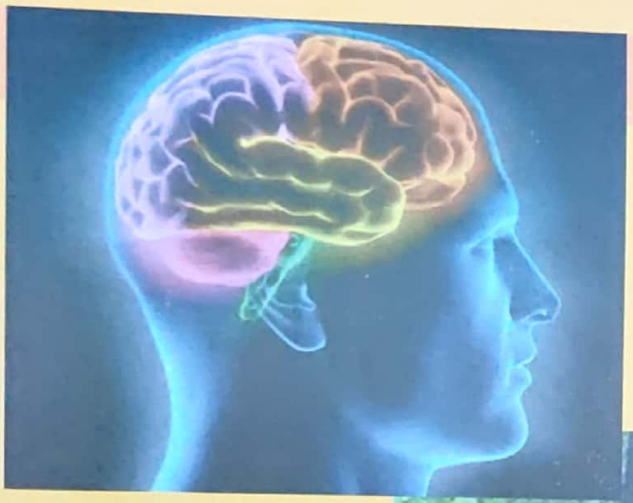
My Living World

Environmental Studies (General Sciences)



Class-V

MY LIVING WORLD

(Class-V)

Publication Division

D.A.V. College Managing Committee

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CONTENTS

1 MY BODY

Our body works like a machine with the help of various organs present in it. **Organs** are special structures present in our body that perform specific functions. Heart, eyes and stomach are some of the many organs present in our body. Our body consists of many systems. A **system** is a group of organs that work together for a particular function. For example we studied, in Class-IV, that the mouth, the food pipe, the stomach and the intestines form the digestive system. Similarly, the nose, wind pipe and lungs help us in breathing.

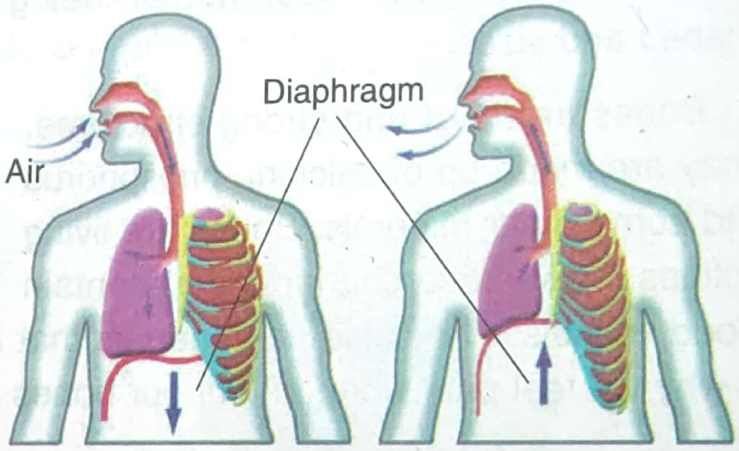
In this chapter, we shall study about the breathing system, the skeletal system and the sensory organs present in our body.

The Breathing System

All living things take in oxygen and give out carbon dioxide. This process is called **breathing**. The process of breathing takes place continuously, without any rest, in all living beings. If this process stops for more than two minutes, the living being can die.

Which parts of your body are involved when you breathe?

Let us find out.



Process of breathing

The air, that we breathe in, or inhale, enters our body through the nasal openings of the nose. The nose is connected to two balloon like structures, inside the body, by a tube called the **wind pipe**. The two balloon like structures are called **lungs**. In the lungs, oxygen is taken up by the blood and carbon dixoide is unloaded. This carbon dioxide is then driven out of the body, or exhaled, through the nose. The oxygen

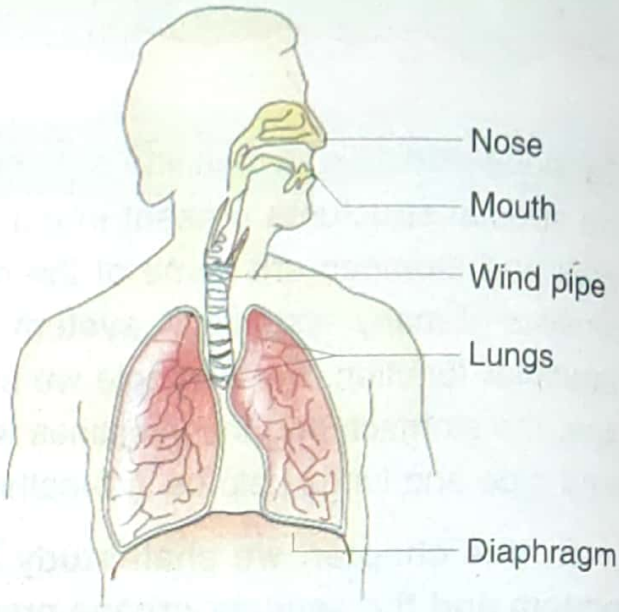
rich blood, from the lungs, is circulated to all parts of our body. Blood also collects carbon dioxide from all parts of the body and brings it to the lungs.

We, thus, understand that during the breathing process, oxygen is consumed by the body. This helps different organs to get energy to perform different body functions. Also, carbon dioxide is driven out of the body as a waste product. Our breathing system is always at work because we have to keep breathing all the time.

Physical exercises, like running, walking and playing, help to keep our body and our breathing system healthy.

Do You Know?

The right lung is slightly larger than the left.



Human breathing system

The Skeletal System

Skeletal system makes the framework of the body. It gives shape and support to the body. The skeletal framework also protects the inner delicate organs.

The skeleton of an adult human being is made up of 206 bones of different shapes and sizes.

Do You Know?

A child is born, with more than 300 bones. As child grows, some of these bones get fused together.

Bones are hard and strong structures. They are made up of calcium, phosphorus and some other minerals. Bones are living entities. They have channels that contain blood vessels. They also have nerves that are necessary to keep them alive. That is why we feel pain when any of our bones gets hurt.

Activity:

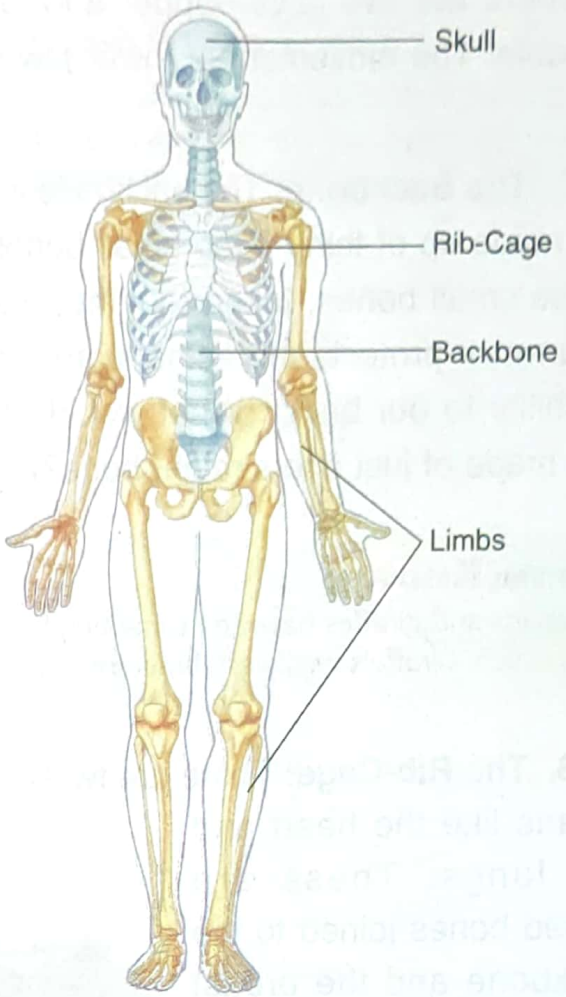
Take a measuring tape. Measure the length of the part of your leg between the knee and the feet. Do the same measurement for your parent. Is the length of this leg part same?
Bones increase in length and size up to a certain age.

The long bones, like the thigh bone and the arm bone, are hollow from inside. This hollow space is filled with cells and soft materials known as the **bone marrow**. Blood cells are manufactured inside this bone marrow. Therefore, bone marrow is known as the **factory for making blood cells**.

Let us study about our skeletal system in some more detail.

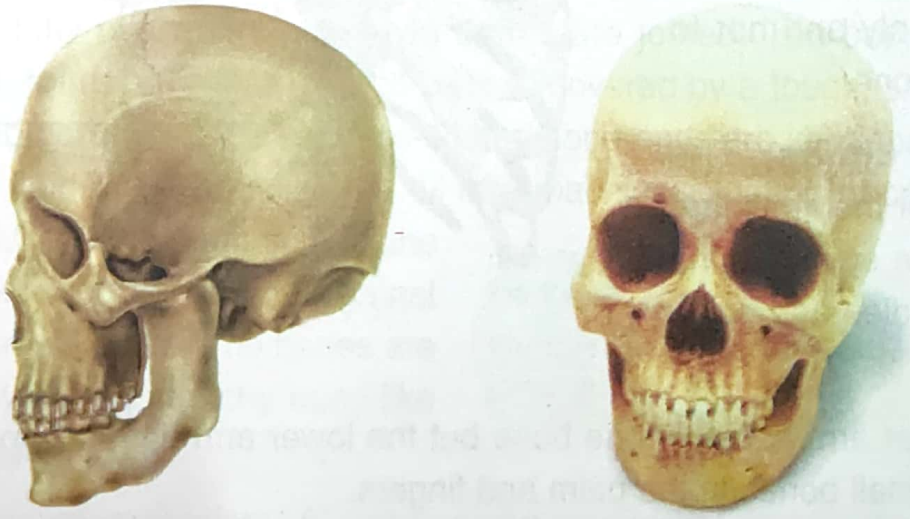
The main parts of the skeletal system are:

1. The Skull
2. The Backbone
3. The Rib-cage
4. The Limbs



Skeleton

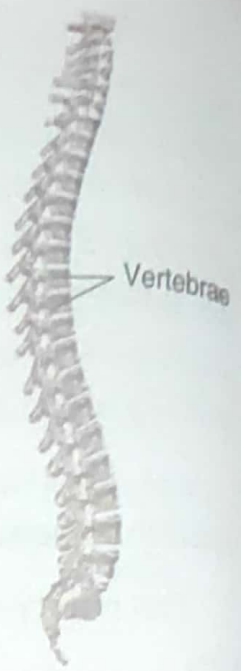
1. The Skull: It is made up of eight flat bones. They are closely fused together. The skull is very important because it protects the most important and delicate organ of the human body, that is, the brain.


side view front view

Skull

There are two jaws—upper and lower. The lower jaw is movable. The movement of lower jaw helps us to eat, talk or laugh.

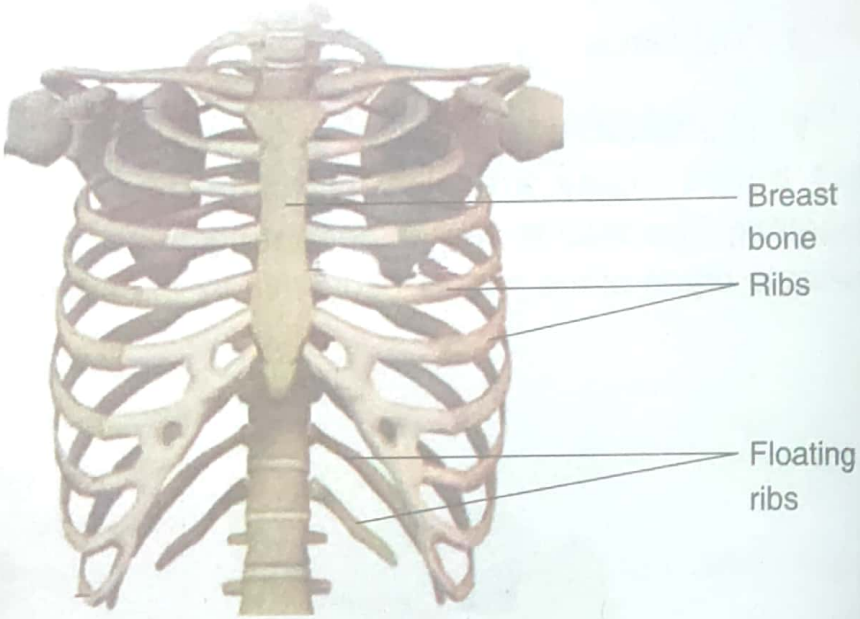
2. The Backbone: The backbone is connected to the skull. It is made up of thirty-three small bones called the **vertebrae**. These small bones, taken together make a strong **vertebral column**. It protects the spinal cord. These small bones give flexibility to our back. (What would happen if our backbone was made of just one straight bone?)



Backbone
(vertebral column)

Do You Know?
Humans and giraffes have the same number of bones in their neck, i.e. seven. Giraffe's neck vertebrae are however, much much longer!

3. The Rib-Cage: There are twelve pairs of ribs, forming a cage, around delicate organs like the heart and the lungs. These are curved bones joined to the backbone and the breast bone. The last two pairs of ribs are called **floating ribs**. This is because they are connected to the backbone only and not to the breast bone.



Rib-Cage

4. The Limbs: The fore limbs, or the arms, are joined to the spine by the shoulder girdles and collar bone.

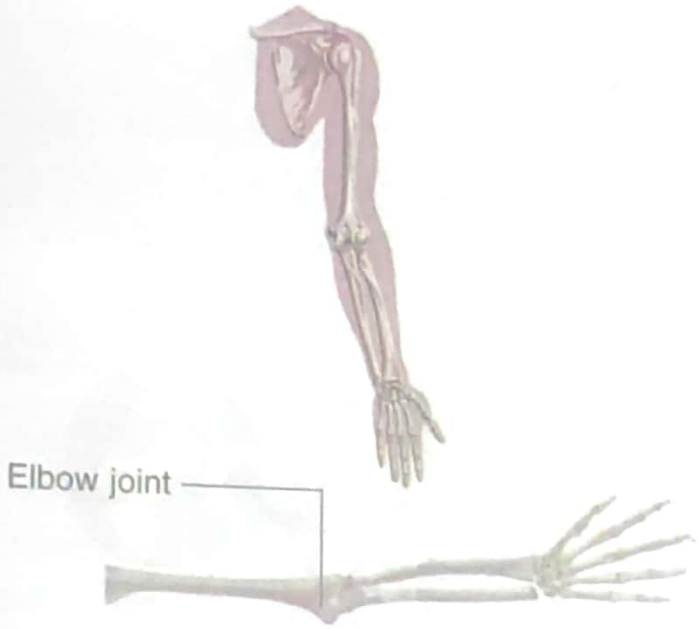
The upper arm has only one bone but the lower arm has two bones. The hand has many small bones in the palm and fingers.

The hind limbs, i.e. the legs, bear the weight of the whole body. The upper part of the hind limbs is made up of the longest bone in our body. This bone is called

femur. The femur, or thigh bone, fits into the hip girdle. The femur is connected to the lower two bones of the leg at the knee. There are many small bones in the ankle and toe region.

Do You Know?

The smallest bone in our body is the **stirrup** bone (stapes) in the ear which measures just 1/4 of a centimetre.



Bones of Arm

Bones of Leg

THE JOINTS

Our bones do not simply work on their own. Carefully observe a skeleten. You will notice that at many different places, two bones are joined. The bones are held together to form **joints**. The end of each bone is covered by a tough, smooth shiny substance called **cartilage**. The cartilage-coated bone-ends are kept apart by a thin film of slippery fluid that works like the oil in a machine. Coating of cartilage and the slippery fluid are important so that the bones do not scratch and bump against each other when we move. The bones are held together by strong stretchy band-like tissues called **ligaments**.

Do You Know?

We have over 230 movable and semi-movable joints in our body.

Our body has several joints. All joints show movement except the skull. The bones of the skull are fused and interlocked and thus, show no movement.

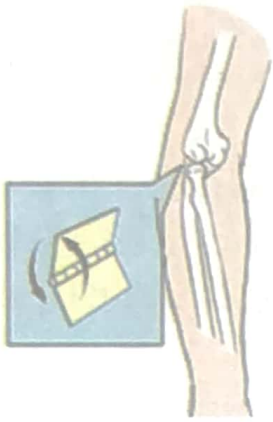
Kinds of Joints

The joints allow movement of bones in different ways.

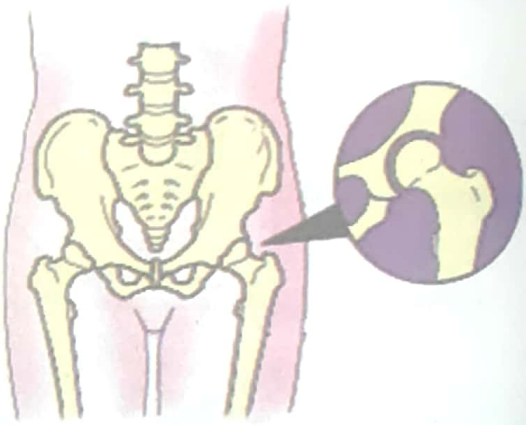
There are four types of joints present in our body which show different types of movement. The four types of joints are **hinge joint**, **ball and socket joint**, **pivot joint** and **gliding joint**.

Let us study about each one of them separately.

1. **The Hinge Joint:** It works like the hinge of a door. The bones, connected by this joint, move in one plane only. This joint provides back and forth movement of the body part. The elbow, knee, toe and finger joints are hinge joints.



Hinge joint in elbow



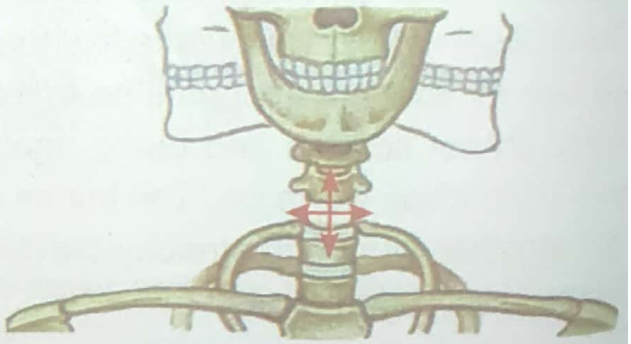
Ball and Socket joint in hip girdle

2. **The Ball and Socket Joint:** In this joint, one bone which has a ball-like end, fits into the hollow socket of another bone. The hip and shoulder joints are examples of this type of joint.

Do You Know?

Arthritis is a disease that causes joint pain, swelling and stiffness.

3. **The Pivot Joint:** This type of joint is found between the skull and the first two vertebrae of the spine. Move your skull to find out the movement of this joint. It moves up and down (when we signal 'yes'), and sideways (when we signal 'no'). In this joint, one bone fits into a ring formed by the other bone.



Pivot joint

4. **Gliding Joint:** This kind of joint is present in wrist, ankle and between any two vertebrae of the spine. The flexibility of the backbone is because of this type of joint. We are able to bend forward or backward, or sideways, owing to the presence of the gliding joint in the vertebrae.

Vertebrae showing gliding joint

Activity:

Lets play a game. Let one student come in front of the class and move one of the body part (say, the shoulder). The other students would have to name the joint involved in that movement.

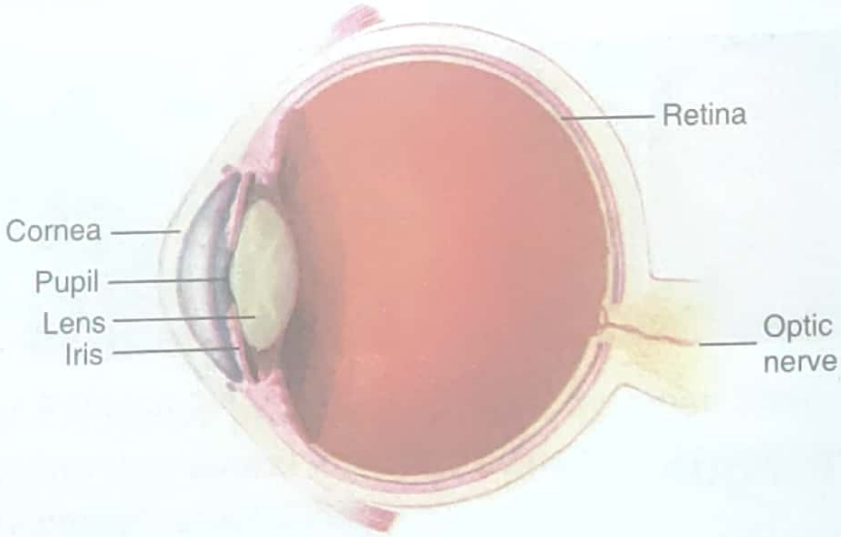
Sense Organs

We know that human beings can smell, see, hear, taste and feel because of five sensory organs. These sense organs (nose, eyes, ears, tongue and skin) collect information and send it to the brain for processing. If any one of them is not working properly, we would not be able to either smell, see, hear, taste or feel, depending on the sense organ involved.

We now discuss these sense organs in some detail.

Eyes

Each eyeball is placed in a bony socket in the skull. They are protected by eyelids and eyelashes. These also protect our eyes from dust and dirt.



Inner view of eye (in section)

The dark structure, in the front of the eyeball, is called the **iris**. The small round black spot, in its centre, is called the **pupil**. The pupil allows light to enter the eye. The retina, at the back of the eyeball, is the screen on which all images get formed. The eye is connected to the brain by a nerve called the **optic nerve**.

Do You Know?

The two eyes of a chameleon can move independently. Therefore, it can see in two different directions at the same time.

Activity:

Go out and stand outside for 10-15 minutes on a bright and sunny day. (Take special care not to look towards the sun directly). Now return to your room. Can you immediately see the things clearly? Why is it so?

Nose

There are **nerve endings** present in the nose which carry message about any chemical substance (odour/fragrance) that enters the nose. This enables us to smell different substances.

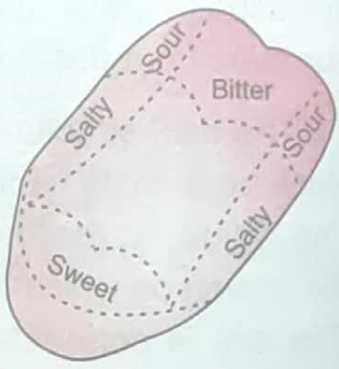
Ears

Human ear is divided into three parts—the outer ear, middle ear and the inner ear. The portion of the ear, that is visible to us, is known as the **external ear**. External ear may vary in shape and size in different animals. The outer ear directs the sound (waves) to the inner ear. The **middle ear** has an ear drum, and three small bones, which convey the vibrations from the ear drum to the inner ear. The **inner ear** helps us to hear and maintain the balance of our body.

External ear of various animals

Tongue

We know that different parts of the tongue have **taste buds** which are sensitive to four different tastes—sweet, sour, salty and bitter.



Taste buds on the tongue

Do You Know?

Human tongue has 9,000 taste buds, a pig has 15,000 of them while a rabbit has 17,000 taste buds.

Skin

Do You Know?
Skin is the largest sense organ of our body.

The skin forms a natural protective covering of the entire body. It helps us to feel pain, touch, pressure, hotness and coldness. There are **sensory structures** in the skin which help us to feel these sensations.

Sense Organs in Different Animals

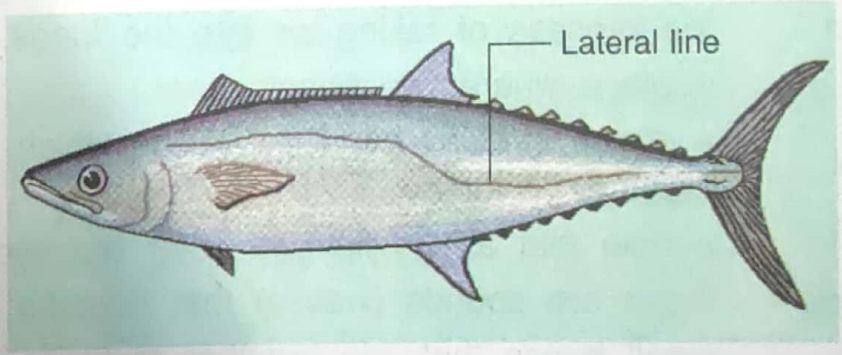
Let us now discuss how different animals use different organs to sense different things.

Insects: Insects, such as cockroach, housefly and butterfly have **feelers** on their bodies. These insects smell and taste with the help of these feelers. The housefly tastes with its legs.

Do You Know?
Insects, like house cricket, can 'hear' through their legs.

Cockroach

Water Animals: Fish can feel the waves produced in water by other living animals. They feel these waves through their **lateral line**. This helps them to detect their prey or know about the enemy present around them.



Lateral line on a fish

Birds: Birds have sense organs (eyes, ears, etc.) which enable them to see, to feel, to smell, to hear and to taste. Besides these responses, birds also make different sounds to inform other birds about different situations. They make a typical sound when there is an enemy around. Similarly, they make a particular sound when they see the availability of food. Birds also group together and make sounds for setting out in search of food or to call all members for taking rest after day's work. They fly in groups often making interesting shapes in the sky.

Reptiles: Some reptiles, like snakes, have a long tongue which helps them to feel and smell. A snake senses the availability of food through its tongue only. The snake feels different kinds of vibrations on the earth through its skin. This helps it to detect the presence of an enemy, a danger or a prey.

Snake

Mammals: All mammals have sense organs, but some mammals have a special power either to smell, to hear or to see. Dogs have a highly-developed sense of smell. Bats have a special power to hear high-pitched sounds. Due to this ability, bats can detect their prey easily even in the dark. This is the reason why bats hunt at night. They detect their prey with the help of high pitched 'sounds' known as **ultrasonics**.

Keywords

- **bone marrow** — cells and soft material in the hollow space of long bones.
- **cartilage** — a tough, smooth elastic structure that cushions bones at their joint.
- **exhalation** — the process of breathing air out from the lungs.
- **inhalation** — the process of taking air into the lungs.
- **joint** — a place where two bones meet.
- **ligament** — a strong stretchy band like tissue which attaches bones together at joints.
- **pupil** — a hole that allows light to enter the eyes.
- **ultrasonics** — these are sounds (waves) that humans cannot hear.
- **vertebrae** — small bones that join together to make backbone.

Something to Know

A. Fill in the blanks.

1. Wind pipe connects nose to the _____ in mammals.
2. Of the two jaws, only the _____ jaw moves.
3. The backbone protects the _____.
4. Fish can feel waves with the help of their _____.
5. A snake uses its _____ to touch and smell objects.
6. Eye is connected to the brain by the _____ nerve.

B. Match the following:

1. elbow	a. longest bone
2. wrist	b. eight flat bones
3. hip	c. hinge joint
4. femur	d. ball and socket joint
5. skull	e. gliding joint

C. Tick (✔) the correct option.

1. The joint in the shoulder is an example of a—
   (a) hinge joint (b) ball and socket joint
   (c) pivot joint (d) gliding joint
2. The framework of bones, that protects our heart and lungs, is known as the—
   (a) spinal cord (b) skull (c) rib cage (d) pivot joint
3. Light enters the eyes through the—
   (a) pupil (b) cornea (c) retina (d) iris
4. The part of the ear which helps in maintaining balance of our body is—
   (a) external ear (b) ear drum (c) middle ear (d) inner ear

D. Answer the following questions in brief.

1. What is breathing?

2. How are fore limbs connected to the spine?
3. State the importance of the rib-cage in our body.
4. Name the main parts of the skeletal system.
5. State the role of inner ear in the process of hearing.
6. How does a snake detect the presence of an enemy or a prey?

E. Answer the following questions.

1. Why do bones have joints?
2. Why is our backbone made up of many small vertebrae instead of having one straight long bone?
3. Why is bone marrow known as the factory for making blood cells?
4. How does a ball and socket joint work?
5. Dogs and bats are also mammals like us. How does our sense of smell compare with that of a dog and our sense of hearing with that of a bat?
6. Do you breathe even when you are sleeping? Give reason for your answer.

VALUE Based Question

The students of Class-V were asked to prepare posters for the coming parent-teacher meet. The teacher assigned different roles to different students. All of them did their work happily in a sincere and organised way. They all helped one another.

Their work was liked and praised by all the visitors. The teacher compared their work with the 'Breathing System' when she taught that topic in the class.

1. State the values displayed by the students.
2. Discuss how doing work in an organised and helpful way is useful for one and all.
3. Why did the teacher compare their work with the 'Breathing System'?

Something to Do

1. Try to make riddles about the functions of sense organs. One example is given below:

   I am an organ that helps you to see,

   Coloured disc in white, can you recognise me!

   Answer: Eye

2. Find out how your external ear compares with that of the external ear of other mammals like cow, horse and elephant. What differences are there? Also find out about any other functions performed by the external ear of these animals.
3. There are many things in the house that have joints, e.g., door and scissors. Compare the joints of your body with different joints that you see in various appliances in your house. Record your results in the following table:

Name of the joint in our body	Joint in an appliance which is similar
Hinge joint	Hinge of a door
Ball and Socket joint	
Pivot joint	
Gliding joint	

2 PLANTS

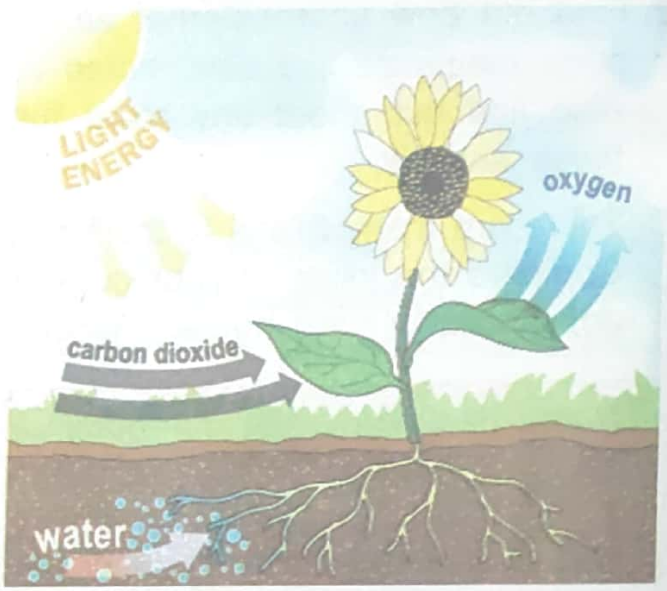
Plants need energy in much the same way as humans, animals and birds. They need energy to grow, to replace their worn out parts, to get rid of wastes, and to reproduce. Like all organisms, plants also get the energy, they need, from food. Plants are special because they synthesise or prepare their own food.

