring back previously swallowed food to the mouth for chewing it the second time. This helps them to absorb most of the nutrients from hard-to-digest food like grass.
- Squirrels have a pair of broad, sharp-edged front teeth (incisors) in each jaw. They use these teeth to gnaw food items like nuts.
- Herbivores like butterfly and hummingbird do not need to worry about chewing their food. They have mouth-parts shaped like a straw to suck nectar from flowers.

Carnivores



Carnivorous animals (Fig. 1.12) or carnivores (carni, meat; vore, eater) are those that only eat the flesh of other animals. Lion, tiger, jackal, vulture, owl, eagle, snake, and spider are examples of carnivores.



Special Characteristics of Carnivores

- Carnivores like lion and tiger have sharp and pointed front teeth (canines). They also have sharp claws and powerful jaws which help them to tear flesh.
- Carnivorous birds like eagle have curved, pointed beaks that allow them to tear flesh.
- Carnivores like chameleon and frog have a long, sticky tongue that they use to catch insects.
- Carnivorous fish like shark has several small, sharp teeth that help them bite off chunks of flesh.

Omnivores

Omnivorous animals (Fig. 1.13) or omnivores (omni, all; vore, eater) are those that eat both plants and flesh of other animals. Bear, racoon, crow, and human beings are examples of omnivores.



Special Characteristics of Omnivores

- Omnivores like a bear and human beings have different types of teeth that help them to eat both plants and flesh of other animals.
- Omnivorous birds like crow have a sharp and pointed beak to help them eat a variety of food.

Scavengers and Decomposers

Instead of hunting live animals, some birds and animals eat the flesh of other animals that are already dead. Vulture is one such bird. These animals or birds are called scavengers. Some other organisms feed on and destroy (or decompose) dead plants and animals. Fungi

and bacteria are examples of such organisms (Fig. Fjg 114 Fung.1.14).



These organisms are called decomposers. Together with scavengers, decomposers play a very important role in nature. Without these organisms, our planet would be covered with dead plants and animals.

Herbivore: An animal that eats only plants and plant products is called a herbivore.

Carnivore: An animal that eats only the flesh of other animals is called a carnivore.

Omnivore: An animal that eats both plants and flesh of other animals is called an omnivore.

Scavenger: An animal that eats only the flesh of animals that are already dead is called a scavenger.

Decomposer: An organism that feeds on and decomposes dead animals and plants is called a decomposer.

Different plant parts like root, stem, leaf, flower, and fruit serve as sources of food. Animal products like meat, egg, honey, milk, curd, cheese, butter, and ghee are eaten by human beings.

Herbivores have wide blunt teeth that help them to grind and chew plants. Carnivores have sharp teeth and claws that help them to tear flesh.

Chapter 2 Components of Food

Food: It is the group of edible substances which provide energy to the living beings and repair the old tissues and build the new tissues.

Nutrition: The process of consuming nutrients required for the growth and development of our body and to obtain energy is known as nutrition.

Our food contains three main substances called nutrients. These are fats, proteins and carbohydrates. In addition, our body requires water, salts (minerals), vitamins and fibres.

Diet: It is the amount of food eaten by a person at a time.

Malnutrition: If a person does not get adequate food, or if his/her diet does not contain all the nutrients, he or she becomes weak. When the body does not get adequate nutrition, it is said to be suffering from malnutrition.

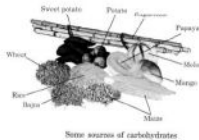
Various food components are grouped in three classes:

- Energy giving food: Carbohydrates and fats.
- Bodybuilding food: Proteins.
- Protective food: Vitamins and minerals.

Carbohydrates



- Grains such as rice, wheat, sorghum, peas, beans, sago (sabudana), sugarcane, sugar beet, many fruits like banana, mango and melons and vegetables are good sources of carbohydrates.
- Cellulose, starch, sucrose, glucose and fructose are the important carbohydrates found in our food.
- Starch turns iodine solution to dark blue or black.



Some sources of carbohydrates

Fats

- Fats are obtained either from plants or from animals. Groundnut oil, soybean oil and mustard oil are examples of fats derived from plants. Fats like butter and ghee are obtained from animals.

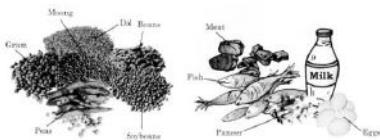


Some sources of fats: (a) plant sources and (b) animal sources

- Fats act as fuel in our body but they provide more energy than carbohydrates. (in) Our body has some advantages of fat deposits in small quantity. It helps body organs to grow and protects them from injury and prevents loss of heat from the body surface.
- Too much fat deposition is harmful for the body. This leads to the condition called obesity.
- Fatty substances leave greasy and transparent spot on paper.

Proteins

- Milk, fish, meat, cheese and eggs are the main sources of animal proteins. Vegetable proteins can be obtained from legumes including pulses and beans.

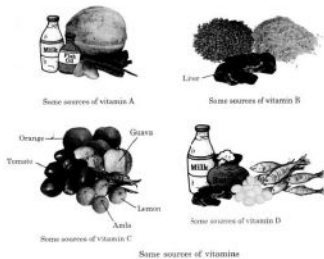


Some sources of proteins: (a) plant sources and (b) animal sources

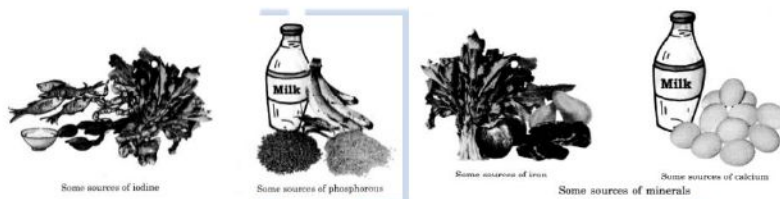
- Proteins are required for growth and repairing of our body. They help in building new tissues. They also account for tough, fibrous nature of hair and nails and for the structure of muscles. They are a part of our blood and help in proper functioning of our body.
- Large amount of protein is needed for building new tissues in short period, such as during infancy, pregnancy or when mother is nourishing a child.



Vitamins: Vitamins are required by our body in very small quantities. Vitamins help in keeping our eyes, bones, teeth and gums healthy. The food items rich in vitamins are called protective food as they protect our body from diseases and keep us healthy.



Minerals: Minerals are needed by our body in small amounts. Each one is essential for proper growth of body and to maintain good health. Some sources of minerals are shown in fig.



Water

- Our body requires a large quantity (5-7 litre) of water daily.
- Water helps our body to perform many functions like digestion, throwing out dissolved waste as urine and impure blood. Water also keeps our body cool through sweating.
- Water helps in blood circulation.

Roughage

- Whole grains, flour and cereals, potatoes, fresh food, raw and cooked vegetables provide roughage to our food.
- It helps in proper digestion of food and prevents constipation.

Food items that are deep fried and roasted usually lose their nutritive value. Energy requirement: Requirement of energy or intake of food depends on profession, age, sex and special needs like pregnancy, infancy, lactation, etc. Deficiency diseases: Diseases that occur due to the lack of nutrients are called deficiency diseases. Some of them are listed in the following Table 2.1. Some Diseases or Disorders Caused by deficiency of Vitamins and Minerals

Name of vitamins and minerals	Deficiency disease or disorder	Main symptoms
Vitamin A	Night blindness	Poor or loss of vision in darkness (night), sometimes complete loss of vision
Vitamin B1	Beriberi	Weak muscles, and very little energy to work
Vitamin C	Scurvy	Bleeding gums
Vitamin D	Rickets	Bones become soft and bent
Calcium	Hypocalcemia	Weak bones, tooth decay
Iodine	Goitre	Glands in the neck appear swollen, mental disability in children
Iron	Anaemia	Weakness

Balanced diet: A diet containing all the nutrients and other components in proper proportions is called a balanced diet.

Beriberi: It is a disease caused due to the deficiency of Vitamin B₁. The muscles of Beriberi victim get weak.

Carbohydrates: Carbohydrates are the energy giving nutrients. The main carbohydrates found in our food are in the form of starch and sugar.

Energy: Energy is the capacity to do work. We need energy for our various activities.

Fats: Fats act as fuels in our body. They are obtained either from animals or from plants.

Minerals: Minerals are needed by our body in small quantities. All of them are essential for proper growth of the body and to maintain good health.

Nutrients: The components of food that are necessary for growth and development of our body are called nutrients.

Proteins: Proteins are required for growth and repairing of tissues in our body. They help in building new tissues.

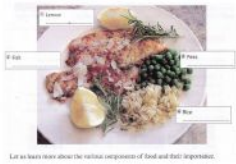
Roughage: Dietary fibres are called roughage. They are mainly provided by plant products in our food.

Scurvy: Scurvy is caused due to the deficiency of vitamin C. Bleeding gums is its main symptom.



Starch: Starch is a kind of carbohydrate.

Vitamins: Vitamins are also an important nutrient. Deficiency of any vitamin causes deficiency diseases.



Food is essential for all animals, including human beings. The food that we eat contains different components. Look at the picture of food items given below. Write the names of components of food that you think are present in the food items. Write your answers in the spaces provided. Let us learn more about the various components of food and their importance. 1. Vitamins, 2. proteins, 3. proteins, 4. carbohydrates.

Components Of Food:

The food that we eat consists of different components or nutrients.

Nutrients are substances that are needed by our body for proper growth and healthy body function. There are six main components present in food: carbohydrates, fats, proteins, vitamins, minerals, and roughage or dietary fibres. These nutrients fulfill different needs of the body.

Carbohydrates:

Carbohydrates provide energy to your body, which keeps it going throughout the day. There are two major types of carbohydrates in food: sugar and starch.



Sugars: Sugar is also called simple carbohydrate. Fruits, honey, and table sugar are some sources of sugar.

Starch: Starch is also called complex carbohydrate. Plants store energy in the form of starch. Rice, wheat, corn, potato, and bread are some sources of starch. When we eat plant products, containing sugar and starch, our digestive system breaks them down into glucose. This glucose, which is the simplest form of sugar is then absorbed into the blood and provides us energy.



Proteins:

Proteins are needed by our body for muscle-building and repairing worn out tissues. Our muscles, organs, and even blood are made up of mostly proteins. If we do not eat proteins, our body will not be able to repair damaged cells, or build new ones. Proteins in our diet come from both animal and plant sources (Fig.2.2).



Fig. 2.2 Sources of proteins

Meat, fish, egg, and milk are some animal sources of proteins. Pulses, soyabeans, grams, and nuts are some plant sources of proteins.

Vitamins:

Vitamins are needed for the proper functioning of our body. They help in keeping our eyes, bones, teeth, and gums healthy. There are 13 vitamins, each of which has a specific function. Vitamins are of two types: fat soluble and water-soluble.

Fat-soluble vitamins Vitamins A, D, E, and K are fat-soluble vitamins.

These are stored in the fat tissues of our body and are used only when the body needs them. Our body prepares vitamin D in the presence of sunlight. Water-soluble vitamins Vitamins B1, B2, B3, B6, B12, and folic acid (together known as vitamin B complex) and vitamin C are water-soluble vitamins. Since water-soluble vitamins are not stored in the body, these need to be regularly supplied through food items like citrus fruits, spinach, and other green leafy vegetables, etc. Lack of vitamins in the body can cause deficiency diseases.

Minerals:

Just like vitamins, minerals also help our body to stay healthy. Minerals perform important functions like formation of bones, teeth, and blood cells and helps in maintaining a normal heartbeat. **Minerals are of two types:**

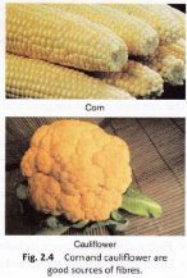
macrominerals and trace minerals (Fig. 2.3). Macrominerals (macro: large) are needed by the body in larger amounts as compared to trace minerals. Calcium, magnesium, sodium, and potassium are examples of macrominerals. Trace minerals are needed by the body in very small amounts. Iron, zinc, copper, and iodine are examples of trace minerals.



Fig. 2.3 Sources of minerals

Roughage or Dietary Fibres:

The portion of the plant food that do not provide any nutrients to our body but help in maintaining a healthy digestive system is called roughage or dietary fibres (Fig. 2.4).



Roughage are of two types: soluble and insoluble. Soluble roughage are soluble in water whereas insoluble roughage are not. Apple, strawberry, peach, and rice are examples of food items rich in soluble roughage that help in blood circulation. Whole grain, carrot, cabbage, turnip, and cauliflower are examples of food items rich in insoluble roughage. Lack of insoluble roughage in the diet causes the stool to become hard and difficult to pass. This condition is called constipation.

Water:

Almost 70% of our body weight is water. Water is needed by our body for good health.

- It helps to transport substances inside our body.
- It helps our body to absorb nutrients from food.
- It helps to regulate our body temperature.
- It is needed for various chemical reactions that take place inside our body during digestion, excretion, etc.
- We get water not only from the liquids we drink but also from the food we eat. Milk, fruits, vegetables, and juices are good sources of water.

Balanced Diet:

Our diet must contain adequate amount of different nutrients for our body to function properly. A diet that contains adequate amount of different nutrients required for the healthy functioning of our body is called a balanced diet.

A balanced diet must include food items from the following four food groups.

- Milk group: includes milk and milk products
- Meat group: includes meat (chicken, fish, lamb, etc.) and meat substitutes (beans, peas, nuts, and seeds)
- Fruit and vegetable group: includes fruits and vegetables
- Grain group: includes breads and cereals.



Deficiency Diseases:

Lack of carbohydrates, proteins, vitamins, or minerals in the diet can cause diseases. Diseases that are caused due to the lack of nutrients in the diet are called deficiency diseases. Deficiency diseases cannot be transmitted from one person to another.

Deficiency of Carbohydrates:

Carbohydrates are the main energy sources. Lack of carbohydrates in the diet results in lack of energy and stamina. A labourer who does hard manual work needs more carbohydrates in his diet than a person who does his work sitting in his office.

Deficiency of Proteins:

Growing children need more proteins in their diet. Lack of proteins in the diet weakens muscles. Deficiency of proteins leads to a disease called kwashiorkor (fig. 2.5). Deficiency of proteins along with carbohydrate deficiency is called Protein Energy Malnutrition (PEM). It leads to marasmus. These diseases are more common in children of rural areas.



Fig. 2.5 Children suffering from Kwashiorkor

Fact File
The Mid-day Meal scheme has been launched by the Government of India. Under this scheme, school-going children are provided free nutritious food in their schools. It has two main motives — to promote education in rural India, especially among poor children, and to prevent malnutrition in children.

A child suffering from kwashiorkor has some or all of the following

symptoms: large pot-like belly, stunted growth, swelling of face and limbs (especially the feet), skin diseases, mental retardation, and diarrhoea. If the treatment is started in time, improving protein intake may correct this disease.

Marasmus is more common among infants and children under 5 years of age. A child suffering from marasmus becomes very thin, shows slow body growth, lack of energy, loss of appetite, weak legs, mental retardation, poor muscle development, etc.

To prevent these diseases, the Government of India has started programmes like the Integrated Child Development Scheme (ICDS) and the Mid-day Meal scheme in schools.

Deficiency of Vitamins:

Table 2.1 lists some important vitamins and their sources, functions, deficiency diseases, and symptoms.



Table 2.1 Vitamins—Functions, deficiency diseases, symptoms, and sources

Vitamin and sources	Function	Deficiency disease	Symptoms
A Sources: Green leafy vegetables, fruits, butter, egg yolk, carrots, and fish	Keeps eyes, hair, and skin healthy	Night blindness	Dryness of eyes; improper vision
B1 Sources: Eggs, whole grains, and sprouts	Aids in digestion; maintains nervous system	Beriberi	Inflammation of nerves; digestive problems and heart abnormalities
B2 Sources: Eggs, milk, and green leafy vegetables	Keeps skin and mouth healthy	Skin disorders	Irritation of eyes; skin and intestinal disorders; inflammation of the tongue
B12 Sources: Meat	Formation of red blood cells	Anaemia	Pale skin; lack of stamina and appetite; frequent headaches
C Sources: Citrus fruits like lime, orange, and lemon; tomatoes and sprouts	Helps to resist infections and keeps teeth, gums, and joints healthy	Scurvy	Loosening of teeth; spongy and bleeding gums; increased susceptibility to diseases; slow healing of wounds; weakness; pain in the limbs
D Sources: Milk, fish, and eggs; sunlight	Aids in the normal growth of bones in children	Rickets	Weak bones; joint and bone deformities like bow legs and pigeon chest; softening of ribs; protruding abdomen
K Sources: Spinach, cabbage, or any other green leafy vegetable	Helps in blood clotting (to stop bleeding)	Haemorrhage (excessive bleeding)	Affects clotting of blood

Some vitamins are very sensitive to heat and light. For example, vitamin C is easily destroyed during cooking. Therefore, vitamin C-rich food items should be eaten raw. Scurvy was common among sailors in ancient times. Due to lack of cure, several sailors died of this disease during long voyages. In the 18th century, James Lind found that eating citrus fruits reduced the occurrence of scurvy in sailors.

Deficiency of Minerals:

Table 2.2 lists some important minerals and their sources, functions, deficiency diseases, and symptoms. Minerals also assist in certain chemical reactions in the body. Cooking does not destroy them.

Table 2.2 Minerals—Functions, deficiency diseases, symptoms, and sources

Mineral and sources	Function	Deficiency disease	Symptoms
Calcium Sources: Milk and green leafy vegetables	Strengthens bones and teeth and helps in clotting of blood	Osteoporosis in adults Rickets in children	Brittle bones; excessive bleeding; stunted growth; weak teeth and bones
Phosphorus Sources: Cereals, pulses (dal), and milk	Strengthens bones and teeth	Rickets in children	Weakening of bones; poor development of bones and nervous system; mental retardation; retarded growth; loss of weight
Iron Sources: Cereals, pulses, meat, and green leafy vegetables	Helps in the formation of haemoglobin and red blood cells	Anaemia	Pale body colour; body fatigue; white nails; loss of weight; swelling in hands and feet
Iodine Sources: Fish and salt	Required for proper working of the thyroid gland	Goitre	Enlargement of the thyroid gland; mental retardation; retarded growth
Sodium and potassium Sources: Salt and most food items	Help in maintaining body's water balance	Body and muscle weakness Paralysis	General weakness; dehydration
Magnesium Sources: Green leafy vegetables, cereals, chicken, and fish	Regulates the functioning of muscles and nerves	Weak muscles and nerves	Loss of appetite; upset stomach; sleeplessness



Deficiency of Water in the Body:

Water is very essential for proper functioning of our body. Excess loss of water from the body leads to a condition called dehydration.

Dehydration causes loss of salts and leads to weakness in the body. Oral Rehydrating Solution (ORS) can be given to the patient to recover from dehydration. It is available free of cost at primary health centres. It can also be made at home by mixing 8 teaspoons of sugar and 1 teaspoon of salt in 1 litre of clean, drinking water.

Saturated fats Fats that are normally solid at room temperature are called saturated fats. **Unsaturated fats** Fats that are normally liquid at room temperature are called unsaturated fats.

Fat-soluble vitamins Vitamins that are stored in the fat tissue and used only when the body needs them are called fat-soluble vitamins.

