Science

7

What does "Progressive Science" series consist of?

Each lesson is supported by :

- Beautiful illustrations
- Learning objectives
- Fact to know
- Let's Recall
- Word power
- Train your Brain
- Cross Curriculum Connect
- Exercises with Revision and Model tasks
- Activity time
- HOTS
- Project time

Tasks for RTP and MTP include :

- Answer the questions in short
- Fill in the blanks
- Answer the questions
- True/False
- Multiple choice questions
- Answer in one word
- Match the columns

Published by :

Preface

Science is an attractive journey into the cause and effect, as well as the reason for all life and the world we live in. It is a subject that effects our line in a preformed manner. Thus it is vital to initiate the scientific temper into children as early as possible.

Children are naturally curious and scientific inquiry is a part of their behaviour from birth. By keeping this point in mind, the series lays stress on learning with understanding.

The series of "**Science**" for classes 1 to 8, is strictly written in accordance with the prescribed elements and guidelines issued in the **Latest National Curriculum Framework** suitable for CBSE and other **State Board Schools**.

Vital information about the series :

- Learning objectives : Recap of the chapter content.
- Fact-o-scope : Which presents snippets of interesting information to take learning beyond the syllabus.
- Let us Recapitulate : Which is given to recapitulate the important points learnt.
- Word Power : Meaning of difficult words are given in this section.
- Train your Brain : This section has been designed to develop skills of creative and critical thinking among the students.
- Model Test Paper : Measures how much a student has learnt. It is included in each chapter in the form of questions and answers and fill up the blanks.
- High order thinking Skills (HOTS) : Challenging opportunities given to develop analytical skills.

Four Formative and two Summative Assessments are given at the end to provide Continuous and Comprehensive Evaluation of knowledge, understanding and application of concepts learnt.

Every effort has been made to make the series fruitful. Any suggestions for the improvement of the series shall be gratefully acknowledged and incorporated in the forthcoming series.

– Publishers

DETAILED CONTENTS

S. No.	Chapter Name	Introduction	Activity and Facts to know	Let's Remember and Glossary	Summary	Exercise	HOTS (Think and Answer)	Let's Recall	Group Discussion and Activity to Do	Creative Task	Work-sheet
1.	Nutrition in Plants	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	One Word Question; Description of the difficult words	Important points of the chapter	MCQs; True/False; Fill up; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
2.	Nutrition in Animals	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	One Word Question; Description of the difficult words	Important points of the chapter	MCQs; True/False; Fill up; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
3.	Heat	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	Fill up; One Word Question; Description of the difficult words	Important points of the chapter	MCQs; True/False; Fill up; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
4.	Acids, Bases and Salts	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	One Word Question; Description of the difficult words	Important points of the chapter	MCQs; True/False; Fill up; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
5.	Physical and Chemical Changes	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	Matching; True/False; Matching; Description of the difficult words	Important points of the chapter	MCQs; One Word Question; Fill up; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
6.	Respiration in Organisms	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	One Word Question; Fill up; Description of the difficult words	Important points of the chapter	MCQs; True/False; Matching; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
7.	Transportation in Animals and Plants	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	One Word Question; Fill up; Description of the difficult words	Important points of the chapter	MCQs; True/False; Matching; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter

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8.	Reproduction in Plants	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	Matching; One Word Question; Description of the difficult words	Important points of the chapter	MCQs; True/False; Fill up; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
9.	Motion and Time	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	One Word Question; Fill up; Description of the difficult words	Important points of the chapter	MCQs; True/False; Matching; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
10.	Electric Current and Its Effects	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	One Word Question; Matching; Description of the difficult words	Important points of the chapter	MCQs; True/False; Fill up; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
11.	Light	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	One Word Question; Fill up; Description of the difficult words	Important points of the chapter	MCQs; True/False; Matching; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
12.	Forests : Our Lifeline	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	One Word Question; Fill up; Description of the difficult words	Important points of the chapter	MCQs; True/False; Matching; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
13.	Wastewater Story	Brief of the main topics covered in the chapter	Activities related to the topics; Some important facts related to the chapter	Matching; Description of the difficult words	Important points of the chapter	MCQs; True/False; One Word Question; Short Question-Answer; Question-Answer	Questions based on the thinking skill of the student	Completing the diagram related to the chapter	Topics to be discuss based on the chapter; Some fun task is given to do	A practical work to do	This extra work sheet revise the whole chapter
	Task for RV–1										
	Task for RV–2										
	Task for MD–1										
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	Task for MD–2										

CONTENTS

SCIENCE

CHAPTER 1

Nutrition in Plants

Introduction

- Mode of nutrition
- Autotrophic nutrition
  - Photosynthesis
- Heterotrophic nutrition
  - Parasitic plants
  - Insectivorous plants
  - Saprophytic plants
  - Symbiotic plants
- Replenishment of nutrients

We have already learnt in the previous class that all living beings need food. We have learnt that various components of our food are carbohydrates, fats, proteins, vitamins, minerals, roughage and water. These components of food are called nutrients. They provide us with energy and help us to perform various life activities.

Plants can prepare their own food, but animals and human beings cannot do so and obtain food from plants or animals that eat plants. Thus, animals and humans directly or indirectly depend upon plants for food.

MODE OF NUTRITION IN PLANTS

The process of taking in food by an organism and its utilisation by the body is called nutrition. All living organisms need energy to perform various activities. They get this energy from food. The food which they eat is broken down into simple substances to get energy. The mode of nutrition in all living organisms can be divided into two categories based on their food habits.

- Autotrophic
- Heterotrophic

AUTOTROPHIC NUTRITION

The mode of nutrition in which organisms make their own food from simple inorganic substances is called autotrophic nutrition (auto = self, and troph = nourishment). We have already studied that green plants make their own food through a process called photosynthesis. Hence green plants are called autotrophs.

HETEROTROPHIC NUTRITION

The mode of nutrition in organisms that cannot make their own food and depend upon others is called heterotrophic nutrition (heteros = others). Animals including man which depend on plants for their food are called heterotrophs.

We shall now learn how green plants make their own food? Which parts of the plant make the food? From where do they get the raw materials? How is the food transported to the various parts of the plant?

PHOTOSYNTHESIS

In green plants, leaves prepare the food. They are the food factories of the plant. Since the leaves prepare food, it is necessary that the raw materials must reach there. They make their own food from carbon dioxide and water in the presence of chlorophyll (a green pigment) and sunlight. This process is called photosynthesis (Photo = light, synthesis = to combine)

We can write the reaction as

$$\text{Carbon dioxide} + \text{water} \xrightarrow[\text{chlorophyll}]{\text{sunlight}} \text{glucose} + \text{oxygen}$$

The following four things are required for photosynthesis :

CHLOROPHYLL

It is the green pigment present in the leaves. It is found in structures called chloroplasts. It helps leaves to capture the energy of the sunlight, which in turn is used to synthesise food from carbon dioxide and water.

SUNLIGHT

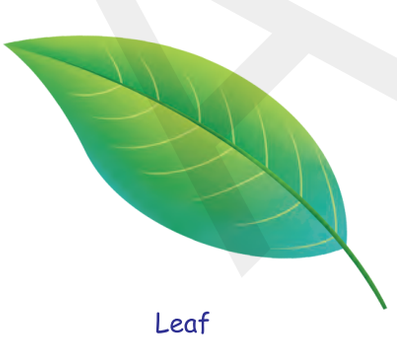
Light energy is absorbed by the chlorophyll.

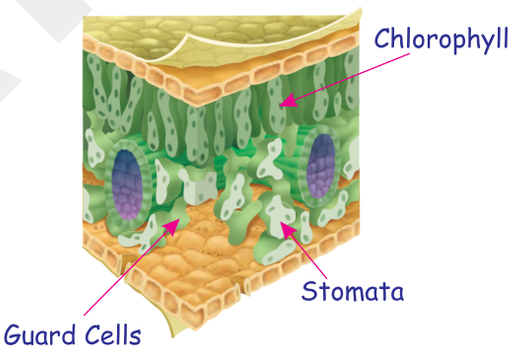
CARBON DIOXIDE

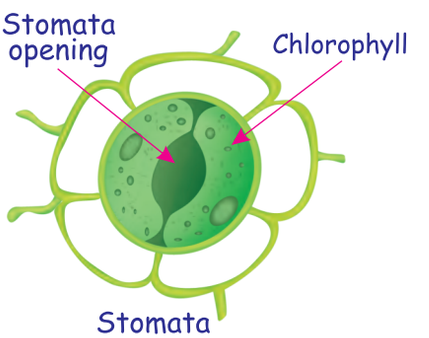
The leaves absorb carbon dioxide from air through tiny pores present on their surface called stomata. They are surrounded by guard cells, which regulate the opening and closing of the stomata.

WATER

Water and minerals from the soil are absorbed by the roots and transported to the leaves.



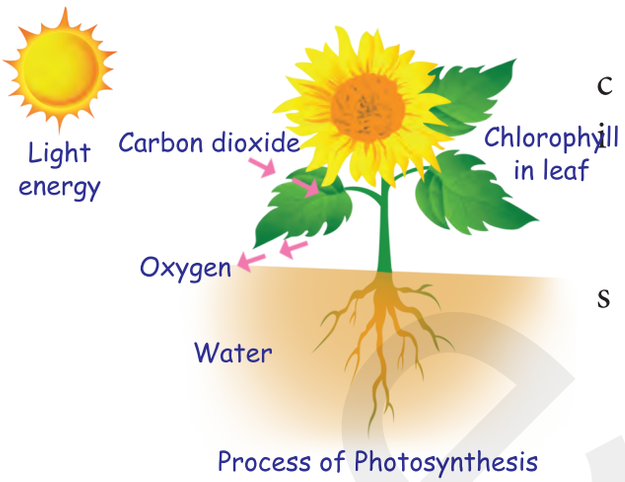




This transportation takes place through pipe like vessels present in the roots, the stems, the branches and the leaves.

During photosynthesis solar energy of the sun is converted into chemical energy. This shows that sun is the ultimate energy for all living organisms. You must have seen from the above equation, that oxygen is a by-product of photosynthesis, which is also essential for the survival of all living organisms.

The carbohydrate is converted into starch.



Process of Photosynthesis

CACTUS PLANTS

The desert plants like cacti have spines instead of leaves. This is to reduce loss of water by transpiration. Cacti have green stems which carry out photosynthesis.

Photosynthesis can take place in green stems and green branches also.

Activity – 1

Take two potted plants with green leaves. Keep one plant in the sun and the other in a dark room. Perform the iodine test with the leaves of both the plants after 48 hours. Now keep both the pots of plants in sunlight. Repeat the iodine test after 3–4 days. Note down your observations? What do you conclude?

PHOTOSYNTHESIS IN PLANTS WITH COLOURED LEAVES

You must have seen plants with red, brown or violet leaves. These plants also contain chlorophyll. However, the amount of red, brown or yellow pigment present in these leaves masks the green colour. Photosynthesis takes place in these coloured leaves also.

Facts to know

Some plants like money plants, crotons have white and green part in the same leaf. Photosynthesis does not take place in the white part.

ALGAE

Have you seen green patches on the surface of ponds or lakes. These are due to the growth of organisms called algae. They are green in colour as they contain chlorophyll. They too can manufacture their own food through photosynthesis.

Synthesis of Nutrients Other Than Carbohydrates

As we have seen plants produce carbohydrates. They are made up of carbon, hydrogen and oxygen. They are used for the synthesis of proteins and fats. For the synthesis of proteins plants also require nitrogen. From where do they get this nitrogen from? Although nitrogen is present in air up to approx. 78%, plants cannot use this free nitrogen. There are some nitrogen-fixing bacteria in the soil which convert this free nitrogen into a form which can be used by the plants. The plants absorb this soluble form along with water through its roots. Farmers also add fertilizers, rich in nitrogen to the soil. Plants are then able to synthesise other components of food like fats and proteins.

Let's Remember

Give one word for each one of the following.

1. Define autotrophs and heterotrophs.
2. Where is chlorophyll found in plants?
3. Is man an autotroph or a heterotroph?
4. Where do you find guard cells?

HETEROTROPHIC NUTRITION

How do plants that do not contain chlorophyll derive their nutrition ? These plants depend on other plants for food as they cannot synthesise their own food. They use the heterotrophic mode of nutrition.

Heterotrophic plants are of four types :

1. Parasitic plants
2. Insectivorous plants
3. Saprophytic plants
4. Symbiotic plants

Facts to know

Giant Water lilies in Amazon can grow upto 6 feet in diameter.

Parasitic Plants

Plants which live on other living organisms and obtain their food from them are called parasitic plants. The organism from which a parasite derives its nutrient from is called a host.

Examples: Cuscuta (amarbel). It does not produce chlorophyll. It has yellow tubular structures that wrap around the stem and branches of a tree. It takes ready made food from the tree on which it climbs. Other example is mistletoe.

Cuscuta on host plant

Mistletoe on host plant

Pitcher plant showing pitcher and lid

Insectivorous Plants

There are some plants which can even eat insects. They are called insectivorous plants. These plants are usually green in colour and leaves of these plants are modified to trap the insects. **Examples:** Pitcher plant and Venus fly trap. In pitcher plant, the leaves are modified into a pitcher like-structure with a lid. The tip of the leaf is modified to form a lid that can open and close the mouth of the pitcher. The inside of the pitcher is lined with downward pointing hairs that do not allow the trapped insect to escape. The lid closes, once an insect enters the pitcher. The pitcher secretes digestive juices that digest the insect. Have you wondered that if the pitcher plant is green, then why does it need to feed on insects? This is because the pitcher plants grow in areas where the soil is deficient in nitrogen. It gets nitrogen by trapping and eating insects.

Saprophytic Plants

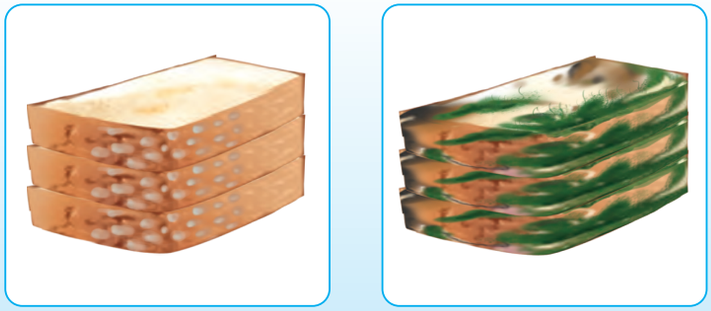
Saprophytes are those organisms which cannot make their own food and obtain their nutrition from dead and decaying plant and animal matter. These plants have no leaves at all. They cannot carry out photosynthesis. Examples are mushrooms, mould and yeast.

Mushroom

You must have seen umbrella like structures growing on logs of wood during the rainy season. These structures are called Mushrooms. They secrete digestive juices on the dead and decaying matter and convert it into a solution. They then absorb the nutrients from it. The mode of nutrition in such plants is saprophytic nutrition and the plants are called saprophytes.

Activity – 2

Take a piece of bread and moisten it with water. Keep it in a closed box in a warm place, for 2–3 days. Observe the piece of bread. You will notice a white cottony growth on the piece of bread. This growth is due to a fungus called bread mould. They appear as cotton like threads if observed with a magnifying glass.



Bread mould

In the rainy season you must seen white patches on your unused shoes and bags which have been left in the hot and humid weather. These white patches are also due to fungi.
The spores of fungi circulate in the air. When they settle on wet and warm things they germinate and begin to grow.

Symbiotic Plants

Some plants live in association with other organisms and share shelter and nutrients. Both the plants gain from each other. Such plants are called symbiotic plants, and the relationship is called symbiotic relationship.

Symbiotic Relationship

Example: Certain fungi live in the roots of trees. The tree provides nutrients to the fungi. The fungi in return provides certain nutrients from the soil to the tree.
Another example is of lichens– It is a green algae and a non green fungus. The algae is an autotroph and provides food to the fungus. Fungus provides shelter, water and minerals from the soil to the algae.

Lichens

Rhizobium-the roots of a leguminious plant

Facts to know

Mushroom is a fungi. All varieties of mushroom are not edible. Some are extremely poisonous.

Let's Remember

Give one word for each one of the following.

1. Do mushrooms have leaves?
2. Give examples of parasitic plants and insectivorous plants.
3. What do you mean by a host?
4. Which bacteria lives in the roots of leguminous plants?

REPLENISHMENT OF NUTRIENTS IN THE SOIL

Plants get nutrition from the soil. Since crops/plants are continuously grown in the soil, the amount of nutrients in the soil decline. Manures and fertilizers are added by the Farmers to replenish the nutrients in the soil. They contain nutrients like nitrogen, potassium, phosphorous, magnesium etc. These nutrients need to be added from time to time to maintain the fertility of the soil and for healthy crops and yield. Usually crops require a large amount of nitrogen. We can grow leguminous plants like gram, moong, beans, peas etc in the fields. Rhizobium bacteria which lives in the roots of leguminous plants can take in atmospheric

nitrogen and convert it into a soluble form in the soil. Rhizobium cannot prepare its own food. These leguminous plants provide food to it. Thus a symbiotic relationship exists between leguminous plants and Rhizobium. In this way, the farmers do not need to add nitrogen for fertilizers to the soil to restore nitrogen content where leguminous plants are grown.

Glossary

nutrition	:	the mode of taking food by an organism and its utilisation by the body
autotrophic	:	the mode of nutrition in which organisms make food for themselves from simple substances
insectivorous	:	insect eating plants which usually grow in nitrogen deficient soil
chlorophyll	:	green pigment present in the leaves which help in the photosynthesis process
parasite	:	the organism which lives on or in other organism
host	:	the organism on which parasite grows or survives
stomata	:	the openings present in the leaves

Summary

- All living organisms need food. Food provides energy for growth and maintenance.
- Green plants are autotrophic as they prepare their own food by the process of photosynthesis.
- Four things are required for photosynthesis-carbon dioxide, water, sunlight and chlorophyll.
- During photosynthesis, solar energy from the sun is converted into chemical energy, which is stored in the leaves in the form of food.
- Some plants depend on other plants for food as they cannot synthesise their own food. They are called heterotrophs.
- Heterotrophic plants are of four types-parasitic, saprophytic, insectivorous and symbiotic plants.
- The nutrients in the soil need to be replenished regularly.

Exercise

A. Multiple Choice Questions (MCQs)

Tick (✓) the right option.

1. During photosynthesis solar energy is converted into _____.

(a) light energy ☐ (b) mechanical energy ☐

(c) chemical energy ☐ (d) electrical energy ☐

2. By-product of photosynthesis is _____.
   (a) oxygen ☐ (b) water ☐
   (c) carbon dioxide ☐ (d) nitrogen ☐
3. This is a symbiotic plant _____.
   (a) mistletoe ☐ (b) venus fly trap ☐
   (c) lichen ☐ (d) mushroom ☐
4. This can convert free nitrogen into a soluble form _____.
   (a) mushroom ☐ (b) bread mould ☐
   (c) yeast ☐ (d) rhizobium ☐
5. Amarbel is an example of _____.
   (a) autotroph ☐ (b) parasite ☐
   (c) saprophyte ☐ (d) insectivore ☐

B. Write 'T' for true and 'F' for false statements.

1. Oxygen is used for photosynthesis. ☐
2. All plants can prepare their own food. ☐
3. Saprophytes cannot prepare their own food. ☐
4. The mode of nutrition in lichens is symbiotic. ☐
5. Plants also need nitrogen for growth. ☐

C. Fill in the blanks with the correct words.

starch soil chlorophyll energy cacti

1. _____ is the green pigment present in the leaves.
2. Light _____ is absorbed by the chlorophyll.
3. The carbohydrate is converted into _____.
4. _____ have green stems which carry out photosynthesis.
5. Plants get nutrition from the _____.

D. Answer the following questions in short.

1. What is the difference between a parasite and a saprotroph?
2. Why cannot all plants prepare their own food?
3. What is the mode of nutrition of an algae?
4. What is common between a mushroom and a bread mould?
5. What are the requirements of photosynthesis?

E. Answer the following questions .

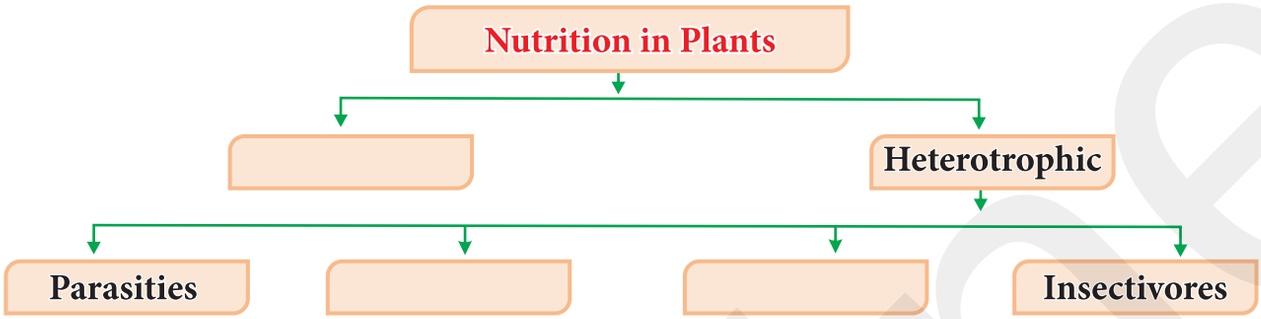
1. Describe the role of leaves in photosynthesis.
2. What is symbiosis? Explain with the help of an example.
3. How are the leaves of the pitcher plant modified to catch insects?
4. Why are saprophytes called cleaners of the environment?
5. Why do farmers grow leguminous crops after harvesting of cereals?

HOTS (Think and Answer)

1. Why do you think we say a pitcher plant is both an autotroph and a heterotroph?
2. What do your think will happen if you coat the leaves of a green plant with oil?

Let's Recall

Complete the following diagram.



Group Discussion

1. A plant without a chlorophyll cannot survive.
2. Insectivorous plants have different mode of nutrition than parasites.

Activity to do

Conduct an experiment to see that carbon dioxide is needed for photosynthesis.

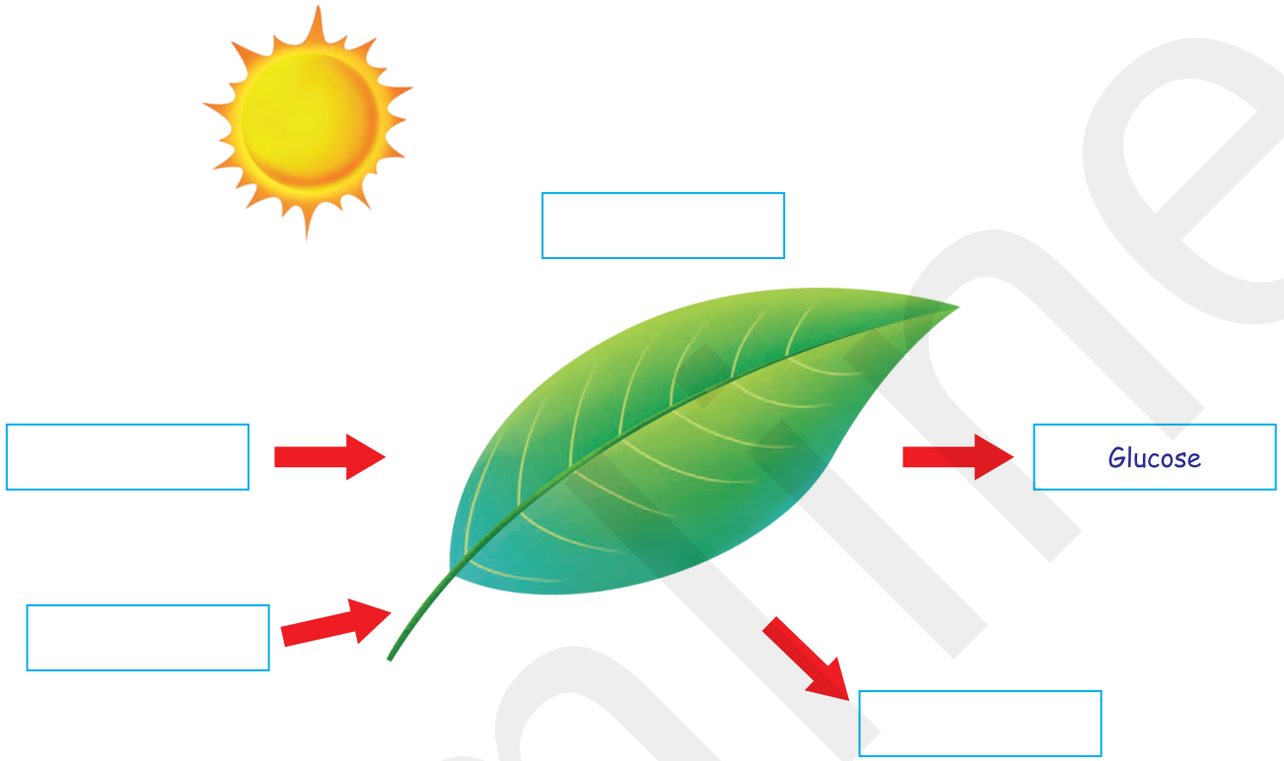
- Take a healthy potted green plant. Keep it in a dark room for 5-6 hours. Water it.
- Take a conical flask. Pour potassium hydroxide solution into it. This solution absorbs carbon dioxide from the air.
- Now place one of the leaf while still on plant inside the flask as shown in the figure. Do not break the leaf. Close the mouth with a cork.
- Keep the plant along with the flask in the sun.
- After a few hours, test this leaf which was in the flask and another leaf from the plant for starch.
- Note down your observations :
  What do you conclude?

Creative Task

Collect pictures of different Insectivorous plants and prepare an album. Learn about their habitat, either from a magazine or with the help of your teacher.

WORKSHEET-1

1. Label the diagram given below and name the process it shows.



2. Write the differences between a total parasite and a partial parasite.

3. Complete this equation.

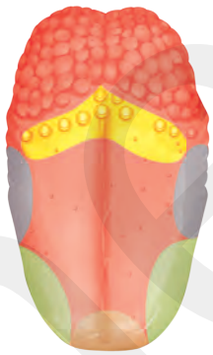
Carbon dioxide+water $\xrightarrow[\text{Chlorophyll}]{\text{sunlight}}$ _____ + _____

CHAPTER 2

Nutrition In Animals

Introduction

- Modes of procuring food
- Digestion in humans
- Teeth
- Care of teeth
- Digestive system in humans
- Digestion in grass eating animals
- Digestion in amoeba



In the previous chapter we have learnt about nutrition in plants and how they make their own food. Animals depend on plants either by directly eating them or eating animals which eat plants. Some living organisms can eat both plants and animals. The food we eat is used for growth, repair and functioning of the body. Animal nutrition includes nutrient requirement, mode of intake of food and its utilisation in the body. The main components of food are carbohydrates, proteins, fats, vitamins and minerals. Besides, our body also needs water and roughage. The food that we eat cannot be utilised as such. It has to be broken down into simple substances. The breakdown of complex components of food into simple substances is called digestion.

MODES OF PROCURING FOOD

Different organisms use different modes of procuring food.

Name of Animal	Mode of Feeding	Food
Mosquitoes, leeches	sucking	blood
Snakes, frogs	swallowing	animals/insects
Bees, humming bird	sucking	nectar
Rabbits, rats, squirrels	gnawing	seeds and fruits
Sea animals, sponges	sponging	suspended food particles

Butterflies, moths	siphoning	nectar
Cows, horses, goats	cutting/chewing	grass
Star fish	scraping	algae

Activity - 1

Find out more in detail how birds, silk worms, oysters, eagles, lice and houseflies feed. Fill in the table.

Name of the Birds	Food	Mode of taking in food
Silkworms		
Oysters		
Eagles		
lice		
Houseflies		

Facts to know

- A bee must visit 4000 flowers to make 1 table spoon honey.
- Humming birds consume double their weight in food daily.

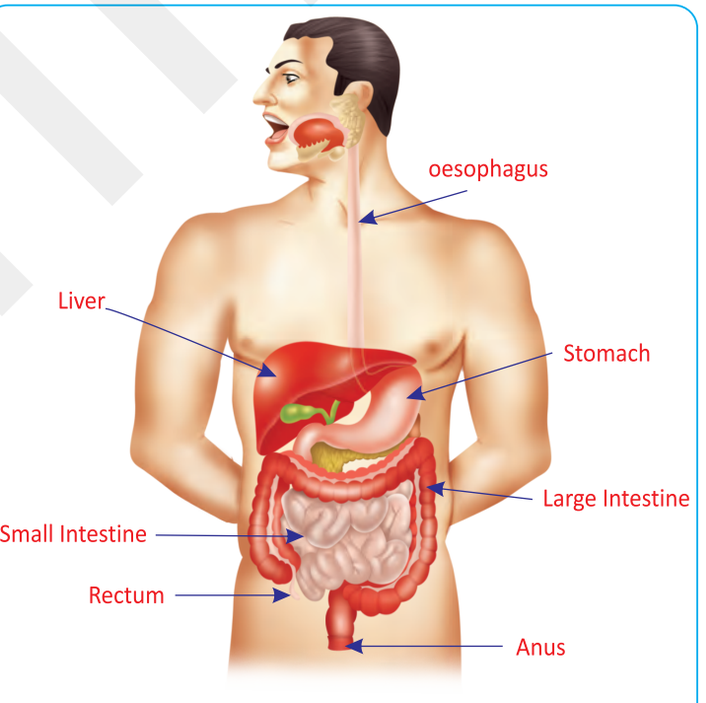
DIGESTION IN HUMANS

The process of digestion begins in the mouth. We take in food through the mouth. The digested food is utilized by the body and the unused part of the food is ejected out as waste.

The digestive system is made of a long tube called the alimentary canal, which begins in the mouth (buccal cavity) and ends at the anus. The alimentary canal is about 9–10 meters long.

It consists of the following compartments :

- The buccal cavity
- Oesophagus or food pipe
- Stomach
- Small Intestine
- Large intestine (caecum, colon and rectum) and



Human digestive system

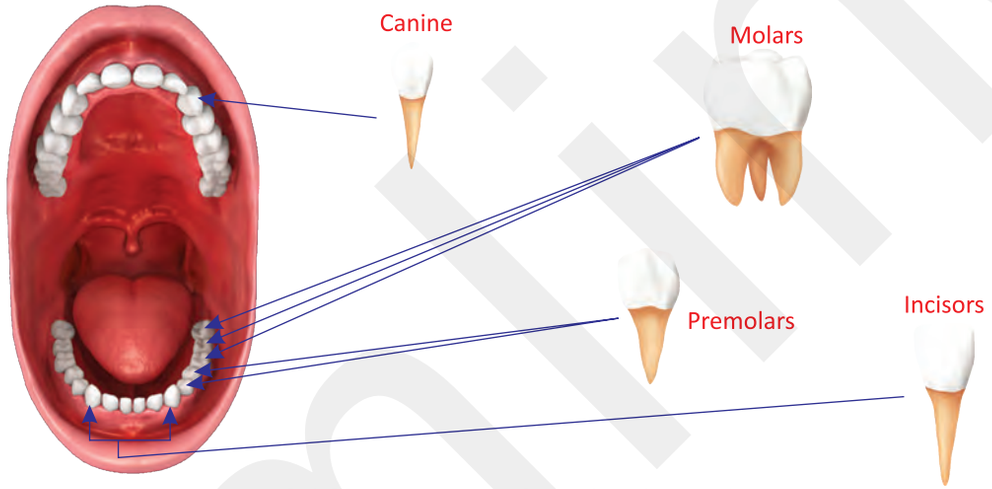
The alimentary canal is also known as the digestive tract. The food is completely digested as it passes from one compartment to another. Digestion involves both physical and chemical processes for converting the complex substances into simple ones. Mechanical digestion involves chewing and churning of food. In chemical digestion, digestive juices secreted by various organs of the digestive tract like salivary glands, pancreas and liver, break down complex food into simpler ones.

The alimentary canal and the associated glands together constitute the digestive system.

Let us study the movement of food through the various compartments.

The Mouth and The Buccal Cavity

The process of taking in food into the body is called ingestion. The mouth contains the teeth, tongue and salivary glands. We have different types of teeth, which help us to break down food into smaller pieces.



Arrangement of different types of teeth in human beings.

Teeth are located in both the upper and lower jaw of the mouth cavity. Each tooth is rooted in a separate socket in the gums. The first set of teeth appear by the age of 2 years. They are 20 in member and are called milk teeth. The milk teeth fall and are replaced by a new set of 32 permanent teeth by the age of 12 years.

Based on the structure and function teeth are of four types.

Type of teeth	Name	Number of teeth		
		Lower jaw	Upper jaw	Total
Cutting or biting	incisor	4	4	8
Piercing or tearing	canine	2	2	4
Chewing and grinding	premolar	4	4	8
Chewing and grinding	molar	6	6	12
			Total	**32**

Let's Remember

Give one word for each one of the following.

1. What is ingestion?
2. The number of milk teeth a child has.
3. How many pairs of incisors are present in the mouth?
4. How many different types of taste can a taste bud detect?

Facts to know

- We eat about 500 kg of food every year.
- An adult stomach can hold 1.5 l of material.

Dental Care

Do you know that bacteria are present even in our mouth? All are not harmful. When we eat food, small pieces of food get stuck up between the teeth. If the teeth are not cleaned properly, harmful bacteria begin to grow and live in it. They act on the sugar present in the food, producing acid. These acids destroy the teeth. This damage to the teeth is called tooth decay. If timely care is not taken, cavities may form, there may be pain and in some cases tooth loss may occur. Chocolates, sweets, soft drinks and other sugar products are responsible for causing tooth decay.

How to prevent truth decay

- Brushing your teeth twice a day. Use a dental floss daily
- Massage your gums gently with a soft-brush
- Rinse your mouth with water after every meal
- Avoid eating sticky and starchy foods like sweets, chocolates, ice creams etc
- Eat raw vegetables like carrots and fresh fruits which help to clean the food naturally

Facts to know

Saliva contains 99% water.

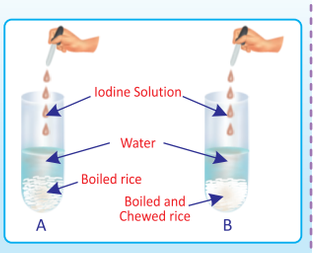
We must take proper care of our teeth to keep them healthy.

Mechanical digestion of food begins when teeth break the food into smaller pieces. This process is called mastication. There are three pairs of salivary glands in the buccal cavity. They secrete a digestive juice called saliva. You must have noticed that the mouth starts watering at the sight or smell of our favourite food. This watery liquid is saliva. The saliva mixes with the chewed food and makes it moist.

Thus saliva breaks down the starch into sugars.

Activity – 2

Take 2 test tubes and label them as A and B. Put some boiled rice in test tube A. In test tube B, put some boiled rice which has been chewed well. Add one teaspoon of water and 2–3 drops of iodine solution in each test tube. Observe blue colour is seen in test tube A, as boiled rice contains starch. The starch in boiled rice is converted into sugar by saliva during chewing. Therefore, no blue-black colour develops in testube B.

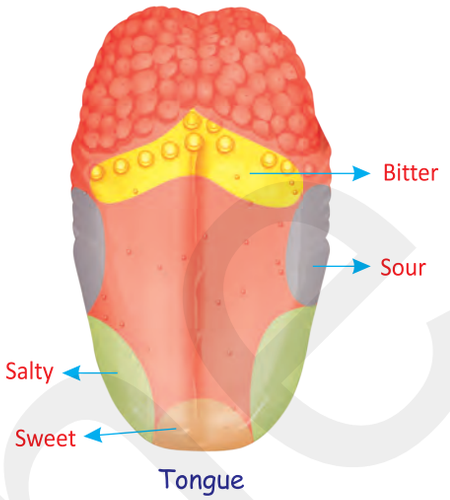


Tongue

Tongue is a flesh, muscular organ. It is attached at the back to the floor of the buccal cavity and free at the front. It can thus be moved in all directions. The main functions of the tongue are–

- It helps to mix saliva with the food
- It helps in swallowing food
- It tells the taste of the food with the help of taste buds
- It helps us in talking

The surface of the tongue is rough due to the presence of thousands of taste buds which help to detect four different types of taste-sweet, salty, sour and bitter. With the help of this activity, let us find out the different locations of different taste buds.



