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UNIT 1

CELLULAR ORGANIZATION

Learning outcomes:

At the end of this unit, students will be able to:

- Recognize cells as the basic unit of life that are organized into tissues, organs, systems and organisms.
- Arrange and rank different levels of cellular organizations – cells to tissues, organs, organs system and organisms.
- Relate the structures of some common cells (nerve, muscle, epithelium and blood cells) to their functions.
- Identify the structures present in an animal cell and plant cell as seen under a simple microscope and relate them to their functions (only cell membrane, cytoplasm, nucleus, cell wall, chloroplast, mitochondria and vacuole).
- Describe the similarities and differences between the structures of plant and animal cells.
- Sketch the animal and plant cells and label key organelles in each.
- Compare and contrast an animal cell and plant cell by preparing slides using onion peels and cheek cells.

UNIT 1

CELLULAR ORGANIZATION

Can you identify something which is common in all of the following pictures:

Yes. All of these are living things. All living things share some characteristics;

- They need food
- They grow with the passage of time
- They produce wastes and excrete them
- They can move towards or away from thing
- They are sensitive to changes in their surroundings and they respond to these changes
- They reproduce for the continuity of life
- They respire to release energy from food
- They are made up of cells



Figure 1.1 Living things

1.1 CELL

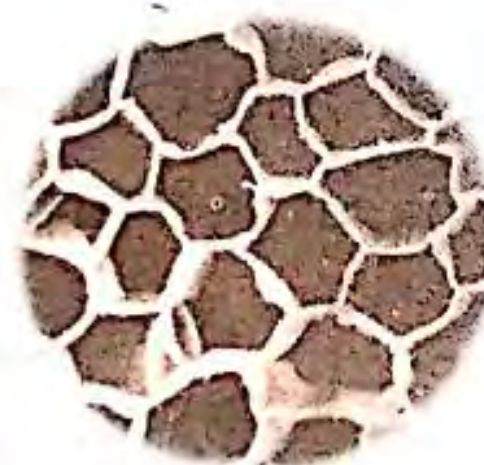
Do you know that your body is made up of trillions of tiny living units? In every given minute many of these units are formed, some die and many continue to do their jobs. Do you know what they are called?

Cells are the building blocks of our bodies. All living things are made of these tiny living units, called cells. A cell is so small in size that you cannot look at it simply with your naked eyes. You need microscope to observe a cell.

Organisms like bacteria and amoeba are unicellular. Animals and plants are made up of many cells and are, therefore, called multicellular organisms.

DO YOU KNOW?

Cells were discovered after the invention of microscope. The cell was first discovered and named by Robert Hooke in 1665. He observed a thin slice of a cork under a microscope and noticed small boxes surrounded by walls, which he named as cells.



Cell



Robert Hooke

INTERESTING FACTS

Microscope is one of the basic tools of a scientist. It is an instrument used to see small things. The apparent size of an object magnifies when seen under microscope.



Microscope

CELLULAR ORGANIZATION



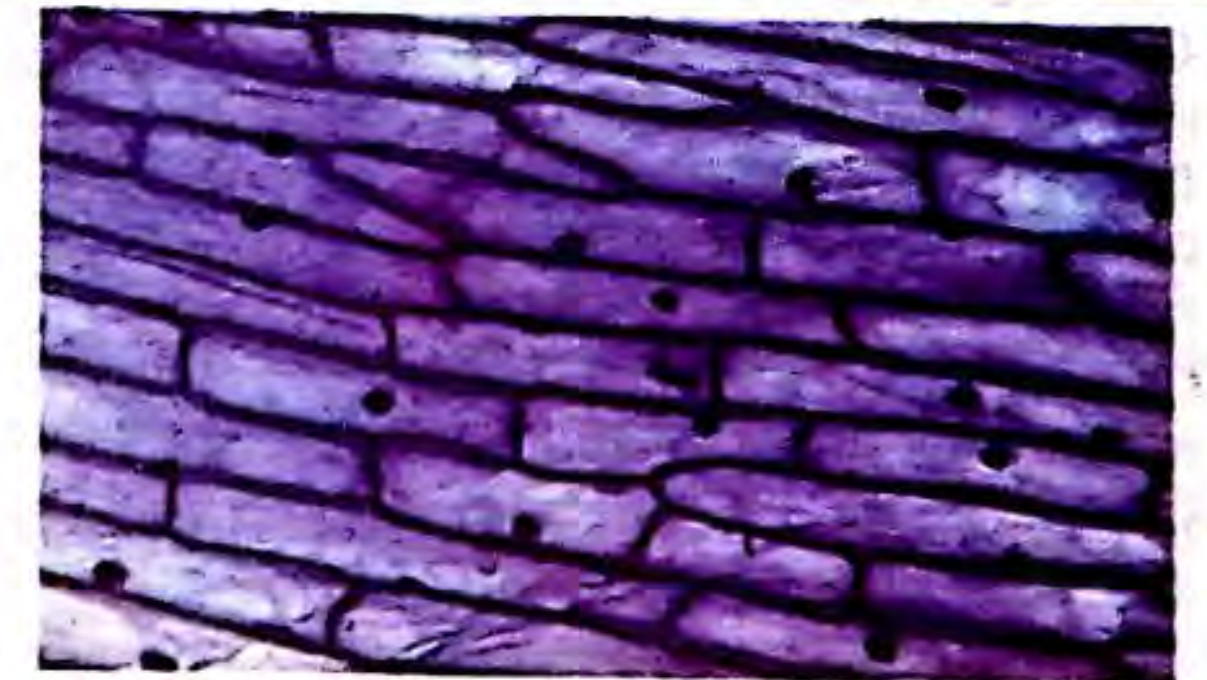
Activity 1.1 Onion membrane slide preparation

Materials:

- A thin onion membrane
- Microscopic glass slides
- Microscopic cover slips
- A needle
- Dropper
- Methylene blue solution
- Water
- Microscope

Procedure:

Carefully cut a piece of thin onion membrane. Put a piece of this tissue on glass slide. Straighten it with the help of needle. Add a drop of Methylene blue solution to it. Methylene blue is a stain that helps to observe cells. Cover it with a cover slip. Observe under microscope. Draw and label what you see.



Checklist of observations

- Large, rectangular interlocking cells
- Clearly visible distinct cell walls surrounding the cells
- Dark stained nucleus
- Large vacuoles at the center
- Small granules may be observed inside the cells (within the cytoplasm)

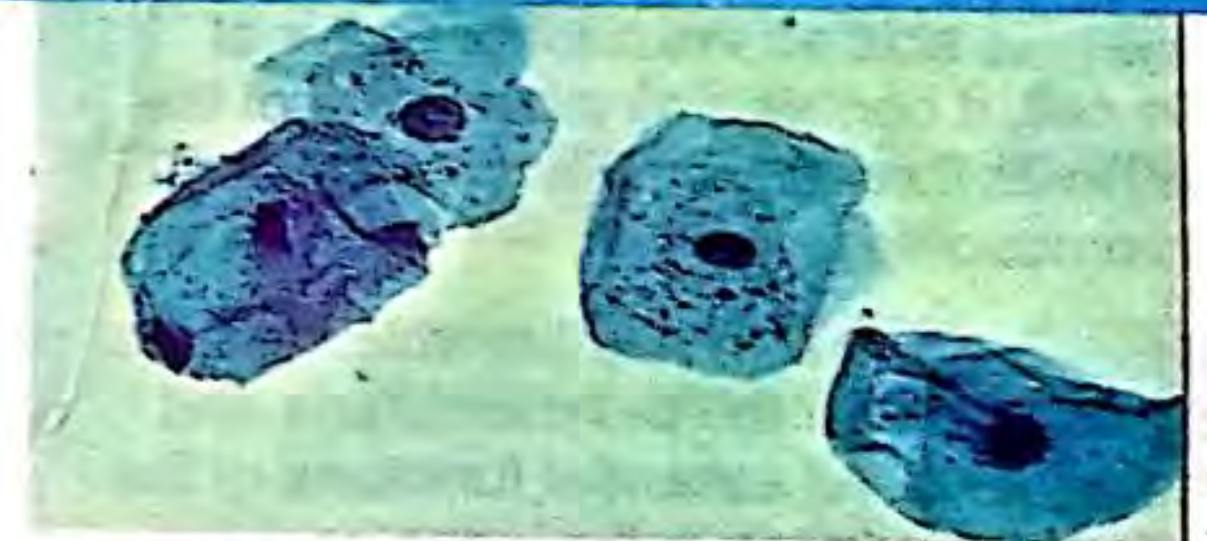
Activity 1.2 Cheek cell slide preparation

Materials:

- Sterile, individually packed cotton swabs
- Microscopic glass slides
- Microscopic cover slips
- A needle
- Dropper
- Methylene blue solution
- Water
- Microscope

Procedure:

- Take a clean cotton swab and gently scrape the inside of your mouth.
- Smear the cotton swab on the centre of the microscope slide for 2 to 3 seconds.
- Add a drop of methylene blue solution and place a coverslip on top.
- Remove any excess solution by allowing



a paper towel to touch one side of the coverslip.

- Methylene blue stains nucleus of the cell. This dye is toxic when ingested and it causes irritation when in contact with the skin and eyes.
- The cells seen are squamous epithelial cells from the outer epithelial layer of the mouth. The small blue dots are bacteria from our teeth and mouth.

UNIT 1

CELLULAR ORGANIZATION



Cell Structure

All living things are made up of basic units i.e. cells. Here we will learn about the cells present in animals and plants. If we look at an animal and a plant cell under a microscope, we can see similarities and differences between them.

DO YOU KNOW?

- Your body has about 75 trillion cells.
- Some of your nerve cells can live throughout your life.
- Some white blood cells and intestine cells live only for 3 days.
- Ostrich egg is the largest cell in the world.
- It would take about 200 of your cells to fit on a full stop.

1.2 COMPARISON OF ANIMAL AND PLANT CELL

Similarities between an Animal and a Plant Cell

Many parts of the cell are same in both animals and plants. Both have a cell membrane, cytoplasm and a nucleus.

Cell membrane is a thin, protective layer around a cell. It holds all parts of the cell together. It is the boundary with gates to control what moves in and out of the cell.

Nucleus acts as the control center of the cell. It contains all information of the cell in its thread like structures called chromosomes.

Cytoplasm is a watery gel which fills the space between the cell membrane and the nucleus. All essential functions of the cell are performed in the cytoplasm. Cytoplasm contains many small structures called organelles.

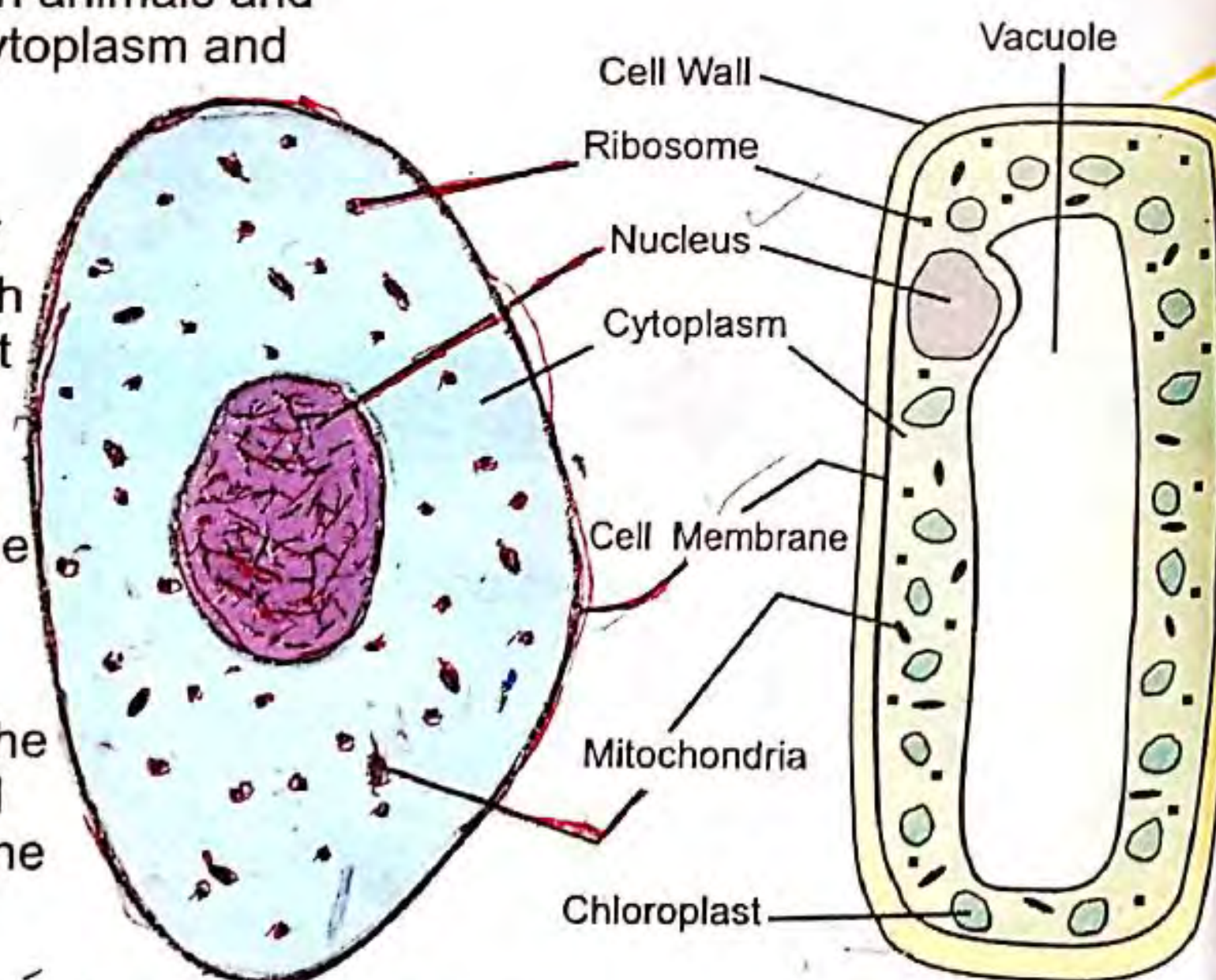


Figure 1.2 Animal cell

Figure 1.3 Plant cell

Cell organelles perform different jobs for the cell. There are many types of organelles in a cell. Some are common in both animal and plant cells. For example mitochondria (singular: mitochondrion) and ribosomes. Mitochondria break down the food to release energy and are therefore called the power house of the cell. Ribosomes are very small organelles which are the factories of protein.

STOP AND CHECK

What would happen if a cell membrane is damaged?



Differences between an Animal and Plant Cell

A plant cell has some unique features including:

Cell wall is present outside the cell membrane of a plant cell. It is a hard and dead layer made up of cellulose. Cellulose is a large molecule which we cannot digest. It is a natural fiber found in plants. When we eat plants, the fiber acts like a broom to clean our intestines. Cell wall gives the plant cell a fixed shape. Animal cell is without cell wall.

Chloroplast is a special organelle for photosynthesis, found in the green parts of a plant. It contains a green pigment called chlorophyll. Chloroplast absorbed sunlight, carbon dioxide and water to make food and oxygen. It is not present in animal cell.

Vacuole stores different types of substances like water and salts if in abundance. Plant cells have a large central vacuole. A fluid filled vacuole provides support from inside to the plant cell. It increases in size during plant growth. Animal cell has small vacuoles dispersed in the cytoplasm.

Activity 1.3 Animal or plant cell model

Make a model of animal or plant cell, using materials of your choice. Label its parts. (Group work)

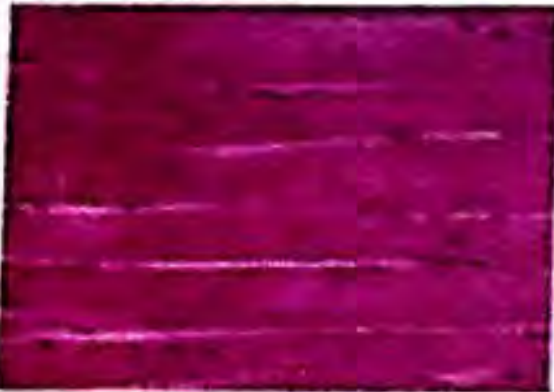
Types of Cells

There are many types of cells. Few examples are discussed here.

Animals cells	Function	Special features
Red blood cell 	transport oxygen from lungs to different parts of the body	• large surface area for oxygen to pass through • contains haemoglobin, which combines with oxygen
Nerve cell 	carries messages all around the body	• very long and thin • connections at each end • can carry messages in the form of electrical signals

UNIT 1

CELLULAR ORGANIZATION

Animals cells	Function	Special features
Muscle cell 	work by contracting and relaxing to move different parts of the body.	- long, thin cells grouped into bundles - many mitochondria present
Epithelium cells 	protection, coverage, secretion, excretion, absorption and filtration.	- tightly packed sheets of cells - present on the body surfaces and inner cavities

1.3 TISSUE

A group of similar cells performing a specific function is called a tissue. Animal tissues are broadly classified into four groups.