Water-soluble vitamins Vitamins that are not stored in the body and need to be regularly supplied through food are called water-soluble vitamins. **Macrominerals** Minerals that are needed by the body in larger amounts are called macrominerals.

Trace minerals Minerals that are needed by the body in very small amounts are called trace minerals. **Dietary fibre** The portion of plant food that does not provide any nutrients to our body but help in maintaining a healthy digestive system is called dietary fibre.

Balanced diet A diet that contains adequate amount of different components of food required for healthy functioning of the body is called a balanced diet. **Deficiency diseases** Diseases that are caused due to the lack of nutrients in the diet are called deficiency diseases.

Carbohydrates, proteins, fats, vitamins, minerals, and dietary fibres are the main components of food. Carbohydrates and fats provide energy to the body. Proteins are needed for muscle-building and for repairing worn-out tissues.

Vitamins and minerals are needed for the normal functioning of our body. A balanced diet should include food items from four basic food groups. Deficiency of carbohydrates causes lack of energy and stamina. Deficiency of proteins causes kwashiorkor whereas combined deficiency of proteins and carbohydrates causes marasmus. Deficiency of vitamins can cause night blindness, beriberi, anaemia, scurvy, and rickets. Deficiency of water can cause dehydration. Deficiency of minerals can cause osteoporosis, rickets, anaemia, and goitre.



Chapter 3 Fibre to Fabric

Fibres: All cloth materials are made up of long, narrow, thin structures called fibres. Fibres are obtained from natural as well as man-made sources.

Natural Sources: Cotton, jute, silk, wool, etc., are obtained from natural sources- plants or animals.

Man-made Sources: Polyester, nylon, rayon etc., are man-made materials used for making clothes.

Plant fibres: All the plants have fibres in their body structure, e.g., cotton and mango have fibres on their seed, coconut on its fruit, jute in its stem and banana tree in its leaf.

Animal fibres: Important animal fibres are wool (hair of sheep) and silk (from silkworm).

Cotton is the most important industrial crop. India was the proud inventor of cotton clothing. Cotton has been used in India since 1800 B.C.

Production: Cotton is grown in Maharashtra, Gujarat, Punjab, Rajasthan, Tamil Nadu and Madhya Pradesh.

Climate required: Cotton plants need warm climate.

Cotton is planted early in the spring.

Black soil is excellent for cotton's cultivation.

Cotton bolls: Fruits of cotton plant are spherical-shaped structures of the size of wall nut which are called cotton bolls. On maturation, cotton bolls burst open, exposing the white fibres. ' When fibres dry in the sun light, they become fluffy.

Cotton fibres: Cotton fibres are obtained from cotton bolls.

Ginning: The process in which seeds from cotton are pulled out by steel combs is called ginning.



Ginning of cotton

Charkha: Charkha is a machine on which yarn was spun directly from ginned cotton in olden days.

Bales: Ginned cotton is compressed tightly into bundles weighing approximately 200 kg called bales.

Sliver: Raw cotton from bales is cleaned, combed and straightened and finally converted into rope like strands called sliver. A sliver of cotton is a loose strand or rope of cotton fibres.



Yarn: Sliver is pulled and twisted so that the fibre forms a strong thread or yarn.



Making yarn from cotton

Twisting of fibres into yarn increases the cohesion and strength of fibres. Handlooms and powerlooms: In villages, the clothes from cotton are woven on small scale known as handlooms. On large scale, cotton clothes are made by machines known as powerlooms.

Uses of cotton: Cotton is used:

- in manufacturing of textiles.
- as an absorbent in hospital.
- as fillers in mattresses, pillows and quilts.
- as a main raw material for the manufacturing of rayon and paper industry.

Clothes from cotton are extensively used as mops in household and for cleaning machines in industries. Jute is the most extensively used fibre next to cotton.

It is obtained from the stem of a plant called 'putson'.



Jute plant

In India, jute is mainly grown in West Bengal, Bihar and Assam.

Extraction of fibres:

- Jute plants are cut at the time of flowering stage.
- The cut plants are grouped at different places in the fields for few days when most of the leaves dry up and fall down.
- Plants are tied into small bundles.
- Retting: The bundles are made to sink in stagnant water of pond for few days when the gummy skin rots out to separate fibres. The process is called 'retting'.
- Fibre is extracted from retted jute by hand, with jerks and pulls.

Uses of jute:

- Jute is extensively used for making gunny bags, potato sacks, carpets, curtains, coarse clothes, ropes, etc.



- These days, fine quality of jute is also used for making jute fabrics. Primitive men and women had no idea about clothes.
- Primitive life was confined mostly to the tropics where the climate was warm and no clothing was needed.
- People migrated to colder regions only after the invention of fire. During stone age, people wore bark, big leaves or animal skins.
- People started wearing stitched clothes after the invention of needle about 40,000 to 50,000 years ago.

Cloth making was developed in three stages:

- First stage was making cloth from plant fibres,
- Second stage began with the use of animal fibres, and
- Third stage began with the development of man-made or synthetic fibres. Type of clothings which we wear is influenced by climate, occupation, culture and daily needs.

Clothing is necessary for the following reasons:

- It protects us from wind and weather.
- It protects us from injury.
- It maintains the body heat.

Woollen and cotton clothes feel rough and that of rayon, nylon or polyester are smooth to touch. Roughness of cotton and woollen fibres is due to the presence of many folds and uneven surface in it.

Silk, rayon, nylon and polyester are smooth because they have long plain, fine structures.

Cloth is made from threads and threads, in turn, are spun from fibres.

All fibres are not suitable for making cloth. Coconut fibres, for instance, are very hard and can only be used for making ropes or as a coir in mattresses.

Soft and long fibres like cotton, wool, nylon, etc., are suitable to make yam. It is advised to wear cotton clothes while working in the kitchen and near fire.

Cotton wool: The lumps of cotton fibres are called cotton wool. It can be used as absorbent, filling quilts, pillows, etc., and making yam.

Fabric: Yam can be woven or knitted manually or by machines into fabric.

Knitting: The process of making fabric from a single yam.

Spinning: The process of making yam from fibres.



Weaving: The process of arranging two sets of yam together to make a cloth is called weaving.

Cotton wool: Cotton wool is obtained from cotton plant. It is made up of thin cotton fibres.

Fabric: Woven material (cloth) is called fabric.

Fibre: Thread like animal or plant tissue is called a fibre.

Knitting: Knitting is a process of making a piece of fabric from a single yam.

Spinning: The process of making yam from fibres is called spinning.

Weaving: The process of arranging two sets of yam together to make a fabric is called weaving.

Yarn: Spun fibres are called yarns.

Clothes are made of different materials. We get these materials from both plants and animals. Identify the materials given below as plants or animal product. Write P for the plant products and A for animal products.



Let us learn about how the story of clothing started, the different materials used to make clothes, and how they are made. Answers: Cotton socks, jute rope, silk cloth, leather shoes.

History Of Clothing:

About 30,000 years ago, people started using animal skins for clothing. It is believed that wool was used as early as 6000 years ago.

Domestication of silkworms to produce silk occurred around 3000 BC in China. In India, cotton came into widespread use around 3000 BC. These fabrics were not stitched. They were just wrapped around the body. Even today, sari, dhoti, and turban are unstitched pieces of cloth.



Fiber And Fabric:

Clothes are made mostly from fibres. Fibres are thin strands of thread, that are woven to make fabric, for example, cotton fabric, silk fabric, etc. The fabric is stitched to make clothes. For example, cotton fabric can be stitched into a cotton frock or a cotton kurta. There are two main processes of making fabric from fibre – weaving and knitting.



Weaving: Weaving involves making fabric by arranging two sets of yarn. It is done using a machine called loom, which can be hand-operated (Fig. 4.1) or power-operated. The pattern in which two sets of threads are arranged in a piece of woven cloth is called a weave (Fig. 4.2).

Knitting: Knitting involves making fabric by forming a series of connected loops of yarn by using knitting needles or machines. Sweaters are made from wool strands by knitting.



Fig. 4.1 A loom for weaving



Fig. 4.2 Weave pattern

Natural And Synthetic Fibres: (Different Types of Fibres)

Fibres used to make fabric may be natural or synthetic. Fibres that are obtained from plants or animals are called natural fibres. Examples are cotton, jute, wool, and silk. Fibres that are made by man from chemical substances are called synthetic fibres. Examples are nylon, rayon, polyester, and acrylic. Let us learn more about plant fibres.

Plant Fibres:

Cotton (Fig. 4.3), jute, coir, silk cotton, hemp, and flax are examples of plant fibres. Denim, used to make jeans, is made from cotton.



Fig. 4.3 Socks and towels made of cotton

Cotton:

The cotton plant is a shrub. It grows well in black soil and warm climate. It needs moderate rainfall. Cotton is a soft fibre that grows around the seeds of the cotton plant. A variety of textile products are made from cotton. In India, 'Ichadi', a coarse hand-woven cloth, is made from cotton.



Fig. 4.5 Production of cotton

Jute:

Jute is a fibre obtained from the bark of the jute plant (Fig. 4.6). It can be grown in different soil types, ranging from clayey to sandy soil. It grows best in loamy soil (mixture of sand, silt, and clay), sandy soil, and clayey soil. It grows well in regions where it rains a lot. Almost 80% of the world's high-quality jute comes from Bangladesh. Bangladesh, India, China, Nepal, and Thailand are the main producers of jute.



Other Useful Plant Fibres:

There are other important plant fibres as well.

Coir: Coir is the fibre obtained from the outer covering or the husk of the coconut. Usually coconuts are left in water for a few months. The husk is then separated from the nut and beaten with wooden mallets to get the fibre. The fibre thus obtained is spun and dyed and is ready for weaving. Coir is used to make several household products like rope and floor covering and also as a stuffing in mattresses and pillows.



Silk cotton: Silk cotton is another plant fibre that is commonly used as a stuffing in pillow, sleeping bag, and life jacket. This fibre is obtained from the silk cotton tree, also called kapok.

The fruits of the kapok tree contain fibres that are light and fluffy (like cotton). When the fruit ripens, it bursts open, releasing the fibres.

Hemp: Hemp fibres are obtained from the stem of the hemp plant. Hemp fibres are used in the production of ropes, carpets, nets, clothes, and paper.

Flax Fibres obtained from the stem of the flax plant are woven to make a fabric called linen. Flax fibres are also used in the production of rope and high-quality paper.

Fabric The material made by weaving the threads from fibres is called fabric.

Weaving Weaving involves the making of fabric from yarn.

Ginning The process of separating the cotton fibres from its seeds is called ginning.

Spinning The process of making yarn from fibres is called spinning.

Retting The process of rotting the stems of the plants in water to remove the sticky substance and separate fibres is called retting.

Clothing materials are obtained from both plants and animals.

Fibres are woven to make fabrics and fabrics are stitched to make clothes. Fibres may be natural or synthetic.

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Cotton, jute, coir, silk cotton, hemp, and flax are some plant fibres.

Chapter 4 Sorting Materials into Groups

There is a vast variety of objects everywhere.

All objects around us are made up of one or more materials.

A thing can be made of different materials.

Many things can be made from the same material.

Classification: The process of sorting and grouping things according to some basis is called classification.

Basis of grouping: We can group materials on the basis of the similarities and differences in their properties.

Each material has its own properties, that may differ from others.

However, some properties may be common to one or more materials.

Uses of a material: Uses of a material depend on its properties and the purpose for which it has to be used.

Metals have lustre while non-metals generally have no lustre.

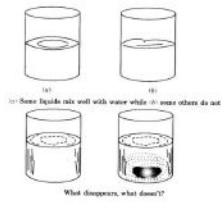
Smooth and rough surface: Some materials feel smooth when touched e.g., mirror and things made of metals; whereas, some other materials feel rough when touched; for example, a piece of stone.

Hardness and softness: Materials which can be pressed easily are called soft while some other materials which cannot be pressed are called hard; for example, cotton is soft while wood is hard.

Solubility

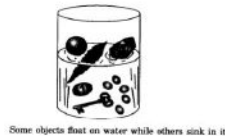
- **Soluble substances:** Substances that get dissolved in water are called soluble substances.
- **Insoluble substances:** Substances which do not dissolve in water are called insoluble substances.
- **Miscible:** Those liquids which mix well with water are said to be miscible.
- **Immiscible:** Substances which do not mix well with water are called immiscible.
- **Solubility of gases:** Solubility of gases in water is very less.
- **Oxygen gas** which is dissolved in water, is very important for the survival of aquatic plants and animals.





Buoyancy: Some materials float in water while others sink:

- Materials like sand, sugar and salt sink in water.
- Materials like wax, oil and wood float on water.



Transparency

- **Opaque:** Materials through which we are not able to see are called opaque. For example, wood, iron, gold.
- **Translucent:** Materials through which things are only partially visible are called translucent. For example, butter paper, old glass door.
- **Transparent:** Materials through which things can be seen are called transparent. For example, glass, water, air, test tube.

Things are grouped together for convenience and to study their properties.

Hard: Materials which cannot be pressed easily are called hard e.g., stone.

Insoluble: Materials which do not dissolve in water are called insoluble.

Lustre: Some materials have a special shine on them which is called lustre.

Material: The matter of which an object is made, is called material. For example, glass, steel, wood, etc.

Metals: Materials which have certain properties like, lustre, malleability, ductility and are sonorous, good conductors of heat and electricity, are called metals.

Opaque: Materials which do not allow light to pass through them are called opaque.

Rough: Some materials have uneven surface and feel rough on touching.

Soluble: Materials which dissolve in water are called soluble.

Translucent: Materials which partially allow light to pass through them are called translucent.

Transparent: Materials which allow light to pass through them are called transparent.



Grouping On The Basic Of Common Properties:

Objects are made of different materials. One material can be used to make different objects. This is possible because different types of materials have different properties. We have to choose materials with the right properties based on what we want to use it for. For example, a chalk made of wood or plastic would be of no use because it cannot be used to write on the blackboard.

Materials have different properties like roughness, lustre, transparency, solubility, flotation, attraction towards a magnet, conduction of heat, and conduction of electricity. Let us study these properties one by one.

Roughness:

Materials can be rough or smooth. Rough materials have bumps or ridges on their surface, which can be felt by touching them. Smooth materials lack these bumps. Examples of rough materials are rocks, sandpaper, and bark of a tree. A glass sheet, flower petals, and surface of an apple are some examples of smooth surfaces (Fig. 5.1).



Fig. 5.1 Materials can be rough or smooth.

Lustre:

Lustre is the shine of a material. All metals in pure state are shiny and said to possess lustre. This property of metals is widely used for making jewellery and other decorative articles. Materials like gold, silver, and bronze have lustre (Fig. 5.2).



Fig. 5.2 Metals have lustre.

Transparency:

Different materials allow different amounts of light to pass through them depending on a property called transparency. Based on transparency, materials can be of three types: transparent, translucent, and opaque.

Materials that allow all the light to pass through them are called transparent materials (Fig. 5.3). Glass, water, acrylic sheet, and cellophane paper are transparent. Shopkeepers generally prefer to keep items like toffee, biscuit, sweet, etc. in transparent jars so that we can see them easily. Windows are also usually made of glass so that light can pass through and light our rooms.

Materials that allow some light to pass through them are called translucent materials. Oiled paper and coloured glass are translucent materials. Materials that do not allow light to pass through them are

called opaque materials. Wood, metal, leaf, stone, and cardboard are opaque materials.



Fig. 5.3 Transparent jar

State:

All substances are made up of matter. Matter exists in three states – solid, liquid, and gas. Table 5.1 Grouping based on the states of matter

Table 5.1 Grouping based on the states of matter

Solid	Liquid	Gas
Definite shape and volume	Definite volume but no definite shape. They take the shape of the container they are poured into.	No definite shape and volume
Cannot be compressed	Can be compressed to a small extent	Highly compressible
Particles are closely packed	Particles are not as closely packed as in solids	Particles are loosely packed

Solid

Liquid

Gas

Solubility:

Different materials have different solubility in water. Based on their solubility, materials can be soluble, insoluble, miscible, or immiscible. Solid materials that dissolve in water are said to be soluble in water. For example, common salt and sugar. Solid materials that do not dissolve in water are said to be insoluble in water. For example, sand, wood, stone, chalk powder, and wax. Liquids that dissolve in water are said to be miscible in water. For example, alcohol, vinegar, lemon juice, honey, and glycerine. Liquids that do not dissolve in water are said to be immiscible in water. For example, kerosene, coconut oil, and diesel.

Some gases dissolve in water (e.g., carbon dioxide and oxygen). Oxygen dissolved in water is essential for the survival of aquatic organisms. Soft drinks have carbon dioxide dissolved in them. Gases like nitrogen, hydrogen, and helium are insoluble in water.

Flotation:

Certain materials float on water whereas others sink. This property of a material to float on water is called flotation. Generally, materials like wood, leaf, and feather float on water whereas rock and metal sink.



A stone will sink in water whereas a feather will stay afloat.



Attraction towards a magnet:

Materials that are attracted to a magnet are called magnetic materials. This property is called magnetism. Objects made of iron are attracted to a magnet. In addition to iron, nickel and cobalt are also attracted to a magnet.

Conduction of heat:

If you observe the utensils in your kitchen, you will notice that though most of them are made of metals, their handles are made of wood or hard plastic.



Fig. 5.4 Handles of most kitchen utensils are made of wood or plastic.

Why aren't the handles made of metal as well? This is because metals get heated whereas materials like plastic and wood do not (Fig. 5.4). It would be difficult to hold the handles made of metal while cooking. Materials that allow heat to flow through them are called conductors of heat whereas those that do not allow heat to flow through them are called insulators of heat.

Generally, metals are conductors of heat whereas non-metals like wood, plastic, glass, bamboo, air, and paper are insulators of heat.

Conduction of electricity:

We get electricity in our homes through cables and wires. An electric cable consists of a number of metal wires with or without a plastic covering (Fig. 5.5). The metal wires conduct or transmit electricity whereas the plastic covering do not. Materials that conduct electricity are called conductors. Materials that do not conduct electricity are called insulators.



Fig. 5.5 Electric cable

For example, metals are conductors of electricity; wood, air, and plastic are insulators. Transparent Materials that allow light to pass through them are called transparent materials.

Translucent Materials that allow some light to pass through them are called translucent materials. Opaque Materials that do not allow light to pass through them are called opaque materials.

Miscible Liquids that are soluble in water are said to be miscible in water.

Immiscible Liquids that are insoluble in water are said to be immiscible in water.



Magnetic materials Materials that are attracted by a magnet are called magnetic materials.

Conductors Materials that conduct heat or electricity are called conductors.

Insulators Materials that do not conduct heat or electricity are called insulators.

Materials have different properties that make them useful for making different objects.

An object can be made from different materials.

Different objects can be made from the same material.

Materials can be rough or smooth, transparent or opaque, soluble in water or insoluble, can float on water or sink; can be a conductor or insulators of heat or electricity.

Chapter 5 Separation of Substances

Pure Substances: Many substances around us contain only one type of constituent particles. Elements and compounds are pure substances. Some of the pure substances are iron, copper, water, salt, etc.

Impure Substances: Substances containing more than one type of constituent particles are called impure substances. Some of the impure substances are pond water, milk, etc.