Activity – 3

Prepare solutions of sugar(sweet), salt(salty), lemon juice (sour) and juice of karela or neem (bitter). With the help of a tooth pick, put a few drops of each solution in different areas of your tongue. Use a separate tooth pick, for each sample. Identify the areas of the tongue where you could feel sweet, salty, sour and bitter substances.

Salty and sweet buds are present at the tip, Sour taste-all the way back along the sides. Bitter taste-at the back of the tongue.

The wind pipe and the food pipe lie close together. But inside the throat the two share a common passage. During the act of swallowing , a flap like structure called **epiglottis** closes the opening of the wind pipe. This prevents the entry of food into the wind pipe. If we talk or eat in a hurry or laugh, the food particles can enter the wind pipe and we cough, get hiccups or feel a choking sensation.

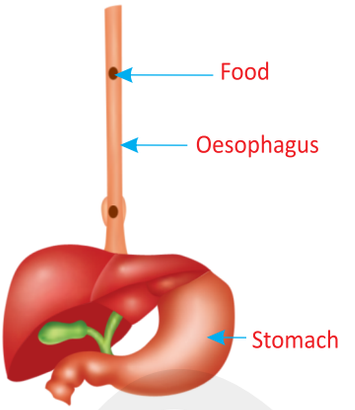
Facts to know

The food that you eat gets cold or warmed in the mouth, till it

Oesophagus/Food pipe

The food which is swallowed enters into the food pipe or oesophagus. It runs along the neck and the chest. It is a hollow tube about 25 cm long, made up of muscles. Food is pushed down by the movement of the wall of the food pipe. No digestion takes place here. From the food

pipe, the food enters the stomach. You must have suffered from vomiting sometimes or the other. This is because at times the food is not accepted by the stomach and is vomitted out.



Stomach

It is like a large sac-like muscular organ. It is J shaped present in the upper abdomen. It is located on the left side. It receives food from the oesophagus. The other end opens into the small intestine. The gastric glands present in the inner lining of the stomach secrete mucous, digestive juices and hydrochloric acid.

The mucous protects the inner lining of the stomach from the action of the hydrochloric acid and enzymes. The hydrochloric acid kills the bacteria which enter along with the food. The acid makes the medium acidic to help digestive juices to act.

Facts to know

It takes your mouth, oesophagus, stomach, small and large intestine, gall

The digestive juices help in the breakdown of proteins into simple substances. The food stays in the stomach for 2–4 hours. The semi digested food is called chyme. From the stomach the chyme goes into the small intestine.

Small Intestine

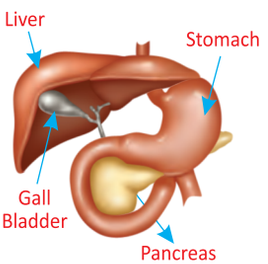
The small intestine is a long coiled narrow tube about 7.5 m long. It is located in the middle of the abdomen. Digestion of food is completed here. The small intestine receives digestive juices secreted by the liver and the pancreas.

Liver

It is the largest gland of our body. It is reddish brown in colour and is situated on the right side on the upper abdomen. It secretes bile juice which helps in the digestion of fats. Bile is stored in an organ called gall bladder, which is sac like. The gall bladder is connected to the liver with the bile duct.

Pancreas

Pancreas is a cream coloured gland located between the stomach and the first part of the small intestine. It produces pancreatic juice which acts on the carbohydrates, proteins and fats and helps in their breakdown into simpler forms.



The partly digested food reaches the lower part of the small intestine. The intestinal juices complete the process of digestion. The carbohydrates are broken down into sugars; proteins into amino acids ; and fats into fatty acids and glycerol.

Absorption

It is the process whereby digested food pass into the blood vessels in the intestinal wall. The nutrients present in the digested food are then absorbed by the finger like projections on the inner wall of the small intestine. These finger like projections are called villi. These villi increase the surface area of the small intestine for absorption of the digested nutrients. The villi have a network of very fine blood vessels called capillaries.

The surface of the villi absorb the digested nutrients, which are then transported through the blood vessels to the different organs where they are utilized to build proteins and other complex substances. This is called assimilation. In the cells, energy is released by the breakdown of glucose (the simplest sugar) into carbon dioxide and water.

The undigested and unabsorbed food enters the large intestine.

Large Intestine

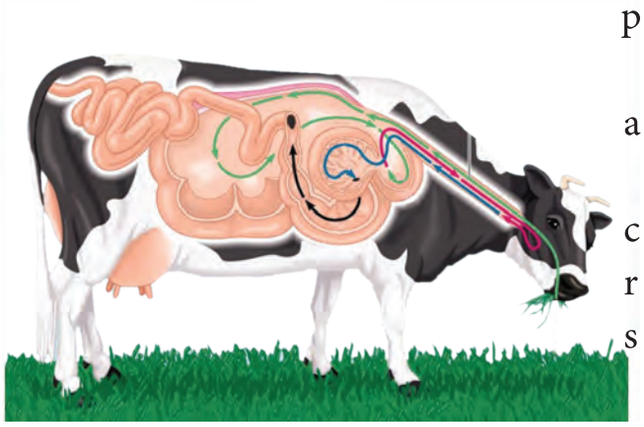
Large intestine is about 1.5 m long. Its main function is to absorb water and some salts from the undigested food material. The undigested waste from the large intestine passes into the rectum. The waste remains here as semi-solid faeces. The faecal matter is passed out through an opening called the anus. The process is called egestion.

Diarrhoea

It is the passage of frequent loose or liquid stools. It occurs due to infection, food poisoning or indigestion. It leads to the loss of fluids from the body, which may cause dehydration. Hence, diarrhoea should not be neglected. The patient should be given oral rehydration solution (ORS). It is a mixture of boiled and cooled water, with a pinch of salt and sugar dissolved in it. It can easily be given at home.

DIGESTION IN GRASS-EATING ANIMALS

Herbivores eat mainly grass or green plants. Have you seen a cow eating grass? The cow, buffalo, horse etc. keep chewing continuously even when they are not eating. They swallow their food after chewing once and store it in the part of the stomach called rumen. Here, the food is partially digested. It is called cud. When the animal is resting, the cud is brought back into the mouth in small lumps and chewed. This process is called rumination. The animals are called ruminants. During rumination cud mixes with the saliva and after chewing it goes into the stomach.

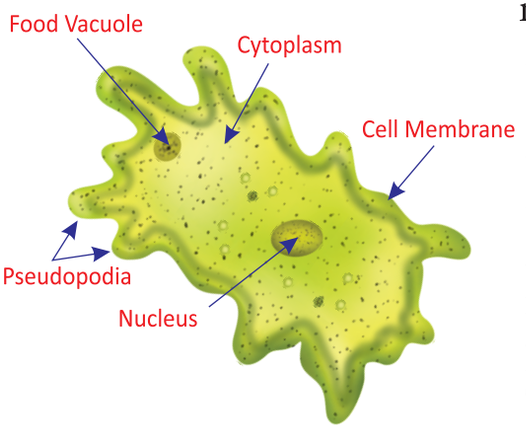


Digestive system of a ruminant

These animals eat grass which is rich in cellulose. These animals have a four-chambered stomach called rumen. The rumen contains a number of bacteria and other microbes which break down the cellulose. The cellulose of the grass is then digested in caecum, a large sac like structure between the small and the large intestine by symbiotic bacteria. These bacteria are not present in humans and hence they cannot digest cellulose.

Feeding and Digestion in Amoeba

Amoeba is a unicellular organism found in pond water. It has a cell membrane, a rounded nucleus and many bubble-like vacuoles in its cytoplasm. An amoeba has an irregular shape. Amoeba can change its shape as well as position. It has projections on its body called pseudopodia, false feet which help in capturing food and in movement.



Amoeba

Amoeba feeds on microscopic organisms. When it senses food, its pushes out the pseudopodia which engulf the tiny particles of food. The food is trapped in a food vacuole.

The digestive juices are secreted into the food vacuole and help in breaking down food into simpler substances. The digested food is absorbed and assimilated and the amoeba grows in size. The undigested food is thrown out by the vacuole.

The basic process of digestion of food and release of energy is the same in all animals, though the mode of nutrition and digestion differs from animal to animal.

Let's Remember

Give one word for each one of the following.

1. *Name the organs of the human alimentary canal.*
2. *What is bile juice?*

Glossary

amino acid	:	all proteins are made up of smaller sub-units called the amino acids
buccal cavity	:	the cavity formed in the mouth between the floor of the tongue and teeth
fatty acid	:	the constituent of a fat
salivary glands	:	the glands that secrete saliva into the mouth
saliva	:	it contains enzyms ptyalin that digests starch
ingestion	:	the process of taking food into the body
egestion	:	removal of waste from the body
assimilation	:	building of proteins and other complex substances from absorbed substances

Summary

- The process of nutrition involves 5 stages namely ingestion, digestion, absorption, assimilation and egestion.
- The human digestive system consists of 1. Buccal cavity 2. Oesophagus 3. Stomach 4. Small Intestine 5. Large intestine 6.Rectum 7. Anus.
- The digestive glands include salivary glands, liver and pancreas. These glands secrete digestive juices. The wall of the stomach and the small intestine also secrete digestive juices.
- The digestion of food begins in the buccal cavity. The complex carbohydrates are converted into sugar. The digestion of proteins starts in the stomach. The digestion of food is completed in the small intestine. The bile juice secreted by the liver, the pancreatic juice secreted by the pancreas and the digestive juice from the intestinal wall complete the digestion of food.
- The digested food is then absorbed by the villi present in the small intestine. It is

Exercise

A. Multiple Choice Questions (MCQs)

Tick (✓) the right option

1. Bitting teeth are called _____.
   (a) Incisors ☐ (b) Canine ☐
   (c) Premolar ☐ (d) Molar ☐
2. Digestion of food starts in the _____.
   (a) Stomach ☐ (b) Food pipe ☐
   (c) Mouth ☐ (d) Small intestine ☐
3. The digestive juice present in the saliva acts on _____.
   (a) Starch ☐ (b) Proteins ☐
   (c) Fibre ☐ (d) Minerals ☐
4. Bile juice is secreted by the_____.
   (a) Stomach ☐ (b) Liver ☐
   (c) Pancreas ☐ (d) None of these ☐

5. Most of the digestion takes place in the _____.

(a) Mouth ☐ (b) Stomach ☐

(c) Small intestine ☐ (d) Large intestine ☐

B. Write 'T' for true and 'F' for false statements.

1. Total number of canine in an adult is 8. ☐
2. Digestion of starch starts in the stomach. ☐
3. Food pipe is also called oesophagus. ☐
4. The taste buds are present in the mouth. ☐
5. Digestion of food is completed in the stomach. ☐

C. Fill in the blanks with the correct words.

9–10 ingestion liver utilised process

1. The food that we eat cannot be _____ as such.
2. The _____ of digestion begins in the mouth.
3. The alimentary canal is about _____ meters long.
4. The process of taking in food into the body is called _____.
5. _____ is the largest gland of our body.

D. Answer the following questions in short.

1. Name the different types of teeth in the human body along with their functions.
2. Why are ruminants able to digest cellulose and not humans?
3. What do you understand by the term assimilation?
4. What is the role of digestive juices produced by the pancreas?
5. How is the food prevented from entering the wind pipe?

E. Answer the following questions .

1. What are villi? Where are they located? What are their functions?
2. Describe a human tongue and its functions.
3. Draw an amoeba and explain the process of digestion in it.
4. What is bile? Where is it produced, stored and what are its functions?
5. Describe the process of digestion in ruminants.

HOTS (Think and Answer)

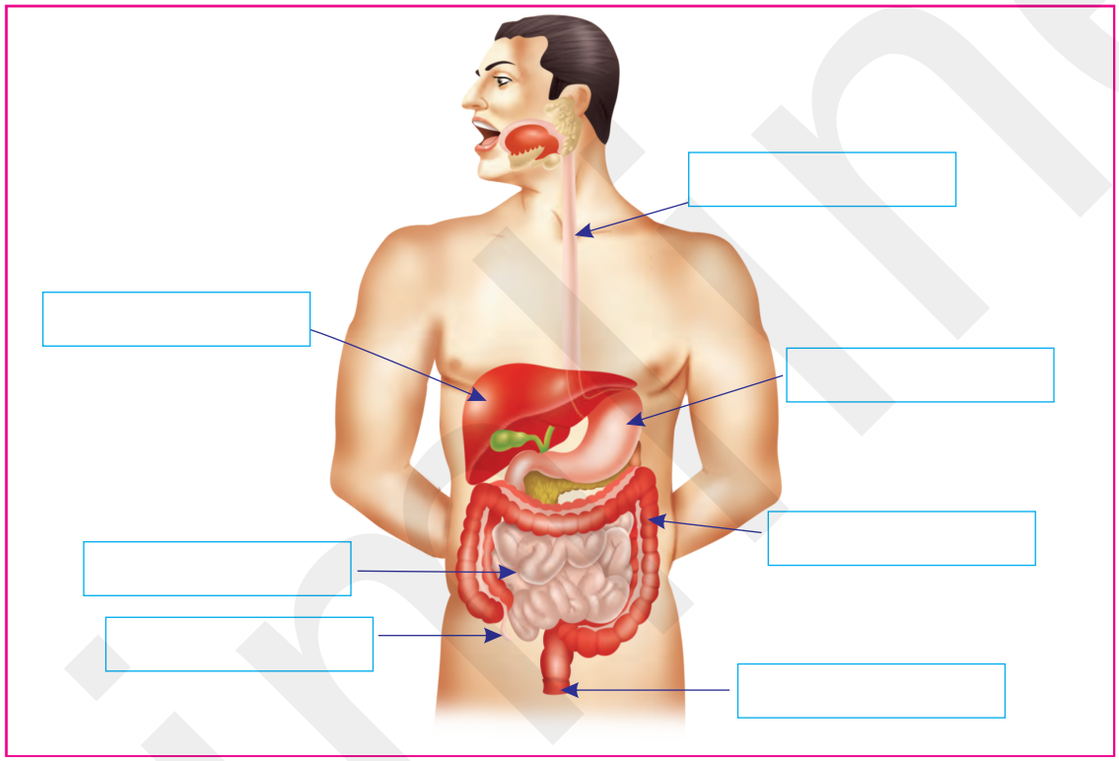
1. Why do you think adults tell us not to talk or laugh while eating food?
2. Why do you think we must drink a lot of water when we have diarrhoea?

Group Discussion

1. Discuss the role of bile in digestion.
2. Discuss the role of villi in absorption.
3. Discuss the role of different types of teeth in digestion.

Activity to do

1. Make a model of the digestive system with the help of modelling clay. Make organs such as liver, stomach, pancreas and large intestine with clay. Rubber tubing can be used to make the oesophagus and small intestine.
2. Label the various parts of the digestive system. Write one function of each part.



Creative Task

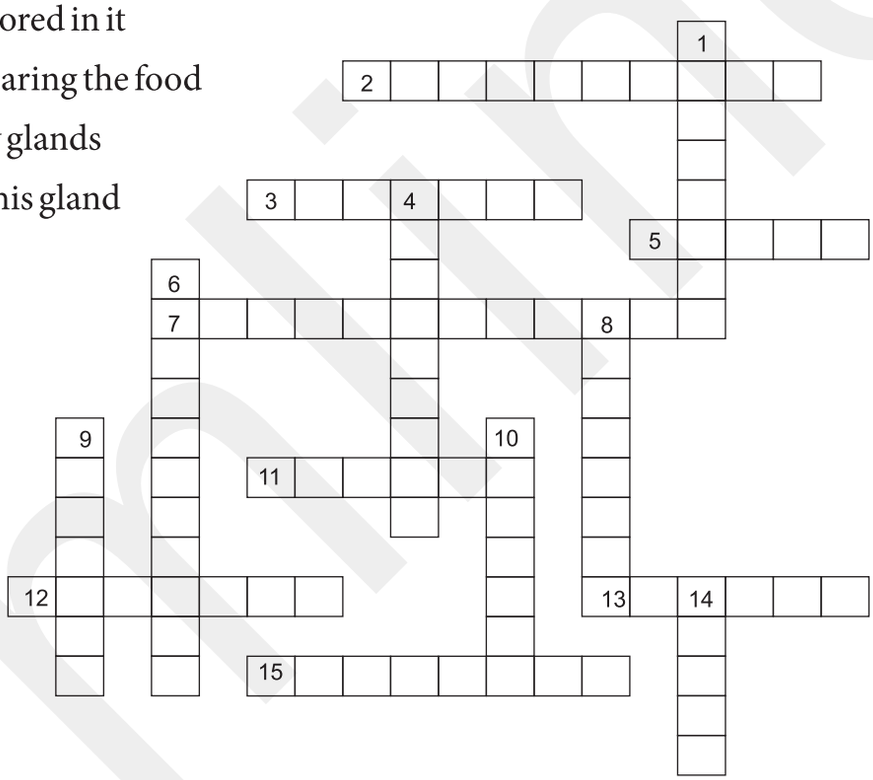
Imagine and create toothpaste enhanced with special herbs which will keep the teeth white and shining. Give it a name.

WORKSHEET-2

Complete the crossword with the help of the clues provided.

Across

2. The tube that connects stomach to mouth
3. Part of throat which is a common passage for food and air
5. Finger-like projections in small intestine
7. The process by which absorbed food is utilized
11. Undigested food gets stored in it
12. The teeth that help in tearing the food
13. It is secreted by salivary glands
15. Trypsin is secreted by this gland



Down

1. The process by which undigested food is removed from the body
4. Animals which chew cub
6. Chewing of food
8. Flat teeth which help in biting
9. This part of the digestive tract secrets hydrochloric acid
10. This enzyme is present in saliva
14. It produces bile

CHAPTER 3

Heat

Introduction

- Heat
- Hot or cold
- Temperature
- Thermometers
- Transfer of heat
- Conductors/insulators
- Flow of heat–conduction, convection and radiation

We feel hot in summer and cold in winter in the northern parts of the country. In the hilly areas it is cold throughout the year. In winter we wear woollen clothes. They keep us warm. We love to sit in the sun in the afternoon.

In summers we wear light coloured, loose fitting cotton clothes. We do not feel like going outside because it is hot. Even inside the house we feel hot. How do we know whether it is hot or cold or that an object is warm or cold? Let us try to find out the answer to this and many more questions.

HOT AND COLD

When we rub our palms against each other, they become warm. One of the methods to determine whether an object is hot or cold is by the sense of touch but this is not a very reliable method.

Object	Hot	Cold
Ice		
Cold drink		
Ice cream		
An iron		
Fruit juice		
Handle of hot frying pan		

In our day-to-day life we come across somethings that are hot and some that are cold. Ice is cold whereas tea is hot.

Some objects are colder or hotter than others.

Heat is a form of energy which causes the sensation of hotness or coldness.

Activity – 1

1. Take 3 glasses. Label them as 1, 2 and 3. Fill glass 1 with cold water, glass 3 with hot water and warm water in glass 2.
2. Dip a finger of one hand in glass 1 and that of the other in glass 3. as shown in the figure. Keep the glass containing warm water in between the 2 glasses. After keeping the fingers in glass 1 and 3 for 2–3 minutes, put both the fingers into glass 2.

3. What do you observe? Do both the fingers feel the same thing? You will feel that one finger feels water is hot and the other feels that the water is cold. But actually the water is neither hot or cold, it is just warm.

Precaution : Do not use very hot water as it will burn your fingers.

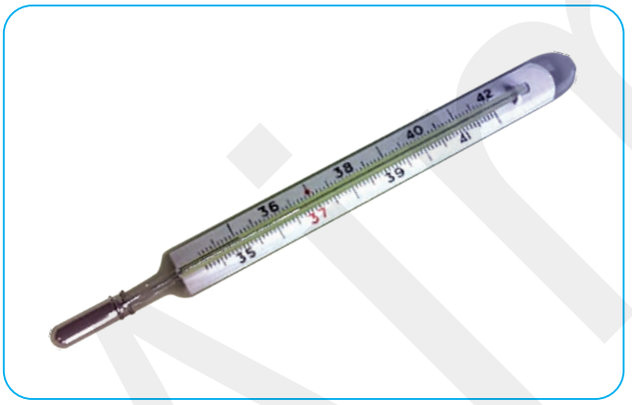
This shows that the term 'hot' and 'cold' are relative terms. We cannot always rely on our sense of touch to decide whether an object is hot or cold.

To overcome the above problem we need to measure the temperature of an object. The degree of hotness or coldness of an object on some chosen scale is called its temperature. We measure temperature with the help of a device called thermometer.

MEASURING TEMPERATURE

You must have seen a doctor or your parents measuring your body temperature with a help of a thermometer when you were having fever. Our body temperature is measured with the help of a clinical thermometer. It is also called Doctor's Thermometer.

Look at a clinical thermometer and examine it carefully.



A clinical thermometer

A clinical thermometer consist of a long, narrow glass tube. It has a bulb at one end, which contains mercury. A small shining thread of mercury is seen in the glass tube outside the mercury. You will also see markings on the thermometer, which shows the temperature from 35°C to 42°C only. The scale is the celsius scale indicated by °C. Earlier the Fahrenheit scale was used, which had a range from 94°F to 108°F.

Facts to know

Mercury is the only metal that exists as liquid at room temperature.

Reading a Thermometer

First determine the value of one small division on the thermometer scale. Count the number of small divisions between two bigger marks. Suppose the bigger marks read one degree and there are 5 small divisions between them, the value of one small division

$$= \frac{1}{5} = 0.2^{\circ}C$$

Precautions to be observed while reading a clinical thermometer

- Wash the thermometer well, preferably with an antiseptic solution both before and after use
- Hold the thermometer from its top end and read the mercury level
- Ensure that before use, the mercury level is below 35°C. If the level is above 35°C, bring it down by giving a few jerks to the thermometer
- Place the bulb of the thermometer under the tongue for one minute
- After one minute, take the thermometer out and note the reading
- Read the thermometer keeping the level of mercury along the line of sight
- The reading obtained is your body temperature. It is in °C
- Be careful, while using a thermometer. It can break easily. Do not hold the bulb while noting down the temperature

The normal body temperature is 37°C. Always remember to write down the unit.

Is the normal body temperature exactly 37°C for all individuals?

Let us try to find this out with the help of the activity given below.

Activity – 2

Measure the body temperature of about 10 of your friends with a clinical thermometer.

Record your observations in the tabular form.

S. No.	Name	Temperature °C
1. 2. 3.		

What do you observe? Is the temperature of all exactly 37°C? The temperature could be slightly higher or even lower. The normal body temperature is the average body temperature of a large number of healthy persons. Since the range of clinical thermometer is 35°– 42°C, we should not use a clinical thermometer to measure the temperature of any object other than human body.

Facts to know

Swedish astronomer, Anders Celsius devised the celsius scale in 1742.

Laboratory Th ermometer

Different types of thermometers are used to measure the temperature of different objects. Laboratory thermometer is one such thermometer. It measures the temperature in the range of – 10°C to 110°C.

There is another type of thermometer called maximum-minimum thermometer, which is

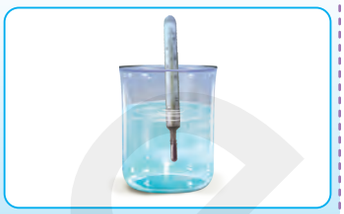
weather reports in newspapers, the maximum and minimum temperature of different cities.

Let us now learn how to use a laboratory thermometer.

Carry out the activities under the supervision of an adult.

Activity – 3

Take some water in a beaker. Dip the thermometer in the beaker containing water. Ensure that the bulb is completely dipped in the water and that the bulb does not touch the bottom or the sides of the beaker. Observe the mercury thread in the thermometer. Record the temperature when it becomes steady.



Precautions to be followed while using a laboratory thermometer

The following precautions need to be followed while using a laboratory thermometer :

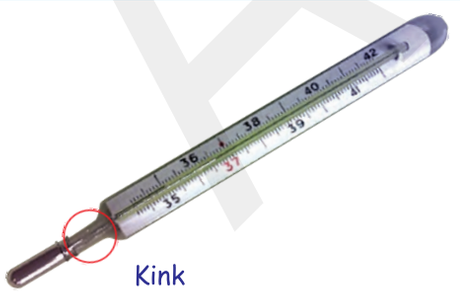
- The thermometer should be held vertical
- The bulb of the thermometer should be completely surrounded from all sides by the substance whose temperature is to be measured
- The bulb should not touch the bottom or the sides of the beaker
- The reading should be taken without removing the thermometer from the substance
- The eye should be kept at the level of mercury thread

Activity – 4

Take a beaker. Put hot water in it. Dip the laboratory thermometer in it. Note down the temperature of water, once the mercury thread becomes steady. Now take out the thermometer from the water. Keep observing the mercury thread. What do you notice? You will notice that the level of mercury starts falling down as soon as the thermometer is removed from the beaker. This is the reason, the reading has to be noted when the thermometer is dipped in water.

However, when using a clinical thermometer to measure our body temperature, we have to remove it from our mouth to note down the temperature. Now you know the answer as to why we cannot use a laboratory thermometer to measure our temperature.

The clinical thermometer must be having some special feature because of which the mercury does not fall or rise when taken out of the mouth.



This is because a clinical thermometer has a kink or constriction in the tube near the bulb. This kink ensures that mercury in the thermometer does not fall down when it is taken out of the patient's mouth; the temperature can therefore be easily read.

The level of mercury thread can be brought back by giving the thermometer a slight jerk.

Now-a-days, digital thermometers are available. The advantage of such thermometers is that they do not use mercury. Mercury is a toxic metal and there is a problem of its disposal in case the thermometer breaks.

Let's Remember

Fill in the blanks.

1. See breeze blows from _____ to _____ .
2. This causes sensation of hotness or coldness _____ .

TRANSFER OF HEAT

When you keep a cooker on the gas, it becomes hot. In fact the handles of the spoon with which you stir vegetables in a pan when kept on a flame also become hot. Why did the handle of the spoon become hot? When you remove the spoon from the pan and kept it outside, it cools down. Why does it cool?

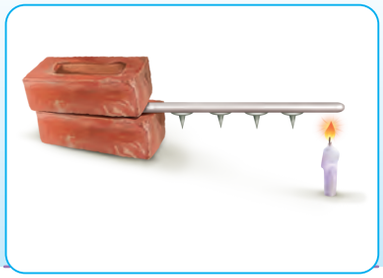
This is because heat is transferred from hotter objects to colder objects. This heat transfers continues till both the bodies attain the same temperature. When a hot body and a cold body are in contact, the hot body loses heat , while the cold body gains heat.

Activity – 5

Take an iron rod. Fix four drawing pins on it with the help of wax at nearly equal distances. Place the rod between two bricks as shown in the figure. Heat one end of the rod with a candle.

What do you observe?

You will see that the pin nearest to the candle falls down first as the wax melts. After some time the second pin falls down and this continues.



The above activity shows that heat travels from the hotter to the colder end through conduction. In solids, generally the heat is transferred by the process of conduction.

Substances which allow heat to flow through them are called good conductors of heat. Some substances do not allow heat to pass through them easily and are called bad conductors of heat or insulators. Metals are good conductors of heat like iron, copper and aluminum. Wool, plastic, cotton, glass, straw, clay, rubber, bakelite are some examples of insulators.

Activity – 6

Take a beaker. Fill it with boiling hot water. Take some articles made of the above mentioned materials. Dip one end of them in hot water. After a few minutes, touch the other end. Note down your observations.

Remember water and air are poor conductors of heat. Both conductors and insulators are useful. Cooking utensils are made of conductors and their handles are made of insulators. (heat-resistant plastics)

Convection

When heat is transferred by conduction, movement of molecules does not take place. In liquids and gases heat is transferred by convection. The method by which heat is transferred from the hotter part to the colder part by actual movement of hot particles in it is called convection .

Activity – 7

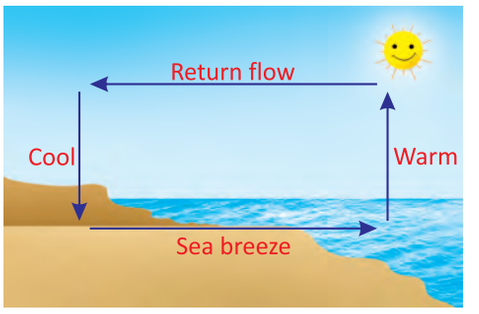
Take a round bottomed flask. Fill it with water up to 2/3rd . Gently place a crystal of potassium permanganate into the flask. Heat the flask with the help of a bunsen burner. What do you observe?

When flask is heated, water near the flame became hot. It rises up (purple coloured). The cold water from the sides moves to take the place of this water. This water now gets heated and it rises and again the water from the sides moves down. This way the whole water gets heated. This activity shows that water transfers heat by the movement of molecules from hotter to colder areas by convection.

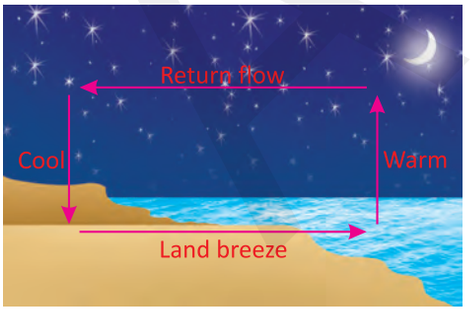
Activity – 8

Take a candle. Fix it on a stand and light it. Keep one hand on the top of the flame at a safe distance so that it does not get burnt. Keep the other hand on the side of the flame. What do you notice? You will see that the hand above the flame feels hot, whereas the hand at the side will not feel as hot. This shows that air gets heated by convection.

Sea Breeze and Land Breeze



In coastal areas, the breeze blows from the sea to the land during day time and is called sea breeze. This is because during the day the lands gets heated up faster than the water. The air over the land becomes hotter and rises up. The cooler air from the sea moves towards the land to take its place.



At night, exactly the opposite takes place. The land cools down faster than the sea water. Therefore, the cool breeze from the land blows towards the sea. This is called land breeze.

This is the reason the windows in the houses in coastal areas are made to face the sea, so as to receive cool sea breeze during the day.

RADIATION

You must have noticed that we feel warm when we move out in the sun or stand in front of a flame. How does the heat of the sun reach us? This heat cannot reach us by conduction or convection. There is no direct contact between us and the sun. There is no medium such as air in most part of the space between the sun and the earth. Moreover, hot air rises up.

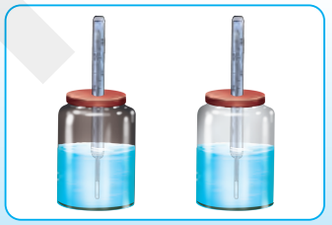
This shows that there is another method of transferring heat. This is called radiation. Radiation needs no medium. It can take place even in vacuum. It is because of radiation we get heat when we sit in front of a heater in a room. All hot objects/substances-solids, liquids and gases, transfer heat by radiation. Our body also gives heat to the surroundings and receives heat from it by radiation. The higher the temperature of a body, the more heat it radiates. All objects radiate heat. When this heat falls on objects like trees, soil, water, human beings etc, some of it is absorbed, some is reflected and a part of it is transmitted.

The amount of absorption and reflection of radiant heat depends upon –° the nature of the surface and ° the colour of the object.

Shiny and smooth surfaces reflect heat, whereas black and rough surfaces absorb heat. This is the reason why in summer we prefer to wear light coloured clothes and in winter dark coloured clothes.

Activity – 9

Take 2 identical cans. Paint one black and the other white from outside. Fill the 2 cans with water (ensure that the amount of water is the same). Leave the 2 cans in the sun in the afternoon for an hour. Measure the temperature of water in both the cans.
What do you observe? The water in which can is warmer?



This activity shows that the black surface is a better absorber of heat radiation than white colour.

Activity – 10

Now place the two cans used in the above activity, inside the room. Leave them undisturbed for 15 minutes. Again note down the temperature of water in the 2 cans. Do you notice any difference?

You will see that the temperature of the water in the black can falls more rapidly than that of the white can. This shows that black surface is a better radiator of heat than white surface. Thus, white and light-coloured clothes are more comfortable in summer as they reflect most of the sun's heat. Dark coloured clothes absorb most of the sun's heat and hence we feel more comfortable wearing them in winter.

Woollen Clothes

We wear woollen clothes in winter because wool is a bad conductor of heat (insulator). It allows body's heat to be trapped inside. Moreover the air present in between the wool fibres prevents the flow of our body heat to the surroundings, so we feel warm. Thus wearing two thin sweaters makes us feel warmer than wearing a thick sweater because there is an additional layer of air between the two sweaters.

Let's Remember

Give one word for each one of the following.

1. Name the two methods of heat transfer in solids
2. Name two conductors.
3. Which surface absorbs more heat? – black/white
4. Wool traps body heat – Yes/No

Glossary

temperature	:	the measure of the degree of hotness or coldness of a body
thermometer	:	the device used to measure the temperature of a body
radiation	:	a process of heat transfer in which a material medium is not necessary
conductor	:	substances which readily conduct heat
insulator	:	substances which do not conduct heat
convection	:	transfer of heat with the actual motion of the medium from one region of space to another

Summary

- Heat is a form of energy which gives us the sensation of warmth.
- Temperature is a measure of degree of hotness of an object.
- Thermometer is a device used to measure temperature.
- Normal temperature of the human body is 37°C.
- The three modes of heat transfer are conduction, convection and radiation.
- Conduction is the main mode of heat transfer in solids.
- In gases and liquids heat is transferred by convection.
- Radiation is the only mode of heat transfer which does not require a medium.
- The material which allow the heat to pass through them easily are called conductors.
- Insulators are materials which do not allow heat to pass through them easily.

Exercise

A. Multiple Choice Questions (MCQs)

Tick (✓) the right option.

1. The range of laboratory temperature is _____.

(a) 35°C to 108°C ☐ (b) –10°C to 110°C ☐

(c) 10°C to 100°C ☐ (d) 39°C to 50°C ☐

2. Normal human body temperature is _____.

(a) 37°C ☐ (b) 35°C ☐

(c) 33°C ☐ (d) 37°F ☐

3. Transfer of heat due to convection occurs in _____.

(a) solids ☐ (b) liquids ☐

(c) gases ☐ (d) b and c ☐

4. Heat from the sun reaches us because of _____.

(a) conduction ☐ (b) convection ☐

(c) radiation ☐ (d) all these ☐

5. We wear dark coloured clothes in winters because they _____.

(a) absorb ☐ (b) reflect heat ☐

(c) radiate heat ☐ (d) none of these ☐

B. Write 'T' for true and 'F' for false statements.

1. Sea breeze blows during the night. ☐
2. Our sense of touch is a reliable guide to the degree of hotness. ☐
3. Plastic is an insulator. ☐
4. Cooking utensils are made from good conductors of heat. ☐
5. Land and sea breeze is caused due to convection current. ☐

C. Fill in the blanks with the correct words.

clinical	37°C	thermometer	solids	temperature

1. A _____ thermometer consist of a long, narrow glass tube.
2. The normal body temperature is _____.
3. The _____ should be held vertical.
4. Conduction is the main mode of heat transfer in _____.
5. _____ temperature is a measure of degree of hotness of an object.

D. Answer the following questions in short.

1. Define heat.
2. Name the three modes of heat transfer.
3. What is the difference between conductors and insulators?
4. Why does the capillary of a clinical thermometer have a kink?
5. Why do we jerk a clinical thermometer before use?