Animal Tissues	Function	Where it is found
Epithelial Tissue	covers, protects and secretes	skin, lining of tubes and organs
Connective Tissue	connects, transports and supports	bone, blood, cartilage, fats, loose connective tissues etc.
Muscular Tissue	moves body parts	heart, muscles
Nervous Tissue	carries messages around the body	brain, spinal cord and nerves

Plant Tissues	Function	Where it is found
Epidermal Tissue	covers and protects	surface of leaves, stem and roots
Photosynthetic Tissue	makes food	green leaves
Supporting Tissue	supports and strengthens	wood of stem and root
Vascular Tissue	moves water and food	vascular bundles

1.4 ORGAN

Tissues join with other tissues to form an organ. Different tissues of an organ work together to do a special job. For example, stomach is an organ to digest food. Epithelial tissue, muscle tissue, blood tissue and nerve tissue join to form an organ e.g stomach.

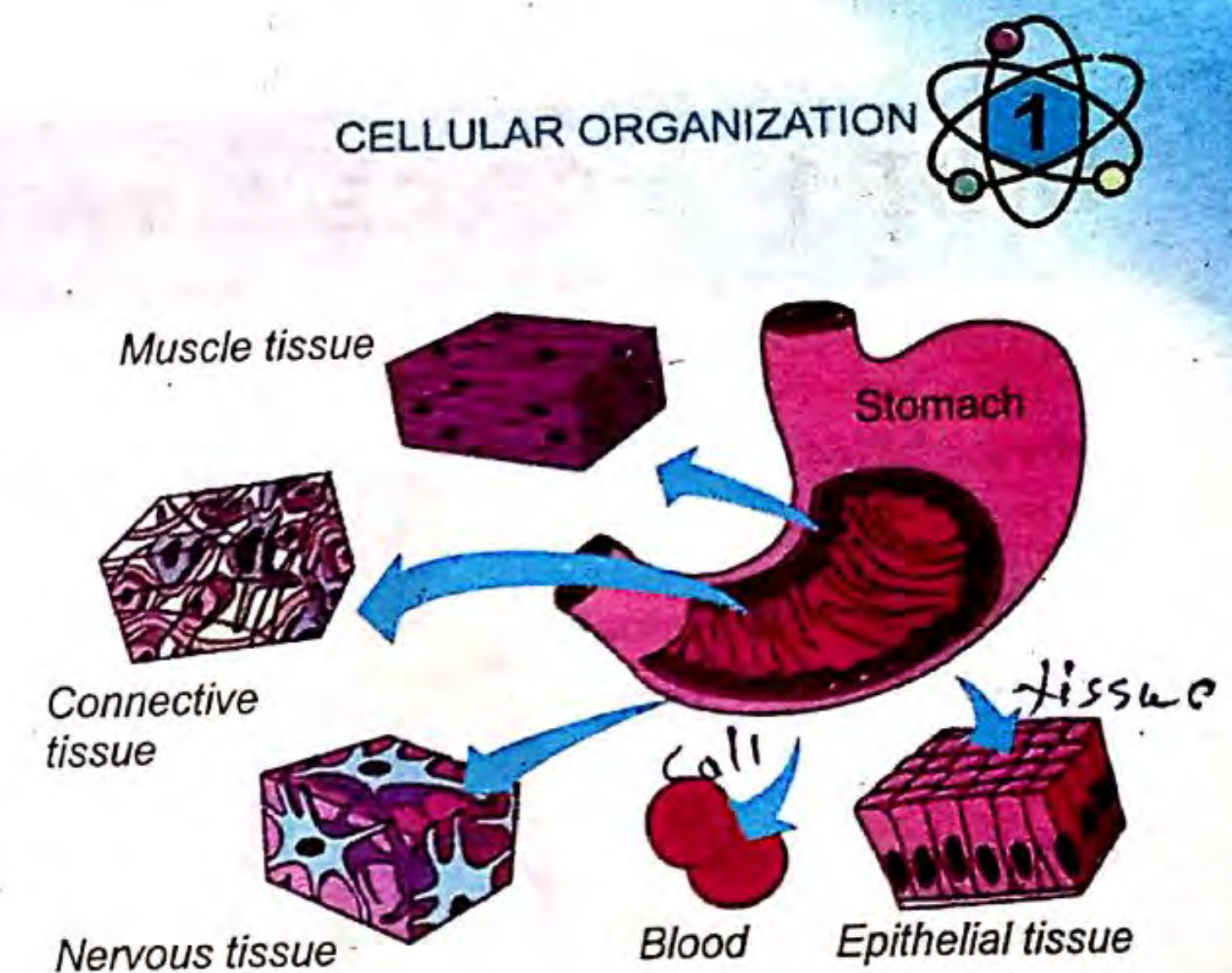


Figure 1.4 Stomach and its tissues

1.5 ORGAN SYSTEM

A group of organs work together to carry out a life process. For example, in your body 206 bones make up the skeletal system. This system provides support to your body, protects your internal organs and helps you move.

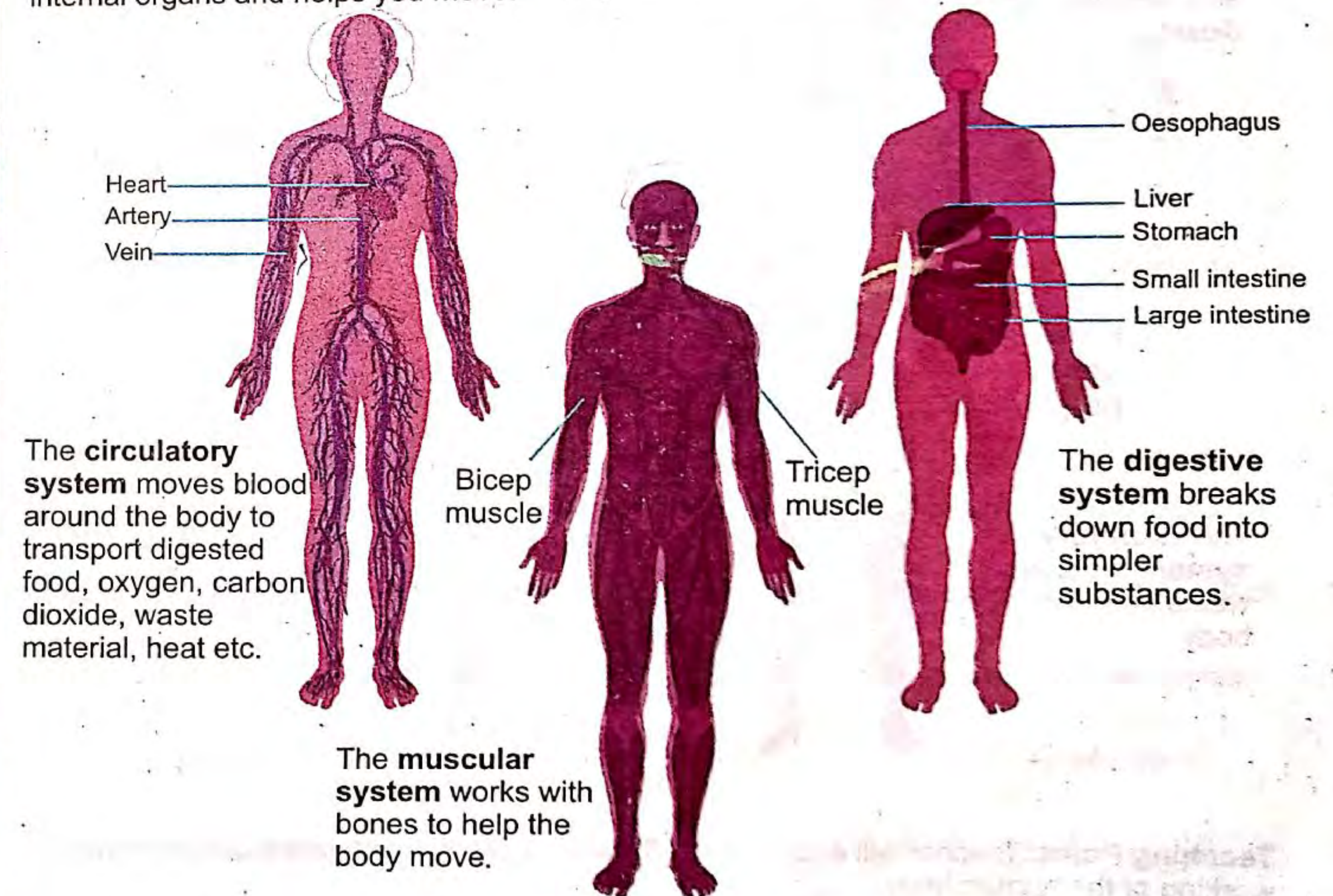


Figure 1.5a Major organ systems

UNIT 1

CELLULAR ORGANIZATION

CELLULAR ORGANIZATION



1.6 ORGANISM

All organ systems work together to make a complex organism. An organism is able to survive on its own.

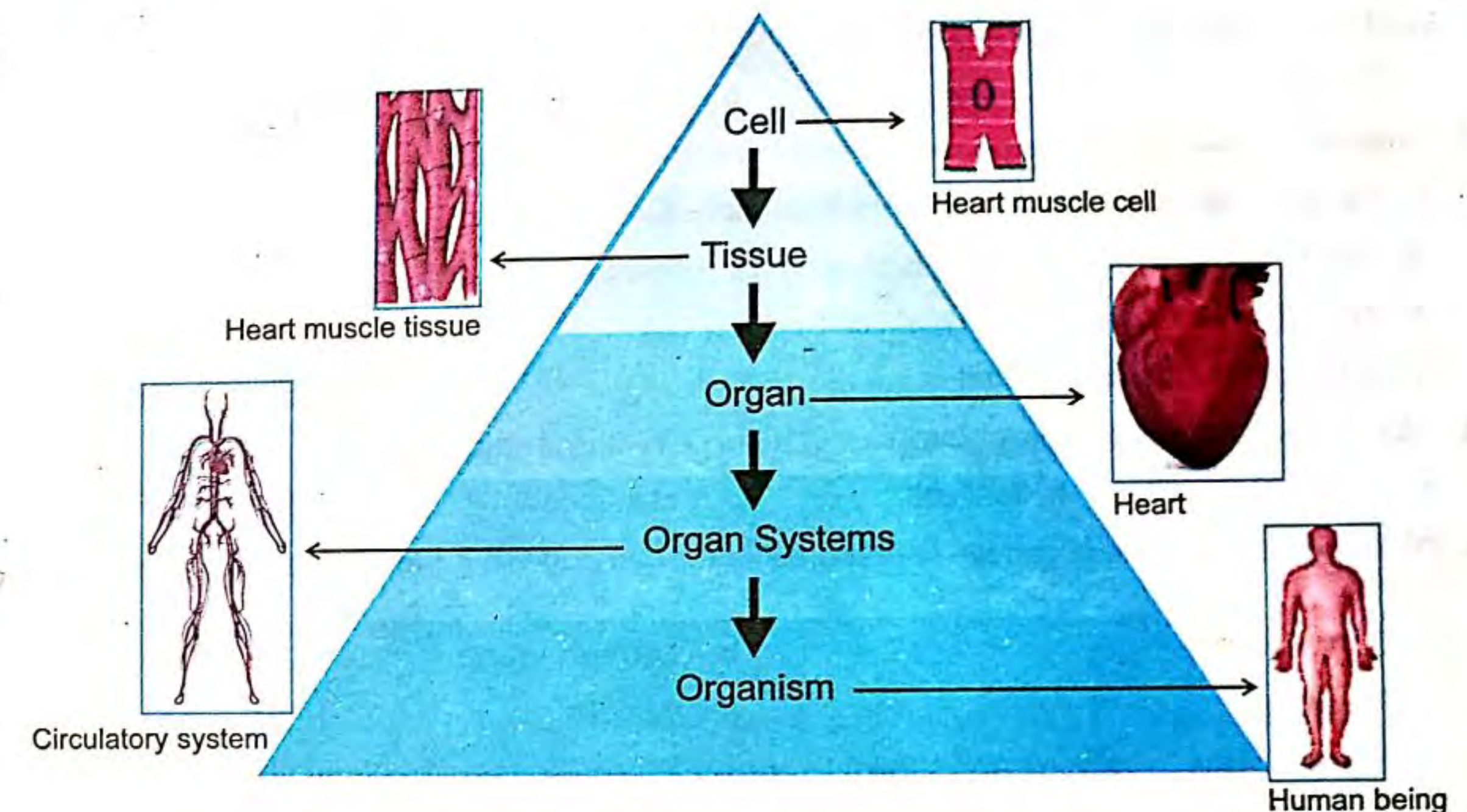


Figure 1.6 Levels of organization

Key Points

- Cell is the structural and functional unit of living things
- Some structures are common in a plant and an animal cell e.g. cell membrane, nucleus, cytoplasm, mitochondria and ribosome
- Some structures are present only in plant cell e.g. cell wall, chloroplast and large central vacuole
- Cells form tissue, tissues form organs, organs form system and organ systems form an organism
- All organ systems work in coordination with each other to perform the life processes

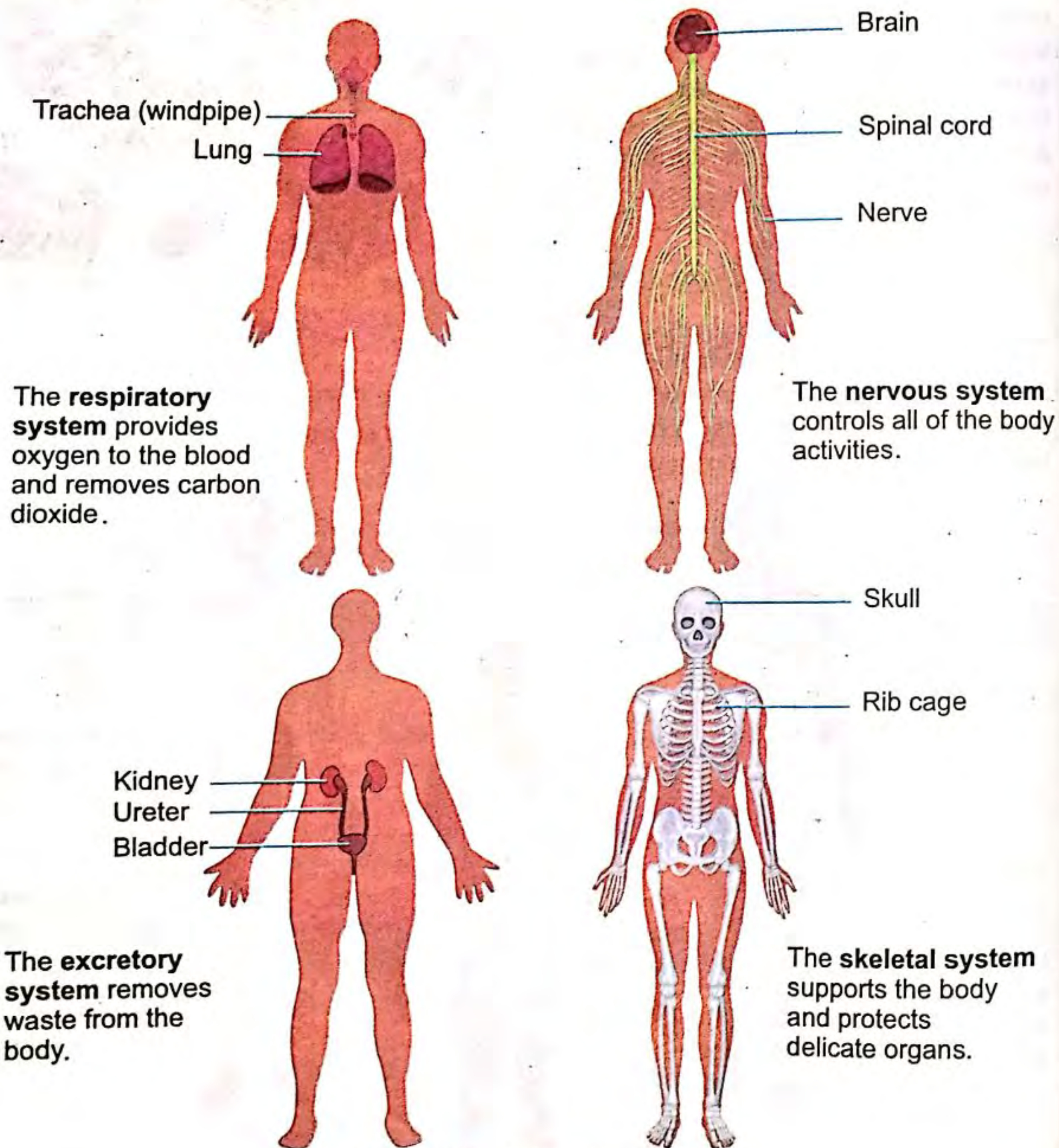


Figure 1.5b Major organ systems

Teaching Point: Teacher will explain that all these systems coordinate together for normal working of the human body.