Impurities: These are the unwanted particles present in a substance making it impure.

Mixtures: Substances which contain more than one component mixed in any ratio are called mixtures. For example, air is a mixture of many gases like nitrogen, oxygen, carbon dioxide, dust particles, etc.

Homogeneous Mixtures: The mixtures in which the particles of the substances present cannot be seen are called homogeneous mixtures. For example, solution of sugar and water, air, cold drinks, etc.

Heterogeneous Mixtures: The mixtures in which particles of the substances present can be seen easily are called heterogeneous mixtures. For example, water in oil, dust in air.

Need for Separation: We carry out the separation of the components of a mixture or an impure substance with the following purposes:

- To remove the unuseful or harmful component.
- To obtain the useful component.
- To remove impurities for getting a pure sample.



Principle of separation

- The substances present in a mixture retain their original properties like particle size, density, melting point, boiling point, volatility, etc.
- We use the difference in any one of these properties in the components of a mixture to separate them.

Methods of Separation: Handpicking, winnowing, sieving, magnetic separation, sedimentation, decantation, loading, filtration, evaporation, sublimation, distillation, churning, etc., are some common methods of separation.

Churning (or Centrifugation): It is the process of separation of the lighter particles of a suspended solid from a liquid. For example, to obtain butter from the curd or milk.

Condensation: The process of conversion of water vapour into its liquid form is called condensation.

Crystallisation: The process of crystallisation is used for obtaining pure crystalline substance from impure sample.

Decantation: It is the transfer of clean liquid from one vessel to the other without disturbing the settled (sedimented) particles.

Evaporation: It is the process of removing water (or moisture) from a mixture either by heating on flame or direct sunlight. For example, salt from sea water is obtained by this method.

Filtration: Filtration is used to separate solid particles from liquid by passing the mixture through a filter paper.

Handpicking: This method is used for separating small particles of dirt, stone, husk, etc., from the grains of wheat, rice, pulses, etc.

Loading: It is the process of faster sedimentation by suspending alum to a liquid.

Sedimentation: It is the process of settling of heavy solid particles in a mixture at the bottom of the vessel.

Sieving

- Sieving is used when two components of a mixture have different particle sizes.
- Sieving allows the fine particles to pass through the holes of the sieve, while the bigger particles remain on the sieve. For example, sieving of wheat flour, sieving of sand at construction sites.

Saturated solution: A solution in which no more soluble substance can be dissolved at room temperature is called saturated solution.



Solution: When a soluble substance is dissolved completely in a liquid (say sugar in water), a homogeneous mixture is formed. It is known as a solution.

Threshing: The process that is used to separate grain from stalks is threshing.

Winnowing: Winnowing can be used to separate lighter and heavier components of a mixture. For example, to separate husk from grain with the help of air.

Methods Of Separation:

Different methods are used for separating different substances that are mixed together. Let us learn about some common methods that are used.

Threshing:

Grains or seeds of plants like rice and wheat serve as sources of food. The flour (atta) that is used for making chapattis is made from wheat grains. After these crops have been harvested or cut, the grains need to be separated from the stalks (the dried stems). This is done by threshing.

The process of beating harvested crops to separate the grains from the stalks is called threshing. It is done manually (by hand) or with the help of machines. Manual threshing is done by holding a pile of crop and beating it on a rock or a hard surface (Fig. 3.1). This loosens and separates the grain from the stalk. Sometimes, threshing is also done by crushing the harvested stalks using bullocks.



Wheat



Fig. 3.1 Manual threshing



Fig. 3.2 A combine harvester

Threshing is also done with the help of machines like the combine harvester (Fig. 3.2). Threshed grains may still contain seed coverings and tiny pieces of leaves or stem (collectively called chaff). These are separated by winnowing.

Winnowing:

The method used to separate chaff from the grain by wind or blowing air is called winnowing.

The mixture of chaff and grain is taken in a winnowing basket (Fig. 3.3). The farmer stands at a higher level and lets the mixture fall to the ground. The grain, being heavier, falls almost vertically whereas the lighter chaff is carried away by the wind and forms a separate heap away from the



grain. The separated chaff is used as fodder for cattle. The direction of the wind plays an important role in the process of winnowing.



Fig. 3.3 Winnowing

Hand-picking:

Rice, wheat, pulses, etc., that we buy from the market may contain impurities (unwanted or harmful particles) in the form of small stones, unwanted grains, etc. Often, these impurities look very different from the food item and can be spotted easily. The method of separation used in such a case is hand-picking (Fig. 3.4). This method is preferred when

- the quantity of the mixture is small,
- the unwanted substance is present in smaller quantities, and
- the size, shape, or colour of the unwanted substance is different from that of the useful one.



Fig. 3.4 Hand-picking

Sieving:

If the components of a mixture are of different sizes, they can be separated by sieving (Fig. 3.5). The smaller component passes through the pores of the sieve whereas the larger component (stones or husk) is left behind in it. This method is used in some homes to separate wheat bran (the bigger particles) from flour.

However, sieving wheat flour is not advisable as wheat bran, which is removed during sieving, is very rich in nutrients and is also a rich is better to remove visible impurities by hand picking.

The process of sieving is also used to separate pebbles and stones from sand at construction sites. The stones and pebbles present in the mixture remain in the sieve and the fine sand particles pass through the holes of the sieve.



Fig. 3.5 Sieving

Sedimentation and Decantation:

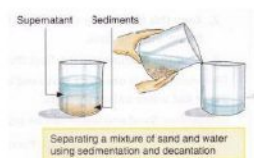
Have you seen pulses being washed in your home? When pulses are kept in a bowl of water, they settle down as they are heavy. However, dirt,



insects, tiny pieces of straw, and other lighter impurities float at the top. The water, which contains these impurities, is then poured out and discarded. This process involves two methods: sedimentation and decantation.

The process of separating insoluble solids, suspended in a liquid, by allowing them to settle down is called sedimentation. The solid particles that settle down during sedimentation are called sediments. The process of pouring out the clear upper liquid without disturbing the sediments is called decantation. The liquid above the sediments is called a supernatant. A mixture of sand and water can also be separated by sedimentation and decantation.

The mixture is left undisturbed for some time. Sand, being heavier, settles down and water is poured out into a separate container.



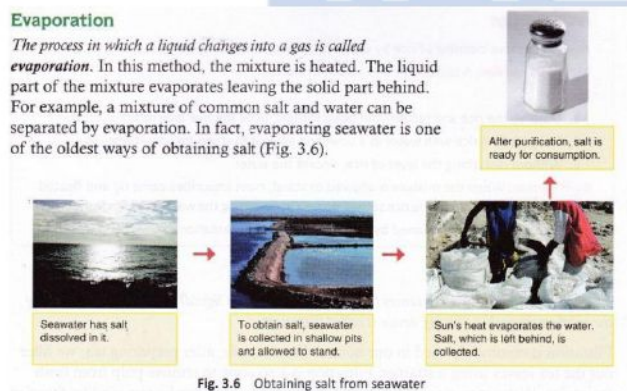
Filtration:

The process by which two substances (an insoluble solid and a liquid) are separated by passing the mixture through a filtering device is called filtration. Filtration is commonly used in our homes. For example, after preparing tea, we filter out the tea leaves using a strainer. Filtration is also done to remove pulp from fresh fruit juice. Water may also contain solid impurities, which can be removed by filtration.

During filtration, the insoluble solid is retained in the filtering device whereas the liquid passes through it. It is important that the particles of the insoluble solid are bigger than the holes in the filtering device for them to be retained in it. A filter paper is a filtering device that has very fine pores in it.

Evaporation

The process in which a liquid changes into a gas is called **evaporation**. In this method, the mixture is heated. The liquid part of the mixture evaporates leaving the solid part behind. For example, a mixture of common salt and water can be separated by evaporation. In fact, evaporating seawater is one of the oldest ways of obtaining salt (Fig. 3.6).



Condensation:

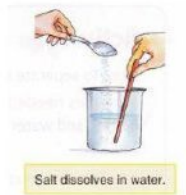
The process in which gas changes into liquid is called condensation.



Condensation is the opposite of evaporation. In nature, water vapour in the air condenses to form its liquid form, the dew. Condensation takes place only when water vapour hits a cold surface.

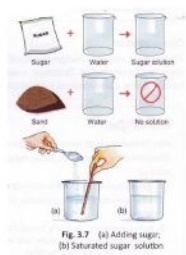
Solution And Solubility:

When some salt is added to water and stirred, the salt disappears. This is because the salt has dissolved in the water.



Dissolving is a change where substances mix completely with the liquid they have been added to. Not all substances dissolve in water. Only some substances, Salt dissolves in water. like salt and sugar, dissolve in water and are known as soluble substances. Substances like chalk and sand do not dissolve in water and are known as insoluble substances. The substance that dissolves is called the solute and the substance in which the solute dissolves is called the solvent. The resulting mixture is called the solution. Thus, solute + solvent = solution.

E.g., sugar + water = sugar solution.



If we keep adding spoonfuls of sugar to water and stir the solution each time, what will happen after some time? We will notice some grains of sugar at the bottom of the solution. This shows that no more sugar can be dissolved. We say that the solution has become saturated (Fig. 3.7).

A saturated solution is the solution in which no more of the solute can be dissolved. But what if we heat the solution? Can we then dissolve that 'extra' sugar present in the saturated solution?

Yes, we can increase the solubility of a solute by heating the solution.

Solubility is the ability of a substance to get dissolved in a given liquid. The quantity of a substance that can dissolve in hot water is much more as compared to that in cold water. There are some other factors that increase the solubility of a solute.

Stirring We can observe this by taking two glasses of water and adding a spoonful of sugar to each glass. Then we keep one glass undisturbed and stir the other. Sugar dissolves faster when the solution is stirred. **Solute in powdered form** We can observe this by taking two glasses of water and



adding a whole sugar cube in one glass and powdered or crushed sugar cube in the other. Sugar in the powdered form dissolves first.

Different substances dissolve in different amounts of water while making a saturated solution. Threshing The process of beating harvested crops to separate seeds from the stalks is called threshing. Winnowing The method used to separate chaff from the grain by wind or blowing air is called winnowing.

Sedimentation The process of separating insoluble solids suspended in a liquid by allowing them to settle down is called sedimentation.

Decantation The process of pouring out the clear upper liquid without disturbing the sediments is called decantation.

Filtration The process by which an insoluble solid is separated from a liquid by passing the mixture through a filtering device is called filtration. Saturated solution A solution that can dissolve no more of the solute is called a saturated solution.

Threshing is done either manually or by using machines to separate seeds or grains from the stalks.

Winnowing involves separating the chaff from the grain by letting the mixture fall to the ground from a height when the wind is blowing. Hand-picking involves manually removing small stones, insects, etc. from the grains.

Sedimentation and decantation are used to separate an insoluble solid from a liquid. Insoluble solid impurities present in water can be removed by filtration. Common salt can be separated from seawater by evaporation. Solubility of a solute can be increased by heating the mixture or it can also be increased by adding the solute in the powdered form.

Chapter 6 Changes Around Us

We can bring about a change in a substance by doing one or more of the following processes:

- Heating.
- Applying force.
- Mixing it with something else.

Changes caused by heating: When an object is heated, it gets affected in one or many possible ways.

- Some objects get hot but do not change in any other way.
- Some objects get hot and also expand in size.
- Some objects get hot and begin to burn.



- Some objects get hot and change their state.

Changes by applying pressure: When we apply force to an object,

- We can change its shape and size.
- Air can be compressed.
- Metals can be hammered into thin sheets.
- Elastic can be stretched.
- Cotton can be spun into thin threads.

Changes by mixing a substance with other: We can bring about a change in a substance by mixing it with another. For example, making solution by mixing water soluble substances in water.

Metals expand on heating and contract on cooling.

Chemical changes: These are the changes in which chemical properties of a substance change, and a new substance is formed. For example, cooking of food.

Physical changes: These are the changes in which only physical property of a substance changes and no new substance is formed.

Characteristics of physical changes:

- No new substances are formed.
- Products are identical to the reactants.
- These changes are reversible.

Characteristics of chemical changes:

- Properties of products are different from the properties of reactants.
- Most of the chemical changes are irreversible.
- These changes always result in energy changes.

Reversible changes: These are the changes that can be reversed. For example, stretching of rubber.

Irreversible changes: These are the changes which cannot be brought back to its original state. For example, burning of paper.

Melting point: A constant temperature at which a solid starts melting. This temperature is called the melting point of that solid.

Freezing: A process in which liquid changes into solid form is called freezing.

Force: A push or a pull acting on a body which tends to change its state of rest or motion is called a force.



Natural changes: The changes which occur in nature on their own are called natural changes. For example, change of day and night, change of season.

Slow changes: The changes which take longer time to occur are called slow changes. For example, rusting of iron, tooth decay.

Changes: Many changes are taken place around us on their own, e.g., flowers bloom and then wither away. We can also bring a change, e.g., change in the size of a balloon by blowing air in it.

Contraction: A process in which an object becomes smaller or shrinks is called contraction.

Evaporation: A process in which liquid changes into vapour is called evaporation.

Expansion: A process in which an object becomes bigger in size, e.g., metals expand on heating.

Melting: A process in which a solid melts to become a liquid on heating is called melting.

Reversible And Irreversible Changes:

Changes that occur around us can be broadly categorized as reversible or irreversible depending on whether or not they can be reversed.

Reversible Changes:

Changes that can be reversed are called reversible changes.

What happens to an ice cream if you do not finish it quickly? It melts. Can you change the molten ice cream back into a solid? Yes! Just keep it in the freezer. Molten ice cream can be changed back to its solid form. Thus, melting is a reversible change. Melting of butter and chocolate are also reversible changes (Fig. 6.1).



Fig. 6.1 Melting is reversible.

What about changes like condensation, freezing, and evaporation of materials? If you take out some ice cubes from the freezer and keep them outside, the ice cubes will absorb heat from the surrounding and melt. When this water (molten ice) is heated for some time, it starts boiling (liquid starts to evaporate) and steam escapes from the container [Fig. 6.2(a)]. Now, if you hold a lid over the container, the steam will again liquify or condense into small droplets of water on coming in contact with the cold lid [Fig. 6.2(b)]. This water can be cooled down further and then kept in the freezer to form ice again [Fig. 6.2(c)]. Thus, the three physical states of water are reversible and can be changed from one state to another by heating or cooling.

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Irreversible Changes:

Changes that cannot be reversed are called irreversible changes.

There are a large number of irreversible changes that take place around us. These result in a new material being produced, which may or may not be useful. Some examples of irreversible changes are given below.

- Ripening of fruits is an irreversible change because it is not possible to get back the raw fruits from ripened or mature ones.
- Blooming of flowers is an irreversible change because flowers cannot change back into buds.
- Milk gets spoiled when not refrigerated, particularly in summer. This is called curdling or souring of milk, which is an irreversible change. Curdling of milk is also done by adding lemon juice to milk for making cottage cheese or paneer.



Burning of paper is an irreversible change. A new substance called ash is left or formed after a paper has been burnt. This new substance differs from the paper in its appearance and properties.



Cooking of food is an irreversible change because we cannot get back the ingredients in their original form after cooking them. For example, after a cake is baked using flour, egg, milk, chocolate, etc., we cannot get back the ingredients (Fig. 6.3).



Fig. 6.3 Irreversible changes

Burning of a candle is often cited as an example of physical change

because what we see immediately is melting of wax that solidifies on cooling. However, when a candle burns, the wax is undergoing two changes at the same time: first it melts, and then it burns. What burns is



actually melted wax. The melted wax burns on the wick – the wick itself isn't burning, it is just the wax on it.

Physical And Chemical Changes:

Changes in which no new substances are formed are called physical changes. For example, breaking of a glass (Fig. 6.4), freezing of water, tearing of paper, etc. Changes in which new substances with different properties are formed are called chemical changes. Cooking of food, burning of substances are chemical changes as entirely new substances are formed. Burning of a candle wax releases carbon dioxide and water vapour (new substances).

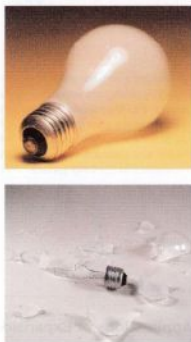


Fig. 6.4 Physical change

Expansion And Contraction Of Materials:

Some materials expand on heating and some contract on cooling. Heating makes the particles (that form the material) expand or become loose. Cooling makes the particles (that form the material) contract or become tight. The amount of expansion differs in solids, liquids, Fig- 6-4 Physical change and gases. Gases expand the most while solids expand the least.

Table 6.1 shows some examples of expansion.

Expansion in solids	Expansion in liquids	Expansion in gases
Railway tracks consist of two parallel metal rails joined together. Small gaps, called expansion gaps, are deliberately left between the rails as there is an expansion of the rails in hot weather.	Water expands on heating. Try this with the help of an adult. Take a glass filled with water to its brim. Pour the water into a container and heat it (do not boil). Now try to pour the water back into the same glass. The water overflows.	If you keep an inflated balloon in the sun for some time, what will happen? It will grow in size as the air inside it expands on taking heat from the surroundings.
		

Cooling does the opposite of heating. Cooling causes a material to contract. Solids contract the least while gases contract the most. Table 6.2 lists some examples of contraction.

Table 6.2 Contraction in solids, liquids, and gases		
Contraction in solids	Contraction in liquids	Contraction in gases
If we hold a very hot glass tumbler under cold water, it cracks. This is because the outer surface of the glass comes in direct contact with cold water and contracts more as compared to the inner surface.	We observed that water expanded on heating. Can you say what will happen if the water is allowed to cool down and then poured back into the glass? Would it still overflow? No. This is because of contraction.	If an inflated balloon is tied at the mouth of a bottle and the bottle is placed in ice-cold water, what will happen? The balloon will shrink in size, as the air inside the balloon contracts on cooling.
		

Applications of Expansion and Contraction:



Expansion by heating can be used in several everyday activities.

The jammed metal lid of a jam jar can be opened by heating. The jar is inverted and just the lid is dipped in hot water. After some time, the lid can be opened easily as the lid gets slightly expanded.

The fact that materials expand on heating is used in thermometers. In many thermometers, mercury is used. When the bulb of the thermometer comes in contact with a hot object, the mercury expands and its level rises in the glass tube, indicating the temperature.

Why the electric lines are never hung tautly between the poles? Wires in the outside environment are subjected to extreme weather conditions ranging from acute hot to cold temperatures. A taut wire on contraction in winters can snap.

Reversible change: A change that can be reversed is called a reversible change.

Irreversible change: A change that cannot be reversed is called an irreversible change.

Physical change: A change where no new substances are formed is called a physical change.

Chemical change: A change where new substances with different properties are formed is called a chemical change.

Changes happen around us and also within us. Some changes are reversible, while some others are irreversible. Some changes are physical changes; some are chemical changes. Heating causes expansion in a material. Cooling causes contraction in a material.

Gases expand the most and solids expand the least. Gases contract the most and solids contract the least.

Chapter 7 Getting to Know Plants

Flowering Plants: Plants which bear flowers are called flowering plants.

Their bodies are divided into roots, stem, leaves and bear flowers and fruits.