E. Answer the following questions.

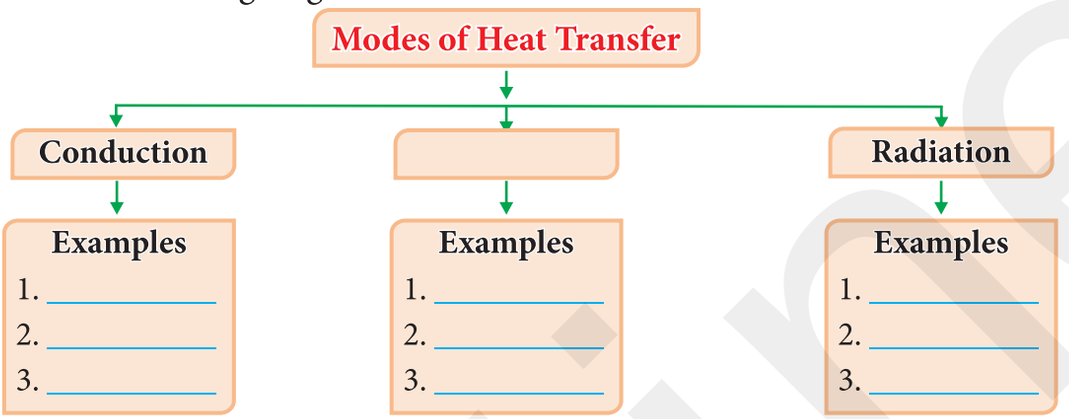
1. With the help of an experiment show conduction of heat in solids.
2. Differentiate between conduction, convection and radiation.
3. What are the precautions to be taken while reading a clinical thermometer?
4. How are land and sea breeze produced?
5. What kind of clothes should we wear in summers and winters? Why?

HOTS (Think and Answer)

1. What do you think will happen if you dip clinical thermometer in a cup of hot boiling tea?
2. Why do you think a frying pan is provided with a plastic handle?

Let's Recall

Complete the following diagram.



Group Discussion

1. Water cannot be made to boil, if there is no gravity.
2. A digital thermometer is better than a clinical thermometer.

Activity to do

Boiling Water in a Paper Cap

You will need : a paper cup, alcohol lamp, a stand and water.

Important: Make sure the cup is of paper and not of plastic.

Fill the cup 3/4th with water. Place it over the stand. Place an alcohol lamp under it. After a few minutes you will see that the water begins to boil. You might have expected paper to burn but as long as there is water in the cup it will not.

This is because water absorbs the heat before the paper could reach a temperature hot enough to burn.

Precautions :

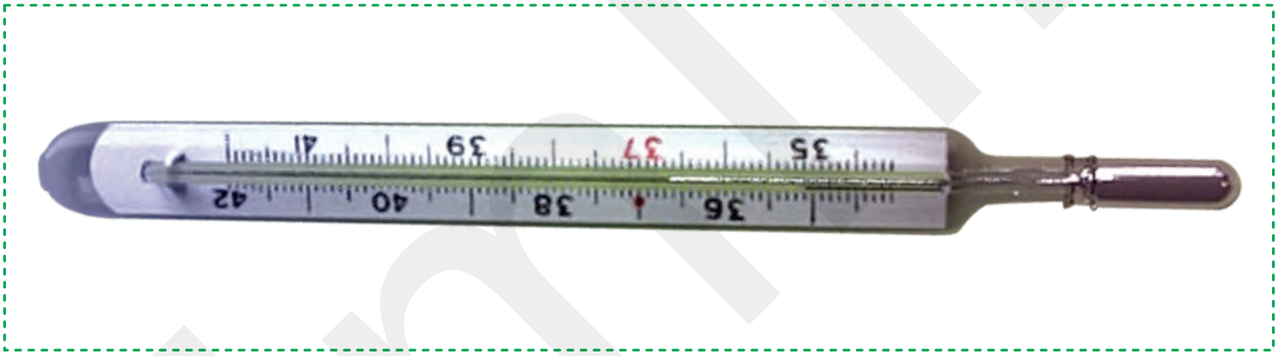
Carry out this experiment under the supervision of an adult. You can surprise your friends with this experiment.

Creative Task

Make a project on the astronomer who devised the celsius scale. Also, write about the various other thermometric scales and the inter-conversions between them.

WORKSHEET-3

1. Identify what is wrong with the following pictures? Write your answer in the space provided.



2. Define the following terms.
   a. Heat

   b. Conducting of heat

CHAPTER 4

Acids, Bases and Salts

Introduction

- Acids
- Bases
- Indicators
- Neutralisation
- Uses of neutralisation reactions in everyday life

We use a large number of substances in our daily life. They all taste different. Some are sour, some are salty while others are sweet or bitter. We differentiate these substances on the basis of taste.

Activity – 1

Let us taste the following substances and record the results.

Substance	Taste
Sugar	
Lemon juice	
Orange juice	
Vinegar	
Curd	
Salt	

Substance	Taste
Tamarind	
Baking soda	
Amla	
Grapes	
Unripe mango	
Milk	

- Taste things only which your teacher has asked you to do so.

Most of these substances have a sour taste, while some are sweet or salty.

ACIDS AND BASES

Items such as lemon juice, orange juice, vinegar, curd, amla and tamarind taste sour. The sour taste of these items is due to the presence of a substance called acid. The word acid comes from the Latin word 'acer', which means sour. Substances which contain acid are acidic in nature. Different substances contain different acids.

Some acids occur naturally in foods and are called naturally-occurring acids.

Given below is a list of naturally occurring acids and the substances in which they are found in.

Acid	Substances in which it is found
Acetic acid	vinegar, tomatoes
Tartaric acid	grapes, tamarind, raw mango
Citric acid	lemons, citrus fruits
Ascorbic acid	amla, citrus fruits
Malic acid	apples
Oxalic acid	spinach, guava
Lactic acid	sour milk, curd
Formic acid	ant's sting
Tannic aid	tea

In addition, there are some acids which are obtained from minerals. We call them mineral acids. They include hydrochloric acid, sulphuric acid, nitric acid and phosphoric acid. Naturally occurring acids are also called organic acids.

BASES

In activity 1, we have seen that some substances like baking soda are bitter in taste. The solution of baking soda feels soapy. This is so because baking soda is basic in nature.

Substances which are bitter in taste and soapy to touch are called bases. The nature of such substances is said to be basic.

Facts to know

Baking soda is sodium bi-carbonate.

A list of commonly found bases and the substances in which they are found is given below :

Base	Substances in which it is found
Sodium hydroxide	Soap
Potassium hydroxide	Soap
Calcium hydroxide	lime water
Ammonium hydroxide	Window cleaning solution
Magnesium hydroxide	Milk of magnesia

INDICTORS

We cannot taste each and every substance. Moreover, it may be dangerous to touch an unknown substance. Then how do we find out the nature of the substance. To test if a given substance is acidic or basic, there are special kind of substances called indicators. They change their colour when added to an acidic or basic solution. Examples of naturally occurring indicators are turmeric, litmus, china rose petals (Gudhal), red cabbage juice etc.

Naturally occurring indicators

Litmus

It is the most commonly used indicator. It is a natural indicator. It is extracted from lichens (a type of plant). Its colour in distilled water is purple (mauve).

Lichens

In acidic medium, its colour is red and in a basic medium its colour is blue.

Blue litmus paper

It is available in the form of a solution or in the form of strips of paper called litmus paper. Generally two types of litmus paper are available, red litmus paper and blue litmus paper.

Red litmus paper

Facts to know

All bases have a bitter taste and are soapy to touch.

Activity – 2

Take different samples like lemon juice, tap water, detergent solution, vinegar, aerated drink, milk of magnesia, baking soda solution, lime water, salt solution etc.

Put a drop of each solution on separate red and blue litmus paper strips. Record your observations in the table given below

S. No.	Test solution	Effect on red litmus paper	Effect on blue litmus paper	Inference
1.	lemon juice	No change	red	It is acidic
2.	tap water	No change	No change	neutral
3.	detergent solution	Blue	No change	basic

Note : Lime water is prepared by dissolving chuna (lime) in water. Keep it for sometime. Use the top water.

The solutions which do not change the colour of either red or blue litmus are know as neutral solutions.

TURMERIC

Turmeric which we use in the kitchen for cooking is another natural indicator.

Activity – 3

- Take some turmeric powder in a bowl. Add a little water to it. Make a paste.
- Spread a thin layer of the paste on blotting paper/filter paper and let it dry completely.
- Cut thin strips of this yellow filter paper.
- Put a drop of soap solution on the strip. Observe what happens. You will see that it turns reddish brown in colour.

You must have seen that a stain of turmeric on a white cloth, turns red when washed with soap. This is because soap solution is basic in nature.

Facts to know

The yellow colour of turmeric is due to a compound called curcumin.

Test the solutions given in the table and note down your observations:

S. No.	Solution	Effect on yellow turmeric paper	Remarks
1.	Vinegar	No change	
2.	Baking soda		
3.	Soap solution		
4.	Orange juice		
5.	Lime water		
6.	Sugar		
7.	Glucose water		
8.	Detergent		
9.	Shampoo		
10.	Sour milk		

Turmeric is yellow in neutral and acidic solutions. It is red in basic solutions.

CHINA ROSE

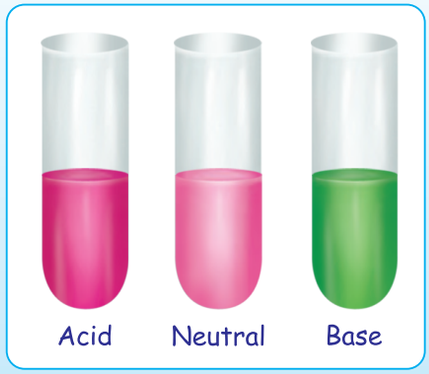
China Rose or Hibiscus (Gudhal) is a flower whose petals are used as a natural indicator for identifying acids and bases.

Take some petals of china rose in a beaker. Add warm water to it. Keep the mixture for sometime till the solution becomes coloured (pink). The coloured water acts as an indicator.

Activity – 4

Add a few drops of china rose indicator solution to each of the solutions given in the table. Note down the effect on acidic, basic and neutral solutions.

S. No.	Solution	Initial Colour	Final Colour
1.	Soda water		
2.	Pineapple juice		
3.	Salt solution		
4.	Vinegar		
5.	Baking soda solution		
6.	Sugar solution		
7.	Lemon juice		



It is seen from the above activity that acidic solutions turn to magenta colour and that basic solutions turn to green colour when the china rose indicator is added.

SYNTHETIC INDICATORS

In addition to natural indicators, there are synthetic indicators which are made in the laboratory. The two most common synthetic indicators are phenolphthalein and methyl orange.

Indicator	Original colour	Colour in acidic medium	Colour in basic medium
Phenolphthalein	Colourless	Colourless	Pink
Methyl Orange	Orange	Red	Yellow

Activity – 5

Let us observe the effect of various indicators on various acids and bases.

S.No.	Sample	Litmus paper	Turmeric paper	China rose	Phenolphthalein	Methyl orange
1.	Dil hydrochloric acid					
2.	Dil sulphuric acid					
3.	Dil nitric acid					
4.	Dil sodium hydroxide					
5.	Dil potassium hydroxide					
6.	Dil ammonium hydroxide					
7.	Dil calcium hydroxide (lime water)					

Note : The above activity must be performed under the supervision of your teacher as the above acids and bases are corrosive in nature, irritating and harmful to the skin.

Let's Remember

Give one word for each one of the following.

1. Why do some things taste sour?
2. Name the acid present in apples.
3. Name the flower whose petals are used as indicator.
4. Name two characteristics of bases.
5. What is the colour of turmeric in neutral solution?

NEUTRALISATION

The reaction between an acid and a base is called neutralisation. When an acid is added to a base they neutralise each other's effect. During the neutralisation process salt and water are produced with the evolution of heat.

$$\text{Acid} + \text{Base} \rightarrow \text{salt} + \text{water}$$

(Heat is evolved)

The salt formed may be acidic, basic or neutral in nature.

When an acidic solution is mixed with a basic solution, both the solutions neutralise the effect of each other. The acidic nature of the acid and the basic nature of the alkali is destroyed. The resulting mixture is neutral, i.e neither acidic nor basic.

Hydrochloric acid(HCl) + Sodium hydroxide (NaOH) → Sodium chloride (NaCl) + water(H_2O)

The salt formed may be acidic, basic or neutral.

The reaction between vinegar and baking soda is also a neutralisation reaction.

NEUTRALISATIONS IN EVERYDAY LIFE

Indigestion

You already know that our stomach secretes hydrochloric acid. This acid helps in the digestion of food. At times there is too much of acid in the stomach with indigestion and a burning feeling. It can be painful sometimes. In acidity doctors prescribe antacids such as milk of magnesia (magnesium hydroxide) which are basic in nature. They neutralise the effect of excessive acid.

Insect Bite

When an ant or bee stings, formic acid is injected into the body which causes itching. To get relief from irritation, baking soda paste (sodium hydrogen carbonate) or calamine lotion (zinc carbonate) is applied on the skin. Both are basic in nature and they neutralise the effect of formic acid.

Soil Treatment

Farmers use fertilisers to improve crop yield. Excessive use of fertilisers makes the soil acidic and plants are unable to grow well in such soil . When the soil is too acidic, quick lime (calcium oxide) or slaked lime (calcium hydroxide) is added to the soil to neutralise the acidic nature of the soil. In case the soil is too basic , organic matter/manure is added to the soil. Organic matter releases organic acids which neutralise the basic nature of the soil.

Factory Waste

Acidic waste of the factories is first neutralised by treating with bases before it is allowed to flow into the water bodies. If they are allowed to flow as such, the acids will kill fish and other aquatic plants and organisms.

Brushing Teeth

We brush our teeth with toothpaste as it is basic in nature and this helps to neutralise the effect of excessive acid around the teeth and prevents tooth decay.

Acid Rain

Have you heard about acid rain? When the rain contains excess of acids it is called acid rain. Carbon dioxide, sulphur dioxide and nitrogen dioxide (which are released as pollutants) dissolve in the rain drops to form carbonic acid, sulphuric acid and nitric acid respectively. The acid rain can damage buildings and statues made of marble, limestone and plaster. The

Glossary

acidity	:	the quality of being sour; degree of sourness; having a pH of less than 7
indicator	:	substances which help us to identify an acid or a base is called an indicator
litmus	:	most commonly used natural indicator
acids	:	a substance which gives hydrogen ion when dissolved in water

Summary

- Acids are sour in taste. Bases are bitter in taste and feel soapy / slippery to touch.
- Substances which help to test the acidic or basic nature of a substance are called indicators.
- Acids turn blue litmus paper red. Bases change red litmus to blue colour.
- Substances which are neither acidic nor basic are called neutral.
- Methyl orange and phenolphthalein indicators are made in the laboratory.

Exercise

A. Multiple Choice Questions (MCQs)

Tick (✓) the right option.

1. The following is not an indicator _____ .
   (a) Turmeric ☐ (b) Hibiscus ☐
   (c) Phenolphthalein ☐ (d) Lemon juice ☐
2. Which of these is not an acid?
   (a) Curd ☐ (b) Lemon juice ☐ (c) Soap ☐ (d) Vinegar ☐
3. Vinegar is sour in taste because of the presence of _____ .
   (a) Acetic acid ☐ (b) Malic acid ☐ (c) Formic acid ☐ (d) Lactic acid ☐
4. Basic soil is corrected by the addition of _____ .
   (a) Urea ☐ (b) Nitric acid ☐ (c) Formic acid ☐ (d) Organic manure ☐

B. Write 'T' for true and 'F' for false statements.

1. Our stomach secretes nitric acid. ☐
2. Citric acid is present in lemon juice. ☐
3. Acids are soapy to touch. ☐
4. Acids are sour in taste. ☐

C. Fill in the blanks with the correct words.

turmeric	farmers	neutralisation	water

1. Lime water is prepared by dissolving chuna in _____ .
2. _____ is yellow in neutral and acidic solutions.

3. The reaction between an acid and a base is called _____ .
4. _____ use fertilisers to improve crop yield.

D. Answer the following questions in short.

1. What is the difference between an acid and a base?
2. Window cleaners turn red litmus blue. What is its nature?
3. Write the reaction between sodium hydroxide and hydrochloric acid.
4. What is an indicator? Give two examples.

E. Answer the following questions.

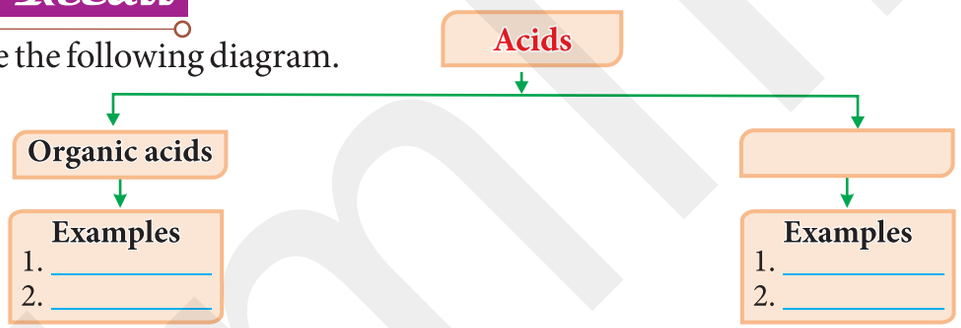
1. Differentiate between strong and weak acids.
2. Differentiate between dilute and concentrated acids.
3. What are indicators and why are they important? Name two natural and two synthetic indicators.
4. Why is factory waste neutralised before disposing it off? How is it done?

HOTS (Think and Answer)

1. Why do you think we must brush our teeth using a tooth paste after eating oranges?
2. Why do you think Taj Mahal is turning yellow?

Let's Recall

Complete the following diagram.



Group Discussion

1. Importance of indicators in laboratories.
2. Role of bases in our daily life.

Activity to do

Prepare an indicator with red cabbage.

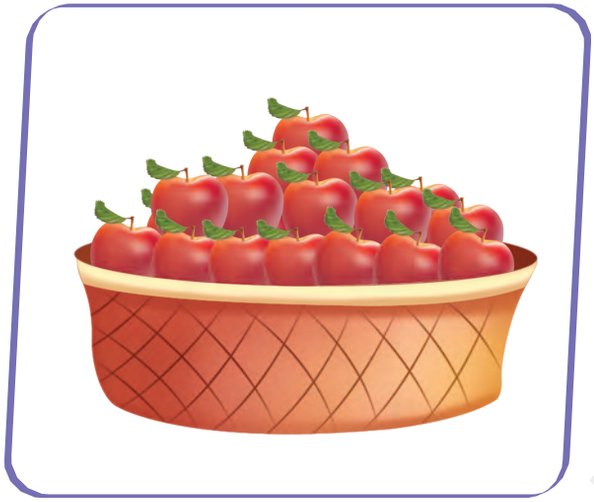
Take a piece of red cabbage. Gently heat it in water for sometime. You will get a red coloured solution. Cool it. Use it to test acidic, basic and neutral solution. Note down your observation.

Creative Task

1. Collect different soil samples from your locality and check whether it is acidic, basic or neutral.
2. Collect different types of fertilisers and check whether they have acidic or basic nature.

WORKSHEET-4

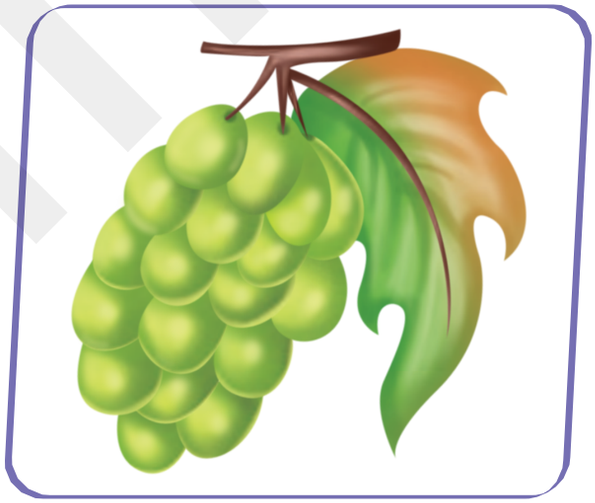
Classify the following things as acidic, basic, or neutral.



Apples

Common salt

Caustic soda



Grapes

Acidic : _____

Basic : _____

Neutral : _____

CHAPTER 5

Physical and Chemical Changes

Introduction

- Physical change
- Chemical change
- Chemical reactions
- Rusting of iron
- Prevention of rusting
- Galvanisation
- Formation of an alloy
- Cystallisation

You must have seen a number of changes taking place around you all the time. Setting of curd is a change, spoilage of milk is a change, water freezing into ice is a change, a bud blossoming into a flower, ice cream melting into a liquid all represent a change.

Make a list of changes which you observe around you.

All the changes which take place in our surroundings can be classified into two kinds– physical changes and chemical changes.

PHYSICAL CHANGES

Let us have a look at some of the changes taking place around us with the help of some simple activities.

Facts to know

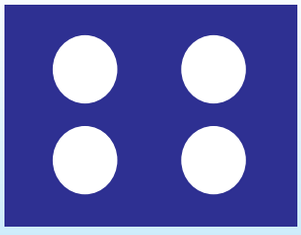
Dry ice is solid carbon dioxide.

Activity – 1

Take some ice in a plate. Keep it in the sun for sometime. It will start melting. Keep the mixture of ice and water back in the freezer. What do you observe? The water again converts into ice.

Activity – 2

Take a square piece of paper. Draw four circles on it. Cut the circles along their outlines. Now place them on the table and try to join the pieces to get back the original piece of paper. You will obviously notice that you cannot join all the pieces of paper to get back the original piece of paper but the property of each piece of paper does not change.



Cutting of paper

Activity – 3

Take a wooden stick. Break it into smaller pieces. Try putting pieces together to make a stick. Is it possible?

The original stick could not be built from the pieces. However, no change in the property of wood.

Activity – 4

Take some water in a pan. Boil it. After sometime you will see steam rising up. Now, hold a cold plate at a little distance above the steam. What do you see? You will see tiny droplets of water on the plate.

Activity – 5

Take a beaker, with a little water in it. Dissolve two tablespoons of salt in it. Heat the solution over a burner. What do you observe after some time? You will see that slowly the water evaporates and salt is left behind.

In the above activities you saw the change in size (Activity 1,3), change in state (Activity 2, 4 and 5) properties such as size, shape, colour, physical state, temperature etc are called physical properties.

When a substance undergoes a change in its physical properties, that change is said to be a physical change. Physical change is generally reversible. No new substance is formed.

Characteristics of a physical change

- Only physical properties of a substance undergo change
- Physical changes are generally reversible
- No new substance in formed
- No or a very small amount of energy is either absorbed or evolved during a physical change

Let's Remember

Match the following.

Column A	Column B
1. Magnetisation of an iron needle	a. chemical change
2. Solid $\underset{\text{cool}}{\overset{\text{Heat}}{\rightleftharpoons}}$ vapour	b. physical
3. Burning of magnesium	c. irreversible change
4. Ripening of fruit	d. moist air
5. Rusting of iron	e. reversible change

CHEMICAL CHANGES

When two or more substances react in such a way that there is formation of one or more new substances, the change is called a chemical change.

Characteristics of a chemical change

- New substances with different properties are formed
- Chemical change is irreversible
- A large amount of heat is either evolved or absorbed during a chemical change

Burning of paper, spoilage of food, germination of seed, curdling of milk, ripening of fruits, burning of gas, bursting of crackers, digestion of food, burning of candle are all examples of chemical changes.

Activity – 6

To be performed under the strict supervision of a teacher.

Take a small piece of magnesium ribbon. Clean its tips with sand paper. With the help of a tong hold it over a candle frame. What do you observe? It will burn with a brilliant white light, leaving behind a powdery ash. The ash is not like the ribbon. We can represent the change by the following equation:

Magnesium (Mg) + Oxygen (O_2) ⟶ Magnesium oxide(MgO)

Mix the ash with a little water in a beaker, stir it well. Test its chemical nature with the help of a blue and red litmus paper.

The red litmus paper turns blue. The blue paper remains the same. What do you infer from this?

The aqueous solution is acidic or basic?

Magnesium oxide dissolves in water to form magnesium hydroxide

$MgO + H_2O \longrightarrow Mg(OH)_2$

Magnesium hydroxide as you have already learnt in the previous chapter is a base. So you have seen that two new substances are formed. Magnesium oxide (ash) on burning of magnesium ribbon and magnesium hydroxide by mixing the ash in water.

Caution : Do not stare at the burning ribbon for long. It is dangerous.

Activity – 7

To be demonstrated by the teacher.

Take 100 ml water in a beaker. Dissolve 1 teaspoon of copper sulphate in it. Add a few drops of dilute sulphuric acid to it. You will get a blue coloured solution. Divide the solution into two beakers. To one beaker drop an iron nail. Wait for half an hour. Compare the colour of the solution in the two beakers. Do you see any change in the colour of the two beakers. You will notice that the colour of the solution changes from blue to green due to the formation of copper sulphate, a new substance. A brown coloured layer is also seen on the iron nail.

The chemical reaction is written as

Copper sulphate + Iron ⟶ Iron sulphate + copper

$CuSO_4 + Fe \longrightarrow FeSO_4 + Cu$

(blue) (grey) (green) (brown)

Copper sulphate Iron sulphate

Reaction between copper sulphate and iron

Activity – 8

Take about 5 ml of vinegar in a conical flask. Add a pinch of baking soda to it. Do you hear something? You will hear a hissing sound and will see bubbles of gas coming out of the flask. Pass this gas through freshly prepared lime water as shown in the figure. You will observe that the lime water turns milky.

Carbon dioxide gas is produced when baking soda is added to vinegar.

Carbon dioxide when passed through lime water turns it milky due to the formation of calcium carbonate, a new substance

(a) Vinegar + Baking soda ⟶ carbon dioxide + other substances

$CH_3COOH + NaHCO_3 \longrightarrow CO_2 +$ other substances

(b) Carbon dioxide + lime water ⟶ calcium carbonate + water

$CO_2 + Ca(OH)_2 \longrightarrow CaCO_3 + H_2O$

(milky)

Thus in all the above activities we have seen new substances being formed. They are all examples of chemical changes.

Some activities involve both chemical and physical changes. In a burning candle, both the processes take place simultaneously — melting of wax and burning of wick.

Chemical changes may show the following signs :

- A fizz (gas) is produced.
- Sound may be produced.
- A new smell may be produced– when food gets spoilt a foul smell is produced.
- Heat or light may be produced– when crackers are burnt heat, light, sound and unpleasant gases are produced. Now you know why children are advised not to play with crackers.
- A change in colour may take place.

Activity – 9

Take a brinjal, potato and apple. Cut them into half and keep aside for half an hour. Do you see any change in colour? This colour change is due to the formation of a new substance on reaction with air.

RUSTING OF IRON

You must have seen that when an iron object is left outside in the rain, a reddish brown layer is deposited on its surface. This is due to the presence of rust which forms naturally due to a chemical reaction. The process of formation of rust is called rusting.

Iron + Oxygen + Water ⟶ iron oxide (rust)

(from air)

$Fe + O_2 + H_2O \longrightarrow Fe_2O_3$

From the above equation it is seen that both oxygen and water are necessary for formation of rust.

The layer of rust falls off slowly and fresh metal surface is exposed to further rusting. This gradually weakens the iron object.

Damage due to rusting causes heavy losses as iron is used to make bridges, ships, cars, trucks and many other articles. Therefore rusting needs to be prevented.

HOW TO PREVENT RUSTING

We can prevent rusting by preventing iron articles from coming in contact with air or water or both. Some commonly used methods for prevention of rusting are :

- Applying a coat of grease or paint. However, they need to be applied regularly.
- **By Galvanization :** It is the process of depositing a layer of zinc on an iron object. Zinc forms a layers of zinc oxide on reaction with air and thus forms a barrier between iron and the atmosphere. Galvanised iron sheets are used for roofing. The iron water pipes we use in our homes to carry water are also galvanised.
- **By Alloying :** Certain metals can be made rust free when mixed with corrosion resistant metals. Stainless steel is an alloy of iron, nickle and chromium and does not rust.

Facts to know

The part of the ship which remains under water rusts faster as rusting is faster in salty water.

CRYSTALLISATION

Crystallisation is a process by which pure crystals of a substance are obtained from an impure substance. Crystals are the purest form of a substance having a fixed geometrical shape.

Let us prepare crystals of copper sulphate.

Activity – 10

Take a beaker. Fill it with water (about 50 ml). Add 2–3 drops of dilute sulphuric acid to it. Heat it over a burner. When the water starts boiling, add copper sulphate powder to it. Stir continuously. Keep adding a little copper sulphate powder till no more of it dissolves. Filter the solution. Let it cool overnight. Do not disturb the solution. Can you see the crystals? You will see blue crystals of copper sulphate at the bottom of the beaker.

Note : Perform this activity under the supervision of your teacher.

Let's Remember

Write 'T' for true and 'F' for false statements.

1. Cutting of a fruit is a chemical change.
2. Heat is evolved in a chemical reaction.
3. Higher the moisture, greater is the rate of rusting.

Glossary

crystallisation	:	formation of crystals of salt from its saturated or supersaturated solution
decomposition	:	breaking of a chemical compound to form two or more new substances
displacement	:	when a more reactive element displaces a less reactive element from its salt solution
galvanisation	:	coating iron with zinc
chemical change	:	a change in which entirely new substance is formed
physical change	:	a change in which no new substance is formed

Summary

- Two types of changes take place around us—chemical changes and physical changes.
- Physical change is a change in properties like shape, size and colour. No new substance is formed. It is mostly reversible.
- In a chemical change, two or more substances react in such a way that one or more new substances are formed. It is irreversible.
- Rusting of iron is a common chemical change. The essential requirements for rusting of iron are presence of oxygen and moisture.
- Galvanisation is the process of deposition of layer of zinc on an object.
- Crystallisation is the formation of crystals of pure substances from their solutions. It is a physical change.

Exercise

A. Multiple Choice Questions (MCQs)

Tick (✓) the right option.

1. This gas turns lime water milky _____.

   (a) oxygen ☐ (b) hydrogen ☐

   (c) carbon dioxide ☐ (d) nitrogen ☐

2. This does not prevent rusting of iron _____.

   (a) galvanisation ☐ (b) alloying ☐

   (c) painting ☐ (d) watering ☐

3. This is not a chemical change_____.

   (a) digestion ☐ (b) respiration ☐

   (c) freezing of water ☐ (d) photosynthesis ☐

4. The formula of sodium hydroxide is _____ .

(a) NaOH ☐ (b) CaOH ☐

(c) KOH ☐ (d) NH_4OH ☐

5. This is not a reversible change _____ .

(a) melting of Icecream ☐ (b) sharpening a pencil ☐

(c) drying of clothes ☐ (d) boiling of water ☐

B. Fill in the blanks with the correct words.

chemical	rusting	solid	iron	physical

1. _____ changes are generally reversible.
2. _____ changes are irreversible.
3. The process of formation of rust is called _____ .
4. Rusting of _____ is a common chemical change.
5. Dry ice is _____ carbon dioxide.

C. Give one word for each one of the following.

1. Coating an iron sheet with a layer of zinc _____
2. A solution in which no more solute can be disolved _____
3. Water changing into vapour _____
4. Why is iron covered with a layer of zinc? _____
5. Why do ships rust more inspite of being painted? _____

D. Answer the following questions in short.

1. What is the basic difference between physical and chemical changes?
2. What are the two essential requirements for rusting?
3. Explain why iron gates are painted?
4. Why does carbon dioxide turn lime water milky? Explain with the help of an equation.
5. What is crystallisation?

E. Answer the following questions.

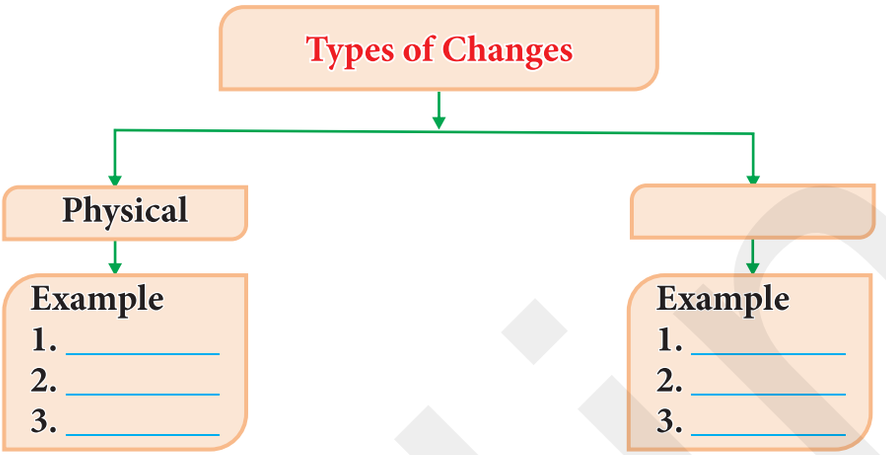
1. What is a chemical change? Give the characteristics of a chemical change.
2. When baking soda is mixed with vinegar, bubbles are formed? Explain the type of change. Write the reactions involved.
3. What is rusting of iron? Suggest two ways by which it can be prevented.
4. Explain why cutting of potato and frying of potato are considered two separate types of changes.
5. What happens when an iron nail is added to an acidified solution of copper sulphate?

HOTS (Think and Answer)

1. Why do you think rusting is more severe in coastal areas?
2. Why do you think you are advised not to play with fire works?

Let's Recall

Complete the following diagram.



Group Discussion

1. Make two groups in the class and discuss on physical changes and chemical changes.
2. Make two groups in the class and discuss on irreversible changes and reversible changes.

Activity to do

Prepare crystals of alum

Take a beaker. Add about 50 ml of water. Dissolve some alum in it. Heat over a burner. Take a pencil and tie a thread to it. Place the pencil horizontally across the beaker and let the thread dip in the solution. Let the beaker stand undisturbed for 2–3 days. You will see a crystal at the end of the thread.

Creative Task

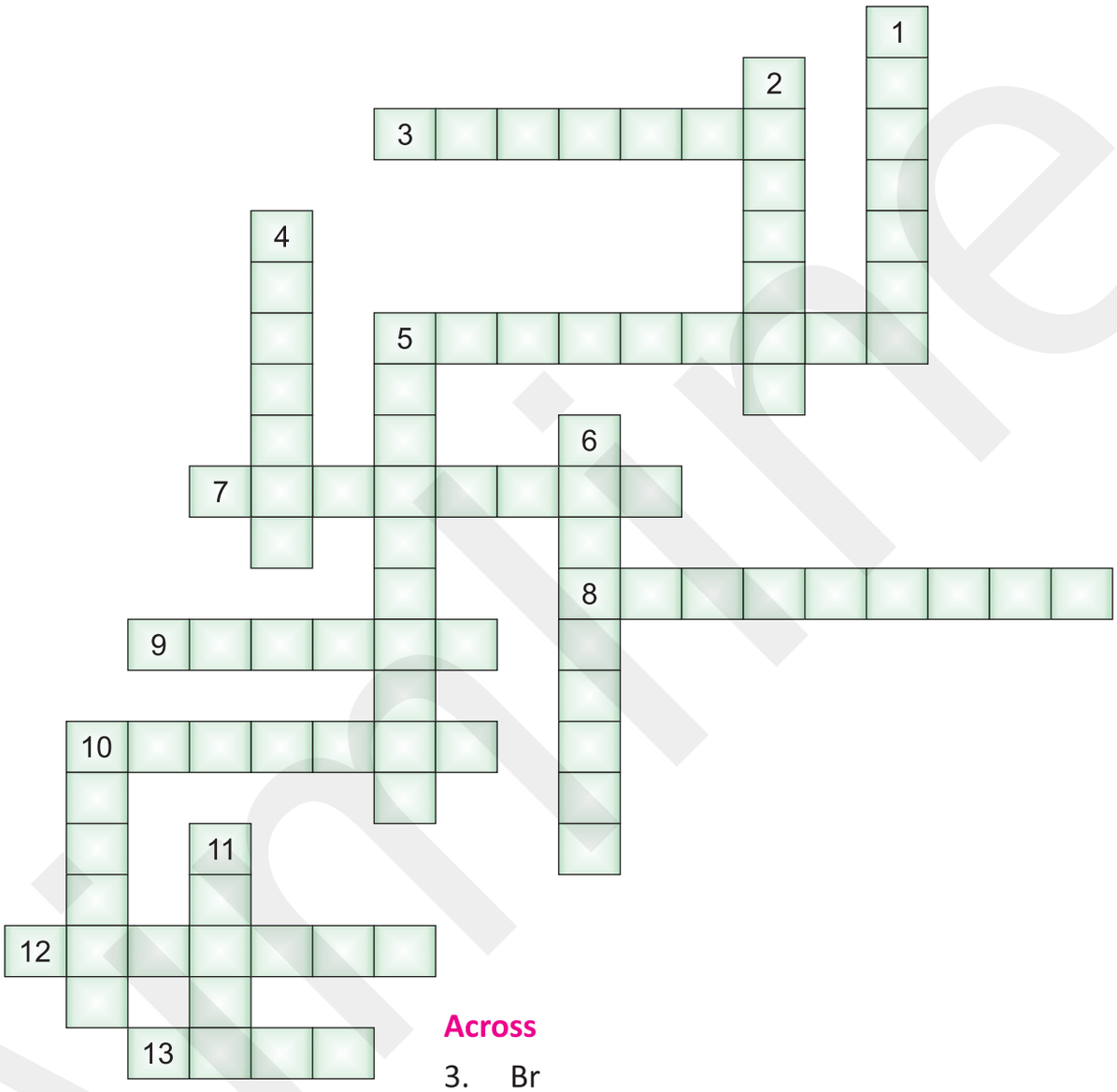
Collect crystal of common salt, sugar, citric acid, copper sulphate (neela thota), iron sulphate (hara thota), cobalt chloride and other, whichever may be available to you.