UNIT 1

CELLULAR ORGANIZATION

CELLULAR ORGANIZATION



END OF UNIT ASSESSMENT

A. MCQs (Choose the correct option)

- Which one of the following is absent in an animal cell?
a. Protein b. Water c. Salts d. Cellulose
- What is the main difference between a plant and an animal cell?
a. Plant cell has a nucleus, it is absent in animal cell
b. Plant cell has a cell wall which is absent in the animal cell
c. Animal cell is larger than the plant cell
d. Plant cell has no chlorophyll
- All plant cells do not contain chloroplast. A plant cell without chloroplast is
a. green stem cell. b. leaf cell. c. root hair cell. d. bud cell.
- Which of the following organelle is responsible for carrying the genetic information inside the nucleus?
a. Chromosome b. Cell membrane
c. Ribosome d. Vacuole
- Which one of the following traps sunlight energy for the process of Photosynthesis?
a. Cytoplasm b. Vacuole c. Cellulose d. Chlorophyll
- Imagine if you had no bones, what would happen to you?
a. Wastes would increase in your blood
b. Your food would not digest
c. Your blood would have more carbon dioxide
d. You would be floppy
- One of the following is the correct pathway of organization.
a. Cell → organ system → organ → tissue
b. Tissue → organ → cell → organ system
c. Organ system → cell → organ → tissue
d. Cell → tissue → organ → organ system
- Liver is a part of:
a. Digestive system b. Circulatory system
c. Respiratory system d. Nervous system

9. Which structure controls the functioning of a cell?

- a. Cytoplasm b. Cell membrane c. Nucleus d. Vacuole

10. Layers of flat cells that cover and protect plant parts are grouped to form

- a. Epidermal tissue b. Photosynthetic tissue
c. Supporting tissue d. Vascular tissue

B. True or False (Correct the statement if it is False).

1. Muscles cover the body and they are example of animal tissues.

True True

2. Mitochondria is the power house of cell and provides energy to the cell.

True True

3. Tissues are a group of organisms with shared structure and function.

True True

4. The control unit of a cell is cytoplasm.

False False

5. Nervous system provides support and protection to the organism.

False False

C. Short Questions

- What would happen to a plant cell if it had no cell wall?
- How does a cell get water and nutrients?
- Do unicellular organisms have tissues?
- What does specialization of cells mean?
- Why do plant cells need both chloroplast and mitochondria?

D. Long Questions

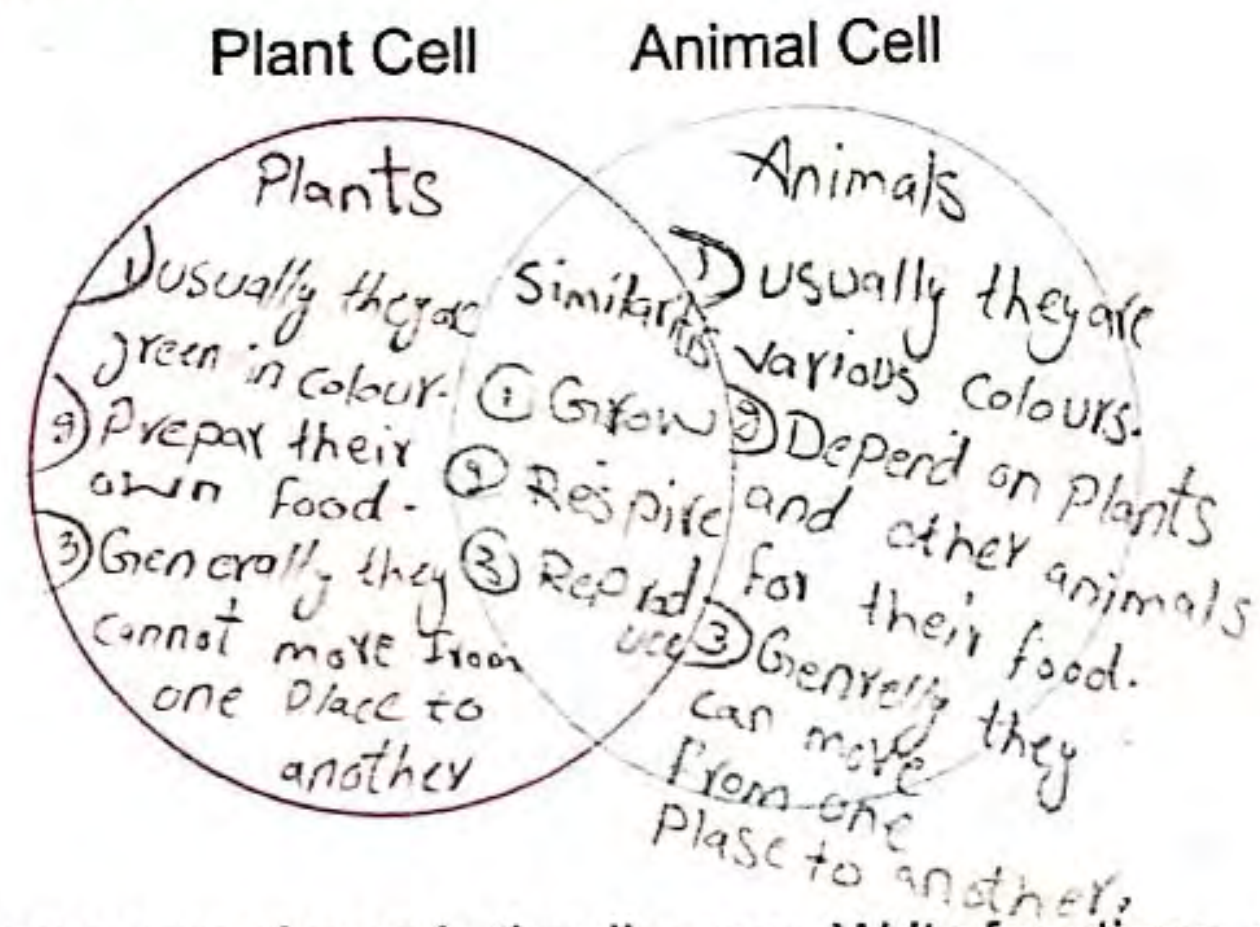
- Describe the properties of living things.
- Draw and describe animal cell.
- Name seven human organ systems. Enlist their components and describe their functions.

UNIT 1

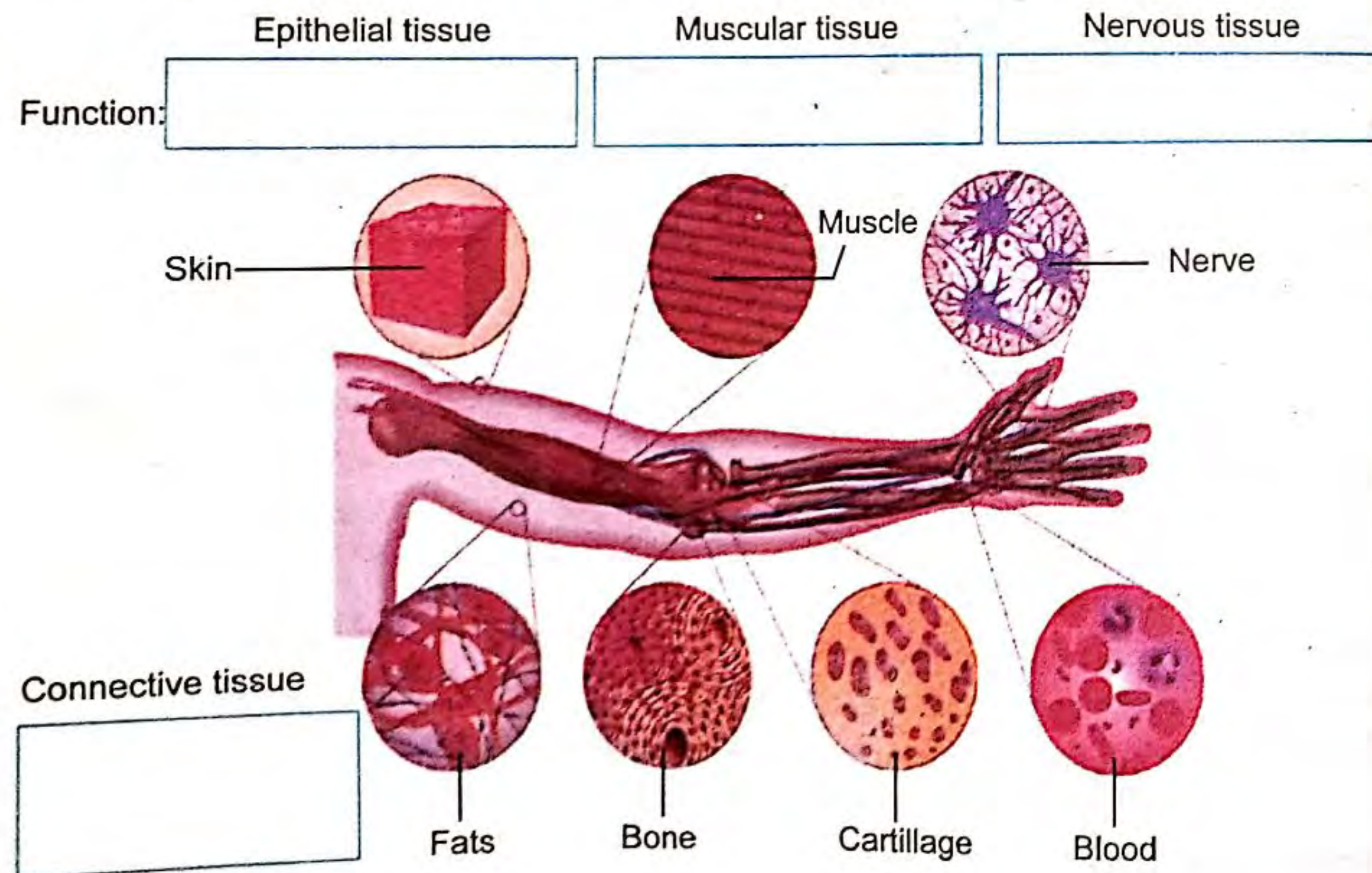
CELLULAR ORGANIZATION

E. Structured response questions

1. In the Venn diagram below, compare plant cell and animal cell.



2. Different parts of your arm are shown in the diagram. Write functions of each.



F. Project work

Make a model of human organ system of your choice by using recycled materials. Label its parts. (Group work).

UNIT 2

REPRODUCTION IN PLANTS

Learning outcomes:

At the end of this unit, students will be able to:

- Describe the different types of reproduction in plants.
- Compare and contrast types of reproduction (sexual and asexual) in plants.
- Distinguish between artificial and natural asexual reproduction in plants. (Budding, Bulbs, Tuber, Runners, Cutting, Grafting, and Layering.)
- Inquire how artificial propagation can lead to better quality yield in agriculture.

UNIT 2

REPRODUCTION IN PLANTS

2.1 REPRODUCTION IN PLANTS

You learned about some life processes in previous chapter. One of them is reproduction. The process of producing new organisms from their parents is called reproduction. **Reproduction** ensures that a group of organisms does not disappear from Earth. This process is very important for the continuation of life on earth.

Plants reproduce by two ways i.e., sexual reproduction and asexual reproduction.

DO YOU KNOW?

The parts of the plants can be divided into two groups i.e., reproductive and vegetative parts. Reproductive part includes only flower, while all other plant parts are called vegetative parts including root, stem and leaves.

2.2 SEXUAL REPRODUCTION

Do you like to grow plants? Have you grown any seedling? All flowering plants can be grown from seeds. **Sexual reproduction** involves the fusion of male and female gametes. The male gametes are inside pollen grain and female gametes are present in ovule. Do you remember structure of flower from grade 4? Sexual reproduction takes place in flowers. It includes gamete formation, pollination, fertilization, seed formation and seed dispersal.

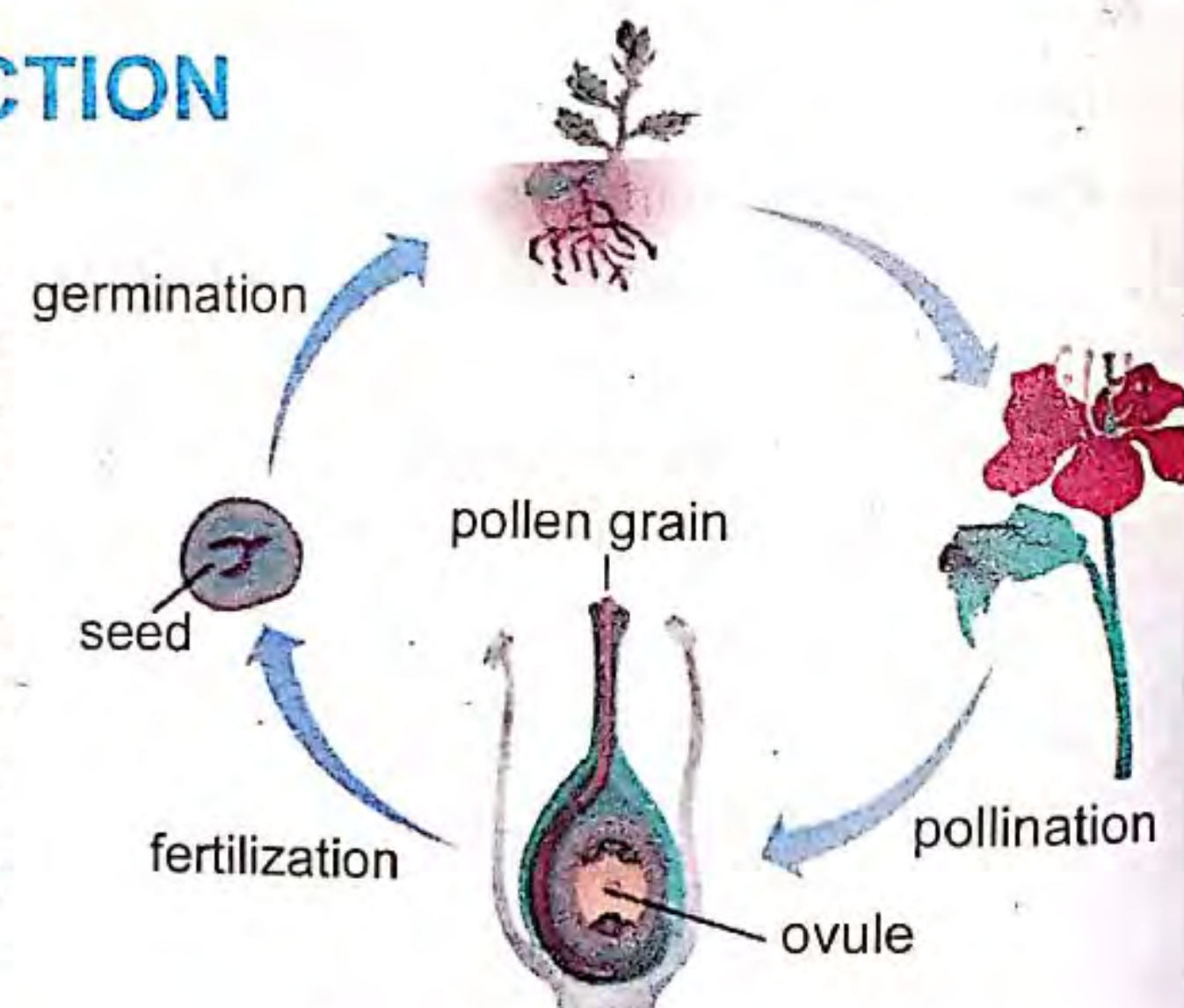


Figure 2.1 Life Cycle of a Plant

2.3 ASEXUAL REPRODUCTION

Have you grown any cutting of plant? Can you grow plants without using seeds? **Asexual reproduction** involves formation of new plants from vegetative parts like root, stem and leaves. This type of reproduction is also called **vegetative propagation**. It does not require flower or seed formation.

Teaching Point: Clones are genetically identical organisms. Vegetative propagation produces natural clones in the form of crops quickly, easily, at low cost and with less water requirement.

REPRODUCTION IN PLANTS



DO YOU KNOW?

Asexual reproduction produces organisms identical to their parents called clones. While sexual reproduction creates new varieties. Can you identify which field of tulip is produced by asexual reproduction?



There are many types of asexual reproduction. This propagation can be classified into two main types i.e., natural and artificial.

2.4 NATURAL PROPAGATION OF PLANTS

Many plants reproduce through vegetative propagation naturally. Methods of natural propagation include **budding**, **bulbs**, **tuber** and **runners**.

DO YOU KNOW?

A bud is a small swelling that can grow into new branches, leaves or flowers. In vegetative propagation, roots and shoots grow from buds. New plants are formed from these buds.



Figure 2.2 Budding on Air Plant Leaves

Budding

Juicy leaf plants like Air plant have buds at the margins of their leaves. Each bud develops into a new plant. Air plant is also called "Zakhm-e-Hayat".

UNIT 2

REPRODUCTION IN PLANTS

Bulb

A bulb is a type of an underground stem with thick, fleshy leaves that store food. It produces smaller buds which grow into new plants.



Figure 2.3 Onion Bulbs



Figure 2.4 Potato tuber

Tuber

It is a swollen, underground stem. Each bud can be cut and planted to grow into a new plant.

Runner

Runners are plant stems that grow along the ground. New strawberry plants grow from the buds along the runners of the parent strawberry plant.