How do Plants Prepare Food?

A plant makes its food in its green leaves. Thus, green leaves are the **food factories** of the plant. The process, by which green plants make their food, is called **photosynthesis**. **Photo** means 'light' and **synthesis** means 'putting together'.

Plants need raw materials like carbon dioxide and water. These are converted into food in the presence of sunlight and chlorophyll.

Carbon dioxide is taken from air through stomata. **Stomata** are the tiny pores present on the leaf surface. Water, required by the plant, is drawn from the soil through the roots. Sunlight is available during the day-time. **Chlorophyll**, which is essential for completing the process, is the green-coloured pigment present in the green leaves of plants.



Process of photosynthesis

Some plants need extra food in addition to what they prepare by photosynthesis. These are plants that grow in poor soil which lacks nitrogen salts. They get their extra nourishment from insects.

Plants, that trap and feed on insects, are called **insectivorous plants**. Venus flytrap and Pitcher plant are two examples of such plants. They trap insects in their sticky leaves which have special shapes. The insects get suffocated, when they are trapped in the leaf, and die. The bodies of these insects are then broken down, digested and consumed by the plant.

Venus flytrap

Pitcher plant

Insectivorous Plants

Reproduction in Plants

All living things reproduce to maintain their race and number on earth. The process, by which a living thing produces more of its own kind, is called **reproduction**.

Plants also reproduce their own kind. They do so mainly in two ways:

1. Reproduction through seeds.
2. Reproduction through different parts of a plant, like underground stem, stem cutting, root and leaf.

Let us study these two ways in some detail.

1. Reproduction through Seeds

The seeds of a plant usually develop inside the fruit. As the fruit ripens, the seeds become mature. These seeds get dispersed through various agents like air, water, insects and human beings. All the seeds, that drop on the soil, do not grow to form new plants. Many of them die due to unfavourable conditions. Only those seeds, which get favourable conditions, like appropriate air, water, soil and proper temperature, grow to form new plants.

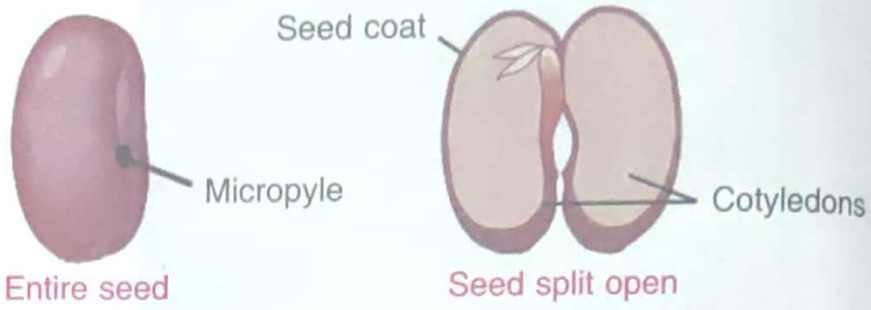
Do You Know?

The Seychelles coconut, found only in the Seychelles Islands near Africa, produces the largest seeds amongst all plants. The fruit, of this palm tree, looks like two coconuts joined together. This is also called the "double coconut".

Let us now study the structure of the seed.

Structure of the Seed

Take some gram or bean seeds. Soak them for 10-12 hours in water. Now pick up one seed and observe its structure carefully. We will notice that it has a hole that allows water to enter its inside. This hole is known as the **micropyle**. The seed is covered by an outer layer called the **seed coat**. Inside the seed coat, there are seed leaves, also called **cotyledons**. Some plants, like pea, gram and bean have two cotyledons whereas wheat, rice and maize have only one cotyledon. Inside the seed leaves, there is a **baby plant**. The baby plant has a tiny root and a tiny shoot. The cotyledons store food for the baby plant to grow.



Parts of a bean seed

Growth of the Plant

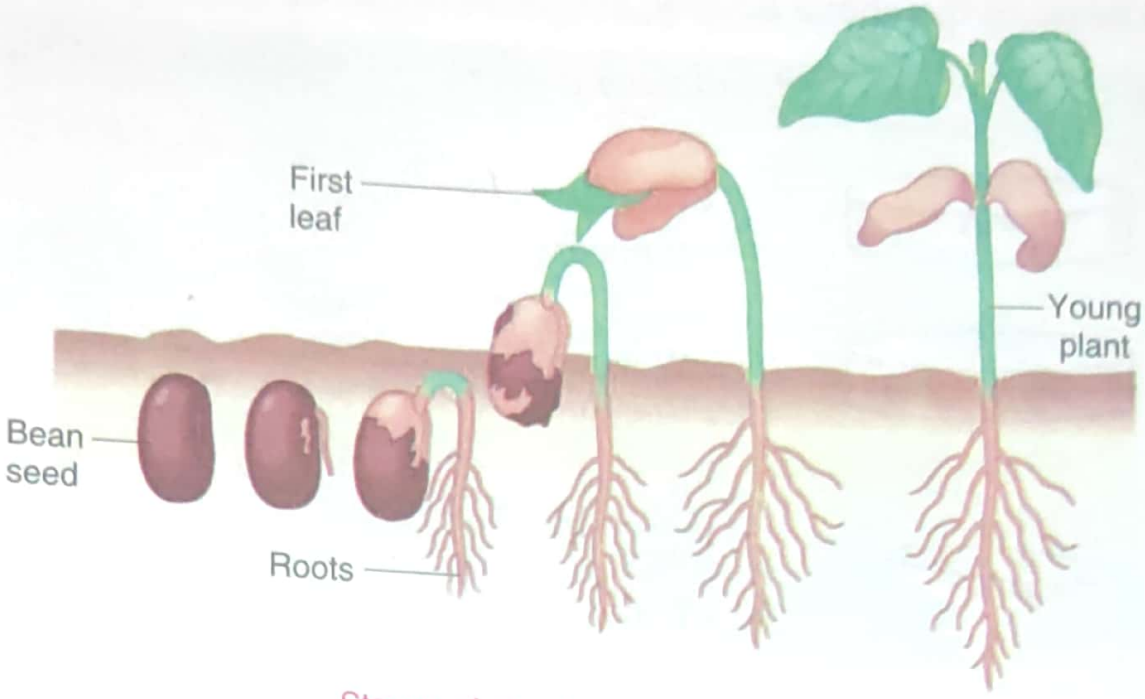
The baby plant starts growing into a new plant when it gets appropriate amount of air and water, and the temperature, around it, is neither too hot nor too cold. To start with, the cotyledons provide food to the growing plant. Later on, the plant starts making its own food with the help of its leaves.

Activity:

Soak some *moong dal* and wheat seeds in separate dishes for 10-12 hours. Observe and compare their structures. Report the differences in their structures, observed by you, to your teacher.

Seed Germination

We know that a plant usually grows from a seed. The process, by which a seed grows and develops into a seedling, i.e. young plant, is called **seed germination**.

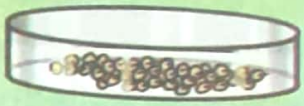
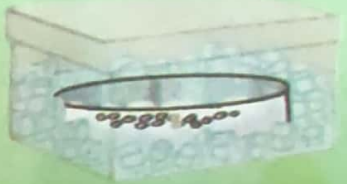


Stages of germination in a bean seed

Seeds need favourable conditions to grow and develop into a seedling. Let us do an activity to study the conditions that are necessary for germination of a seed.

Activity:

Take some seeds of gram, or *moong dal*. Put them separately in four glass dishes, labelled as A, B, C and D. Keep them for 4-5 days under the conditions as given below:

Dish		Conditions Present
A		Keep seeds on moist cotton at room temperature.
B		Keep seeds without water at room temperature.
C		Keep seeds in a dish completely filled with water at room temperature.
D		Keep the dish, having seeds, on moist cotton in an ice-box or a refrigerator.

After 4-5 days, we will observe that the seeds, present in the glass dishes B, C and D, have not germinated. The seeds of dish A show good germination. It is due to the fact that in dish A, there is appropriate amount of water, air and warmth needed for germination. In the other glass dishes, one, or other, of these favourable conditions, is missing.

On the basis of the above activity, complete the following:

Dishes		Conditions present	Condition missing
B		• Air • Warmth	_____
C		• Water • Warmth	_____
D		• Air • Water	_____

We can, thus, conclude that appropriate amount of water, air and correct warmth are necessary for germination of seeds.

Do You Know?

A healthy birch tree can produce up to one million seeds a year.

Is it possible to grow some plants without seeds? Let us find out.

2. Reproduction by Different Parts of the Plant

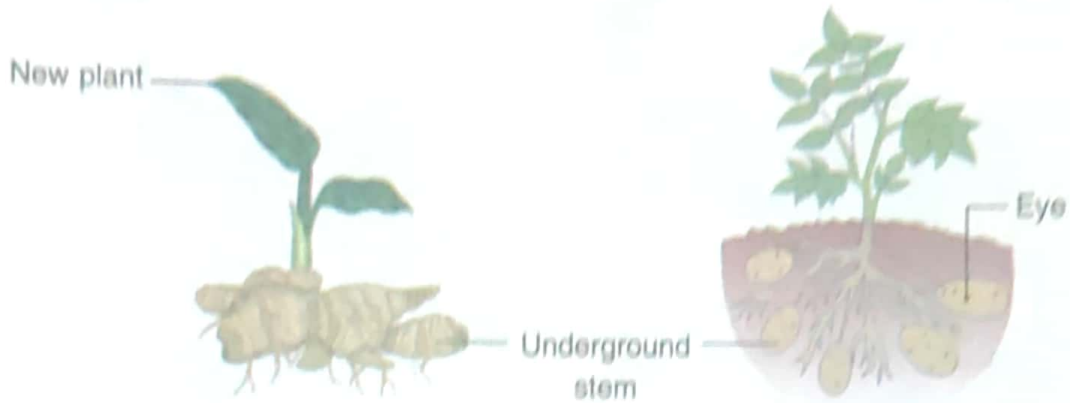
In many plants, reproduction takes place through other parts of the plant. A new plant can grow (i) from the underground stem, (ii) by stem cutting, (iii) from roots or (iv) from leaves of a plant. This type of reproduction, in which a new plant arises from some part of a plant, without the involvement of seeds, is called **vegetative reproduction**.

Vegetative Reproduction

It is of great importance because it is an easier and faster method of increasing the number of the same plant. It also helps to grow plants, like banana, which bear no seeds.

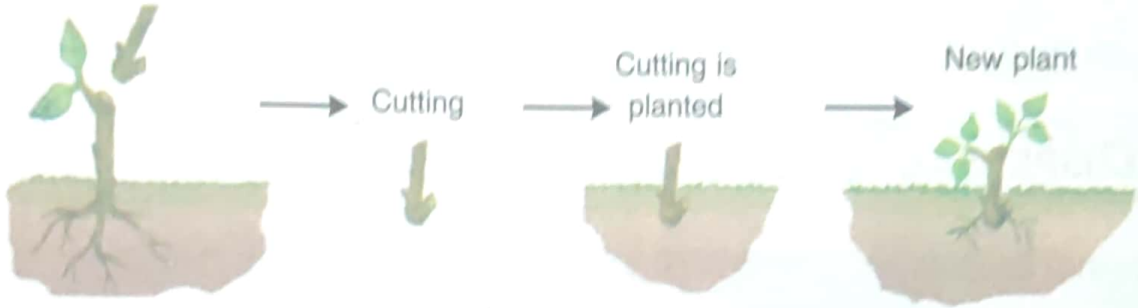
Let us now study how the different parts, of a plant, are involved in the process of vegetative reproduction.

(a) **Reproduction through underground stem:** In plants, like banana, ginger and potato, a new plant grows from the underground stem. In these plants, a part of the stem, present underground, grows and develops roots and shoots to make new plants.



Ginger Potato

(b) **Reproduction by stem cutting:** New plant can also be grown by using the stem cutting of a grown up plant. Stem cuttings are used for growing plants like sugarcane, *bougainvillea*, rose and grapes.



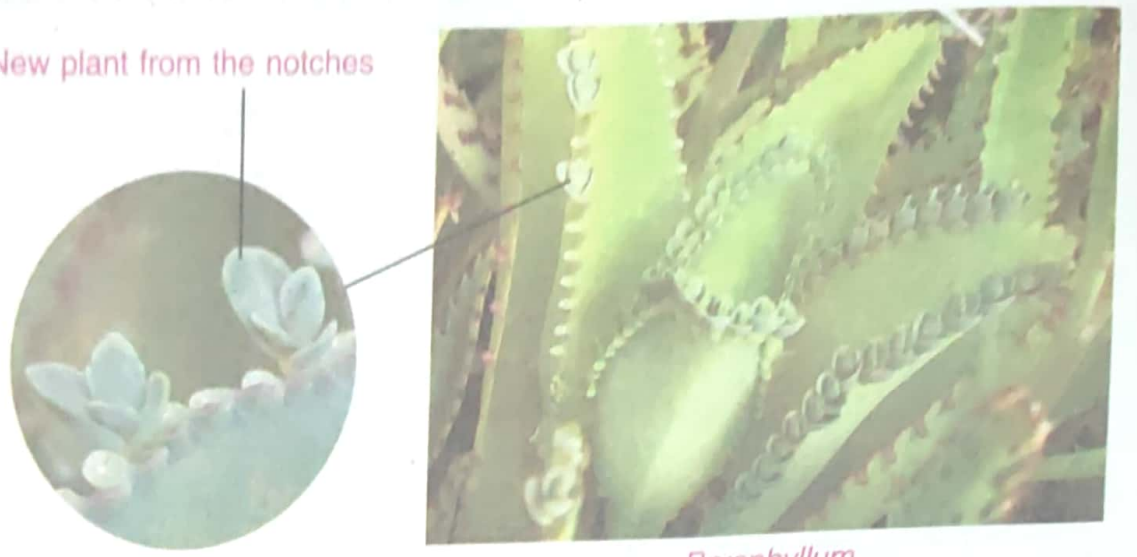
Rose cutting

(c) **Reproduction through root:** When the fleshy roots of some plants, like *Dahlia* and *Asparagus,* are placed in water, very many roots appear at the lower end and shoots appear at the upper end. In sweet potato, new plants arise from its root itself.

Dahlia

Sweet potato

(d) **Reproduction through leaf:** In plants like *Bryophyllum*, new young plants arise from the notches of the leaves where small buds are present. These small buds get detached from the leaf and develop into new plants.



Bryophyllum

We can, thus, say that different plants reproduce, either through seeds, or from some other part of the plant. They maintain their number and race through an appropriate method of reproduction.

Seed Dispersal

We know that flowers produce fruits and most fruits bear seeds. However, all seeds, of a given plant, do not germinate near their mother plants. This is because they will then have to struggle to get sufficient air, water, sunlight and nutrients and many of them would die. Nature, therefore, enables the seeds to move over to other places. It does so through various agents, such as air, water, animals, birds, insects and human beings. They all help in the transfer of seeds to different places. The process of transfer of seeds, to different places, is called **seed dispersal**.

We now discuss, in some detail, about the different methods of seed dispersal.

Different Ways of Seed Dispersal

Human-made ways: Humans select seeds of useful plants and sows them in the soil to get new plants. You must have seen farmers sowing seeds of different useful plants like wheat, maize and mustard.

Natural ways: Plants, especially those growing in forests, use lots of natural methods to scatter their seeds. These are given below:

1. **Dispersal by wind:** The seeds of madar *(aak)*, thistle and dandelion get dispersed through wind. These seeds are very light, small and have hair on them. The hair enable them to fly with the wind and get dispersed.

Madar Seed Dandelion Cotton Seed Hiptage Seed

Dispersal of seeds by wind

2. **Dispersal by water:** Plants, which are near water bodies (sea, river, lake), disperse their seeds through water. Coconut, water lily, *Hydrilla* and lotus are examples of plants which disperse their seeds through water. The seeds float on the water for some distance before being carried away. They sink into mud on the shore, or on the fringes, of the water body.

Coconut Lotus

Dispersal of seeds by water

3. **Dispersal by birds, insects and rodents:** Sparrows, ants, rats, squirrels, etc., carry fruits and grains to their burrows, nests and other places. They drop some grains, or seeds, on their way. These may grow into plants in the new environment.

Dispersal of grains/seeds by birds, insects and rodents

4. **Dispersal by human and animals:** Fruits, which are fleshy and juicy, are eaten by humans, and other animals, and their seeds get thrown away. Seeds of watermelon, papaya, mango, pumpkin and gourd often get dispersed by this method. These seeds can grow into new plants under suitable, and favourable, conditions.

   Many plants, like castor, burdock, cockleburr and mimosa, depend on animals, including humans, to carry their seeds away from their parent plants. Their fruits are thorny or have hooks on them. They get stuck to the clothes of humans, or skin and fur of animals. They get carried to different places where they fall down and grow into new plants.

Dispersal of seeds of fruits by humans and animals

5. **Dispersal through cracking and bursting:** Some fruits crack and burst on ripening and scatter their seeds far away from the parent plant. These

may grow into new plants. Seeds of pea, ladyfinger, bean and balsam get dispersed by this method.

Dispersal of seeds by cracking and bursting

Now you know why, and how, plants grow at all places. The dispersal of seeds plays an important role in increasing the number of plants all over the earth.

Do You Know?

The well known Indian Scientist, Prof. J.C. Bose, proved, through his experiments, that plants have life. He invented an instrument, called the **crescograph**, which could be used to measure the rate of growth of a plant.

Keywords

- **chlorophyll** — green pigment in leaves.
- **cotyledons** — parts of the seed that contain food for the baby plant.
- **germination** — the growing of baby plant from seed.
- **photosynthesis** — process by which green plants make their own food.
- **seed coat** — the thick outer covering of the seed, which protects the baby plant.
- **seed dispersal** — the transfer of seeds to places away from the mother plant.
- **seedling** — the small baby plant that grows out of seed.
- **vegetative reproduction** — type of reproduction without seeds.

Something to Know

A. Fill in the blanks.

1. _____ are known as food factories of the plant.
2. Plants, like _____, reproduce through roots.
3. _____ and _____ are the raw materials needed for photosynthesis.
4. _____ is a small hole present on the seed.
5. Movement of seeds, from one place to another, is called _____

B. Match the following:

1. type of reproduction without seeds	a. chlorophyll
2. green pigment present in leaves	b. banana
3. a fruit that does not bear seeds	c. *bryophyllum*
4. reproduction through leaves	d. pea and ladyfinger
5. dispersal of seeds through cracking	e. vegetative reproduction

C. Tick (✔) the correct option.

1. The small baby plant, coming out of a seed is known as the—
   (a) grain (b) stomata (c) root (d) seedling
2. The process, by which a plant make its own food, is called—
   (a) photosynthesis (b) germination (c) reproduction (d) dispersal
3. Which of these plants has only one cotyledon?
   (a) gram (b) pea (c) wheat (d) bean
4. For proper germination, a seed needs—
   (a) water only
   (b) just the right temperature
   (c) air only
   (d) water, air as well as the appropriate temperature

5. Lotus seeds are dispersed mainly through—

(a) insects (b) birds (c) air (d) water

D. Answer the following questions in brief.

1. Name the pigment present in green leaves of a plant.
2. Why do some plants feed on insects?
3. Name the two methods of reproduction in plants.
4. State the conditions required for the proper germination of a seed.
5. Name two plants that reproduce through stem cuttings.

E. Answer the following questions.

1. Why do all seeds not germinate to form new plants?
2. Seeds do not germinate when they are kept in an ice-box or refrigerator. Why?
3. State the importance of vegetative reproduction in plants.
4. List any three natural ways of seed dispersal. Give one example for each of them.
5. How can one grow a rose plant without seeds?
6. State the function of following:

(a) seed coat (b) cotyledons (c) micropyle

7. Write the ways of dispersal of seeds in the following plants.

Plants	Ways/Agents of Dispersal of seeds
Madar	
Lotus	
Castor	
Beans	
Mango	
Water lily	

VALUE Based Question

Riya's neighbours went to Chennai for 20 days during summer vacation. They requested Riya's mother to take care of their plants in their absence.

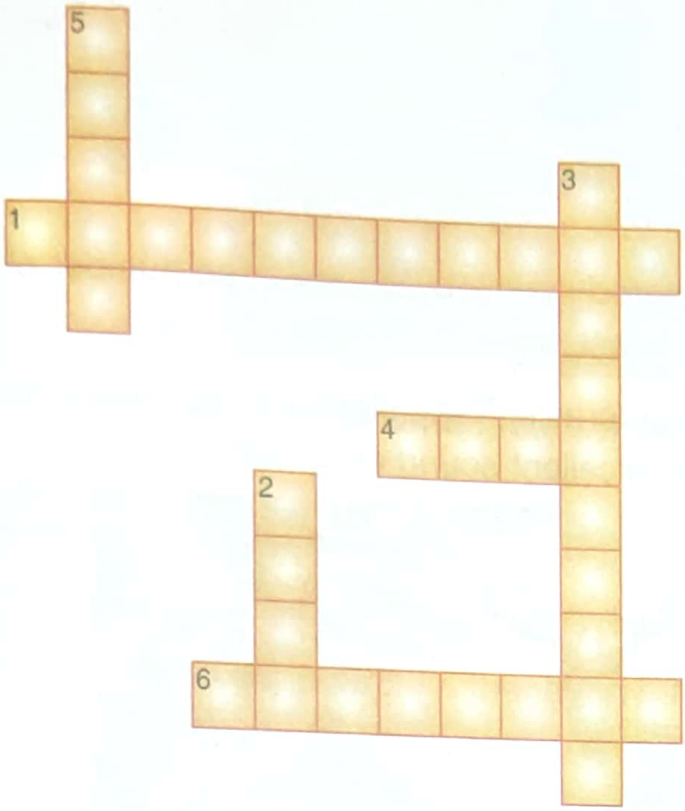
Riya and her mother took this responsibility happily.They watered the plants regularly and shielded them from the heat of the sun during day time. When the neighbours returned home, they thanked Riya and her family for taking good care of their plants.

1. In what ways Riya and her mother took care of plants?
2. State the qualities of Riya that are depicted by this situation.
3. What could have happened if Riya and her mother had not taken care of their neighbour's plants?

Something to Do

1. Have you ever thought of planting a sapling on your birthday or gifting saplings as return gift to your friends? Do such activities help to save environment? Discuss.
2. Draw well-labelled diagrams of five different seeds in your notebook.

3. Solve the crossword puzzle.



Across →

1. The process by which a seed produces a baby plant (11)
4. Important for plant growth (4)
6. A young plant (8)

Down ↓

2. A plant that grows from stem cuttings (4)
3. Store food for the baby plant (10)
5. Lotus seeds are dispersed by _____ (5)

4. Take some seeds of wheat and *moong dal*. Soak them in water overnight and put them in soil. Record your observations and compare the results with your classmates. Discuss the same with your teacher.

   Record your observations with diagrams in the following manner.

Germination of Seeds

Days	Observations	Diagrams of the seed/seedling/plant
Day 1		
Day 3		
Day 5		
Day 7		
Day 9		

3 FORESTS

A **forest** is an area where the earth is covered mainly by a very large number of trees. The very large number of trees, in a forest, support many life forms.

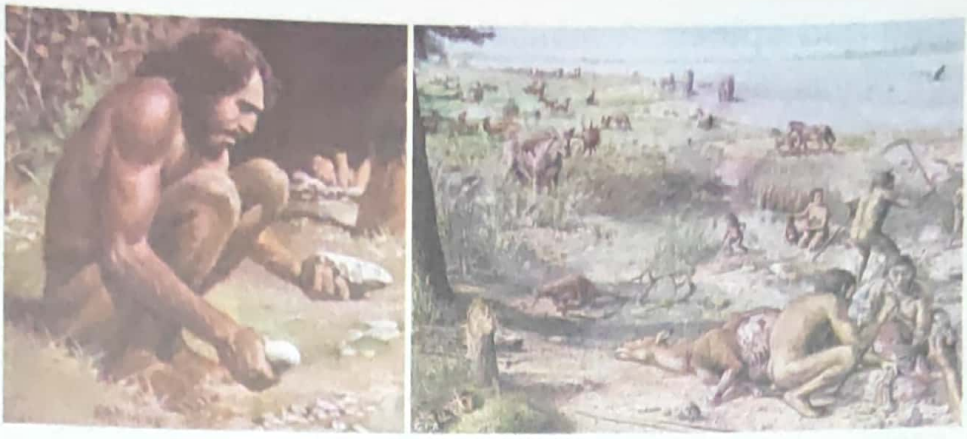
Trees are an important component of the forests. They clean the air, cool it on hot days, conserve heat at night and act as excellent sound absorbers.

Forest

Forests create a special environment, which in turn, affects the kinds of animals and plants that live and survive there. Forests develop at places where the average temperature is greater than 10°C and where there is an annual rainfall of at least 200 mm.

For early man, forest was his home where he got food and shelter.

Human beings and forests have always had a complex relationship. We have always been dependent on forests for getting clean air, food, fuel, water, shade and shelter. Thus, forests play multiple roles to take care of our basic needs.



Let us now try to understand how forests play all these roles.

Advantages of Forests

Forests help us in the following ways:

- The trees purify the air by absorbing carbon dioxide and releasing oxygen. This helps to maintain the climate balance over a large area.
- Trees also help in checking global warming by absorbing carbon dioxide which is the main greenhouse gas.
- Forests act as natural absorbers of rain water. The soil, held by roots of trees, soaks in the rain water. A large portion of rain water seeps down the soil. This recharges the ground water.
- Forests prevent soil erosion. Trees bind soil particles with their strong roots. This prevents soil from being washed, or blown away.
- Forests prevent floods as the soil, held by roots of trees, absorbs running water and prevents floods.
- Forests help to bring good rainfall. This leads to more greenery around and better crops.
- Forests also serve as home to many types of animals. These include mammals, reptiles, insects, birds and wild animals.

Forest Products

Forests provide a number of things that are used by humans. Some forest products are:

1. **Wood/Timber:** Wood, obtained from trees in forests, is used for making furniture. It is also used for making paper and as a fuel.

2. **Medicines and spices:** A number of medicines are obtained from forests. Medicinal plants, like *amla*, *aswagandha* and *brahmi*, grow in forests. Some spices are also obtained from forests.

Amla

Aswagandha

Spices

3. **Gums, resins and dyes:** Gums are used for making adhesives and in medicines. Some varieties of gums are used as food. Many resins are used to make varnish and paint. Many dyes, used to colour clothes and paper, are also obtained from forests.

Resins

Powder Dyes

Gums

4. **Special leaves:** Areca nut leaves are used to make disposable plates. *Tendu* leaf is also called **green gold** of Odisha. The leaves of *Tendu* are used for particular wrapping purposes.

Tendu leaves

Binding *tendu* leaves

5. **Honey:** Large beehives are found in forests that are used for extraction of honey. Bees' wax is used in cosmetics and medicines.



6. **Bamboo:** This plant is used for making baskets, boats, bridges, buckets, cloth, cooking utensils, fishing rods, handicrafts, musical instruments, paper, furniture, toys, umbrellas and walking sticks. It is also used as food.



Do You Know?

Bamboo is a very useful plant. It is also used for making blinds, brushes, canoes, carts, charcoal, chopsticks, cooking utensils, fans, fences, firewood, food steamer, furniture, garden tools, hats, incense, particle board, pens, pipes, ply, roofing, scaffold, tableware and toothpicks.

7. **Special products:** Sandalwood, lac and rubber are some special products obtained from forests.



DEFORESTATION

We now know that forests are very useful for mankind. However, some of us cut down trees in an unplanned manner due to their own selfish interests. This is neither right nor desirable.

Human beings cut forests because of the following reasons:

- Need more land to make houses, industries and for agriculture.
- Need wood for construction.
- Need some trees for specific use which they cut without planting more of them.

Such activities are leading to a drastic reduction in the forest cover on earth. The government has made laws according to which cutting down of trees is a punishable offence. When some trees need to be cut, a larger number of trees must be planted.

Harmful Effects of Deforestation

Cutting down of trees by man is very harmful. It leads to:

- Decrease in rainfall in the surrounding areas.
- Increase in the amount of carbon dioxide in the atmosphere that can increase global warming.
- Decrease in the levels of ground water in the nearby areas.
- Increase in soil erosion that can cause more frequent floods. These can result in widespread destruction.
- Destruction of habitat of a number of plants and animals.

How to Protect Forests?

Throughout the world, forests are in danger. Many plants and animals, that live in these forests, are disappearing fast. Many people, and cultures, that depend on forests for their way of life, are also under threat.

Do You Know?

- Only 20% of the world's ancient forests are left.
- A forest, of the size of a football field, disappears every two seconds.

The Forest Conservation Act was enacted by the Indian Parliament in 1980. According to its rules, the indiscriminate cutting of trees, in forests, is a punishable offence.