Put these crystals separately in cellophone pouches, seal them and arrange them in the form of a chart on a sheet of cardboard arranging colourless crystals in one row and coloured crystals in another row.

Label the pouches with the name of the substance in each.

WORKSHEET-5

Complete the crossword puzzle given below with the help of clues provided.



Down

1. Ca
2. Browning of vegetables
4. Hg
5. Tetraatomic molecule
6. Metal with valency as 3
10. Natrium
11. H_2O

Across

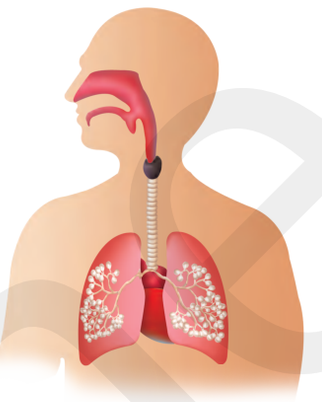
3. Br
5. Kalium
7. Purest solid forms of a substance
8. Mg
9. C
10. S
12. Process of formation of rust
13. Ferrum is the latin name

CHAPTER 6

Respiration in Organisms

Introduction

- Importance of respiration
- Cellular respiration
- Types of respiration
  aerobic and anaerobic
- Breathing
  - Inhalation & exhalation
- Mechanism of breathing
- Breathing in other animals



Respiration is the most important life process common to all living organisms.

Why do we respire?

All living things need energy to do work, just as machines need energy to run. All living organisms are made up of a number of cells. A cell is the smallest, structural and functional unit of an organism. Each cell performs various functions of life, such as nutrition, excretion and transportation. To perform these functions, cells need energy. Our body requires energy when we are eating, running, reading or even when we are sleeping.

Where does this energy comes from? This energy is produced in the body from the food we eat. The food has stored energy which is released during respiration. Therefore, we respire to produce energy needed by the body for various activities.

When we breathe we take in oxygen and breathe out air rich in carbon dioxide. The air we breathe in is transported to the cells. In the cells, glucose is oxided in the presence of oxygen to release energy, water and carbon dioxide.

The process of break down of food in the cells with release of energy is called cellular respiration as it takes place inside the cells.

TYPES OF RESPIRATION

Respiration is of two types – aerobic and anaerobic respiration.

Aerobic respiration

The process of respiration which occurs in the presence of oxygen is called aerobic respiration. The breakdown of glucose occurs in the presence of oxygen. A large amount of energy is produced along with water and carbon dioxide.

Glucose + oxygen → energy + carbon dioxide + water

Anaerobic respiration

Respiration without oxygen is called anaerobic respiration.

In this process very little energy is produced. Glucose is broken down to ethyl alcohol and carbon dioxide with the production of energy.

$$\text{Glucose} \xrightarrow[\text{respiration}]{\text{anaerobic}} \text{alcohol} + \text{carbon dioxide} + \text{energy}$$

We can respire anaerobically, but for only a very short time, when we perform heavy and vigorous exercises and the demand of energy increases but the supply of oxygen is limited.

$$\underset{\text{(in muscle)}}{\text{Glucose}} \xrightarrow[\text{respiration}]{\text{anaerobic}} \text{lactic acid} + \text{energy}$$

The lactic acid produced accumulates in the muscles which causes muscle cramps. We get relief from cramps by hot water bath or massage. This is because the blood circulation improves, which in turn improves the supply of oxygen to the muscles. This helps to convert lactic acid into carbon dioxide and water and the pain subsides.

Anaerobic respiration takes place in certain organisms like yeast, and some bacteria. They can survive even in absence of air and are called anaerobes. Yeast is used to make wine and beer as it breaks down glucose into alcohol. The process of respiration involves breathing and cellular respiration.

BREATHING

The process of taking in fresh air rich in oxygen and giving out air rich in carbon dioxide is called respiration.

The process of taking in air rich in oxygen is called inhalation and the process of giving out air rich in carbon dioxide is called exhalation.

Respiration is a continuous process which goes on till one lives. As long as there is life, respiration takes place. The number of times a person breathes in one minute is called the breathing rate. During breathing, inhalation and exhalation take place alternately and continuously. The breathing rate of a normal individual at rest is 15–18 times per minute. The breathing rate is not constant. It depends on the oxygen requirement of the body.

Facts to know

Breathing is also

Activity – 1

(a) Let us find out how the breathing rate varies under different conditions.
Note down the breathing rate (the number of times you breathe in and breathe out in a minute) while performing the following activities.

S.No.	Activity	Rate of breathing
1.	After resting	
2.	After studying	
3.	After walking briskly	
4.	After running fast	
5.	After climbing stairs	
6.	After jogging	

Find out in which activity the breathing rate is fastest and in which it is the slowest.
You may need to take help of your friend to record the rate.

(b) Compare your breathing rate with those of your friends.

S.No.	Name	Breathing rate			
		At rest	reading	After walking briskly	After running fast 100 m
1.					
2.					
3.					
4.					

What do you observe?
You will notice that the breathing rate is not constant.

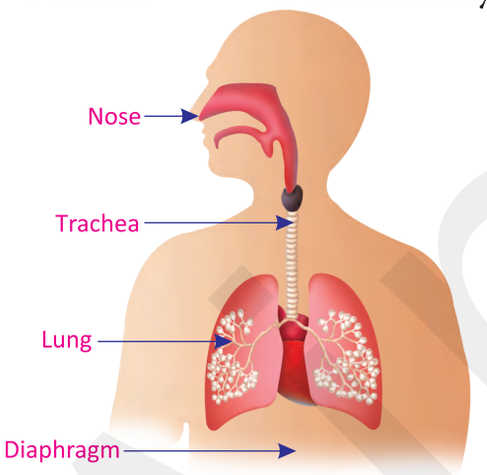
When the body works hard, breathing rate increases as the energy requirement increases. As a result more oxygen is supplied to the cells and more food is broken down to supply energy. This is the reason why you feel hungry after doing strenuous exercise. During heavy exercise breathing rate can increase up to 25 times per minutes.

You must have often wondered why do we yawn when we are sleepy or drowsy. This happens because the lungs do not take in enough oxygen from the air. This leads to oxygen shortage in the body. We yawn to meet this shortage of oxygen. Yawn is actually a deep long breath.

How do we breathe?

The human respiratory system consists of the following :

- Nostrils
- Nasal cavity
- Trachea
- Bronchi and
- Lungs



Human Respiratory system

When we breathe in, the air enters our nose through the nostrils. The air we breathe in may contain dust, pollens, smoke etc. Our nasal cavity contains hair which entrap the dust particles and other irritants and prevent them from reaching the lungs. At times these particles may get past the hair in the nasal cavity, they then irritate the nasal cavity and we sneeze. Sneezing throws out these foreign particles from the air inhaled.

From the nasal cavity the air reaches the lungs through the trachea (wind pipe) and bronchi (singular bronchus). One bronchus enters each lung.

Lungs are present in the chest cavity. They are surrounded by ribs on all the sides. A large muscular sheet called the diaphragm forms the floor of the chest cavity. The diaphragm muscles and the rib cage move during the breathing process.

Let's Remember

Give one word for each one of the following.

1. What is cellular respiration?
2. Which produces more energy–aerobic respiration or anaerobic

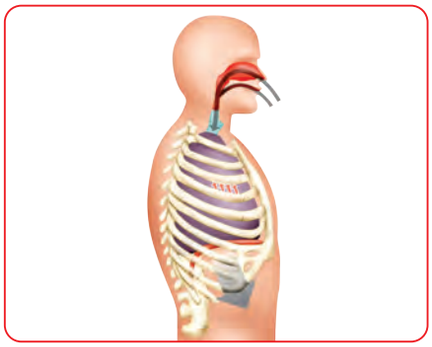
MECHANISM OF BREATHING

Have you seen your chest go up and down as you breathe? During inhalation the ribs move up and outwards and the diaphragm moves down. These movements increase the volume of the chest cavity. The volume of the lungs increases and the pressure inside the lungs decreases. As a result, air rushes into the lungs. Causing them to inflate.

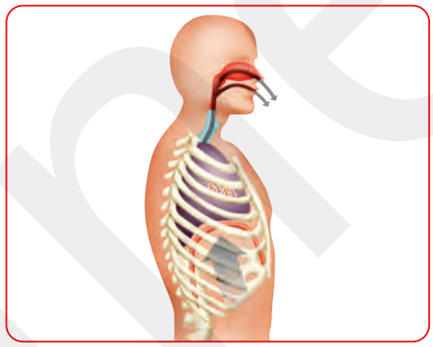
The chest expands during inhalation.

Exhalation

During exhalation, ribs moves down and inwards and the diaphragm moves up. This reduces the volume of the chest cavity and the lungs contract. The air inside the lungs is pushed out due to increase in pressure inside the lungs.



Inhalation



Exhalation

Activity – 2

Ask your friend to measure your chest with the help of a measuring tape, while you take a deep breath. Note down the reading. Measure the size of the chest again when fully expanded. Note down the measurement. Measure the chest sizes of your friends while repeating the activity.

Measuring chest size

Effect of breathing on the chest size

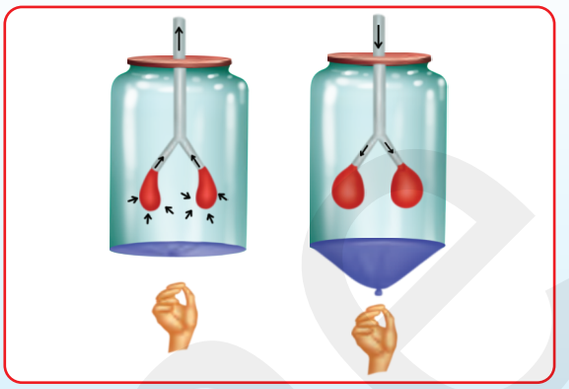
S. No.	Name of the friend	Size of the chest		
		During Inhalation	During exhalation	Difference in Size
1. 2. 3. 4.				

Find out which friend can expand her chest the most.

Let us make a simple model to demonstrate the mechanism of breathing.

Activity – 3

- Take a wide plastic bottle and cut off its bottom. Take a Y-shaped glass or plastic tube.
- Fix a rubber cork into the mouth of the bottle to make it air tight.
- Make a hole in the centre of the cork so that the tube can pass through it .
- Fix two deflated balloons to the ends of the Y tube.
- To the base of the bottle tie a thin rubber or plastic sheet with the help of a string or a rubber band.



Model to show mechanism of breathing

The model is ready

(a) Pull the rubber sheet down gently and observe the balloons.

(b) Now push the rubber sheet up and see what happens to the balloons.

The balloons represent the two lungs and the rubber sheet represents the diaphragm. When rubber is pulled down, space inside the bottle increases, pressure in the bottle decreases and air from out side pushes into the balloons and they get inflated. When the rubber sheet is released or pushed up, space in the bottle is decreased, pressure in the bottle is increased and air is forced out of the balloons. The balloons deflate.

What do we breath out?

The air we breathe out (exhaled air) contains carbon dioxide and water. Let us perform a simple activity to confirm this.

Activity – 4

Take a little freshly prepared lime water in a test tube. Close the mouth of the tube with a cork. Insert a straw through the hole so that one end of it dips in the lime water. Blow through the straw a few times. What do you observe?

The lime water turns milky. This shows that exhaled air contains carbon dioxide. $Ca(OH)_2 + CO_2 \rightarrow Ca\ Co_3 + H_2o$

Effect of exhaled air on lime water

Activity – 5

Breathe out on a clean mirror for a few minutes. What do you see on the mirror?

The mirror becomes hazy due to the deposition of water droplets. This shows that exhaled air contains moisture.

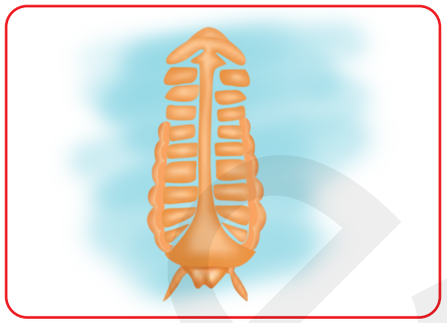
Inhaled air contains approx 21% oxygen and 0.03% carbon dioxide, whereas the exhaled air contains approx 16.4% oxygen and 4.4% carbon dioxide.

BREATHING IN OTHER ANIMALS

Different animals breathe through different parts of their body. Various animals living on land like lion, cow , horse, elephant, cat, dog, frog, lizard and snake have lungs. But many other organisms have different organs. Let us study some of them.

Cockroach

They have small openings on the sides of their bodies. These openings are called spiracles. The air enters the body through these spiracles and is carried through tubes called tracheal tubes. Oxygen defuses into the body tissue and reaches every cell of the body.



Tracheal system in cockroach

Similarly, carbon dioxide from the cells goes into the tracheal tubes and moves out through the spiracles. Besides cockroaches, other insects also have spiracles.

Earthworm

Earthworms breathe through their skin. The skin of the earthworm is moist and slippery. Exchange of gases take place through this skin. The frogs can also breathe through their skin when in water. Their skin is also moist and slippery.

Earthworm

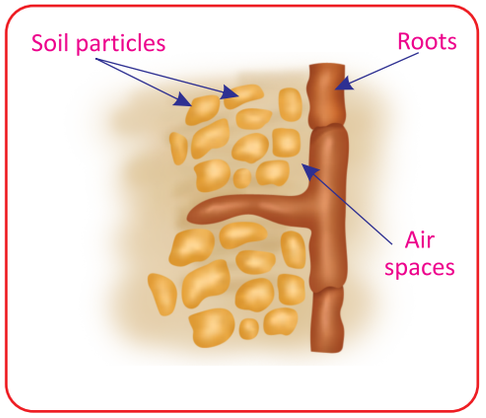
Fish

Fish breath through gills. Gills help them to use the dissolved oxygen in water. Gills are projections of the skin which are well supplied with blood vessels for exchange of gases.

Breathing organs in fish

RESPIRATION IN PLANTS

Plants also respire just like other living beings. They also need oxygen for survival. They take in oxygen from air and give out carbon dioxide. In plants, respiration can take place independently through different parts such as roots, stems and leaves. In plants exchange of gases takes place through tiny holes called stomata, present on the surface of their leaves.



Roots absorb air from the soil

The root cells also need oxygen to produce energy. Roots take in oxygen that is available in the small spaces between soil particles and give out carbon dioxide. Now you can guess why farmers plough or till the soil?

In the cells of the plant, oxygen is used up to break down glucose into carbon dioxide and water just as in other organisms.

Let's Remember

Fill in the blanks.

1. The process of taking in air is called _____ .
2. The sheet of muscles present below the lungs is called _____ .
3. Yeasts produce _____.

Glossary

aerobic respiration	:	the type of respiration in which breakdown of glucose occurs with the use of oxygen is called aerobic respiration
breathing rate	:	the number of times a person breathes in a minute
diaphragm	:	a large muscular sheet which forms the floor of the chest cavity
exhalation	:	the process of giving out air or water from the respiratory organs
gills	:	respiratory organs of aquatic organisms
inhalation	:	the process of taking in air or water into the respiratory organs
spiracles	:	an external opening from the trachea in insects

Summary

- All living beings respire. It is necessary to produce energy needed by our body.
- Respiration is the process of taking in oxygen into the cells, breaking down glucose into carbon dioxide and water with the release of energy.
- The break down of glucose takes place in the cells of an organism (cellular respiration).
- There are two types of respiration aerobic respiration(In the presence of oxygen) and anaerobic respiration (in the absence of oxygen).
- When the demand of energy increases during heavy exercise and the supply of oxygen is limited in our cells, food breakdown is by anaerobic respiration.
- Breathing is a part of the process of respiration, wherein we take in fresh air rich in oxygen and give out air rich in carbon dioxide.
- The process of taking in air is called inhalation and exhalation is the process of giving out air rich in carbon dioxide.
- Movement of the ribs and the diaphragm contribute in the process of respiration.
- The rate of breathing increases with increased physical activity.
- Earthworms breathe through their moist skin. In fishes exchange of gases takes place through gills and in insects through trachea.
- In plants, the exchange of gases takes place through stomata. The roots take in air from the soil. The breakdown of glucose in the plant cells is similar to that of other organisms.
- Many animals like lion, elephant, horse, cow, cat, dog, breathe through lungs and the breathing process is similar to that of the humans.

Exercise

A. Multiple Choice Questions (MCQs)

Tick (✓) the right option.

1. Cramps occur due to accumulation of this in the muscles _____.
   (a) lactic acid ☐ (b) water ☐
   (c) CO_2 ☐ (d) alcohol ☐
2. The normal breathing rate per minute in an adult at rest is _____.
   (b) 25–30 ☐ (b) 5–7 ☐
   (c) 15–18 ☐ (d) 21–25 ☐
3. During inhalation the ribs move _____.
   (a) upwards ☐ (b) down wards ☐
   (c) outwards ☐ (d) do not move ☐
4. Fish breathe through _____.
   (a) skin ☐ (b) spiracles ☐
   (c) gills ☐ (d) lungs ☐
5. Glucose is oxidized to alcohol during _____.
   (a) aerobic respiration ☐ (b) anaerobic respiration ☐
   (c) photosynthesis ☐ (d) respiration ☐

B. Write 'T' for true and 'F' for false statements.

1. The rate of breathing increases after rest. ☐
2. The diaphragm moves up during exhalation ☐
3. Frog can breathe through its skin as well as lungs. ☐
4. Plants respire only during the day. ☐
5. Breathing and respiration mean one and the same thing. ☐

C. Match the following.

Column A	Column B
1. Respiration	a. cramps
2. Bronchioles	b. skin
3. Earthworm	c. epiblema
4. Roots	d. alveli
5. Lactic acid	e. oxygen

D. Answer the following questions in short.

1. What is the basic difference between aerobic and anaerobic respiration?
2. Write down the end products of respiration.
3. Why does the breathing rate increases after physical activity?
4. Name the organs of the respiratory system of humans.
5. How do earthworms breathe?

E. Answer the following questions.

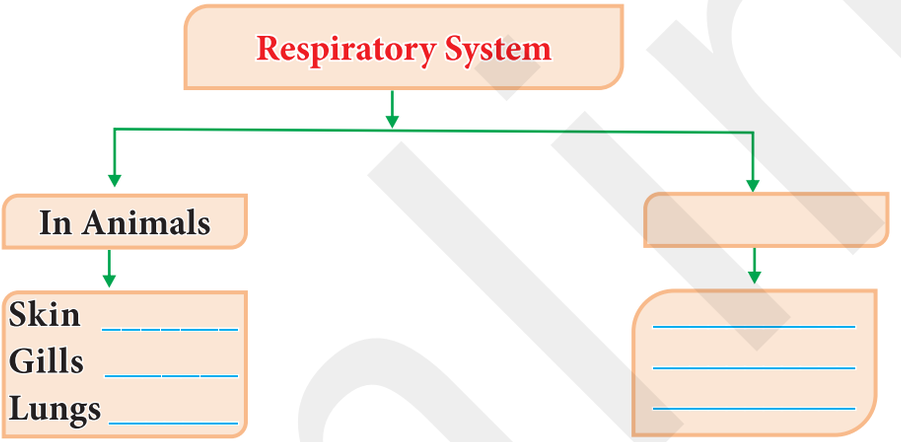
1. Why do we sneeze when we are in a highly dusty area?
2. Why do athletes suffer from cramps?
3. Why do living things need energy? From where does it comes from?
4. Differentiate between inhalation and exhalation. What is breathing rate?
5. With the help of a diagram, describe the respiratory system in humans.

HOTS (Think and Answer)

1. Why do you think potted plants should not be watered too much?
2. Why do you think it is said that we should not sleep under a tree at night?

Let's Recall

Complete the following diagram.



Group Discussion

Discuss why fish die when taken out of water.

Activity to do

- To make a model to demonstrate the mechanism of breathing.
- Take three test tubes. Fill ¾ of each with water. Label them A, B and C. Keep a snail in test tube A, a water plant in test tube B and in C keep snail and plant both. Which test tube would have the highest concentration of CO_2?

Creative Task

1. Observe fish in an aquarium. You will find some flap like structures on both sides of their heads. These are flaps which cover the gills. These flaps open and close alternately. On the basis of these observations explain the process of respiration in the fish.
2. Visit a local doctor. Learn about the harmful effects of smoking. You can also collect material on this topic from other sources. You can seek help of your teacher or parents. Find out the percentage of people of your area who smoke. If you have a smoker in your family, confront him with the material that you have collected.

WORKSHEET-6

Find the Words For Your Respiratory System.

Given below is a square of letters in which are different words related to respiration in organisms are hidden. These words may be present in any direction-upwards, downwards, or along the diagonals. Clues about those words are given below the square.

S	V	M	P	L	U	N	G	S
C	Z	G	Q	W	X	N	T	L
R	M	A	T	I	D	O	T	C
I	Y	R	X	Y	M	S	R	A
B	R	H	I	A	N	T	A	Y
S	T	P	T	B	Z	R	C	E
M	I	A	M	T	S	I	H	A
S	P	I	R	A	C	L	E	S
N	E	D	K	J	N	S	A	T

(i) The air tubes of insects.

(ii) Skeletal structures surrounding chest cavity.

(iii) Muscular floor of chest cavity.

(iv) Tiny pores on the surface of leaf.

(v) Small openings on the sides of the body of an insect.

(vi) The respiratory organs of human beings.

(vii) The openings through which we inhale.

(viii) An anaerobic organism.

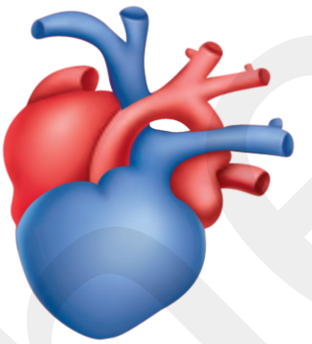
(ix) An organism with tracheal system.

CHAPTER 7

Transportation in Animals and Plants

Introduction

- Circulatory system
- Blood-RBC, WBC, Platelet
- Blood vessels—artery, vein, capillaries
- Heart- heart beat
- Excretion in animals
- Excretory system in humans
- Dialysis
- Transportation in plants



You already know that food, water and oxygen are required by living organisms for survival. The materials produced in one part of the body need to be transported to various other parts of the body. Similarly, the wastes produced within the body, need to be transported to parts from where they can be removed.

The process of transport of substances is very important in a living body. Let us now learn how the various substances are transported in plants and animals.

In multicellular organisms, the transportation is done by a specialised system, known as the circulatory system.

CIRCULATORY SYSTEM

The circulatory system consists of the heart, the blood vessels and blood. Blood is the major means of transport of all necessary material to different parts of the human body.

BLOOD

Blood is a liquid which flows in the blood vessels. It circulates throughout our body. It helps in transporting:

- Digested food from the small intestine to the other parts of the body.
- Oxygen from the lungs to the cells of the body.
- Waste material for removal from the body.

Human Circulatory System

Blood is made up of two parts.

1. The fluid part called the plasma.
2. The cells of many kinds present in the plasma. The cells are of three kinds–red blood cells, white blood cells and platelets.

Red blood cells: (RBC's or Erythrocytes)

They contain a red pigment called haemoglobin. Haemoglobin combines with oxygen from the lungs to be transported to various body parts and ultimately to the cells. Haemoglobin gives red colour to the blood and is the carrier of oxygen.

White blood cells (WBCs or Leukocytes)

They help to fight infection. They provide immunity to the body against diseases and infection. They are larger than the RBC's and do not contain haemoglobin.

Platelets

When you fall down and there is a cut, blood flows out. But after sometime, the bleeding stops and a dark red clot is formed. This is due to another type of cells present in the blood called platelets. They are small, colourless and irregularly shaped.

Facts to know

- About 5.6 l of blood is present in an healthy adult.
- Blood of a cockroach is colourless.

Blood Vessels

Blood flows in our body through a complex system of tubes called blood vessels. There are three types of blood vessels :

(a) Arteries (b) Veins (c) Capillaries

Arteries

These are the blood vessels that carry blood from the heart to all parts of the body. This blood is rich in oxygen. The only exception is the pulmonary artery which carries blood from the heart to the lungs and is deoxygenated. Arteries have thick, elastic walls as the blood flow is rapid and at high pressure. They are deeply placed inside the skin.

Activity - 1

Place your middle and index finger on the inner side of your left wrist. Do you feel any sensation? You will feel a throbbing movement. It is the pulse and is due to the flow of blood in the arteries. Count the number of pulses per minute. This gives the pulse rate per minute

Counting the pulse

v Record your observations and that of your friends in the table.

S.No.	Name	Pulse Per Minute
1. 2. 3. 4. 5.		

The average pulse in a resting person is between 72–80 beats per minute.

You must have noticed a doctor holding your wrist and counting the pulse when you visited him. The pulse rate can be felt on the temple, wrist or back of the knee, where the arteries are just under the skin.

Facts to know

William Harvey discovered the circulation of blood.

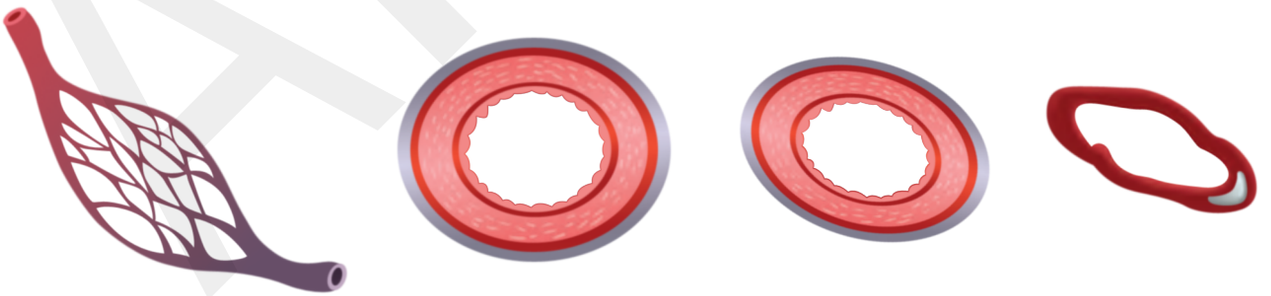
Veins

Veins carry blood rich in carbon dioxide or deoxygenated blood from the various parts of the body back to the heart. The veins are thin walled. There are valves present in the veins which prevent back flow of blood. Blood thus, flows towards the heart only. They are situated just under the skin and can be seen as greenish-blue tubes on your hands and legs. Pulmonary vein, however carries oxygen rich blood from the lungs to the heart.

Capillaries

The capillaries are the thinnest of the blood vessels. Arteries branch into fine and small blood vessels upon reaching the tissues. These fine tubes are capillaries.

The capillaries join up to form veins which empty into the heart. The walls of the capillaries are very thin so that diffusion of gases and chemical substances easily take place through them.

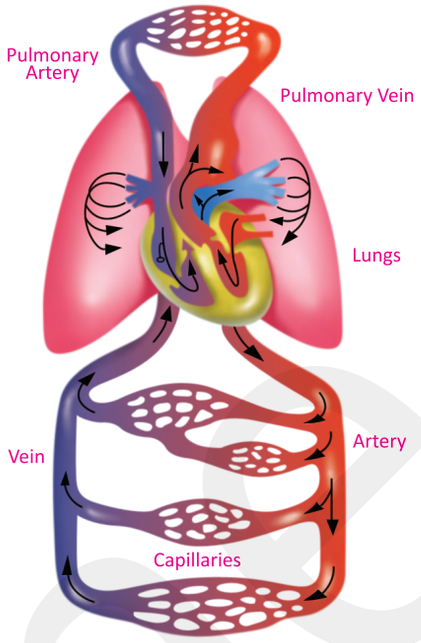


Capillary network Artery Vein Capillary

HEART

The heart is a four-chambered muscular organ present in the chest cavity, located between the lungs. Its lower tip is slightly tilted towards the left. Its size is about that of your fist. It pumps blood to the various parts of your body. It works non stop.

The heart has four chambers. This prevents mixing of the blood rich in oxygen and the blood rich in carbon dioxide. The two upper chambers are called the atria (singular atrium)and the two lower chambers are called ventricles. The partition between the chambers prevents mixing of the blood. The functioning of the heart can be understood from the figure, given alongside.

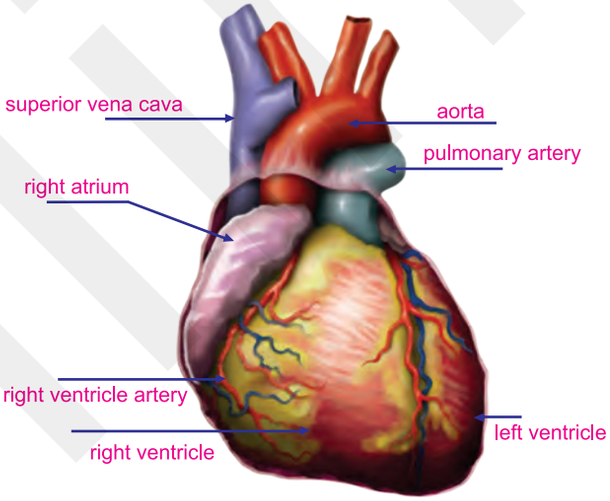


Schematic diagram of Circulation

The left side has oxygenated blood and the right side contains de-oxygenated blood.

Heart Beat

The walls of the different chambers of heart are made up of muscles. These muscles contract and relax. The regular rhythmic contraction and relaxation of the muscles of the heart is known as the heart beat. The muscles of the heart are involuntary and we have no control over them. They work non stop throughout life. You can hear your heart beat if you place your hand on the left side of the chest. Doctors listen to the heart beat using an instrument called the stethoscope.



Sections of Human Heart

A stethoscope amplifies the sound of a heart beat so that it can be heard easily. It consists of the following three parts :

- A chest piece that carries a diaphragm. It is sensitive to heart beats and is placed by doctors on your chest.
- Two ear pieces.
- A tube which joins the two ear pieces to the chest piece.

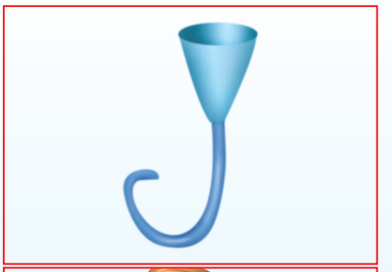

Stethoscope

Facts to know

In crabs the blood

The number of heart beats and their nature helps the doctor to have an idea about the condition of your heart. Let us make our own stethoscope.

Activity – 2



Take a small funnel (about 6–7 cm in diameter). Fix a rubber tube about 50 cm long on the stem of the funnel. Stretch a rubber sheet or a balloon sheet over the mouth of the funnel and fix it with a rubber band tightly.

Put the open end of the rubber tube on one of your ears. Place the mouth of the funnel on your chest near your heart. Listen carefully. What do you hear?

The thumping sound you hear is your heart beat. Count the number of heart beats in one minute. Listen and count the heart beats of your friend. Count again after running for a few minutes.

Heart beat and Pulse Rate

Name of your friend	While resting		After runing	
	Heart beat	Pulse rate	Heart beat	Pulse rate
1.				
2.				
3.				
4.				
5.				

Record your own pulse rate and heart rate, as well as that of your friends, in the table.

In an adult human being, the heart pumps out blood to the arteries about 70 times per minute. Each heart beat generates one pulse in the arteries. The rate of pulse per minute indicates the rate of heart beat.

With exercise or physical activity the heart beat increases. This is because more oxygen is to be supplied to the muscles to produce extra energy. The heart beat can increase up to 150–200 times per minute.

In a child the heart beats 90–100 times per minute.

Let's Remember

Fill in the blanks.

1. The fluid part of the blood is called _____ .
2. The cells present in blood are _____ , _____ , _____ .
3. The red pigment present in blood is _____ .
4. The three types of blood vessel are _____ , _____ and _____ .
5. The lowest tip of the heart is titled towards the _____ .

EXCRETION IN ANIMALS

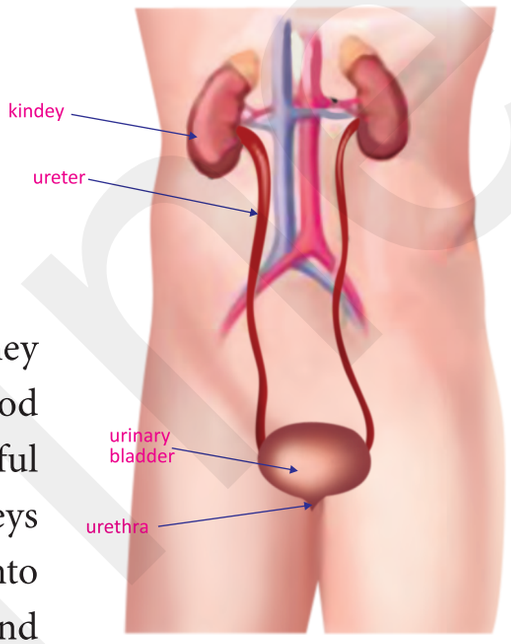
We have already learnt that undigested food in the large intestine is removed during egestion and that carbon dioxide is removed as waste from the body through the lungs during exhalation. A number of other waste materials are produced by the body which need to be removed as they are toxic.

The process of removing toxic wastes from the body is called excretion. The organs involved in their removal make up the excretory system.

EXCRETORY SYSTEM IN HUMANS

The excretory system in humans consists of

- Kidneys (a pair)
- Ureters
- Urinary bladder
- Urethra



Human Excretory System

Kidneys

Kidneys are the most important organ of this system. They are dark, red, bean shaped structures. When the blood reaches the kidneys it contains both useful and harmful substances. The blood capillaries present in the two kidneys act as filters. The useful substances are absorbed back into the blood. The waste substances are dissolved in water and removed as urine. Urine goes to the urinary bladder from the kidney through the two narrow tubes called ureters.

The urine is stored in the urinary bladder. The urine is passed out from the body through the opening at the end of the urethra. The urine consists of 95% water, 2.5% urea and 2–5% other waste products.

Facts to know

A normal adult excretes about 2 litre of urine daily.

Dialysis

At times a persons kidneys can get damaged due to infection. Leading to the accumulation of toxic material in the blood. Dialysis is a method of removing these toxic materials from blood through an artificial kidney. This is done

Facts to know

Hydra and sponge do not have a circulatory system. They get oxygen and food from the water in which they live and the waste and carbon dioxide is also moved out in the water.

Our skin also acts as an excretory organ. Our body gets rid of water, urea and salts through sweat. Sweat is secreted by the sweat glands present under the skin. Sweating helps to regulate body temperature. It helps to cool our body as the body loses heat when sweat evaporates. That is why you must have seen we sweat a lot on a hot day compared to a cold pleasant day.

TRANSPORT OF SUBSTANCES IN PLANTS

Recall how plants absorb water and minerals from the soil by the roots and transport it to the leaves for preparation of food through a process called photosynthesis. The food made by the leaves has to be carried to all parts of the plants. Food as we have already learnt is the ultimate source of energy and every cell gets energy by the breakdown of glucose. This energy is used to carry out vital activities of life.