Herbs, shrubs and trees: Plants are usually grouped into herbs, shrubs and trees on the basis of their heights, stem and branches:

- (a) **Herbs:** Plants with green and tender stem are called herbs. They are usually short and sometimes do not have branches.
- (b) **Shrubs:** Some plants have branches arising from the base of the stem. The stem is hard but not very thick. They are called shrubs.
- (c) **Trees:** Some plants are very tall and have hard and thick stem.



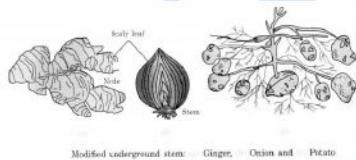
They have branches arising from upper part of the stem. They are called trees.



Creepers and climbers: The stem of some plants are very thin and weak. They either lie on the ground or need support to stand up. They are called creepers and climbers respectively.

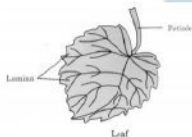
Stem

- It bears leaves, buds, flowers, fruits, etc.
- The stem conducts water from the roots to the leaves and to the other parts and food from leaves to the roots and other parts of the plant.
- Potato, yams, ginger, onion, etc. though present in the soil, are actually stem and store food within them.



Leaf

- Leaves have a variety of shapes, sizes and other structures.
- **Venation:** The pattern of veins and veinlets on the leaves is called venation.
- **Veins:** Thread like structures in the leaves forming a network.



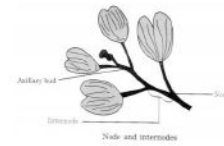
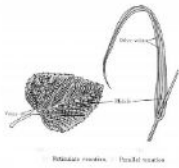
- **Midrib:** It is the thick vein in the middle of the leaf.
- **Types of venation:** Two types of venation are found:
 - **Reticulate:** If the venation is in net like appearance on both sides of midrib, it is called reticulate. For example, peepal.
 - **Parallel:** In the leaves of grasses, the veins and veinlets are parallel to one another. Such a venation is called parallel.

Node: Places where leaves and branches are joined to stem are called nodes.

Internodes: The part of stem between two nodes is called internode.



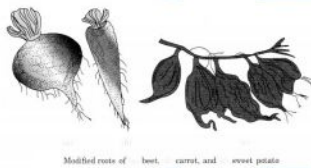
Function of leaves



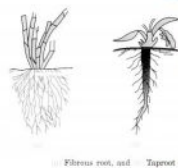
- **Transpiration:** It is the process of evaporation of water from the surface of leaves.
- **Photosynthesis:** Green leaves synthesize food with the help of sunlight, air and water by a process called photosynthesis.

Roots

- Roots are mostly the underground part of the plant.
- They absorb water and mineral from the soil.
- They hold the soil firmly to keep the plant upright.
- Some roots store food and become plump.



- Roots are of two types: fibrous root and taproot.



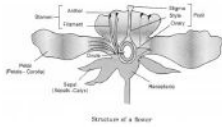
- **Fibrous roots:** In the plants like grass, the branches of the root come out from the base of the stem. Such roots are known as fibrous roots.
- **Taproots:** In some plants, the branches of the root arise from a thick structure under the ground which is called the main or primary root. Such roots are called taproots.
- **Root hair:** The fine hair like structures on the branches of root are root hair.
- **Lateral roots:** The smaller roots on taproot are called lateral roots.
- Plants having leaves with reticulate venation have taproot and plants having leaves with parallel venation have fibrous root.

Flower

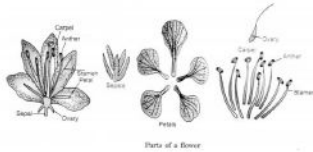
- It is usually the most attractive part of a plant, also called as modified shoot



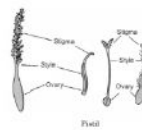
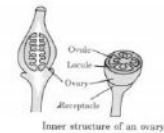
- Sepals, petals, stamens and pistils are the main parts of the flower.



- Parts of a flower are usually present in rings or whorls.
- Pedice:** The stalk that joins a flower to the plant is called the pedicel.



- Sepals:** It is the outermost whorl of the flower. Often they are small, green leaf like structures. They protect the inner parts of a flower while it is still a bud.
- Petals:** Inside the sepals there is the whorl of petals. Different flowers have petals of different colours. Some flowers have sweet smelling petals. With its colour and fragrance, the petals attract not only the human beings but also the insects and the birds.
- Stamens:** These are 4-6 in number and are male reproductive part of a flower. Each stamen is made up of two parts – filament and anther. Anther contains pollen grains.
- Pistil:** It is the innermost part of a flower. Ovary can be divided into three parts: (a) Stigma, (b) Style and (c) Ovary.



Ovary may further be divided into locules. Locules contain ovules.

Conduct: The water and minerals are transported to leaves and other parts of plant attached to the stem.

Petiole: The part of a leaf by which it is attached to the stem is called petiole.

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

Ovules: The small bead like structures inside the ovary are called ovules (see Fig.).

Climbers: Some plants with weak stem need support to go upright. These are called climbers.

Conduct: To carry a substance from one place to other is called to conduct.

Creepers: Some plants with weak stem lie on the ground. These are called creepers. **Fibrous roots:** Roots in which many branches come out from the base of the stem are called fibrous roots.

Herbs: Plants with green and tender stem are called herbs.



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

Lateral roots: Smaller roots which arise from main root in the taproot systems are called lateral roots.

Midrib: The thick vein in the middle of the leaf is called the midrib.

Ovule: Small bead like structures attached in the inner wall of the ovary are called ovules.

Parallel venation: In the leaves of grass, veins are parallel to one another. This is called parallel venation.

Petal: This is the prominent part of the open flower. Different flowers have petals of different colours and of different forms.

Petiole: The part of the leaf by which it is attached to the stem is called petiole.

Photosynthesis: A process by which green plants make their food from sunlight, carbon dioxide and water is called photosynthesis.

Pistil: Innermost part of a flower is called pistil. It is female reproductive part of the flower.

Reticulate venation: When veins and veinlets form a net like design in both sides of midrib, the venation is called reticulate venation.

Sepal: Sepal protects the inner parts of flower when it is a bud.

Shrubs: Some plants have branches arising from the base of the stem to make bushy appearance. The stem is hard but not very thick. They are called shrubs.

Stamen: Stamens are the male reproductive parts of the flower.

Taproot: The root system in which a single root arises from the base of the stem, with secondary and tertiary branches is called a taproot system.

Transpiration: The loss of water in the form of vapours from the stomata on leaves is called transpiration.

Trees: Tall plants with hard, thick and woody stem are called trees.

Veins: Thread like structures in leaf are called veins.

Root Systems : There are two main types of root systems: tap root and fibrous root system.

Tap Root System: In the tap root system (Fig. 8.1), a single root (called the primary root) comes out from the seed after germination. Tap roots are also called true roots.

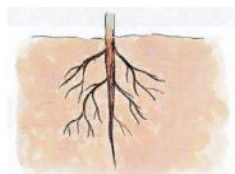


Fig. 8.1 Tap root system



Later, smaller roots called lateral roots branch out from this primary root. Mango, neem, pine, sheesham, pea, carrot, radish, turnip, and beetroot are examples of plants in which tap roots are found.

Fibrous Root System:

Fibrous roots (Fig. 8.2), which grow from the base of the stem have a bushy appearance. These roots are thin and almost equal in size. Grass, maize, wheat, onion, sugarcane, and rice are examples of plants with fibrous roots.



Fig. 8.2 Fibrous root system

Functions of Roots:

Some functions of roots are given below:

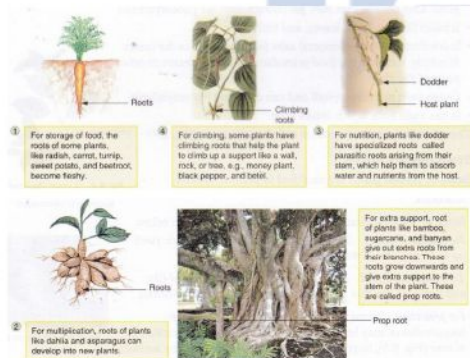
Anchoring the plant Roots help to anchor the plant firmly into the ground.
Absorption of water and nutrients from the soil They help plants to absorb water and nutrients from the soil, which are essential for their survival. Desert plants have relatively longer roots because they penetrate deep into the soil in search of water.

Preventing soil erosion They help to bind the soil particles together, thereby preventing them from being carried away by water or wind.

Sometimes roots are modified to perform various other functions like reproduction, nutrition, etc.

Root Modifications:

Roots of some plants are modified to perform additional functions. Let us study some of these modifications and their functions (Fig. 8.3).



Shoot System:

All parts of a plant that are above the ground form the shoot system. It includes stem, leaf, flower, fruit, etc.

Stem:

The stem is a very important part of the plant.



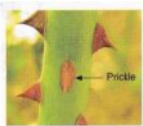
Functions of a Stem:

- It holds leaves in position and helps them to spread out as the stem and its branches grow. This ensures that they get enough light for photosynthesis.
- It bears flowers, buds, leaves, and fruits.
- It conducts water and mineral salts from the roots to the leaves. Similarly, it carries the food manufactured by the leaves to other parts of the plant.
- Green stem has chlorophyll and can carry out photosynthesis.
- It has nodes from which leaves arise. The space between two nodes is called an internode (Fig. 8.4).

**Stem modifications:**

Stems of certain plants are modified to perform special functions.

Some of the modifications and their functions are given below. For storage of water Stems of plants like cactus and jade swell up to store water in them. To manufacture food Stems of some plants become leaf-like and flattened like that of a cactus and perform photosynthesis.



For protection Stems may be modified as thorns, like in bougainvillea or may be in the form of hard and sharp prickles, as in rose (Fig. 8.5), to protect the plant from being eaten by animals.



For support Stems of some climbers like grapes and passion flower are modified to form special structures called tendrils (Fig. 8.6). These help the climber plants like, which have weak stems, attach themselves to others for support. For storage of food Potato, onion, and ginger are modified stems that store food. There are three kinds of underground stems: tubers (e.g., potato), rhizomes (e.g., ginger), and bulbs (e.g., onion and garlic) (Fig. 8.7). For multiplication of the plant Rhizomes, bulbs, and tubers also help in the multiplication of plant. Stem cuttings of some plants like rose, jasmine, and hibiscus grow into new plants.





Fig. 8.7: (a) Taproot, (b) Fibrous root, (c) Stilt root

Leaves:

Leaves are known as food factories of the plant. They arise from at the nodes of the stems and have a characteristic shape and size. Let us study its different parts (Fig. 8.8).

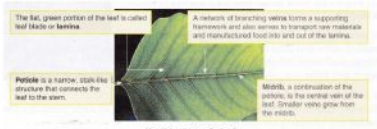


Fig. 8.8: Parts of a leaf

The arrangement of veins in a leaf is termed as venation. Venation is of two types: parallel and reticulate. If the veins run parallel to one another from the base to the tip of the leaf, the leaf is said to have parallel venation, e.g., banana and onion (Fig. 8.9). If the veins are arranged in a net-like pattern on both sides of the midrib the leaf is said to have reticulate venation, e.g., peepal and mango (Fig. 8.10).

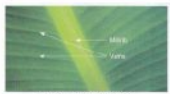


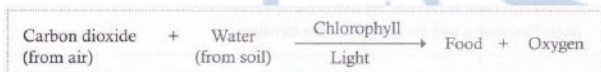
Fig. 8.9: Parallel venation



Fig. 8.10: Reticulate venation

Functions of a leaf:

A leaf performs various important functions for the plant. It is usually green due to the presence of a green pigment called chlorophyll. A leaf prepares food for the plants. The process of making food by the plant using carbon dioxide, water, chlorophyll, and light is called photosynthesis.



Plants store food in the leaves, fruits, and stems in the form of starch. Plants breathe with the help of their leaves. Leaves of most plants have tiny openings called stomata (singular: stoma) (Fig. 8.11) under their surface.

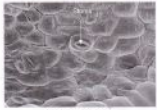
The exchange of gases takes place through the stomata (Fig. 8.12).

Leaves also lose water through the stomata. The loss of water through the stomata is called transpiration. Transpiration helps the plant in the following ways:

It helps in cooling the leaves, just as loss of water during sweating helps in keeping our bodies cool.

During transpiration, more water is 'pulled' upwards from the roots to compensate for the lost water. This water brings along important nutrients from the roots, which are required by the leaf. Thus, transpiration helps in the transport of nutrients within the plant.



Fig. 8.11 Stomata
(as seen under a microscope)Fig. 8.12 An open stoma
(as seen under a microscope)

Leaf modifications:

Leaves of some plants are modified to form special structures called tendrils. Tendrils help plants to attach themselves to a support. Plants having tendrils are generally climbers. For protection, leaves of certain plants get modified to form spines. Spines also reduce the amount of water lost from the plant.

Flowers, Fruits, and Seeds :

A flower is the reproductive organ of a plant. Figure 8.13 shows the parts of a flower.

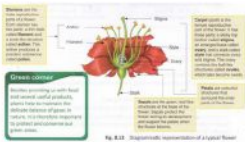


Fig. 8.13 Diagrammatic representation of a typical flower

Pollination :

For a flower to develop into a fruit and form seeds, pollen grains must be transferred from its anthers to the stigma.

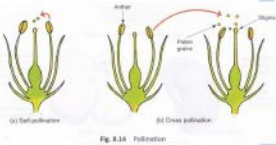


Fig. 8.14 Pollination

The transfer of pollen grains from an anther to a stigma is called pollination (Fig. 8.14). Many flowers are brightly coloured and have a sweet smell to attract insects like bees (Fig. 8.15). When the insect sits on the flower, the pollen grains stick to its body and may get rubbed off when it sits on another flower. This helps in pollination.



Fig. 8.15 Insects as pollinating agents

After pollination, the ovules change into seeds. As seeds (Fig. 8.16) form, the ovary develops into a fruit. Figure 8.17 shows the structure of a bean seed. Under suitable conditions, i.e., availability of sufficient water, air, and warmth, a seed becomes a baby plant.

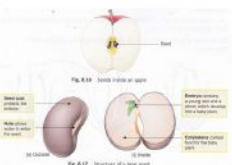


Fig. 8.17 Structure of a bean seed

Node: Part of the stem from where the leaves arise is called a node.



Internode: The distance between two nodes is called the internode.

Venation: The arrangement of veins in a leaf is called venation.

Transpiration: The loss of water through the stomata is called transpiration.

Stamen: Male part of a flower is called the stamen.

Carpel: Female part of a flower is called carpel.

Pollination: Transfer of pollen grains from the anther to the stigma is called pollination.

Seed coat: The outer covering of a seed is called the seed coat.

The parts that remain under the ground (roots) form the root system.

The parts above the ground (stem, leaves, flowers, and fruits) form the shoot system.

There are two main types of root systems: tap root system and fibrous root system.

Roots may be modified for support, storage of food, propagation, etc.

Stems may be modified for support, protection, photosynthesis, food storage, and reproduction.

Leaves are green because they have a green pigment called chlorophyll.

Green leaves manufacture their food with the help of carbon dioxide, water, and light.

Flower is the reproductive organ of a plant. Flowers have petals, sepals, stamens, and carpel.

The pollen grains need to be transferred to the stigma from the anther of the flower for pollination.

The seed has an embryo, which develops into a new plant under suitable conditions.

Chapter 8 Body Movements

Skeletal System

- Bones in our body form the framework that supports the whole body. This framework is called the skeleton.
- Our skeleton is made up of a number of bones and cartilages.
- There are about 650 muscles attached to the various bones in our body.
- The bones are hard and rigid.
- Cartilages are comparatively soft and elastic.



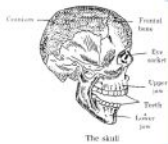
Functions of skeleton

- Skeleton system gives support to the body.
- It protects the inner organs.
- Together with muscles, it gives the body its shape.
- Red blood cells and some white blood cells are produced in the marrow of the bone.

X-ray machine: We can get photographs of bones by a machine called X ray machine. Doctors use these photographs to examine the injuries and diseases of bones. The bones in our body vary in their sizes and shapes. Different types of bones have different functions.

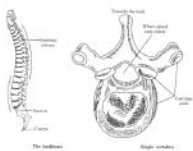
The skull: The skull has two main parts:

- **Cranium:** The bones of cranium are flat. They are held firmly like a zipper. It covers and protects the brain.
- **Facial bones:** The facial bones comprise the upper jaw, lower jaw and few other bones. The lower jaw is movable. The movement of lower jaw enables us to eat, talk and sing.

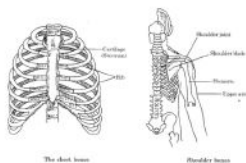


Eye sockets: The skull also includes a pair of eye sockets. These form a safe pocket for eyes.

The backbone: Backbone or vertebral column is composed of 33 small, ring like vertebrae joined end to end. It forms a hollow bony tube. The main nerve cord passes through it.



The Chest bones: 12 pairs of ribs along with backbone make a cone shaped cage, called rib-cage, which protects the heart.

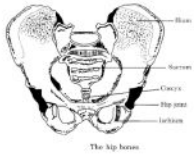


The Shoulder bones: The shoulder bone is formed by the collar bone and the shoulder blade. The shoulder bones are flat and large. They help in forming joints with long bones.

Hip bones: The hip bone is formed by the fusion of three bones. Like shoulder bones, the hip bones are also flat and large. They help in forming



joints with long bones. Together with the last two parts of backbone, it forms a large bony bowl called pelvis.

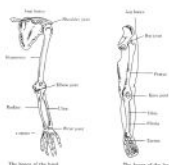


Bones of hands and legs: Bones of arms, thighs, etc., are long. They give strength to our body. Bones of fingers and toes are short. They help us in holding things. The hands and legs are constructed in same pattern as described below: (See Figs).

Part of hand	Part of leg	Number of Bones
Upper arm	Thigh	One long bone
Fore arm	Lower leg	Two long bones
Wrist	Ankle	Several small bones
Palm	Foot	Five bones
Fingers	Toe	Each has three small bones (except thumb, which has two small leaves)

Bone joints: The place where two or more bones meet together is called a joint. In our body, five types of joints are present namely:

- Fixed joints which do not allow movement, e.g., joints of cranium.
- Ball and socket joint allow movement in all directions, e.g., joints between upper arm and shoulder, thigh and hip.
- Pivotal joint allows movement in many planes, e.g., skull makes such joint with first two vertebrae.
- Hinge joints allow movement only in one direction, e.g., fingers, the knee, etc.
- Gliding joints allow only a limited amount of movement, e.g., joints of backbone.



Muscles: The bones are moved by the alternate contractions and relaxations of two sets of muscles.

Tendons: join muscles to the bones.

Ligament: joins two bones.



Bristles: Bristles are hair like structure, connected with muscles. The bristles help to get a good grip on the ground. '

Cavity: It is the hollow space or cavity in one bone, into which the other bone fits. Such joint allows movements in all directions.

Gait of animals: Some animals do not have bones. They have muscles which help to extend and shorten the body. During movement, animal first extends the front part of the body, keeping the rear position fixed to the ground. After that animal fixes the front end and releases the rear end.

Now animal shortens the body and pulls the rear end forward. During this practice, animal moves forward by a small distance.

Rib cage: Ribs join with the chest bone and the backbone together to form a box. This is called rib cage.