Many areas in India have been converted into National Parks, and Wildlife Sanctuaries, to protect the forest cover and the animals that live in the forests. A **national park** is a reserved land, usually declared and owned by the national government. It is protected from most human developments and pollution. A **sanctuary** is also a reserved area in which birds and animals are protected from hunting.

A national park differs from a sanctuary in that no human activity is allowed inside the former, while limited activities are permitted within the latter. National parks receive more financial support from the Central Government. The Gir National Park in Gujarat is probably the only place in the world where the Asiatic lion is protected so that it can live in its natural surroundings.

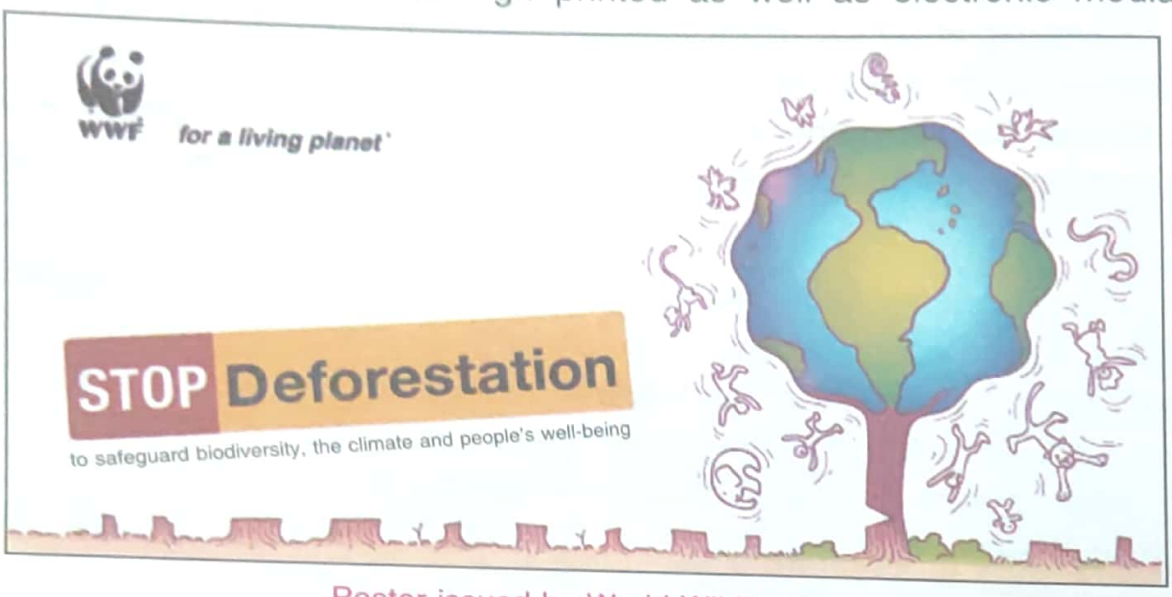
Asiatic lion at Gir National Park

A pair of Siberian cranes at the Bharatpur Bird Sanctuary

Bharatpur Bird Sanctuary in Rajasthan is the largest bird sanctuary in Asia. It is famous as a refuge for migratory birds like Siberian cranes, barons, ibis, pelicans and painted storks. These, and many other migratory birds, make it their temporary home during very severe winter months.

Some other National Parks, in the Himalayan foothills, are the Corbett National Park and the Dudhwa National Park. These provide an unforgettable wildlife experience.

- A number of organisations are spreading awareness about the importance of forests and trees through printed as well as electronic media.



Poster issued by World Wildlife Fund

- We all can also contribute towards forest conservation:
  (i) by minimising the use of wood and wood products.
  (ii) by not using products that promote destruction of forests. Many people buy fur obtained from animals, ornaments made of elephant tusks, etc. This should not be done as it leads to killing of wild animals.
  (iii) by celebrating the growing of plants as a festival and involving more and more people in this activity. This festival is celebrated in many parts of India as *Van Mahotsava*.

Do You Know?

Van Mahotsava is a programme launched by the Indian government to increase the number of trees in our country. Every year thousands of trees are planted during this forest festival. Many schools also celebrate *Van Mahotsava* by planting trees. This way, they contribute towards making the earth green.

Forests are earth's **air purifiers**. They are often referred to as the **earth's lungs**. Just as our lungs absorb carbon dioxide from the blood and infuse it with oxygen, green plants absorb carbon dioxide during photosynthesis and in return, release oxygen into the atmosphere

Do You Know?

The well-known *Chipko Andolan* literally means 'Hug the Trees Movement'. It originated from an incident in a remote village high up in the Himalayas in 1972. There was a dispute between the local villagers and a logging contractor who had been allowed to fell trees in a forest close to the village.

Undeterred, the women of the Reni village reached the forest quickly and clasped the tree trunks. They thus, prevented the workers from using their axes and saws to cut trees.

The *Chipko Andolan* fueled worldwide attention. It is the symbolic heading of "tree huggers" who put themselves in danger, in order to protect a part of the natural environment from getting harmed.

Keywords

- **afforestation** — the process of large scale planting of trees.
- **bird migration** — a regular seasonal movement, along a flyway between breeding and wintering grounds, undertaken by species of many birds.
- **canoe** — a light weight narrow boat.
- **deforestation** — large scale cutting of trees.
- **forest** — a forest is an area with high density of trees.
- **refuge** — a place providing shelter and protection.
- **scaffold** — a temporary structure used to support people and material during construction or repair of buildings.

Something to Know

A. Fill in the blanks.

1. Forests serve as home to many types of _____.
2. Forests absorb large amounts of _____ gas.
3. Deforestation _____ rainfall in the surrounding areas.
4. _____ is the largest bird sanctuary in Asia.
5. For early man, forests were a source of _____ and _____.

B. Match the following:

1. resins	a. cutting down of trees
2. forests	b. adhesives
3. deforestation	c. soil conservators
4. *aswagandha*	d. paint
5. gums	e. medicinal plant

C. Tick (✔) the correct option.

1. The leaf, used to make disposable plates, is the—
   (a) *tendu* leaf (b) areca nut leaf
   (c) *amla* leaf (d) *brahmi* leaf
2. Deforestation results in—
   (a) soil erosion (b) floods
   (c) low rainfall (d) all the above
3. Bee wax is used to make—
   (a) spices (b) varnish
   (c) medicine (d) adhesive
4. Which of the following is not a forest product?
   (a) gum (b) timber (c) *aswagandha* (d) kerosene

5. If forests disappear, the amount of—
   (a) carbon dioxide, in air, will decrease.
   (b) oxygen, in air, will increase.
   (c) carbon dioxide, in air, will increase.
   (d) nitrogen, in air, will increase.

D. Answer the following questions in brief.

1. Name any four products that are obtained from forests.
2. Why do some men cut trees?
3. What is the Gir National Park famous for?
4. Name two migratory birds that visit Bharatpur Bird Sanctuary.
5. What is the average temperature and annual rainfall neded for a forest to develop?

E. Answer the following questions.

1. List four harmful effects of deforestation.
2. How do forests prevent soil erosion?
3. State the importance of forests to human beings.
4. Why are forests known as the 'lungs of earth'?
5. How can we contribute towards protection of forests?

Ridhi visited Kullu-Manali during her vacation. She glanced at shops with showpieces, household items, decorative items, key rings and jewellery boxes. She was attracted towards the gift items made of wood. She wanted to buy some such gifts for her friends. Her mother suggested that she should buy fresh fruit boxes of cherries, peaches and almonds as gifts for her friends. Ridhi agreed with her mother and did not buy items made from wood.

1. Who do you think had made the better choice of purchasing the gifts? —Ridhi or her mother?
2. Make a list of five things, used at home or school, made from wood.
3. Suggest two ways by which every person can contribute towards forest conservation.

Something to Do

1. Visit a national park or a wildlife sanctuary and prepare a list of ten plants and ten animals that you see there. Are these plants and animals present in the area where you live? What could be the reason?
2. Given below is a poem about how human activities can be harmful to the environment. Read this poem and write down five harmful activities of humans. Suggest some ways by which we can stop and reverse the harmful effects.

"The world is finite, resources are scarce,
Things are bad and will be worse,
Coal is burned and gas exploded,
Forests cut and soil eroded,
Wells are dry and air polluted,
Dust is blowing, trees are uprooted,
Oil is going, ores depleted,
Drains receive what is excreted,
Land is sinking, seas are rising,
Man is far too enterprising,
Fires will rage with man to fan it,
Soon we will have a plundered planet."

—K.E. Boulding

4 ANIMALS—OUR FRIENDS

Since the beginning of civilisation, animals have played an important role in the life of human beings. We have animals, like dogs, cats and parrots, as pets. Everyday, we use many products, like milk, cheese, honey, eggs and meat, as food; these are obtained from animals. Horses and oxen are used as draught animals to draw wagons and carts; they are also used to assist the farmers in their fields.

The following points further explain the usefulness of animals in our day-to-day life:

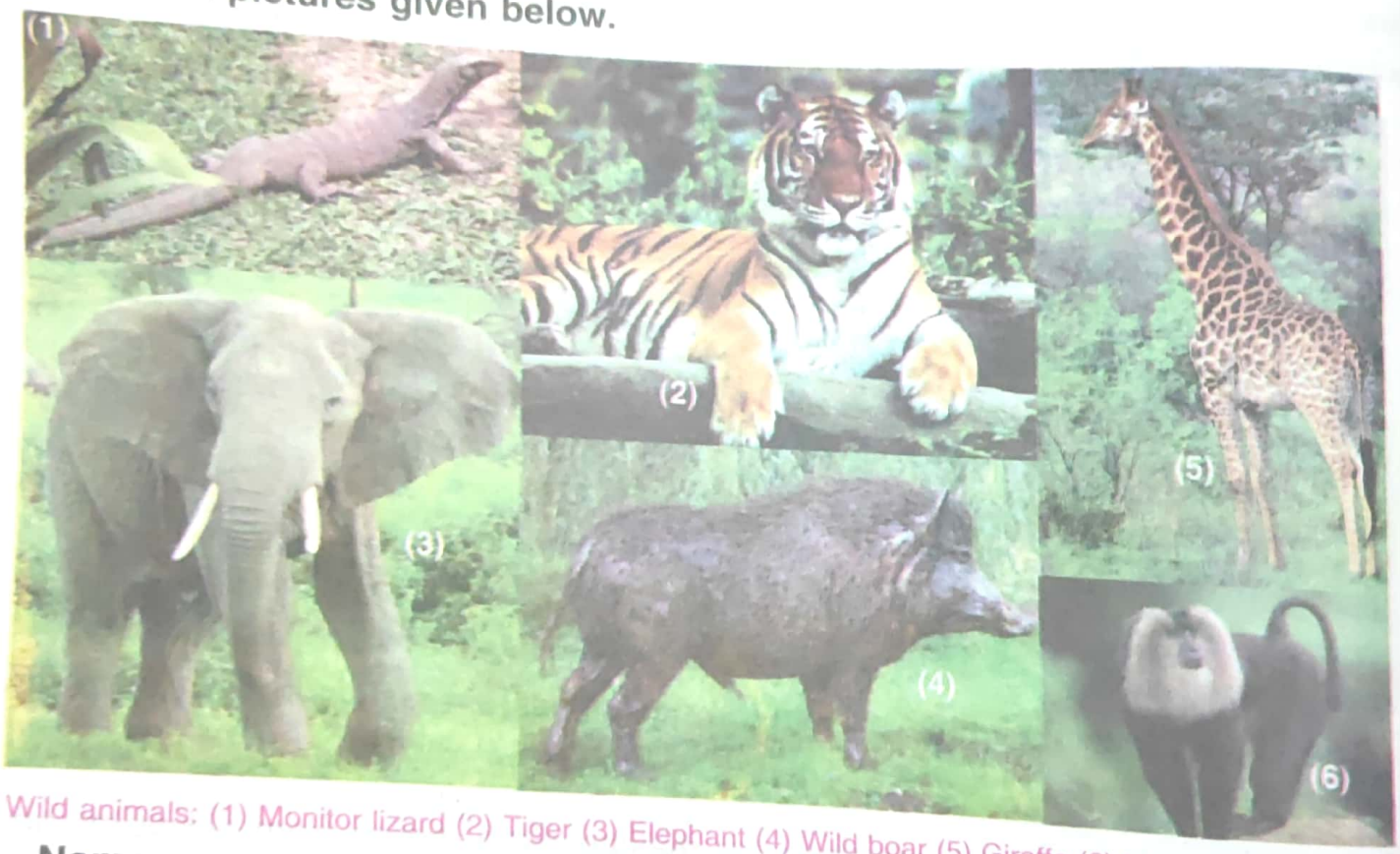
- Silk and wool, that are used for making cloth, come from silkworm and sheep respectively.
- Leather, obtained from the skin of animals like goat, sheep and buffalo, is used to make shoes, purses and bags.
- Pearls, used as jewellery, are obtained from oysters.
- Many types of fish, prawns, lobsters and crabs, are used as sea food.
- Animals like horses, camels, elephants are used as means of transport.
- In the ancient times, kings had dogs that used to assist them in hunting in the forests. At present, dogs assist police in various search operations.

- Animal waste, like cowdung, is converted to compost. Compost makes soil fertile for growth of plants.

WILDLIFE

Wildlife includes all those plants and animals that live and grow in their natural surroundings. Wildlife is found everywhere—in plains, rivers, mountains, seas, rainforests and deserts. Today, there are very few places left on the earth where wildlife is totally untouched by human beings.

Look at the pictures given below.



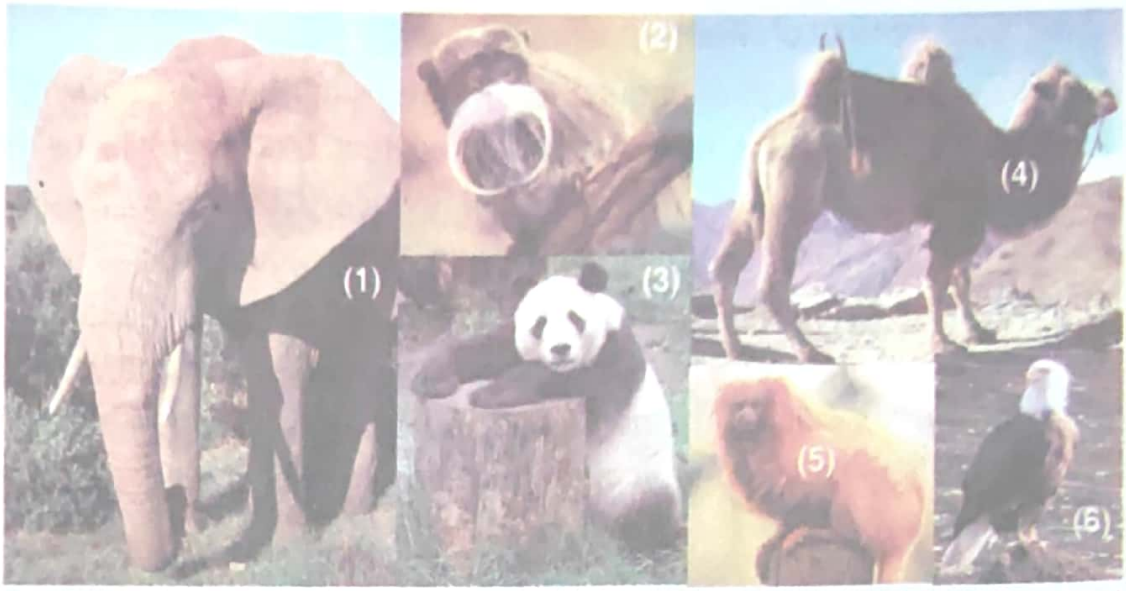
Wild animals: (1) Monitor lizard (2) Tiger (3) Elephant (4) Wild boar (5) Giraffe (6) Lion-tailed macaque

Name some more wild animals that live in forests.

Wild animals were present on the earth long before the arrival of human beings. They have as much right to live here as we do. However, we, the human beings, are destroying the natural surroundings of these animals by cutting down forests and by polluting rivers. Due to this, many wild animals are not able to live in their changed surroundings and are increasingly becoming extinct.

Extinct animals are those animal species which are no longer living. Animals like Tasmanian tiger, quagga, passenger pigeon, golden toad and caribbean monk seal, have already become extinct.

Endangered animals are those animal species that are in danger of becoming extinct. Animals, like African elephant, bactrian camel, bald eagle, golden lion, tamarin and panda, are some of the animals that face the danger of becoming extinct.



Endangered Animals: (1) African elephant (2) Tamarin (3) Panda (4) Bactrian camel (5) Golden lion (6) Bald eagle

Do You Know?

Kenya's Masai Mara, one of the world's most famous Wildlife Sanctuaries, was recently voted one of the seven wonders of the natural world. However, it is getting seriously threatened by human activities.

Dangers of Wildlife Trade

In many parts of the world, wildlife is in danger because of many illegal hunting and poaching activities. There are animals which are being killed because their body parts are used by humans. This is known as **wildlife trade**.

Let us find out which body parts of various animals are being used for trading.

- Elephants are hunted for their tusks. The tusks, or ivory (as it is commonly known), are used for making jewellery and decoration pieces.
- North and South American bears are also being killed for their gall bladders, which are then smuggled to other countries and used to make medicines.
- Rhinoceroses are being slaughtered for their horns. These, are grounded into powder form, to make medicines.

- Musk deer is becoming extinct because it is being hunted to obtain *Kasturi*, an ingredient of many perfumes.
- A variety of mountain goat is hunted because its hair yield a very expensive variety of wool—*pashmina*.
- Tigers, endangered throughout their range, are killed for making use of their bones. The skins of tigers are used to decorate walls by hunters. Tiger claws and teeth are worn as jewellery by many supersitious persons who think that these can bring them good luck.
- Legs of frog are eaten as they are considered to be a 'delicacy'. About 200 million to 1 billion frog legs are consumed each year. This might lead to the extinction of many species of frog. Such a decrease, in the population of frogs, will affect many organisms and also increase the insect population.
- *Caviar*, another very costly delicacy, is made from the unfertilised eggs of a variety of fish. However, this has led to a steady decline in the number of this variety of fish.

If this type of illegal trade continues, many species may disappear from earth.

Protection of Wildlife

We hear of cases where monkeys are troubling people. They often take away things from their houses. Sometimes, we hear of leopards and tigers having become man eaters. We should realise that they are doing so because man is destroying their living areas by cutting down forests. Protection of wildlife is very important.

Government of India enacted the **Wildlife (Protection) Act, 1972** with the objective of effectively controlling poaching and illegal trade in wildlife. This has been amended in January, 2003. Punishment and penalty for offences under the Act have been made more stringent.

A very important reason for protecting wildlife is that they form an important part of many food chains. If they are killed, many other animals in that food chain get affected.

Food Chain and Food Web

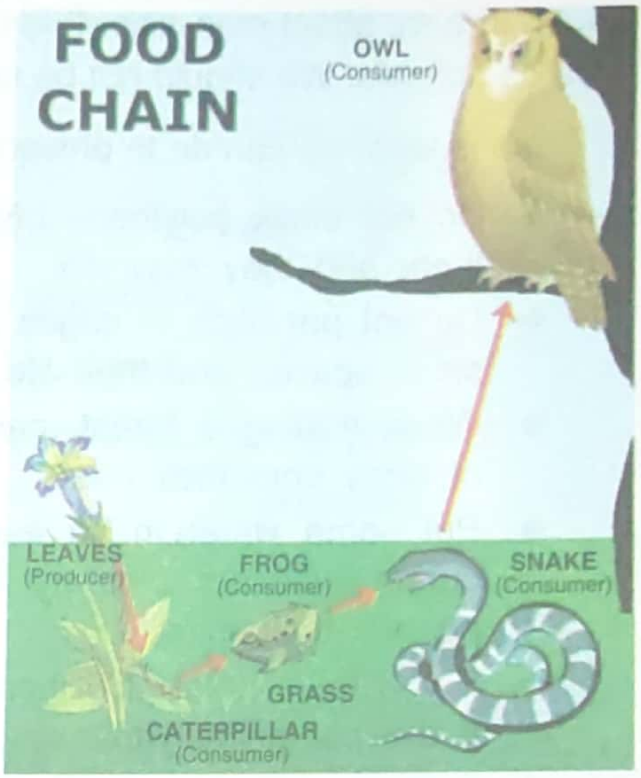
Food chain is a process of 'who eats whom'. A food chain shows how each living organism gets its food. For example, leaves (eaten by), caterpillar (eaten by), a frog

(eaten by), snake (eaten by) an owl form one food chain. If we destroy one link in a food chain, we might end up by destroying the whole food chain.

Food chains are found in all habitats, such as desert, water or plains.

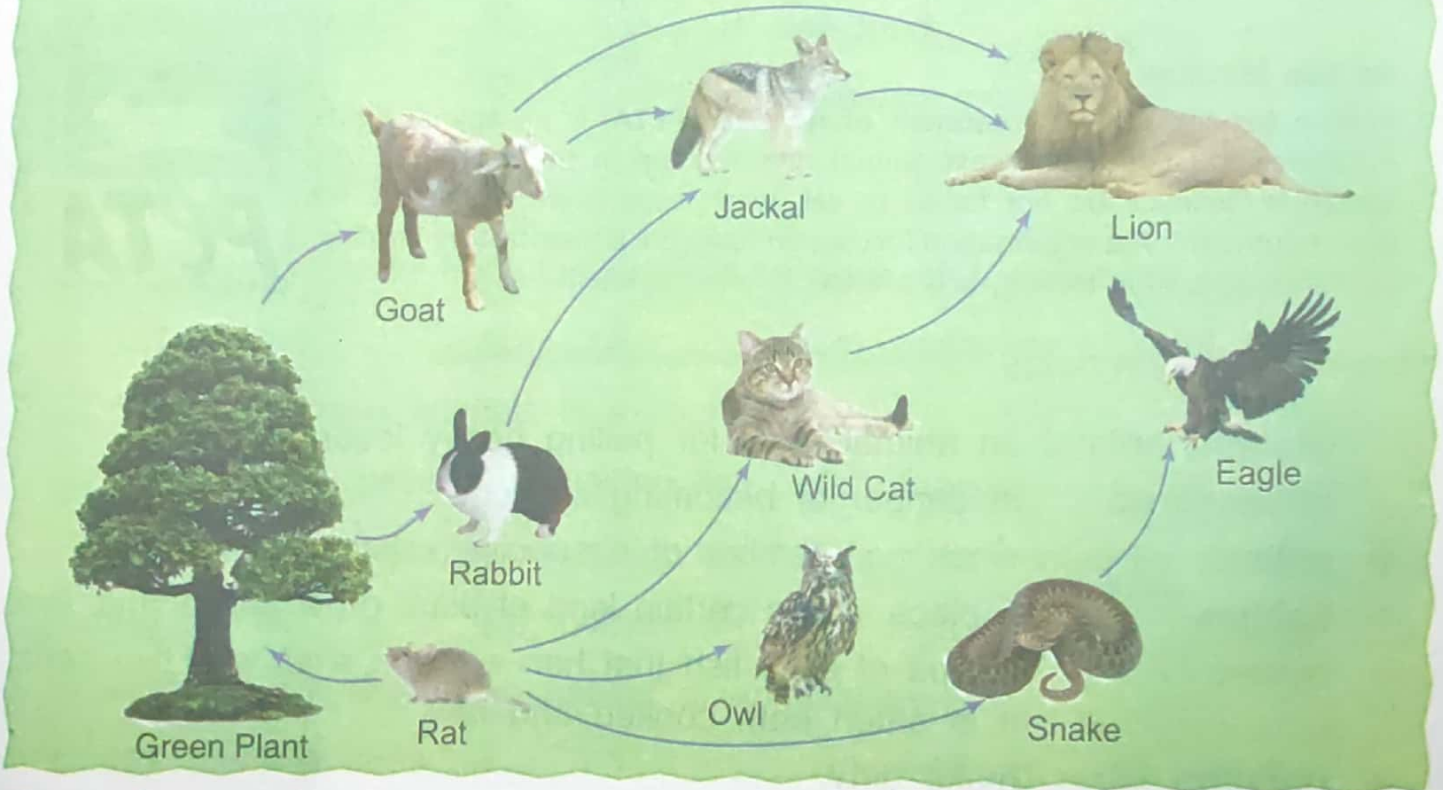
Most animals are part of more than one food chain; they also eat more than one kind of animals in order to meet their food requirements. Such interconnected food chains form a **food web**.

Food webs show how plants and animals are interconnected in many ways to help them survive in nature.



Activity:

Try to make at least five food chains from the given food web.



Care for Animals

Many animals are being affected due to the activities of man. Man is destroying a number of food chains and is thereby, disturbing the food webs. All such activities

would, in turn; affect man also. It is important for all of us to be more considerate towards animals. We should not be cruel towards them.

Here is what we can do to prevent cruelty to animals:

- Do not throw polythene bags in the garbage. Stray cattle can swallow them and they may die.
- Do not put birds in cages and fish in aquariums. They feel trapped in small spaces and their life span gets reduced.
- When visiting a forest, park or garden, one should not remove eggs of birds from their nests.
- Put some water in an earthen bowl and keep it outside, especially during summers. You will be able to see many birds coming there to quench their thirst.
- If you have pets, give them the love and good care that they deserve. If the pet animal appears to be sick, take it to the veterinarian.
- Talk to your friends about how to treat animals with kindness and respect. Be a good role model.
- Visit and support your local animal rescue organisation.

Do You Know?

People for the Ethical Treatment of Animals (PETA) is an animal rights organisation. It is the largest animal rights group in the world. PETA's slogan is "animals are not for us to eat, wear, experiment on, or use for entertainment." The organisation focuses on four core issues: factory farming, fur farming, animal testing, and animals in entertainment.

Keywords

- **draught animal** an animal used for pulling heavy loads.
- **endangered** in danger of becoming extinct.
- **extinct** when no member of a species exists any longer.
- **habitat** a place where certain kind of plant grow and animal live.
- **oyster** a type of shell fish that has a rough shell with two parts; it is eaten both cooked and raw.
- **pollute** make dirty.
- **species** a group of very similar plants or animals.
- **tusk** extra long tooth that grows outside the mouth of elephants.
- **veterinarian** doctor that looks after, heals and treats animals.

Something to Know

A. Fill in the blanks.

1. We keep _____ and _____ as pets.
2. _____ assist police in search operations.
3. *Kasturi* is an ingredient of _____ deer.
4. _____ of elephant have been used for making jewellery.
5. Extinction of frogs will increase the _____ population.
6. Food chains are found in all _____.

B. Match the following:

1. crab	a. pulling cart
2. oyster	b. endangered animal
3. ox	c. pearl
4. mountain goat	d. sea food
5. bald eagle	e. *pashmina* wool

C. Tick (✔) the correct option.

1. A delicacy made from the unfertilised eggs of a variety of fish is the—
   (a) *kasturi* (b) caviar (c) *pashmina* (d) tusk
2. Which of these animals is extinct?
   (a) bactrian camel (b) golden lion (c) quagga (d) panda
3. The body part of rhinoceros, for which it is often hunted by humans, is—
   (a) bones (b) horns (c) legs (d) skin
4. Humans are destroying habitat of animals by—
   (a) planting trees (b) reducing water pollution
   (c) controlling wildlife trade (d) cutting down trees

5. Which of the following food chain is correct?

(a) leaves → frog → snake

(b) grains → hen → man

(c) acorn → rat → eagle

(d) plant → jackal → lion

D. Answer the following questions in brief.

1. Name five wild animals.
2. Give the meaning of the term food chain.
3. How are human beings destroying the natural surroundings of wild animals?
4. Name the animals that can become man eaters.
5. Which Act has been passed by the Indian government to protect wildlife?

E. Answer the following questions.

1. State any five ways in which animals are useful to us.
2. Differentiate between extinct and endangered animals. Give two examples of each type.
3. What is wildlife trade? Why is it harmful?
4. Suggest any four steps to prevent cruelty to animals.
5. Some wild animals are hunted because their body is considered useful by man. Give four examples of such wild animals. Also mention the part of the body which is used in each case.

Based Question

Aadya, a student of Class-V, had a senior lady, madam Mehani, as her new neighbour. She had a young puppy as her pet. Aadya noticed that Rashi, her helping hand, would take care of the puppy. She would take it for a walk in the morning and again in the evening. She would feed it proper puppy food at regular intervals. Aadya soon became friends with both the puppy and Rashi. She would also help the senior lady to the extent she could.

After some days Rashi had to go on leave as she was urgently needed at her home. Madam Mehani became a little panicky as she was not strong enough to take the puppy for its walks. Aadya, however, assured her that she would do the needful and help her to the best possible extent. She requested her mother to take care of the puppy in the morning as she had to go to her school. Her mother appreciated her helpful nature, and her concern and empathy for others. The mother and daughter helped Madam Mehani till Rashi came back. Both madam Mehani and Rashi thanked Aadya and her mother for all the help and care they provided. The puppy also seemed to be thanking them as it wagged its tail and played with Aadya.

1. State the values, displayed by Aadya that you would also like to have.
2. Have you ever had a chance to help a senior citizen? Share your experiences with your classmates.
3. Do you think that a pet is likely to be a good companion for a single senior citizen?