Transport of water and minerals

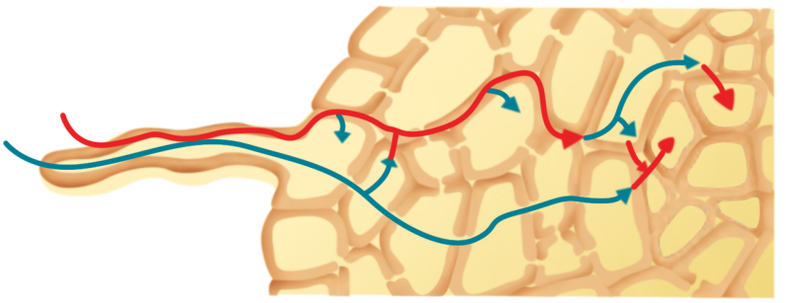
Water is absorbed from the soil through roots. The root has many hair called root hair which increase the surface area of absorption of water and minerals dissolved in water. The root hair absorb water present in between the soil particles.

From the roots, water and nutrients move through pipe-like structures present in plants. The pipes or vessels are made of special tissue. These special pipes made of vascular tissue for transporting water and minerals in the plant are called xylem. Xylem forms a continuous network of channels connecting the roots to the tips of the leaves passing through the stem and branches.

The food prepared by the leaves is transported to all parts of the plants through vascular tissue called phloem.

Thus the transportation of substances in plants takes place through two vascular tissues—xylem and phloem.

Transport system in plants



Movement of water and minerals through the root hair

TRANSPIRATION

Not all the water absorbed by the plant is used up. The excess water is given out by the plants in the form of water vapour through the stomata present in the leaves. The process is called transpiration. The evaporation of water from the leaves produces a suction pull which enables pull water to great heights in trees. The suction pull is similar to the one developed when we suck water through a straw.

Transpiration also helps to keep the plants cool and provides rigidity to the plant body.

EXCRETION IN ANIMALS

Aquatic animals like fishes excrete cellular waste as ammonia, which directly dissolves in water. The major excretory product of birds and reptiles is uric acid. In humans it is urea.

Let's Remember

Give one word for each one of the following.

1. What are the constituents of urine?
2. What waste materials are excreted through sweat?
3. Name the vascular tissues through which transportation takes place in plants.
4. How do aquatic animals excrete waste?

Glossary

blood vessels	:	the tubes that enclose and transport blood from one organ to other organ
artery	:	blood vessel that carries oxygenated blood to different parts of body
vein	:	blood vessel that carries deoxygenated blood
haemoglobin	:	the iron pigment present in red blood cells
xylem	:	vascular tissue which transports food
plasma	:	the liquid part of the blood
stethoscope	:	the instrument used to measure heart beat

Summary

- The circulatory system helps in the transportation of nutrients and oxygen to the different cells of the body. It also helps in the removal of waste products from the body.
- The circulatory system consists of heart, blood vessels and blood.
- Blood consists of plasma, red blood cells, white blood cells and platelets.

- The red blood cells contain haemoglobin which gives red colour to the blood. The white blood cells fight against germs and provide immunity to the body. Platelets help in the clotting of blood.
- In humans, blood flows through arteries and veins and heart acts as a pumping organ.
- The arteries carry oxygenated blood to all parts of the body and the veins carry deoxygenated blood from the various parts of the body back to heart.
- The heart has four chambers. The left side deals with oxygenated blood and the right side deals with deoxygenated blood.
- The human heart beats about 70–80 times in an adult person. This is called heart beat.
- Removal of waste products from the body is called excretion.
- The excretory system of humans consist of a pair of kidneys, two ureters, urinary bladder and urethra.
- Humans excrete their wastes through lungs (carbon dioxide), skin (sweat), anus (faeces) and urinary system (urine).
- Urea and salt are excreted through sweat.
- The root hair present in the roots of plant absorb water and minerals from the soil.
- The vascular tissue phloem transports food from the leaves to the various parts of the plant.
- Plant lose a lot of water in the form of water vapour through stomata during transpiration.
- During transpiration a force is created which pulls up the water absorbed by the roots of the plants to reach the stems and leaves.
- Aquatic animals like fish excrete waste substances likes ammonia which directly dissolve in water.
- Birds and reptiles excrete uric acid in semi-solid form.

Exercise

A. Multiple Choice Questions (MCQs)

Tick (✓) the right option.

1. This helps to fight against infection _____ .

   (a) RBC's ☐ (b) WBC's ☐ (c) platelet ☐ (d) all three ☐

2. The main organ of the excretory system is _____ .

   (a) kidney ☐ (b) ureter ☐ (c) urinary bladder ☐ (d) urethra ☐

3. Sweat consists mainly of _____.
   (a) water ☐ (b) carbon dioxide ☐ (c) oxygen ☐ (d) none of these ☐
4. The main waste of snakes is _____.
   (a) urea ☐ (b) uric acid ☐ (c) ammonia ☐ (d) oxygen ☐
5. The number of chambers present in the human heart _____.
   (a) 1 ☐ (b) 2 ☐ (c) 3 ☐ (d) 4 ☐

B. Write 'T' for true and 'F' for false statements.

1. Haemoglobin is present in the WBC's. ☐
2. Pulmonary artery carries oxygenated blood. ☐
3. The device used to hear heart beat is a stethoscope. ☐
4. Humans excrete uric acid through skin. ☐
5. Heart beat decreases after physical activity. ☐

C. Match the following.

Column A	Column B
1. Chlorophyll	a. phloem
2. Green colour of leaves	b. haemoglobin
3. Transportation of water	c. xylem
4. Cells which fight against germs	d. chlorophyll
5. Red colour of blood	e. plasma
6. Liquid part of blood	f. white blood cells

D. Answer the following questions in short.

1. Name the various components of blood.
2. Why does the blood flow in one direction only in the veins?
3. Why is blood needed by all parts of our body?
4. What is meant by excretion?
5. What is the importance of transportation?

E. Answer the following questions.

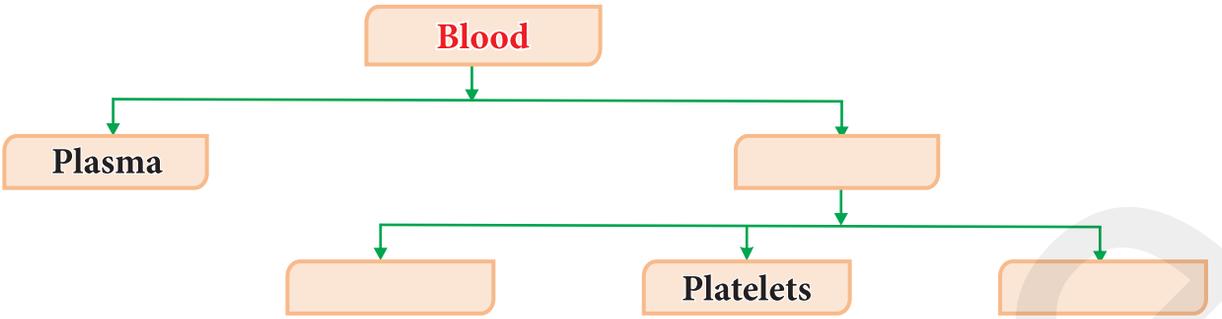
1. Describe the composition of blood.
2. Name the blood vessels. What are the differences between arteries and veins?
3. Describe the functions of the heart.
4. What is transpiration? Why is it important?
5. How does transportation of nutrients and water take place in plants?

HOTS (Think and Answer)

1. What do you think would happen if there were no platelets in blood?
2. Why do we sweat more in summers than in winters?

Let's Recall

Complete the following diagram.



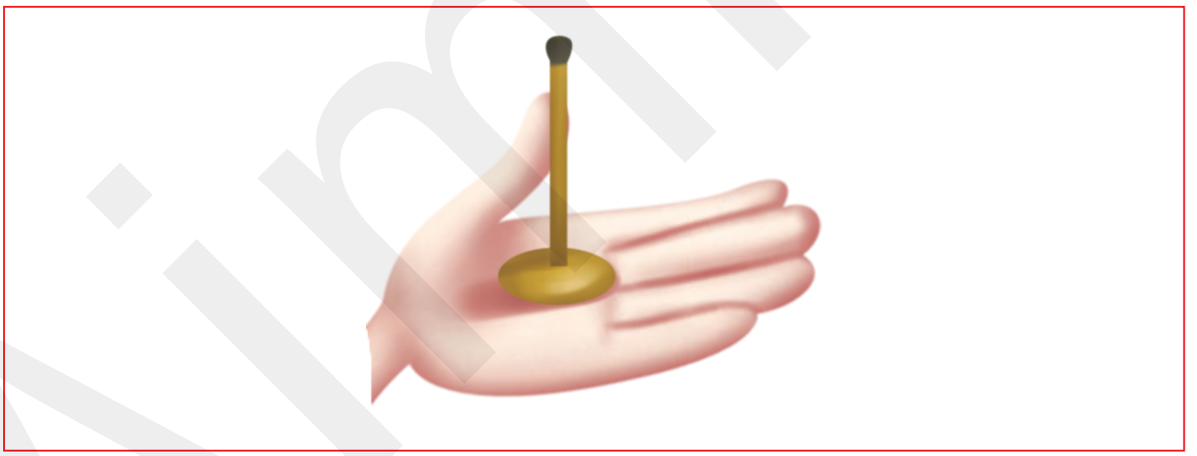
Group Discussion

1. Role of valves in the heart.
2. Role of valves in the vein.

Activity to do

Make a pulse detector at home

- Put a thumb pin into a base of a large match stick. Put it on your hand where you can feel the pulse, with the arm resting on the table. The head of the match stick will move slightly back and forth with each heart beat.

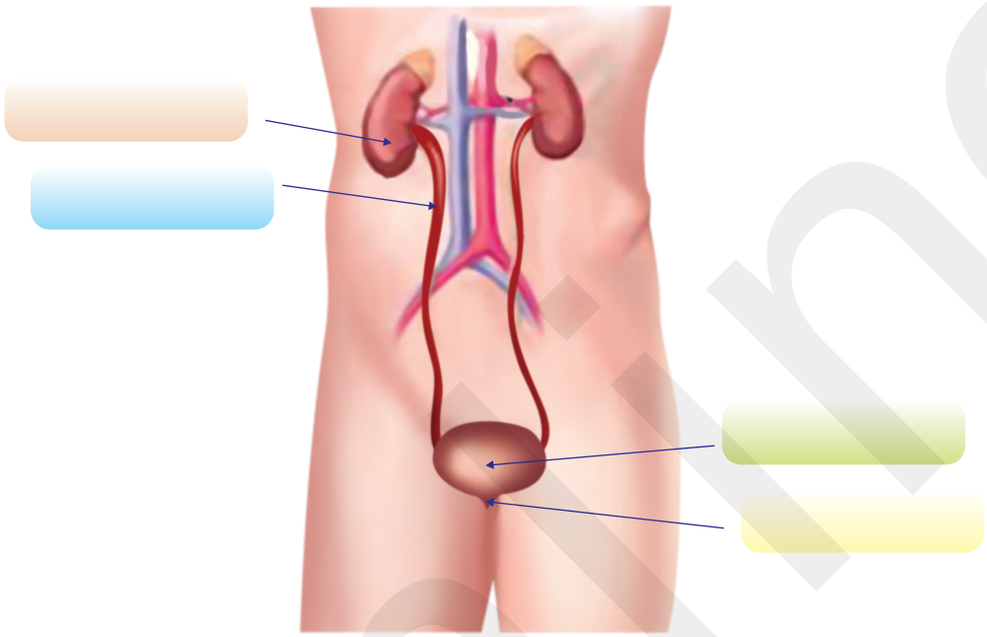


Creative Task

1. Measure the pulse rate of people of individuals across various age groups – infants, toddlers, children, adolescents, adults and elderly individuals. Compare their plus rates.
2. Find out about blood groups of different individuals. What is the importance of these blood groups? You can consult a doctor for this.

WORKSHEET-7

Write down the name and one function of each numbered organ.



Functions of the organs:

1. _____.
2. _____.
3. _____.
4. _____.

CHAPTER 8

Reproduction in Plants

Introduction

- Modes of reproduction in plants
- Asexual reproduction
- Vegetative propagation
- Budding
- Fragmentation
- Spore formation
- Sexual reproduction
- Pollination
- Fertilisation
- Formation of fruits and seeds
- Dispersal of seeds

You have already learnt in the previous class, that all living beings reproduce. The production of new individuals from the parents in known as reproduction. Plants reproduce by different modes. Let us study them in detail.

MODES OF REPRODUCTION

Plants reproduce by the following two methods–

1. Asexual reproduction and
2. Sexual reproduction.

Asexual reproduction

In asexual reproduction, only a single parent is involved and plants give rise to new plants without seeds or spores. There are a number of methods of asexual reproduction including budding, fragmentation, spore formation and vegetative propagation.

Vegetative propagation is also a type of asexual reproduction. In this new plants are produced from roots, stems, leaves and buds. Roots, stems, leaves and buds are called the vegetative parts of a plant and hence the name vegetative propagation.

Advantages of vegetative propagation

- Plants take less time to grow. They bear flowers and fruits earlier than those produced from seeds.
- New plant obtained is identical to the parent plant.
- Only one parent is required.
- Seedless plants can be obtained.

STEM

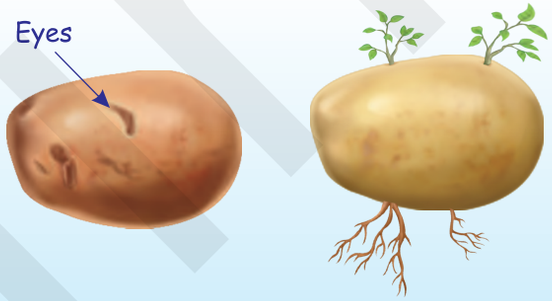
Activity – 1

Take a rose plant. Cut a portion of a branch with a node (node is a point on the stem or a branch from where leaf grows). This is called a cutting. Bury this cutting in moist soil. Water the cutting daily and observe its growth. After a few days you will notice new roots come out followed by new leaves. Note down the number of days it takes for the roots and leaves to develop.

Champa, bougainvilla, sugarcane, money plant and coleus are grown from their cuttings. Apart from flower buds, there are buds at the point where the leaf joins the node of the stem. These are called vegetative buds which can give rise to new plants. Plants like potatoes, ginger, onion and turmeric have buds from which new plants grow.

Activity – 2

Take a fresh potato. It is an underground stem called tuber. Observe scars or depressions on it. These are buds called eyes. Cut a few pieces of potato, each having an eye. Sow them in the soil. Water the soil regularly for a few days. What do you observe? Roots and shoots are seen coming out from the eyes.



Potato plant sprouting

Leaves

Some plants like bryophyllum have buds on the margins of the leaves. Small plants called plantlets develop from these buds. When these plantlets detach off from the main plant and fall on moist soil they give rise to a new plant.


Buds on the margin of a bryophyllum leaf.

Roots

Plants such as dahlia, sweet potato and asparagus have swollen roots as they store food. When these swollen roots are buried in the soil they produce new plants.

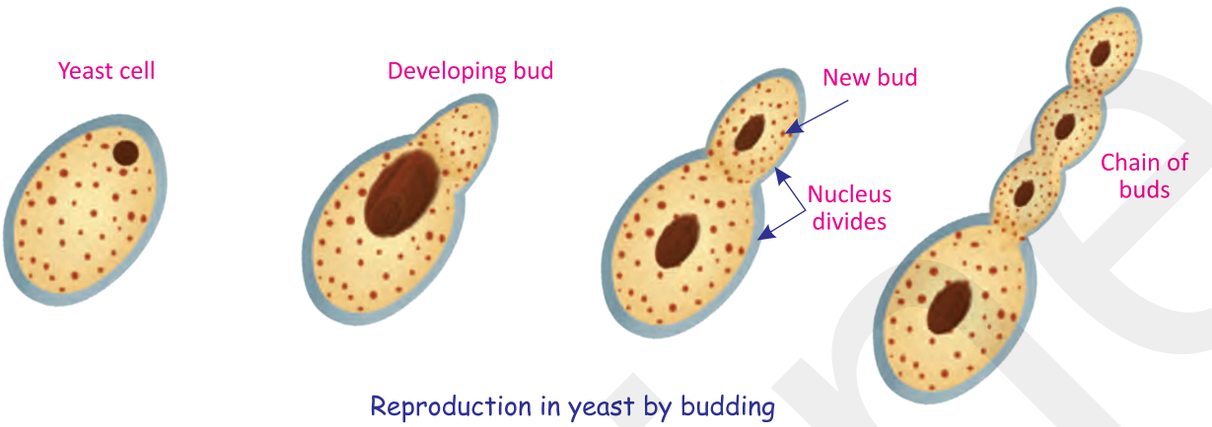
Facts to know

Cacti produce new plants when their parts fall on the ground.

BUDDING

Yeast is a non green plant which can only be seen under a microscope. They grow and multiply very fast if sufficient nutrients are made available to them.

In yeast a bulb like projection is formed on the body of the organism known as the bud. The nucleus of the parent body divides into two, one of which goes into the bud. The bud gradually grows and gets detached from the parent body to form a new yeast cell. The new yeast cell matures and produces more yeast cells. At times the buds do not detach from the body and a chain of yeast cells is formed in a very short time. This is called a colony. Yeast cells require moisture, food and warmth to grow.



Reproduction in yeast by budding

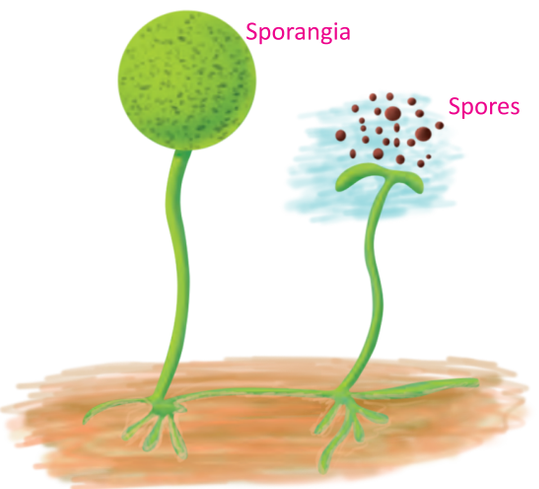
FRAGMENTATION

Fragmentation is a very common method of reproduction in algae. You must have seen algae in ponds or in other stagnant waters. They appear as slimy green patches. When food material is available the body breaks into two or more parts called fragments. Fragmentation is the breaking of a body into two or more parts. Each fragment grows into a new individual. The process continues and they are able to cover a large area in a short time.

Fragmentation in algae (Spirogyra)

SPORE FORMATION

Some plants like ferns, mosses and fungi (bread mould) reproduce asexually through spores. You must have seen bread mould or fungus. If you examine it under the microscope or a magnifying glass you will see fine thread like structures called hyphae and spherical structures called sporangia. The sporangia are filled with spores. The spores are asexual reproductive bodies, having a thick protective wall. This thick wall enables them to withstand unfavourable condition such as extreme temperatures, low humidity and lack



Spore formation in fungus

of food and water. When the sporangia are ripe, they burst open, releasing spores . They float in the air. Under favourable conditions, a spore germinates into a new mould.
Ferns and mosses also reproduce with the help of spores.

Let's Remember

Match the following.

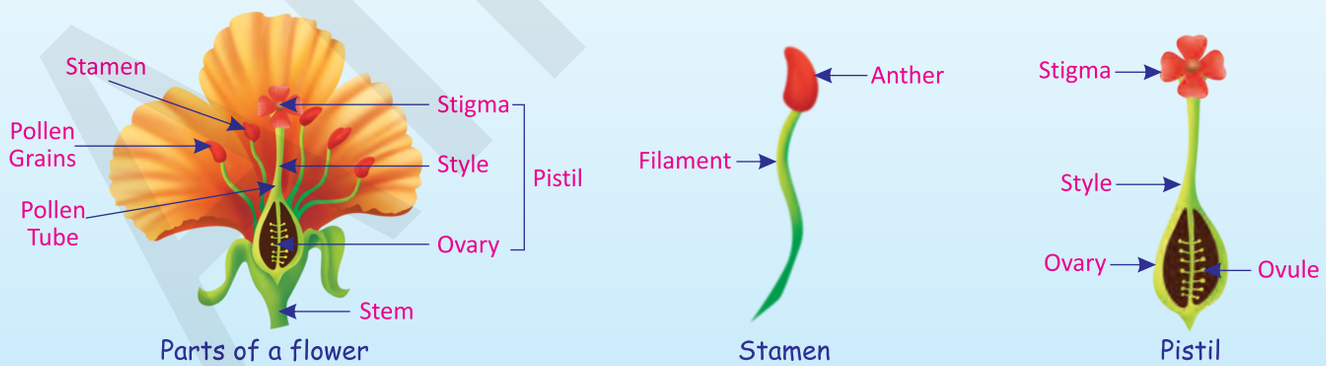
Column A	Column B
1. Eyes	a. explosion
2. Bud	b. unisexual
3. Mature ovary	c. potato
4. Stamen	d. yeast
5. Peas	e. male reproductive organ
6. Papaya	f. fruit
7. Wings	g. maple

SEXUAL REPRODUCTION

Sexual reproduction is the most common form of reproduction in plants. The process of reproduction in which new plants are obtained from seeds is called sexual reproduction. We have already learnt that flower is the reproductive part of a plant. Stamens are the male reproductive parts and pistil is the female reproductive part.

Activity – 3

Take a large flower– china rose, mustard or petunia. Separate the parts of the flower- sepals, petals, stamens and pistils. Study the various parts of a stamen and a pistil.
Most flowers have both stamens and pistils. Such flowers are called bisexual flowers.
Examples are mustard, pea, rose, sunflower, petunia, and china rose. Some flowers contain only the stamens or the pistil. Such flowers are called unisexual flowers. Some examples are cucumber, papaya, mulberry, corn and date palm.
In plants, the male and female flowers may be present in the same plant or in different plants.



Stamen bears anther and filament. Anther contains pollen grains. The pollen grains produce the male gametes.

Pistil

Consists of stigma, style and ovary. The ovary contains one or more ovules. The ovules contains the female gamete or egg.

In sexual reproduction male and female gametes unite to form a zygote.

The main steps involved in sexual reproduction in plants are :

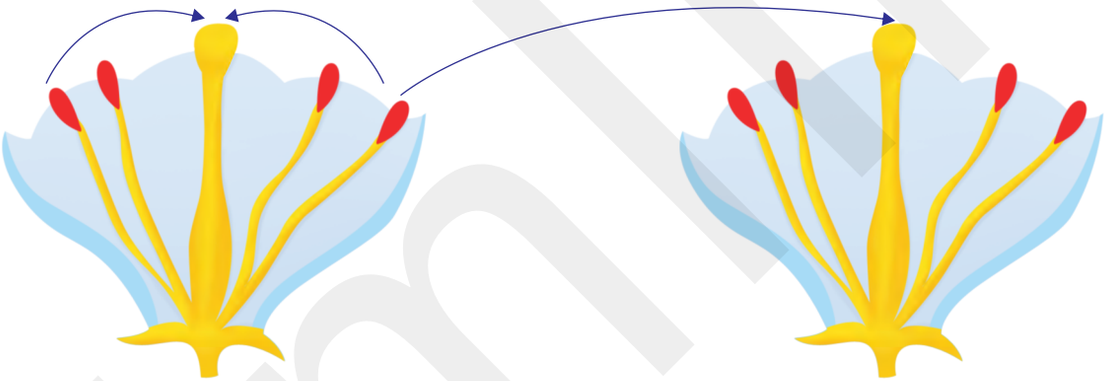
- Pollination
- Formation of seeds
- Germination of seed
- Fertilisation
- Formation of fruit

Facts to know

Mammals such as bat and rodents also pollinate flowers.

POLLINATION

The transfer of pollen grains from the anther of the stamen to the stigma of the pistil by air, water, insects etc is called pollination. Insects visit the flower and carry away pollens on their bodies. If the pollen lands on the stigma of the same flower, it is called self pollination. When the pollen of a flower lands on the stigma of another flower of the same plant, or that of a different plant of the same kind it is called cross pollination.



Types of pollination

The transfer of pollen grains to the stigma of a flower takes place with the help of wind, water or insects. These are called the agents of pollination.

Facts to know

Brinjal and tomatoes are actually fruits.

FERTILISATION

After pollination, male gamete unites with a female gamete to form a zygote. The process of fusion of male and female gamete to form a zygote is called fertilisation. The zygote develops into an embryo.

FRUIT AND SEED FORMATION

After fertilisation ovary increase in size and forms the fruit. The ovules become the seeds. The sepals, petals and other parts of the flower fall off.

The fruit is the seed bearing part or the ripened ovary of the flowering plant. The seed contains an embryo, which is covered in a protective coat. This embryo gives rise to a new plant. Fruits are of two types:

- Fleshy and juicy such as apples, mangoes, peaches, oranges.
- Hard such as almonds, walnuts.

SEED DISPERSAL

You must have wondered how the same kinds of plants are found in different places. This is possible because of seed dispersal. The process by which seeds are scattered to different places is known as seed dispersal. If the seeds of all the plant were to fall at the same place and grown, there would be hundreds of new plants growing close together. They would compete with each other for light, water, and minerals. Many would not be able to survive the tough competition and would die. Seed dispersal prevents this over crowding and helps plants to invade new habitats.

Seed dispersal is carried out by agents such as wind, water and animals.

(a) Wind : Seeds of some plants like grass are very light, winged seeds such as those of drumstick

and maple, hairy seeds of madar and sunflower, are blown by the wind to far off places.

(b) Water : Seeds and fruits of some plants have structures which enable them to float in water. Fruits like water lily, coconut or palm float in water. They are able to float because of a spongy or fibrous outer coat.

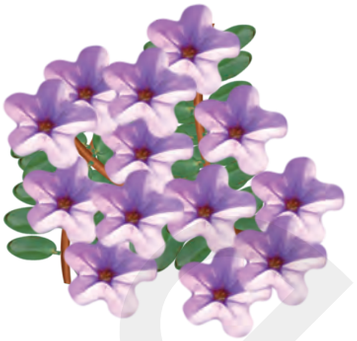
Fruits and seeds dispersed by water

Animals

Some seeds and fruits have hooks, barbs, spines, or bristles that stick to the skin of animals or clothes of humans and are carried to far off places. Examples are xanthium, tribulus and urena.

Xanthium

Tribulus



Urena

Explosion

In some plants like balsam, castor seeds, peas and bean plant, the fruit burst with a sudden jerk and the seeds are scattered to far off places.

Let's Remember

Give one word for each one of the following.

1. Name the male and female reproductive parts of a flower.
2. Give two examples of bi-sexual flowers.
3. Name the agents of pollination.
4. Name two plants, in which seeds are dispersed by wind.

Glossary

budding	: the process of formation of a new cell from a parent cell as an out growth or bud
fertilization	: the process of fusion of male and female gamets to form a zygote
zygote	: the cell formed by the fusion of two gametes
reproduction	: the process by which new individual organisms are produced
bisexual flowers	: flowers that have both the pistil and the stamens

Summary

- All living beings reproduce.
- Plants reproduce either by sexual reproduction or asexual reproduction.
- Fragmentation, budding, spore formation and vegetative propagation are methods of asexual reproduction.
- In vegetative reproduction, plants reproduce from vegetative parts such as stem, roots, leaves and buds.
- Some flowers are bisexual i.e. they have both stamens and pistils.
- Yeast reproduce by budding and algae by fragmentation.
- The pollen grain produces gametes. Female gametes are found inside the ovules.

Exercise

A. Multiple Choice Questions (MCQs)

Tick (✓) the right option.

1. The mature ovary forms the _____ .
   (a) Seed ☐ (b) Fruit ☐ (c) Stamen ☐ (d) Pistil ☐
2. Yeast reproduce by _____ .
   (a) Fragmentation ☐ (b) Spore formation ☐
   (c) Budding ☐ (d) Seeds ☐
3. The process leading to the fusion of male and female gamete is called _____ .
   (a) Fertilisation ☐ (b) Pollination ☐
   (c) Germination ☐ (d) Seed formation ☐
4. The seeds of xanthium are dispersed by _____ .
   (a) Wind ☐ (b) Water ☐ (c) Animals ☐ (d) Explosion ☐
5. Money plant reproduces by _____ .
   (a) Root ☐ (b) Leaf ☐ (c) Stem ☐ (d) Bud ☐

B. Write 'T' for true and 'F' for false statements.

1. Ferns and mosses multiply by budding. ☐
2. Dahlia multiplies by its roots. ☐
3. All flowers have both male and female parts. ☐
4. Coconut is dispersed by water. ☐
5. Animals help in the dispersal of balsam seeds. ☐

C. Fill in the blanks with the correct words.

filament reproduce two parent fragmentation

1. New plant obtained is identical to the _____ plant.
2. _____ is a very common method of reproduction in algae.
3. Stamen bears anther and _____ .
4. All living beings _____ .
5. Pollination is _____ types.

D. Answer the following questions in short.

1. Name the agents of seed dispersal.
2. How does fertilisation take place in plants?

3. Name the various methods of asexual reproduction.
4. Name the various steps involved in the sexual reproduction of plants.
5. State the main difference between sexual and asexual reproduction.

E. Answer the following questions.

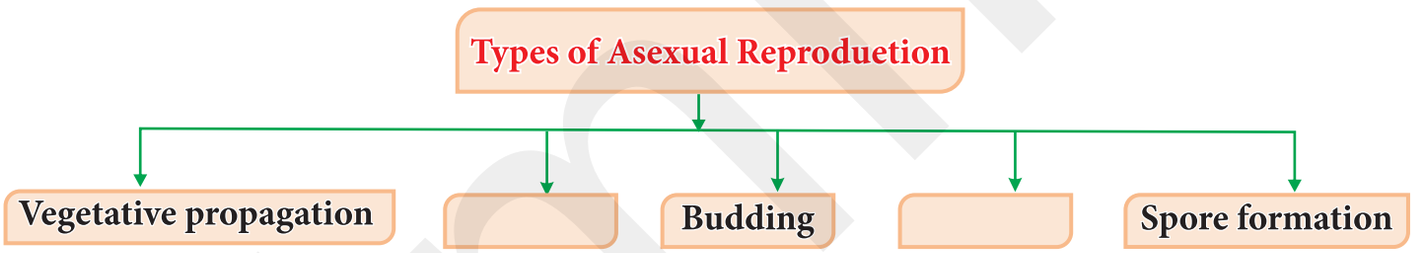
1. What are the advantages of asexual reproduction?
2. Explain how does bread mould reproduce.
3. Why is seed dispersal important in flowers? How are seeds dispersed? Explain with examples.
4. Draw a labelled diagram of the reproductive parts of a flower. Explain.
5. What is pollination? Explain the difference between self-pollination and cross-pollination.

HOTS (Think and Answer)

1. Your friend says that she saw a flower that did not have a pistil. Is she telling the truth? If so, why?
2. What do you think will happen if you put a cutting of money plant in a glass of water?

Let's Recall

Complete the following diagram.



Group Discussion

Discuss the features of an insect-pollinated flower.

Creative Task

Make a chart on different types of reproduction in plants with examples.

WORKSHEET-8

Visit the market. Find out which fruits are available.

Draw seeds of the fruits. Find out how the seeds and fruits are dispersed. Find out whether the flowers are unisexual or bisexual. See whether the fruit has one, two, few or many seeds. You could also collect information though internet.

Fruit	No. of seeds	Flower unisexual/bisexual	Mode of dispersal of seeds and fruits

CHAPTER 9

Motion and Time

Introduction

- Types of motion
- Slow or fast motion
- Speed
- Measurement of time
- Simple pendulum
- Distance time graph

If we look around we find different objects moving. In our previous class, we have studied what is motion and the different types of motion. Let us recall, motion could be in a straight line, it could be circular or periodic.

TYPES OF MOTION

The motion of soldiers in a march past or the cars moving on a road is translatory motion. Motion of a pendulum or that of a swing is periodic motion. The motion of the earth around the sun is circular motion.

SLOW OR FAST MOTION

The motion of some objects is slow, while that of other objects is fast. Some objects move faster than other objects. For example, a train runs faster than a car, and a car runs faster than a cycle. Even the same vehicle may move faster or slower at different times. How do we decide which object is moving faster or slower? The distance moved by objects in a given interval of time helps us to determine which object is moving faster or slower. Thus, we need to know two things to understand how fast an object is moving:

- Distance travelled by the object.
- Time taken by the object to cover the distance.

When we say an object is moving fast or slow, we are referring to its speed.

SPEED

Speed is the distance travelled by an object in unit time.

When we say that the bike is moving with a speed of 80 kilometer per hour, it means that it will cover a distance of 80 kilometer in one hour. The speed of the bike will not be uniform. It

will start slowly and then pick up speed, it will depend on the traffic, or on the kind of road. When we say the bike has a speed of 80 kilometer per hour, we are considering the total distance covered by it in one hour. What we actually calculate is the average speed.

$$\text{Thus speed} = \frac{\text{Total distance covered}}{\text{Total time taken}}$$

When a body covers equal distances in equal intervals of time it is said to be uniform motion. However, if the object moving in a straight line keeps changing its speed, it is said to be in non-uniform motion. In daily life, it is very rare to find objects moving with a constant speed over a long distance or for long durations of time.

MEASUREMENT OF TIME

We all know how important time is. Right from the time we get up till the time we go to sleep, we perform various activities in which we need to know the time. These days we see the time with a clock. In earlier times there were no clocks, then how did elders come to know the approximate time?

In older days, people used the events or phenomenon in nature which repeated themselves at regular intervals. For example time interval between one sunrise and the next is a day. The time interval between sunset to sunrise is called a night, the time between one full moon to another was a month. A year was measured as the time taken by the earth to complete one revolution of the sun.

Some devices made by man to measure time were sundial, water clock and sand clock.

Sun Dial

It measures time by the position of the sun. The length of the shadow cast by an object will change with the time of the day as the position of the sun changes. One can see sundial at Jantar Mantar in New Delhi.

Sand Clock

It is based on the fact that a fixed time, usually an hour is taken for the sand to fall from the upper chamber to the lower chamber. Hence this clock is also called the hour clock.

Water Clock

In water clock, water is used instead of sand.

Some ancient time-measuring devices

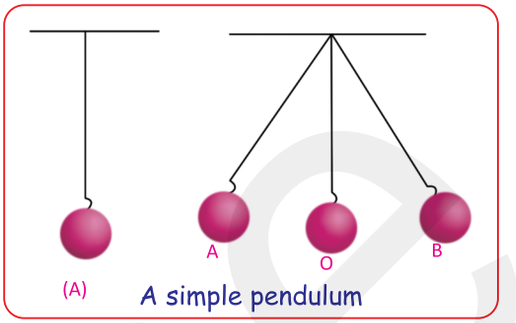
The above devices were not very accurate and there was a need for a more precise instrument for recording time.

In 1656, Christiaan Huygens, a Dutch mathematician and physicist made the first pendulum clock. It was based on periodic motion.

SIMPLE PENDULUM

A simple pendulum consists of a small metallic ball(or a stone) called a bob suspended from a rigid stand by a thread.

Figure (A) shows the pendulum in the rest position. This position is also called its mean position. When the bob of the pendulum is pulled to a side and released, it begins to move to and fro at fixed intervals. This back and forth motion of a simple pendulum is an example of periodic or oscillatory motion.



A simple pendulum

When the bob moves from one position and returns to the same position, it is said to complete one oscillation. The path of oscillation could be (i) between two extreme positions i.e. from A to B and back to A or (ii) Start from the mean position O, moves to A, to B, and back to O.

The time taken by the pendulum to complete one oscillation is called its time period.

Activity – 1

Take a string about 30 cm long and tie a stone or a small metallic ball at one end. Tie the other end to a rigid surface like door handle or knob, so that it can swing freely without touching any object. Switch off the fan in the room. Mark the mean position of the bob on the floor or on the wall. Release the string attached to the bob from one extreme position and let it oscillate freely. Measure the time it takes to complete 10 oscillations with the help of a stop-watch.In case you do not have a stop-watch use a wrist watch or a wall clock having a seconds needle. Note down the reading. Divide the time taken to complete the oscillations by 10, you will get the time period of the pendulum. Repeat the activity a number of times. You can repeat the activity with different number of oscillations like 20,30 etc.