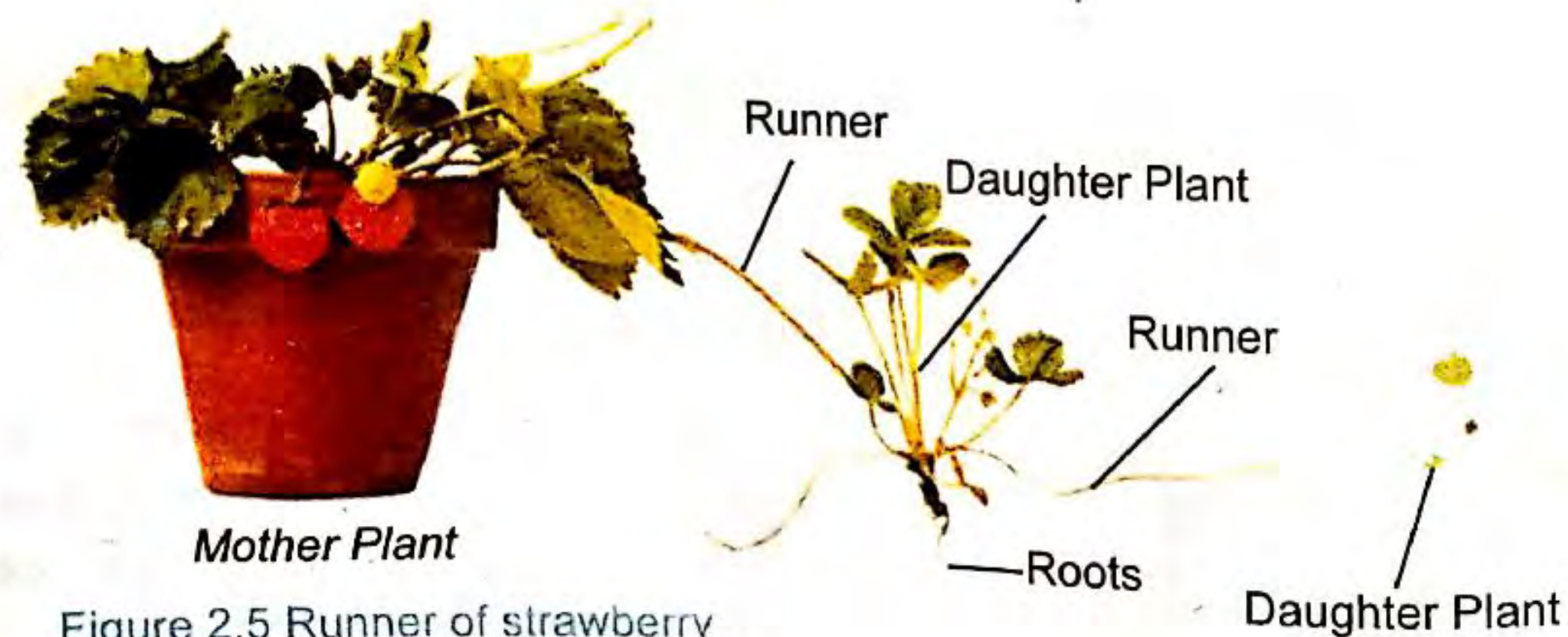


Figure 2.5 Runner of strawberry

2.5 ARTIFICIAL VEGETATIVE PROPAGATION

Artificial vegetative propagation requires human action. The most common types of artificial vegetative reproductive techniques include **cutting**, **layering**, **grafting** and **tissue culture**.



Figure 2.6 Cutting

Cutting

A stem cutting from a rose plant will grow roots and form a new plant. Root and leaf cuttings can also be grown.

Layering

When a branch of shrub touches the ground, it produces roots and forms a new plant. Layering can be done by bending a branch, removing a ring of bark and covering it with soil mound.



Figure 2.7 Layering

Grafting

Grafting is a technique of combining two plants. It uses the roots and the bottom portion of one plant (rootstock) and attach it to shoot (scion) from the top portion of another plant. Grafting is done for many fruit trees.

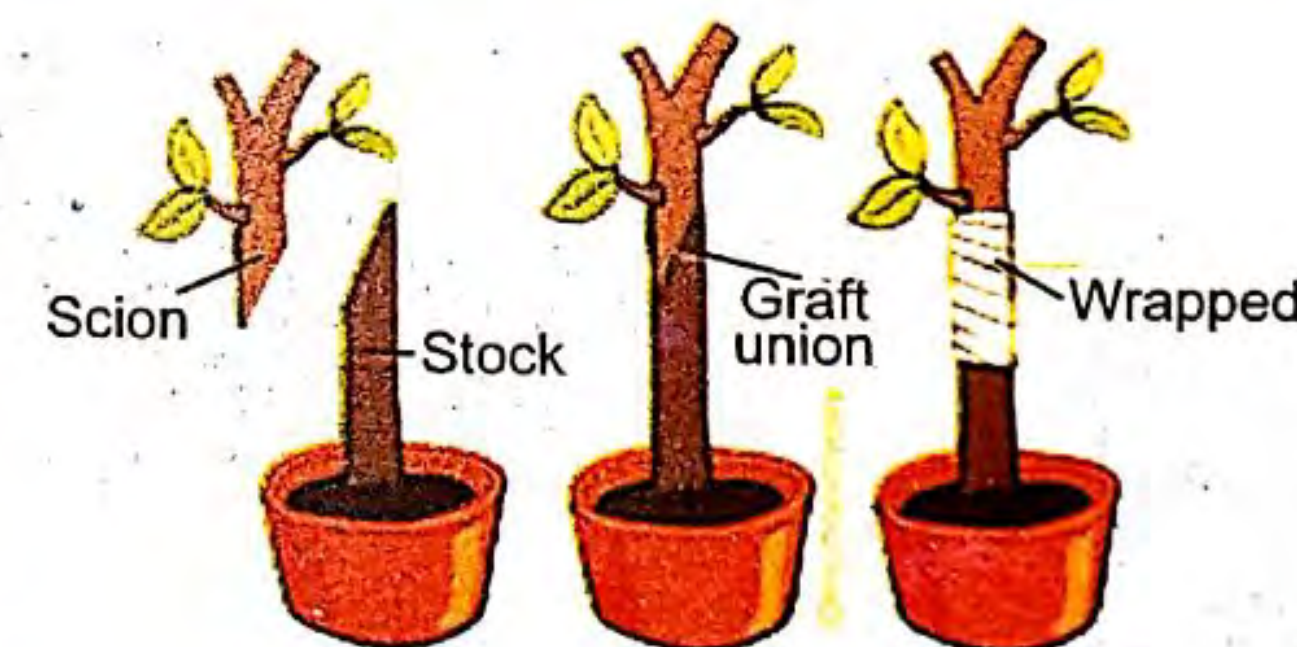


Figure 2.8 Grafting



2.6 ADVANTAGES OF VEGETATIVE PROPAGATION

Agriculture specially fruits trees growth depends on the benefits of the vegetative propagation. The desirable plant can be reproduce exactly, quickly and cheaply by these methods.

Following are the benefits of vegetative propagation.

- Quick and easy way to produce new plants
- New plants are identical to the parent plant
- Desirable fruit characters are maintained
- Only one parent is required for reproduction, so there is no need of pollination etc.
- Plants that do not produce seeds are propagated by these methods, for example banana

There are some disadvantages as well such as:

- No new variety can be produced
- Cannot cope with changing environmental conditions
- Very little chance of surviving any disease attack

Activity 2.1 Investigate benefit of vegetative propagation (Group work)

Students will choose best rose plants from the school. They will collect seeds from those plants. In winter they will get cutting of those plants.

One group will grow rose plants from seeds and the other group will grow rose plants via cuttings. All conditions of soil, watering, temperature and light availability will be same for both groups. Students will record following observations.

	Rose Plants from Seeds	Rose plants from Cutting
Number of seeds / Cuttings used		
Number of small plants grown after one month		
Number of leaves on plants after two months		
Number of flowers after three months		
Colour and size of flowers		
Smell of flowers		
Total production of flowers in three months		

Key Points

- Reproduction is of two types: Sexual reproduction involves gamete formation, pollination, fertilization, seed formation and seed dispersal while in asexual reproduction all these processes are absent
- Vegetative propagation is asexual reproduction in plants. It increases the number of identical plants in a short period of time
- Natural vegetative propagation techniques include budding, bulbs, tuber and runners
- Artificial vegetative propagation techniques include cutting, grafting, layering and tissue culture
- Agriculture is improved by the use of artificial vegetative propagation



END OF UNIT ASSESSMENT

A. MCQs (Choose the correct option)

- A potato can be grown from its seeds, but mostly farmers cut pieces of potato tubers and bury them in soil because
 - a. it needs more water.
 - b. it is a quick way of producing plants.
 - c. potato pieces are useless.
 - d. it is the habit of farmers.
- Farmers prefer vegetative propagation methods because they can:
 - a. Produce new varieties
 - b. Grow plants/crops quickly and easily
 - c. Cope with all types of diseases
 - d. Survive all types of weather changes
- Which one of the following is not a process involved in vegetative propagation?
 - a. Cutting
 - b. Tuber
 - c. Runner
 - d. Fertilization
- Sexual reproduction is a big advantage to a group of organisms because it provides a lot of
 - a. variety in organisms.
 - b. identical organisms.
 - c. energy for organisms to survive.
 - d. similar copies of parents.
- An onion plant produces a new plant without the formation of seeds. This type of reproduction is called
 - a. budding.
 - b. fragmentation.
 - c. fission.
 - d. vegetative propagation.
- Tulips, lilies and onions can be reproduced by
 - a. bulbs.
 - b. tubers.
 - c. cuttings.
 - d. runners.

UNIT 2

REPRODUCTION IN PLANTS

7. A stem is the part of a shoot system which grows in the air. Sometimes stem can be underground in plants like
- rose and jasmine.
 - mango and orange.
 - strawberry and mint.
 - potato and onion.
8. Potato tubers have depressions called eyes. If a piece is without an eye it will not grow into a new plant because eyes
- have seeds.
 - have buds.
 - can grow branches.
 - can grow roots.
9. Grafting is done mostly in fruit trees to provide root stock which has:
- Weak roots
 - Strong and resistant roots
 - Diseased roots
 - Small roots
10. In layering technique no harm is caused to the parent plant because:
- Few branches are involved
 - Some roots are used as rootstock
 - Some leaves are removed
 - Some buds are added

B. Match the columns

Column A	Column B
Bulb	Formation of new organisms without gametes
Runner	Swollen underground stem with buds
Tuber	Fertilization of gametes
Sexual reproduction	Underground stem with thick fleshy leaves
Cutting	Piece of stem, root or leaf
Plantlets	Stems growing along the ground
Asexual reproduction	Buds at margins of leaves

REPRODUCTION IN PLANTS



C. Short questions

- Differentiate between sexual and asexual reproduction.
- Why do organisms reproduce? What will happen if a group of organisms is unable to reproduce?
- Define buds? What are the different structures formed from buds?
- Why do we seldom see potato seeds while we see many potatoes around us?
- Compare artificial and natural vegetative propagation.

D. Long questions

- Differentiate between sexual and asexual reproduction.
- Compare artificial and natural vegetative propagation.

E. Structured response questions

- The Tree of 40 Fruit is a single tree that grows forty different types of fruits including peaches, plums, apricots, nectarines, cherries, and almonds. It took 10 years for its formation.



- Which technique of vegetative propagation is used in the formation of this tree?
- Can you make a tree which can grow more than one type of fruit?
- If such trees are grown in Pakistan will it be helpful for agriculture?

Teaching Point: The tree of 40 fruits is created by a US university professor. Encourage students to search about it and answer questions related to it.

UNIT 2

REPRODUCTION IN PLANTS

2. The following figure shows vegetative propagation in geranium plant.



Parent plant



Cutting of stem



New plants

a. Which type of vegetative propagation is used in this figure?

b. Why a piece of stem from parent plant is placed in water for few days?

c. Can we get new varieties of geranium plant by this method?

d. What are the benefits of producing new plants by this method?

F. Project work

Divide the students in your class in seven groups. Each group has to grow a crop by vegetative propagation method they learned in this chapter. Students can use a ground patch in school or a large pot.

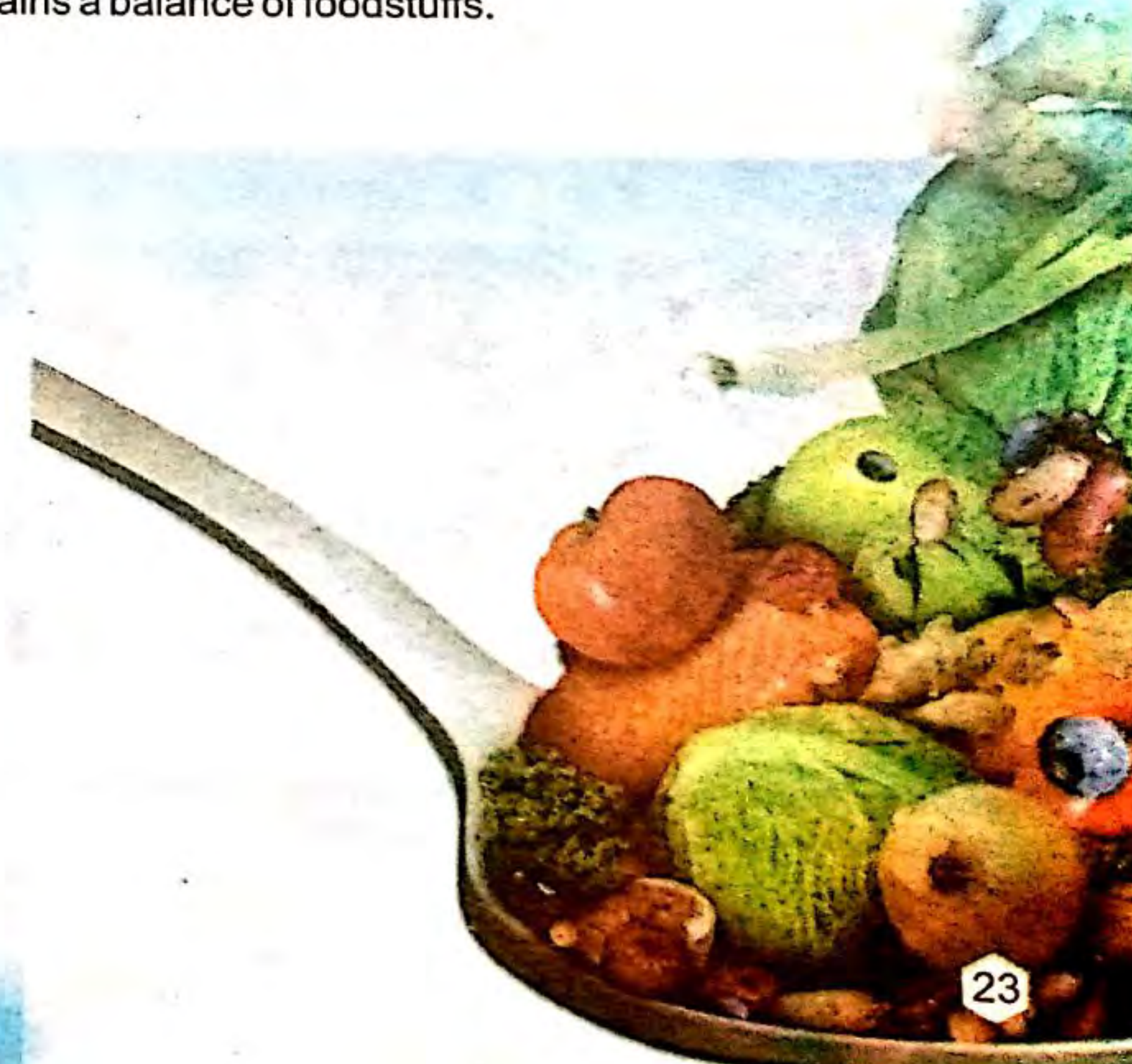
UNIT 3

BALANCED DIET

Learning outcomes:

At the end of this unit, students will be able to:

- Identify the constituents of a balanced diet including protein, carbohydrates, fats and oils, water, minerals (limited to calcium and iron) and vitamins (limited to A, C and D) for humans and describe the functions of these nutrients.
- Identify the essential nutrients, their chemical composition and food sources.
- Identify and describe essential nutrients' deficiency disorders.
- Recognize that a healthy diet contains a balance of foodstuffs.
- Correlate diet and fitness.



UNIT 3

BALANCED DIET

3.1 NUTRITION IN FOOD

What type of food do you eat daily?

What could be the best way to stay healthy?

We enjoy eating tasty food. The food that we eat in a day give us energy. A balanced diet is a diet that consists all essential nutrients that our body requires to perform its functions properly.

All these nutrients are present in different types of food like fruits, vegetables, grains, meat and dairy products etc.



Figure 3.1 Balanced Diet

Why balanced diet is important?