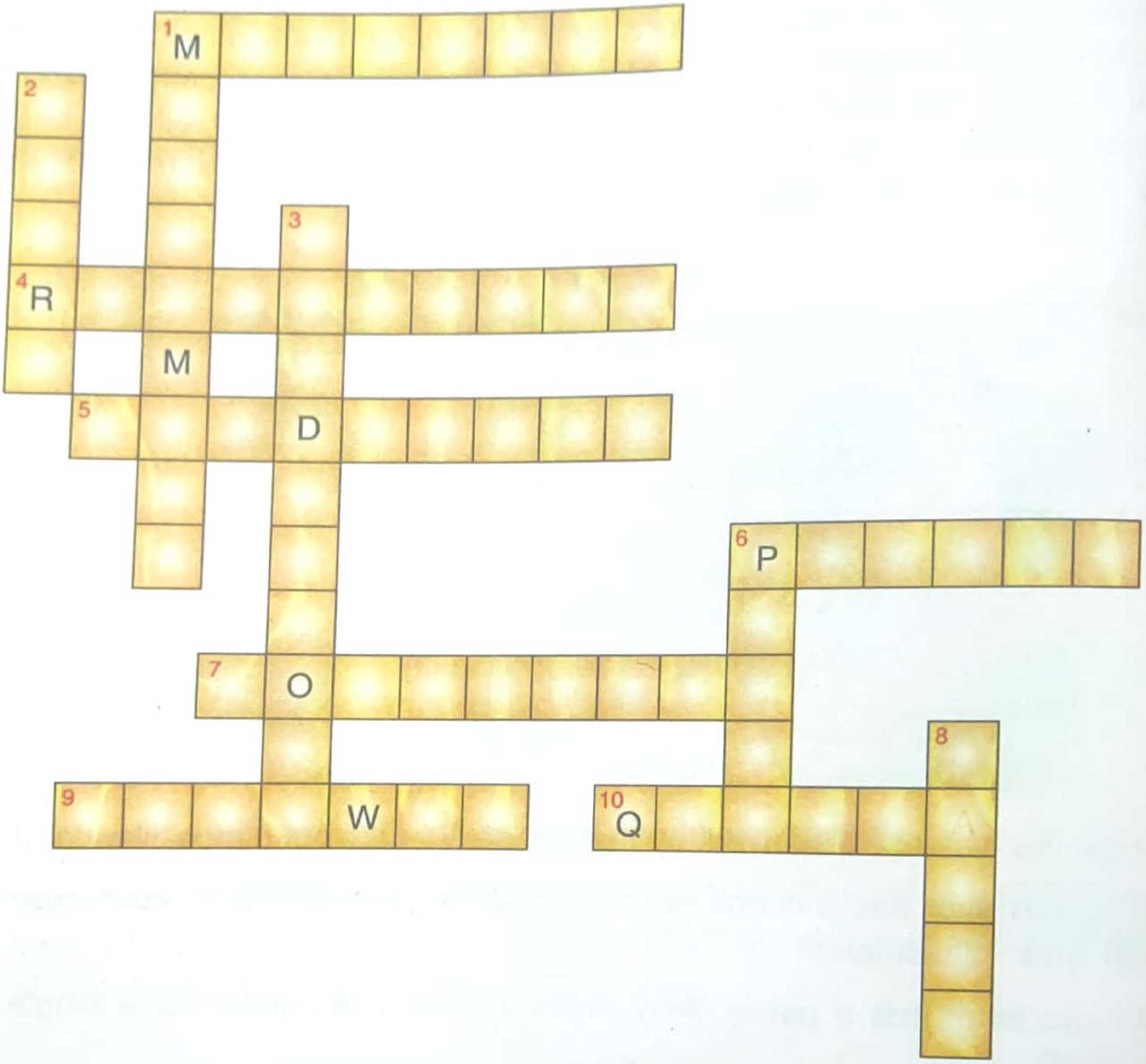
Something to Do

1. Complete the following food chains. The first one is done for you.
   1. Plant → Insect → Sparrow
   2. Grass → _____ → Lion
   3. Plant → Grasshopper → _____ → Snake

4. Producer → _____ → Carnivore

5. Grains → Mouse → _____

2. Solve the following crossword puzzle with the help of given clues.



Across →

1 Hunted for *Kasturi.*

4 Slaughtered for horn.

5 Rules the sky but still in danger of becoming extinct.

6 Green bird, my pet.

7 Who eats whom.

9 Interconnected food chains form a _____

10 I was there once upon a time...

Down ↓

1 Voted as one of the seven wonders of the world.

2 Open an oyster and you may find me.

3 A relative of frog, I am now extinct.

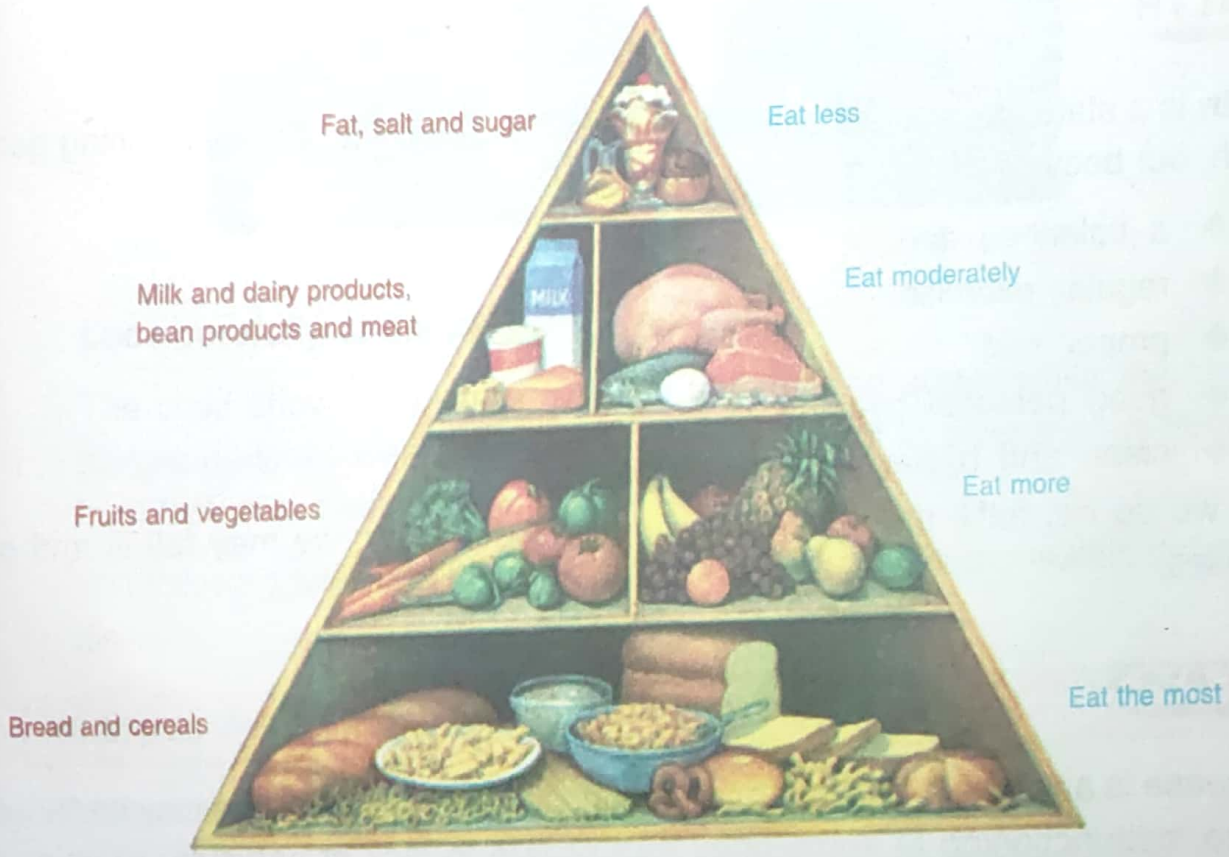
6 I eat bamboo leaves to grow, am in logo of WWF

8 Desert is my home.

5 FOOD AND HEALTH

All living organisms need food. Food helps us to grow and stay healthy. It also gives us energy to do work. We eat different kinds of food. This not only suits our tastes but also provides us with different types of nutrients. **Nutrients** are substances present in food that are required for proper growth and development of our body. Carbohydrates, proteins, fats, vitamins and minerals are the main nutrients that may be present in different food stuffs.

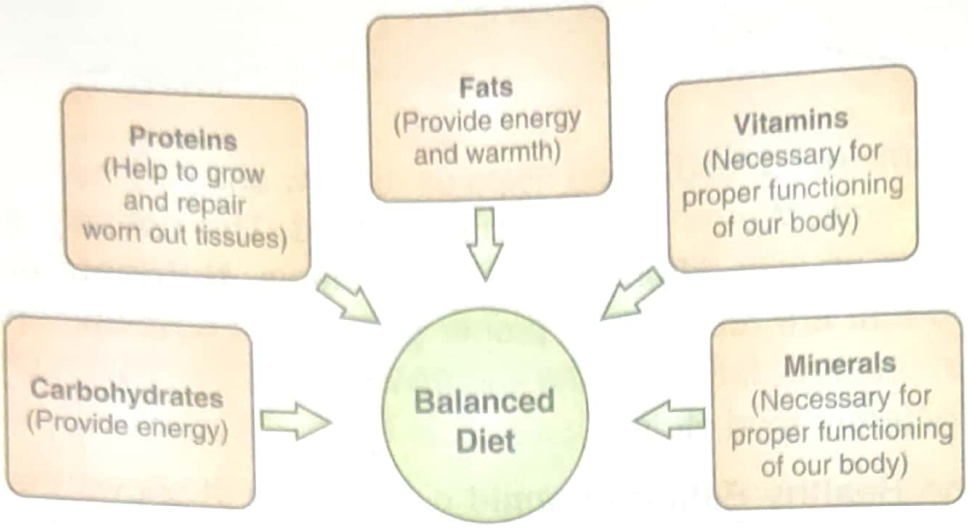
Observe the **Healthy Eating Pyramid** given below. It shows the proportion of food stuffs and nutrients that we should eat for making our food balanced and good for our health.



Healthy Eating Pyramid

For the Teacher: Teacher will explain the Healthy Eating Pyramid to the students and discuss the role of different food items in providing nutrients to our body. She/He will also explain to the students why it is better to be a vegetarian.

We already know that there are different types of foods, i.e. energy giving, body building and protective foods. They should be taken in appropriate amounts so that our diet is balanced.



Nutrients in a Balanced Diet

HEALTH

Health is a state of complete physical and mental well being. For maintaining good health, our body needs:

- a balanced diet
- regular exercise
- proper rest
- good personal hygiene
- clean and hygienic surroundings.

If we do not fulfill these different needs of our body, we may fall ill and get diseases.

DISEASES

A **disease** is any defect, or abnormality, found in the body. Diseases may be caused due to malfunctioning of some body part or due to lack of particular vitamins or minerals in the body. Diseases are classified into two main categories:

1. Non-Communicable diseases
2. Communicable diseases

Non-Communicable Diseases

Diseases, which generally do not get tranmitted from one person to another are, called **non-communicable diseases**. While some of these diseases may be present at birth, a number of them are caused due to deficiency of some particular nutrient, such as proteins, carbohydrates, vitamins or minerals in our diet. Diseases, that are caused due to some deficiency in our diet, are known as **deficiency diseases**.

Let us now learn more about deficiency diseases.

(a) **Protein-Carbohydrate deficiency disease:** Protein is a body building nutrient and carbohydrate is an energy giving nutrient in our body.

(i) A healthy child

(ii) A weak child

Look carefully at the pictures given above:

The child shown in picture (i) looks healthy and active while the child in picture (ii) looks weak and sick. The child shown in picture (ii) is suffering from lack of proteins and carbohydrates in his diet.

The following table lists the main symptoms of protein-carbohydrate deficiency disease:

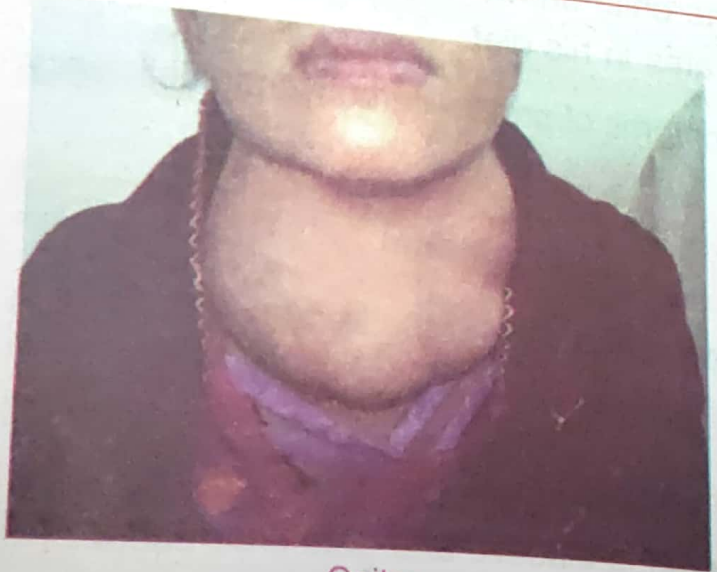
Nutrients deficient in diet	Symptoms
Proteins and Carbohydrates	• Improper growth of the body • Loose skin and sunken eyes • Thin and light hair • Person is inactive and gets tired easily

Children, in the age group of 6 months to 3 years, often suffer from this type of deficiency disease if they do not get a proper balanced diet.

(b) **Mineral deficiency diseases:** Minerals, like calcium, phosphorus, iron, iodine and sodium, are present in our body in small amounts. Deficiency of different minerals in our body leads to improper functioning of different parts of the body.

Study the following table and find out the diseases and their symptoms caused by the deficiency of different minerals:

Minerals	Deficiency Diseases	Symptoms
Iron	Anaemia (Less haemoglobin content in blood)	A person— • Looks weak and pale • Gets tired very easily • Is prone to different infections
Calcium/ Phosphorus		• Weak teeth lose their shine and whiteness • Weak, soft and fragile bones
Iodine	Goitre (Enlargement of glands in neck)	A person shows— • Swelling in the neck region • Retarded growth • Mental disorder



Goitre

Do You Know?

Haemoglobin is a pigment found in blood which transports oxygen and provides red colour to blood.

For the Teacher: Discuss the different types of food sources, that need to be included in the diet, to prevent each deficiency disease.

(c) **Vitamin deficiency:** In Class-IV, we have already learnt about the types of vitamins, their functions and sources.

Let us study the table, given below, to find out the diseases caused by the lack of different vitamins.

Vitamins	Deficiency Diseases	Symptoms
A	Night blindness	• Unable to see in dim light • Dullness in eyes • Dry and scaly skin
B	Beri-Beri	• Extreme weakness • Paralysis of body parts
C	Scurvy	• Swollen and bleeding gums • Loose teeth • Pain in joints
D	Rickets	• Soft and weak bones • Bow-shaped legs

Scurvy

Rickets

Do You Know?

In 1910, an American scientist found that the outer layer of rice kernel contains a substance called **Thiamin**. This is needed by the body to prevent a disease called **Beri-Beri**. This substance, also called **Vitamin B_1**, was the first vitamin to be discovered.

Prevention of Deficiency Diseases

The deficiency diseases can be prevented by adopting the following measures:

1. One should take a balanced diet containing all types of nutrients.
2. One must follow good food practices and habits.
3. Children must be given adequate amount of milk, milk products, and additional food items like juices, soft-boiled rice, porridge, etc.

Do You Know?

Malnutrition is a term used for a condition caused by improper or inadequate nourishment. It often results in one or more of the deficiency diseases.

Communicable Diseases

The diseases, which generally get transmitted from one person to another, are called **communicable diseases**. These diseases are transmitted either through germs, like bacteria, virus, fungi or non-living or living agents. The germs enter the body of a person through—

- nose or mouth.
- food and water taken.

Ways by which communicable diseases spread

1. By insects:

Diseases, like malaria and dengue, are spread by bite of mosquitoes. Plague is spread by fleas.

2. By air, water and soil:

Air, water and soil are non-living agents which can transmit diseases. The germs of the disease enter air, water or soil through coughing, sneezing, etc., by an infected person. They can then enter the body of another person. Germs of common cold, measles and chickenpox spread through air while germs of diseases, like cholera, typhoid, jaundice, spread through water.

Prevention of Communicable Diseases

Communicable diseases can be prevented by observing the following precautions:

1. All the articles and clothes of infected person should be disinfected.
2. One must always cover the nose or mouth while sneezing or coughing.
3. The surroundings must be kept clean and hygienic.

4. Water must not be allowed to stagnate around homes; stagnant water is the breeding place of mosquitoes.
5. It is important to keep on changing the water in room coolers, flower pots and other containers after every 3-4 days. If not changed, such water can become the breeding place of dengue mosquitoes.
6. Vaccination must be done to prevent many diseases like measles, polio and chickenpox.

Keywords

- **communicable diseases** — diseases that can be transmitted from one person to another.
- **deficiency disease** — disease caused due to lack of, or deficiency of, any nutrient in diet.
- **disease** — a defect or abnormality found in the body.
- **non-communicable disease** — diseases that cannot be transmitted from one person to another.
- **symptoms** — signs that indicate a disease.

Something to Know

A. Fill in the blanks.

1. A _____ is any defect or abnormality found in the body.
2. Children, in the age group of _____ years, often, suffer from protein-carbohydrate deficiency disease.
3. Minerals are present in _____ amounts in our body.
4. The disease, that causes enlargement of glands in the neck, is known as _____.
5. The diseases, that get spread through insects, air, water and soil, are known as _____ diseases.

B. Match the following:

1. anaemia	a. vitamin C
2. night blindness	b. iodine
3. scurvy	c. vitamin B
4. goitre	d. iron
5. beri-beri	e. vitamin A

C. Tick (✔) the correct option.

1. Haemoglobin content becomes less when a person is suffering from—
   (a) goitre (b) rickets (c) anaemia (d) beri-beri
2. A person having swollen and bleeding gums, might be suffering from—
   (a) rickets (b) scurvy (c) beri-beri (d) anaemia
3. Germs of common cold spread through—
   (a) air (b) water (c) soil (d) mosquitoes
4. Deficiency of proteins and carbohydrates, in the diet of a small child, can lead to—
   (a) weak bones (b) improper growth of body
   (c) bleeding gums (d) bow shaped legs

5. Legs become bow shaped due to deficiency of—

(a) vitamin A (b) vitamin B (c) vitamin C (d) vitamin D

D. Answer the following questions in brief.

1. State the two main categories of diseases.
2. Write two symptoms of the disease 'Beri-Beri'.
3. Name any two diseases that are spread through the bite of mosquitoes.
4. A girl finds it difficult to see in dimlight and has dry and scaly skin. Name the disease she might be suffering from.
5. Why should we not allow water to stagnate around our homes?

E. Answer the following questions.

1. How does calcium-phosphorus deficiency affect our body?
2. Suggest some measures that can help us to prevent the occurence of deficiency diseases.
3. How can we prevent the spread of germs from a sick person to a healthy person?
4. Isha was suffering from chickenpox. Her teacher advised her not to come to school till she has recovered completely. Why?
5. Why are deficiency diseases called non-communicable diseases?

Rajat had to go through a slum area while on his way to school. He noticed that some slum children looked weak and pale and were quite inactive. He did not see them playing or running around like other children of their age. He discussed this problem with his Science teacher.

His teacher, along with the help of school doctor, organised a medial camp for the slum children. Rajat and his friends presented a '*nukkad natika*' (street play) to highlight how some not very costly food items can help those children to improve their health.

1. Why did the slum children look weak and pale?
2. How did Rajat and his teacher help the slum children? Discuss.
3. Suggest the names of some food items that are not too costly but are good for our health.

Something to Do

1. Prepare flash cards of four different colours, say red, green, blue and yellow. Write names of deficiency dieases on red cards (one disease on one card), symptoms on green card, nutrient missing on blue cards and food sources, to prevent their occurrence, on yellow cards. Now shuffle the cards and ask your friends to match the other coloured cards to each of the red cards.
2. Prepare a small skit on 'How to Stay Healthy?' and present it in the class/ school assembly. You can also go to a nearby slum and educate the slum dwellers through your skit.

6 SPOILAGE AND WASTAGE OF FOOD AND FOOD PRESERVATION

Annam Parabrahmaswaroopam, says our Indian philosophy. This means that our great saints regarded 'food as a form of God'. However, many of us do not respect and follow this age old saying. The result is that millions of tons of food is being spoiled, wasted or discarded, when a large number of our fellow beings are not getting even two 'square meals'. It has been well said:

"Don't waste food; Share it with others."

Spoilage of Food

Have you ever observed what people often do after shopping for groceries?

Here are a few common observations:

- Fruits and vegetables are usually placed in the lower shelves of the refrigerator when they have to be used after a few days.
- Milk is boiled before storing. Also bottles/packets, containing milk, are stored in the refrigerator whenever possible.
- Biscuits, chips, pulses, uncooked rice, and so on, are stored in jars/ boxes that are at room temperature. Turmeric powder, or certain (properly packed) insect repellent tablets, are placed in pulses and rice so that insects do not spoil them.
- Raw chicken, fish, and other non-vegetarian items are cooked immediately or kept frozen till they are required.
- Onions and potatoes are stored in the kitchen in trays, or shelves, at room temperature.
- Sugar and salt are placed in containers and stored at room temperature in the kitchen.
- Curd is prepared at room temperature but as soon as it sets, it is placed in the refrigerator or used as soon as possible.

Such activities are carried out in order to preserve the food so that it does not get spoiled.

If some of the above mentioned items, like milk, fish, curd, eggs and fruits, are left on the kitchen shelf for a few days, their appearance, smell and taste changes. Curd becomes sour and milk curdles. Fruits get covered with a whitish, or orange powdery, substance. Some also start emitting foul smell. All these signs indicate that these food items are no longer fit for eating, and are spoiled.

Causes of Spoilage of Food

We just noted that if food is not stored properly, it gets spoiled. Before finding out the causes of spoilage of food, let us do an activity.

Activity:

Let us grow bread moulds.
Take a piece of bread and divide it into three parts. Provide the conditions as mentioned below to the three parts of bread for 6-7 days. Record your observations.

Bread piece	Conditions provided	Observations (change in colour, appearance and smell)
Bread piece 1	Dry the piece of bread in sun and leave it on the kitchen shelf (warm and dark place) for 6-7 days.	
Bread piece 2	Put the piece of bread in the refrigerator for 6-7 days.	
Bread piece 3	Put the piece of bread in a box and sprinkle some water so that it remains moist. Leave it in a covered box for 6-7 days.	

Which piece of bread has some cottony growth on it and which becomes red, brown or black after a few days? These, changes take place because bread moulds start growing on the bread. These moulds are a type of fungus.
Observe these fungi with a magnifying glass.

Now let us discuss the causes that lead to spoilage of food.

1. **Micro-organisms:** Tiny organisms, like bacteria and fungi, are the main cause for the spoilage of food. These organisms tend to grow fast in the presence of moisture and warmth.

   In the activity given above, you must have observed that moisture and temperature were two important factors for growth of the moulds/organisms. Thus, for preventing food from getting spoiled, we need to:

   - remove moisture from food, i.e. dry it.
   - keep the food at low temperature (in the refrigerator) to reduce the chances of growth of fungi and bacteria.

2. **Enzymes:** Enzymes are chemicals that are present in all fruits and vegetables. They are useful because they cause ripening of fruits. Most raw fruits are green in colour and sour, or bitter, in taste. When they ripen, they change their colour and become sweet. This happens because of the action of enzymes.

   Enzymes are, thus, quite useful. However, they also speed up chemical changes that result in the loss of flavour, colour and appearance. They can thus, also contribute to the spoiling of the food products.

3. **Insects, worms and rats:** These animals usually make their home in places that are moist and dark and where food items are available. It is, therefore, very important to keep the cupboards, shelves and containers clean and dry. This will prevent them from making a home at places where our food items are kept.

Prevention of Spoilage of Food

Food must be prevented from getting spoiled. The following methods can help to prevent food from getting spoiled.

1. Perishable food stuffs, like milk, meat, fruits and vegetables, must be stored in the refrigerator.
2. Foods, like spices, cereals, biscuits and other snacks, should be kept in airtight jars. This helps to prevent their contact

Perishable food stuffs

with the moisture in the air. The shelves and cupboards, where they are stored, must also be kept clean and dry.

3. **Food preservation** is the process of treating and handling of food to stop, or slow down, the spoilage caused by micro-organisms. Food, preserved by this method, can usually be stored for a quite a long time. It can then be used even when it is not available in its fresh form.

Airtight food containers

Some of the methods used for preservation of food are:

a. **Dehydration:** In this process, water content of the food stuff is removed. Since most micro-organisms need water to grow, they cannot multiply, or grow, on dried foods. Many vegetables, like onions and cauliflower, are dried to preserve them.

b. **Preservation by adding sugar and salt:** Both sugar and salt serve as preservatives. These tend to take out moisture from the food so that it is not available for growth of micro-organisms. This method is useful in preparing and preserving pickles and jams.

c. **Preservation by adding acetic acid:** Acetic acid, in the form of *vinegar*, is used in the manufacture of several pickled products. *Vinegar* also stops the growth of micro-organisms.

d. **Canning and bottling:** Canning involves cooking food, sealing it in sterile cans or jars, and boiling the containers to kill or weaken any remaining bacteria through a form of sterilization. Many fruits, vegetables and meat products are canned to preserve them.

Jams and pickles

e. **Pasteurisation:** It is the process in which the food product is subjected to pressurised heating, for a short time, followed by immediate cooling. The temperature used during pasteurisation is below 212°F (100°C). Milk is pasteurised to kill micro-organisms. However, many more

heat-resistant organisms only get reduced in number and do not get completely removed. Hence the pasteurised milk must generally be stored under refrigeration to keep bacterial growth in it under control. In addition to destroying some micro-organisms, pasteurisation also inactivates some enzymes and increases the shelf life of milk.

Do You Know?

Pasteurisation has been named after the well known microbiologist Louis Pasteur. Drinking unpasteurised milk is generally not safe as we can get diseases due to the presence of disease causing micro-organisms. We should always drink fresh and pasteurised milk.

f. **Refrigeration:** This procedure uses low temperature to prevent growth of micro-organisms. Micro-organisms and enzymes get deactivated at low temperatures and hence, the spoilage of food gets prevented.

g. **Vacuum packing:** In this method air is removed from the package prior to sealing. The vacuum, thus created, reduces oxygen in the package. This limits the growth of bacteria or fungi in the package. This method is commonly used to store dry foods like cereals, nuts, coffee, cheese and potato chips.

Do You Know?

Foods, containing fats and oil, change their smell and taste and become rancid in the presence of oxygen. Manufacturers usually fill nitrogen gas in packets of potato chips and other *namkeens* to prevent them from becoming rancid.

Importance of Food Preservation

Food preservation is helpful in many ways:

- It helps to maintain nutritive value of food.
- It increases the shelf life of food, thus, increasing its supply. Many perishable foods can be preserved for a long time.
- It makes seasonal foods available throughout the year.
- It decreases wastage of food by preventing decay or spoilage of food.
- It helps in adding variety to the diet. For example, in some countries some fruits and vegetables cannot be easily grown due to unfavourable soil or weather conditions. Their non-availability can be overcome through import of preserved fruits and vegetables from other parts of the world.

Wastage of Food

At a party, you must have seen how some people fill up their plates with all types of food that is available without even thinking whether they will be able to eat it or not. Sometimes they are not able to finish even half of it. So what happens to the food that is left over in the plate? It is discarded and put in the garbage bins. Is it right to waste food, especially in a country like ours, where lakhs of people cannot afford even one square meal a day? We should only take as much as we can eat.

Also, while shopping, we should buy only what we can consume. Excess of food, when bought, is likely to go waste. We need to remember:

"TAKE WHAT YOU EAT; EAT WHAT YOU TAKE."

Keywords

- **dehydration** — the process of removing water from a substance.
- **enzymes** — chemicals present in fruits and vegetables which speed up chemical changes in them.
- **food preservation** — the process of treating, or handling, food to stop, or slow down, its spoilage or decay.
- **micro-organisms** — organisms, like bacteria and fungi, which are too small to be seen by unaided eye.
- **pasteurisation** — the process of heating food followed by immediate cooling, to limit the growth of micro-organisms.

Something to Know

A. Fill in the blanks.

1. Micro-organisms like bacteria and _____ spoil the food.
2. Insects make their home in _____ and _____ places.
3. Enzymes can be harmful because they can cause _____ of fruits and vegetables.
4. Snacks, like biscuits and chips, should be stored in _____ jars.
5. The growth of micro-organisms slows down at _____ temperatures.