S. No.	Time taken for 10 oscillations	Time period
1.	a	a/10
2.		
3.		
S. No.	**Time taken for 20 oscillations**	
1.		
2.		
3.		

Facts to know

The time period of a pendulum varies with the length of the string. It increases with increase in length.

What do you notice? You will observe that the time period is the same in each case. This shows the constancy of time period of the pendulum.

Winding clock and wrist watches are refinements of the pendulum clocks. All clocks make use of some periodic motion whether it is a wall clock or a table clock or a wrist watch. Now a days clocks have an electric circuit using one or two cells. These clocks are called quartz clocks or digital clocks. They are much more accurate than the clocks available earlier.


Wall clock


Wrist watch


Stop clock

Digital clock

Let's Remember

Give one word for each one of the following.

1. Give two examples of periodic motion.
2. What is meant by the time period of a pendulum?
3. Which is more accurate a pendulum clock or a quartz clock?
4. Is the time period of a pendulum dependent on the length of the string? If yes how does it vary?

Units of Time and Speed

The standard unit of time is second. It's symbol is 's'. Bigger units of time are minutes (min), hours (h) and days (d).

Let us recall $1\ \text{min} = 60\ \text{s}$

$1\ \text{hr} = 60\ \text{min}$

Since speed $= \dfrac{\text{distance}}{\text{time}}$ the basic unit of speed = m/s or ms^{-1}

It can also be written as m/min or km/hr.

Note : The symbols of all units are written as singular. Now that we know the units of speed, Let us calculate average speed.

Example : Three boys A, B and C took part in a 100 m race. They took 10,12,15s respectively to complete the race. Who ran the fastest and who ran the slowest?

A ran the race in 10s, hence his speed $= \dfrac{100}{10} = 10\ ms^{-1}$

B ran the race in 12s, hence his speed $= \dfrac{100}{12} = 8.3\ ms^{-1}$

C ran the race in 15s, hence his speed $= \frac{100}{15} = 6.33\ ms^{-1}$

Hence A ran the fastest as his speed is 10 ms^{-1}, where C ran the slowest as his speed is 6.33ms^{-1}.

Do you know that special clocks are available which can measure time intervals as small as one billionth of a second. Such time Intervals are used in scientific research.

Measuring speed

Let us measure the speed of a moving ball.

Activity – 2

Draw a straight line on the ground, about 2 m in length. You stand at one end of the line and let your friend stand at the other end. Ask your friend to gently roll the ball along the line from point A to B. Note the time it takes to travel the distance A to B with the help of a stop watch and also note down the time it takes when it comes to rest. How much time does it take to rest? Repeat the activity 4 times. Record your observations.

S. No.	Stop watch reading	Distance travelled	Average speed
1.			
2.			
3.			
4.			

Calculate the average speed.

You can calculate the speed of both your friend and yourself while walking, jogging, running and cycling over a fixed distance. Determine who is the fastest and the slowest among you by calculating the speed in ms^{-1}.

Motion is dependent on speed. Higher the speed faster the motion and vice versa.

Once you know the distance travelled and the time taken by a moving body, the average speed can be calculated. Similarly, once the speed of an object is known the distance moved by it in a given time can be calculated.

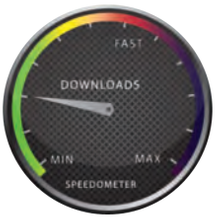
Distance = speed × time

Likewise, the time taken to cover a distance can also be calculated once the speed and distance are known. Time = Distance/speed.

Facts to know

Falcon is the fastest creature on earth. It can achieve a speed of 320 km/hr.

Cars, buses and other vehicles are fitted with a speedometer on the dashboard. It records the speed of the vehicle in km/h. There is another instrument fitted which records the distance moved by the vehicle. This meter is called odometer.



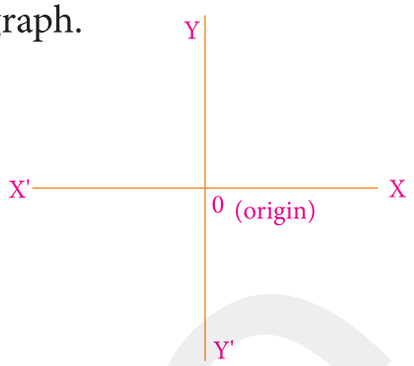
Speedometer and Odometer

DISTANCE TIME GRAPH

The motion of an object can be represented by the distance time graph.

How to draw a graph

Take a sheet of graph paper. Draw two lines perpendicular to each other. The lines represent the two axes— X-axis and Y-axis. Mark the two lines as XOX^1 and YOY^1 as shown in the figure. The horizontal line is called the X-axis and the vertical lines is called the Y-axis. The point where the two axes meet is called the origin and is marked as O. All positive values are shown along OX and OY only.



X-axis and Y-axis on graph paper

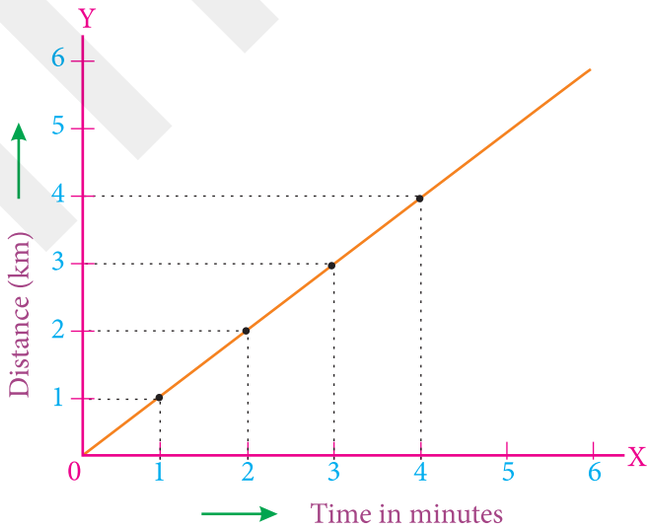
Suppose, while travelling in a car, your friend noted down the distance and the time taken for it to cover that distance. The data is as under :

S. No.	Time (m)	Distance (Km)
1.	0	0
2.	1	1
3.	2	2
4.	3	3
5.	4	4

Represent the data in the form of graph. Time is always taken along the X-axis and distance along the Y-axis.

You can now make a graph as follows :

- Draw two perpendicular lines. They represent the two axes, mark them as OX and OY.
- Represent time along the X-axis and distance along the Y-axis.
- Next decide on the scale to represent time and distance



Distance time graph:

- Plot the values of time and the corresponding value of distance given in the table.
- In the above graph, the set of points corresponding to the position of the car at various times is shown.
- Join all the points on the graph. It is a straight line. The above graph is called a distance-time graph.

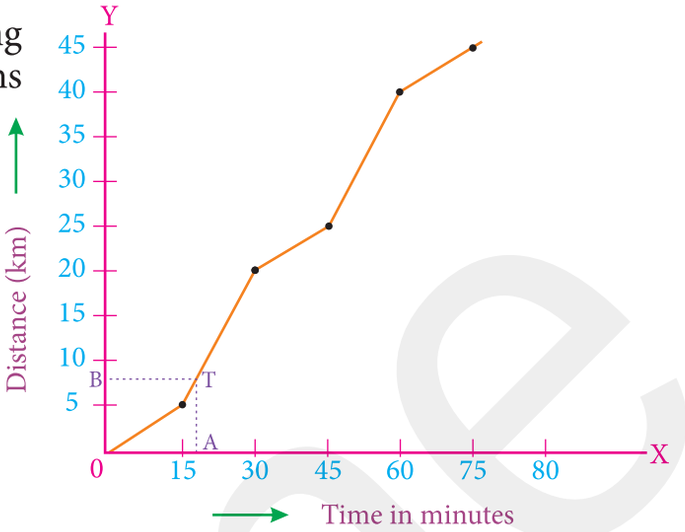
If the distance-time graph is a straight line, it indicates that the body is moving with a

constant speed i.e. it is in uniform motion. In other words, a body is said to be in uniform motion if it covers equal distance in equal intervals of time.

When the speed of an object is not uniform during the course of the motion, the distance-time graphs are different.

Suppose a car B is in motion. Its values are :

Time (min)	Distance (Km)
0	0
15	5
30	20
45	25
60	40
75	45

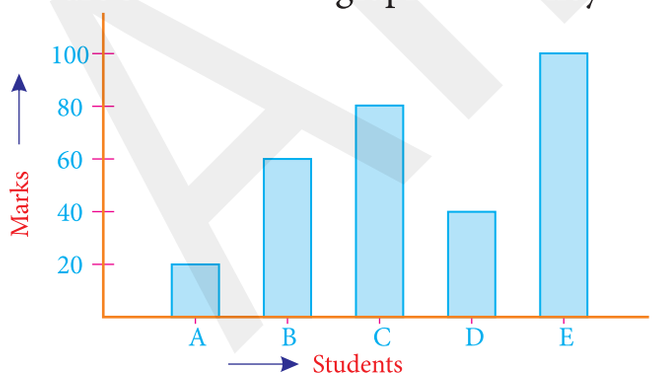


Follow the same steps as before. It is not a straight line. This shows that the car is in non-uniform motion.

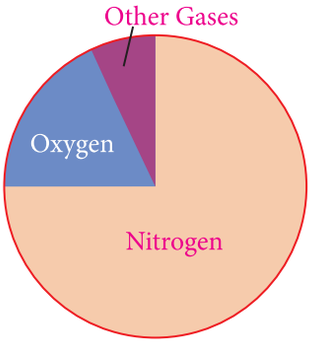
Uses of Distance-Time Graph

- They tell us whether an object is having uniform or non-uniform motion.
- They tell us the distance covered by an object in a given time period. We can determine how much the car has travelled in say 20 minutes by plotting the point corresponding to 20 min and then drawing a perpendicular line to the X-axis at point A. Then mark point T, on the graph at which this perpendicular line intersects. Next draw a line parallel to the X-axis through point T. This line intersects Y-axis at point B. Thus OB, gives the distance covered by the car in 20 minutes. We can plot the distance- time graph of two or more objects on the same graph to compare the speed.
- We can also calculate the speed from the distance-time graph.

There are other kinds of graphs also. They are called bar graph and pie chart.



Marks scored by students in English



Pie chart showing composition of air

Let's Remember

Fill in the blanks.

1. The standard unit of time is _____ .
2. The speed of vehicles is measured by _____ .
3. The small mass or metal ball in a pendulum is called _____ .
4. A pendulum shows _____ motion.

Glossary

speed	:	ratio of distance travelled to the time taken
time	:	what a clock reads
unit of time	:	second
periodic	:	intermittent
time period	:	a stretch of time
speed	:	the distance moved by a body at a given time
isochronous	:	measured at or occurring at the same time

Summary

- The distance travelled by a moving object in a unit time is called speed.
- The speed of an object helps to decide whether an object is moving slow or fast.
- The speed of an object is the distance covered by the object divided by the time taken to cover the distance. Basic unit of speed is metre per second (m/s).
- The measurement of time started with finding the time interval between periodic events.
- Time period of a pendulum is the time it takes to complete one oscillation.
- A simple pendulum consists of a small metallic ball (bob), suspended by a thread from a support.

Exercise

A. Multiple Choice Questions (MCQs)

Tick (✓) the right option .

1. This is an example of translatory motion _____ .

(a) Motion of a spinning top ☐ (b) Motion of a train ☐

(c) Motion of a swing ☐ (d) Motion of a pendulum ☐

2. The basic unit of speed is _____.

(a) Km/hr ☐ (b) Km/s ☐

(c) m/s ☐ (d) km/min ☐

3. This is not used for measuring time _____.

(a) Water clock ☐ (b) Sun dial ☐

(c) Pendulum ☐ (d) Metre scale ☐

4. Which one is correct? Time = _____.

(a) Distance×speed ☐ (b) Distance÷speed ☐

(c) Speed÷distance ☐ (d) $\frac{1}{\text{distance} \times \text{speed}}$ ☐

5. The Instrument used to measure distance covered by a vehicle _____.

(a) Speedometer ☐ (b) Odometer ☐

(c) Anemometer ☐ (d) Voltmeter ☐

B. Write 'T' for true and 'F' for false statements.

1. A device in which falling sand is used to measure time is called a water clock. ☐
2. All moving bodies have constant speed. ☐
3. Motion of the hammer of an electric bell is periodic motion. ☐
4. A sand clock can tell the time of the day. ☐
5. Most of the natural phenomenon are periodic in nature. ☐

C. Match the following.

Column A	Column B
1. Speed	a. brass bob
2. Simple pendulum	b. measures time
3. Clock	c. ms^{-1}
4. Distance time graph	d. velocity

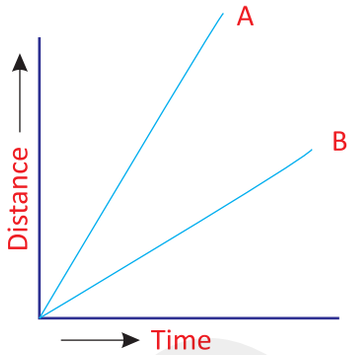
D. Answer the following questions in short.

1. What is average speed?
2. What is periodic motion?
3. What are the parts a simple pendulum?
4. A car takes 5 hrs to cover a distance of 150 km. Calculate its speed.
5. Define oscillation and the time period of a pendulum.

E. Answer the following questions.

1. Differentiate between uniform and non-uniform motion with examples.
2. How can we determine the speed of an object from its distance time graph?
3. Describe a simple pendulum with the help of a labelled diagram.
4. Name the three types of graphs. Give examples of the same with labelled diagrams.
5. Your father takes 30 minutes to reach his office from home in his car. If his car has a speed of 20 km/hr, calculate the distance between his house and office.

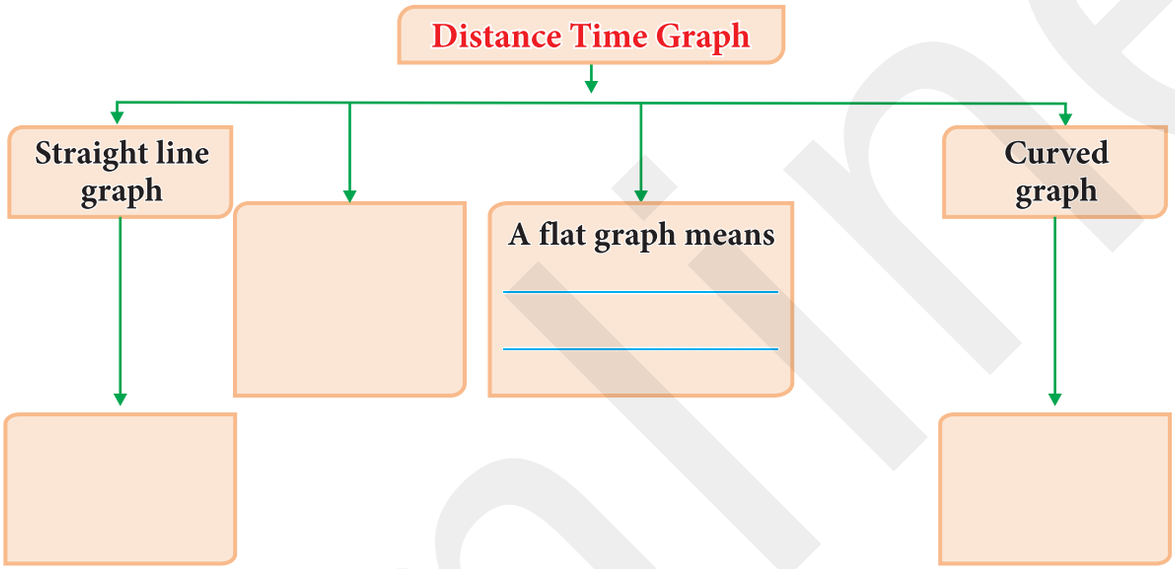
HOTS (Think and Answer)



1. From the graph, which do you think is moving faster, and why?
2. What do you think will be the distance-time graph of a body at rest. A horizontal line parallel to the X-axis or a vertical line perpendicular to the X-axis.

Let's Recall

Complete the following diagram.



Group Discussion

1. Pendulum is still the most reliable means of measuring time.
2. Second is too small a unit to measure time.

Activity to do

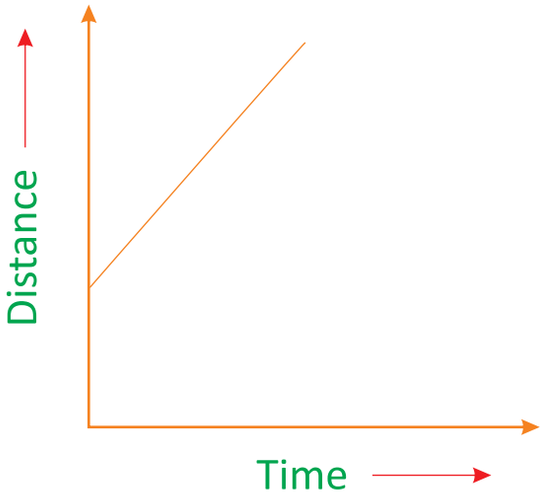
1. Make a sundial in the open courtyard of your house. Try determining the time of day using it.
2. Visit a nearby observatory or Jantar Mantar. Learn about the sundial and other fixtures in the observatory form the guide or your teacher.

Creative Task

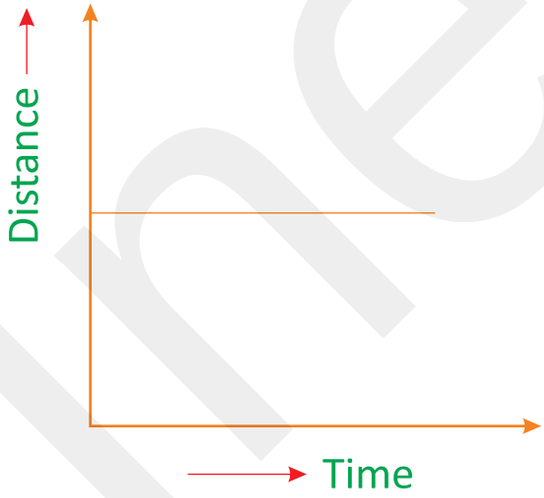
Collect information about time-measuring devices that were used in the ancient times in different parts of the world. Prepare a brief write up on each one of them. The write up may include the name of the devices, the place of its origin, the period when it was used, the unit in which the time was measured by it and a drawing or photograph of the devices, if available.

WORKSHEET-9

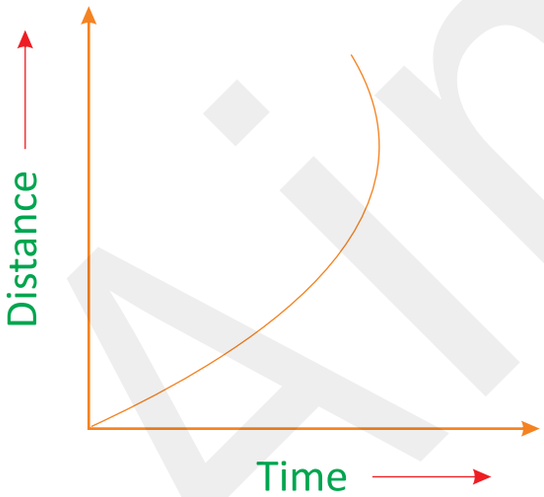
Which of the following distance-time graphs shows a truck moving with speed which is not constant?



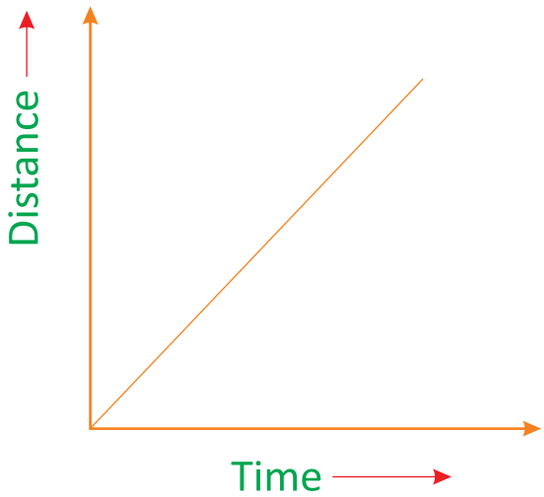
(a)



(b)



(c)



(d)

CHAPTER 10

Electric Current and Its Effects

Introduction

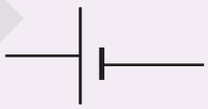
- Electric circuit
- Symbols of electric components
- Circuit diagram
- Heating effect of current
- Fuse
- Magnetic effect of current
- Electric bell

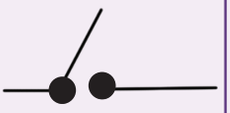
You have already studied in the previous class that an unbroken path through which an electric current can flow is called electric circuit. You also know how electric current is generated and how it plays an important role in our lives. The simplest source of an electric current is an electric cell. A simple circuit consists of only a bulb and a cell.

However, drawing electric circuits which contain a large number of components is a tedious process, so common electric components are represented by symbols.

SYMBOLS OF ELECTRIC COMPONENTS

The components such as cells, bulbs, wires, switches, battery etc are called elements of an electric circuit. Each of them is represented by a symbol.

S.No.	Elective Component	Symbol	Description
1.	Electric cell 		An electric cell is represented by two vertical lines-one longer line and a shorter but thicker parallel line. The longer line represents the positive terminal and the shorter, thicker line represents the negative terminal.
2.	Battery 		Battery is a combination of two or more cells. The positive terminal of one cell is connected to the negative terminal of the other cell.

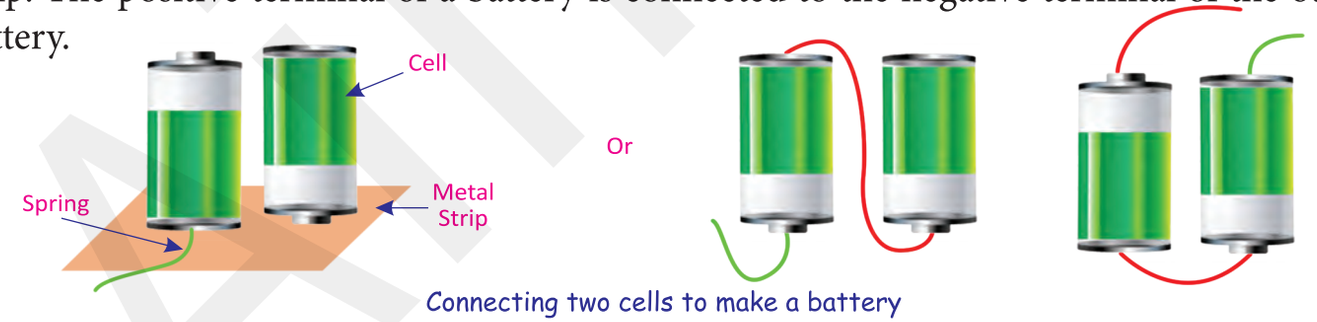
3.	Wire 		The connecting wires are represented by a straight line.
4.	Electric bulb 		An electric bulb contains a filament that glows when the current is provided.
5.	Switch in 'ON' position 		When the two points in the switch are connected, the circuit gets closed and switch is said to be in the 'ON' position. In this position current flows through the circuit.
6.	Switch in 'OFF' position 		When the two points in the switch are not connected, the circuit remains open. The switch is said to be in the 'OFF' position and current does not flow through the circuit.

Battery : Many devices like torches, transistors, toys use batteries. The cells may be placed one after the other connecting negative terminal of one with the positive terminal of the other.

A battery of two cells

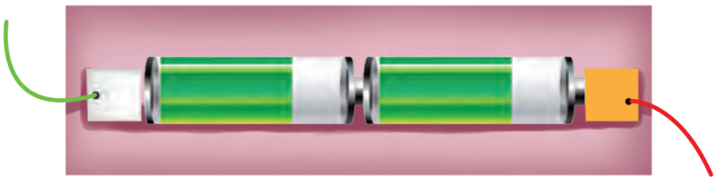
A battery of four cells

However, in some of the devices, the cells are not placed one after the other but are placed side-by-side in a compartment. The cells are connected with the help of a thick wire or a metal strip. The positive terminal of a battery is connected to the negative terminal of the other battery.



Connecting two cells to make a battery

Let us now see how can we connect cells to prepare batteries. We can make a cell holder with the help of a wooden block, two iron strips and rubber bands. The rubber band must hold the metal strip tightly. Cell holders are also available in the market for making batteries of two or more cells. Always remember to connect the positive terminal of a cell to the negative terminal of the next cell. A piece of wire is connected to each of the two metal clips on the cell holder.



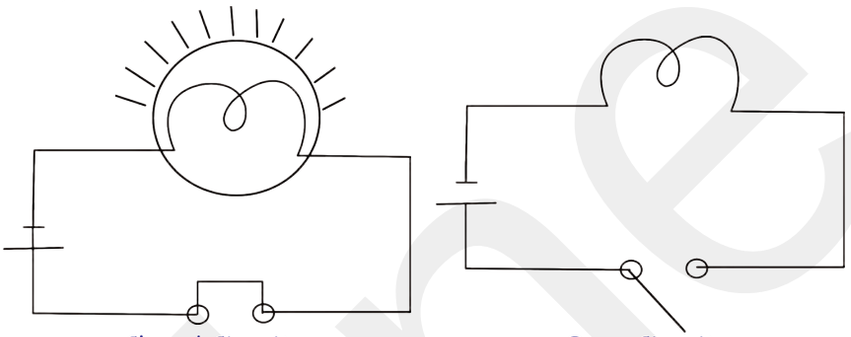
A cell holder

Holder for battery of two cells

Have you seen a battery used in inverters, cars, trucks etc. It has a number of cells in them in series. They are rechargeable.

CIRCUIT DIAGRAM

We can represent an electrical circuit using symbols for the various components as given.



Closed Circuit

Open Circuit

A diagram which shows the arrangement of various components in an electric circuit with the help of their symbols, is called the circuit diagram.

The bulb will glow only if the switch is in the 'ON' position and the circuit is closed. The current flows throughout the circuit instantly. When the switch is in the 'OFF' position, the bulb will not glow as the circuit is incomplete. No current will flow through any part of the circuit. A thin wire called filament present in the bulb glows when current is passed through it. When the filament is broken, bulb is said to be fused.

Let's Remember

Give one word for each one of the following.

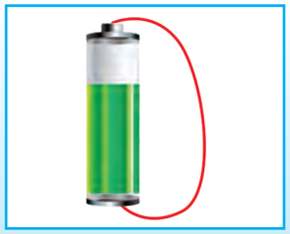
1. What is an electric circuit?
2. Name two devices which use batteries?
3. What is the thin wire of the bulb called?
4. How are two cells connected to each other?

Note : Carry out all the activities under the supervision of an adult only.

HEATING EFFECT OF ELECTRIC CURRENT

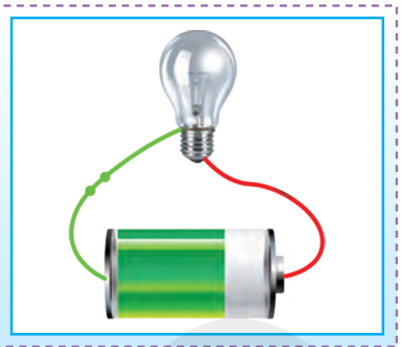
Activity – 1

Take an insulated copper wire. Connect the two ends of the wire (after removing the insulation at the ends) to the cell as shown in the diagram. Disconnect the two wires after sometime (1 min) and touch the wire at the two ends. What do you feel? You will notice that the two ends become hot.



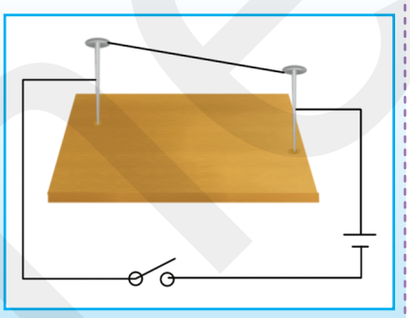
Activity – 2

Make an electric circuit using an electric cell, a bulb, a switch and connecting wires as shown in the figure. Keep the switch in the 'OFF' position. The bulb does not glow. Touch the bulb. Now put the switch in the 'ON' position. The bulb will glow. After one minute, put the switch in the 'OFF' position and touch the bulb. What do you feel? The glass of the bulb gets heated.



Activity – 3

Take about 7–8 m long nichrome wire and tie it between the nails as shown in the figure. Make a circuit. Keep the switch in 'ON' position. After a few seconds touch the wire. Switch off the current and touch the wire again. What do you observe. The wire gets hot when electric current passes through it. (Precaution = While performing these activities touch the wire only for a short time).



When an electric current flows through a wire, a part of the electrical energy is converted into heat energy and the wire gets heated.

This heating effect of current is used in several appliances which we use at home like electric iron, hot plate, electric toaster, electric hair dryer, electric kettle, geyser and electric oven. These appliances contain a coil of wire called element. The element heats up when electric current is passed through it. Have you seen the element in a toaster? It becomes red hot and gives off heat.

Electric toaster

Electric heater

Lit filament in a bulb

The amount of heat produced in a wire depends on:

- Material of the wire
- Length and thickness of the wire
- Strength of the electric current

Facts to know

Nichrome is an alloy of iron, nickle, chromium, and manganese. It does not melt at high temperature.

Depending on the requirement, wires of different materials, lengths and thicknesses are used. Long and thick wires offer higher resistance than small and thin wires. The wires used for making electrical circuits do not normally become hot, whereas heating elements in some electrical appliances like a room heater or toaster get so hot that they are seen as a dull red glow. Hence nichrome is used in the element as it offers large resistance and gets heated when current flows through it . The filament of an electric bulb is made of very thin

tungsten wire. It gets heated to such a high temperature that it starts glowing. To reduce wastage in electricity, these days fluorescent tube lights and compact fluorescent lamps (CFL's) are available which may be used in place of a bulb. They reduce the amount of heat produced due to lighting and hence reduce wastage.

Facts to know

Silver offers least resistance, but being expensive it is not used for making conducting wires.

At times if a large amount of current is passed through a wire, the wire becomes very hot and it may break or even melt.

FUSE

Electric fuse is a safety device in an electric circuit which prevents damage to electrical appliances and possibly fires caused due to excessive flow of current. Fuse is made of wires which melt quickly and break when large electric current is passed through them. In buildings, fuses are inserted in all electrical circuits. The fuse has a special wire, the melting point of which is lower than the metals which are used to make the conducting wires. When excess current flows through the circuit, the fuse wire becomes hot and melts. This creates a gap in the circuit and saves the appliance. There are different types of fuses that are used for different purposes. The common symbol used for a fuse is 

Fuse used in building

Cartridge type fuse

Fuse used in electrical appliance

Excessive electric current can be produced if

- There is improper insulation of wires as a result there is direct touching of wires.
- Many devices are connected to a single socket. This causes over load in the circuit.

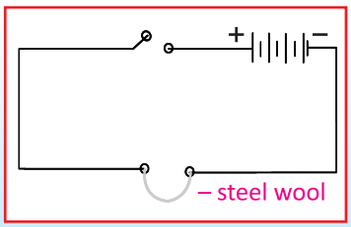
Short circuit and overload of current can cause fires.

MCB

Nowadays Miniature Circuit Breakers (MCBs) are being used in place of fuses. These are switches which automatically turn off when there is an overload or short circuit. They can be reset by hand to restore normal circuit. A fuse needs to be replaced after a single use.

Activity – 4

Set up an electric circuit as shown in the figure. Connect a strand of thin steel wool between two connecting wires. The steel wool will serve as a fuse. Turn the switch ON. Touch the steel wool wire. What do you feel? It gets hot and then melts down and breaks the circuit. When heavy current is passed through a wire having low melting point, it melts to break. This is how a fuse works.



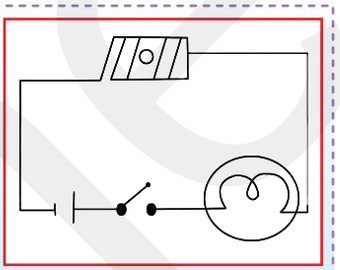
MAGNETIC EFFECT OF CURRENT

Increase in the number of coils increases the magnitude of magnetic field. The compass needle is actually a tiny magnet. As you have already studied in the previous class, the needle of the compass points in the north-south direction. The below activity shows that when current flows through the wire, it behaves like a magnet, and the needle of the compass gets defected.

Facts to know

Copper wire do not heat up when current flows through it as copper is a good conductor and it offers very little resistance to the following current.

Activity – 5



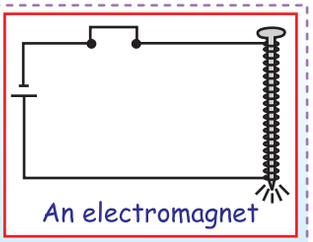
Take a tray from inside a discarded match box. Wrap an electric wire around it a few times. Place a small compass in the box. Now connect the free ends of the wire to an electric cell through a switch as shown in the figure. Note the direction in which the compass needle is pointing. Place a magnet near the compass. What do you observe? With an eye on the compass needle, put the switch in the 'ON' position. Do you observe some change? Put the switch in the 'OFF' position. What do you see? Repeat the experiment. The compass needle deflects when connected to a circuit and the deflection gets reversed when the switch is in the 'OFF' position.

Hans Christan Oersted, a Danish physicist, in the year 1820, was the first to observe deflection in a compass when current was passed through a wire. This is known as the magnetic effect of electric current. In fact electric current can be used to produce magnets.

ELECTROMAGNET

Let us make an electromagnet.

Activity – 6



Take an iron nail about 6–10 cm long. Wind an insulated flexible wire tightly like a coil on the nail. Connect the free ends of the wire to the two terminals of a cell through a switch. Switch on the current. Place some pins near the nail. What do you observe?

The nail behaves like a magnet. The pins cling to the nail when an electric current flows through it. When the current is switched off the pins drop, as the coil loses its magnetism. Such a coil is called an electromagnet.

Note: Do not switch on the current for more than a few seconds at a time, the cell will weaken very quickly.

The strength of the magnetic field can be enhanced by using a battery instead of a cell. The electromagnet works only when the current is flowing through it.

Facts to know

- Electric current is measured in amperes.
- Solenoid is a device made of a long wire that has been wound many times (usually around a hollow metalic wire) of cylindrical shape.

The strength of the electromagnet depends upon:

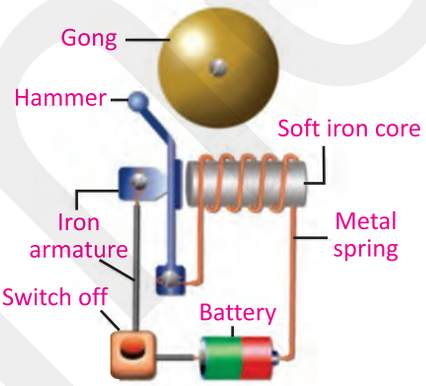
- The amount of electric current passing.
- The number of turns of a coil.

USES OF ELECTROMAGNETS

Electromagnets have many practical applications.

- In cranes to pick magnetic material from a junkyard.
- In hospitals-doctors use electromagnets to remove small pieces of magnetic material from the eye which have accidentally gotten in .
- They are used in various electrical appliances like loud speakers, electric motors, electric fans, electric bell.
- Many toys have electromagnets inside them.

ELECTRIC BELL



An electric bell

The electric bell is based on the magnetic effect of electric field. You must have often wondered what makes the door bell ring? An electric bell has an electromagnet that pulls a strip of iron that makes the hammer to hit the gong to ring the bell.

An electric bell consists of two soft iron rods mounted on a non-metalic strip. The connecting wire is wound on the rods like a coil. The coil acts as an electromagnet. The iron strip is connected to a hammer at one end. The other end of the wire is connected to a contact screw through a switch. When the iron strip is in contact with the screw, the current flows through the coil, which becomes an electromagnet. It attracts the hammer towards it. The hammer strikes the gong of the bell to produce a sound. The current flowing through the coil stops. This happens because the connection between the hammer and the contact screw breaks.