- It leads to a good physical and mental health.
- It helps to grow the body properly.
- It builds the immunity to fight or resist diseases.
- It provides energy

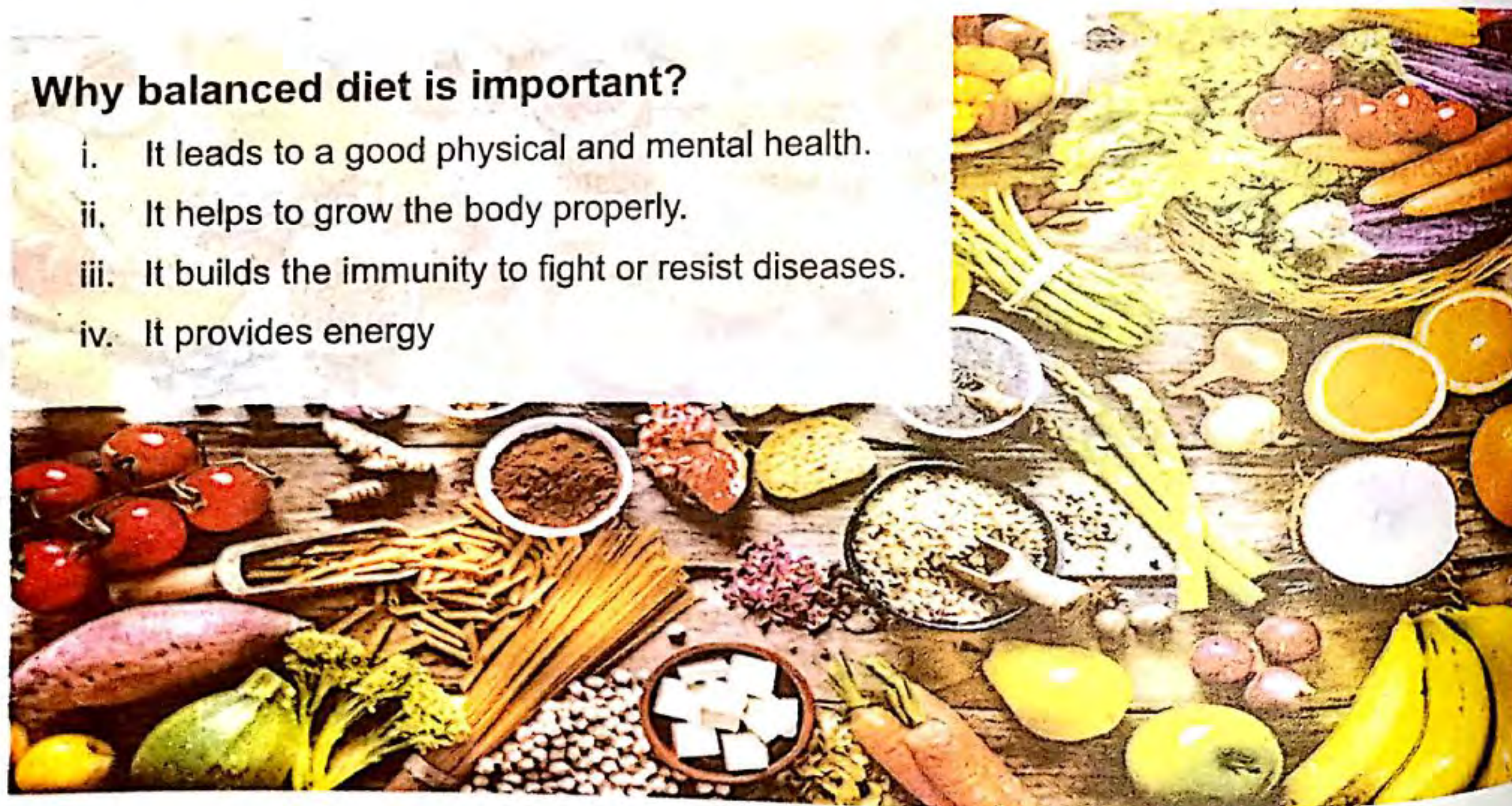


Figure 3.2 Balanced Diet

Teaching Point: Teacher will discuss the importance of Balanced diet and how it is helpful to maintain physical and mental health.

What are different types of nutrients in food?

Food consist of different types of nutrients that our body needs. These are the chemical substances that are present in different types of food. Components of food required for normal growth and metabolism are called nutrients.

Nutrients

Carbohydrates

Proteins

Fats and oil

Minerals

Vitamins

Water

Carbohydrates

Rice, bread, grain and fruits are major foods in your meals. These foods are rich in carbohydrates. Carbohydrates are the main source of energy. They are called fuel for the body. Carbohydrates consist of starch and sugar. Carbohydrates deficiency in the body may lead to headache, fatigue, weakness and body growth may stop.



Figure 3.3 Rich Sources of Carbohydrates

DO YOU KNOW?

The brain is the only carbohydrate-dependent organ in the body

UNIT 3

BALANCED DIET

BALANCED DIET



Protein

Foods that consist of proteins include chicken, lentils, fish, meat, egg, nuts and beans etc. Protein also provides energy but mainly they play an important role in making of body cells and muscles. It helps to build body tissues, hormones and enzymes. It serves as a fuel source for cells and tissues when needed. Protein deficiency may cause different disease like Kwashiorkor, Marasmus, slow growth, swelling, fatty liver, skin damage, discolouration of hair and more infections.



Figure 3.4 Rich Sources of Protein

DO YOU KNOW?

Animal food like meat, fish, poultry, eggs and dairy contains more proteins as compared to the proteins that we get from plants like vegetables, whole grains, seeds and nuts. Animals' proteins are good for the body building as it consist of all essential nutrients. While plant proteins consist of many essential nutrients. They become more effective when used together.

STOP AND CHECK

Can you name the food groups that have good quality proteins?

What would happen to a child who is not taking protein in his diet?



Fats and Oils

Seeds, nuts, eggs, dairy products and olive oil are resource of fats. Fats and oils are the energy rich foods. They are important for the growth of young children. It can be stored in our body and it keeps our body warm. The healthy fats help to improve your brain function. Deficiency of fats may cause infections, skin and hair problems.



Figure 3.5 Rich Sources of Good Fats and Oils

Vitamins and Minerals

Nutrient

Vitamins

Minerals

Function

Deficiency disease

Source

A

C

D

Calcium

Iron

Improves your night vision and eye sight, enhance immunity to infection

Loss of Vision or poor vision

Vegetables, fruits, egg yolk and butter

Good for skin. Helps to heal it quickly if it is damaged,

Scurvy that causes bleeding gums, wounds take longer time to heal

Citrus fruits, and vegetables like orange, Mango, Lemon, Cabbage, potato

Helps to make bones and teeth strong, helps in the absorption of calcium

Causes Rickets in which bones become weak and bent

Dairy products, eggs, liver and fish oil, sunlight

Make bones, enamel of teeth, clotting of blood and control muscles contraction

Poor skeletal growth, osteoporosis, bones and teeth become weak

Dairy products, green vegetables like spinach and eggs

Good for the formation of hemoglobin, transport oxygen in the blood

Anaemia, weakness, fatigue, pale complexion

Liver, meat, fish, eggs, nuts, whole cereals and green vegetables



DO YOU KNOW?

Haemoglobin (Hb) is a protein found in the red blood cells that carries oxygen in your body and gives blood its red color. Hb levels vary from person to person.

UNIT 3

BALANCED DIET



Figure 3.6 Rich Sources of Fiber

Fiber

We mostly get fiber from fruits and vegetables. The right amount of fiber keeps our intestine healthy and working properly. Deficiency of the fiber may cause constipation, bloating, diabetes and high cholesterol level.

DO YOU KNOW?

Keeping your food diary is one of the most important way to keep health. You can download my plate app to easily track calories.



Know what's in your food.
Make better choices.



Activity 3.1 Fat detection in food

To find out if a food sample contain fats or not. Choose any food and crush the small sample. Next Put the sample in test tube and than add ethanol above the level of food. Now Shake it well and add water. What do you observe? If a cloudy mixture appears it means fats are present.



BALANCED DIET



Water

People can live without food for many days but they cannot live without water. Water is the main component of our blood. It keeps the lining of the mouth wet. We may also obtain water from fruits and vegetables that are high in water content like cucumber and watermelon. Water help to transport nutrients in the body. It helps to remove the toxic material from the body.



Figure 3.7 Water containing food



Figure 3.8 Drinking Water

Activity 3.2 Role play

Organize a role play activity in which the whole class participates. One learner can be selected as the King or Queen of the class, while 5-6 students can assume various roles as an advisors such as the Royal's fitness instructor, their mother, their doctor etc. Everyone else is trying to become the Royal's new personal chef. Each candidate must prepare an ideal meal for the King, and talk about its nutritional benefits along with its taste and other features. The king after consulting their advisors will hire their new chef.



UNIT 3

BALANCED DIET

3.2 NUTRITION AND THEIR COMPOSITION

But have you ever thought how much a body need these nutrients to stay health?

As we already learned there are seven essential nutrients that are required to stay healthy. These essential nutrients are carbohydrates, proteins, fats, water, minerals, fiber and vitamins. All these nutrients are made up of different types of elements.

Following is the table showing a percentage of daily calories from each food group, their elements and sources.

Nutrients	Elements	%age of daily calories	Food sources
Carbohydrates	Carbon, Hydrogen, Oxygen	45 – 55 % (130 g)	Whole grain cereals, fruits, vegetables, beans and lentils
Proteins	Carbon, Hydrogen, Oxygen, Nitrogen,	20 – 35 % (46 – 56 g)	Meat, fish, egg, dairy products, nuts, beans and lentils
Fats	Carbon, Hydrogen, Oxygen	20 – 35 % (12 g)	Seeds, nuts, egg, dairy products and olive oil
Vitamins	Carbon, Hydrogen, Oxygen	Traces	Fruits, vegetables, nuts, dairy products, egg and fish
Minerals	Made up of single element or compound e.g Sodium, Calcium, Potassium, Iron	Traces	Fruits, vegetables, nuts, dairy products, egg and fish

DO YOU KNOW?

There are two types of nutrients:

Micronutrients are those nutrients which a body needs in a small amount. These are vital to healthy development, disease prevention and well being.

Macronutrients are carbohydrates, fat and protein. They are the nutrients you use in the largest amounts.

BALANCED DIET



3.3 BALANCED DIET

A balanced diet creates energy that helps to perform the tasks. The habit of balanced diet is as important as food. Here are some tips to maintain healthy and balanced diet.

Here are some tips

- Eat plenty of all colour fruits and vegetables like apple, orange and pear.
- For proteins eat meat, fish, chicken, beans and peas.
- Milk is a good source of calcium and vitamin D.
- Drink plenty of water daily.
- Avoid eating fast food.
- Avoid eating too much fat containing food.
- Do not cut out any food group.



Figure 3.9 Food Pyramid

Activity 3.3 Choose a letter of the week

Teacher will assign a letter every week to students. Student will find information and discuss healthy foods which start with the chosen letter of the week. For example, for the letter 'M'; try mushroom, milk and mango.



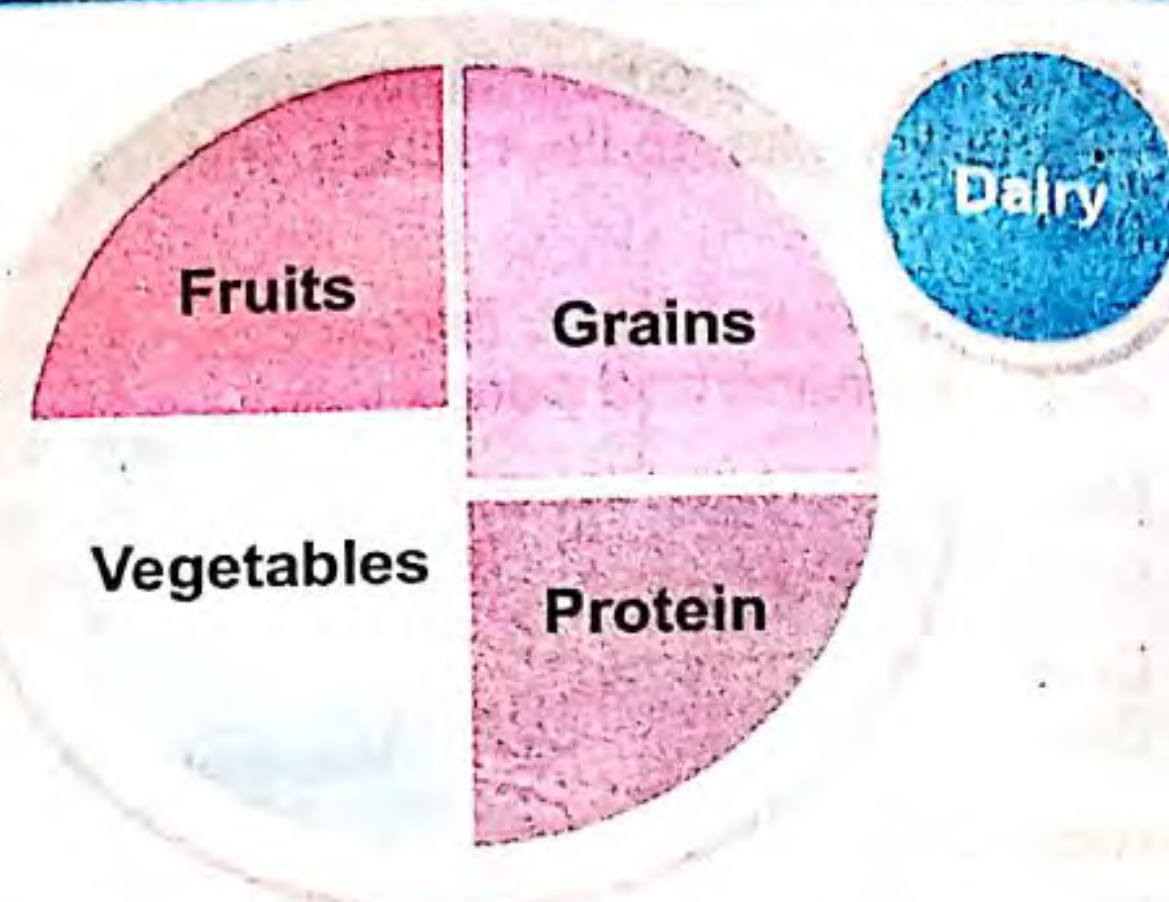
UNIT 3

BALANCED DIET

Activity 3.4 My healthy plate

My Plate is a HEALTHY Plate

To stay healthy one needs to make food and beverage choices from all five food groups including fruits, vegetables, grains, protein foods, and dairy to get the nutrients you need. Fill the following:



Breakfast	Lunchbox	Dinner
Fruit:	Fruit:	Fruit:
Grain:	Grain:	Grain:
Dairy:	Dairy:	Dairy:
Protein:	Protein:	Protein:
Vegetable:	Vegetable:	Vegetable:

Teaching Point: Teacher will demonstrate how to prepare healthy food by using different food choices. To perform this activity he/she can use food drawings also.

BALANCED DIET



3.4 DIET AND FITNESS

Have you ever thought what does health mean?

Is there any connection between diet and health? And how can we keep ourselves fit and healthy?

- Health does not only mean the absence of any disease but it means a person who is physically and mentally fit. There is a strong relationship between diet and health. By choosing right type of food we can maintain our health. Eating a balanced diet plays an important role in improving our health.

Diet that consists of fruits, vegetables, grains and nuts and meat reduces the disease risk while on the other side an unbalanced diet can lead to health and weight problems.

Is it the only the diet that keeps us healthy and fit?

Along with diet a regular exercise not only improves health but it improves mood and sleeping habits. Diet and exercise go side by side for a healthy living.

Regular exercise is very important to maintain good health. There are many advantages of regular exercise that helps to maintain fitness as it increases energy levels, increases muscle strength and brain function, it lowers the threat of many diseases and it can help us to maintain a healthy weight.

- Now we can say eating healthy food and exercise appropriately is key of healthy life. People with good health can perform their activities well. Now it's your turn to make a decision that how you will make your body healthy, strong and active.

TRY IT OUT

Do you know, not getting enough sleep is linked to fats? What would happen if you do not get enough sleep? And how much sleep children need between ages 6-13 years.



DO YOU KNOW?

One third of the people on the planet are malnourished, with 2 billion people overweight or obese and 821 million people going hungry.



UNIT 3

BALANCED DIET

Key Points

- There are seven different types of nutrients; proteins, carbohydrates, fats and oils, fiber, vitamins, mineral and water
- Varieties of foods contain these nutrients
- A balanced diet contains all types of nutrients
- Any nutrient missing in a diet may lead to nutritional deficiency disease
- A balanced diet makes you fit and healthy
- The amount of nutrients in a diet depends on age, gender and activities



END OF UNIT ASSESSMENT

A. MCQs (Choose the correct option)

- Hamna likes to eat junk food and refuses to eat fruits and vegetables. She will become
 - fit and active.
 - healthy and smart.
 - lazy and fat.
 - efficient and energetic.
- Nasir developed asthma in childhood. His mother had a misconception that dairy products and carrots increase asthma attacks, so these should not be included in his diet. After few years he was unable to see in the dim light and had repeated fractures. It is due to
 - deficiency of fibres.
 - deficiency of vitamin A and calcium.
 - deficiency of carbohydrates.
 - deficiency of proteins.
- Which of the nutrient is helpful for making new cells in the body?
 - Protein
 - Carbohydrates
 - Fats
 - Fiber
- Fuel of the body is:
 - Vitamin
 - Carbohydrates
 - Fiber
 - Fats
- Energy is stored in the food in the form of:
 - Mineral
 - Calorie
 - Diet
 - Nutrients
- Meat and fish are good source of:
 - Protein
 - Carbohydrates
 - Fats
 - Fiber
- Vitamin C deficiency may lead to:
 - Berry berry
 - Scurvy
 - Night blindness
 - Anaemia
- A balanced diet is a diet:
 - With protein, carbohydrates and fats
 - With all seven nutrients
 - With all seven nutrients in appropriate portion
 - With equal amount of seven nutrients



9. Which type of food is called body building food?

- a. Carbohydrate b. Protein c. Fats d. Minerals

10. Which of the following disease causes the bleeding of gums?

- a. Anaemia b. Scurvy c. Rickets d. Bruising

B. Short Questions

- Differentiate between food and nutrient.
- Enlist the food items which are good source of fiber. (any four)
- Name any two diseases caused by the deficiency of vitamin A and calcium.
- What type of food we should eat less?
- Is an apple a healthy choice for snack? Justify your answer.
- Why balanced diet is important?
- Why do we need proteins in our diet?

C. Long Questions

- Differentiate between macro and micro nutrients and explain the role of macronutrient in body.
- How can we have a balanced diet? Elaborate your answer.
- Is there any relationship between diet and fitness? Explain
- What do various nutrients do in our body?