B. Write True or False for the following statements.

1. Growth of bread moulds, on bread, indicates that it has got spoiled. _____
2. Vinegar is used as a preservative. _____
3. It is safe to drink unpastuerised milk. _____
4. We can eat more than the required quantity. _____
5. We may eat spoiled food rather than wasting it. _____

C. Tick (✔) the correct option.

1. A natural insect repellant, found in our kitchens, is—
   (a) salt (b) sugar
   (c) turmeric powder (d) wheat flour
2. Dry foods, like cereals and nuts, are preserved by—
   (a) adding salt and sugar (b) vacuum packing
   (c) dehydration (d) pasteurisation
3. Fruits and vegetables get ripened due to the action of—
   (a) enzymes (b) bacteria (c) fungi (d) insects

4. The least perishable food item, from the following, is—
   (a) milk (b) biscuits (c) meat (d) curd
5. The chances of spoilage of food can be reduced by keeping the food—
   (a) moist (b) warm
   (c) at low temperatures (d) in open containers

D. Answer the following questions in brief.

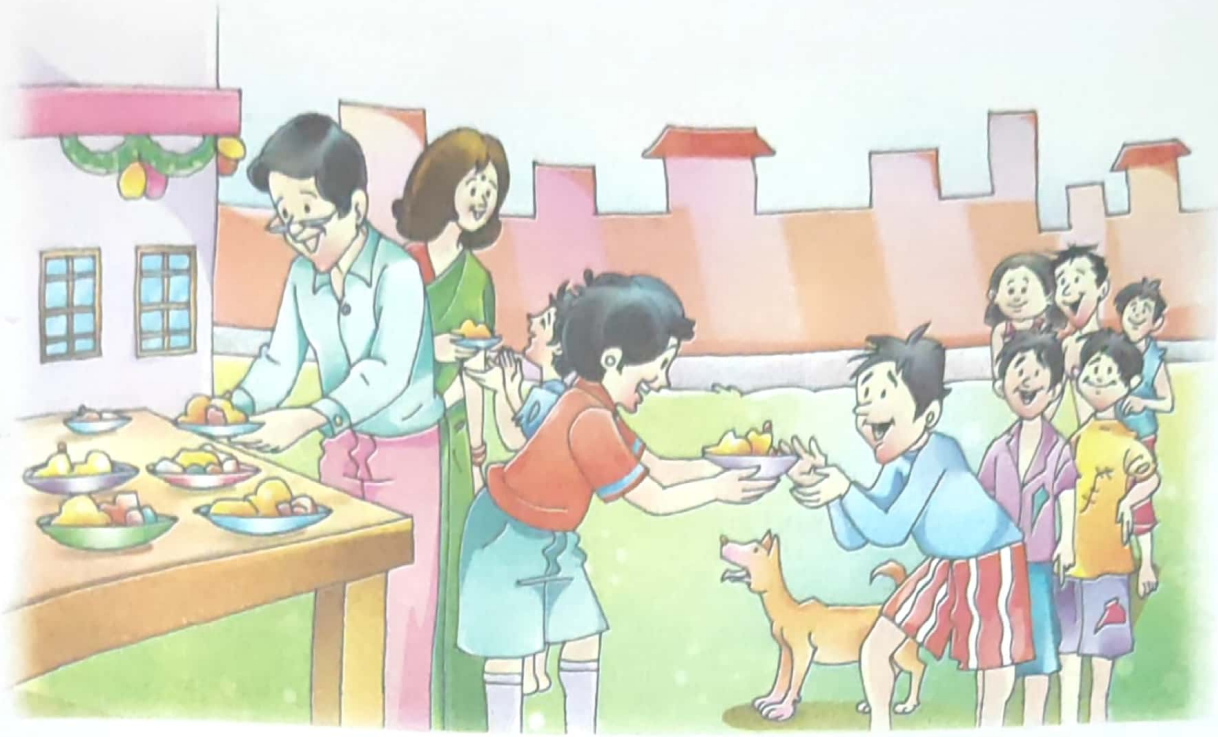
1. State two factors that contribute to the fast growth of micro-organisms.
2. What is likely to happen to curd if it is not stored in the refrigerator?
3. What do you understand by food preservation?
4. How can we protect our food from insects, worms and rats?
5. Why does food stay fresh for a longer time when stored in a refrigerator?

E. Answer the following questions.

1. Give any three reasons for spoilage of food.
2. How is food preservation useful to us?
3. Why is it important to check the manufacturing and the expiry date of packaged food items before consuming them?
4. Explain the following methods of food preservation:
   (a) Dehydration (b) Canning and Bottling (c) Pasteurisation
5. Rakesh bought two raw papayas. He kept one papaya in the refrigerator and other papaya on the kitchen shelf. Which will ripen first and why?

Based Question

Amit's father organised a party on his birthday. Many food items were prepared for the guests. A good amount of food was left over after the party. Amit asked his parents to distribute that food among the children in the nearby slums. They immediately packed the food and went to distribute it. The children were quite happy while eating that food. Amit felt satisfied by sharing the food items with those children.



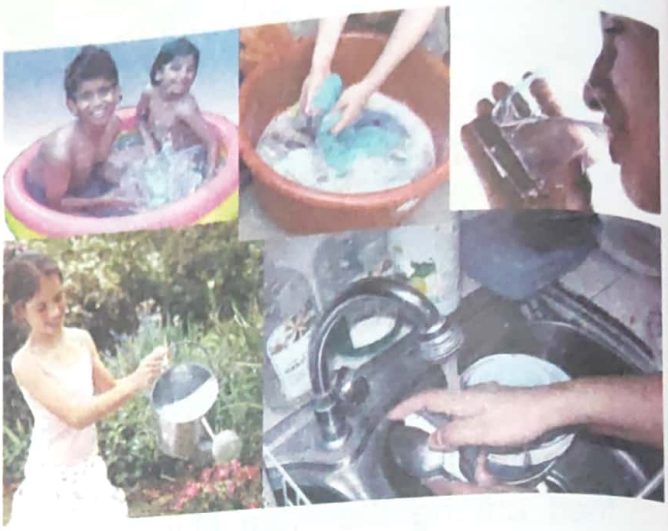
1. List the values displayed by Amit and his parents.
2. Do you think Amit and his parents did the right thing by distributing the food among the slum children?
3. Have you ever had a chance to feed a needy person? Share your experience, if any, with the class.

Something to Do

1. Find out the recipe for preparing mango pickle. Make a list of ingredients that are added to the pickle to prevent the growth of micro-organisms.
2. Note down the list of ingredients mentioned on a bottle of jam, sauce and juice. Which of these ingredients prevent spoilage of these food items?
3. Discuss the following situations in groups:
   (a) A large amount of sugar, rice, wheat flour and pulses are stored in a house but fruits and vegetables are bought on daily, or, weekly basis. What could be the reason for this activity?
   (b) Mohan visited his grandparents' village during the Summer Vacation. He saw that there were plenty of mangoes available. He wanted to take a basket full of mangoes. Is he doing the right thing? Give reasons for your answer.

7 IMPORTANCE OF WATER

Water is an important natural resource which is essential for all living beings. It is essential for the existence and survival of plants, birds, animals and human beings. We use water for drinking and other household activities like washing, bathing, cooking, cleaning and so on. Water is also used for irrigating the fields, generating electricity and for transportation.



Do You Know?

The human body contains about 70% water.

Do You Know?

Boats and ships have been a very important means of transportation from very early times. They move on water bodies like rivers, oceans and seas.

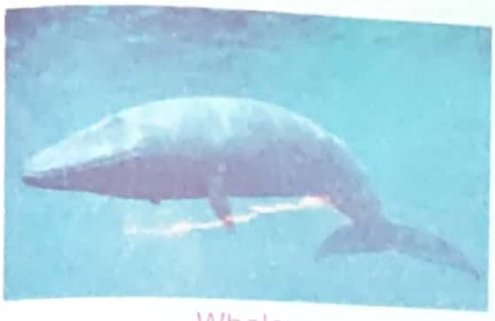
Let us now learn about the importance of water for animals and plants.

Importance of Water for Animals

All animals drink water. This helps them in digesting their food. The nutrients present in food get dissolved in water. This helps their bodies to absorb the nutrients. The animal body also produces waste materials. Some of these wastes get dissolved in water and are excreted in the form of urine.

Water bodies, like lakes, rivers and seas, are natural habitat for many animals. Animals living in water are called **aquatic animals**.

Fish, whale, seahorse, prawn and octopus are some of the common aquatic animals. These animals cannot live outside water.


Whale


Seahorse


Prawn


Octopus

There are some other animals, like frog, turtle and crocodile, that can live both in water and on land. Such animals are called **amphibious animals**.


Frog


Turtle


Crocodile

Importance of Water for Plants

Plants require various nutrients for their proper growth. These nutrients get dissolved in water present in the soil. Plants absorb water from the soil with the help of their roots. This absorbed water transports the nutrients to various parts of the plant.

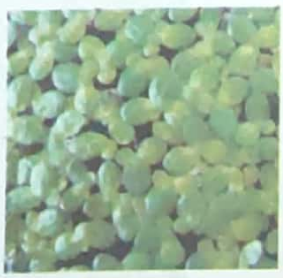
Plants also need water for preparing their own food by the process of photosynthesis. Plants require water for germination of seeds.

Water is a habitat for many plants. We call such plants as **aquatic plants**.

Water lily, lotus, water hyacinth, duckweed, water lettuce and *hydrilla* are some examples of aquatic plants.


Lotus


Water hyacinth


Duckweed


Water lettuce


Hydrilla

Do You Know?

'Kamal kakri', often eaten as a vegetable, is, in fact, the stem of the lotus plant.

Water Availability in Nature

In the previous class, we have learnt that about three-fourth of the surface of earth is covered with water. However, only a very small percentage (about 3%) of it is practically used by humans in their daily life.

Ground Water

About 97% of water is present in seas and oceans. The remaining 3% water is present in rivers, ponds, lakes, streams and glaciers. A small part of water, from earth's surface, seeps into the ground and gets trapped between underground rocks. This is called **ground water**.

Earlier, people used to fetch water for their daily needs from rivers, lakes or wells. Even now, in many areas, where there is no system of supplying water through pipes, people depend on natural sources of water like rivers or ponds.

People taking water from pond

Ways of Drawing Out Ground Water

Ground water can be drawn out in many ways.

Earlier, people used to draw ground water from *baolis* or stepwells. A **stepwell** is a well having steps on all sides. This enables people to go down to fetch water.

A Stepwell or *Baoli*

Water Wheel or *Rehat*

A Well

Ground water can also be drawn out and used for irrigation with the help of a water wheel or a *rehat*.

A very common and widely used method to draw out ground water, from a well, is to use a pulley.

Ground water is also drawn out using tubewells. In a tubewell, a long pipe is inserted deep into the ground where it dips below the ground water level. Water is then drawn up by using a hand pump or an electric pump.

Water Supply

Now-a-days, there are well-planned water supply systems that supply water to homes and offices in the cities. Such systems are also being used in many villages. In such systems, the river water is usually purified by a series of processes that make it fit for drinking. This purified water is then sent to homes and offices through a network of pumps and pipes.

Keywords

- **amphibious animals** — animals which can live both in water and on land.
- **aquatic animals** — animals which live in water.
- **aquatic plants** — plants which grow in water.
- **ground water** — water which is trapped between underground rocks.
- **stepwell** — a well which has steps on all its sides.

Something to Know

A. Fill in the blanks.

1. Water helps in _____ of food in animals.
2. Animals living in water are called _____.
3. Animals, which can live both in water and on land, are called _____
4. Water, trapped between underground rocks, is called _____
5. _____ and _____ are aquatic plants.

B. Write True or False for the following statements.

1. Water is required for germination of seeds. _____
2. Ground water can be drawn up by a hand pump. _____
3. About 50% of water is present in seas and oceans. _____
4. Octopus is an amphibious animal. _____
5. River water is purified for drinking purpose. _____

C. Tick (✔) the correct option.

1. About 97% of water is present in—
   (a) seas and oceans (b) lakes
   (c) ponds (d) glaciers
2. Plants absorb water from the soil with the help of—
   (a) stem (b) leaves (c) branches (d) roots
3. A *rehat* is used for—
   (a) supplying water through taps.
   (b) purifying river water.
   (c) drawing out ground water for irrigation.
   (d) absorbing water from the soil.

4. An example of an amphibious animal is—

(a) fish (b) frog (c) *hydrilla* (d) duckweed

D. Answer the following questions in brief.

1. Name any two water bodies that exist on the surface of earth.
2. What are animals living in water known as? Write names of two such animals.
3. What are amphibious animals?
4. Write names of four aquatic plants.
5. How do plants absorb water from the soil?
6. State two common methods of drawing out ground water.

E. Answer the following questions.

1. Besides its domestic use, state three other uses of water.
2. How does water help in excretion of waste material from animal bodies?
3. List any four ways in which water is important for plants.
4. How can ground water be drawn out through tubewells?
5. What is a stepwell?
6. How is water supplied in cities?

Based Question

During the summer vacation, Kanika went to stay with her grandparents. Her grandparents lived in a small village. There was a pond near their house. Her mother would often tell her that the pond had many fish in it and flowers, like water lily and lotus, could be seen in it.

Kanika was sad to see that there were no flowers blooming in the pond. Also, there were hardly any fish in it. She noticed that some women were washing clothes and some people were bathing their cattle in the pond.

She could now understand that it was such pollution that had made pond water unfit for the fish and the flowers. She shared her concern with her grandparents. They assured her that they would ask the village *panchayat* to take steps to reduce the pollution of the pond water.

1. State the values displayed by Kanika.
2. Name two aquatic animals and two aquatic plants, other than those mentioned above.
3. Discuss, in your class, the steps that the village *panchayat* can suggest to reduce pollution of pond water.

Something to Do

1. Collect information, along with pictures, about some of the '*baolis*' existing in various parts of India. Share and discuss this information with your classmates in the school.
2. Work in a group of 4–5 students and make a water wheel, with the help of your teacher.
3. Suggest ways and means of sensitising people about the need of keeping water bodies free from pollution.

8 PROPERTIES OF WATER

On a hot summer day, when you go back home from school, your mother may give you cool *nimboo-pani* to drink. This is a very refreshing drink. Do you know how is it prepared?

Let us learn to prepare *nimboo-pani*.

Activity:

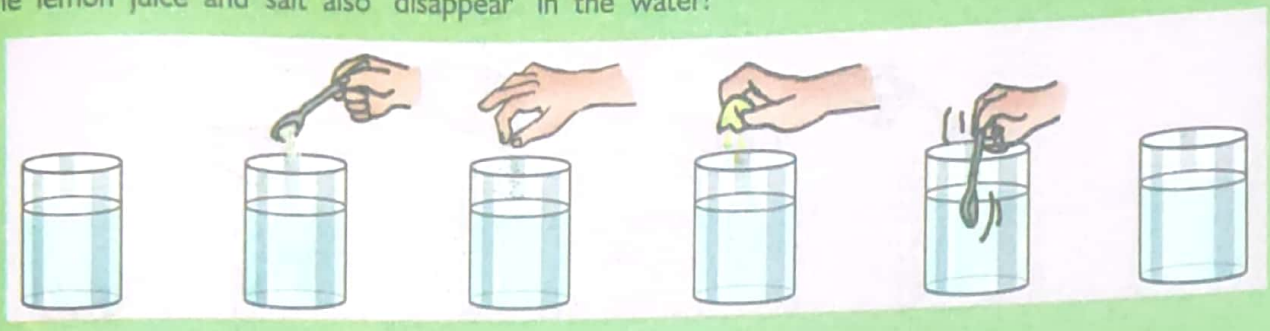
Take water in a glass tumbler. Add one teaspoon of sugar in it. Stir this mixture.

What do you observe?

The sugar 'disappears' in water.

Add some lemon juice and a pinch of salt to the above mixture and stir.

The lemon juice and salt also 'disappear' in the water!



Is this some kind of magic?

This is not magic. In fact, sugar, salt and lemon juice get 'dissolved' in water.

Soluble Substances

When a substance completely mixes in water, such that its particles are not visible, it is said to have got **dissolved** in water.

A substance which dissolves in water is said to be **soluble** in it.

Thus, sugar, salt and lemon juice are all soluble in water.

Solute and Solvent

When a substance dissolves completely in any medium, we get a **solution**. Thus, by mixing sugar in water, we get a solution of sugar in water.

The substance, that gets dissolved in a medium to form a solution, is called a **solute**. The medium, in which the substance is dissolved, is called a **solvent**. In the previous activity, water is the solvent whereas sugar, salt and lemon juice are all solutes. The refreshing *nimboo-pani* drink is a solution.

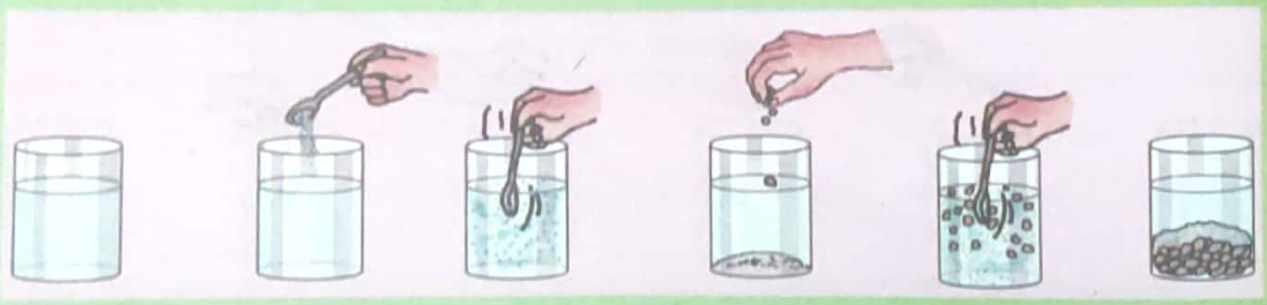
Insoluble Substances

There are many materials that do not get dissolved in water in the way sugar, salt and lemon juice do. Such substances are said to be **insoluble** in water.

Let us perform the following activity to understand this.

Activity:

Take some water in a glass beaker or tumbler. Add some sand to it and stir thoroughly. Then, add some tiny pebbles to the same container and stir again.



What do you observe?

Sand and pebbles do not 'disappear' in water. They are seen clearly in water as separate entities.

This shows that sand and pebbles do not dissolve in water. They are, therefore, said to be insoluble in water.

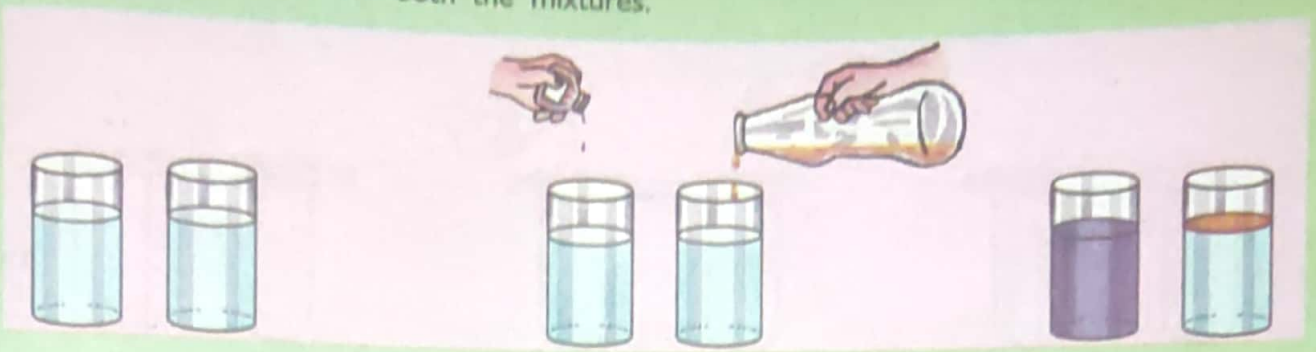
We have observed earlier that lemon juice gets dissolved in water.

Do all liquids get dissolved in water?

Let us check this by performing the following activity.

Activity:

Take two glass tumblers. Fill them half with water. Add a few drops of ink in one tumbler and mustard oil in the other. Stir both the mixtures.



What do you observe?

Ink dissolves in water whereas mustard oil does not dissolve.

It is not only solids and liquids that may, or may not, get dissolved in water. We find that some gases are soluble in water while others are not. Gases, like carbon dioxide and oxygen, dissolve in water in small amounts. Aquatic animals use this dissolved oxygen for breathing.

Nitrogen gas, on the other hand, is insoluble in water.

Floating and Sinking

The materials, which do not dissolve in water, either **float** on its surface or **sink** to the bottom of the container.

Let us perform the following activities to understand this.

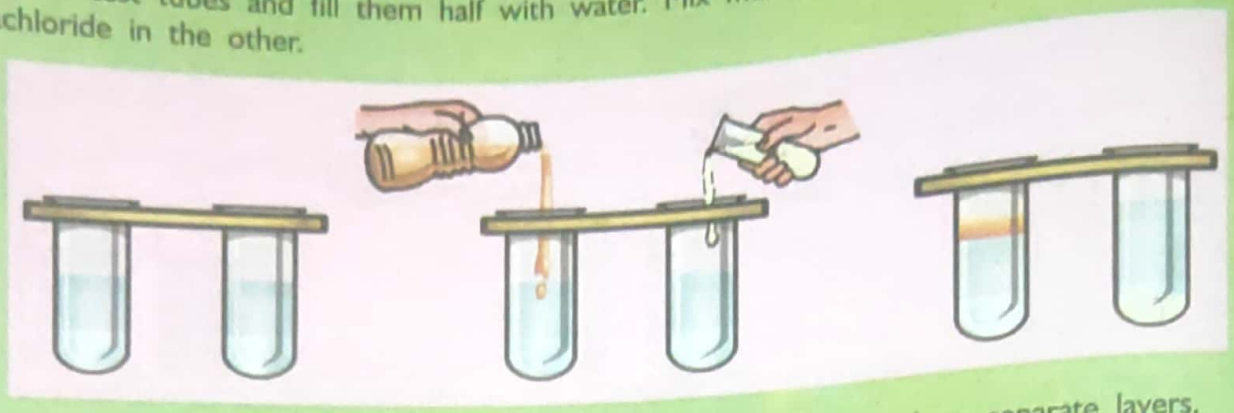
Activity:

Take two glass beakers. Fill them half with water. Put some coins in one beaker and some cork pieces in the other. Stir both thoroughly.

Coins and cork pieces are both insoluble in water. However, coins sink to the bottom of the beaker while cork pieces float on the surface.

Activity:

Take two test tubes and fill them half with water. Mix mustard oil in one test tube and carbon tetrachloride in the other.



Both mustard oil and carbon tetrachloride are insoluble in water and form separate layers.

Mustard oil is seen to form a layer above water. We say that it floats on water.

Carbon tetrachloride, on the other hand, forms a layer below water. We say that it sinks in water.

Note: Teacher should handle carbon tetrachloride herself/himself.

We observe that some materials sink in water and some materials float on its surface. Sand, coins, pebbles, carbon tetrachloride, iron nails, marbles are some materials which sink in water.

Cork, butter paper, thermocole, saw dust, hair oil, mustard oil are some materials which float on the surface of water.

A given material may sink in water, or float on it, depending on its nature and type. You will learn more about this property in higher classes.

Physical States of Water

Water mainly exists in the liquid form but it can be changed into its vapour or solid forms. This is done by changing its temperature.

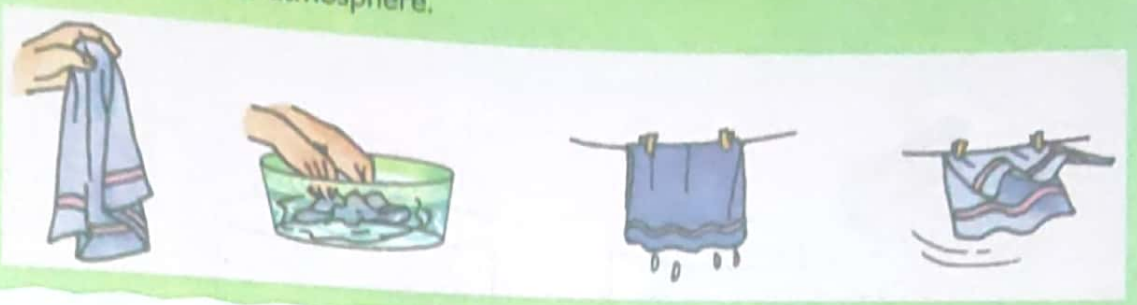
Liquid form of water

Change of Liquid Water into Water Vapour

Let us perform the following activities to learn about the change of liquid water into water vapour.

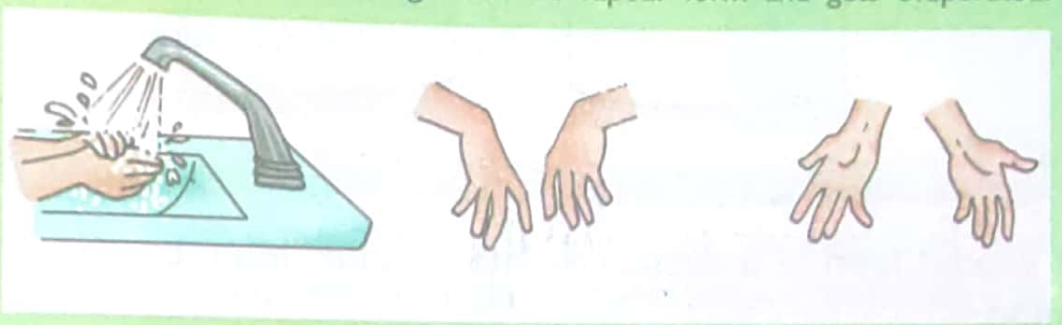
Activity:

Dip a handkerchief in water and then spread it on a wire in the open. It will dry out after sometime. It happens because the water gets evaporated, that is, changes into vapour form. These water vapours go into the atmosphere.



Activity:

Wash your hands with water but do not wipe them. After sometime, the hands will get dry on their own. It is because the water changes into its vapour form and gets evaporated.



Change of a liquid into its vapour form is called **Evaporation.**

Change of Water Vapour into Liquid Water

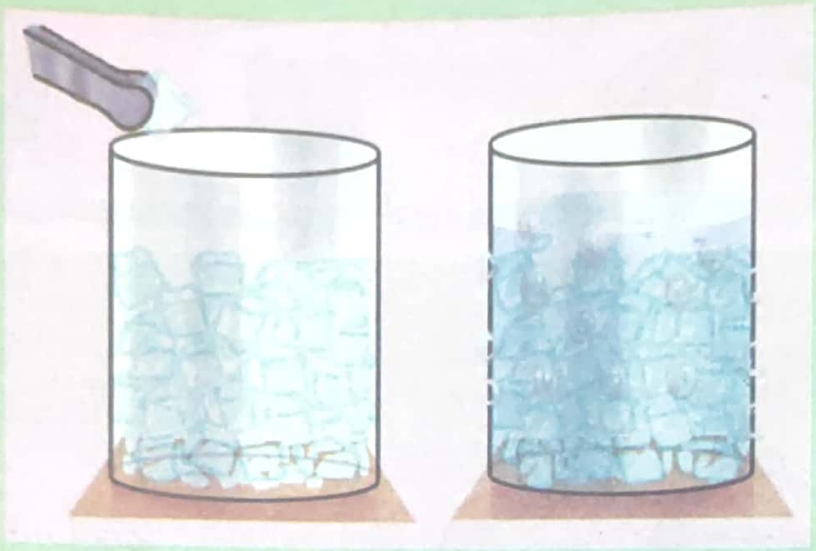
Let us perform the following activities to learn what happens to water vapour when it is cooled.

Activity:

Take some hot water in a cup and cover it with a saucer. After sometime, lift the saucer. You will see tiny droplets of water deposited on it. The vapours, coming from hot water, form liquid water on cooling.

Activity:

Take a glass tumbler and put some ice in it. Observe it for sometime. Water droplets will appear on the outer surface of the tumbler. Water vapours, present in the air, get cooled on the surface of the tumbler (containing ice) and change into liquid water.



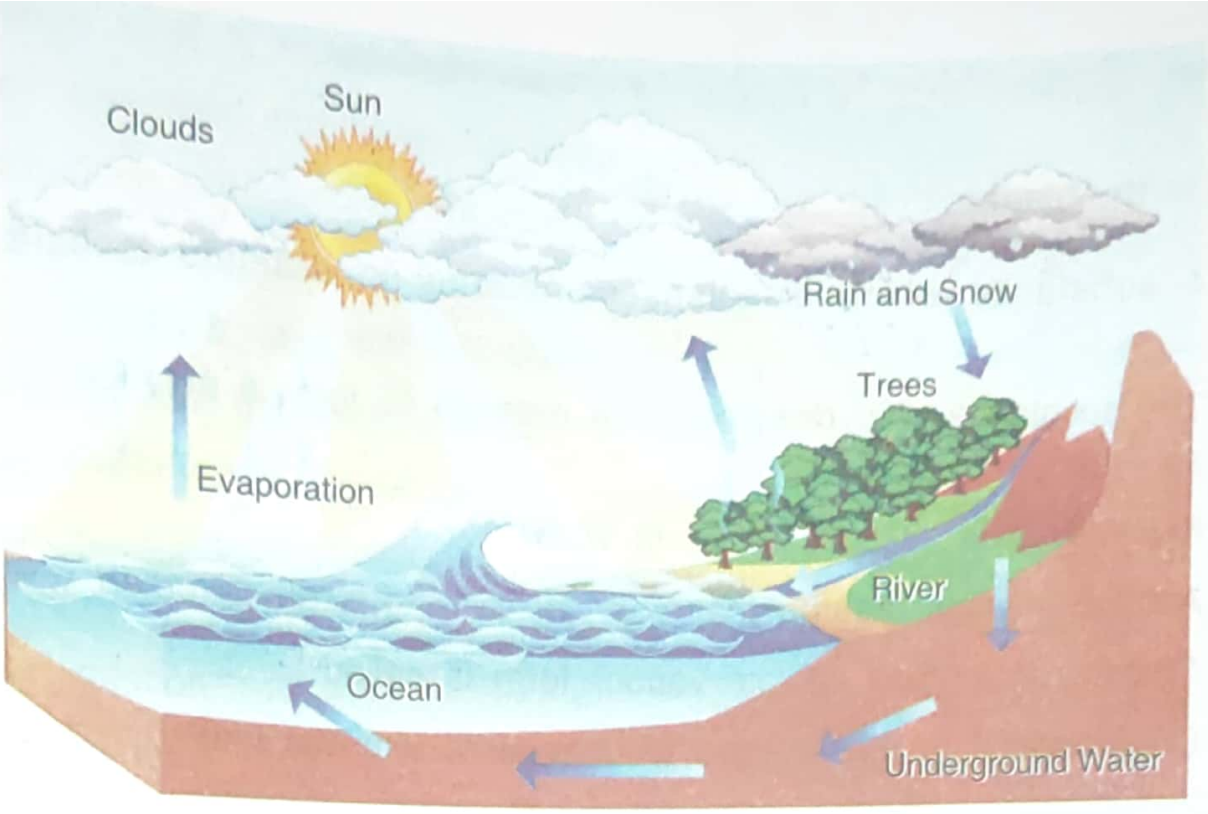
Change of vapour form of a substance into its liquid form, on cooling, is called **Condensation.**

Such a process of conversion of water vapour into its liquid form occurs in nature also on a large scale. Can you guess, when?