Locomotion

There are two kinds of movements:

- The organisms move their body parts without changing their position.
- Animals move from one place to another. This kind of movement is called locomotion.

Locomotion in some Animals

- **Birds** Most of the birds have two kinds of locomotion. They walk with legs on the ground. They also fly in the air. Ducks and swans also swim in water.
- **Flying adaptations:** Streamlined body, bones with air spaces, forelimbs modified into wings, air sacs connected to lungs and massive flight muscles are some adaptations in birds for flying.
- **Fish:** The fish swims by forming loops alternately on the two sides of the body. The tail pushes them forward. The vertebrae and the muscles attached to them work for it.
- **Snakes:** Similarly, the snakes crawl on the ground by alternately looping sideways. A large number of vertebrae and associated muscles push the body forward. The ventral scales also help in the process.
- **Insects:** The body and legs of insects have hard joined coverings, forming an exoskeleton. The muscles of the breast connected with three pairs of legs and two pairs of wings help the cockroach to walk and fly.
- **Snails:** The snails are moved by the muscular foot. The hard unjoined shell have no relation with the foot.



- **Earthworm:** The earthworm moves by alternate extension and contraction of the body affected by the muscles. The minute movable bristles help in gripping the ground.

Backbone: Backbone or vertebral column is composed of 33 small ring like bones called vertebrae. It is a hollow bony tube.

Ball and socket joint: A joint in which rounded end of one bone fits into the cavity of the other bones.

Bristles: Hair like structures projecting out of the body of earthworms. With the help of these, it fixes itself with the ground.

Cartilage: It is the additional part of the skeleton that is not as hard as the bones and which can be bent also.

Cavity: The bowl like part (hollow space) in the shoulder bone allows the rounded end of the arm bone to fit into it to form ball and socket joint.

Fixed joints: Some of the joints allow no movement. These are called fixed joints, e.g., joints in skull and upper jaw.

Gait of animals: Some animals do not have bones. They have muscles which help to extend and shorten the body. During movement, animal first extends the front part of the body, keeping the rear position fixed to the ground. After that animal fixes the front end and releases the rear end.

Now animal shortens the body and pulls the rear end forward. During this practice animal moves forward by a small distance.

Hinge joint: Hinge joint is found in the fingers, elbow and knee. It allows movement only in one direction.

Muscle: Muscles are involved in the movement of bones.

Outer Skeleton: Skeleton found outside the body is called outer skeleton, e.g., hair and nails in human.

Pelvic bones: Bones in the hip region are called pelvic bones.

Pivotal joint: The joint where our neck joins the head is a pivotal joint.

Rib cage: Ribs join the chest bone and the backbone together to form a box. This is called rib cage.

Shoulder bones: The two bones of the shoulders are called shoulder bones.

Skeleton: The framework of the body which is made up of bones and cartilage is called skeleton.

Streamlined: The body shape where body tapers at both ends is called streamlined body, e.g., body of birds and fish.

Chapter 9 The Living Organisms and Their Surroundings

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Aquatic habitat

- When organisms live in water, this place of living is known as aquatic habitat.
- Ponds, lakes, rivers, oceans, etc., are examples of aquatic habitat.
- Water is a medium in aquatic habitat.

Terrestrial habitat

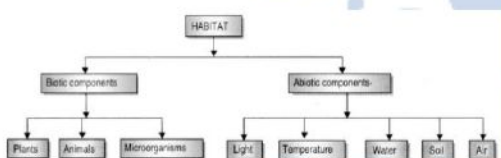
- When organisms live on land, this place of living is known as terrestrial habitat.
- Forests, deserts, orchards, tea gardens and mountains are the examples of terrestrial habitat.
- Air is the medium in terrestrial habitat.

Mountain

- The mountain is a special terrestrial habitat where temperature is very low and most of the areas are covered with snow.
- The plants like grasses, mosses and lichens and animals like snow bear, fox, water fowl, musk deer and wolf are found commonly in this habitat.

Several kinds of plants and animals may share the same habitat.

Adaptation: The change of specific features and habits, which enables a plant or an animal to live in a particular habitat is called adaptation.

Components of a habitat**Light**

- The sunlight is essential for the survival of the biotic components as the sun is the ultimate source of energy for all living things.
- The sunlight affects growth, flowering, seed germination and in many other ways in plants. Indoor plants put in the shade for a long time grow faster but become delicate and weak.
- Light also affects animals. Animals living in caves and burrows where sunlight cannot reach have very much reduced eyes e.g., Proteus. Amblyopsis do not have eyes.
- **Nocturnal animals:** Some animals like bats, cockroaches and owls are called nocturnal as they are active during night.

Temperature

- Temperature regulates growth, movement, reproduction, morphology and other aspects of life.
- Animals living in hot areas e.g., snakes, desert rats and lizards are not able to get sufficient water. They have thick skin and do not sweat.
- Desert animals e.g., camel have long legs. Long legs help them to lift their body above the ground. Thus, they are able to avoid direct contact with the hot ground.

Water

- All living organisms need water for their survival.
- Aquatic plants: These have the following adaptations:
- Root system is poorly developed.
- Air filled cavities found inside the body make them spongy and buoyant.
- Leaves in submerged plants are thin and narrow; while in floating plants, they are big and flat with waxy coating.

Desert plants: These have the following adaptations:

- Well-developed root systems.
- Stem is succulent and spongy which help in storage of water.
- It is also green and performs photosynthesis.
- Stomata (sunken) are less in number.
- Leaves are either very small or converted into spines.

Fish: It has the following adaptation:

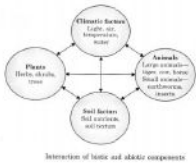
- Tapering ends.
- Slippery scales which help in swimming.
- Gills for respiration.

Phytoplanktons: These are floating plants, in aquatic habitat.

Zooplankton: These are small animals floating on the surface of aquatic habitat.



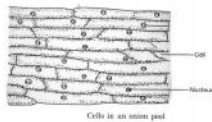
Interaction of biotic and abiotic components: Organisms do not live in isolation but are interdependent.



Living things: These are the objects which need water, air and nutrients for their survival.

Non-living things: These are the objects which do not need water, air and nutrients for their survival.

Cell: It is the basic structural and functional unit of the living things. The structure of a cell can be seen in the peel of an onion bulb or from the lower surface of a leaf under a magnifying glass or a microscope.



Life: It is a process seen only in living objects in the form of growth, movement, feeding or eating, sensitivity, respiration, excretion and reproduction.

Characteristics of the living things: All living things on this earth possess certain basic characteristics. These include the following:

- Growth
- Movement
- Feeding
- Responsiveness
- Excretion
- Respiration
- Cellular structure
- Reproduction
- Adaptation.

Growth: It is defined as the permanent irreversible increase in the size and total weight of the living object.

- Animals grow for a certain period.
- In case of trees, growth takes place throughout the life.
- Growth in plants and animals is influenced by several factors like food, climate, life style, etc.

Life Span: Each animal lives for a certain period. This period is referred to as life span.



Movement: Change in the position from one place to other is called movement.

Locomotion: The movement involving change of place in animals is called locomotion. Animals use wings (bird), fins (fish), limbs (cow, horse, buffalo, man) for locomotion. Plants generally show movements of various parts, e.g., flower buds open, roots grow away from light, when we touch the leaves of mimosa (touch me not), they shrivel up.

Cellular Structure

- Cells constitute plants and animal bodies.
- Cells are organised in various ways in different organisms.
- They help in carrying out various functions like nutrition, respiration, etc.
- They are called structural and functional unit of all living organisms.

Nutrition: The process of taking food by organisms is generally referred to as nutrition or nourishment. Food and water are essential for life. Food provides energy that helps in the growth of body and its repair.

Autotrophs: They are the living forms which can synthesize their own food by photosynthesis, e.g., green plants. **Heterotrophs:** They are the living organisms which cannot manufacture their own food, e.g., all animals. **Saprophytes:** The living organisms which obtain their nutrition from the dead plants and animals are called saprophytes.

Parasites: The plants and animals that feed on the other living bodies are called parasites.

Respiration

- Respiration is a process in which oxygen taken by an organism combines with reserved food, undergoes oxidation and releases energy.
- Breathing: Taking in air and releasing it in animals is referred to as breathing.
- We inhale oxygen (O₂) and exhale carbon dioxide (CO₂).

Excretion

- The removal of excretory waste from the body of a living being is called excretion.
- The process of removal of wastes in plants is referred to as secretion.
- Latex, resin and gum are wastes for the plant but useful for us.

Response to Stimuli



- Living beings respond to changes in their surroundings.
- **Stimuli:** The factors like food, water, light, touch, gravitational force, etc., are stimuli (stimulus) to which plants and animals respond.

Reproduction

- The process of a living being to produce of its own kind is called reproduction.
- Life produces life.
- Plants reproduce through seeds. Some plants also reproduce through vegetative parts.

Adaptation: The change in specific features and habits which enable a plant or an animal to live in a particular habitat is called adaptation.

Aquatic habitat: When organisms live in water, their place of living is known as aquatic habitat.

Biotic component: Living things of a habitat form its biotic component.

Excretion: The removal of nitrogenous waste substances from the body of a living being is called excretion.

Growth: Increase in size and total weight of the living organism is called growth.

Habitat: The place where an organism survives, flourishes and reproduces is called its habitat.

Living things: These are the things which need water, air and nutrients for their survival.

Reproduction: The process of a living being to produce of its own kind is called reproduction.

Respiration: Respiration is a process in which air taken by an organism combines with the reserved food, undergoes oxidation and releases energy.

Stimulus: The factors like food, water, light, touch, gravitational force, etc., are stimuli to which plants and animals respond.

Chapter 10 Motion and Measurement of Distances

In ancient time man used to move only on foot and carry goods either on his back or on the back of some animals.

A great change in the modes of transport was made:

- by the invention of wheel.



- by the invention of steam engine.

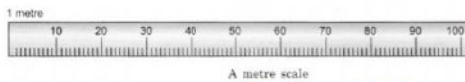
Non-standard measures: The lengths of steps, arms, hands, or fingers of different people are different, therefore the distance measured with their help is not always reliable. These methods are, therefore, called non standard measures.

Standard measures: Measures that are the same all over the world are known as standard measures.

In October 1960, the 12th general conference on weight and measures adopted the International system of units. "The System International Units" is the set of units to maintain uniformity all over the world.

Metre: It is the standard unit of length. The symbol of metre is m.

Each metre (m) is divided into 100 equal divisions, called centimetre (cm).



Each centimetre has ten equal divisions, called millimetre (mm). Thus 1 m = 100 cm

1 cm = 10 mm

For measuring large distances, metre is not a convenient unit. We define a larger unit of length. It is called kilometre (km).

1 km = 1000 m.

Simple multiples of units: Units that are used for the measurement of larger distances are the multiples of SI unit. For example: deca, hecto, kilo.

1 decametre = 10 m

1 hectometre = 100 m

1 kilometre = 1000 m

Sub-multiples of units: Units used for measuring smaller distances are the sub-multiples of SI units.

For example, milli, centi, deci.

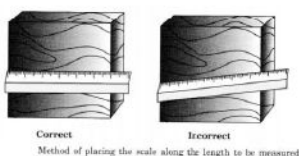
1 m = 10 decimetre

1 m = 100 centimetre

1 m = 1000 millimetre.

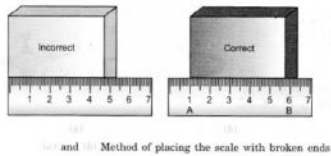
Making measurement of a length: In making measurement of length of an object, we should follow the following procedure:

Place the scale in contact with the object along its length as shown in Fig.



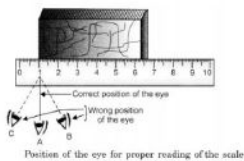
Measurement with a scale with broken ends

- Avoid taking measurements from zero mark.
- Use any other full mark of the scale, say 1.0 cm.
- Subtract the reading of this mark from the reading at the other end. For example, in Fig. 10.3 (6), the reading at starting mark is 1.0 cm and at the other end it is 6.5 cm. Therefore, the length of the object is $(6.5 - 1.0) \text{ cm} = 5.5 \text{ cm}$.



(a) and (b) Method of placing the scale with broken ends

Correct position of the eye is also important for making measurement. Your eye must be exactly above the point where the measurement is to be taken as shown in Fig. 10.4. Position 'A' is the correct position of the eye. Note that from position A', the reading is 1.0 cm. From positions 'B' and 'C', the readings may be different.



Position of the eye for proper reading of the scale

Least count: A scale is marked in centimetres and millimetres. With the scales of this kind we can measure correctly up to one millimetre, that is one-tenth of a centimetre. This is called the least count of a (15 cm) scale.

Measuring the length of a curved line: We cannot measure the length of a curved line directly by using a metre scale. We can use a thread or divider to measure the length of a curved line.

Motion: It is a state of objects in which they are moving, that is, they are changing their place with the changing time.

Rest: All the stationary objects which are not in motion, that is, do not change their place with time are said to be at rest.

Rectilinear motion: When the objects change their position with time along a straight line, this type of motion is called rectilinear motion.

Circular motion

- When a body moves in a circular path, its motion is known as circular motion
- Examples:
 - motion of stone tied in a thread and whirled.
 - motion of a blade of an electric fan.
 - motion of second's hand in a clock.



In circular motion, the object remains at the same distance from a fixed point.



Some objects in circular motion

Rotational motion: Motion in which a whole body moves about an axis is called a rotational motion. Example: motion of a top.



Spinning top

Periodic motion: Motion in which an object repeats its motion after a fixed interval of time is called periodic motion.

Examples:

- Oscillations of a pendulum.
- (Motion of a swing.

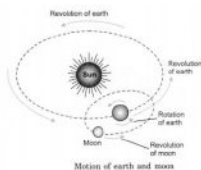


Some objects in periodic motion

Combination of two or more types of motions: In some situations, the motion of an object may be a combination of two or more of the above mentioned types of motion.

Examples:

- Motion of a ball on the ground. Here, the ball is rotating about an axis but the axis itself is moving along a straight line. Thus, the ball executes a rectilinear motion as well as rotational motion.
- Motion of earth—earth executes rotations on its axis and also revolves around the sun.



Unit of measurements

- It involves the comparison of an unknown quantity with some known quantity of the same kind.
- This known fixed quantity is called unit.
- The result of measurement is expressed in two parts. One part is a number; the other part is the unit of measurement.



Circular motion: When a body moves in a circular path, its motion is known as circular motion.

Distance: Measurement of gap between two points in certain units is called distance.

Measurement: Measurement means the comparison of an unknown quantity with some known quantity.

Motion: It is a state of objects in which they are moving that is, they are changing their place with time.

Periodic motion: Motion in which an object repeats its motion after a fixed interval of time is called periodic motion.

Rectilinear motion: When the objects change their position with time along a straight line, this type of motion is called rectilinear motion.

SI units: In October, 1960 the 12th general conference on weight and measures adopted the International system of units to maintain uniformity all over the world. This system of units is called SI units.

Units of measurement: Measurement means the comparison of an unknown quantity with some known quantity. This known fixed quantity is called a unit of measurement.

Chapter 11 Light, Shadows and Reflection

Source of light: An object which emits light, is called a source of light. For example, sun, torch, etc.

Non-luminous objects: These are the objects which do not emit light of their own. Such a body becomes visible when light falls on it. For example, the moon, the planets, etc.

Ray of light: A straight thin beam of light from a source to an object is called a ray of light.

Obstacle: An object which comes to the path of the light is called an obstacle.

Formation of a shadow

- All the opaque objects seem to form a dark shadow of their own.
- We need a source of light, an opaque object in the way, and a screen to see a shadow.
- **Screen:** This is a surface on which the shadow is formed. It may be a butter paper or simply ground.
- Shadows give us some information about shapes of objects.



- The colour of the opaque object does not affect the colour of the shadow.
- All the space behind the opaque object, up to some distance behind it seems to be filled with the shadow.

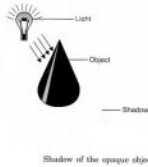
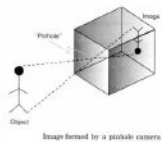


Image formed by a pinhole camera

Images formed by a pinhole camera are upside down. Here is a picture showing the path of rays of light coming from an object far away to a pinhole and then to screen.



When sunlight passes through the leaves of a tree, the gaps between the leaves act as the pinholes. These natural pinholes cast nice round images of the sun.

Rectilinear propagation: Light travels in a straight line. It is called rectilinear propagation of light.

Image formation by a plane mirror: We are able to see images through a mirror. Image formed by a mirror (flat) has following features:

- Reflected image retains the colour of the object.
- Image is erect but laterally inverted.

Lateral inversion: Right side of the object appears as left side in the image formed by a plane mirror. For example, if we show our right hand, image in the mirror will show as left hand.



In a mirror, if you see another person, surely the other person can also see you in that mirror.

Luminous: Objects that give out or emit light of their own are called luminous objects.

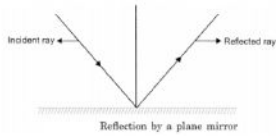
Mirror: A smooth shining surface, which rebounds the light back in same or in different directions is called a mirror.

Opaque objects: If an object completely stops the passage of all the light falling on it, it is an opaque object.



Pinhole camera: It is a device which forms a photograph-like image of a bright object on a screen.

Reflection of light: When a ray of light falls on a smooth and polished surface, light returns back in the same medium. It is called reflection.



Shadow: Opaque objects do not allow light to pass through them and cast dark patches behind them. These dark patches are called shadows.

Translucent objects: Some objects allow only a part of light falling on them to pass through, such objects are called translucent objects. For example, a single thin sheet of paper.

Transparent objects: Those objects which allow all the light to pass through them are called transparent objects.

Sources Of Light

Any object that gives out light is called a source of light. Luminous objects are also called sources of light. Sources of light can be natural or artificial (man-made) (Fig. 13.1).

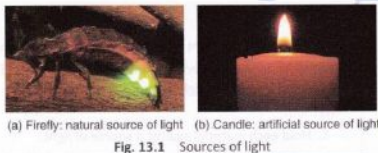


Fig. 13.1 Sources of light

Examples of natural sources of light are 'he sun and other stars and insects like the firefly. Some artificial sources of light are candle, electric bulb, and laser.

Transparent, Translucent, And Opaque Materials :

Different types of materials transmit light differently. Based on the way they transmit light, materials can be divided into transparent, translucent, and opaque materials.

Materials that allow light to pass through significant scattering or absorption [Fig. 13.2(a)] are called transparent materials. We will be able to see through these materials very clearly. Examples of transparent materials are clear air, clear glass, clean water, some kinds of plastic, and cellophane paper.

Materials that allow light to pass through them, but scatter or diffuse the light as it passes through, i.e., a parallel beam of light comes through in all directions are called translucent materials [Fig. 13.2(b)], That is why an object cannot be seen clearly through a translucent material. Examples of translucent materials are butter paper, a frosted glass, paper smeared with oil, and smoked glass.



Materials that completely block light are called opaque materials [Fig. 13.2(c)]. We will not be able to see through these materials at all. Examples of an opaque materials are metal, mud, cement, coal, and wood. A mirror is a very good example of opaque material. An ideal mirror does not let any light pass through it.