D. Structured response questions

- Protein content of food:
the table below shows protein content of some food items
 - Which food contains the highest amount of protein?
 - How much protein will present in 1 cup of spinach?
 - How much protein is present in 5 eggs?
 - How much protein is in 1/2 oz of walnuts?

Food	Serving size	Protein (g)
Egg	1 egg	6
Peas	½ cup	4
Spinach	½ cup	3
Walnuts	1 oz	4
Yogurt	1 cup	11
Pumpkin Seeds	1 oz	9

UNIT 3**BALANCED DIET**

2. You are invited in your friend house, you are provided with different types of foods given below in the table. You have to choose a balanced diet. Choose a balanced meal and explain that how it is a balanced meal.

Food	Food
French Fries	Soft drink
Butter rice	Water
Banana	Fried rice
Cottage cheese	Baked Chicken
Ice cream	Milkshake
Pizza	Bread with butter
Meat	Vegetable salad
Jelly	Pasta
Tea with milk and sugar	Baked vegetables
Lemonade	Apples

3. Write the correct nutrient for each food.



4. Match the nutrient to their function

Vitamins	Build and repair the body
Proteins	Keep body healthy and fight disease
Water	Store energy in body
Fats	Energy giving food
Carbohydrates	Keeps body clean and helps in digestion

E. Project work

Make healthy and balanced diet menu for your school lunch.

UNIT 4**HUMAN DIGESTIVE SYSTEM****Learning outcomes:**

At the end of this unit, students will be able to:

- State the importance of digestion in the human body and describe physical and chemical digestion.
- Sequence the main regions of Alimentary Canal, its associated organs and describe the functions of different parts of the Alimentary Canal.
- Briefly describe the role of enzymes in digestion.
- Conclude that blood transports the products of digestion to other parts of the body and the undigested products get egested/defecated.
- Briefly describe some major digestive disorders.



UNIT 4

HUMAN DIGESTIVE SYSTEM

4.1 DIGESTION

Imagine you have just eaten an apple? Does the apple look same in the mouth and stomach? Can your body absorb the nutrients of apple directly?

You just learned that your food mainly consists of large molecules of carbohydrates, proteins and fats. These molecules are too big to enter your cells through cell membrane. Your body cells cannot use food until it is broken down into smaller molecules. **Digestion** is the breakdown of food into smaller molecules.

Digestion begins as soon as you chew the food. It continues as the food travels through the organs of the digestive system. Food breakdown starts with **physical digestion**: The large pieces of food are broken into smaller pieces by cutting and chewing action of your teeth. Your tongue also helps by mixing and rolling of food. The muscles of your stomach help in mechanical digestion by mashing the food.

Activity 4.1 Physical digestion

Take a banana. Peel it and cut into small pieces by using knife..Crush these pieces with spoon. Mix some milk in it. Now use a fork to beat it and change into mashed banana. Can you relate action of knife, spoon and fork with any part of your body?

Rest of the digestion is **chemical digestion** by enzymes. **Digestive enzymes** breakdown large food molecules into smaller molecules. For example, the bread you eat has large molecules which are broken by enzymes into smaller molecules. These small molecules are absorbed and used by the cells.

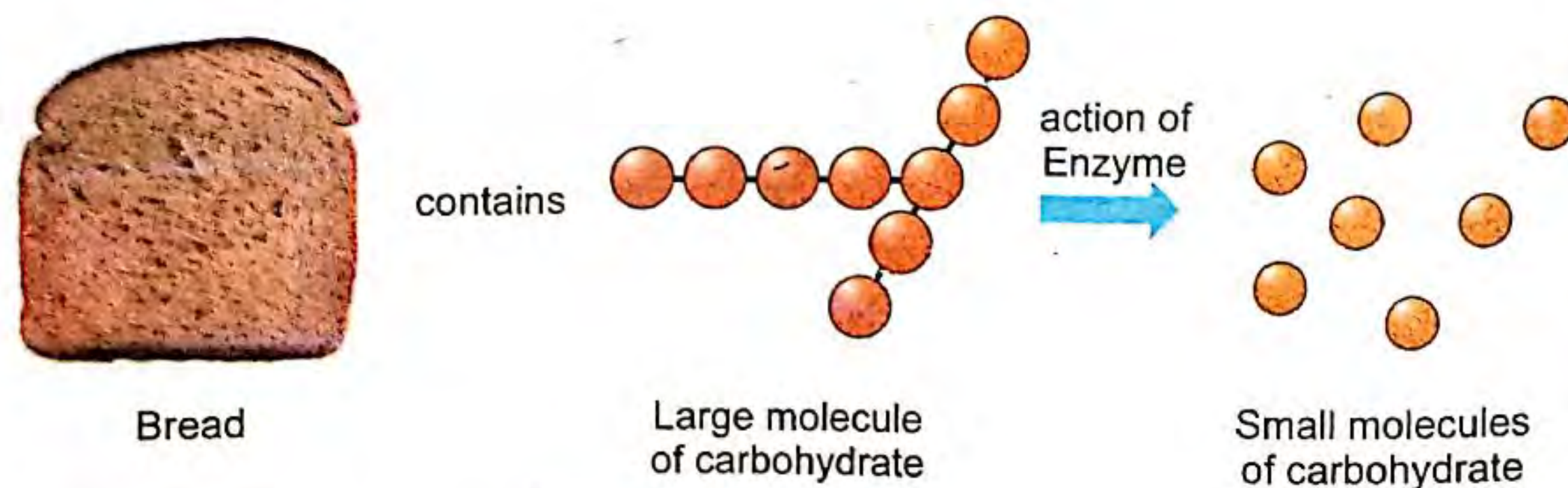


Figure 4.1 Action of Enzyme

HUMAN DIGESTIVE SYSTEM



4.2 HUMAN DIGESTIVE SYSTEM

1. Digestion begins in **mouth**:

- **Physical digestion** by
Teeth (tearing and crushing)
Tongue (rolling and mixing)
- **Chemical digestion** by
enzymes of saliva
(for starch digestion)

Liver produces bile to help fat digestion

Gall bladder stores bile

Pancreas produces digestive enzymes that flow into small intestine

5. Materials that cannot be digested and some liquids move into **large intestine**. It absorbs water from the undigested material. No digestion takes place here

2. The food you swallow enters a food pipe called **oesophagus**. Smooth muscles in its walls contract and push the food towards stomach

3. The partly digested food enters your **stomach**:

- **Physical digestion** by smooth muscles in the walls (mashing)
- **Chemical digestion** by gastric juice from stomach glands. It has enzymes and acid for protein digestion

After several hours in the stomach the food becomes a soupy mixture. Muscles push this thick liquid into the small intestine

4. **Chemical digestion** completes in the **small intestine**. Enzymes from pancreas and intestinal glands digest all types of food into nutrients. These nutrients are absorbed into the blood through the walls of the villi. Villi are tiny finger like projections lining the small intestine

6. **Rectum** stores the solid waste called faeces until it leaves the body through anus

Figure 4.2 Human Digestive System

Teaching Point: The food we eat passes from different parts of digestive system. Digested food is absorbed in blood and undigested food is removed from body.

UNIT 4

HUMAN DIGESTIVE SYSTEM

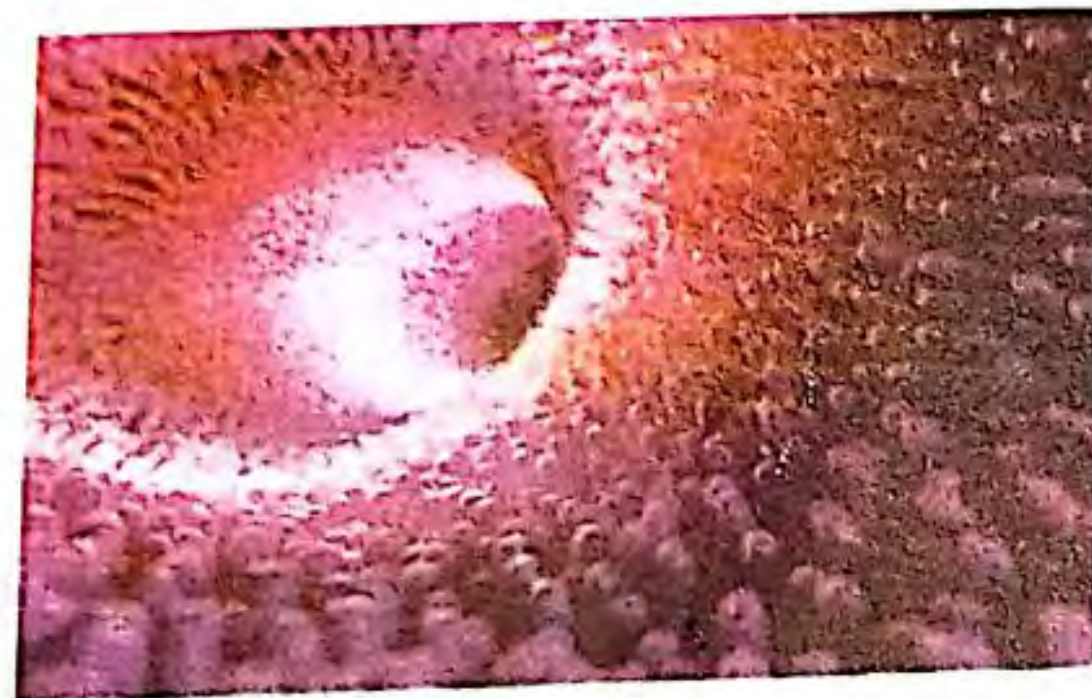
Try it out

Chew a piece of dry bread for a minute without swallowing it. What do you notice about the change in taste and texture of the bread? Explain your observations.

All the digested food absorbs into blood through the villi of small intestine. The blood in the circulatory system carries these nutrients to all cells of body.

DO YOU KNOW?

Villi are small finger like projections in the small intestine which increase surface area for absorption of digested food.



INTERESTING FACTS

- A child has 20 milk teeth. They fall between the age of 6 and 12 to make room for 32 adult teeth called permanent teeth
- Acid in your stomach can dissolve an iron nail. A thick layer of mucus lining the stomach protects it from its own acid
- Friendly bacteria live in our large intestine. They make vitamin K for us
- About 30% of the faeces consists of bacteria

Activity 4.2 Model of alimentary canal

Make a model of the alimentary canal that shows how each organ is positioned and connected to the next and indicates the pathway of food in the process of digestion from the mouth to the rectum. Use recycle material and work in groups.



DO YOU KNOW?

Following are the main steps of digestion.

1. Taking in of the food is called **ingestion**.
2. Crushing of food from large size to small size particles is called **physical digestion**.
3. Breakdown of large food molecules into small food molecules with the help of enzymes is called **chemical digestion**.
4. Small food molecules after digestion pass from digestive system to blood by **absorption**.
5. Food molecules are taken into cells and used by **assimilation**.
6. Undigested food is removed out of the body by **egestion**.

4.3 DIGESTIVE DISORDERS

All of you are familiar with some digestive disorders.

1. **Vomiting** is the throwing up of stomach content. You can get vomiting due to food poisoning, infections, head ache, motion sickness etc.
2. **Diarrhoea** is the watery, loose motions three or more times a day. You can get diarrhoea due to infections, medicines, stress etc.
3. **Constipation** occurs when the faeces become hard, dry and difficult to pass. You can get constipation due to some medicines, less water intake, less exercise and less fibre in diet.

Activity 4.3 Pass the parcel role play

- Sort students into groups of 7 to 8, where one student plays the human eating a certain food, while the other 7 play one of the following organs: mouth, pharynx, esophagus, stomach, small intestine, large intestine and rectum.
- Use a large piece of paper representing food entering the mouth and traveling through the alimentary canal.
- Each student should act the part of their organ and talk about how they are processing the food onward.
- Every part can also explain their disorders as well.

UNIT 4

HUMAN DIGESTIVE SYSTEM

Key Points

- Digestion is the breakdown of food into small molecules so that it can enter into cells through cell membrane
- Digestion is of two types i.e., mechanical and chemical
- Mechanical digestion is a physical process of breaking large pieces of food into small ones by cutting, grinding and mashing
- Chemical digestion is a chemical reaction of breaking large molecules of food into small molecules
- Enzymes are special molecules which can breakdown large food molecules into small ones
- Digestive system starts from the mouth and ends at the anus. It is responsible for intake and digestion of food, absorption of nutrients and removal of undigested material
- After absorption, the food is transported by blood to other parts of the body
- Common digestive disorders include vomiting, diarrhoea and constipation



END OF UNIT ASSESSMENT

A. MCQs (Choose the correct option)

- You take a piece of bread and break it into smaller pieces. It is an example of:
 - Physical digestion
 - Chemical digestion
 - Enzyme action
 - Absorption
- Bile helps in fat digestion. It is secreted by:
 - Stomach
 - Pancreas
 - Liver
 - Gall bladder
- Two parts of digestive system are involved in both physical and chemical digestion. They are:
 - Mouth and oesophagus
 - Mouth and stomach
 - Stomach and small intestine
 - Small and large intestine
- The food you eat takes almost 24 hours to move from mouth to anus. This movement is due to the contractions of:
 - Cardiac muscles
 - Smooth muscles
 - Skeletal muscles
 - Voluntary muscles
- Large molecules of food are broken into small molecules of food with the help of:
 - Teeth
 - Tongue
 - Muscles
 - Enzymes

HUMAN DIGESTIVE SYSTEM



- The undigested food is removed from the body by the process of:
 - Ingestion
 - Digestion
 - Absorption
 - Egestion
- The small food molecules produced after digestion of food are taken to other parts of the body by:
 - Muscles
 - Saliva
 - Blood
 - Intestine
- Bile is stored in:
 - Liver
 - Gall bladder
 - Pancreas
 - Small intestine
- The food we eat may be solid or liquid, but stomach converts it to:
 - Soupy gel
 - Soupy mixture
 - Solid balls
 - Watery solution
- Stomach produces enzyme and acid for digestion of:
 - Carbohydrates
 - Proteins
 - Fats
 - Oil

B. Short questions

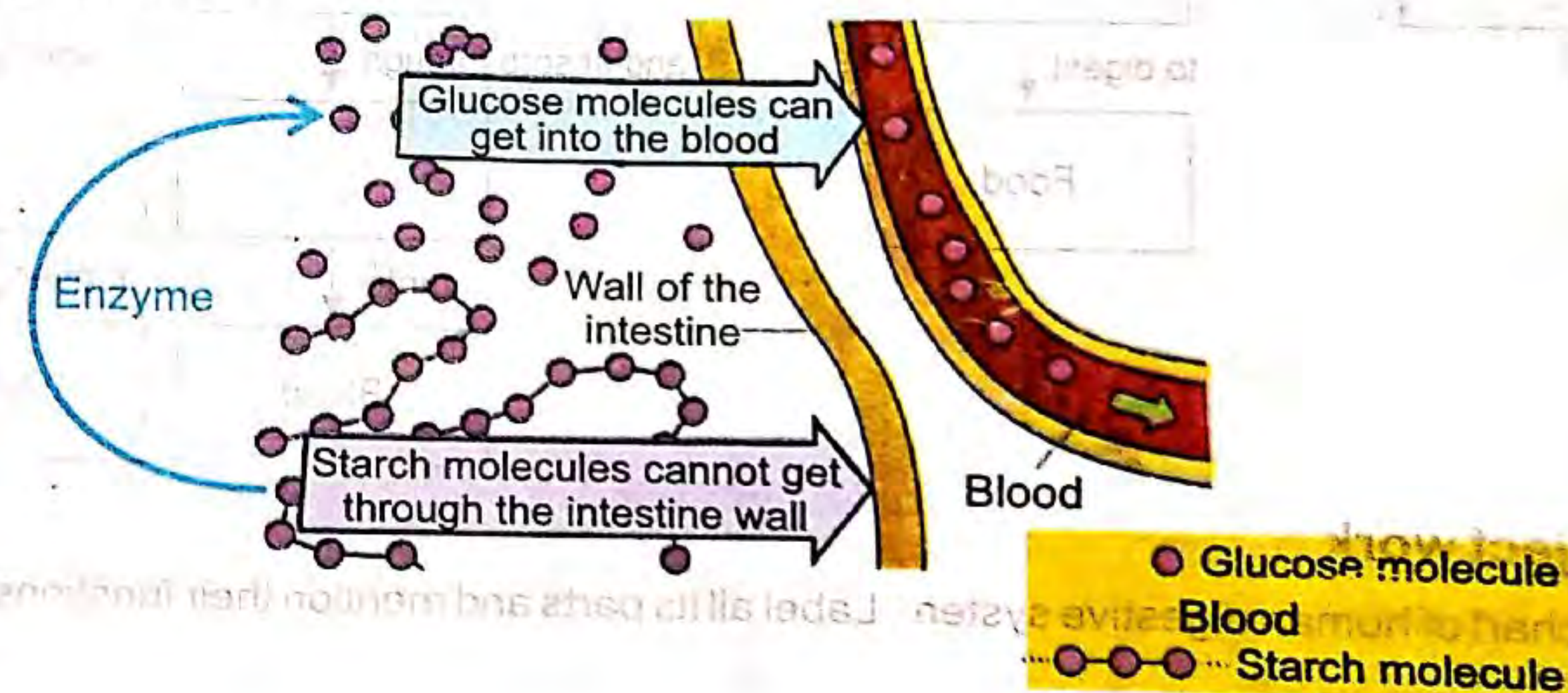
- Define digestion. Why do we need to digest food?
- What role do the muscles play in digestion?
- What is the benefit of breaking up food into smaller pieces?
- Explain digestive enzymes. Give example.
- How can villi help in absorption of food?