Water Cycle

Water, from oceans, seas, rivers and lakes, changes into vapour as it evaporates due to the heat of the sun. These water vapours rise up. As these go very high, they get cooled and condense to form tiny droplets of liquid water. In this way, clouds are formed. As more and more water vapours condense, the drops of water in the clouds get bigger and bigger. Finally, they fall back on the earth as rain.

A part of rain water, which falls on the earth, sinks into the ground. Some of this ground water is taken up by the plants and some of it goes to wells or springs. Most of the rain water goes back to the rivers and seas. From there, it again gets evaporated by the heat of the sun. The cyclic process, of evaporation of water from the earth's surface, followed by its condensation, is called **water cycle** in nature.



Water Cycle in Nature

Raindrops, when just formed, are the purest form of water. By the time they reach the surface of the earth, they become impure, because they dissolve many harmful gases present in air and also get dust and smoke mixed up with them.

Do You Know?

Transpiration is a process similar to evaporation. It is the loss of water from parts of plants, especially leaves. Transpiration adds to the amount of water vapour present in the air. Thus, it also plays a role in cloud formation.

Keywords

- **condensation** — change of vapour form of a substance into liquid form on cooling.
- **evaporation** — change of a liquid into its vapour form.
- **solute** — the substance that gets dissolved in a medium to form a solution.
- **solution** — mixture formed when a substance dissolves completely in any medium.
- **solvent** — the medium in which a substance is dissolved to form a solution.

Something to Know

A. Fill in the blanks.

1. A substance which dissolves completely in a liquid is said to be _____ in it.
2. The substance, that dissolves in a medium to form a solution, is known as the _____.
3. Mustard oil is _____ in water.
4. Aquatic animals breathe the _____ gas dissolved in water.
5. Change of a liquid into its vapour form is called _____.
6. Condensation is the process of change of vapours into _____.

B. Write True or False for the following statements.

1. Sugar and salt are soluble in water. _____
2. Hair oil is insoluble in water. _____
3. Pebbles float on water. _____
4. Sand sinks in water. _____
5. Water vapours can be changed into liquid water by heating. _____

C. Tick (✔) the correct option.

1. In a solution of sugar and water—
   (a) water is the solute.
   (b) sugar is the solvent.
   (c) both water and sugar are solutes.
   (d) water is the solvent.

2. When sand is mixed with water, it—
   (a) dissolves and floats on water.
   (b) does not dissolve but floats on water.
   (c) does not dissolve but sinks in water.
   (d) dissolves and sinks in water.
3. Wet clothes get dried due to—
   (a) water cycle
   (b) evaporation
   (c) respiration
   (d) condensation
4. Mixture of sugar, salt and lemon juice in water is a—
   (a) solution
   (b) solvent
   (c) solute
   (d) floating mixture

D. Answer the following questions in brief.

1. Define a solution.
2. What is a solvent?
3. Name two substances that are soluble in water.
4. Name two substances that are insoluble in water.
5. Write the names of four substances that float on water.
6. Name the three forms of water.

E. Answer the following questions.

1. Give two examples each of:
   (a) liquids which dissolve in water.
   (b) liquids which are insoluble in water.
   (c) solids which float on water.
   (d) solids which sink in water.
2. What do we understand by the terms 'evaporation' and 'condensation'?
3. How are clouds formed?
4. How does rain water get impure?
5. Draw a diagram showing the water cycle.

VALUE Based Question

One day, when Anant came back after playing football with his friends, he was thirsty. He requested his mother to prepare lemonade for him. After washing his hands, he went to help his mother to prepare it.

He took water in a tumbler, added two spoons of sugar to it and stirred it. Sugar got dissolved in water.

His mother then added a pinch of salt and some lemon juice to the sugar solution. Anant stirred the mixture and added some ice to it. A cool lemonade drink was now ready.

1. In the solution prepared by Anant, name the solutes and the solvent.
2. If the glass tumbler, containing the cold lemonade, is kept on the table for sometime, what change will be observed?
3. State the values displayed by Anant.
4. Share your experiences, of having helped someone, with your friends.

Something to Do

1. The window panes of a closed car, with people sitting inside, often get foggy in winter. Find out the reason for this observation.
2. Perform the following experiments and discuss the observations in the class with your teacher. Also, draw your own conclusion about the properties of water.

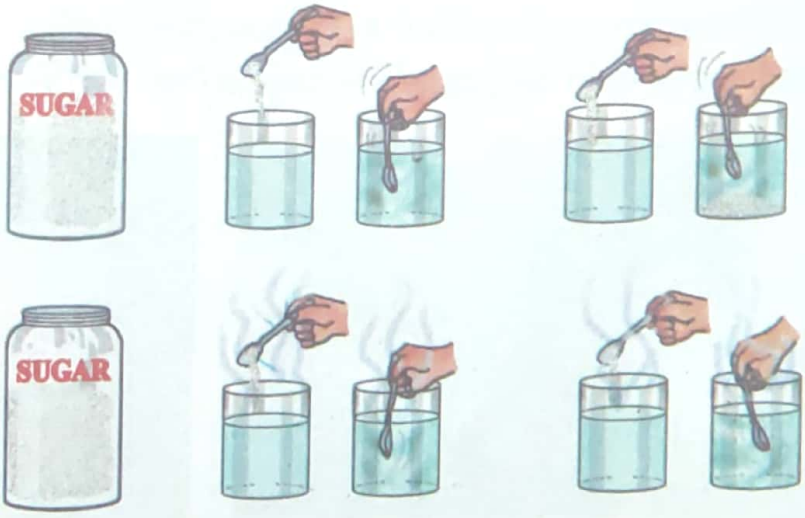
Experiment I:

To learn about the effect of heating on the amount of a substance that gets dissolved in water.

Take a glass tumbler and fill it half with water. Add two teaspoons of sugar to it and stir. Sugar will dissolve. Add some more sugar and stir. A stage soon comes when sugar does not dissolve in water but starts 'settling down'.

Take another tumbler with moderately hot water in it and repeat the experiment.

Which of the two dissolves a greater amount of sugar?



Experiment II:

Check the solubility of the following materials in water and find out whether they float on the surface of water or sink in it.

Rubber eraser, chalk piece, marble, wood shaving, ice cube, a five rupee coin, cooking oil, cork.

3. Fill the boxes with suitable words on the basis of the clues given below:

Down ↓

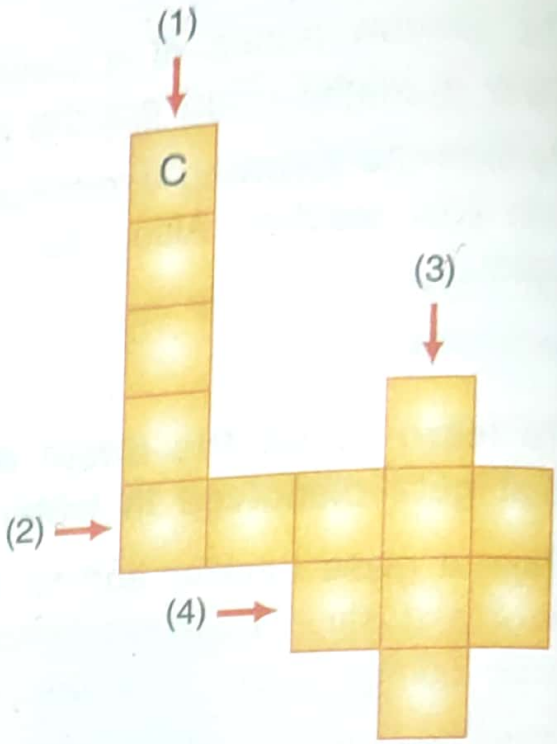
(1) These sink in water.

(3) A grey substance that does not dissolve in water and sinks in it.

Across →

(2) A sweet substance that is soluble in water.

(4) A liquid that is soluble in water.



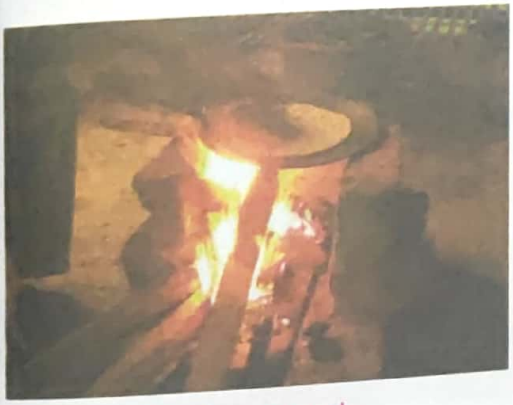
9 FUELS

When we run around for a while, we feel tired after sometime. In fact, whenever we do any work involving physical activity, we feel tired after sometime. Why is this so? This is because when we do some work, we use up a part of the energy stored in our body.

Where do we get this energy from? We get energy from the food we eat. A substance that produces energy on burning is called a **fuel**. Hence, food can be thought of as a 'fuel' for our body.

Types of Fuels

Fuels are available in solid, liquid or gaseous forms. Wood, coal, coke and cowdung cakes are some examples of solid fuels. Kerosene, petrol and diesel are examples of liquid fuels. Liquefied Petroleum Gas (LPG), Compressed Natural Gas (CNG), Piped Natural Gas (PNG) and biogas are examples of gaseous fuels.



Burning wood

Petrol being filled in a car

LPG cylinder

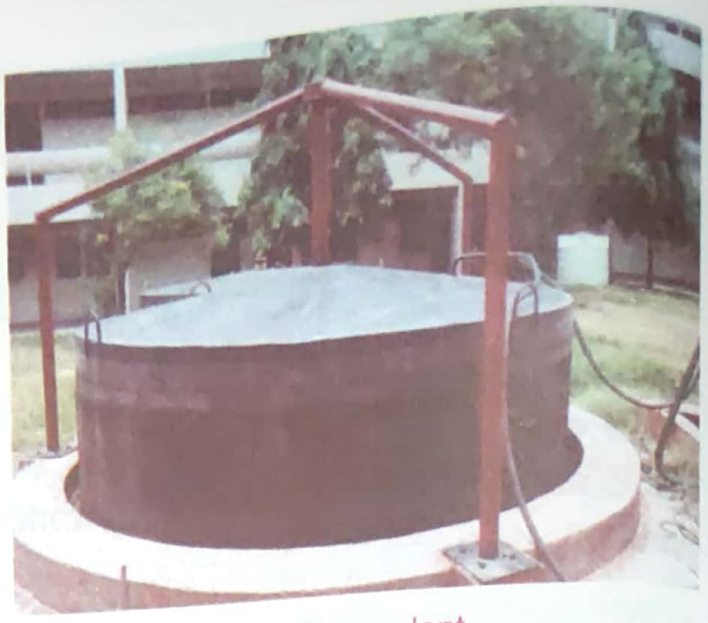
Uses of Fuels

We now know that fuels produce energy on burning. Energy is required for many purposes. We need energy for cooking, for movement of trains, automobiles and aeroplanes, for generating electricity, for running various machines and so on. For getting energy, we use different types of fuels in different situations.

Domestic Fuels

In the early ages, man discovered 'fire', and learnt cooking. At that time it was wood that was mainly used as the fuel. Later, cowdung cakes, coal and kerosene also started getting used as domestic fuels. These fuels are used even now, in some households. It is gaseous fuels, like LPG, PNG and biogas, that are now commonly used as domestic fuels. These are **'cleaner fuels'** as they do not produce smoke on burning and do not leave any ash after burning.

These 'cleaner fuels' are convenient to use, and are more efficient. They are also more 'eco-friendly'.



A Biogas plant

Do You Know?

The ash, a by-product of coal combustion, is used as a filler for things like the tennis rackets and golf balls.

Fuels for Transportation

Trains were earlier run with the help of steam engines. In these engines, steam was produced by burning coal. Now-a-days, train engines use either electricity or diesel.

Steam engine

Auto-rickshaw

Aeroplane

CNG bus

Vehicles, like buses, cars and scooters run on petrol or diesel. Aeroplanes commonly use a highly refined kerosene based fuel known as Aviation Turbine Fuel (ATF). Buses, auto-rickshaws and cars now prefer to use CNG as their fuel. This is because CNG powered vehicles have lower maintenance costs and better efficiency. Also CNG is a better **'green fuel'**. It causes less air pollution, is more eco-friendly and causes less harm to the health of humans and animals.

Activity:

Select three modes of transportation that are often used for travelling (i) within the city (ii) between two cities and (iii) between two countries. Complete the following table on this basis.

S.No.	Mode of transportation	Fuel used as source of energy
1. Within the city		
2. Between two cities		
3. Between two countries		

Fuels for Generating Electricity

Powerhouses often burn coal to convert water into steam. This steam energy is used to operate turbines which in turn, help to generate electricity.

This method of generating electricity is not eco-friendly. It is being gradually given up. Other better, and more eco-friendly methods, are now being used for generating electricity.

Do You Know?

Electricity is now being produced by using the energy stored in water and also by using wind energy and energy of the sun. These methods are more eco-friendly than the one based on using coal.

Activity:

Put the following steps in correct order and draw the flow chart of the process.

Production of steam

Water gets heated up

Coal burns

Turbine turns

Electricity produced

Fuels and Machines

Earlier, household works, like washing clothes, washing utensils, spinning, weaving, separating cotton from seeds, and so on, were done manually. This was time consuming, slow and tiring. Hand-operated machines were then developed to help

us do these jobs faster and in a less tiring manner. Later on, machines working through steam (generated by burning coal), were invented. This resulted in an increase in the demand for coal.

Railways, ships, powerhouses and factories required large supplies of coal. The reserves of coal, in nature, started depleting rapidly. Coal cannot be replenished easily as nature takes a very long time to make it.

To meet these challenges, steam engines were gradually replaced by other engines which used liquid fuels like petrol and diesel. Petrol, diesel and kerosene are all obained by refining crude oil (petroleum). However, petroleum reserves in nature are also limited and cannot be replenished easily.

Fossil Fuels

Both coal and petroleum are fossil fuels.

Fossil fuels are fuels that are formed by decomposition of animal and plant matter, buried deep under the surface of earth, at the high temperature and pressure prevailing there. Such deep buried animal and plant matter got changed into fossil fuels over a period of millions of years.

Main Fossil Fuels

There are three main fossil fuels—coal, crude oil (petroleum) and natural gas.

Coal is a combustible black sedimentary rock. It is primarly used for production of heat and electricity.

Crude oil (petroleum)—This was formed from dead sea-creatures. These dead sea-creatures fell to the sea-bed where their bodies underwent chemical changes due to bacteria.

Coal

Oil

Natural Gas

Natural gas—This was formed much the same way as crude oil. It is often collected when drilling for oil.

Renewable and Non-renewable Sources of Energy

Sources of energy, which once used, cannot be readily replenshied are called **non-renewable sources** of energy. Coal and petroleum are two of the non-renewable sources of energy.

There are, however, some sources of energy which are freely available and which can be readily replenished. They are called **renewable sources** of energy. Solar energy, tidal energy, wind and biomass (waste matter of animals and plants) are examples of renewable sources of energy.

Do You Know?
Electricity, generated by using the energy of water, is called **hydroelectricity.**

Solar water heater

Wind energy

Activity:

Complete the following table:

Item/Object	Source of energy	Renewable/Non–Renewable
Flying kite		
Kerosene stove		
Sail-boat		
Bulb		
Television		
Car		

Also make similar table of your own.

Looking for Alternatives to Fossil Fuels

Fossil fuels are available in limited quantity and are not likely to last for a long time. They are also a major cause of environmental pollution. We should, therefore, use them with care. We should avoid their wastage and take suitable steps to minimise their use. Efforts are now being made to develop vehicles which can run on electricity. Other alternative fuels are also being tried.

Electric Car

Electric Scooter

We should also make suitable efforts to conserve fuels as and when we can. For example, it is better for us to cycle, or walk, to a nearby place instead of going on a car or a motor bike. It is also desirable to form car-pools and to use public transport, like buses and metro trains, for travelling within the city.

This will not only save fuel and money, but will also reduce environmental pollution. We all need to take adequate steps to face the challenges and problems posed by the fuel crisis and increasing environmental pollution.

When it is bright, switch off the light

Activity:

Make an energy collage that classifies different kinds of sources of energy. Use suitable pictures and present the finished collage to the class. Discuss why you have classified the pictures under the category of renewable and non-renewable sources of energy.

Keywords

❖ biomass	the waste matter of animals and plants.
❖ CNG	compressed natural gas.
❖ coal	a black rock that is a type of fossil fuel.
❖ fossil fuel	fuels which are formed from decomposition of living things over a period of millions of years.
❖ fuel	a substance that produces energy on burning.
❖ green fuel	fuel which causes less environmental pollution.
❖ LPG	liquefied petroleum gas.
❖ non-renewable source of energy	a source of energy likely to be available only for a limited period of time.
❖ petroleum	fossil fuel used mainly for transportation.
❖ PNG	piped natural gas.
❖ renewable source of energy	sustainable source of energy likely to be always available.

Something to Know

A. Fill in the blanks.

1. _____ acts as fuel for our body.
2. Cowdung cake has been often used as a _____ fuel.
3. Aeroplanes use highly refined _____ based fuel.
4. _____ is a better green fuel.
5. Petrol and _____ are fossil fuels used for transportation.
6. Solar energy is a _____ source of energy.

B. Write True or False for the following statements.

1. LPG is used as a domestic fuel. _____
2. Some train engines run on diesel. _____
3. Powerhouses burn CNG to generate electricity. _____
4. Coal is a renewable source of energy. _____
5. We should use public transport to help reduce environmental pollution. _____

C. Tick (✔) the correct option.

1. Out of the following, the fuel, that is best for reducing environmental pollution, is—
   (a) diesel
   (b) coal
   (c) compressed natural gas
   (d) cowdung cakes
2. A good fuel is one that—
   (a) does not burn easily.
   (b) is costly and not easily available.
   (c) does not produce smoke or leave ash.
   (d) is not easy to store.

3. A fuel, that is not obtained by refining petroleum, is—

(a) petrol (b) diesel (c) kerosene (d) biogas

4. Out of the following, the energy source, that is a renewable energy source, is—

(a) petrol (b) wind (c) diesel (d) coal

5. Coal, a common fossil fuel, is formed—

(a) from the waste of animals.

(b) from dead sea-creatures.

(c) by decay of water plants.

(d) by decay of vegetation, under heat and high pressure, over a long period of time.

D. Answer the following questions in brief.

1. State the main function of a fuel.
2. Give one example each of solid, liquid and gaseous fuels.
3. Why is biogas regarded as a better fuel than cowdung cakes?
4. Why is CNG called a better green fuel?
5. Name the three main fossil fuels.
6. State two disadvantages of fossil fuels.

E. Answer the following questions.

1. How have fossil fuels been formed?
2. When is a source of energy said to be a renewable source of energy? Give two examples of such sources.
3. When is a source of energy said to be a non-renwable source of energy? Give two examples of such sources.
4. How is coal used by powerhouses for generating electricity?
5. Why should efforts need to be made to reduce the use of fossil fuels?

VALUE Based Question

Ramesh, a very hardworking and sincere engineer, got a chance to visit a village in a far flung area. The people of the village were using wood and cowdung cakes as the fuel for cooking their food. They also did not keep their village neat and clean.

Ramesh explained to villagers the importance of cleanliness in their life. He also helped them to set up a biogas plant. The villagers felt very happy when they started using this new fuel. They found it to be a convenient, cleaner and more eco-friendly fuel.

1. State the values, and qualities, displayed by Ramesh.
2. Why is biogas a better fuel than wood or cowdung cakes?
3. Discuss how a neat and clean environment is good for 'one and all'.

Something to Do

1. Make a poster on: 'Energy saved today is the energy for tomorrow'.
2. Make a presentation on 'Wind energy and its practical uses'.

3. Collect information about the following and discuss it with your classmates and teacher:

   (a) What is meant by the 'mileage' of a vehicle?

   (b) Do all vehicles give the same 'mileage'?

   (c) How can one get a better 'mileage' from a vehicle like a car?

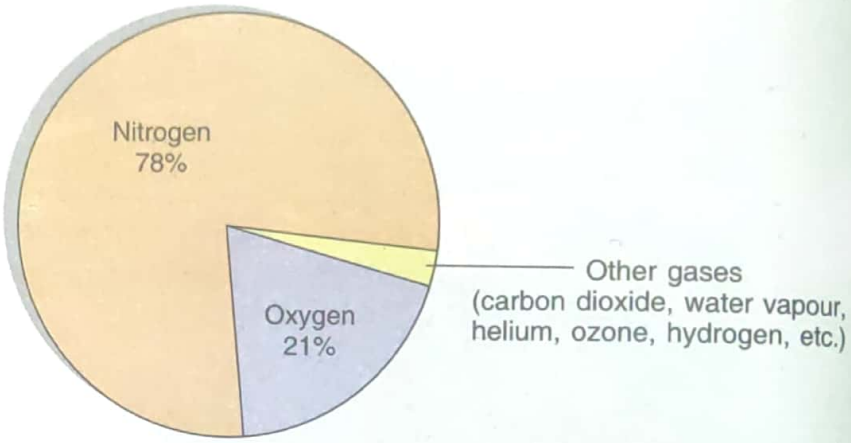
4. Collect information about how solar energy can be used to get electricity. Find out the names of some places where 'solar power projects' are being put to use.

10 AIR

Air is present all around us. We can feel it but cannot see it. This is because pure air is colourless, odourless and tasteless. We feel air only when it blows.

Composition of Air

Air is an invisible mixture of gases. It is made up mainly of nitrogen (nearly 78%) and oxygen (nearly 21%). It also contains water vapour and small amounts (1%) of other gases. These other gases include carbon dioxide, ozone, helium and hydrogen among others.



Composition of Air

Do You Know?

The amount of water vapour present in air determines the **humidity** of air.

Importance of Air

Air is very important for animals and plants.

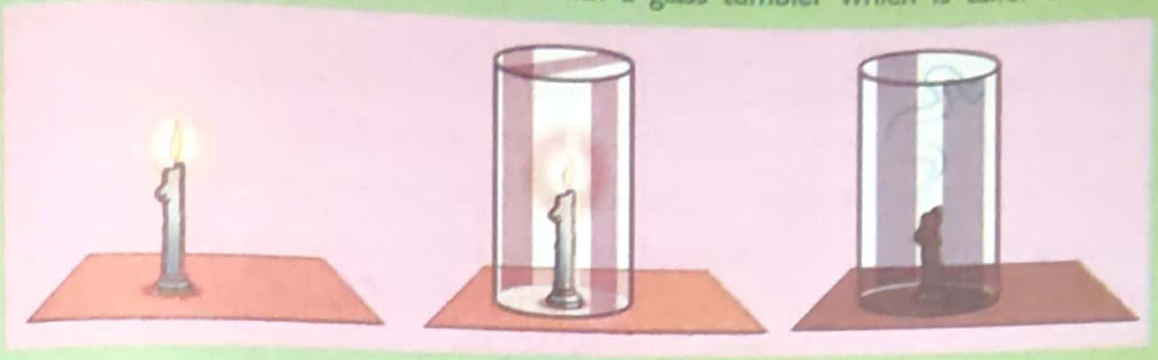
All the animals, including human beings, need oxygen to live. They all need this oxygen every minute and second of their life. They take oxygen from air through the process of breathing. The oxygen, present in air, is used to produce energy from the food that is eaten. In this process, carbon dioxide gets formed which is breathed out.

Oxygen is also required for burning.

The following activities help us to understand the importance of air in our life.

Activity:

Take two lighted candles. Cover one of them with a glass tumbler which is taller than the candle.



What do we observe?

The covered candle soon gets 'put out' but the uncovered candle keeps on burning.

This happens because the covered candle soon uses up all the oxygen present in the air inside the tumbler. It does not get more air and, hence more oxygen, needed by it to keep burning. It, therefore, stops burning after a while.

Plants also require air to live and grow.

Activity:

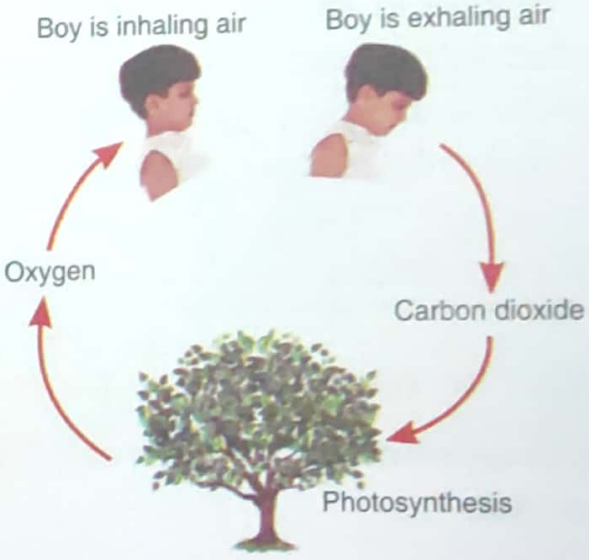
Take two potted plants. Add water to both the plants and keep them in sunlight. Cover one of the plants with a thin, transparent plastic sheet. Observe the plants for some days.

The plant, which is kept covered with plastic sheet, will 'shrink up' and 'dry out' after some days. The other plant will remain healthy.

This is because plants need air to live. They use the carbon dioxide, present in air, to prepare their own food by a process known as **photosynthesis**. They carry out this process in the presence of sunlight.

Nature Maintains a Balance

Animals and human beings use oxygen present in the air and give out carbon dioxide gas. Plants, on the other hand, consume carbon dioxide during photosynthesis in day time. They then give out oxygen. In this way, a balance of carbon dioxide and oxygen is maintained in the air.



Do You Know?

On an average, a human being breathes 22,000 times and takes in about 16 kilograms of air everyday.

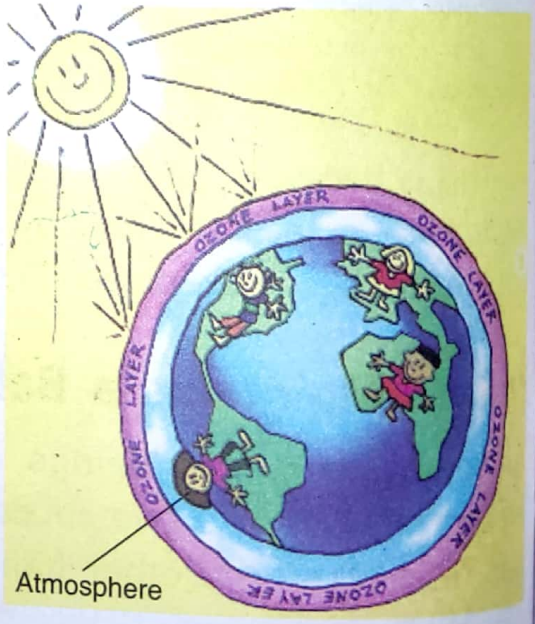
Role of Nitrogen

Nitrogen gas, present in the air, is also essential for the growth of plants. Nitrogen helps in the rapid growth of plants. It also helps them to develop their fruits and seeds. It also increases the size and quality of their leaves. Plants, therefore, require nitrogen in large amounts. However, plants cannot absorb nitrogen directly from the air. Nitrogen gas has to be changed into other forms to be utilised by the plants. The bacteria, present in the soil, help to convert the atmospheric nitrogen into such specific forms (nitrate and ammonium salts). These salts are taken in by plants to get the nitrogen needed by them. The plant roots absorb these salts from the soil. Plants then use them to form proteins which are essential for their growth.

Nitrogen from the air → Bacteria in the soil act on Nitrogen → Nitrogen gets converted into specific forms → Such specific forms of nitrogen get absorbed by plants for their growth

The Atmosphere—A Shield

Our atmosphere also acts as a shield–very much like an umbrella–to protect us from the harmful rays of sunlight. Ozone gas, present in the upper layers of the atmosphere, prevents harmful ultraviolet rays of sunlight from reaching the surface of the earth. These ultraviolet rays can cause skin and eye diseases in animals and affect the growth of plants. Thus, ozone layer in the air protects the animals and plants from the harmful effects of the ultraviolet rays present in sunlight.



Pollution of Air

We have now learnt about the importance of air for animals as well as plants.

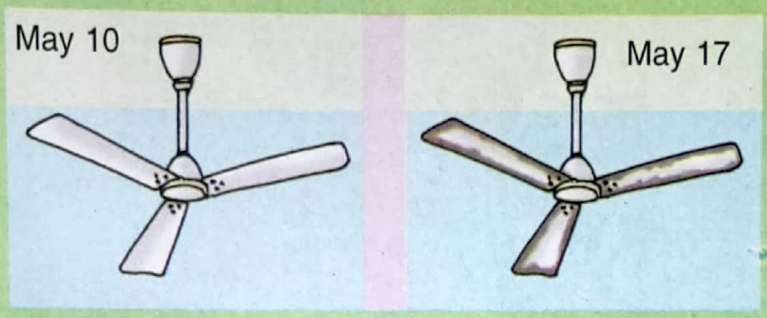
Let us now see how we can find out whether the air that we breathe is pure or not.