The coil stops behaving like an electromagnet. It no longer attracts the iron strip. The hammer returns to its original position due to the spring action. The hammer strikes the gong every time the circuit is completed.

Remember : When buying electrical appliances including fuse, MCBs etc ensure they have the ISI mark. This ensures that the appliance is safe.

Let's Remember

Match the following.

Column A	Column B
1. A drawing of an electric circuit	a. circuit breaker
2. MCB	b. heating effect of current
3. Heater	c. magnetic effects of current
4. Electromagnet	d. circuit diagram

Glossary

cell	:	an arrangement to convert chemical energy into electrical energy
battery	:	a series combination of two or more cells
electric components	:	these are the devices which form an electric circuit
electric circuit	:	an arrangement through which current can flow
heating effect	:	production of heat when electric current is passed through a wire
magnetic effect	:	it is the production of magnetic field around a wire when a current is passed through it
electromagnet	:	it is a magnet produced by passing a current through a wire wound around an iron core

Summary

- The components such as cells, bulbs, wires, switches etc are called elements or components of an electrical circuit.
- For convenience, scientists have developed symbols to represent electric components.
- A diagram showing arrangement of various components in an electric circuit using symbols is called a circuit diagram.
- When an electric current passes through a wire, it gets heated. This is called the heating effect of current. It has many useful applications in electric appliances like electric iron, immersion rod, toaster, hot plate etc.
- Electric fuse is a safety device that protects the electric appliance from damage and prevents fire. These are wires made of some special material which melt quickly and break when large electric current are passed through them.
- A wire carrying current behaves like a magnet.
- An electromagnet is a current carrying coil of an insulated wire wrapped around a piece of iron.
- Electro magnets find many uses in our daily life. They are used in devices like electric bell, electric motor, cranes, toys etc.

Exercise

A. Multiple Choice Questions (MCQs)
Tick (✓) the right option.

1. Electromagnets are used in _____ .
   (a) Heater ☐ (b) Electric iron ☐
   (c) Electric bell ☐ (d) Electric switch ☐
2. The correct symbol of a cell is _____ .
   (a) ⊣⊢ ☐ (b) ⊣⊢ ☐
   (c) ⊣‖⊢ ☐ (d) ⊣‖⊢ ☐

3. The device used to prevent the flow of excess current in the circuit is _____ .

(a) Switch ☐ (b) Coil ☐

(c) Cell ☐ (d) Fuse ☐

4. The thin wire inside a bulb is _____ .

(a) Coil ☐ (b) Filament ☐

(c) Magnet ☐ (d) None of these ☐

5. MCB is a _____ .

(a) Safety device ☐ (b) Heating device ☐

(c) An electric circuit ☐ (d) All three ☐

B. Write 'T' for true and 'F' for false statements.

1. Electric current flows in the circuit when switch is in the 'ON' position. ☐
2. The electrical fuse is based on the magnetic effect of current. ☐
3. Fuse wire has low electric resistance. ☐
4. Electric current can be used to make magnets. ☐
5. The more the current in a wire, hotter it will get. ☐

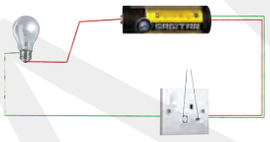
C. Fill in the blanks with the correct words.

strip filament single current electric

1. The simplest source of an electric current is an _____ cell.
2. The rubber band must hold the metal _____ tightly.
3. The _____ of an electric bulb is made of very thin tungsten wire.
4. A fuse needs to be replaced after a _____ use.
5. Electric _____ is measured in amperes.

D. Answer the following questions in short.

1. Draw symbols representing-a bulb, a switch in the off position, an electric fuse and a battery consisting of four cells.
2. What are the essential components of an electric circuit?
3. Draw diagram to represent the following circuit.



4. Name two effects of electric current.
5. What is a fuse?

E. Answer the following questions.

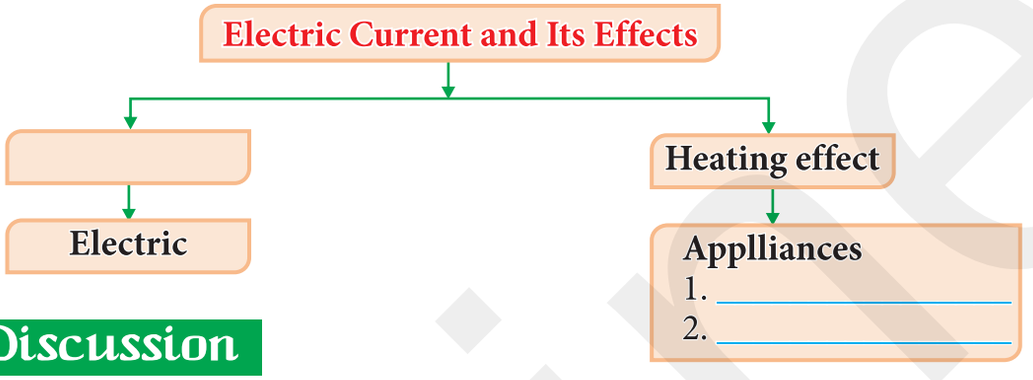
1. How does an electric bell work?
2. What is meant by the heating effect of current? Name five appliances based on its effect.
3. How will you make an electro magnet in the laboratory?
4. What is an electromagnet? Give some uses of it. Name two factors on which the strength of an electromagnet depends on?

HOTS (Think and Answer)

1. Why do your think a fuse is made of a long wire having a low melting point?
2. Do you think an electromagnet can be used for separating paper and plastic from a garbage dump? Why?

Let's Recall

Complete the following diagram.



Group Discussion

1. A MCB is better than an old fuse wire.
2. Divide the class into two groups. Hold a discussion/debate over the advantages and disadvantages of using CFLs over electric bulbs (incandescent bulbs) for lighting.

Activity to do

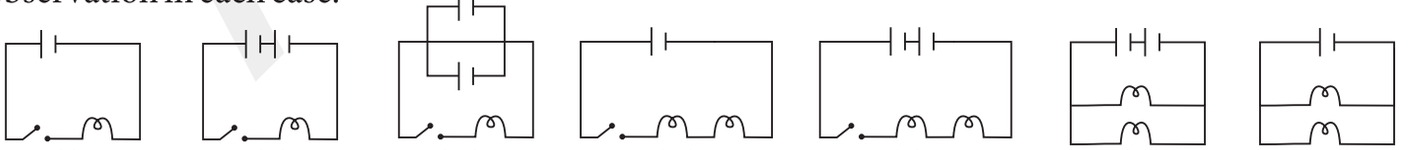
Electro Magnetic Suction.

- Take 5 ft copper wire (insulted).Wrap it tightly round a drinking straw. Your solenoid should be about 3 ft long. You will have enough wire to wrap a couple of layers.
- Trim the edges of the straw so that they stick out of the solenoid.
- Hold the solenoid horizontally and put the end of the needle in the straw. What happens?
- Strip an inch of insulation off each end of the wire and connect the end to a 6 V battery. Insert the needle part-way in the straw again. This time what happens? Don't let the wire remain connected to the battery for more than a few seconds it will get hot and drain the battery.
- When you connected the solenoid to the battery current flowed through the wire creating a magnetic field. The field attracted the needle just like a magnet and sucked it into the straw.

Note : Carry out this fun activity under the supervision of an adult.

Creative Task

Make the following circuits and record your observations about the brightness with which the bulbs glow. Rate the brightness as: very little, medium, bright and very bright. try to find reasons for your observation in each case.

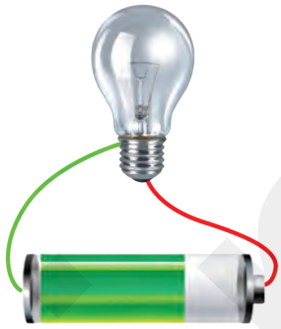


WORKSHEET-10

1. Look at the pictures given below. The bulb will not glow in any of the cases. The reasons are given. Draw lines to match the correct boxes with the figures given below.

(a)

(b)



(c)

(d)

(a) The source that produces an electric current is missing.	(b) The path is broken or incomplete.	(c) There is no wire for electric current to flow through.	(d) The rubber band blocks the flow of current as it is an insulator.

2. Define the following terms.

a. A battery

b. Closed electrical circuit

c. Heating effect of current

CHAPTER 11

Light

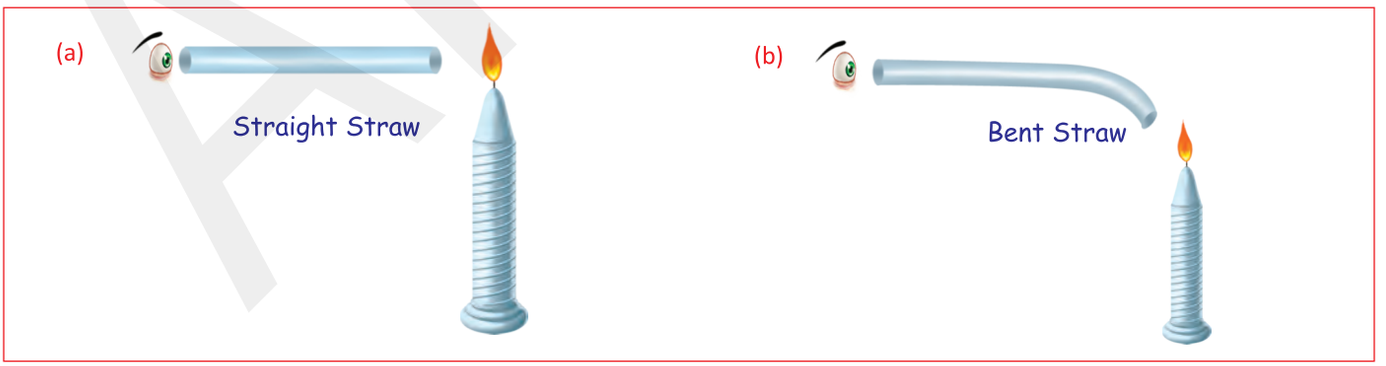
Introduction

- Rectilinear propagation of light
- Reflection of light
- Mirror-plane and spherical
- Real and virtual images
- Lateral inversion
- Lens—convex and concave lens
- Formation of images by lens
- Sunlight—white or coloured
- Dispersion of light
- Newton's disc

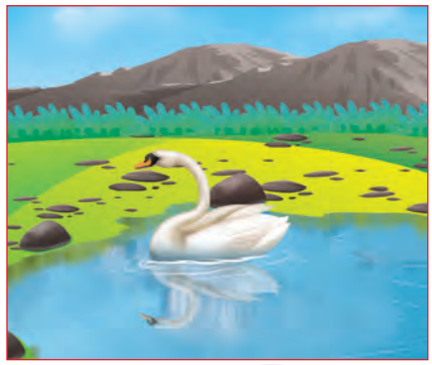
We have already learnt that light is a form of energy. We cannot see anything without light. When you see the beam of light either from a torch or that coming from the head lights of a car, you notice that light appears to travel in straight line.

LIGHT TRAVELS IN STRAIGHT LINE

In the previous class, you had performed an activity to show this. You first observed the flame of a candle through a straight straw and then through a bent straw. If you recall, you were not able to see the flame with the bent straw. This activity showed that light travels in straight line. This property of light is called rectilinear propagation of light.



REFLECTION OF LIGHT



Reflection in water

When light falls on a polished surface, such as a mirror or a shining stainless steel plate, some of it is absorbed and some bounces back. You know that light travels in straight line, but we can change the direction of light by reflection. The surface of water also acts like a mirror and it can change the direction of path of light. You must have noticed reflection of trees, buildings etc in water. The change in direction of light by a mirror is called reflection of light.

Activity – 1

Place a lighted candle in front of a plane mirror. Try to see the candle in the mirror. It appears that a similar candle is placed behind the mirror. The candle is called the object and the copy of the object in the mirror is called its image.

Now move the candle to a different position in front of the mirror. Observe the change in the position of the image.

Now place a vertical screen (a sheet of white paper) behind the mirror and try to obtain the image of the candle on it.

Next bring the white sheet in front of the mirror. Can you see the image of the candle now?

It seen that when the candle is kept 8 cm from the mirror, image also seems to be 8 cm behind the mirror.

The image formed is upright in each case. The top and bottom of the image is same as the top and bottom of the object. Such an image is called erect. You cannot touch the image obtained on the mirror as the image appears to be behind the mirror. Such an image is called a virtual image.

The size of the image of the candle is the same as the size of the candle.

The image of the candle cannot be obtained on the white sheet of paper in both the cases.

Thus, it is seen that an image formed by a plane mirror is

- Erect
- Virtual- i.e. it cannot be obtained on a screen.
- Of the same size as that of the object.
- At the same distance from the mirror as the object is in front of it.
- The image appears to be formed found behind the mirror.

Facts to know

We see objects when light reflected from them reach our eyes.

Activity – 2

Stand in front of the mirror. Hold your left ear with the left hand. Which ear does your hand hold in your image? Observe carefully. You will see the right hand holding the right ear. In the mirror the 'right' appears 'left' and the 'left' appears right. Now write a few words on a piece of paper and hold it in front of the mirror.

TO	→	OT
Ǝ	→	E
YOT	→	TOY
NAHOR	→	ROHAN

Thus, it is seen that images formed on a plane mirror interchange sides only. However, the image does not appear upside down. This inter change of sides left to right and vice versa between the object and its image called lateral inversion.

Now, you will be able to understand why AMBULANCE is written in an inverted manner on an ambulance van. When the driver of a vehicle in front of the van looks in the rear-view mirror of his/her vehicle, they will read it as AMBULANCE.
and then allow it to go ahead by making way for it.

An ambulance

Plane mirrors have many uses. They are used in :

- Looking glasses
- Periscopes
- Kaleidoscopes
- Solar cookers as a reflector

SPHERICAL MIRRORS

Let us study the characteristics of images formed by spherical mirrors. Spherical mirrors are mirrors with a curved surface.

Activity – 3

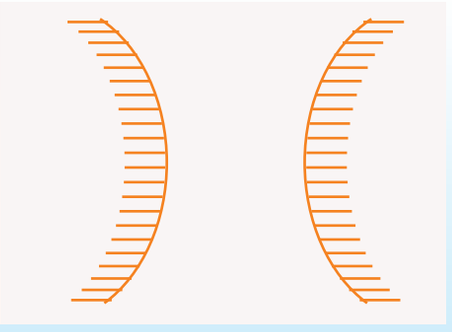
Take a shiny stainless steel spoon. Look at your reflection in it both on the outer side of the spoon as well as on its inner surface. Do you see your image on it? Is the image different from what you see in the plane mirror?

The stainless steel spoon serves as a spherical mirror. It has two types of reflecting surfaces one that bulges out to form a convex surface, and one that curves inwards to form a concave surface.

Outer side Inner side

On the concave side of the spoon/inside of the spoon your image formed will be erect and larger in size. If you increase the distance of the spoon from your face, the image will be inverted.

Whereas, on the convex side of the spoon (outside of the spoon) your image formed will be a real image.



Concave mirror Convex mirror

Concave and convex mirrors are called spherical mirrors because they are a part of a sphere. To understand this better, take a coconut which has been cut into a half. The inner surface of the cut coconut is called concave and the outer surface is called convex.

Some common examples of curved mirrors are spoons, laddles, kadhai, shaving mirrors, car mirrors etc.

FORMATION OF IMAGES IN A CONCAVE MIRROR

Activity – 4

Fix a concave mirror on a stand and place it on a table.

Place a white sheet of paper in front of it. This will act as a screen. It would be better if the paper is pasted on a card board sheet.

Place a lighted candle at a distance of about 50cm from the mirror.

Real images formed by a concave mirror

Try to get the image of the flame on the screen by changing the position of the screen. What kind of image is formed?

Virtual image formed by a concave mirror

Move the lighted candle closer towards the mirror at different distances. Again adjust the white screen to obtain the image of the candle flame on it. What do you observe? Record your observations in the tabular form. When the candle is placed very near to a concave mirror, a virtual image is formed behind the mirror. The image is erect and magnified.

In other cases, real, inverted image is formed smaller than the size of the object. Size of the image increases as the lighted candle is brought closer to the mirror.

Image formed by a concave mirror for objects placed at different distances from it.

Distance of the candle from the mirror	Smaller/Larger than the object	Nature of the image	
		Erect or Inverted	Real or Virtual
50 cm 40 cm 30 cm 20 cm 10 cm	Enlarged	Erect	Virtual

Thus it is seen that image formed by a concave mirror may be smaller or larger than the object. It can also be real or virtual. As the distance of the object from the concave mirror increases, the size of the image also decreases.

USES OF CONCAVE MIRROR

- Used in head lights of cars/torches/scooters/search lights.
- Used by doctors for examining eyes, ears, nose and throat.
- Used by dentists to see an enlarged image of the teeth.
- Used as shaving mirrors and make-up mirrors to see an enlarged erect image of the face.
- Used in reflector type telescopes.

Shaving mirror

Telescope

IMAGES FORMED BY CONVEX MIRRORS

Activity – 5

Repeat the activity 4, using a convex mirror instead of a concave mirror. Record your observations in a table similar to the one used in activity 4. What did you notice?

The image formed by a convex mirror is always virtual, erect, and smaller than the object, irrespective of the position of the object from the mirror.

USES OF CONVEX MIRRORS

- Used as rear view or side view mirrors in cars and scooters. They view a large area much wider than that of a plane mirror.
- These mirrors help the driver to see the traffic coming from behind.
- Used in shops/malls for surveillance.

Convex mirror or side view mirror

Nature of image formed by different types of mirror

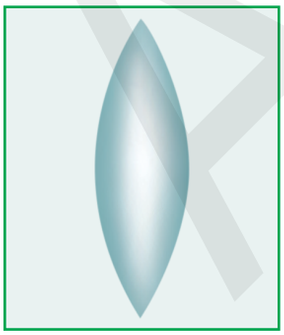
Nature of image formed			
Mirror	Real/Virtual	Upright/inverted	Size
Plane	Virtual	Upright	Same size as that of the object
Concave	Real except when the object is very close to the mirror, then image formed is virtual	Inverted when real, upright when virtual	Depending on the position of the object from the mirror. It could be diminished, enlarged or of same size as of the object
Convex	Virtual	Upright	always diminished

LENSES

A lens is a piece of any transparent material which has two surfaces, with either one or both being spherical. Lens are used in cameras, telescopes, microscopes and in spectacles. The magnifying glass which you must have used to observe very small objects is also a type of lens.

A magnify Lens

There are two types of basic lens — Convex Lens and Concave Lens.



A Convex Lens

A Concave Lens

Convex Lens is thicker in the middle than at the edges, whereas a concave lens is thinner in the middle and thicker at the edges.

Since lens are transparent light can pass through them.

Activity – 6

Take a magnifying lens (convex lens)and adjust its position in such a way that you are able to see a bright spot on the white sheet of paper placed in bright sunlight. The spot is the image of the sun. Hold the lens in the same position for sometime. What do you see? The piece of paper will start burning.

Now repeat the same experiment with a concave lens. You will not be able to see any bright spot on the paper (real image).

The convex lens forms a sharp image of a far off object whereas a concave lens does not form a sharp image. It forms a virtual image.

FORMATION OF IMAGES IN CONVEX LENS

Activity – 7

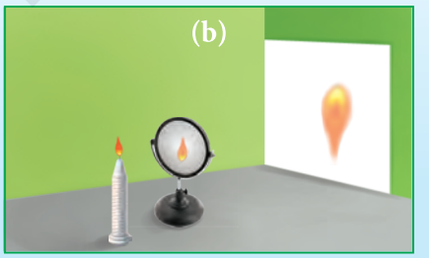
Take a convex lens and fix it on a stand. Place it on a table. Now place a lighted candle at a distance of 50 cm from it. Place a white sheet of paper (screen) on the other side of the lens. Move the screen forward and backward so as to get a sharp image of the flame.

What kind of image is seen? You will see an image that is real, inverted and smaller than the object (a).

Now bring the candle closer to the lens and again observe. The image now formed will be real, inverted and larger in size than the object (b).

Bring the candle even closer to the lens. What do you observe? The image formed is virtual, erect and magnified.

Real, Inverted and diminished image



Real, Inverted and magnified image

Activity – 8

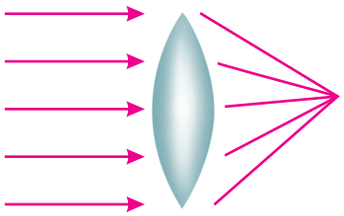
Formation of Images in Concave Lens:

Now repeat the activity 7 with a concave lens. Do you notice any difference in the image formed?

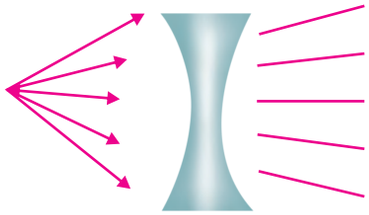
The images formed by a concave lens are erect, virtual and diminished for all positions of the object.

Virtual, erect and diminished image

A convex lens is also called a converging lens as it converges (bends inwards) the light falling on it. A concave lens on the other hand, diverges the light falling on it and is called a diverging lens.



Convex Lens



Concave Lens

Differences between Convex and Concave Lens

Convex Lens	Concave Lens
• It is thicker in the middle and thinner at the edges. • It is a converging lens. • Forms real and inverted images for all distances. The only exception is when the object is placed very close to the lens, then it forms a virual, erect and magnified image.	• It is thinner in the middle and thicker at the edges. • It is a diverging lens. • It always forms a virtual, erect image, smaller in size from that of the object.

Let's Remember

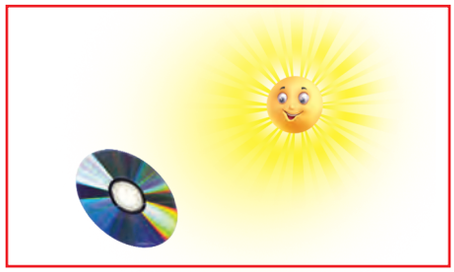
Give one word for each one of the following.

1. Define a lens.
2. Draw a convex lens and concave lens.
3. Why is a convex lens called a converging lens?
4. With the help of a diagram show that a concave lens is a diverging lens.

SUNLIGHT-WHITE OR COLOURED

Have you seen a rainbow, it usually appears after the rain when the sun is low in the sky? How many colours does it have? A rainbow is made of seven colours- violet, indigo, blue, green, yellow, orange and red (VIBGYOR). If you take a CD (Compact Disc) out in the sun, you will see many colours when light is reflected from the CD. The colours actually come from the sunlight.

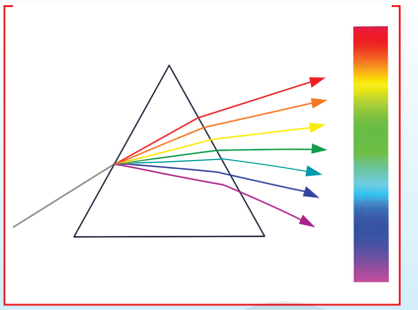
A Rainbow



A CD placed in the sun

Activity – 9

Take a glass prism. Allow a narrow beam of white light (sunlight) to fall on one face of a glass prism. Place a white sheet of paper on the other side of the prism. What do you observe? You will see a band of seven colours, similar to those seen in a rainbow. This shows that white light consists of seven colours. The process of splitting white light into a band of seven colours is called dispersion of light. The seven colours formed due to splitting of white light is called spectrum of white light.



A prism splits white light into seven colours

NEWTON'S DISC

Newton's disc is a coloured disc painted with the seven colours of the rainbow in equal sections. When the disc is rotated, very fast, the colours disappear and the disc appears white. This is because the colours get mixed together.

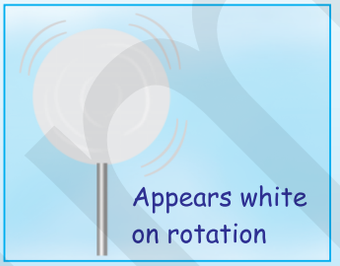
Let us make a coloured disc.

Newton's Disc

Activity – 10

Take a circular piece of cardboard. Divide it into 7 segments. Paint each segment in seven colours of the rainbow in the order of VIBGYOR. Make a small hole in the centre of the disc and fix the disc on a stick loosely. Rotate the disc quickly in sunlight. The disc will appear white.

Disc with seven colours of rainbow



Appears white on rotation

Facts to know

Sir Essac Newton was the first to show that white light consists of 7 colours.

Let's Remember

Fill in the blanks.

1. An image which cannot be obtained on a screen is called .
2. The change in direction of light by a mirror is called _____ .
3. _____ shows lateral inversion.
4. Concave and convex mirrors are called _____
5. A _____ lens is a converging lens and _____ lens is a diverging lens.

Glossary

virtual image	:	an image that cannot be formed on a screen
real image	:	an image that can be formed on a screen
erect image	:	an image that is upright (the right way up) as compared to the object
inverted image	:	an image that is upside down as compared to the object
lens	:	a curved and polished piece of glass or any other transparent material
newton's disc	:	an arrangement to combine colours

Summary

- Light travels in straight line.
- A smooth , polished, shiny surface is called a mirror.
- The bouncing back of light from the surface of an object is called reflection.
- An image which is obtained on a screen is called real image.
- Spherical mirrors are of two types - concave mirrors and convex mirrors.
- A convex mirror always forms a virtual, erect and diminished image.
- Convex lens are called converging lens and concave lens are called diverging lens.
- A magnifying lens is a convex lens which magnifies the objects.

Exercise

A. Multiple Choice Questions (MCQs)

Tick (✓) the right option.

1. A magnifying glass is a _____.
   (a) Concave mirror ☐ (b) Convex mirror ☐
   (c) Concave lens ☐ (d) Convex lens ☐
2. The image which can be obtained on a screen is called a _____.
   (a) Diminished image ☐ (b) Enlarged image ☐
   (c) Real image ☐ (d) Virtual image ☐
3. A virtual image larger than the object can be produced by a _____.
   (a) Concave mirror ☐ (b) Convex mirror ☐
   (c) Plane mirror ☐ (d) Concave lens ☐
4. The rear view glass in cars is made of _____.
   (a) Concave mirror ☐ (b) Convex mirror ☐
   (c) Plane mirror ☐ (d) None of these ☐

5. While doing make-up ladies use _____.

(a) Concave mirror ☐ (b) Concave lens ☐

(c) Convex mirror ☐ (d) Concave lens ☐

B. Write 'T' for true and 'F' for false statements.

1. A concave lens always forms a virtual image. ☐
2. Plane mirrors are used for making periscopes. ☐
3. The field of view of a convex mirror is much wider than that of a concave mirror. ☐
4. Convex lens is thicker at the edges. ☐
5. A concave mirror always form a real image. ☐

C. Match the following.

Column A	Column B
1. Glass	a. plane mirror
2. Lateral in version	b. always erect image
3. Convex mirror	c. used in telescope
4. Convex lens	d. transparent
5. Diffused reflection	e. irregular surface

D. Answer the following questions in short.

1. What kind of image does a plain mirror produce?
2. What is lateral inversion?
3. What is the difference between real and virtual images?
4. Mention two uses each of concave mirrors and convex mirrors.
5. Give two differences between a concave and a convex lens.

E. Answer the following questions.

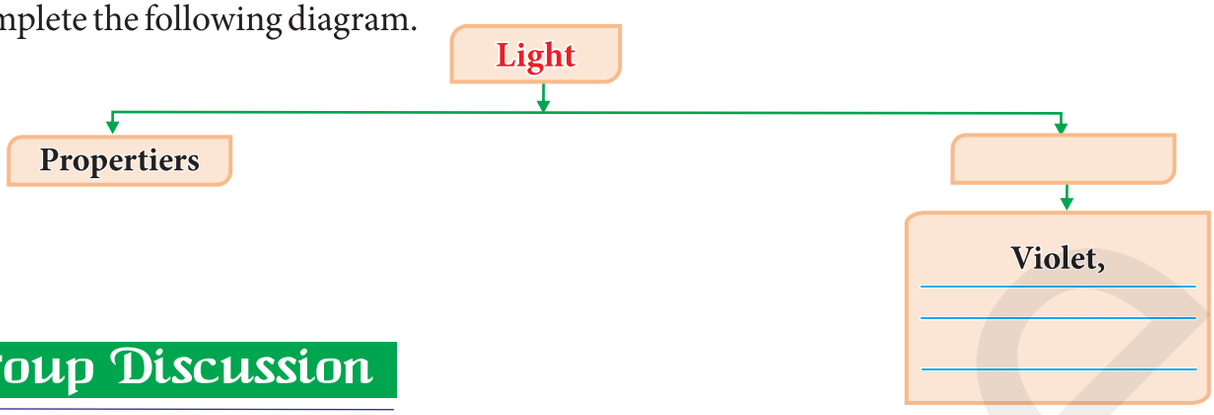
1. How will you differentiate between concave, convex and plain mirrors?
2. Explain why the word Ambulance is written as ƎɔИAlUꓭMA on an ambulance?
3. How is a convex lens similar to a concave mirror?
4. What do you mean by dispersion of white light? With the help of a diagram show dispersion of white light by a prism.
5 Show with the help of an activity that convex lens converges rays of light whereas concave lens does not.

HOTS (Think and Answer)

1. Why do you think rear side mirrors are made of convex mirror and not concave mirror?
2. What do you think will be the size of the image of an object in a big plane mirror and a small plane mirror?

Let's Recall

Complete the following diagram.



Group Discussion

1. Mirrors are better than lenses.
2. Real and virtual images.

Activity to do

Make a water Magnifier :

You will require :

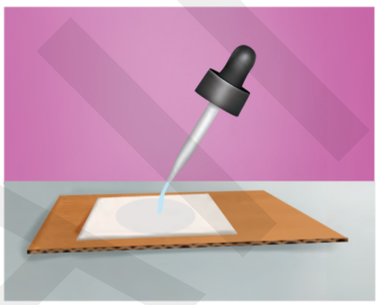
- A piece of cardboard
- transparent tape
- coin
- pencil, scissors
- an eye dropper or a drinking straw

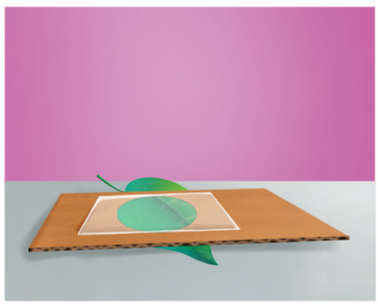
(i) Cut a cardboard square 3×3 inches. Trace a coin, in the middle of the square using a pencil.

(ii) Cut out the traced circle. Stick a piece of transparent tape over the hole.

(iii) With the help of an eye dropper or a drinking straw, put a drop of water on the tape. The water should form a small round lens.

(iv) Now using this as a magnifier, try to read a news paper with it. You can also study leaves and other objects close up.





Creative Task

Take a new shining metal spoon and hold it a little distance away from your face. With the concave side of the spoon towards you, slowly bring your face closer to the spoon. Observe the changes in the image being obtained on the spoon. Repeat the same for the convex side of the spoon.

WORKSHEET-11

1. Locate as many words/terms used in this chapter from the following word-maze.

A	B	C	D	E	F	G	H	V	B	I	J	K
W	X	Y	Z	C	D	E	P	I	X	E	J	Z
K	T	L	M	O	M	E	T	R	E	X	A	Y
A	B	C	D	N	P	E	T	T	I	Q	X	M
L	M	N	O	V	L	E	T	U	J	S	E	S
P	Q	R	S	E	T	E	M	A	K	T	M	R
X	Y	Z	L	X	X	X	M	L	Q	S	P	Q
L	R	E	F	L	E	C	T	I	O	N	O	T
P	Q	S	T	E	Y	Z	W	M	R	L	E	T
G	H	I	Y	N	J	K	L	A	I	R	M	N
Z	Y	A	X	S	D	E	F	G	X	Y	O	Z
W	R	S	T	U	Y	K	L	E	U	V	W	R
X	Y	Z	R	A	I	N	B	O	W	P	Q	R

2. Draw a ray diagram for the formation of an image by a concave mirror when the object is placed very near to the mirror.

CHAPTER 12

Forests: Our Lifeline

Introduction

- Description of a forest
- Uses of a forest
- Interdependence of plants and animals
- What would happen if there were no forests
- Conservation of forests

Forest is a very large piece of natural land which is not fenced. It provides home to a variety of plants and animals. Various types of herbs, shrubs and trees, mosses, creepers and climbers are found here. Birds, mammals, insects, worms, reptiles and microbes grow and live in forests. About 21% of the total geographical area of India is covered with forest. About one-third of the world's surface is covered with forest.

DESCRIPTION OF A FOREST

A forest is covered with many trees such as sal, teak, sheesham, semal, neem, palash, fig, khair, amla, bamboo, kachnar etc. Several other types of trees, shrubs and herbs are also found in the forests. Additionally numerous creepers and climbers are seen on the trees. Forming a green cover over the forest.

A view of a forest

Neem

Semal

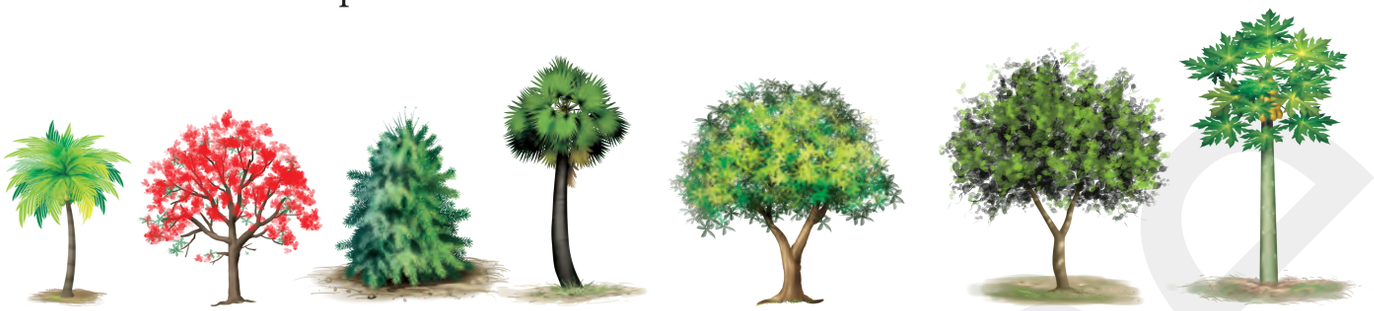
Sheesham

Teak

In certain areas of a forest, trees are so thick that sunlight barely reaches the forest floor, creating a dark environment. Trees of various heights, leaf shapes, flowers and fruits are found in the forests.

The branches of tall trees form a roof over other plants in the forest. This is called a canopy**.** It is habitat for many animals like monkeys, eagles, toucans and sloths. The trees in this layer are as high as 100 feet.

The part of the tree above the stem, which has a branch is called a crown. Different trees have crowns of different shapes and sizes.



Some crown shapes

These crowns create different horizontal layers in the forest called understoreys**.** Tall trees form the top layer followed by shrubs and tall grasses. Herbs form the lowest layer. It is a habitat for owls, lizards, jaguars, red eyed frogs and leopards.

Due to variations in climatic conditions there are differences in the types of trees, plants and animals from forest to forest.

Forest floor

Canopy and under storeys in a forest

The forest floor is very dark, covered with dead and decaying matter consisting of leaves, twigs, fruits, seeds and herbs. It is spongy and rich in nutrients, providing favorable conditions for plant seeds to germinate and grow into new plants.

The forest floor is a habitat for millipedes, beetles, insects, ants and also large animals like rhinoceros, tigers, lions, elephants and cobras. Many fungi and bacteria are also found here. Many animals like bison,

Some forest animals

jackals, porcupine, boar etc. live in the deeper areas of the forest. The environment is very peaceful in a forest.

Activity

Given below is a list of items found in homes. Write their source.

Item	Source	Item	Source
1. Plywood		2. Boxes	
3. Paper		4. Match stick	
5. Wooden furniture		6. Rubber	
7. Fuel wood		8. Cover mats	
9. Cotton clothes		10. Spices	

Find out how many come from forests.