C. Long questions

- Explain the different types of digestion.
- Draw and describe human digestive system.

D. Structured response questions

- The following diagram shows change in the starch (a large carbohydrate molecule) in the human intestine.

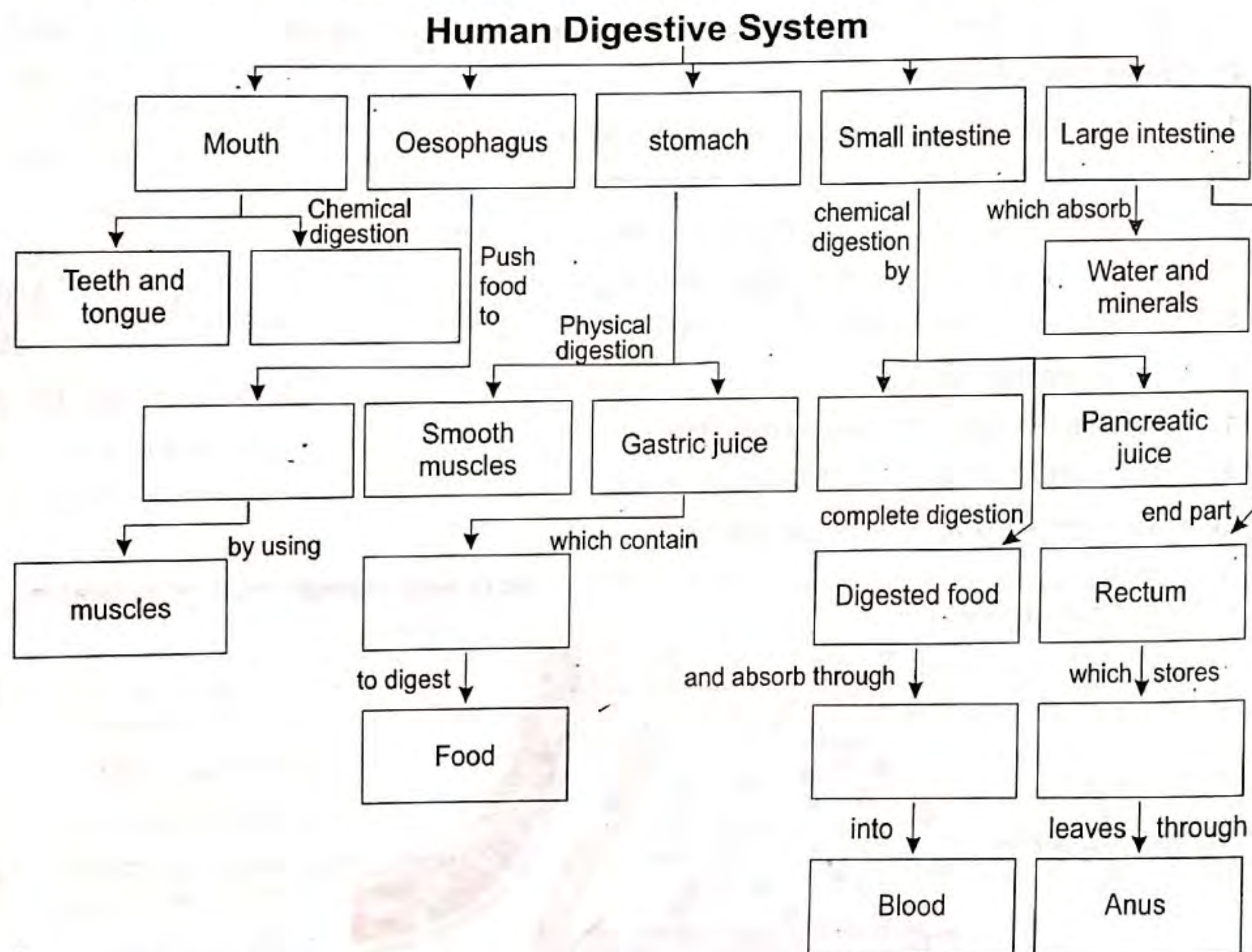


UNIT 4

HUMAN DIGESTIVE SYSTEM

- Name the food molecule and digested molecule in the figure.
- How starch is converted into glucose?
- Glucose molecules do not need to be digested but starch molecules do. Explain this difference.

2. Complete the empty boxes in this concept map of human digestive system.



E. Project work

Make a chart of human digestive system. Label all its parts and mention their functions as well.

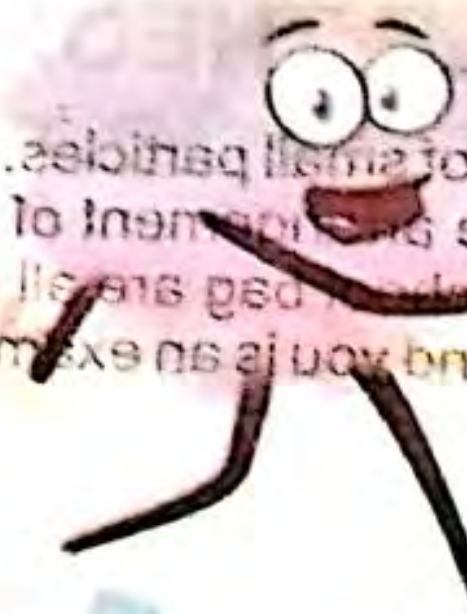
UNIT 5

MATTER AS PARTICLES

Learning outcomes:

At the end of this unit, students will be able to:

- Explain the Particle Theory of Matter.
- Use particle model of matter to investigate the movement and arrangement of particles in three states.
- Explain why gases and liquids take the shape of their containers but solids do not, in terms of the Particle Theory of Matter.
- Discuss, using the particle theory of matter, why liquids and gases can flow easily but solids cannot.
- Interpret the evidence for the existence of the particles in matter by observing daily life examples (adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water).
- Apply the particle theory of matter to explain diffusion.
- Explain the changes in states: Melting, freezing, evaporation, condensation, and sublimation, using the particle model of matter.



All matter is made up of small particles. The particles are in constant motion. Based on the arrangement of the particles, matter exists in three states: solid, liquid and gas. You can observe the change of state of matter in your daily life.

5.1 STATES OF MATTER

Look around yourself, what do you see? Everything we see is made up of matter. The tables, chairs, white board, your water bottle, and the water inside it, is also matter. Also note that what we cannot see is also matter, for example the air around us.

Based on our observation, let us define matter as anything that occupies space and has mass.

Teaching Point: Particle theory of matter must be explained by demonstrating arrangement of students showing as particles of solids, liquids and gases.

DO YOU REMEMBER?

Volume: Space occupied by an object.

Mass: Amount of substance that makes up an object

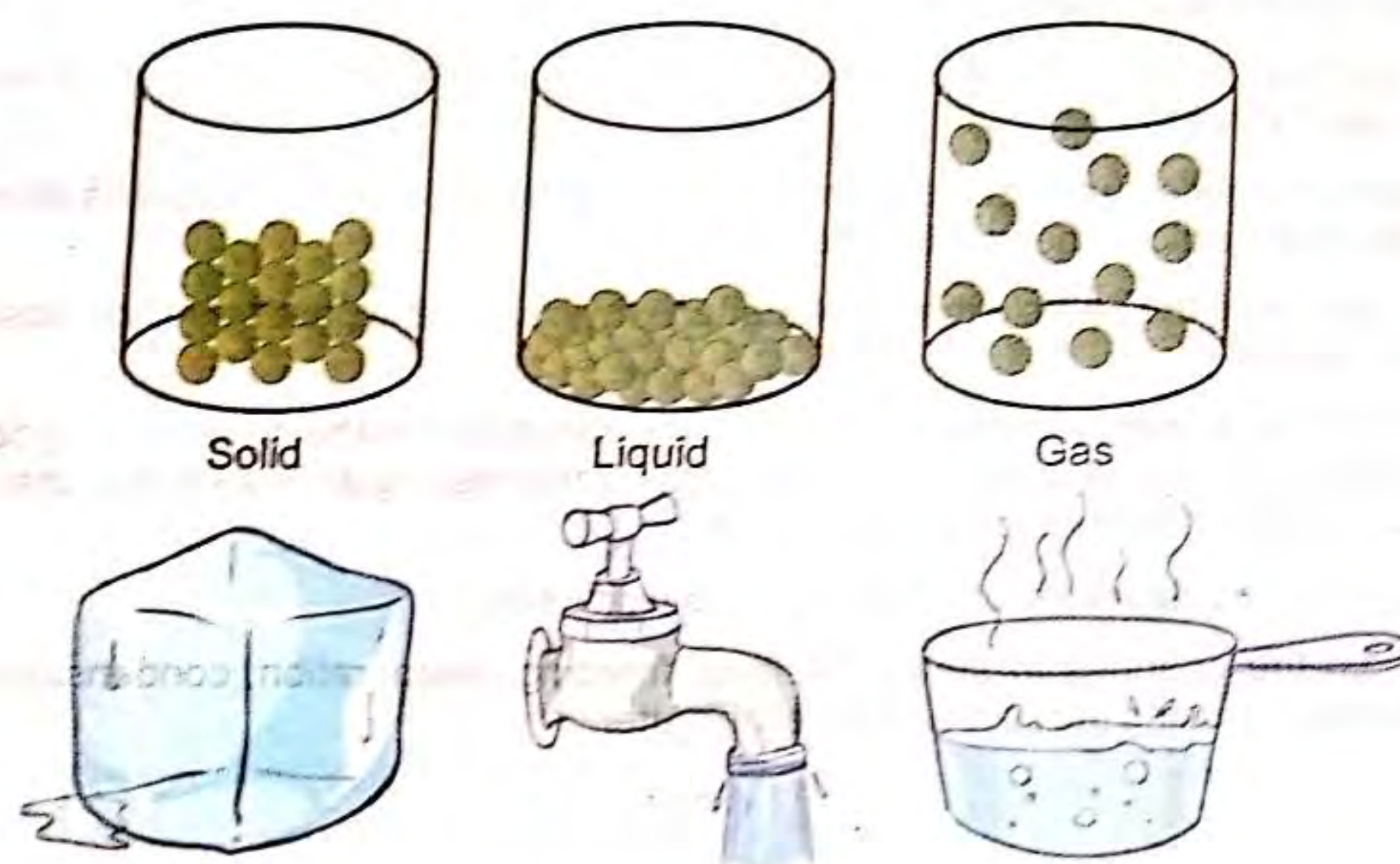


Figure 5.1 States of Matter

5.2 PARTICLE THEORY OF MATTER

All matter is made up of small particles. There are spaces in the particles and they are in constant motion. Based on the arrangement of the particles, matter can exist in different states. Books, chairs, tables, your school bag are all solids. Similarly, water or the drink in your water bottle is liquid and the air around you is an example of gas.



Solids

Arrangement of particles in a solid state

- The particles in the solid are tightly packed together.
- The forces of attraction between the particles are very strong.
- The tightly packed particles of the solid give solids a definite shape.
- It is hard to compress solids.
- More energy is required to break the forces of attraction in the particles of a solid.

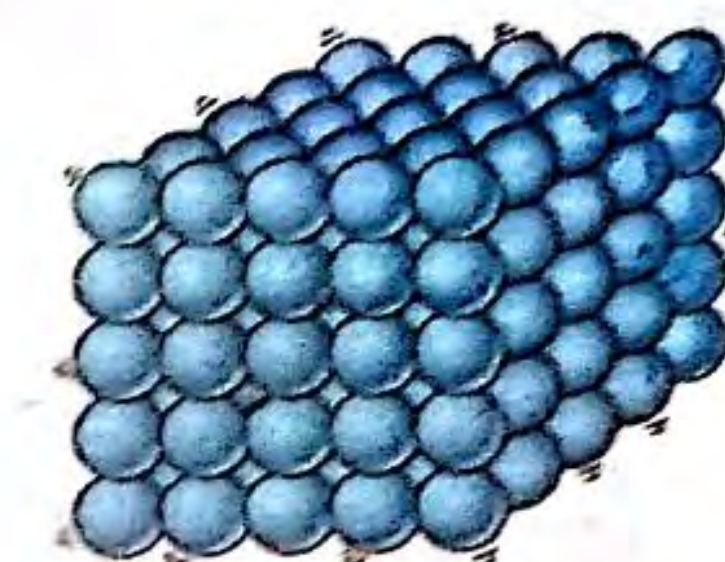


Figure 5.2 Particles in Solid

Example: A book has a certain shape, but can you squeeze a book into your pencil box? Or your chair in your school bag?

Obviously not! You need a school bag of a certain size to ensure it fills in all your books, notebooks, lunch box and pencil box because all solids have a certain shape that occupies the space accordingly.

Similarly, wood and metals are other examples of hard solids which cannot be compressed and retain their original shapes.

More examples are shown below:



a) Metallic nail



b) Wood



c) Table and chair



d) Books

Liquids

Arrangement of particles in a liquid state

- The particles in liquids are close together but not very tight as in solids.
- The particles of the liquids are continuously moving and sliding onto one another.
- Liquids don't have a definite shape and they acquire the shape of container.
- Liquids have weak attractive forces between their particles. This allows particles to slide past one another, so liquids can flow.
- It is also not easier to compress liquids, like solids.
- Less energy is required to break the force of attraction between the particles of liquids as compared to solids.



Figure 5.3 Particles in Liquids

UNIT 5

MATTER AS PARTICLES

Liquids



Oil



Mercury



Water



Milk



Blood

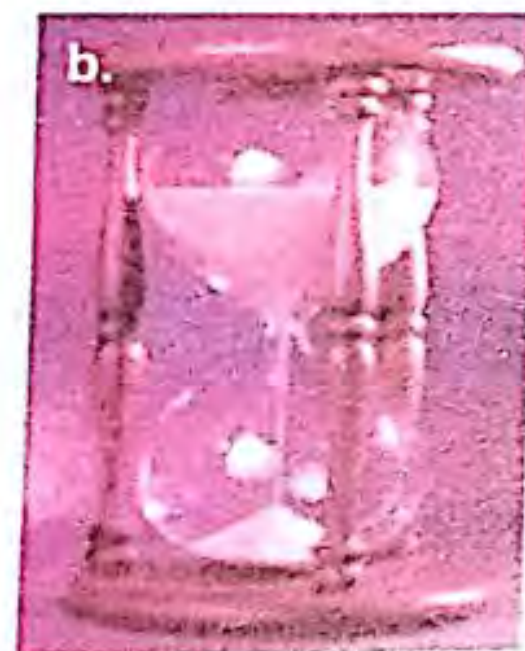
Points to ponder:

- 1) Pour the same amount of drink from your water bottle in a cup, glass, and bottle. Compare the shapes of your drinking vessels. What did you notice?
- 2) Sand can be poured like a liquid and yet sand is a solid.

There are materials around us which do not fall in the definition of solids, liquids and gases, what is your explanation?