Observing the Purity of Air

Perform some simple activities at home to learn about the purity of air.

Activity:

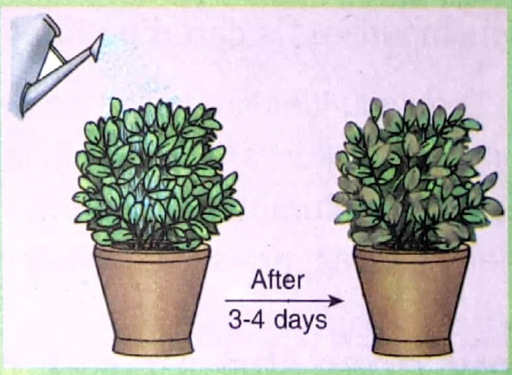
Clean the blades of a ceiling fan.



Observe it after a week, especially in summers, when the fan is in use.
You will observe that the blades of the fan have become dirty. They gather dust present in the air.

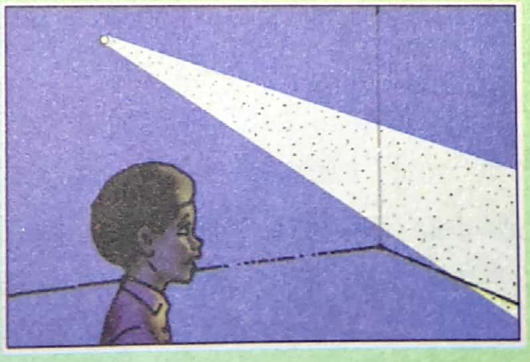
Activity:

Take a potted plant and wash its leaves with water. Keep the plant in the open. Observe it for 3-4 days. The leaves of the plant will look dull and dirty after 3-4 days as they get covered with dust particles present in the air.



Activity:

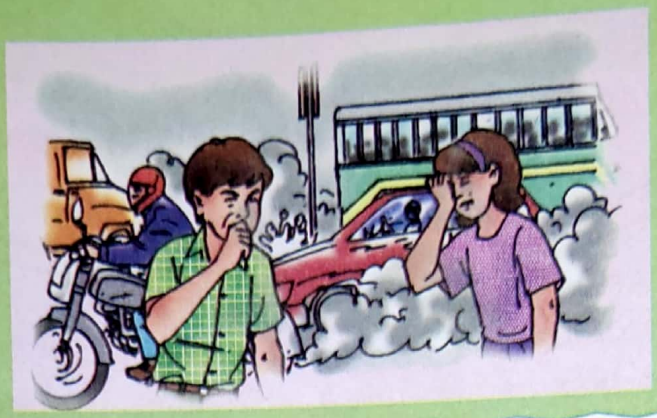
Allow a very thin ray of light to enter a dark room.



Dust particles present in air will be visible to us in the beam of light.

Activity:

While waiting at a busy road crossing, you sometimes may get irritation in the eyes and throat. The smoke, coming out from the vehicles, contains harmful gases. These get mixed with air and cause irritation.



All these observations show that the air, we breathe, is not always pure. It contains impurities like dust and soot. It can also have germs in it. It can also contain harmful gases like carbon monoxide, oxides of nitrogen and sulphur. The air, having such impurities, is called **polluted air**.

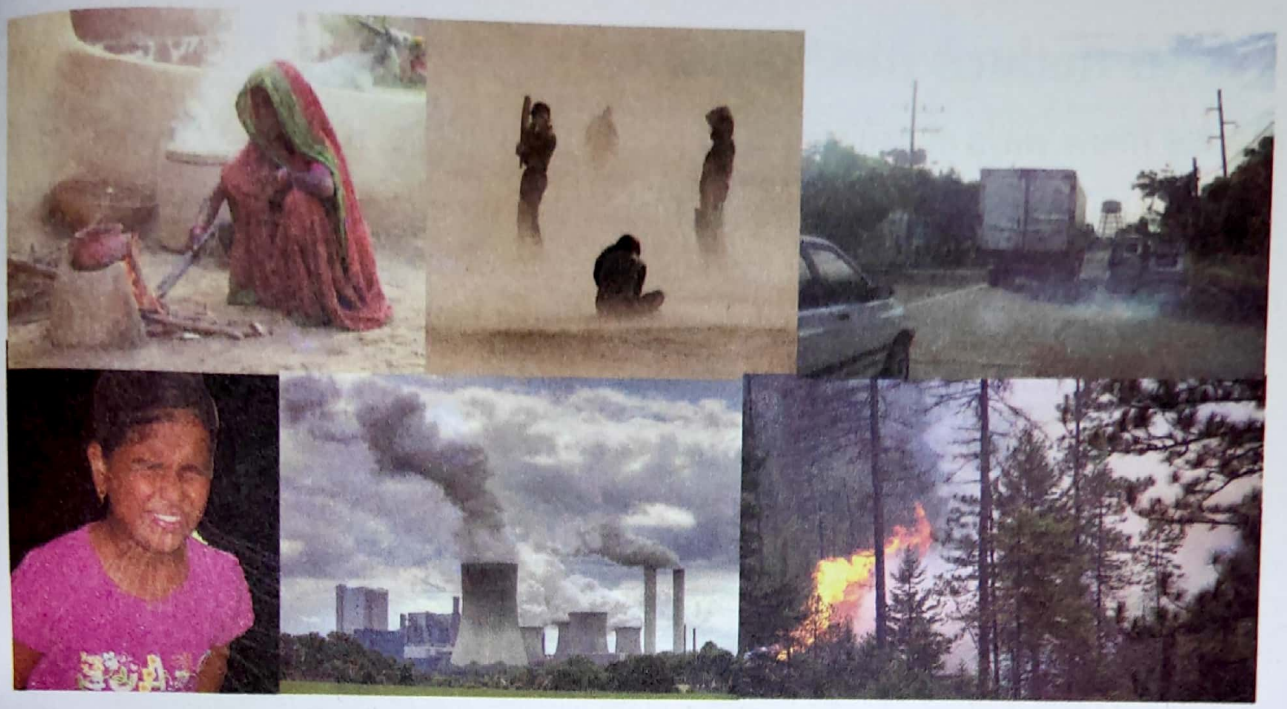
The impurities are called **pollutants.** There are two basic forms of air pollutants. Pollutants, like carbon monoxide, ozone, oxides of nitrogen and sulphur, are **gaseous pollutants**. Pollutants, like smoke, dust and germs which are present in air as particles, are **solid pollutants**.

How does the air get polluted?

We list below some of the usual causes that pollute the air.

1. Dust raised from the ground during dust storms.
2. Stone dust raised by crushing of stones in quarries.
3. Smoke emitted by vehicles.
4. Smoke from forest fires.
5. Smoke raised by burning of coal in powerhouses.
6. Burning of wood, cowdung cakes, garbage, etc., in households and open places.
7. Germs from coughing and sneezing.

There can be many more such causes.



Do You Know?

Stoves, using cowdung cakes, wood and thrash as cooking fuel, are a major source of air pollution in India. They produce smoke whose concentration can be as much as five times higher than that produced by ordinary coal.

The good thing is that the use of such stoves is decreasing with time.

Effects of Air Pollution

1. By breathing air, polluted with dust, smoke and harmful gases, we may suffer from various problems like suffocation, cough, headache and so on. Polluted air may also cause skin and eye diseases.
2. Gases, like oxides of nitrogen and sulphur, present in automobile exhausts, mix with rain water and form acids. This **acid rain** damages crops and reduces the fertility of soil. It can also damage monuments made of marble.
3. Presence of carbon dioxide, and some other gases, in air, causes a phenomenon called **greenhouse effect**. This phenomenon helps the earth to stay 'suitably warm'. However, if these gases are present in excess, in air, their 'increased greenhouse effect' can cause **global warming**, i.e. an 'extra increase' in the average temperature of the earth. This can result in an increase in the melting of polar ice-caps which can cause wide-spread damage and destruction.

Ways to Reduce Air Pollution

There are many ways of minimising air pollution. Some of them are suggested below:

1. **We should plant more trees:** Plants use up carbon dioxide gas, present in the air, for producing their food using photosynthesis. This helps to reduce the greenhouse effect and maintain the earth's temperature at a desirable level. We should also prevent deforestation, that is, excessive cutting of trees.

2. **Lesser use of vehicles:** We should use a bus or metro, if available, for going to the office instead of using a personal vehicle. We can also share, or 'pool', vehicles for going to the office.

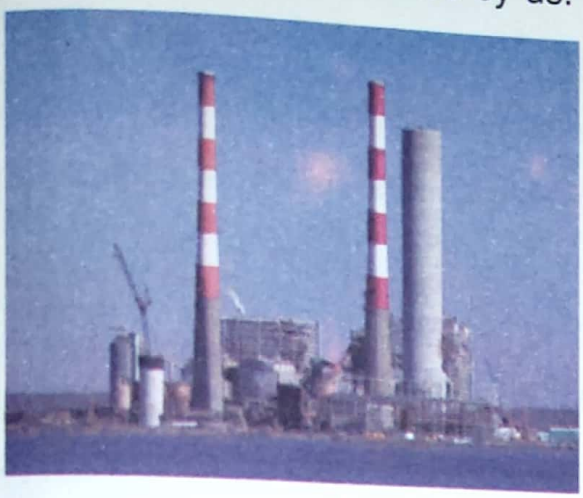
   This will reduce the number of vehicles on the road. As a result, the amount of smoke emission will also get reduced.

3. **Regular check-up of vehicles:** We should get our vehicles regularly checked for their pollution level. If a vehicle is giving out more smoke, it should be repaired at the earliest.

4. **Use of cleaner fuels:** We should use LPG, or biogas, for cooking instead of coal, wood or cowdung cakes. Use of CNG, for running vehicles, is also desirable.

5. **Dumping the garbage in a pit:** Garbage should not be burnt. Instead, it should be dumped in a pit where it gets converted into compost. This compost can be used as manure.

6. **Constructing tall chimneys:** Powerhouses, and factories, should construct tall chimneys so that smoke coming out of them goes higher up in the atmosphere and is not inhaled by us.



7. **Good habits:** We should cover our nose and mouth while sneezing or coughing, so that germs of the disease are not released in the air.

Try to think of some other ways of reducing air pollution!

We all need to be actively involved in this important task. Reducing, and minimising, environmental pollution is the responsibility of each and every person.

Activity:

Make a concept map/flowchart to depict: Air Pollution–finding a solution. Use suitable pictures for this purpose.

Keywords

- **acid rain** — mixture of acidic gases with rain water.
- **composition** — components present in a given substance.
- **global warming** — additional/extra increase in the average temperature of earth.
- **greenhouse effect** — phenomenon which helps the earth to maintain its surface temperature.
- **photosynthesis** — process of making food by plants.
- **water vapour** — gaseous form of water.

Something to Know

A. Fill in the blanks.

1. The two main gases present in the air are _____ and _____.
2. Animals need _____ gas for breathing.
3. Plants use _____ gas to prepare their own food.
4. The process, by which plants prepare their food, is called _____.
5. _____ gas, present in the atmosphere, protects us from the harmful rays of sunlight.
6. Air, containing impurities, is called _____.

B. Write True or False for the following statements.

1. Pure air is colourless, odourless and tasteless. _____
2. An empty glass bottle contains air. _____
3. Air gets impure due to the presence of nitrogen gas. _____
4. Leaves of a plant look greener before rain. _____
5. Oxygen is required for burning. _____

C. Tick (✔) the correct option.

1. The gas, which is present the most in air, is—
   (a) oxygen (b) nitrogen
   (c) carbon dioxide (d) water vapour
2. An air pollutant, which exists in solid form, is—
   (a) sulphur (b) nitrogen (c) smoke (d) ozone
3. The gas, whose amount varies with weather changes, is—
   (a) nitrogen (b) helium (c) water vapour (d) oxygen
4. The gas, that gets reduced, through the process of photosynthesis, is—
   (a) sulphur oxide (b) nitrogen oxide
   (c) ozone (d) carbon dioxide

5. When sulphur dioxide reacts with water and oxygen in air, it results in the production of—

(a) snow
(b) acid rain
(c) nitrogen oxide
(d) carbon dioxide

D. Answer the following questions in brief.

1. Name the main components of air.
2. State the meaning of the term 'Photosynthesis'.
3. State two possible harmful effects of ultraviolet rays.
4. Define the term 'Air pollutant'.
5. Name any two of the gaseous pollutants present in air.
6. List any four causes of air pollution.

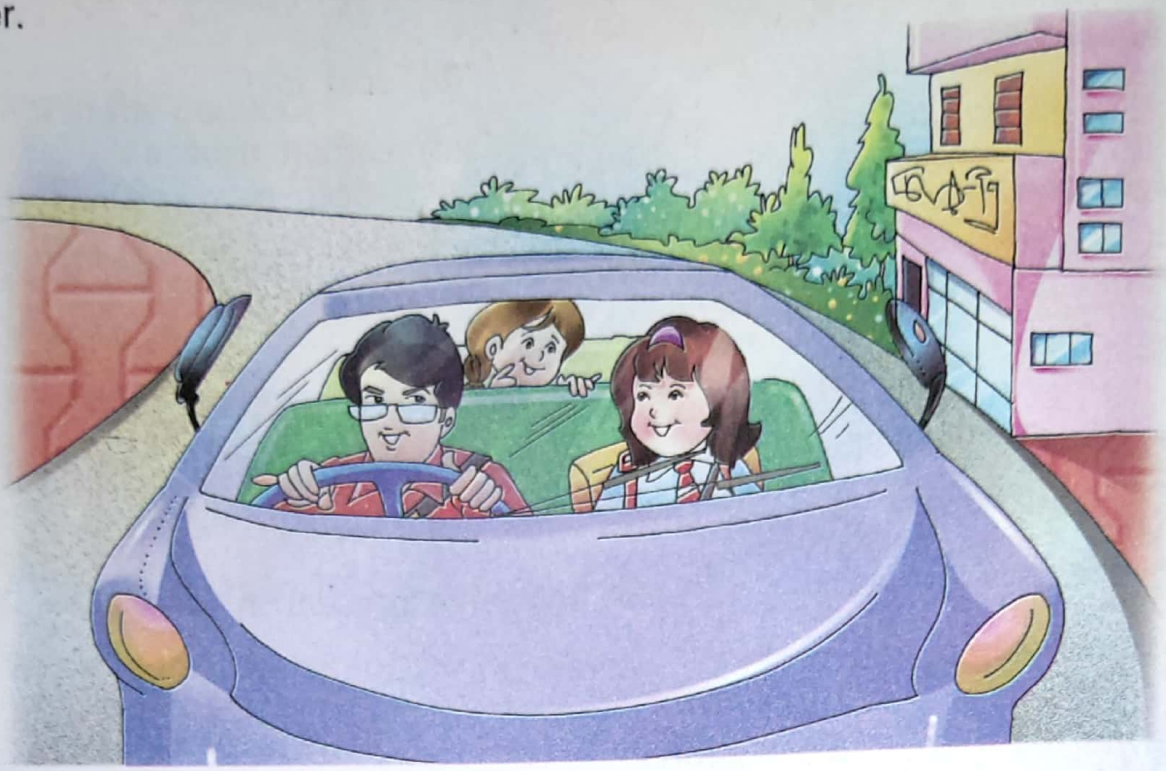
E. Answer the following questions.

1. Why is air necessary for animals?
2. How is nitrogen important for plants?
3. How is the balance of oxygen and carbon dioxide in air, maintained in nature?
4. Why is 'acid rain' harmful?
5. Why should we feel 'worried' about 'global warming'?
6. Suggest some ways of reducing air pollution.
7. How does planting of trees help in making air cleaner?

Based Question

Reema and her neighbour Neha study in the same school. Their parents used to drop them to the school, separately, in their own cars. One day Reema suggested to her father that she and Neha could share, or 'pool' the car. Her father appreciated the suggestion and agreed to talk to Neha's father.

Neha's father also liked the idea. From the next day they started going to school together.



1. Do you agree with Reema and why?
2. Would this practice of commuting to school help nature?

Something to Do

1. Make a poster on 'Go Green—to breathe clean' using magazine pictures.
2. Try to find out the answer to the following questions:
   (a) Why do plants look greener after rain?
   (b) Why are LPG and biogas called 'cleaner fuels'?
3. With the help of block diagram, explain the role of nitrogen, in the growth of plants.
4. Power stations, which burn fossil fuels to produce electricity, are one of the main causes of increasing the amount of carbon dioxide in the air. One way, to reduce the air pollution caused by power stations, is to use less electricity. Suggest how you can try to make an effort to reduce the electricity consumption in your home.

11 OUR SOLAR SYSTEM

We all live on the planet earth. Our earth is one of the eight known planets and is a member of a large family in space. The sun is the most important member of this family. This family of sun and its eight planets constitute the **solar system**.

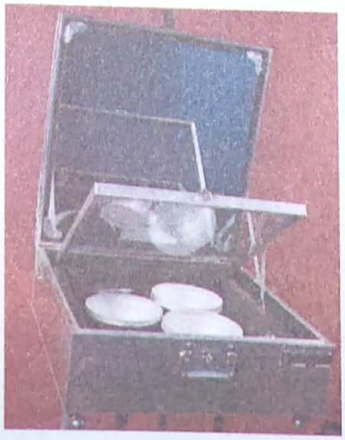
THE SUN

The Sun is the central part of the solar system. It is a huge sphere of very hot gases. We can think of it as a ball of fire. It produces light of its own. It is, thus, a luminous body. It is also very large and massive as compared to all the planets. It appears small to us due to its very large distance from the earth.

The sun is a source of huge energy. It gives out energy in the form of heat and light. We call the energy, received from the sun, as **solar energy**. The earth receives almost all of its energy from the sun.

The sun is essential for growth, and maintainence, of all forms of life on the earth. All living beings, whether plants or animals, depend on the sun for their food. Plants make their food in the presence of sunlight. All other animals get their food, directly or indirectly, from plants.

We use solar energy in many ways. Solar cookers and solar geysers are used for cooking food and getting hot water in our homes. We also have solar cells that work through solar energy. These are used in devices like the calculators and wrist watches. They are also used in man-made satellites and space vehicles. They also provide electricity in many remote areas.



Solar cookers

Solar geysers

Do You Know?

The sun, being so essential for evolution and propagation of life on the earth, has been worshipped as a God by almost all the ancient civilisations. The Hindu mythology speaks of sun as *Surya Dev*.

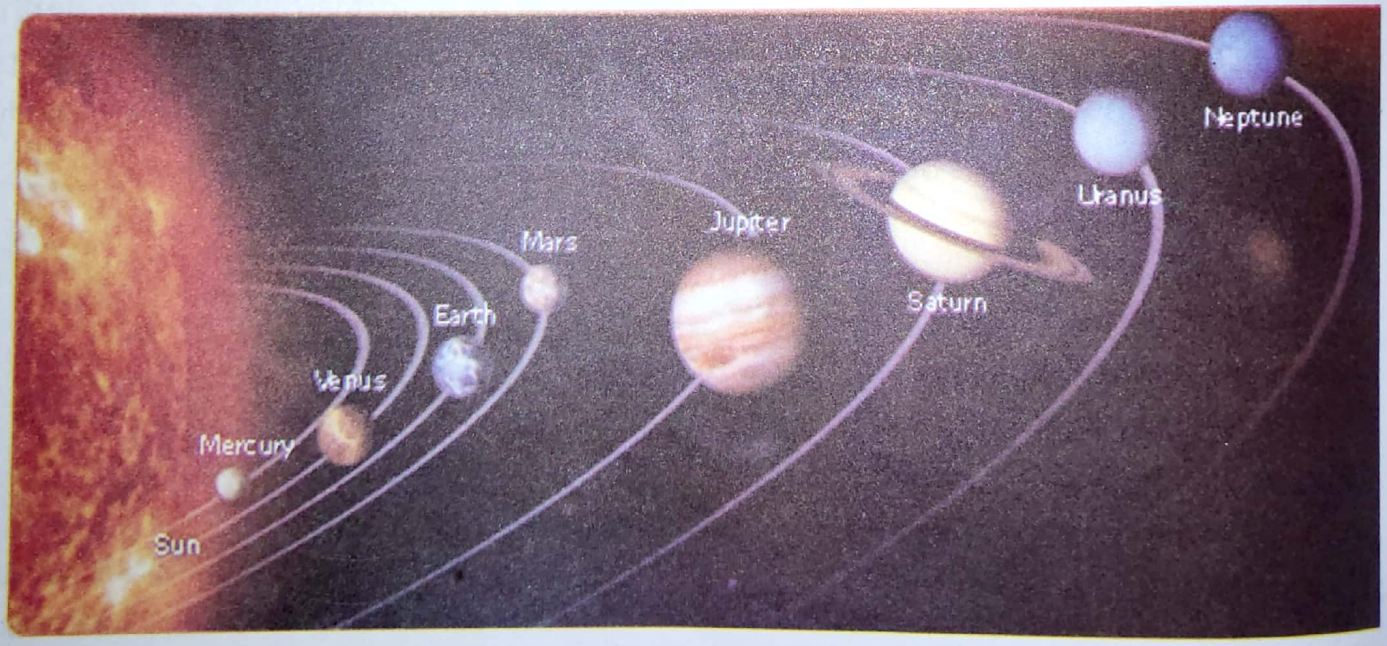
PLANETS

Planets are (almost spherical) celestial bodies, which move around the sun. This movement is known as **revolution**. Each planet revolves around the sun in a definite path. This path is nearly circular in shape and is known as the **orbit** of the planet. Planets do not have light of their own. Their observed brightness is only due to the sunlight reflected by them.

Do You Know?

Astronomer Johannes Kepler, a German (1571-1630), found that orbits of planets were not exactly circles, as considered by Aristotle and Copernicus, but were more like flattened eggs. Such flattened egg like shapes are referred to as **ellipses**. According to Kepler, the path of a planet, around the sun, i.e. its orbit, is elliptical in shape, with the sun at its focus.

There are eight planets in our solar system. All these planets are at different distances from the sun. The planets of the solar system, in increasing order of their distances from the sun, are—**Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus** and **Neptune**.



Solar system

Let us now learn more about these planets.

Mercury (*Budh*) is the planet closest to the sun. It is a dry, hot and almost airless planet. It is also the smallest planet. Unlike the earth, there is no atmosphere, around this planet. The light and heat of the sun, therefore, reach the side of mercury, facing the sun, directly. This side becomes very hot. The other side remains comparatively cold.

The next planet, nearest to sun, is **Venus** (*Shukra*). Its size is nearly the same as that of the earth. It receives a much large amount of heat and light from the sun as compared to the earth. Venus has a very thick atmosphere. This reflects back a large amount of solar energy that falls on it. Venus is, therefore, the brightest object seen in the sky after the sun and the moon. Its thick atmosphere also traps a large amount of the solar energy reaching its surface. It is because of this trapping that it is the hottest of all the planets—hotter than even Mercury, the planet, that is closest to the sun.

Do You Know?

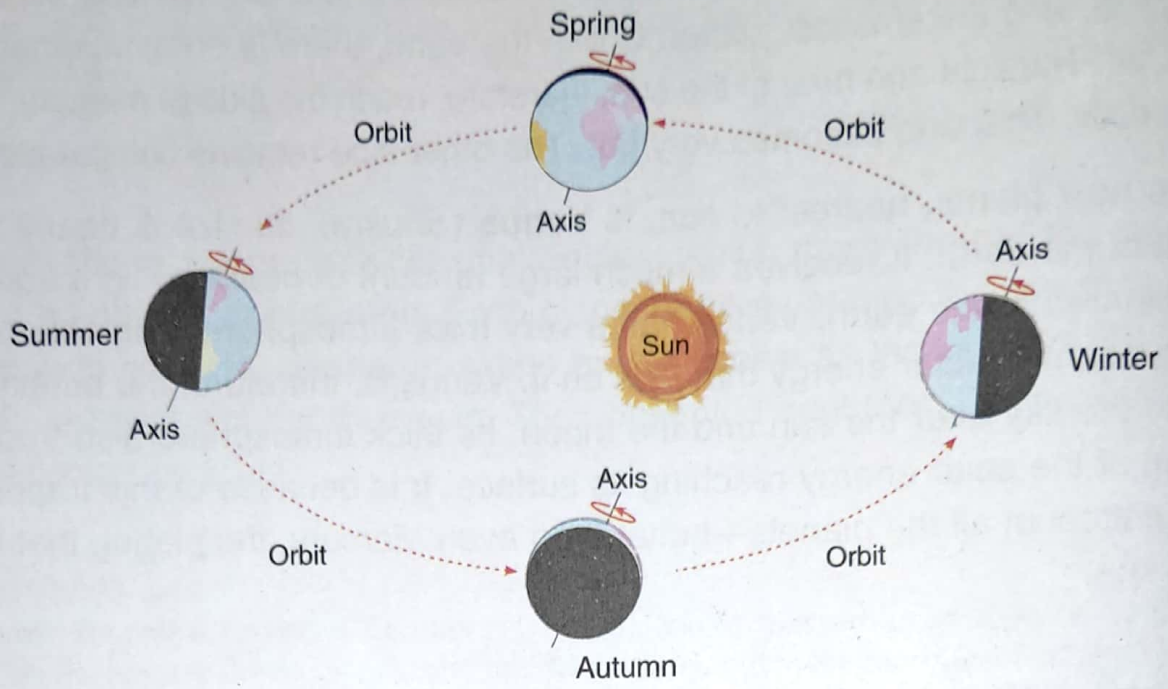
The time taken by a planet to complete one revolution is called its **time period of revolution** or its **year**. The time period of revolution increases as the distance of planet from the sun increases.

Planets do not collide among themselves or with the sun. This is because planets are in constant motion around the sun and move in the same direction in orbits that are widely far apart.

Earth (*Prithvi*) is the third planet in terms of increasing distance from the sun. The surface of earth, as seen by us, appears to be flat. This is due to its large size. From far off space, the earth appears like a beautiful blue and green spherical ball. This is due to the reflection of sunlight from the water and landmass present on its surface. Because of this, the earth is sometimes referred to as the **blue planet**.

Earth

The earth completes one revolution around the sun in nearly 365 days. Different seasons appear on different places on the earth due to its revolution around the sun.



Change of Seasons

The earth not only revolves around the sun but also rotates (or spins) about its own axis (like a spinning top). It completes one rotation about its axis in 24 hours. Days and nights are due to this rotation of the earth about its own axis. During its rotation, the side of the earth, facing the sun, receives light and appears bright. This side is said to have **day**. The other half then does not receive light from the sun and is said to have **night**. The two halves reverse their roles after every half rotation, i.e. every 12 hours nearly.

Our earth is a very unique and special planet of the solar system. It is the only planet that can sustain life on it. It fulfils, and meets, the entire set of conditions essential for development and sustainance of life. These conditions are:

- Presence of atmosphere.
- Presence of (liquid) water on the surface.
- Right size and right distance from the sun that enables it to receive just the correct amount of solar energy.

Do You Know?

A day for a planet equals the time taken by it to complete one rotation about its own axis. A year, on the other hand, equals the time taken by it to complete one revolution (in its orbit) around the sun.

Mars (*Mangal*) is the planet that lies beyond earth in our solar system. It is almost half the size of earth. Its atmosphere is much thinner than that of the earth. It appears to be red and is often called as the **red planet**.

Mercury, Venus and Mars have structures similar to that of the earth. These planets are mostly made up of rocks and metals. Hence, these planets are also called **terrestrial (earth-like) planets**.

Do You Know?

Observations, on the surface of Mars, have given scientists some indication of presence of some forms of life on it. It is perhaps for this reason that most characters, in science fiction, have human like strange characters coming here from the Mars.

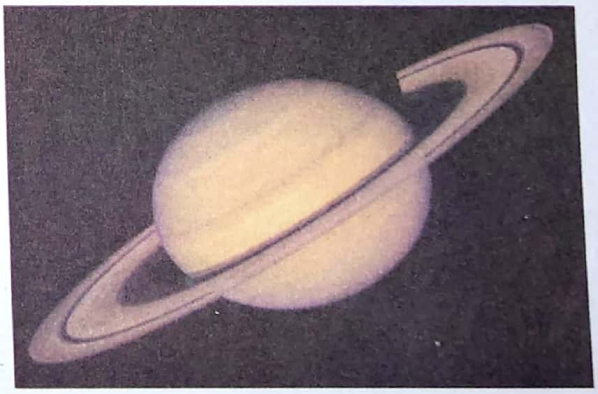
The other four planets of the solar system are very cold planets, very much farther away from the sun.

Jupiter (*Brihaspati*) is the fifth planet in terms of the distance from the sun. It is the largest of all the planets.

Do You Know?

There is a collection of a large number of very small planets or **planetoids** that lie mainly in a belt between the orbits of Mars and Jupiter. These are known as **asteroids**. This belt is, therefore, referred to as the **asteroid belt**.

Saturn (*Shani*) is the sixth, and the second largest, planet of the solar system. Saturn has a system of beautiful rings surrounding it. It is, therefore, also known as the **ringed planet**.



Saturn

Uranus (*Arun*) is the seventh planet in the solar system. It also has a ring system. It is the third largest planet in the solar system. It is a 'gas giant' without any solid surface.

Neptune (*Varun*) is the eighth planet from the sun in the solar system. Neptune is also known as a **windy planet** as very strong winds blow on its surface.

Jupiter, Saturn, Uranus and Neptune are mostly made up of gases and ice. All these planets, taken together, are also known as **gaseous planets**. They are also referred as the **jovian planets**.

Activity:

Select your favourite planet. Collect information about it from science journals/encyclopedias/magazines/ internet resources. Prepare your report about it in the following way.