Fig. 13.2 Different types of materials

Propagation Of Light

Usually light travels in a straight line. When we want to represent the propagation of light with a diagram, we represent it with the help of rays and beams.

Ray A ray is a line with an arrow that shows the direction of propagation of light, and such a diagram is called a ray diagram.

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

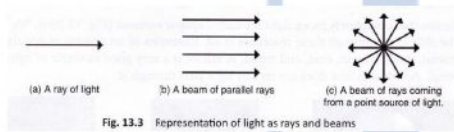


Fig. 13.3 Representation of light as rays and beams

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

Shadows

An opaque object blocks the light falling on it. This creates an area of darkness on the side of the object away from the source of light. A translucent object also creates a faint area of darkness. An area of darkness formed by an opaque object obstructing light is called a shadow. The following three things are required for a shadow to form (Fig. 13.4):

- a source of light
- an opaque object
- a screen or surface behind the object.



Fig. 13.4 Formation of shadow

A shadow will not form if any of these is absent. This explains why we cannot see a shadow in the dark. It is only when light rays are obstructed by an opaque object that we get a shadow of the object.

Let us perform an activity to learn about the characteristics of a shadow.

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Characteristics of a Shadow:

A shadow has the following three characteristics:

- It is always black, regardless of the colour of the object used to make the shadow
- It only shows the shape or outline of the object and not the details.
- The size of a shadow varies depending on the distance between the object and the source of light, and the distance between the object and the screen.

Reflection Surfaces

We say light is reflected when it bounces off a surface. Reflection of light helps us to see most of the things around us. Reflection of light by a surface depends on the nature of the surface. A rough and bumpy surface (also called an irregular surface) reflects a parallel beam of light incident upon it in different directions (Fig. 13.5). A

good example of a rough surface is bark of a tree and blanket. This kind of reflection is called diffused reflection.

A smooth surface (a highly polished surface) reflects a parallel beam of light incident upon it in one direction. (Fig. 13.6). A good example of a smooth surface is a mirror. When you stand in front of a mirror, you can see yourself in the mirror. This is called your image.



Fig. 13.5 Reflection from a rough surface

Fig. 13.6 Reflection from a smooth surface

A very interesting phenomenon occurs when an object forms an image by reflection. This is something all of us must have noticed while seeing ourselves in the mirror. When we lift our right hand, the image in the mirror appears to lift its left hand. This seeming left-right reversal is called lateral inversion.

An image is different from a shadow. Some of the differences between an image and a shadow are given in Table 13.1.

Table 13.1 Differences between the image and the shadow of an object

Image	Shadow
1. Has the colour of the object.	1. Is always black, regardless of the colour of the object.
2. Gives the details as well as the outline of the object.	2. Gives only the outline of the object.
3. Undergoes lateral inversion (i.e., left-right reversal).	3. Does not undergo lateral inversion.

A Pin-hole Camera :

A pin-hole camera is just a box (Fig. 13.7) with a very tiny hole on one of its sides. Light falls on the hole, and an inverted image is formed on the side opposite to the hole. The human eye acts very much like a pin-hole camera.



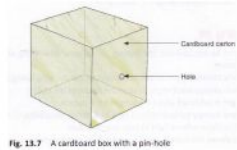


Fig. 13.7 A cardboard box with a pin-hole

Source of light: An object that gives out light (luminous object) is called a source of light.

Transparent material: A material that transmits all the light is called a transparent material.

Translucent material: A material that transmits some amount of light is called a translucent material.

Opaque material: A material that completely blocks the light is called an opaque material.

Shadow: An area of darkness formed by an opaque object obstructing light is called a shadow.

Objects can be transparent, translucent, or opaque, depending on how much light can pass through them.

A shadow is formed when an opaque object blocks the light falling on it. A shadow is always black regardless of the colour of the object. We say light is reflected when it bounces off a surface.

A rough and bumpy surface reflects light in different directions.

A smooth surface reflects light in only one direction.

An image shows the colour, outline, and details of the object.

Chapter 12 Electricity and Circuits

Power station: Electricity that we use at homes, in our factories, is supplied from a power station.

Electric cell: Electric cell is a source of electricity.

Production of electricity in a cell: An electric cell produces a small amount of electricity from chemicals stored inside it. When the chemicals in the electric cells are used up, the electric cells stop producing electricity.

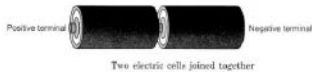
Terminal: All types of electric cells have two terminals, a positive terminal and a negative terminal. In a dry cell used in our homes, the central carbon rod is the positive (+) terminal and the zinc contained is the negative (-) terminal.



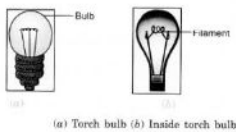
An electric cell

Battery: When two or more cells are joined together, the combination is called a battery.





Bulb: We get light from a thin tiny wire inside the glass cover. This is called filament. It is supported by two thicker wires, as shown in Fig. One of these thick wires is connected to the metal casing around the base of the bulb. The other is connected to the metal tip of the base. The base of the bulb and the metal tip of the base are the two terminals of the bulb. These two terminals are fixed in such a way that they do not touch each other. The inside portion of the bulb is filled up with inert gases, like argon.

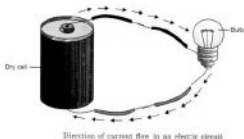


Circuit: The complete path, from one terminal of the electric cell through the bulb and back to the other terminal of the electric cell, is called a circuit.

Open circuit: If there is any gap in the path of a circuit, the bulb does not light up. Such a circuit is called an open circuit.

Closed circuit: The bulb lights up only when a bulb and wire form a complete path, which starts at one terminal of electric cell and ends at the other terminal. Such a circuit is called a closed circuit.

Flow of current in a circuit: As soon as the path from one terminal of electric cell to the other is completed, an electric current starts flowing through the circuit and the bulb lights up. The electric current flows from the positive terminal of the electric cell to its negative terminal.



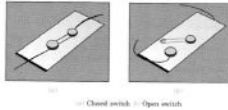
In the bulb, current enters through one of its terminals, flows through the filament inside the bulb and comes out through the other terminal of the bulb. When the current flows through the filament, it starts glowing.

Fused bulb: If the filament of the bulb is broken, the circuit is not completed and hence the current cannot flow. The bulb with broken filament is called a fused bulb. When a bulb gets fused, it does not light up.

Electric switch: Electric switch is a simple device that either breaks the circuit or completes it to stop or start the flow of current.

- When the switch completes the circuit, it is called closed switch.
- When the switch breaks the circuit, it is called open switch.





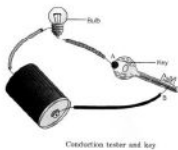
Conductors

- Materials through which electric current can flow are called conductors.
- Most metals are conductors.
- Our body is also a good conductor.

Insulators

- Materials, through which the electric current cannot pass, are called insulators. In other words, insulators are the bad conductors of electricity.
- Rubber and wood are insulators.

Conduction tester: It is a simple device to test whether a material is a conductor or insulator.



Filament: The thin wire that gives off light is called the filament of the bulb.

Dry cell: Dry cell is a source of electricity. It generates direct current (DC) due to chemical reaction that takes place inside it.

Bulb: An electric bulb is a device which glows and emits light, when electric current is passed through it.

Conductors: Materials that allow electric current to pass through them are called conductors.

Electric cell: Electric cell is a source of electricity.

Electric circuit: The complete path from one terminal of the electric cell through the bulb and back to other terminal of the electric cell is called an electric circuit.

Filament: In electric bulb, there is a thin tiny wire inside the glass cover. This is called filament.

Insulator: Materials that do not allow electric current to pass through them are called insulators.

Switch: Electric switch is a simple device that either breaks the circuit or completes it to stop or start the flow of current.

Terminal: All types of electric cells have two terminals, a positive



terminal and a negative terminal.

Life without electricity is difficult to imagine. Many devices and machines in our day-to-day life run on electricity. Look at the pictures given below. Which of these run on electricity? Write their names in the space provided.

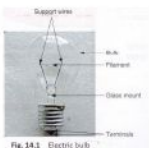


Things that run on electricity have electric current passing through them. In this, chapter, you will learn about electric current, what is needed to produce it, the conditions required to make an electric current flow, and the materials through which current can flow. You will learn some very interesting things like how to make a small bulb glow and how to make an electric switch. Answers: Refrigerator, Fan.

Electric Current

Most of the devices and machines we use like an electric iron, oven, room heater, refrigerator, ceiling fan or an electric bulb work when an electric current flows through them.

With help from an adult, look at what is inside a transparent electric bulb (Fig. 14.1). Among other things, you will see that it has a thin filament (a very thin metal wire). The filament heats up when an electric current is passed through it. It heats up so much that it begins to glow and give out light. Now, we will learn what produces an electric current.



Source Of Electric Current

A device that can be used to produce an electric current is called a source of electric current. Common sources of electric current are cells and batteries (collection of cells) which comes in various shapes and sizes (Fig. 14.2), and electric current that we get from plug points in houses. A very useful kind of cell which we use very often is the dry cell. Due to a chemical reaction that takes place in cells and batteries, electric current is produced. For large-scale production of electricity, flowing water or steam is used.



The Dry Cell:



A dry cell is a very convenient source of electric current. The dry cell, as its name suggests, contains dry or semi-solid ingredients.

Let us take a look inside a dry cell [Fig. 14.3(a and b)].



The dry cell contains a paste of ammonium chloride inside a zinc container. Inside the paste, a cardboard container containing powdered manganese dioxide and carbon is placed. The cardboard container has microscopic 'holes' in it (such materials are called porous materials) through which a chemical reaction takes place between ammonium chloride paste and powdered manganese dioxide. A rod, usually carbon, with a metal cap is dipped into the manganese dioxide. The whole thing is then sealed (with only the metal cap sticking out), so that the contents do not spill out.

The zinc can is also wrapped so that only the base is exposed. Every source of electric current has two ends or terminals where conducting wires are connected to draw electric current. The tip of the metal cap and the base of the zinc can are called the positive and negative terminals of the dry cell, respectively. Electric current can be thought of as 'flowing in' from one terminal and 'flowing out' from the other. If the tip of the metal cap and the base of the zinc can are connected by a metal wire, current will flow through it.

Different Types of Electric Cells: Apart from the simple primary cells like dry cell, there are different types of electric cells. Different cells use different methods for producing an electric current. Primary cells can be used only once, and have to be thrown away once they have been used up.



There are cells that can be recharged once they are drained. These are called secondary cells. They are used in mobile phones, laptops, and car batteries. Nowadays, solar cells are being used in many applications. Solar cells use sunlight to produce electric current. Fig. 14.4 Some devices that work on dry cell.

Many calculators are powered with solar cells. Solar panels made up of solar cells are used to light up streets and many homes.

Flow Of Electric Current

Three basic conditions (Fig. 14.5) are required for an electric current to flow.

- A device used to produce an electric current like cell, battery, or a plug point acting as a source.



- A wire made of a metal like copper, silver, or aluminium, which will allow electric current to flow through easily.
- An unbroken loop (of the wire) running from one terminal of the source, through various appliances, back to the other terminal of the source.

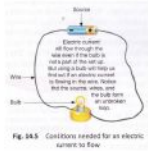


Fig. 14.5 Conditions needed for an electric current to flow

Making a Simple Electric Circuit:

When we connect the terminals of a pencil cell (name given to the cell due to its shape) to a bulb using two wires, the bulb glows. This happens because we provide a path for the current to flow. A path for an electric current to flow is called an electric circuit.

In Figure 14.6(a), one wire from the pencil cell is connected to the torch bulb, while the other wire is not. The electric circuit is not complete here. In Figure 14.6(b), both the wires from the cell are connected to the torch bulb. The electric circuit is complete in this case. Electric current flows only if there is an unbroken path or closed circuit starting from one terminal of the source, through the torch bulb, to the other terminal of the source. Thus, the bulb glows in Figure 14.6(b) but not in Figure 14.6(a).

The circuit in Figure 14.6(a) is not complete. Hence, current cannot flow through the circuit and the bulb does not glow. Such a circuit is called an open circuit. The circuit in Figure 14.6(b) is complete. Electric current flows through the circuit and, as a result, the bulb glows. Such a circuit is called a closed circuit.



Fig. 14.6 (a) Open circuit—the bulb does not glow

Fig. 14.6 (b) Closed circuit—the bulb lights up

Fig. 14.6 Electric circuit

Fig. 14.7 The direction of electric current in the circuit

Electric current flows in a particular direction. In an electric circuit, the electric current flows from the positive terminal to the negative terminal of the electric cell. Figure 14.7 shows the direction of flow of electric current in a circuit.

Electric Switch

We use electric switches (Fig. 14.8) to put on or off the electrical devices and machines. But do you know how it works?

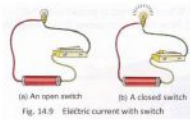


Fig. 14.8 An electric switch

An electric switch is a device that is used to open or close an electric

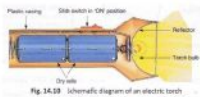


circuit. When we open an electric circuit, the flow of electric current in the circuit stops [Fig. 14.9(a)], and when we close an electric circuit, an electric current flows through it [Fig. 14.9(b)]. In an electrical circuit, a switch is sometimes.



Electric Torch

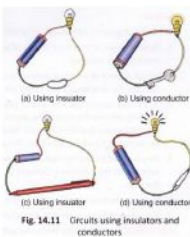
A schematic diagram of an electric torch is shown in Fig. 14.10. An electric torch has one or more dry cells inside it, which act as the 'source'. These cells are connected through a switch to a small bulb. When the switch is pushed to the 'on' position, the circuit is complete and the bulb glows. When the switch is pushed to the 'off' position, the circuit is incomplete (broken). Now the current cannot flow through the circuit, and the light goes out.



Conductors And Insulators

Look at Figures 14.11(a)-(d). Each shows a complete electric circuit. Then why is it that the bulb glows only in circuits (b) and (d)? It is because not all materials allow electric current to pass through them.

A material that allows electric current to pass through it is called a conductor of electricity like the key and the safety pin [Figs. 14.11(b) and (d)]. A material that does not allow electric current to pass through it is called an insulator of electricity like the rubber band and the plastic pen [Figs. 14.11(a) and (c)].



All metals are conductors of electricity while some are better conductors than others. A few non-metals like graphite (pencil lead is made of graphite) are also conductors of electricity.

Examples of insulators are glass, wood, rubber, pure water, and dry air. However, the smallest impurity in water (impurities are substances like salts, dissolved in water) makes it a conductor. The handles of screwdrivers and testers used by electricians are usually made of wood or hard plastic. They also wear rubber gloves while repairing an electric switch to avoid electric shock.



Electrical Safety

Electricity can be very dangerous, if you do not handle electrical devices carefully. One should never play with electrical wires and sockets. Electricity from cells is safe and you can experiment with it, but you have to be careful not to connect the two terminals of a cell directly through a wire/conductor. Electricity generated by portable generators is dangerous and should not be used for experiments.



Source of electric current: A device that can be used to produce an electric current is called a source of electric current.

Electric circuit: A path for an electric current to flow is called an electric circuit.

Closed circuit: A circuit which has an 'unbroken path' through which an electric current can flow is called a closed circuit.

Open circuit: A circuit with a break in it is called an open circuit.

Electric switch: A device that is used to open or close a circuit is called an electric switch.

Conductor (in this chapter): A material that allows electric current to pass through it easily is called conductor.

Insulator (in this chapter): A material that does not allow electric current to pass through it easily is called an insulator.

In a dry cell, a chemical reaction takes place to produce an electric current. A dry cell contains solid or semisolid ingredients.

All cells have two terminals: the positive and the negative terminal.

Electric current flows only if there is an unbroken or complete path, starting from one terminal of the source, through various devices back to the other terminal of the source.

An electric switch is a device that is used to open or close a circuit.

Chapter 13 Fun with Magnets

Natural Magnet: Magnetite is called natural magnet.

Uses of a Magnet: A magnet finds its use at a number of places. For example, refrigerator's door, some pencil boxes, many toys, magnetic stickers, soap stand, pin stand, all make use of a magnet for their functioning.





Shapes of Magnets: Magnets are made of different materials and in different shapes.



Effect of a magnet on materials: A magnet attracts certain materials, whereas some do not get attracted towards magnet.

Magnetic materials: The materials which get attracted towards the magnet are known as magnetic materials, e.g., iron, nickel, cobalt.

Non-magnetic materials: The materials which are not attracted towards the magnet are known as non-magnetic materials, e.g., leather, plastic, cloth, paper. **Magnetic poles:** Magnetic attraction is maximum near the ends of the magnet. These ends are called magnetic poles.



When suspended freely, magnet always aligns in north-south (N-S) direction.



Lode stone: It was a stone used by sailors in olden days to identify directions when they were in sea.

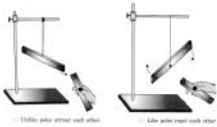
Compass: This is a small glass case containing a magnetised needle pivoted on a nail. The needle can rotate freely. Wherever it is kept, its needle always rests in north-south direction. Normally the north-pole of the needle is painted red or some other indication is given to identify north and south-poles. So using this needle, north and south can be identified.



Attraction between two poles: Opposite poles of two magnets attract each other. It is called attraction.

Repulsion between two poles: Similar poles of two magnets repel each other. It is called repulsion.





Magnetic effect can pass through screen: Magnetic influence can pass through screens of some substances like cloth, plastic, paper, glass, etc. Magnets lose their properties if they are heated, hammered or dropped strongly and hardly.



To keep them safe, bar magnets should be kept in pairs with their unlike poles on the same side. They must be separated by a piece of wood while two pieces of soft iron should be placed across their ends. For horse-shoe magnet, orfe should keep a piece of iron across the poles.



Compass: This is a small glass case containing a magnetised needle pivoted on a nail. The needle can rotate freely and always rests in north south direction.

Magnet: A magnet is a metallic object which attracts iron or magnetic things. **Magnetite:** It is an ore of iron which has magnetic properties.

North pole: When suspended freely, one pole of the magnet always points towards north. This is known as north-pole.

South pole: When suspended freely, the end of a magnet points towards south. This is known as south-pole.



Look at the pictures shown below. Put a V' mark against the object that you think would stick to a magnet and 'x' against the objects that would not stick to a magnet.

Let us now learn more about magnets. Answers : 1. False, 2. True, 3.True, 4.False, 5.False, 6.True.

Discovery Of Magnets

According to a legend, the first magnet was discovered by a Greek shepherd named Magnes. It is said that the nails in his shoes and the iron tip of his staff got stuck to a large black rock on which he was standing. Greeks named this strange type of rock 'magnetite'. The Chinese also knew about magnets. Ancient Chinese sailors used magnets for navigation.



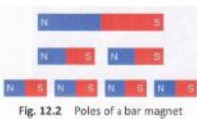
Magnets

Magnets are made of materials that attract objects made of certain substances like iron, cobalt, and nickel. Magnets come in various shapes and sizes (Fig. 12.1). They can be found as horseshoe, ring, cylindrical, or bar shape. Not all objects are attracted to magnets. Objects that are attracted by a magnet are said to be magnetic, e.g., iron and nickel. Objects that are not attracted by a magnet, are said to be non-magnetic, e.g., wood and plastic.