USES OF FORESTS

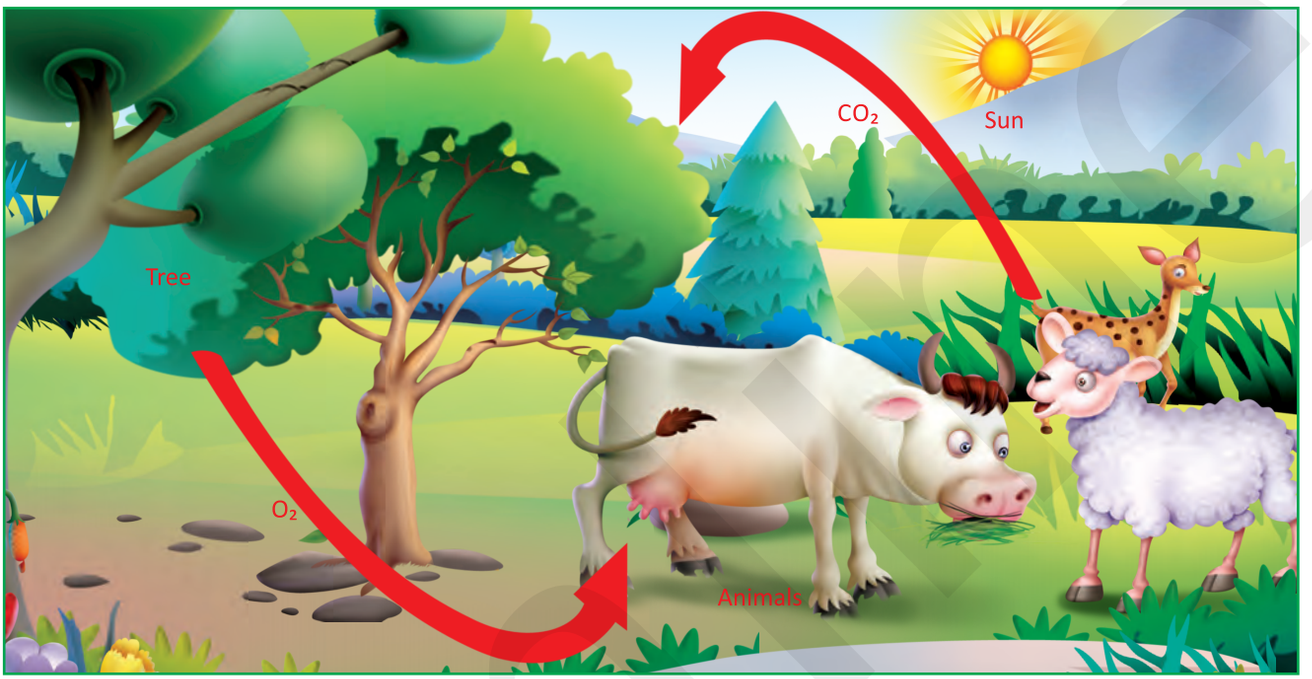
Forests are an important and useful renewable resource available on earth.

- A large number of products we use in our daily lives come from forests. Forests provide us with products like honey, gums, oils, spices, fodder for animals and medicinal plants. They also provide us with timber, firewood, fibre, paper, rubber, perfumes and dyes.


- Forests act as good absorbers of rainwater, helping to maintain the water table throughout the year. Rainwater does not stagnate in the forest as the raindrops do not hit the ground directly. The flow of raindrops is intercepted by the canopy, and then the water drips slowly over branches of shrubs and herbs. If there are no trees, rain will hit the ground directly and flood the area.
- Forests help control floods and also maintain the flow of water in streams, ensuring a steady water supply.
- Forests prevent soil erosion and floods. Trees hold onto the soil particles through their root system, preventing soil from being washed away.
- Forests purify the air as plants and trees release oxygen during the process of photosynthesis. They provide oxygen for animal respiration. They help in maintaining the balance

of oxygen and carbon dioxide in the atmosphere. This is the reason why forests are called green lungs.

- Forests regulate the climate. During the process of transpiration plants release water vapour into the air. This increases humidity and cools t he air, leading. To cloud formation and rainfall in the adjoining areas.
- Forests help to check global warming by abserving carbon dioxide during the process of photosynthesis. Carbon dioxide as you know is one of the main green house gases.



Balance of oxygen and carbon dioxide

- Forests provide a habitat for a wide variety of animals, plants and insects. The dense bushes and t tall grass also help to protect small animals from the carnivores that inhabitat the area. Insects like beetles, feed on the seedlings of herbs and shrubs. The decaying animal dung also provides nutrients to the seedlings to grow. The animals help in the seed dispersal of certain plants. This helps the forests in growing and regenrating. The abundant food opportunities in the forest support more herbivores. More the number of herbivores means better food availability for the carnivores. Decomposers help to maintain the supply of nutrients to plants in the forest. All these factors contribute to the growth and regeneration of forests.

Facts to know

Animal droppings and foot prints help the forest officers to recognise the animals.

- Forests reduce noise pollution as trees act as shock absorbers.

- Tall trees like coconut and palm act as wind breakers. Trees break the force of wind and act as shield against incoming storms.
- Many tribes live in forests. The forests provide them with food, water, shelter and medicines. They use some natural plants as medicines.
- Some forests have been developed into recreational parks, attracting tourists for hiking, camping, research and various outdoor activities.

Let's Remember

Give one word for each one of the following.

1. What do you find in forests?
2. Why is the forest floor very dark?
3. How do forests help in controlling noise?
4. How do forests help check global warming?

INTERDEPENDENCE OF PLANTS AND ANIMALS

The forests provide a home to many living organisms. The living organisms are classified into the following types:

- Autotrophs
- Heterotrophs and
- Saprotrophs

Green plants produce their own food and are called autotrophs or producers. Herbivores eat green plants and grass, while carnivores eat herbivores. Thus all ultimately depend on plants for food and are called consumers or heterotrophs**.** Without plants, herbivores and thereby carnivores would not get food. In forest, various mushrooms and micro-organisms known as decomposers, feed upon dead plant and animal tissues, converting them into humus. The humus ensures that the nutrients from dead plants and animals are released into the soil, Which is then absorbed by the roots of plants. When animals die, their remains are consumed by vultures, eagles crows, jackals etc. These animals are called scavengers and this cycle continues, ensuring the recycling of nutrients are recycled. Nothing goes to waste in the forest.

FOOD CHAIN

A grasshopper eats grass which in turn is eaten by a frog. A snake eats the frog, while an eagle eats the snake. This forms a food chain. Such a chain in which one organism eats another organism is called a food chain.

Grass → grasshopper → frog → snake → eagle

Many such food chains exist in nature. If one food chain is disturbed other food chains also get affected.

What would happen if forests were to disappear

Forests are being cleared at a very fast rate. Destruction of forests or large scale felling of trees is called deforestation and the growing population is responsible for all this.

Deforestation

If forests disappear then :

- The amount of carbon dioxide in the air will increase. This will cause the temperature of the earth to rise (global warming). Many species of plants and animals will be lost.
- The animals will not get food and shelter if there are no trees. Posing a danger to animal life.
- Deforestation will cause severe floods, soil erosion, land slides etc because in absence of trees, the soil will not hold water.
- Felling of trees may also lead to drought as it will affect rainfall.
- We will not get valuable products, like timber, medicinal plants, fruits and nuts.

Hence we need to conserve our forests.

CONSERVATION OF FORESTS

We must conserve our forests. Few measures which may be adopted to conserve forests are :

- **Aforestation :** It is the large scale planting of trees. Government must take steps to plant trees on a large scale.
- Preventing overgrazing.
- Protection from forest fires.
- Planned cultivation–A forest must not be cleared off trees and converted intoagricultural land to prevent soil erosion.
- Forests must be protected from insects and pests.
- Illegal cutting of trees must be stopped. The Indian government has made illegal logging punishable under law.
- All activities leading to soil erosion must be stopped.

We must all conserve this natural resource.

Let's Remember

Fill in the blanks.

1. Forests are a _____ natural resource.
2. _____ act as good absorbers of rain water.
3. The decaying leaves and animal droppings in a forest enrich the _____ .
4. Large scale felling of trees is called _____ .
5. Decomposers convert the dead and decaying organic matter into _____ .

Glossary

emergent layer	:	the layer of tallest trees in a forest
canopy	:	the green roof formed by tall trees over the plants lying below
producers	:	green plants that produce their own food
consumers	:	all animals that depend on plants for food
food web	:	a network of interconnecting food chains
deforestation	:	clearing of forests in large numbers

Summary

- Forest is a large area of uncultivated land where various plants, animals and micro-organisms exist in their natural homes.
- Forests are important natural renewable source.
- The branch part of a tree is called the crown of the tree.
- In a forest, trees form the uppermost layer followed by shrubs, with herbs forming the lowest vegetation.
- The ground surface of the forest is called the forest floor.
- Soil helps the forest to grow and regenerate.

Exercise

A. Multiple Choice Questions (MCQs)

Tick (✓) the right option.

1. Trees that act as wind breakers are _____.
   (a) teak ☐ (b) mango ☐ (c) palm ☐ (d) sal ☐
2. Micro-organisms act on dead plants and animals to produce _____.
   (a) humus ☐ (b) blood ☐ (c) soil ☐ (d) minerals ☐
3. These forms the lowest layer in the forest _____.
   (a) trees ☐ (b) shrubs ☐ (c) herbs ☐ (d) none of these ☐
4. The lowest layer of the forest is called _____.
   (a) canopy ☐ (b) under storey ☐ (c) forest floor ☐ (d) emergent ☐
5. Which of the following is not a forest product?
   (a) honey ☐ (b) sealing wax ☐ (c) plywood ☐ (d) petrol ☐

B. Write 'T' for true and 'F' for false statements.

1. Forests increase the carbon dioxide content of air. ☐
2. Forests canopy lies below the understoreys. ☐

3. Forests aid in soil erosion. ☐
4. The forest floor is hard. ☐
5. Eagles feed on the dead remains of animals. ☐

C. Match the following.

Column A	Column B
1. Forests	a. forest floor
2. Dark coloured, spongy	b. seed dispersal
3. Bacteria	c. falling water table
4. Animals	d. saprotrophs
5. Deforestation	e. timber

D. Answer the following questions in short.

1. Name the three layers of a forest.
2. Explain how forests prevent floods?
3. List five products we get from forests.
4. What is the role of decomposers in a forest? Name them.
5. What are understoreys in a forest?

E. Answer the following questions.

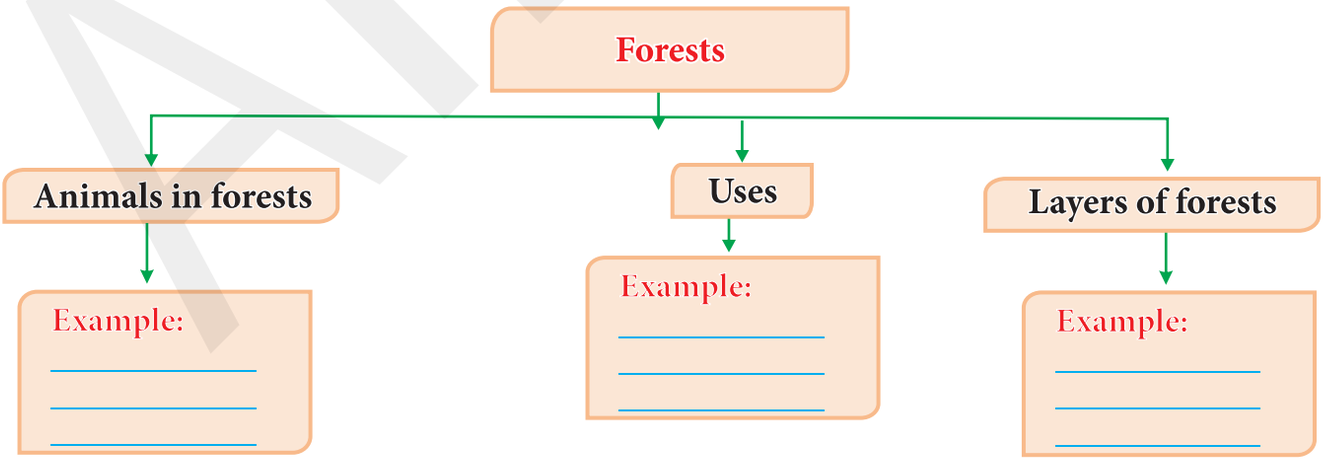
1. Explain five ways in which forests are useful to us.
2. What is deforestation? What are the consequences of deforestation?
3. With the help of an example, explain a food chain.
4. How do forests help in maintaining the balance between O_2 and CO_2 in the atmosphere?
5. How can we conserve forests?

HOTS (Think and Answer)

1. Why do you think forests are called the green lungs?
2. What happens if there were no fungi and bacteria on earth?

Let's Recall

Complete the following diagram.



Group Discussion

Discuss what would happen to the number of lions if all the deer suddenly disappeared from a forest.

Activity to do

Measuring Air Pollution :

You will need
- White posterboard
- Scissors
- Vaseline
- String
- Magnifying glass
- Permanent marker
- Hole punch

- Find out an area where you can hang pieces of poster board. You can do it inside your house or outside in your yard.
- Cut the posterboard into several squares.
- Draw a square with the marker on each cutout piece of posterboard, a little smaller than the square itself.
- Punch a hole in the top of each poster board and tie a piece of string in each hole.
- Smear a thin layer of vaseline inside the drawn square on each cutout and hang them in the places you have chosen.
- Collect the squares after five days
  With the help of a magnifying glass count how many particles you can see stuck to the vaseline in each squares. Record the number of particles as well as the location in your notebook.
  You can ask your friends living in different localities to carry out this activity and compare the results.

Creative Task

Make a list of the national parks and wildlife sanctuaries in India and show them on a map. Also mention the flora and fauna predominantly found there.

WORKSHEET-12

Define the following terms.

a. Forest

b. Forest floor

c. Saprotrophs

d. Food chains

e. Deforestation

CHAPTER 13

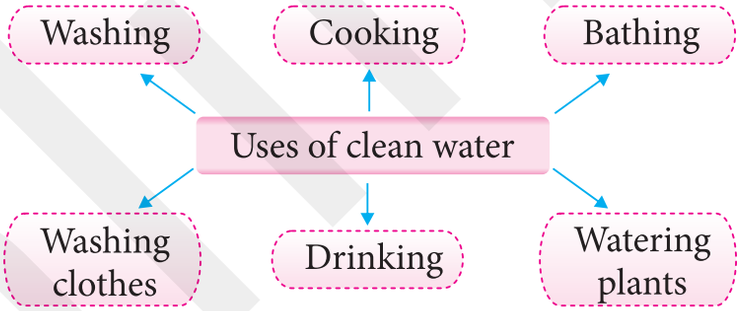
Wastewater Story

Introduction

- Water–Our lifeline
- Sewage
- Treatment of polluted water
- Duties of an active citizen
- Better house keeping practices
- Sanitation and diseases
- Alternative methods of sewage disposal

Water as we all know is a precious resource. It is a basic necessity of life. We use water for a number of activities.

Let us quickly recall them.



However, most of the above activities makes the water dirty and unfit for further use.

The water which is rich in lather, mixed with oil, dirty water which goes down the drains from sinks, showers, toilets and laundries is called wastewater. This wastewater can and should be reused. We should not waste this water. We must clean up the water by removing pollutants.

WATER–OUR LIFELINE

Clean water is our basic need. However clean drinking water is not available to all. Realising the urgency of the non-availability of clean drinking water to a large population of the world, the General Assembly of United Nations declared the period 2005–2015 as the International Decade for action on 'Water for life', on the World Water Day, on 22 March 2005.

Water for Life 2005-2013

During this period, every effort will be made to reduce the number of people who do not have access to safe drinking water by half.

The process of removing pollutants from wastewater before it enters a water body or is reused is called sewage treatment. The treated water is safe to use.

WHAT IS SEWAGE?

Sewage is wastewater that flows down the drains of houses, hospitals industries, offices etc. Rain water that runs down the street during a storm or heavy rain is also sewage water. It is liquid waste. The impurities present in sewage are called pollutants or contaminants.

Contaminants present in sewage

Contaminants	Example
Organic impurities	Human and animal waste, oil, urine, fruit and vegetable waste, pesticides, herbicides.
Inorganic waste	Metals, nitrates and phosphates
Nutrient	Phosphorous and nitrogen
Bacteria	Typhoid (salmonella typhi) and cholera (vibrio cholera) causing water borne diseases.
Other microbes	Causing dysentery etc.

Sewage thus contains organic and inorganic impurities, nutrients, bacteria and microbes that can cause diseases.

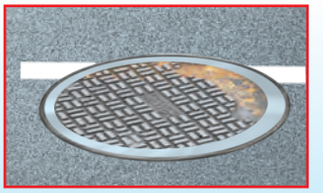
You must have noticed one set of pipes bringing clean water to your homes and another set of pipes that takes away wastewater from the houses.

The underground pipes, used to carry drainage water and wastewater are called sewers. These sewers are linked together to form a network called sewage system. It is through these sewers that sewage is collected from the point of origin to the point of disposal *i.e.* the treatment plant.

You must have seen manholes on roads. These are openings which are covered with heavy cemented or metallic lids. They are provided at every 50–60 meter in the sewerage at the junction of two or more sewers or at points where there is a change in direction. They help to access the underground sewerage for cleaning and maintenance.

Activity

Study the sewage route in your school. How many manholes do you find? Make a line diagram of the sewage route.



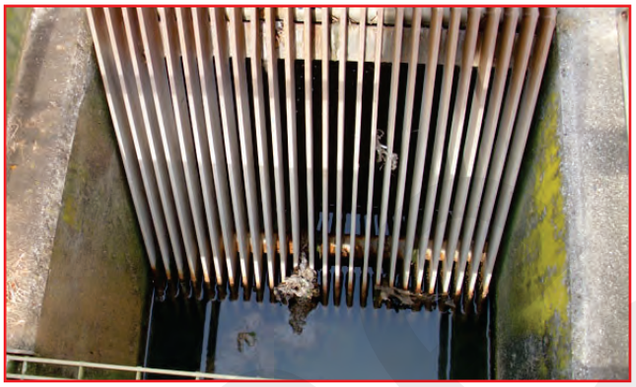
Manhole

TREATMENT OF POLLUTED WATER

(Wastewater Treatment Plant — WWTP)

Water treatment plant cleans and maintains the quality of drinking water through the following processes:

- Water is passed through bar screens where large objects such as rags, sticks, cans, plastic bags, napkins are removed.
- Next water is passed through a grit and sand removal tank called the grit chamber. The speed of the incoming water is reduced so that sand, grit pebbles etc settle down.
- Water is then passed through a large sedimentation tank. This tank is sloped inwards, to allow organic matter like faeces to settle down which is then removed with a scraper. The solid waste that settles down is called sludge. Light waste like oils, soaps, plastics and grease float on top and are removed with a skimmer. The clear water, thus obtained, is called clarified water.
- The secondary treatment of water now begins. The organic matter in the sludge is broken down with the help of anaerobic bacteria. The sludge is converted into methane, carbon dioxide and humus through a process called digestion. Biogas is also produced in this process which can be used as fuel or for generating electricity.
- The clarified water is aerated to help aerobic bacteria to grow. These bacteria decompose human waste, food waste, soaps and other waste matter still remaining in the clarified water. The suspended microbes then settle down at the bottom of the tank as sludge. This process takes several hours. This activated sludge is about 97% water and the water is removed by sand drying beds or machines. Tried sludge is used as a manure.



Bar screen

Grit and sand removal tank

Sedimentation of tank

- The upper layer of clean water is then discharged into the water body — sea, river or into the ground.
- At times chemicals may be used to remove phosphorous and nitrogen from the water. Chlorine gas or ozone is used to disinfect the water before discharging it into water bodies. This is the Tertiary Treatment.
  This water can again be used for a number of purposes including the supply of drinking water.

Facts to know

Water in a river gets cleansed naturally.
Washing hands with soap and water greatly reduces the incidence of diarrhoea.

BE AN ACTIVE AND RESPONSIBLE CITIZEN

You must have often come across choked drains, with dirty water overflowing. You must have also covered your nose because of the offensive smell. During the rainy season, you might at times have to wade through dirty water. Isn't it disgusting? This becomes a breeding place for flies, mosquitoes and other insects. In case you come across open drains, you must make it a point to approach the municipality or the gram panchayat and insist upon them to cover the drains.

BETTER HOUSE KEEPING PRACTICES

- You must take proper steps to dispose of the waste.
- Do not dispose of cooking oil, ghee, fat, butter in drains. They should be thrown in dustbins only, as they clog the pipes. In open drains, fat clogs the soil pores, thereby reducing the effectiveness of filtering water.
- Chemicals, cleaners, beauty products, paints, insecticides, medicines and motor oil should not be poured down the drain. They can kill microbes that aid in purifying water and should be properly disposed of.
- Solid waste such as used tea leaves, remains of solid food, plastic bags, cotton, sanitary towels should be thrown in a dustbin. These wastes can also block drains, impeding the free flow of oxygen and hampering the degradation process.

SANITATION AND DISEASES

Poor sanitation and drinking contaminated water can cause a large number of diseases. In India, you must have seen while travelling in a train that a large number of people defecate in open fields, on railway tracks, on dry river beds and at times directly in water. This is highly hazardous as it causes both soil and water

Throw garbage in dustbin

contamination. Both surface and ground water get polluted–ground water as you know is a source of water for wells, tube wells and springs. A large number of water-borne disease like cholera, typhoid, polio, meningitis, hepatitis and dysentery can be spread.

ALTERNATIVE METHODS FOR SEWAGE DISPOSAL

Alternative methods for sewage disposal include lowcost onsite sewage disposal system such as septic tanks, chemical toilets and composting pits.

Septic tanks

They are suitable in places like hospitals, isolated buildings or a cluster of few houses where there is no sewerage system. Household waste flows into an underground septic tank. This tank acts as a sedimentation-cum-digestion tank, where sludge settles down and lighter waste floats on the surface. Anaerobic bacteria present in the sewage help in decomposing the solid waste. Liquid waste flows through pipes into the ground where it mixes with the soil. Septic tanks needs to be cleaned every four to six months.

Biogas plants

This method is prevalent in villages and small towns. Excreta is sent directly to a biogas plant through covered drains and the biogas produced is used as a source of energy.

Vermi composting toilets

In this method, earthworms are used to convert human excreta into compost. These toilets require minimal water and the operation is simple and hygienic. This is an innovative design recently developed in India.

SANITATION AT PUBLIC PLACES

- Large number of people visit the railway stations, bus stands, airports, hospitals, fairs etc. daily. We must contribute in maintaining sanitation at these public places. Although government has laid down certain standards of sanitation, unfortunately they are not followed. As responsible and active citizens we should :
- Not litter anywhere. We must use a dustbin for throwing waste.
- Not throw plastic bags on the road.
- Not spit or urinate in public places.
- Educate others on the need to maintain good hygiene and sanitation in public places.

Remember to keep your home, school and other surroundings neat and clean. You can play an important role in keeping the environment clean and healthy.

Let's Remember

Match the following.

Column A	Column B
1. Water pollutant	a. typhoid, cholera
2. Bacteria	b. network of pipes
3. Drinking water	c. Sewage
4. Sewerage	d. biogas
5. Sludge	e. odourless and colourless

Glossary

contamination	:	adding pollution and getting polluted with harmful components
effluent	:	liquid waste with floating impurities, may be from sewage or industry
sewage	:	wastewater flowing through sewers and drains
sewerage	:	removal of wastewater flow through the sewer system
sludge	:	solid waste that settles down as sediment
bloom	:	abundance of something

Summary

- Water discharged after use is called waste water and it should be recycled and reused.
- Sources of wastewater include household, industries, agricultural fields and other human activities.
- The by-products of waste water treatment are sludge and biogas.
- In places where there is no sewerage system, lowcost onsite method of sewage system can be adopted such as septic tank, composting pits and chemical toilets.
- Open drain system is breeding place for flies, mosquitoes and disease causing organisms.
- We should adopt good housekeeping practices to minimise waste.

Exercise

A. Multiple Choice Questions (MCQs)

Tick (✓) the right option.

1. Nutrient present in sewage is _____.

(a) nitrates ☐ (b) phosphate ☐

(c) phosphorous ☐ (d) carbon dioxide ☐

2. The fuel obtained by decomposing sludge is _____.
   (a) kerosene ☐ (b) phosphate ☐ (c) biogas ☐ (d) all of these ☐
3. This is a water borne disease _____.
   (a) typhoid ☐ (b) malaria ☐ (c) dengue ☐ (d) mumps ☐
4. We use this to disinfect water before discharging it into river _____.
   (a) nitrogen ☐ (b) oxygen ☐
   (c) carbon dioxide ☐ (d) ozone ☐
5. The process of exposing water to circulating air is called _____.
   (a) aeration ☐ (b) sedimentation ☐
   (c) contamination ☐ (d) chlorination ☐

B. Write 'T' for true and 'F' for false statements.

1. Sewage cannot be recycled. ☐
2. Septic tank is an on-site disposal method. ☐
3. Dried sludge is waste. ☐
4. Open drain system provides good sanitation. ☐
5. The left over food should be thrown down the drain. ☐

C. Give one word for each one of the following.

1. Saline water in the sea _____
2. Water on land _____
3. Clean water fit for drinking _____
4. Dirty water containing garbage and human washes _____
5. Fuel obtained from decomposing sludge _____

D. Answer the following questions in short.

1. What is sewage?
2. Why should oils and fats not be released in the drains?
3. What does waste-water contain?
4. What happens when sewage is passed through bar screens?
5. What is digestion?

E. Answer the following questions.

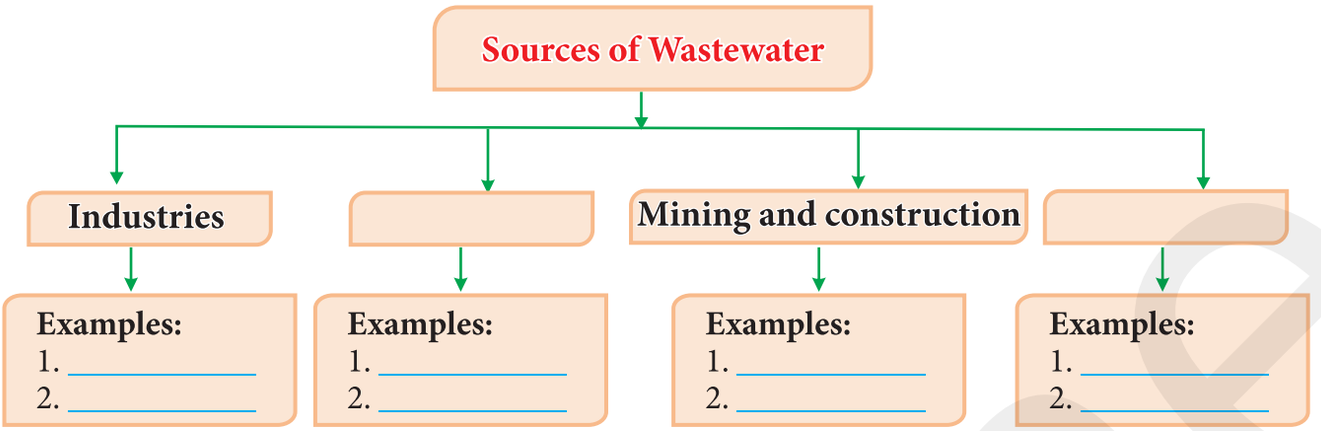
1. Why is it harmful to discharge untreated sewage into rivers and seas?
2. What should we not do to maintain sanitation in public places?
3. Suggest four methods to control water pollution.
4. What are the harmful effects of improper drainage?
5. What is a septic tank? How does it function?

HOTS (Think and Answer)

1. What do you think would happen if there were no manholes in the sewerage?
2. What will happen if plastic bags are thrown in the drains?

Let's Recall

Complete the following diagram.



Group Discussion

Arrange a discussion on ways and means to be adopted for keeping our holy rivers clean.

Activity to do

Create your own water filter

You will need

- A earthen pot with a hole at its base
- Cotton wool
- Muddy water
- Gravel
- Sand

You can make our own water filter.

- Put the cotton at the bottom of the pot.
- Next, add a layer of sand.
- Finally add a layer of gravel on top.
- Your water filter is ready. Pour muddy water in the pot and see how it goes. Water will flow drop by drop out of the hole at the base of the earthen pot. You will be surprised to see that the muddy water has turned clean.

Creative Task

1. Under the supervision and guidance of teacher arrange a visit to a 'Sewage Treatment Plant' and look for the complete process of wastewater treatment. Always seek the help of qualified and licenced guide to lead you.
2. Survey your residential colony and record the ways and means for disposal of wastewater.

Revision Test Paper-I

(Based on chapters 1 to 4)

A. Multiple Choice Questions (MCQs)

Tick (✓) the right option.

1. Amarbel is an example of _____.
   (a) autotroph ☐ (b) parasite ☐
   (c) saprophyte ☐ (d) insectivore ☐
2. Bile juice is secreted by the _____.
   (a) stomach ☐ (b) liver ☐
   (c) pancreas ☐ (d) none of these ☐
3. Most of the digestion takes place in the _____.
   (a) mouth ☐ (b) small intestine ☐
   (c) stomach ☐ (d) large intestine ☐
4. Sheep are not reared in _____.
   (a) Kerala ☐ (b) Punjab ☐
   (c) Jammu and Kashmir ☐ (d) Rajasthan ☐
5. Heat from the sun reaches us becuase of _____.
   (a) radiation ☐ (b) conduction ☐
   (c) convection ☐ (d) all of these ☐

B. Write 'T' for true and 'F' for false statements.

1. Plants also need nitrogen for growth. ☐
2. Food pipe is also called oesophagus. ☐
3. Wool is obtained only from sheep. ☐
4. Silk is an expensive material. ☐
5. Plastic is an insulator. ☐

C. Give one word for each one of the following.

1. Where is chlorophyll found in plants?
2. Name the organs of the human alimentary canal.
3. What do you mean by reeling of silk?
4. Name one method of heat transfer in solids.
5. Which surface absorbs more heat?

Revision Test Paper-2

(Based on chapters 5 to 9)

A. Multiple Choice Questions (MCQs)

Tick (✓) the right option.

1. Bases have this taste _____.
   (a) sweet ☐ (b) sour ☐
   (c) salty ☐ (d) bitter ☐
2. Which is not a chemical change?
   (a) digestion ☐ (b) respiration ☐
   (c) freezing of water ☐ (d) Photosynthesis ☐
3. Which gas turns lime water milky ?
   (a) oxygen ☐ (b) hydrogen ☐
   (c) carbon dioxide ☐ (d) nitrogen ☐
4. The climate of Rajasthan is _____.
   (a) Hot and dry ☐ (b) Hot and wet ☐
   (c) Cold and dry ☐ (d) Cold and wet ☐
5. Cyclones are called this in japan _____.
   (a) Hurricane ☐ (b) Typhron ☐
   (c) Cyclone ☐ (d) Twister ☐

B. Write 'T' for true and 'F' for false statements.

1. Acids are sour in taste. ☐
2. Iron gates when painted do not rust. ☐
3. The climate in the north east is wet. ☐
4. Monsoon winds carry dust. ☐
5. A hurricane is funnel shaped. ☐

C. Give one word for each one of the following.

1. Name the acid present in apples
2. Name the flower whose petals are used as indicator
3. Coating an iron sheet with a layer of zinc
4. What is a rain gauge ?
5. What does an anemometer measure ?

Model Test Paper -I

(Based on chapters 1 to 9)

A. Answer the following questions in short.

1. What is the mode of nutrition of an algae?
2. What do you understand by the term assimilation?
3. Why is shearing not painful?
4. Why do we jerk a clinical thermometer before use?
5. What is the difference between an acid and a base?

B. Fill in the blanks.

1. _____ are also called producers.
2. Chewing of food is a _____ process.
3. Silkworm feed on _____ .
4. We wear _____ clothes in winter.
5. Acid turn _____ litmus to _____ .

C. Match the following.

Column A	Column B
1. Methyl orange	a. petals used as an indicator
2. Product of acid + base	b. apple
3. China Rose	c. an indicator
4. Malic acid	d. original colour colourless
5. Phenol phthalein	e. salt

D. Answer the following questions.

1. How are land and sea breeze produced?
2. Why is factory waste neutralised before disposing it off? How is it done?
3. What is rusting of iron? Suggest two ways by which it can be prevented.
4. How is wool fibre obtained from sheared wool?
5. Describe the process of digestion in ruminants.

E. Collect samples of silk produced in different states of India. Find out the names of the different silk.

Revision Test Paper-3

(Based on chapters 10 to 13)

A. Multiple Choice Questions (MCQs)

Tick (✓) the right option.

1. During inhalation the ribs move _____.
   (a) upwards ☐ (b) outwards ☐
   (c) downwards ☐ (d) do not move ☐
2. The main waste of snakes is _____.
   (a) water ☐ (b) oxygen ☐
   (c) carbon dioxide ☐ (d) none of these ☐
3. The mature ovary forms the _____.
   (a) seed ☐ (b) fruit ☐
   (c) stamen ☐ (d) pistil ☐
4. The basic unit of speed is _____.
   (a) km/hr ☐ (b) km/s ☐
   (c) m/s ☐ (d) km/min ☐
5. Which is not used for measuring time?
   (a) water clock ☐ (b) Sundial ☐
   (c) pendulum ☐ (d) Meter scale ☐

B. Write 'T' for true and 'F' for false statements.

1. Only human beings have lungs. ☐
2. Heart beat decreases after physical activity. ☐
3. Dahlia multiplies by its roots. ☐
4. Coconut is dispersed by water. ☐
5. All moving bodies have constant speed. ☐

C. Give one word for each one of the following.

1. Which gas do we breath out?
2. How do aquatic animals excrete waste?
3. Name the agents of pollination.
4. Name two hard fruits.
5. Which is more accurate a pendulum clock or a quartz clock?

Revision Test Paper -4

(Based on chapters 14 to 18)

A. Multiple Choice Questions (MCQs)

Tick (✓) the right option.

1. The thin wire inside a bulb is _____.
   (a) coil ☐ (b) filament ☐
   (c) magnet ☐ (d) none of these ☐
2. A magnifying glass is a _____.
   (a) concave mirror ☐ (b) convex mirror ☐
   (c) concave lens ☐ (d) convex lens ☐
3. The total amount of water on earth _____.
   (a) remains constant ☐ (b) decreases ☐
   (c) increases ☐ (d) none of these ☐
4. Which of the following is not a forest product?
   (a) honey ☐ (b) scaling wire ☐
   (c) plywood ☐ (d) petrol ☐
5. Nutrient present in sewage is _____.
   (a) nitrates ☐ (b) phosphate ☐
   (c) phosphorous ☐ (d) carbon dioxide ☐

B. Write 'T' for true and 'F' for false statements.

1. Fuse wire has low electric resistance. ☐
2. Convex lens is thicker at the edges. ☐
3. Ground water is impure. ☐
4. Forests aid in soil erosion. ☐
5. Dried sludge is waste. ☐

C. Give one word for each one of the following.

1. Mention two uses of electromagnets.
2. Name the colours of a rainbow.
3. How does poor rainfall affect the water table?
4. What do you find in forests?
5. What is the waste?

Task for Summative Assessment-2

(Based on chapters 10 to 18)

A. Answer the following question in short.

1. Write down the end products of respiration.
2. Name the various components of blood.
3. Name of the agents of seed dispersal.
4. What is average speed?
5. What is a fuse?

B. Fill in the blanks.

1. Yeasts produce _____ .
2. _____ pumps blood non-stop.
3. _____ turns into seeds.
4. The standard unit of time is _____ .
5. The combination of two or more cells is called _____ .

C. Write 'T' for true and 'F' for false statements.

1. Humans excrete uric acid through skin. ☐
2. Ground water is impure. ☐
3. Forests aid in soil erosion. ☐
4. Dried sludge is waste. ☐
5. Baking soda is ammonium hydroxide. ☐

D. Answer the following questions.

1. What do we sneeze when we are in a highly dusty area?
2. Why do athletes suffer from cramps?
3. Describe the composition of blood.
4. How does fertillisation take place in plants?
5. How can we determine the speed of an abject from its distance time graph?

E. Measure the pulse rate of people of different ages–infant, toddler, child, adolescent, adult, aged person. How do they compare?