Planet Report

My favourite Planet _____ (Picture/Symbol)
is the _____ (1st, 2nd, 3rd, etc...) planet from the sun. It is one of the _____ (inner/outer) planets because it is located _____ (near, far off, very far off) from the sun. This planet is known for _____

_____

This planet has _____ (number of moons) moons orbiting it.

Can this planet be seen at night without a telecope? _____

Is this planet made up mostly of gases or rocks? _____

Does this planet have clouds around it? _____

List (some) interesting facts about your planet.

_____

_____

Activity:

Draw two objects that you can see in the outer space.

Drawing I

Drawing II

Find the answers to the following questions.

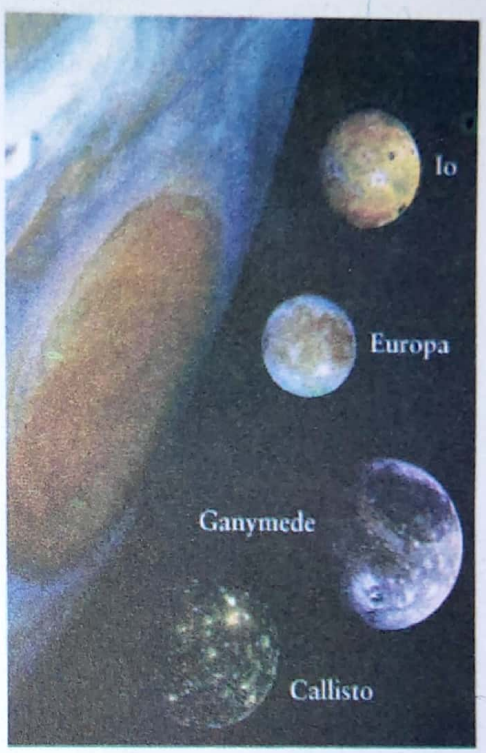
1. Which one appears to be smaller? _____
2. Which one appears to move faster? _____
3. Which one would you like to visit? _____
4. Which one appears closer to the Earth? _____
5. Why do you find it unique? _____

Do You Know?

Till the year 2006, Pluto was regarded as the ninth planet of the solar system. However, in the year 2006, the International Astronomical Union (IAU), in its meeting, held at Prague on 26 August 2006, decided that Pluto would no longer be regarded as a planet as it does not satisfy the basic characteristics of the definition of a planet. We, therefore, now talk of only eight planets.

SATELLITES

A **satellite** is a (small) object that revolves around a much larger object. We usually talk of the satellites of the planets in the solar family. Following man's recent inventions, we now talk of two types of satellites—**natural satellites** and **artificial (man-made) satellites**.

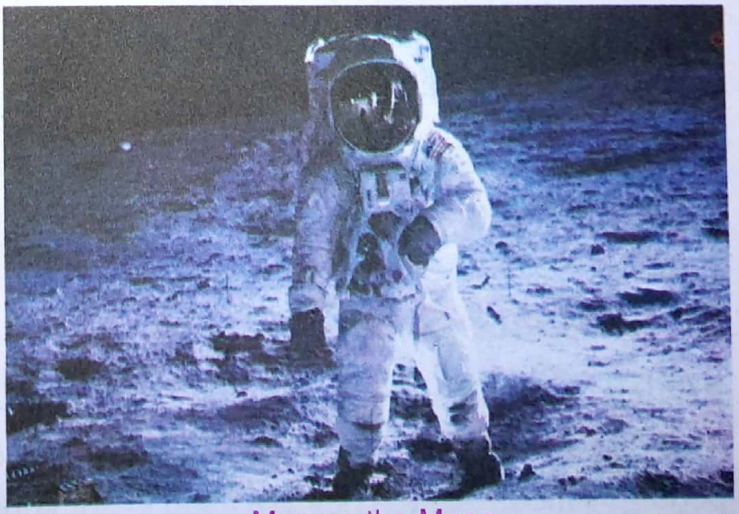


Natural Satellites of Jupiter

1. Natural Satellites

Celestial bodies, which revolve around a planet, are known as the **natural satellites** of that planet. Our earth has only one natural satellite—the moon. Some of other planets, of our solar system, have more than one natural satellite. Saturn and Jupiter are known to have a very large number of satellites, or moons, revolving around them.

Moon—The moon, our nearest neighbour in space, is a natural satellite of the earth. It is a non-luminous object, i.e. it does not have its own light. It only reflects a part of the sunlight it receives from the sun.

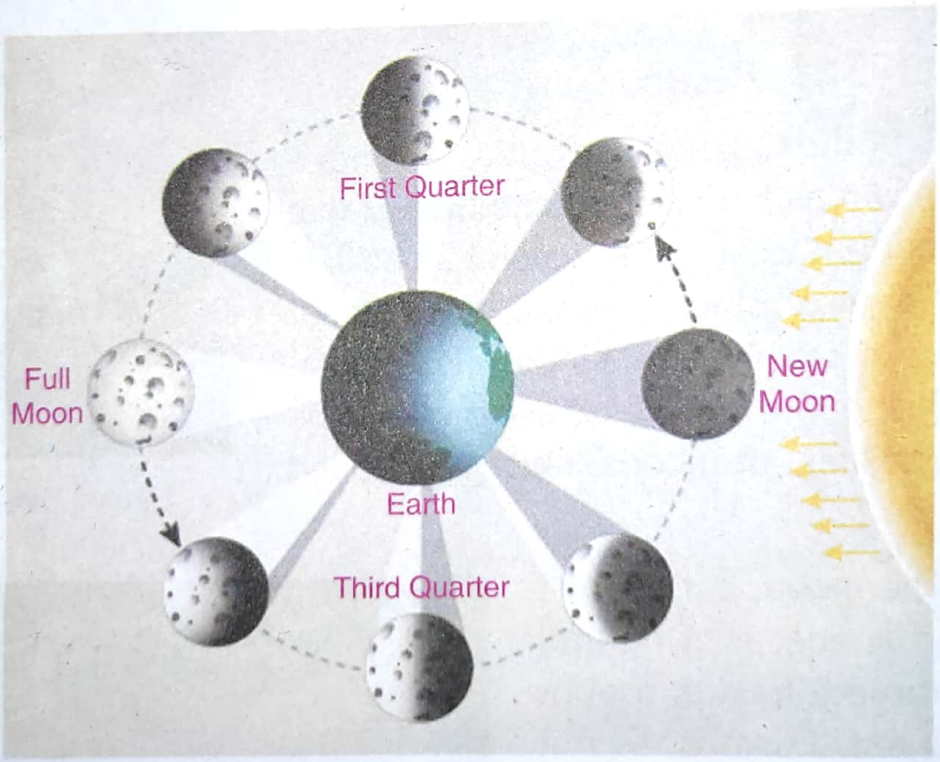

Man on the Moon

Do You Know?

Indians have always been fascinated by Moon from very ancient times. Twenty-first century India launched its lunar probe **'Chandrayaan-1'**. It was launched by ISRO in October 2008 and operated till August 2009. Now India is gearing up to launch **'Chandrayan-2'** by the end of 2016. The mission will conduct new experiments to study the moon's surface.

It revolves around the earth in a definite path (orbit) and takes nearly 28 days to complete one revolution around the earth.

We all observe that the every day shape and size of the moon appears to change gradually. This is because of the changes, in the relative position of the earth and the moon, with respect to sun. The different appearances of moon, on different days, are known as the **phases of moon**. These phases include (i) completely dark phase—*amavas* or new moon day (ii) a complete bright phase—*poornima* or full moon day. These two phases of moon are separated by nearly 15 days.



Phases of Moon

2. Artificial Satellites

Artificial satellites are man-made objects, which can be made to revolve around the earth. They are, however, much closer to the earth than the moon. Artificial satellites perform various tasks. They are used in communication for transmitting radio, telephone

and television signals. They are also used for weather forecasting and remote sensing. Artificial satellites are also being used to collect information about the other planets and the stars. India launched its first artifical satellite, named Aryabhatta, in 1975.

Do You Know?

- India has launched 74 satellites till date of many types since its first attempt in 1975.
- Rohini, Apple, INSAT, EAUSAT, CARTOSAT, IMS-1, Chandrayan-1, GSAT-4, Jugnu and SARAL are some of the other Indian satellites.

An Artificial Satellite

Do You Know?

The satellites, that now make it possible to have a live view of an event, in any part of the world, are very special satellites. They take as much time to complete one orbit around the earth as the time taken by the earth to complete one rotation on its axis. Scientists refer to them as **geo-stationary satellites.**

Keywords

- **artificial satellite** — man-made satellite.
- **revolution of earth** — earth's orbital motion around the sun.
- **rotation of earth** — earth's spinning about its own axis.
- **satellite** — a satellite is a moon, that orbits a planet.
- **solar energy** — light and heat energy received from the sun.
- **solar system** — collection of the sun, the planets, their moons and other celestial bodies linked to the sun.

Something to Know

A. Fill in the blanks.

1. The earth is sometimes known as the _____ planet.
2. The earth completes one rotation about its axis in _____ hours.
3. The main members of the solar system are the sun and _____ planets.
4. The sun is a huge source of _____ and _____
5. Day and night occur on earth due to its _____ about its own axis.

B. Match the following:

1. the ringed planet	a. Mercury
2. the largest planet	b. Neptune
3. a natural satellite	c. Jupiter
4. the windy planet	d. Moon
5. the smallest planet	e. Saturn

C. Tick (✔) the correct option.

1. The number of planets, in our solar system, is—
   (a) seven (b) eight
   (c) nine (d) ten
2. The planet, which reflects large amount of sunlight falling on it, is—
   (a) Mercury (b) Mars
   (c) Earth (d) Venus
3. The planet Uranus is also known as a—
   (a) windy planet (b) terrestrial planet
   (c) jovian planet (d) red planet

4. The correct statement, about the atmosphere of the planet named in it, is—

   (a) Venus has mostly carbon dioxide around it.

   (b) Mercury has mostly nitrogen around it.

   (c) Saturn has mostly helium around it.

   (d) Earth has mostly ozone around it.

5. The fourth and the sixth planets, of the solar system, are, respectively—

   (a) Jupiter and Uranus (b) Mars and Saturn

   (c) Uranus and Jupiter (d) Neptune and Saturn

6. Consider the following statements about the Earth's moon:

   A. The moon is Earth's natural satellite.

   B. We can see full moon after every 15 days.

   C. The moon is a non-luminous object.

   D. The moon takes nearly 18 days to complete one revolution around the earth.

   The statements, that are correct, are the statements—

   (a) A and B (b) B and D (c) B and C (d) A and C

7. The first Indian satellite is—

   (a) Kalpana-1 (b) Aryabhatta (c) INSAT (d) EDUSAT

D. Answer the following questions in brief.

1. Name the hottest planet in our solar system. Is it closest to the Sun?
2. How much time does the earth take to—

   (i) revolve once around the sun?

   (ii) to complete one rotation about its own axis?

3. State the nature of the shape of orbit of planets.
4. Write the meaning of the term 'Artificial Satellites'.

E. Answer the following questions.

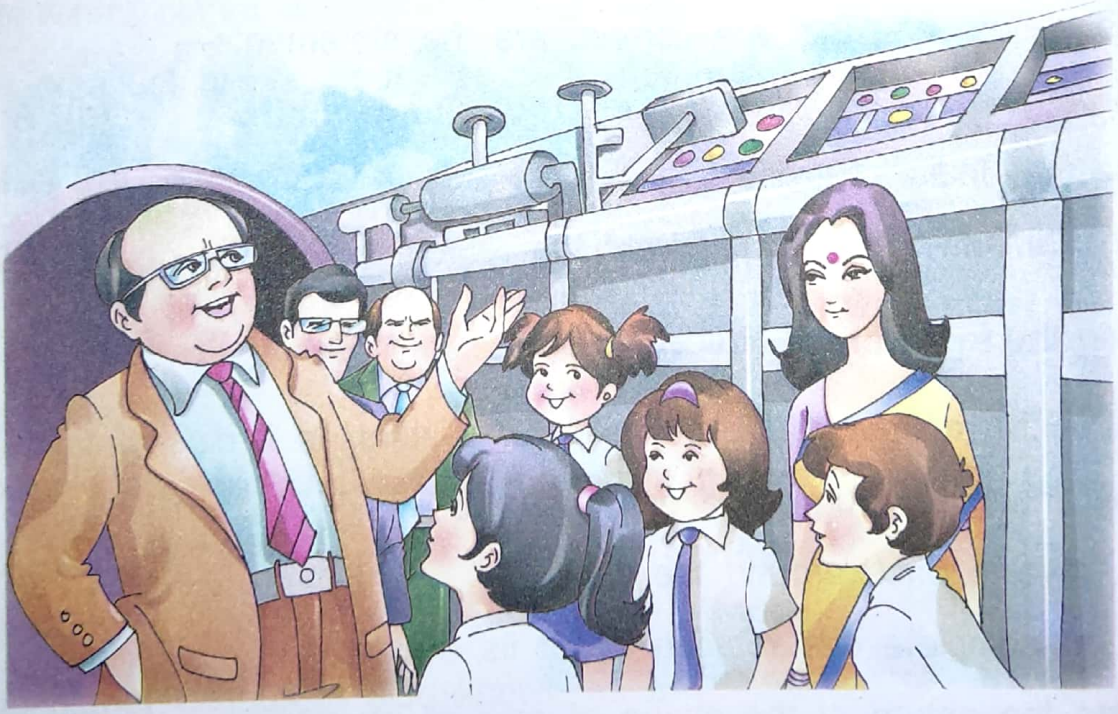
1. How is the sun useful to us?
2. Name the terrestrial planets. Why are they so called?
3. State the conditions necessary for existence of life on a planet.
4. Why do we observe phases of moon?
5. State two uses to which artificial satellites are being put.

VALUE Based Question

The students of Class-V, of the local DAV school, were invited by the boss of a new industrial unit.

The students, and teachers, of the school felt very happy when they visited this new industrial unit. The boss and staff, of the unit, greeted them warmly and took them around their unit.

They told their visitors that their UNIT was very eco-friendly and was using solar panels (assembly of Solar Cells) to meet most of their energy requirements.



1. State the values displayed by the boss and staff of the industrial unit.
2. Do you think that it is advisable to use solar panels whenever, and wherever, possible?

Something to Do

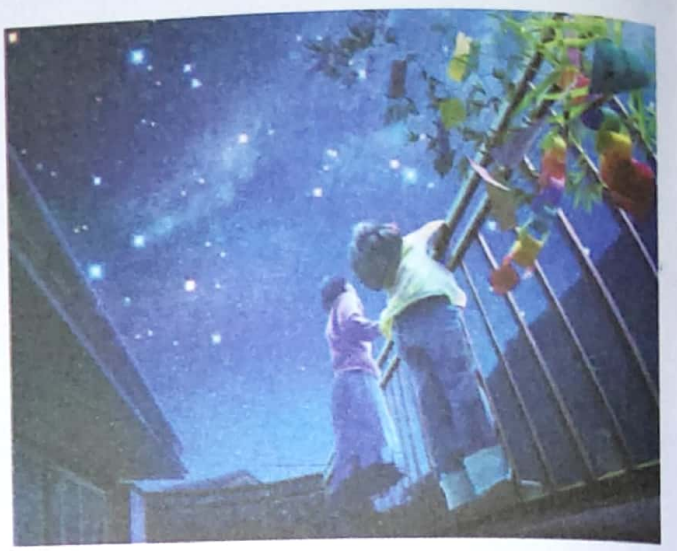
1. Make your own scrapbook of solar system by collecting data about sizes, distances, temperatures, etc., of its members.
2. Observe the moon continuously for several nights. Make a sketch of moon every night. Try to find the time interval between full moon and new moon.
3. Try to make a Model of the Sun, Earth and Moon that shows the Earth orbiting the Sun, and the Moon moving around the Earth.
4. Try to make riddles on 'Planets.' One example is given below:

   I am a planet very close to the sun. I appear to be a tiny planet which is very hot. I have no moons but I orbit the sun very fast. Can you guess my name?

   (**Ans.** Mercury)

12 OBSERVING THE SKY

It is a beautiful clear night. A student watches the brilliant display of stars up in the sky. She is fascinated and also curious. She wants to know why some stars appear bright and some very dim. Are these stars really stationary or moving in the sky? Are there any other celestial bodies that can be seen in the sky besides stars?



Let us also try to find answers to these questions.

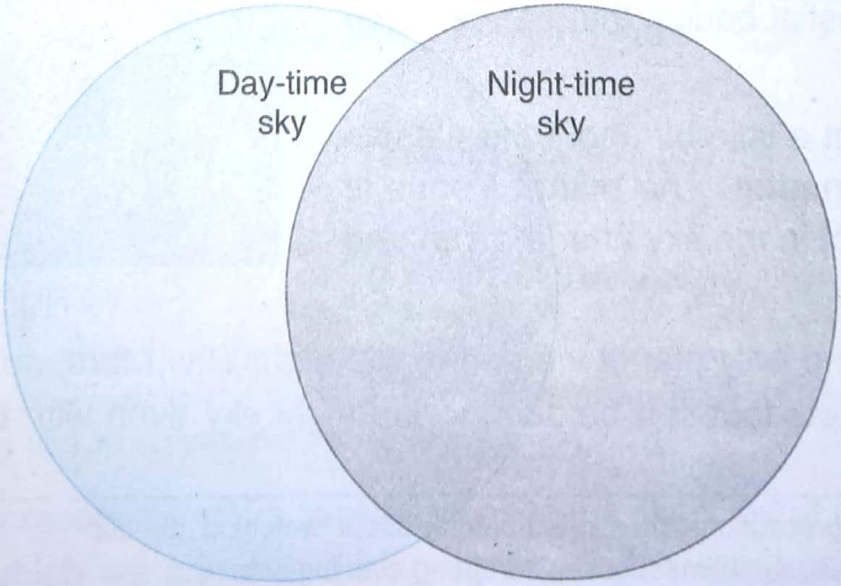
Sky watching can be a fascinating experience. It is best done at a place where there are no bright lights and the atmosphere is clear without clouds and dust.

Observe the sky during day-time and night-time for five days. Record and draw pictures of all the objects, which can be seen with the unaided eye in the table given here.

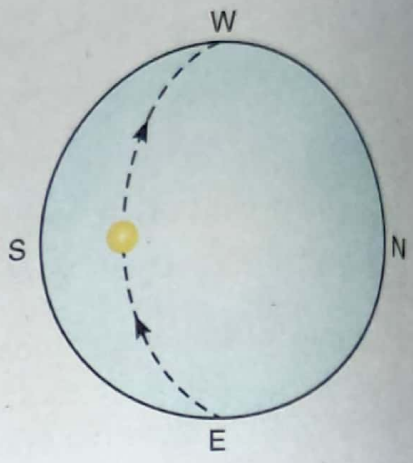
(***Warning***–*Never, remember, NEVER look at the sun directly during day-time. This can harm your eyes very seriously.*)

Date	Objects you can see in the sky during day. (Draw the pictures also.)	Objects you can see in the sky during night. (Draw the pictures also.)	Does this object appear to move?

Compare and contrast your day sky and night sky observations using the following circles. Write the names of the objects in the two circles. In the middle, where two circles cross each other, write the names of those objects, if any, that you could observe both during day-time and night-time.



DAY-TIME SKY



Path of Sun

We can see the sun* (and, sometimes even the **moon**) during the day-time. The sun dominates the day-time sky with its brightness. During the day, the sun appears to move through the sky. It appears to rise in the east and to set in the west.

We now understand that this apparent motion of the sun, for us, is because of the rotation of the earth on its axis from west to east.

We can also, sometimes, see some planets, like **Mercury** and **Venus**, during early morning hours. These planets have, therefore, been named as **morning** (and **evening****) stars. They are seen very low near the horizon in the sky.


Morning star

NIGHT-TIME SKY

We all know that Moon appears as the brightest and most recognisable object in the sky at night.

In addition to the moon, **stars** and **planets** are the other celestial bodies that can be seen in the night sky.

We have learnt a little bit about the planets in the previous chapter. The planet Venus is the brightest object in the sky after the sun and the moon.


Night sky

Venus is not the only planet we see in the night sky. Mars, Jupiter and Saturn are the other planets that can be seen in the night sky even with the unaided eye.

---

* Always observe the precautions, mentioned before, about 'watching' the sun.

** Because they are also, sometimes, observed during evening time.

The rest of the planets are very faint and can be seen only with the help of powerful telescopes.

Do You Know?

The planet Saturn was the first planet discovered by using a telescope.

Do You Know?

Our sun shines with a yellowish-white light. All the other stars are, however, not yellowish-white. Stars vary in size, brightness, temperature and colour. The hottest stars shine with a whitish-blue light.

STARS

We all know that there are a very large number of stars in our sky. These are huge spheres of very hot gases having light of their own.

It is interesting to note, and realise, that the sun is also a star. It is the star nearest to the Earth. It may come as a surprise to you but its brightness is less than that of many stars. We now know that our sun is a star of average brightness.

Almost all the stars are million of times farther away from us as compared to the distance of the sun from us. It is for this reason that the sun appears like a ball to us, but the other stars appear only as points or dots.

Stars appear as dim 'points' in the night sky. This is due to their very large distances from us. They do not disappear during day-time. They are present there in the sky, all the time. However, they are not visible during day-time due to sun's brightness.

Constellation

Let us closely, and carefully, observe some bright and prominent stars on a clear night sky. What do we observe? Some of these stars appear to form some kind of a pattern that appears to resemble some familiar figure. Such a group of stars is known as a **constellation**.

A **constellation** is a group of stars that appear to form some recognisable pattern or shape in the sky.

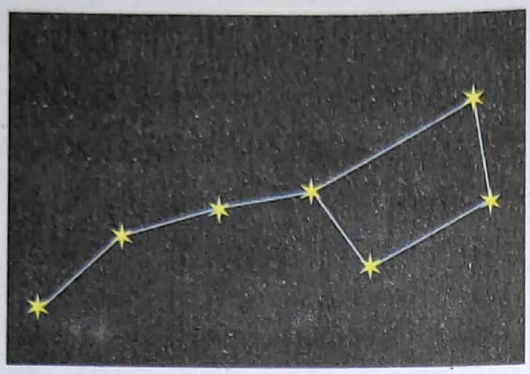
Do You Know?

Ancient people devised the concept of Constellations so that they would be able to recognise and label some of the stars in the sky. This was important for them as they were dependent on these stars to find directions and to measure time.

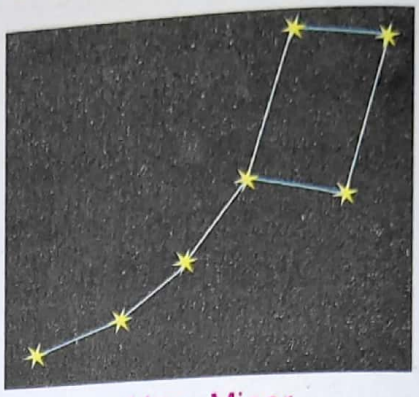
We can easily recognise some constellations in the sky. One of the most important constellations, which we can see during spring, in the early part of night, is the

Ursa Major. This is also known as the **Great Bear** (or **Big Dipper**). The two stars, at the top of this constellation, are called **pointers**. This is because the line joining those points is in the direction of a special star called the **Pole Star** (North Star).

Some of the other easily recognisable constellations are **Orion** (visible in winter), **Ursa Minor** (or **Small Dipper**) (visible in spring) and **Cassiopeia** (visible in autumn).*



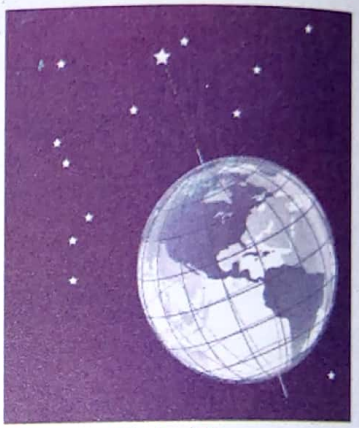
Ursa Major



Ursa Minor

Pole Star

Pole Star or **Dhruvtara** is a special star present in the northern hemisphere. This star, unlike other stars, appears to remain fixed at one place. This is so because it lies (almost) along the axis of rotation of the earth. Because of this special feature, this star has been useful to travellers. It defines the North direction.



Pole Star

Activity:

To design the patterns of the main constellations and to name them

Material required: A-4 size black cardboard, glue or fevistick, crayons and aluminium foil.

Procedure: Choose two constellations, one visible in summer and one visible in winter. Using aluminium foil, make 3-D stars by rolling the foil into balls. Stick these 'star balls' on a black cardboard on which the shape of the two constellations has already been drawn. Now, using crayons, of appropriate colours, draw imaginary lines joining the stars. Next, cut out the letters, that make up the name of the constellations, using the aluminium foil sheet. Label the constellations on the cardboard.

Put the labelled constellations on the back wall. You now have a view of a part of the night sky in the classroom itself.

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* Teacher should explain that due to the Earth's orbit around the sun, different constellations can be seen in the sky, throughout the year. The constellation of Orion can be seen during winter evenings and the constellation of Scorpius can be seen in the sky during summer evenings.
Teacher should also encourage the students to find out more about the various constellations visible at different times during the year.

Identifying the Planets in the Sky

We can identify a planet, in the background of stars, by closely observing the night sky. Some of the features of planets that enable us to distinguish them from stars are:

- A planet is closer to us than the stars. That is why, planets appear like tiny discs whereas stars appear as points.
- Stars appear to twinkle. Planets do not twinkle.
- Stars do not appear to change their relative position with each other in the night sky; they appear to be almost stationary. However, planets change their relative position with respect to each other. They appear to move against the background of stationary stars. This was the reason why ancient people named them as **planets**, i.e. **wandering stars**.

Changing Night Sky

We now know that stars do not appear to move with respect to each other in the sky. However, if one closely observes some bright stars for an hour or so, it will be found that there is a slight shift in the position of these stars in the sky. Stars like the sun, appear to move from east to west. This, as we have now understood, is due to the rotation of earth on its axis from west to east.

Do You Know?
The earth revolves around the sun. Alongwith this revolution around the sun, the earth also rotates about its own axis. These two motions of the earth cause the same star to appear to rise four minutes earlier every day.

Do You Know?
We see a whole different set of stars in the sky after every six months. This is because the earth revolves around the sun and, in six months time, moves to the other side of the sun.

Keywords

- **constellation** a constellation represents the patterns formed by some stars in the sky.
- **pole star** pole star, a star that appears to remain stationary. It is (approximately) aligned with earth's axis of rotation.
- **star** a self luminous celestial body consisting of very hot gases.

Something to Know

A. Fill in the blanks.

1. A group of stars that appear to form a pattern in the sky is known as a _____.
2. A planet is _____ to us than the stars.
3. The planets are also known as _____.
4. The pole star defines the _____ direction.
5. Stars _____ but planets do not _____.

B. Match the following:

1. a constellation visible in winter	a. Sun
2. the 'morning stars'	b. Moon
3. a constellation visible in spring	c. Orion
4. the brightest object in the night sky	d. Ursa Minor
5. a star of average brightness	e. Mercury and Venus

C. Tick (✔) the correct option.

1. The planet that can be (sometimes) seen in the evening sky, even with unaided eye, is—

   (a) Neptune (b) Saturn (c) Mercury (d) Uranus

2. The two stars, at the top of Ursa Major, are called—

   (a) Pole Stars (b) Big Dipper (c) Small Dipper (d) Pointers

3. The Cassiopeia is—

   (a) a bright group of stars in the sky.

   (b) an artificial satellite.

   (c) the name given to a spacecraft.

   (d) a constellation visible in autumn.

4. From the following, the object in the sky, that (apparently) moves least in a given time is—

(a) North Star (b) Venus (c) Sun (d) Moon

5. The brightest planet in the night sky is—

(a) Jupiter (b) Venus (c) Mars (d) Neptune

6. On closely observing some bright stars, for some hours, one finds that stars appear to move from—

(a) east to west (b) west to east

(c) north to south (d) south to north

D. Answer the following questions in brief.

1. Why do, we usually not see the stars during the day?
2. In which part of the sky are we likely to find Venus when it is visible as an evening star?
3. State the cause of the apparent motion of the sun from east to west?
4. Name the special star in the northern hemisphere. Why has it been useful for travellers?

E. Answers the following questions.

1. Define the term 'constellation'.
2. In what respects is, the pole star, different from other stars?
3. Write two points of difference between a planet and a star.
4. Why do stars appear to slightly shift their position in the night sky?
5. Why do stars appear as points to us?

Based Question

Dhruv is studying in a reputed public school of Delhi. His grandparents live in a small town at the foothills of the Himalayas. During summer vacation he visited his grandparents. He behaved in a very polite and nice way and was very respectful

towards his grandparents. In night, he was amazed to see very large number of bright stars twinkling in the night sky. His grandfather showed him various groups of star forming some beautiful patterns. He was very excited to see these beautiful patterns of stars, which he was not able to see in Delhi.

1. Do you think that pollution in atmosphere effects the natural phenomenon of twinkling of stars?
2. How did Dhruv behave with his grandparents? Share your own similar experiences with your friends.
3. State the name of one group of stars forming a familiar pattern seen in summer.

Something to Do

1. Try to locate Venus in the night sky. Find out from newspaper reports when Venus is likely to be visible.
2. After sunset go, with your parents, to some large open ground from where the horizon is clearly visible. Look at a rising star. Mark its direction with respect to a pole or a tree. Next day go to the same spot a little earlier and observe the same star from the same position. Repeat, and tabulate, your observations for a few days. Discuss your findings with your teacher or friends.

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