Poles Of a Magnet

When magnetic materials (like iron filings) are brought close to a magnet, they do not stick evenly to all parts of the magnet. They stick more on certain parts of the magnet. These are called the poles of the magnet. Magnetic forces are the strongest at the poles. For example, the two ends of a bar magnet are its poles.



There are two types of poles in every magnet, irrespective of its shape.

These are, by convention, called the North Pole (N) and the South Pole (S) (Fig. 12.2). The two poles cannot exist independently. That is, they always come in pairs. If we break a bar magnet in the middle, we would get two pieces, each having a North Pole and a South Pole. We could go on breaking the magnet into smaller pieces, and everytime we would get both the poles in each piece.

Using a Magnet To Find Directions

Today, we use magnets for various purposes. In ancient times, the primary use of a magnet was to find directions. If a magnet is allowed to move freely, it comes to rest in a direction very close to the Earth's North-South direction. This property of a magnet was

used to find directions on the surface of the Earth by travellers. An instrument with a magnet that is used to find directions is called magnetic compass.

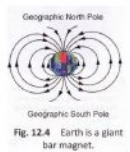
It has a small magnetic needle at its centre. This needle can rotate freely and always points in the Earth's North-South direction. Different directions (north, south, east, and west) are marked on the compass. Figure 12.3 shows how one can find directions using a magnetic compass.



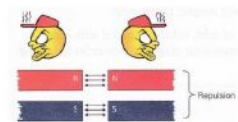
Do you know why a freely suspended magnet always points in the Earth's north-south direction? It behaves like it is under the influence of another magnet. But where is this other magnet? It is the Earth itself. This alignment happens because of the influence of the Earth, which itself acts like a giant bar magnet (Fig. 12.4). It influences all the magnets (within its region of influence) to align themselves along its North-South direction.

Attraction And Repulsion

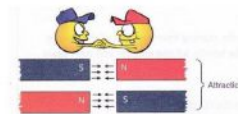
When two magnets are brought close to each other, they are either pulled towards each other, or pushed away from each other. When the magnets are pulled towards each other, they are said to attract each other. When they are pushed away from each other, they are said to repel each other. Whether the magnets attract or repel depends on which poles of the magnets are facing each other.



When like poles of the magnets (N-N or S-S) are brought close to each other, they repel. This is called repulsion.



When unlike poles of the magnets (N-S or S-N) are brought close to each other, they attract. This is called attraction.



Types Of Magnets

There are two types of magnets: temporary and permanent. Magnets that retain their magnetic properties only for a short period of time are called temporary magnets. Magnets that retain their magnetic properties for a long period of time are called permanent magnets.

Temporary magnets are usually made of iron, cobalt, or nickel. These materials behave like magnets only when they are near a strong magnet. They quickly lose their magnetic property if the influence of the strong magnet is removed.

Permanent magnets are made from mixtures of iron, cobalt, or nickel with other materials. These make strong magnets and retain their magnetic properties for a long time.

Care Of Magnets

A magnet can lose its properties due to the following activities.



- Dropping from a height
- Hitting with a hammer
- Applying heat
- Improper storage can also cause loss of magnetic properties.



Bar magnets should be stored in pairs, with Dropping from a height unlike poles alongside each other. A horseshoe magnet should be stored with a piece of soft iron kept across its poles.

Uses Of Magnets

Magnets have several uses:

- Credit cards, ATM cards, and identity cards have a strip of magnetic material that stores information.
- Television and computer monitors use magnets.
- Computer hard discs and audio and video cassettes have magnetic material that store information.
- Magnets are used in picking up substances made of iron from scrapyards.



Magnet: An object that attracts substances like iron, cobalt, and nickel is called magnet.

Magnetic compass An instrument with a magnet that is used to find directions is called magnetic compass.

Temporary magnets: Magnets that retain their magnetic properties only for a short period of time are called temporary magnets.

Permanent magnets: Magnets that retain their magnetic properties for a long period of time are called permanent magnets.

Only magnetic materials are attracted by magnets.

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

Magnetic forces are the strongest at the poles of the magnet. A freely suspended magnet will come to rest in the Earth's North-South

direction. Like poles of two magnets repel each other. Unlike poles of two magnets attract each other. Magnets can lose their properties if they are dropped from a height, hit with a hammer, heated, or stored in an improper manner.

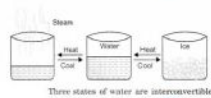


Chapter 14 Water

Water cycle: It is circulation of water through the process of evaporation or condensation as rain or snowfall. Water cycle is like a ring. In nature, the water cycle takes place from sea to land and back to sea again.

Three States of Water

- Water can exist in all the three states – solid, liquid and gas.
- **Liquid state:** The water that we use in everyday life is a liquid. It is called liquid state of water.
- **Gaseous state:** We have learnt that on heating, water evaporates to form its vapour. Water vapour is its gaseous state.
- **Solid state:** Water turns into ice on cooling. Ice is the solid form of water.
- These three states of water are interconvertible to each other, that is, we can change it from one state to another.



- The easy interconvertibility of water from one state to other makes its availability in all parts of the earth and throughout the year.



Evaporation

- The process of changing water to its vapour form is known as evaporation.
- Evaporation takes place from open surfaces of water all the time – day and night.
- Evaporation of water takes place continuously from oceans, rivers, lakes, wells and soil. Oceans, seas, rivers, lakes, ponds and wells together are often known as water bodies.
- During the day time, sunlight falls on the water in oceans, rivers, lakes. The fields, roads, rooftops and other land areas also receive sunlight. The sunlight also carries heat with it. As a result, water from oceans, rivers, lakes and the soil, and other land areas gets continuously changed into vapour.
- Thus, water vapour gets continuously added to air due to evaporation.

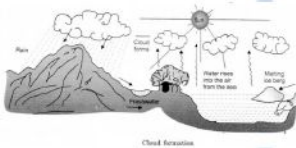
Transpiration



- **Transpiration:** It is the loss of water from the leaves of plants in the form of vapour.
- Every plant, whether it is in a crop field, a forest, on the roadside or in a kitchen garden, transpires to give off water vapour. The amount of water vapour that goes into air through the process of transpiration is very huge.

Condensation

- **Condensation:** The process of conversion of vapour into liquid form of water is called condensation.
- The process of condensation is opposite to evaporation.
- **Cloud formation:** The climate close to the earth's surface is warm. It gets cooled as one goes up in atmosphere. Water vapour being lighter, rises up in the atmosphere. At the upper layer of atmosphere, where the temperature is lower, the vapour gets condensed into tiny water droplets and forms clouds.



Precipitation

- **Precipitation:** Clouds carry small droplets of water in them. It may so happen that many droplets of water come together to form larger sized drops of water. Such drops of water may become so heavy that they begin to fall. Falling of water drops is called precipitation.
- **Rain:** If the water during precipitation remains liquid till it reaches the surface of the earth, we have rains.
- **Hail/Snow:** Sometimes precipitation may be in the form of hail or snow. Water in a hail or snow is in its frozen or solid form.
- **Dew:** Many times, especially during winter nights, the air near the surface becomes quite cool. As a result, the water vapour present in it condenses to form water droplets. These water droplets appear as dew.

Water Back to Ocean

The water that falls on the land as rain and snow sooner or later goes back to oceans. This may happen in many ways.

Uses of Water

- It is needed for drinking, bathing, washing, cleaning of vessels, toilets, flushing, etc.



- Our body contains about 70 per cent of water. Therefore, water is essential for our life.
- Water helps animals and plants to cool.
- Water is essential for the germination of seeds.
- Water is required for irrigation of the crops.
- Water is used to generate electricity.
- Water wheel is used to run flour mills.
- Water is used in many industries, like paper, rayon, petroleum refining, fertilizers, dyes, drugs and other chemical industries.
- Water is used in car radiators to keep the engine cool.
- In cold countries, people use water to warm their houses.
- Water is used to keep the things cool.

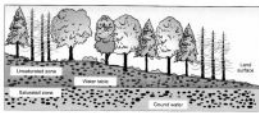
Sources of Water

Rivers and springs: Most of the water which human beings use for drinking, washing and farming comes from rivers and springs. The river flows down the mountain side and across the land, finally flowing into a sea or an ocean.

Oceans and seas: Most of the water on the earth is found in the oceans and seas. However, the water found in the oceans and seas is not fit for drinking or agricultural purposes as it contains large amount of salt. However, ocean acts as a habitat for large number of plants and animals.

Snow: Some regions of the earth are covered with snow especially during winters. Water formed by melting of snow is another source of water. This snow melts slowly. Sometimes this water flows down in the form of streams and rivers. Streams and rivers are another sources of water.

Groundwater: The ground water is actually rainwater which mainly comes from seepage of water accumulated under the ground. Figure 14.3 shows the accumulation of groundwater.



Water table: If you take soil from ground, it has air as well as water. As you go down, the amount of water increases and air decreases. A level below surface, where it is only water, is called the water table.

Lakes and ponds: These are small reservoirs of water. These are created by Collection of rainwater in low lying areas. Seepage from the groundwater reserves also adds to the water in lakes and ponds.



Rain: The rain is a very important source of water for us. All resources of water are fed mainly by rains.

Natural Calamities

The conditions of flooding and drought are called natural calamities.

Drought: If it does not rain for a year or more at a place, the soil will lose its water by evaporation and becomes dry. Water will also be lost through transpiration process from the plants. Rivers, ponds and wells will dry and the water table would lower down. All this will affect the humans, animals and wild plants. If it continues for one or two years consecutively, it results into drought.

Consequences of drought: The result of drought may be no crops. The availability of food and fodder will decrease. The overall consequence of such a situation will lead to loss of life of humans and animals.

Flood: In case of continuous rains, the water level of rivers, lakes and ponds will rise. The soil surface will get laden with water resulting into flood. **Consequences of flood:** When the soil gets too much of water, air in the soil comes out of it. Due to lack of air, the animals living inside the soil also come out of it. Heavy rainfall also results in the loss of crops due to flood.

Factors responsible for flood: A number of factors are responsible for flood. These factors can be intensity and duration of rainfall, soil condition and presence of plants or trees on the ground.

Water Conservation

- It is very important that water should be used carefully. We should take care that water should not get wasted.
- It is not necessary that the water used in the garden is fit for drinking. Yet most often we water the gardens with drinking water supplied by the corporation. We should use water for gardening that has already been used in the kitchen for washing vegetables and fruits, etc.
- Always be careful that the water tank in your house doesn't overflow when it is being filled.
- Don't use a hose pipe to wash your car or scooter. Use a bucket instead.
- If you leave the tap running while brushing your teeth, about 16 litres of water get used up. Fill a mug with water and use instead.

Rainwater Harvesting

- Water harvesting is the activity of collection of rainwater directly by various means.



- Harvested water can either be used immediately or it can be stored for later use.
- In Kerala and Mizoram, where it rains almost the whole year round, small tanks are used to collect rainwater, which drains from rooftops through pipes into these tanks. This water is used directly.
- In a place like Delhi where the monsoon lasts only for 3 months, it is more useful to collect rainwater as ground water.



Water vapour: The gaseous form of water is called water vapour.

Clouds: When water vapour goes up where temperature is low it gets condensed into tiny water droplets and forms clouds.

Condensation: The process of conversion of vapour into liquid form of water is called condensation.

Drought: If it does not rain for one or two years consecutively at a place, it is known as drought.

Evaporation: Process of conversion of water into water vapour is called evaporation.

Flood: In case of continuous rains for long time at a place, it will result into the rise in the water level of rivers, lakes and ponds. The soil surface will get laden with water resulting into flood.

Groundwater: The groundwater is actually rainwater which mainly comes from seepage of water, accumulated under the ground.

Hail: Sometimes during precipitation of water droplets, water freezes, and takes the form of hail.

Ocean: Ocean is the biggest body of water surrounding the globe.

Rainwater harvesting: Rainwater harvesting is the activity of collection of rainwater by various means.

Snow: It is the condition similar to the formation of hail.

Water vapour: Water exists in three forms – solid, liquid and gas.

Gaseous form of the water is called water vapour.

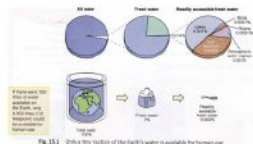
Water cycle: It is the circulation of water through the process of evaporation and rain or snowfall.

Water Available For Use



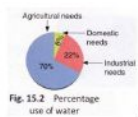
About three-fourth of the Earth's surface is covered with water. That is why it is also called the water planet. But do you know how much water is readily available for use? Most of the water (about 97%) is in the seas and oceans as salt water. This water is too salty to be used for drinking and irrigation. Thus, only a tiny fraction (about 3%) of the Earth's water is available to us as freshwater. Out of this, 2.997% is locked up in the mountains or glaciers or is buried so deep under that it costs too much to extract.

So, only about 0.003% of the fresh water is easily available to us in the form of groundwater, river, lake, stream, soil moisture, and water vapour. See Figure 15.1.



Uses Of Water

Besides being essential for life, water is used for many other purposes. In India, about 70% of the total water available is used for agriculture, 20-22% by industries and only 8% is used for personal or domestic needs. Figure 15.2 shows a pie chart that gives the percentage use of water. Let us learn more about the various uses of water.



Agricultural needs Our country depends a lot on agriculture.

Farmers rely on water to sustain their agricultural crops, e.g., wheat, paddy, etc. Many times, rainfall is not sufficient to water these crops, and farmers have to use artificial watering systems, referred to as irrigation.



Fig. 15.3: Agricultural needs

Industrial needs Factories use a large amount of water every day – as raw material, for cleaning, heating, cooling, generating electricity (e.g., water turbines), etc. The amount of required depends on the kind and size of the factory, and water.

Personal/domestic needs We need water to drink. Water that is suitable for drinking is called potable water. We also need water to bathe, wash clothes and dishes, clean our house, and to water plants. Apart from these uses, water is also used for transportation and recreation (Fig. 15.6). It also regulates the climate of a place and provides homes to many animals.



Fig. 15.4: Water turbines



Fig. 15.5: Personal needs



Fig. 15.6: Boat race is one of the favourite sports



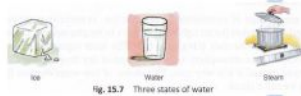
Different States Of Water

In nature, water exists in three states. It could be in the form of liquid (e.g., rain, river, sea), solid (e.g., ice, snow, hail), or gas (e.g., water vapour) (Fig. 15.7).

You can heat water over a stove to convert it into vapour. What happens if you leave water in an uncovered vessel on a summer afternoon outside your house? After a few hours, you will find that the level of water in the vessel has decreased. This is because a lot of it would have escaped into the atmosphere in the form of water vapour. The process by which a liquid is converted to its vapour is called evaporation.

What about the reverse process? The process by which the vapour of a substance is converted to its liquid form is called condensation. Water vapour is also added into the air by the leaves of plants, through the process of transpiration.

Evaporation and condensation of water take place on a very large scale on the surface of the Earth and its atmosphere. These processes play a key role in cloud formation and rain.



Cloud Formation

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

Water Cycle

Water droplets in the clouds keep bumping against one another and sometimes stick to form bigger drops. When these drops become too heavy to float in the air, they drop down back to the Earth as rain. The water that comes down as rain, in time, evaporates and goes up to form clouds again. This leads to forming a cycle, known as the water cycle. The water cycle is the cyclic movement of water from the atmosphere to the Earth and back to the atmosphere through various processes. Figure 15.9 shows how the water cycle works.



Evaporation Sun's heat changes the water in oceans, rivers, ponds, and other water bodies into water vapour. **Transpiration** Plants give off water vapour through their leaves.

Condensation Water vapour rises up and condenses on dust particles to form clouds. **Precipitation** Water stored in clouds reaches Earth in the form of rain, snow, etc.

Collection Some rainwater seeps into the ground, forming groundwater. Rainwater also flows into streams and rivers and then finds its way into seas and oceans.

Drought

Sometimes it does not rain for a long time – for an entire month, two months, the whole season, two years, etc. The abnormally long period of insufficient or no rainfall at all is called drought. During drought, rivers run dry, the water level in lakes goes down, and even the water in the soil dries up (Fig. 15.10).



Fig. 15.10 Result of drought

There is very little or no water available during a drought. Most plants die leading to a lack of food in the region. The lack of food in a region for a long period is called famine. When there are no plants, animals that survive on plants also die. Animals and humans also die due to thirst and dehydration (excessive loss of water from the body).

Flood

Just as too little rain is bad, too much rain is bad as well. It leads to water being everywhere, sometimes the entire area remains under water or submerged. A condition when the ground becomes submerged under water, due to heavy rain and overflowing of rivers is called flood. During a flood, plants and crops die either due to suffocation by excess water or due to the soil being washed away, robbing their roots of support.



Fig. 15.11 Result of flood

In such waterlogged conditions, many disease-causing germs start multiplying and cause water-borne diseases. Sometimes water-borne diseases affect thousands of people at the same time. A disease affecting thousands of people at the same time is called an epidemic.

A flood can thus lead to many conditions – disease, starvation, loss of life, and property. A flood also can have the same effect on the food chain as



a drought does. Both drought and flood are natural disasters – unfortunate events brought about by nature – that can have a very strong effect on the lives of people.

The economy of a country can crumble as a result of the loss of property and life and many more things. But we can and must try to reduce the bad effects of these disasters as much as possible. We must understand that such things can happen, and so we must be prepared to face them as and when they happen.

Conservation Of Water

Since only a small percentage of water on our planet is usable, it is very important that we use water carefully. Conservation of water can be done by building dams, avoiding wastage of water at homes, both indoors and outdoors, harvesting rainwater, and preventing pollution of water.

Building Dam

A dam is a structure built to hold back water in order to prevent floods, and to provide water for irrigation and storage. Building a dam is a solution to both drought and flood (Fig. 15.12).



Fig. 15.12 A dam

Dams are also used in producing electricity. Built on rivers, a dam has high walls and has many openings or gates to both let in and hold back water. During heavy rainfall, when the rivers fill up, water enters the dam. When water is needed later, the gates are opened to let out water.

Avoiding Wastage at Homes

Some ways to avoid wastage of water at homes are given below.



Fig. 15.13 Water conservation at home

Rainwater Harvesting:

The process of collecting and storing rainwater from roofs or a surface catchment is called rainwater harvesting (fig. 15.14). Storing rainwater that collects on roofs instead of letting it go down the drain, is a practical solution in case of droughts. This technique is known as rooftop rainwater harvesting. This involves collecting rainwater from rooftops in dugout ponds, vessels, or underground tanks to store water for long periods.

Another option is to allow water to go into the ground directly from the roadside drains that collect rainwater. The stored rainwater is treated



before use because it may contain bird faeces, chemicals, and other pollutants, which need to be removed before use.



Fig. 15.14 Rainwater harvesting

Preventing Water Pollution:

Another method to conserve water is to safeguard our freshwater bodies from pollution. Garbage and harmful chemicals pollute the water and make it unfit for use. Polluted water (Fig. 15.15) is also very bad for aquatic life. Plants and animals in and around polluted water may die or get infected. And when human beings consume contaminated fish, etc., they are also put at risk of diseases.



Fig. 15.15 Water pollution caused by harmful chemicals and garbage

Saltwater: Water of the seas and oceans that has high salt content, making it unfit for drinking and irrigation, is called salt water.

Freshwater: Water found in rivers, lakes, and ponds used for domestic and commercial purposes is called fresh water.

Irrigation: Watering crops by artificial means is called irrigation.

Potable water: Water fit for human consumption is called potable water.

Transpiration: The release of water vapour into the atmosphere through the leaves of plants is called transpiration.

Water cycle: The cyclic movement of water from the atmosphere to the Earth and back to the atmosphere through various processes is called the water cycle.

Drought: Abnormally long period of insufficient or no rainfall is called drought.

Famine: Lack of food in a region for a long period is called famine.

Flood: A condition when the ground becomes submerged under water, due to heavy rain and overflowing of rivers is called flood.

Epidemic: A disease affecting thousands of people at the same time is called an epidemic.

Dam: A structure built on a river to store and hold back water is called a dam.

Rainwater harvesting: The process of collecting and storing rainwater from roofs or a surface catchment is called rainwater harvesting.

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Only a tiny fraction of the Earth's water is available as fresh water. All living things have a lot of water in their body. Almost 70% of our body weight contains water.

We need water for many purposes—drinking, personal needs, agricultural needs, industrial needs, for transportation and recreation, and regulating the climate. It is home to various plants and animals.

Water exists in solid, liquid, and gaseous states. Evaporation and condensation play an important role in cloud formation. The water cycle is the cyclic movement of water from the atmosphere to the Earth and back to the atmosphere through various processes.

The abnormally long period of insufficient or no rainfall is known as drought. When there is too much rainfall in an area, rivers overflow and water cover all the area around. This is called a flood. A flood can cause great destruction. Rainwater harvesting is one of the ways to conserve water.

Chapter 15 Air Around Us

Wind: When air is in motion, it is called wind.

Air: Air is a mixture of different gases.

Properties of air

- It is colourless i.e., it has no colour and taste.
- It is transparent i.e., we can see through it.

Air occupies space. It fills all the space in a container which is otherwise empty and seems to be empty.

Air exerts pressure in all directions. All living organisms require air for their survival because it contains O₂ (oxygen gas) and CO₂ (carbon dioxide gas) as parts of its mixture.

Smoke: These are the dark-coloured gases caused by burning of anything.

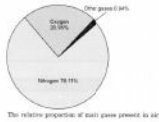
Weathercock: It shows the direction in which the air is moving at that place.



Composition of Air

- Air is not one substance but is a mixture.
- Air is a mixture of some gases, water vapour and dust particles.
- The gases in the air are mainly nitrogen, oxygen, a small amount of carbon dioxide and some other gases.





Water vapours

- Air contains water vapours.
- When air comes in contact with a cool surface, it gets cooled and fog appears.
- The presence of water vapour in the air is important for the water cycle in nature.

Dust particles

- Air contains dust particles.
- The presence of dust particles in air varies from place to place and time to time.

Oxygen

- The component of air that supports burning is called oxygen.
- Oxygen is necessary for the survival of all living beings. It is required in respiration.
- Percentage of oxygen in the air is around 20.95%.

Nitrogen

- The major part of the air is nitrogen. It takes up four-fifth of the space (be around 78.11%) that air fills.
- Nitrogen does not support burning.

Carbon dioxide

- Carbon dioxide makes up a small component (0.03%) of air around us.
- It causes a feeling of suffocation.
- All materials, when they burn consume oxygen and produce carbon dioxide.
- It is also produced along with water vapour during respiration.
- Plants need carbon dioxide for photosynthesis and to live.

Atmosphere

- Our earth is surrounded by air in the form of a thin layer. This thin layer is called the atmosphere.
- The atmosphere extends up to several kilometres.
- The air becomes thinner and thinner as we go high up from the surface of the earth.



- The atmosphere is quite active due to the movement of air, with respect to the earth.
- The processes like cloud formation, thundering, rain etc., occur in the atmosphere.

Uses of Air

- Air exerts force on objects that come in its way. This property of air is quite useful.
- Fun like firkins, pinwheel is based on the force applied by air.



- The air current makes the windmills to rotate.



- Air helps in the movements of sailing yachts, sliders, parachutes and aircraft.
- Air also helps in dispersal of seeds and pollens of flowers.
- Compressed air is used in tyres of vehicles.
- Nitrogen is used on a large scale to manufacture fertilizers.
- Winnowing is possible only because of the air.
- Air is also useful for playing several musical instruments.
- Birds, bats and many insects fly in the air.
- We cannot hear the sounds in the absence of air.
- Various components of air play various important roles.

Atmosphere: The envelope of air that surrounds the earth is known as the atmosphere.

Carbon Dioxide: Carbon dioxide is a gas produced during respiration. It is also produced on burning of organic substances. It is used by plants for photosynthesis.

Composition of Air: Air is a mixture of nitrogen, oxygen, carbon dioxide, water vapour and a few other gases.

Oxygen: Oxygen supports burning and is necessary for living organisms.

Nitrogen: It is the major portion of our atmosphere.

Smoke: These are the dark-coloured mixture of gases produced due to the burning of anything.



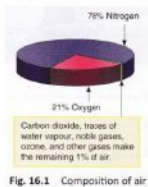
Windmill: Windmill is a huge apparatus which is rotated by wind. It is used to draw water from tube wells and to run flour mills.

Air is all Around Us

A thick blanket of air, called the atmosphere, surrounds our Earth. Air is also present in things which seem to be empty. Let us find this out by doing an activity.

Composition Of Air

It contains mainly nitrogen and oxygen. It also contains carbon dioxide, noble gases, water vapour, dust particles, and traces of other gases. The composition of air is shown in Figure 16.1. Let us now verify the presence of some constituents of air.



Nitrogen and Oxygen :

Air contains about 78% nitrogen and 21% oxygen. Oxygen in air supports burning whereas nitrogen does not. Let us prove this by doing a simple activity.

Carbon Dioxide:

Air contains about 0.03% of carbon dioxide. Plants and animals take in oxygen and give out carbon dioxide during respiration. When you burn something, carbon dioxide is also produced.

Water Vapour:

Air contains varying amounts of water vapour depending on the weather of a place. You have learnt about the water cycle. The sun heats up the water in the seas and oceans. This water evaporates and forms water vapour. You can verify the presence of water vapour in air by observing wet clothes drying on a clothesline (Fig. 16.2). Where does the water from these wet clothes disappear? The water from the wet clothes forms water vapour and mixes with

the air.



Fig. 16.2 Air contains water vapour.

Dust and Smoke:

Have you seen sun rays entering a dark room? Have you noticed tiny particles in the rays? These are dust particles. Air contains dust. Air also contains smoke released from factories and vehicles (Fig. 16.3).





Fig. 16.3 Air contains dust and smoke.

Air Supports Life

We all need air to survive. Air contains oxygen and carbon dioxide useful to plants and animals. Plants use carbon dioxide of the air to make their own food by a process called photosynthesis. Let us see how air supports life in plants and animals.



Fig. 16.4 Stomata on the underside of a leaf

In Plants:

Plants have tiny pores called stomata, found on the underside of a leaf (Fig. 16.4). Air containing carbon dioxide and oxygen enters the plant through these openings where it gets used in photosynthesis and respiration.

In Animals:

All animals need to respire, be it a cockroach, a fish, or an elephant. It is just that they use different organs and mechanisms for respiration. Sometimes, we wrongly use the terms of breathing and respiration interchangeably. Breathing is a physical act of taking in oxygen and giving out carbon dioxide, whereas respiration is a chemical process by which glucose in the body breaks down to give energy.



In Aquatic Animals and Plants:

Most aquatic animals like fish, tadpole, crab, and shrimp have special organs for respiration called gills. Gills help to take in oxygen and give out carbon dioxide. Some aquatic animals

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



Aquatic plants like Hydrilla also breathe in oxygen dissolved in water through their stomata.

In Amphibians:



Amphibians like frog, newt, and salamander need breathing systems for both air and water. Crocodile and alligator swim through water with part of their snout above the water surface

to breathe easily through nostrils.



In Birds:

Birds have an efficient respiratory system as they need high levels of oxygen during flight. Birds have a pair of lungs with air sacs that remain open all the time, so that air can easily pass through them.



In Mammals:

Most mammals breathe with the help of lungs. They take in oxygen and give out carbon dioxide.

Balance Of Oxygen And Carbon Dioxide In The Air

The balance of oxygen and carbon dioxide in the atmosphere is maintained through respiration in plants and animals and by photosynthesis in plants. Plants produce oxygen during photosynthesis and utilize oxygen during respiration. They produce much more oxygen during photosynthesis than they consume, during respiration. This is how the oxygen consumed by plants and to a large extent by animals is replenished in the air through photosynthesis.

Air Pollution

The addition of substances in the environment in quantities that are harmful to live beings is called pollution. Air is getting polluted day by day because of various human activities. Burning of fuels like coal and petroleum, excessive burning of fuels like wood, smoke and harmful gases released from industries (Fig. 16.5), smoke released by vehicles (Fig. 16.6), and machines releasing gases are the major causes of air pollution. These gases spread and mix in the air and spoil the quality of air, thereby making it impure.



Fig. 16.5 Industrial pollution



Fig. 16.6 Vehicular pollution



Air pollution has major adverse effects on plants, animals as well as human beings. Harmful gases present in the polluted air make breathing difficult. Air pollution also leads to a lot of

lung disease like asthma and lung cancer. Air pollution also damages crops. If we do not start looking after the quality of air around us, the oxygen and carbon dioxide levels will no longer be balanced and living beings will be the ones getting affected.

There are a number of ways by which we can reduce air pollution. Some of them are: planting more and more trees, recycling plastics, regular checking of vehicles for the emission of harmful gases, etc.

Atmosphere: A thick blanket of air Pollution The addition of substances in the surrounding the Earth's surface is called the environment in quantities that are the harmful atmosphere. to

living beings is called pollution.

All living organisms need air to survive. Air cannot be seen but can be felt when it moves. Air is a mixture of several gases. Oxygen is needed for respiration. Carbon dioxide is given out as a by-product after respiration.

Insects take in air with the help of tiny holes in their bodies called spiracles; earthworm breathes through their skin, which is kept moist with the help of a substance called mucus. Some aquatic animals like whale and dolphin as well as mammals breathe with the help of lungs.

Amphibians like frog breathe with the help of lungs, when on land. In water, these animals breathe with the help of their moist skin.

Birds breathe through lungs and air sacs that are open all the time.

There are several causes of air pollution: excessive burning of fuels like wood, coal, and petroleum, machines releasing gases, vehicles releasing smoke, and several types of harmful gases released by industries.

Chapter 16 Garbage In Garbage Out

Dumping of wastes: We sweep houses, shops and other places, collect the dirt and other waste materials in the polythene and throw it either in a drain or at the corner of the street.

The heaps of rubbish material not only spread dirtiness but also provide shelter to houseflies, mosquitoes, microorganisms, bacteria and other disease-carrying living organisms.

Hospital waste includes bandages, cotton impulse, injection bottles, tablet wrappers, cut out plaster, syringes, glucose bottles, needles, papers, corks, instruments, tubes, fruit peelings and seeds.



Mostly wastes are used for filling the low lying areas. These things pollute the soil and are responsible for several fatal diseases.

Many people sort out syringes, tubes, needles and other reusable instruments, wash them and reuse them which become the cause of many diseases.

The filling materials diffuse in the soil and pollute the soil.

Dustbins: The utensil or space where the waste material is collected is called dustbin.

Green dustbins: Generally we use green dustbin for collecting biodegradable waste.

Blue dustbins: The non-biodegradable wastes which do not decompose naturally are kept in blue dustbin.

Biodegradable waste: The waste matter which is decomposed by microorganisms naturally is called biodegradable waste.

Non-biodegradable waste: The waste matter which is not decomposed by micro-organisms is called non-biodegradable waste.

The edible wastes which are thrown by people in the polythene bags and eaten up by cow, pig, dog, etc., are not digested in their alimentary canal as a result of which the cattle become patients.

Polythene and plastics are very useful in our lives but are non biodegradable.

Unnecessary use of plastic and polythene should be checked.

We should try to use paper and jute bags as much as possible.

3'R': We should use 3'R' for checking the increase of waste matter. The first 'R' means 'Reduce'. The meaning of the second 'R' is 'Reuse' and the meaning of the third 'R' is 'Recycling'. We should use things in maximum which are biodegradable.

Waste material: Every person creates rags and throws all those things which he has used once and does not use it again. These things are commonly called waste materials.

Landfill: Waste material, faeces of animals, kitchen waste, garden waste, etc., are collected in dustbins from where it is thrown out into the low lying areas for filling a purpose.

Compost: The manure made up by kitchen wastes and garden wastes is called compost manure. It increases the fertility of the soil.

Vermicomposting: Method of preparing compost with the help of redworms is called vermicomposting (Fig.).





Fig. 16.1. Bacteriophage

Garbage: All the used or unusable substances which cannot be reused in the same form is called garbage.

Recycling: It is a process in which a material which has been used once is recycled to produce something to reuse.

Segregation Of Wastes

Garbage or waste may be in the form of fruit or vegetable peels, discarded objects, wrapping materials, wasted food as household garbage, or discarded chemicals and fertilizers washed into rivers, domestic sewage, etc. These wastes can be segregated into biodegradable and non-biodegradable. Wastes that rot (undergo degradation) by the action of decomposers (tiny organisms found in the soil) are called biodegradable wastes. Dead plants and animals and their products (e.g., fruit and vegetable peels, paper, and leaves) decay very easily. These wastes mix with the soil and produce manure. Wastes that do not rot by the action of decomposers are called non-biodegradable wastes. For example, glass, plastic, and metals. Many of them can be recycled to produce new things.

Depending on the type of wastes, two garbage bins – one for biodegradable wastes and other for non-biodegradable wastes should be used. This will help in easy sorting and recycling of wastes to make beneficial products.



Best out of waste

The Rock Garden in Chandigarh is an excellent example of how solid wastes can be utilized. Every item in this garden is made from waste materials like tyres, plastic bottles, eggshells, and tube lights. This innovative idea of utilizing solid waste has made the Rock Garden very popular tourist attraction.

Management Of Biodegradable Wastes

Some of the ways to manage biodegradable wastes are as follows:

Composting:

Since biodegradable or organic wastes like vegetable peels, waste food, leaves, dead flowers, and egg shells can be recycled, they are converted



into manure by burying them in compost pits. Recycling of organic wastes like vegetable peels, waste food, leaves, etc., by burying them in compost pits is called composting. Composting is a simple and almost effortless process of recycling. The biodegradable wastes are degraded by the action of small organisms like bacteria and fungi. There is also a different kind of composting where a kind of earthworm called red worms (or red wrigglers) act on wastes and degrade them.

This type of composting with the help of a type of earthworm called red worms, is called vermicomposting (Fig. 17.1). Red worms break down the organic matter into nutrient-rich manure which increases soil fertility.

Vermicompost can be made in 3-4 weeks and it appears as loose soil-like material. One should not put animal product or oily substance in the pit as it could lead to the growth of disease-causing organisms.



Fig. 17.1 Vermicomposting

Landfills

Large areas used for waste disposal are called landfills. The landfill is another method to manage a huge amount, of biodegradable waste. In a landfill, garbage is buried in such a way that it does not damage the environment (Fig. 17.2). Garbage buried inside landfills stay here for a long time as it decomposes very slowly. After a landfill is full, it can be converted into a park. For example, Indraprastha Park in New Delhi is built on a landfill site.



Fig. 17.2 Structure of a landfill

Management Of Non-Biodegradable Wastes

As non-biodegradable wastes like plastic bags, glass bottles, etc., cannot be broken down by decomposers, their disposal poses a big problem. Non-biodegradable wastes can be managed by practising the concept of 3 Rs—Reduce, Reuse, and Recycle.

Reduce

We need to reduce the amount of waste generated by consuming more and throwing away less. We often buy more things than we really need. Nowadays, disposable items have become popular, for example, ballpoint pen, plastic bag, disposable napkins etc. We are using them frequently without giving a thought to their hazardous effects.

Here are some tips for reducing wastes:

- Use a fountain pen in place of a ballpoint pen,



- Use old newspapers for packaging, and
- Use cloth napkins in place of disposable ones.

Reuse

We can reuse certain things for more than one purpose. If we reuse them for other purposes, we can help in reducing waste. Here are some of the tips for reusing things:

- Small jars and bottles can be cleaned to keep some other kitchen stuff.
- One should prefer glass bottle to metal can when buying juice or soft drink. The bottles can be refilled.
- Old clothes can be made into other usable items like cushion cover, handkerchief, etc.
- Old mobile phones can be donated to friends or family.

Recycle

The process by which waste materials are used to make new products is called recycling. Materials like glass, metal, plastic, and paper are collected, separated, and recycled to make new things.

Recycling of Plastics

Bucket, bottle, toy, shoe, bag, pen, and comb are a few things made of plastic. Use of plastics has become a major concern nowadays because they are non-biodegradable and release harmful gases upon heating or burning. They can also contaminate foodstuffs. If eaten by animals, plastics can choke and kill them. Therefore, one should reduce and reuse plastic items as far as possible. When plastic items are to be discarded, they should be recycled to make new things.

Not all the plastics generated are recycled, hence causing much damage to life on Earth. In many places in India, plastics are totally banned seeing its adverse effects on the environment.

Some of the ways to reduce, reuse, and recycle plastics are as follows:

- Paper, cotton, and jute bag should be preferred over plastic bags (Fig. 17.4).
- Some disposable plastic containers and jars can be used to grow plants (Fig. 17.5).
- Empty bottles can be refilled for storage of water or any other liquid stuff. Think about the number of times you buy a bottle of water when you are out. Instead, you can fill the used bottle and carry it whenever you are out.
- Zip foils can be reused after cleaning thoroughly each time after storing foodstuffs.





Recycling of paper:

Paper is made from trees and trees are essential for our survival on Earth. So, even if paper is biodegradable, depletion of trees at a fast pace is a big concern. Therefore, to save trees we must use paper carefully. Some of the ways to save paper are:

- We should always write on both sides of paper sheets.
- Unused pages from old notebooks can be torn off and made into a new notebook for doing rough work and other miscellaneous work.
- We can also reuse envelopes and covers by using stickers to write new addresses.
- We can also make fresh paper from old newspapers.

By now, we know how harmful garbage accumulation can be. But, by following the 3Rs concept, we can manage the garbage generated in our surroundings so that it is beneficial to the environment.

Biodegradable wastes: Wastes that rot by the action of decomposers are called biodegradable wastes.

Non-biodegradable wastes: Wastes that do not rot by the action of decomposers are called non-biodegradable wastes.

Composting: Recycling of organic wastes like vegetable peels, waste food, leaves, etc., by burying them in compost pits is called composting.

Vermicomposting: Composting with the help of a type of earthworm, called red worms, is called vermicomposting.

Landfills: Large areas used for waste disposal are called landfills.

Recycling: The process by which waste materials are used to make new products is called recycling.

There are mainly two types of wastes based on their ability to rot over a period of time: biodegradable and non-biodegradable wastes.

Dead plants and animals and their products decay while objects like plastic and glass do not.

Vermicomposting and landfills are two ways of managing solid wastes.

By practising the concept of 3Rs (Reduce, Reuse, and Recycle), we can manage our wastes well. the pond is used

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