Look at the photographs below,

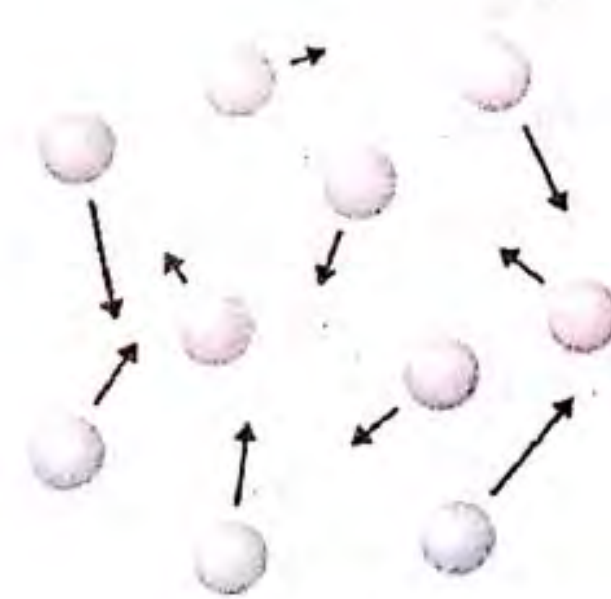
- You can make a sand castle (solid)
- Sand can flow in an hourglass like a liquid
- Sand behaves like a gas in a dust storm



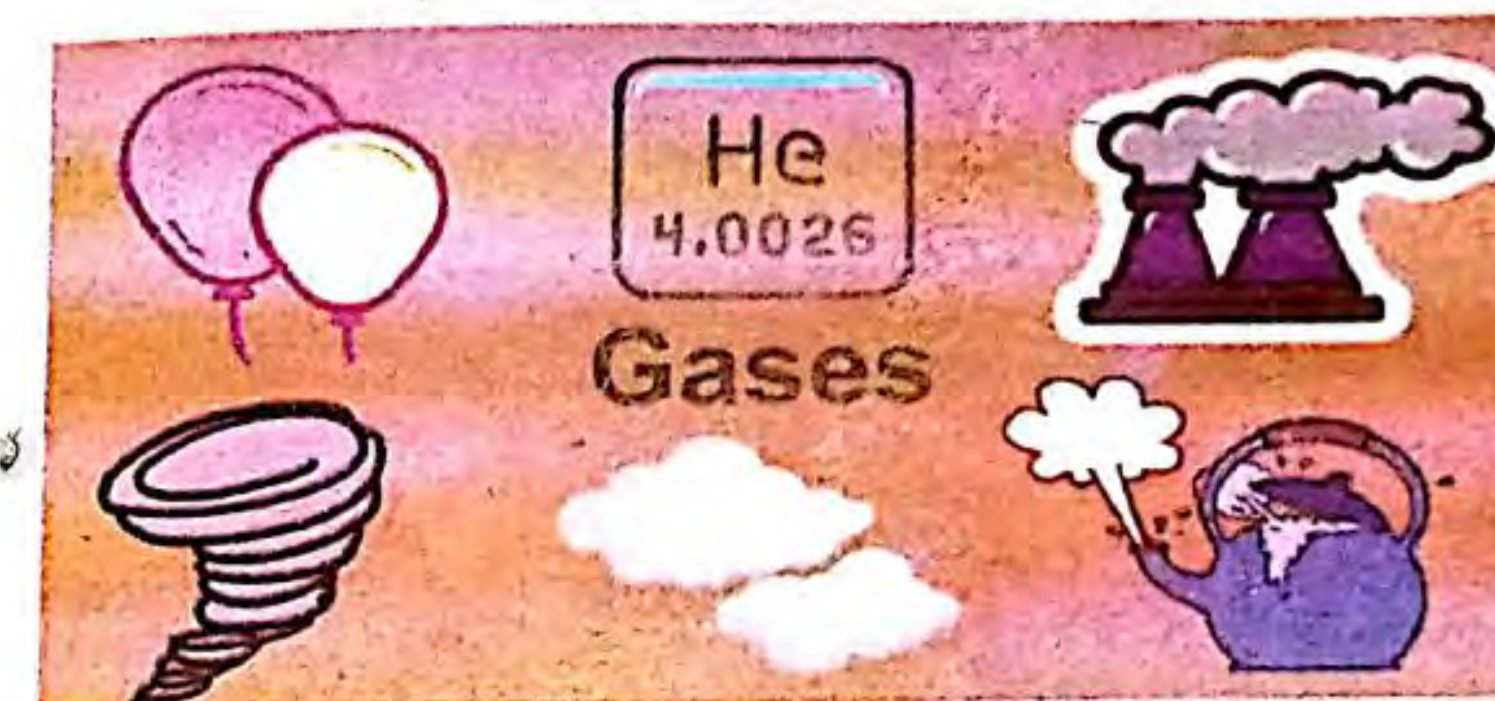
Gases

The particle presentation of the gaseous state is shown in figure.

- The particles in gases are far away from each other and can easily be compressed.
- The particles of the gases are continuously moving and colliding with each other.
- Particles of gases exert a certain pressure on the surface of the container when they strike its surface.
- The particles of gases take up any shape they occupy, therefore like liquids, Gases do not have any shape.
- Less energy is required to break the force of attraction between the particles of a gases.



Particle in Gases

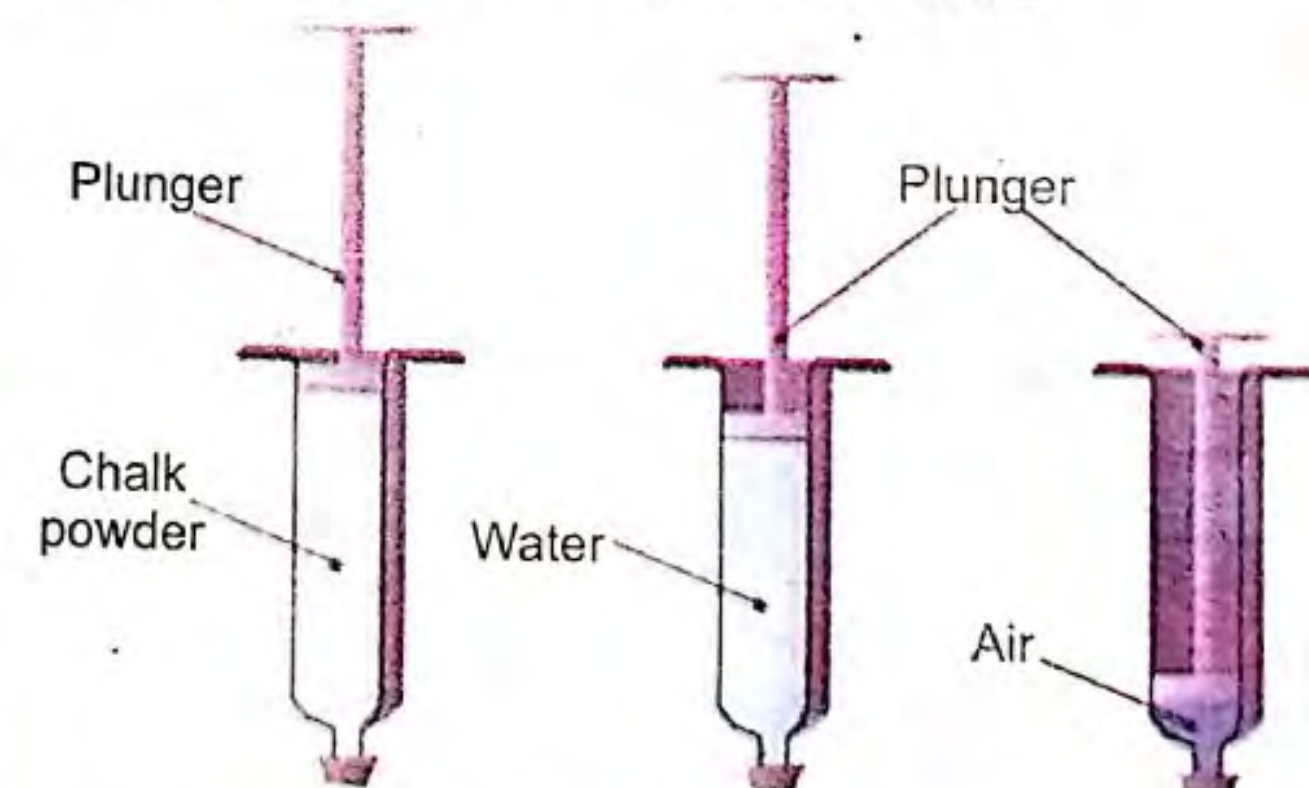


DO YOU KNOW?

- 1) Have you ever blown a balloon? The air from your lungs is transferred in the non-inflated balloon and you gradually see a balloon taking up a certain shape. Balloons are found in different shapes and sizes, they are made of a flexible material!
- 2) Similarly, we use an air pump to fill in air in a basketball. Did you know that a certain amount of air is required for a proper bounce?

Activity 5.1 Compression of solids, liquids and gasses

1. Take three syringes. Fill them with chalk powder, water and air
2. Close the nozzle of all three syringes with cork
3. Now press the syringe
4. Record your observations in a table



Solids are not compressible

Liquids are hardly compressible

Gases are compressible

MATTER AS PARTICLES



INTERESTING FACTS

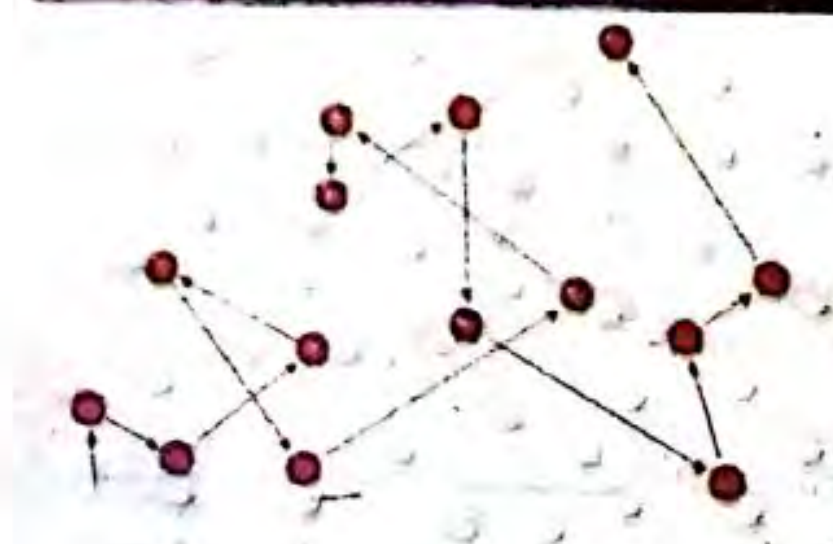


Brownian motion

The continuous movement of particles in both gases and liquids is also called the Brownian motion after a Botanist named Robert Brown.

In 1827 Robert Brown observed the movement of pollen grains in water under the microscope.

This zigzag pattern supports the theory of particle matter. This was discovered far before the particle theory was even proven.



Brownian motion

UNIT 5

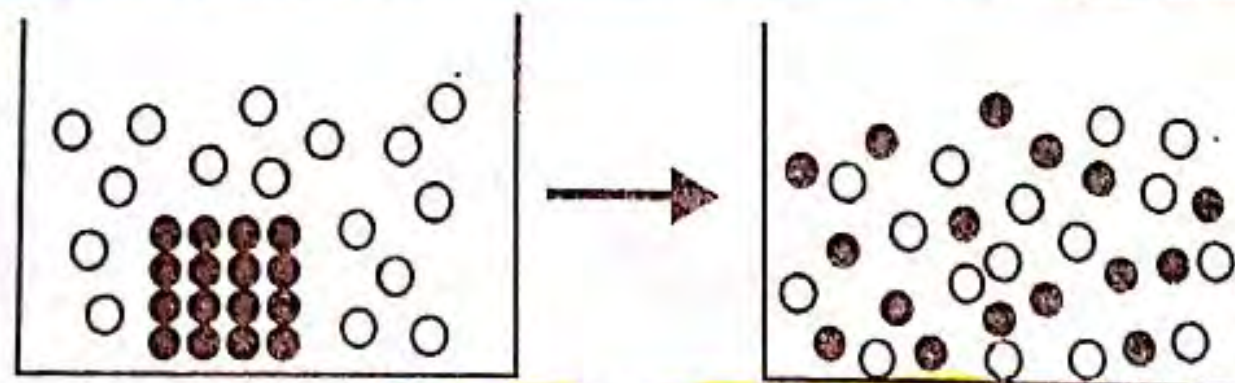
MATTER AS PARTICLES

MATTER AS PARTICLES



Activity 5.2 Dissolving sugar in water

When sugar is dissolved in the water, it disappears in water. This happens so because there are some spaces in the water into which the **sugar particles get trapped and disappears from the solution.**



1. Pour room-temperature water into clear plastic cup so that the water is deep enough to completely cover a sugar coated candy and place this cup on a piece of white paper.

2. Once the water has settled, place one candy in the center of the cup. Be careful to keep the water and the candy as still as possible. Observe for about 1 minute.



You will observe:

The coating will dissolve from the candy, the solid particle of sugar will find placed within the spaces of the liquid. Leaving a white layer under the color and then the brown chocolate underneath. The colored coating of the candy will collect in a circular pattern around the candy.



5.3 DIFFUSION

Based on our understanding on the fact that gases are made up of particles which are far apart and are in constant motion, it means gases can easily move from place to another.

The phenomenon of particles moving from an area of high concentration to low concentration is called diffusion. Diffusion takes place in gases and liquids. See the demonstration in figure given below.

Have you noticed that aroma of the food fades away as we move away from the place where it is being cooked?

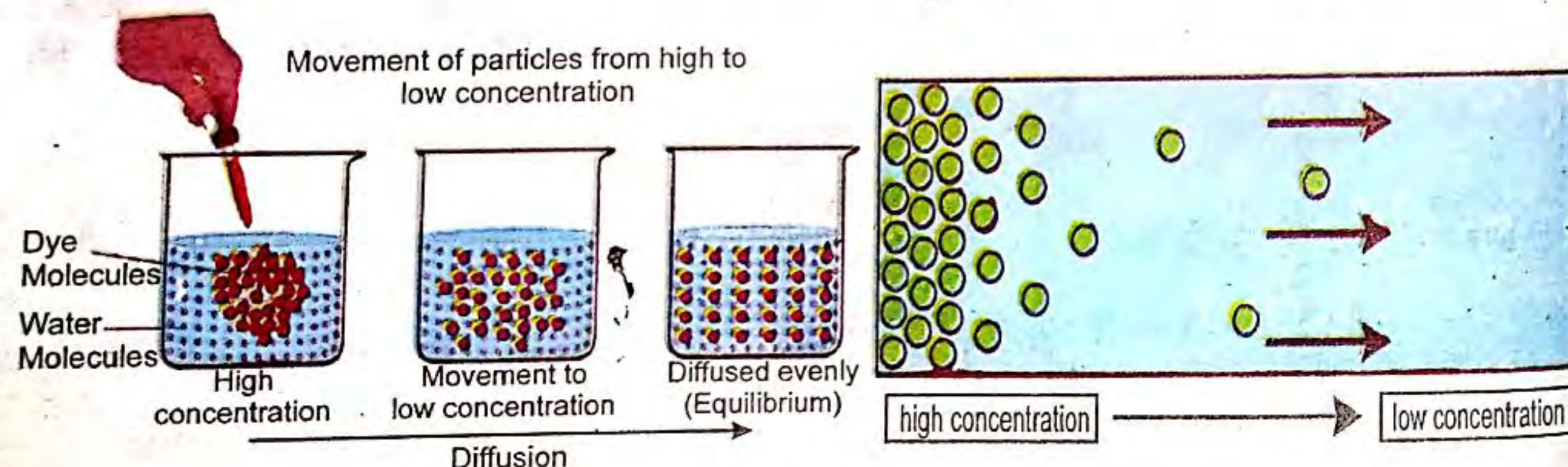


Figure 5.5 Diffusion

Activity 5.3 Observing diffusion

1. Take any air fresher and spray it in one corner of the room and go to the other corner, you will observe that the smell will slowly travel and eventually it will evenly spread in the entire room.
2. Similarly dip a tea bag in a hot cup of water. What you see write your observation below:

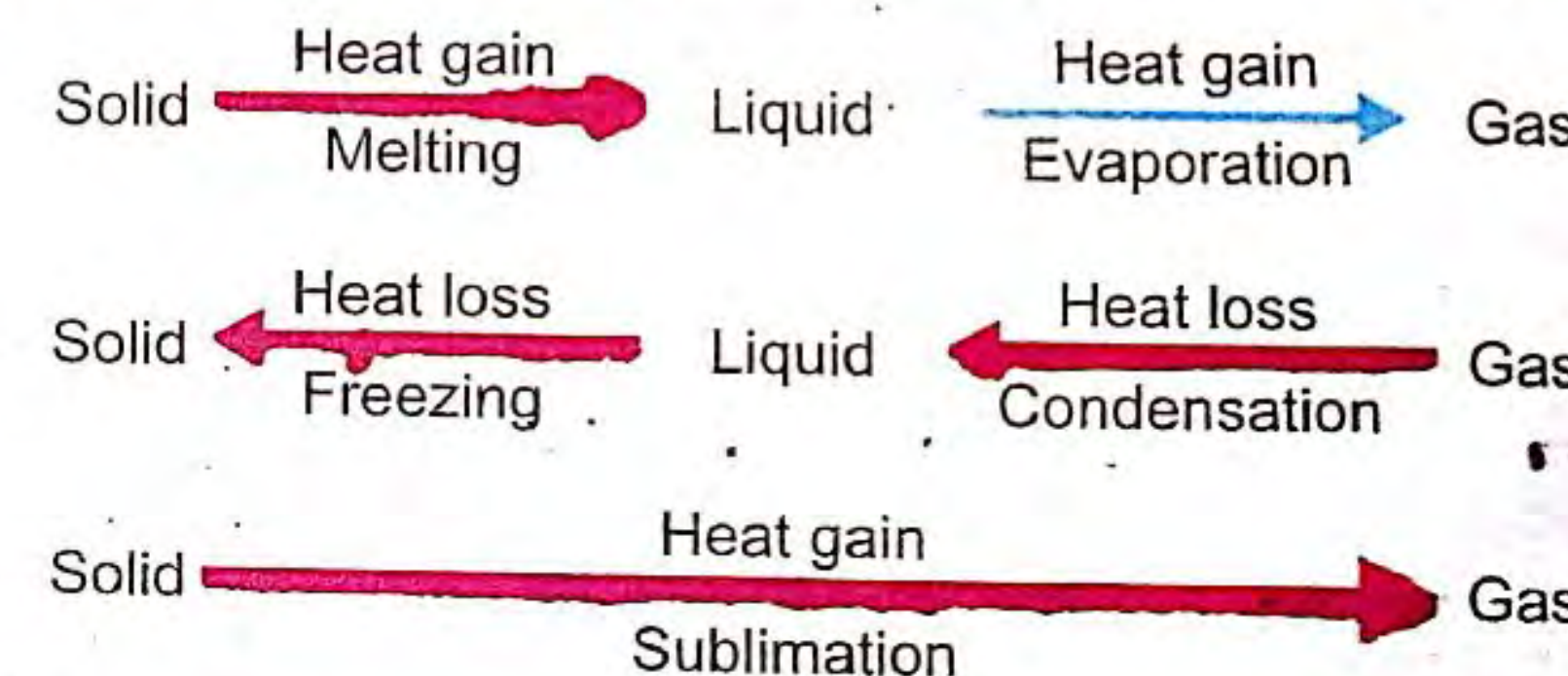
STOP AND CHECK

Why do you think diffusion can only take place in liquids and gases and not in Solids? Give your reasons.

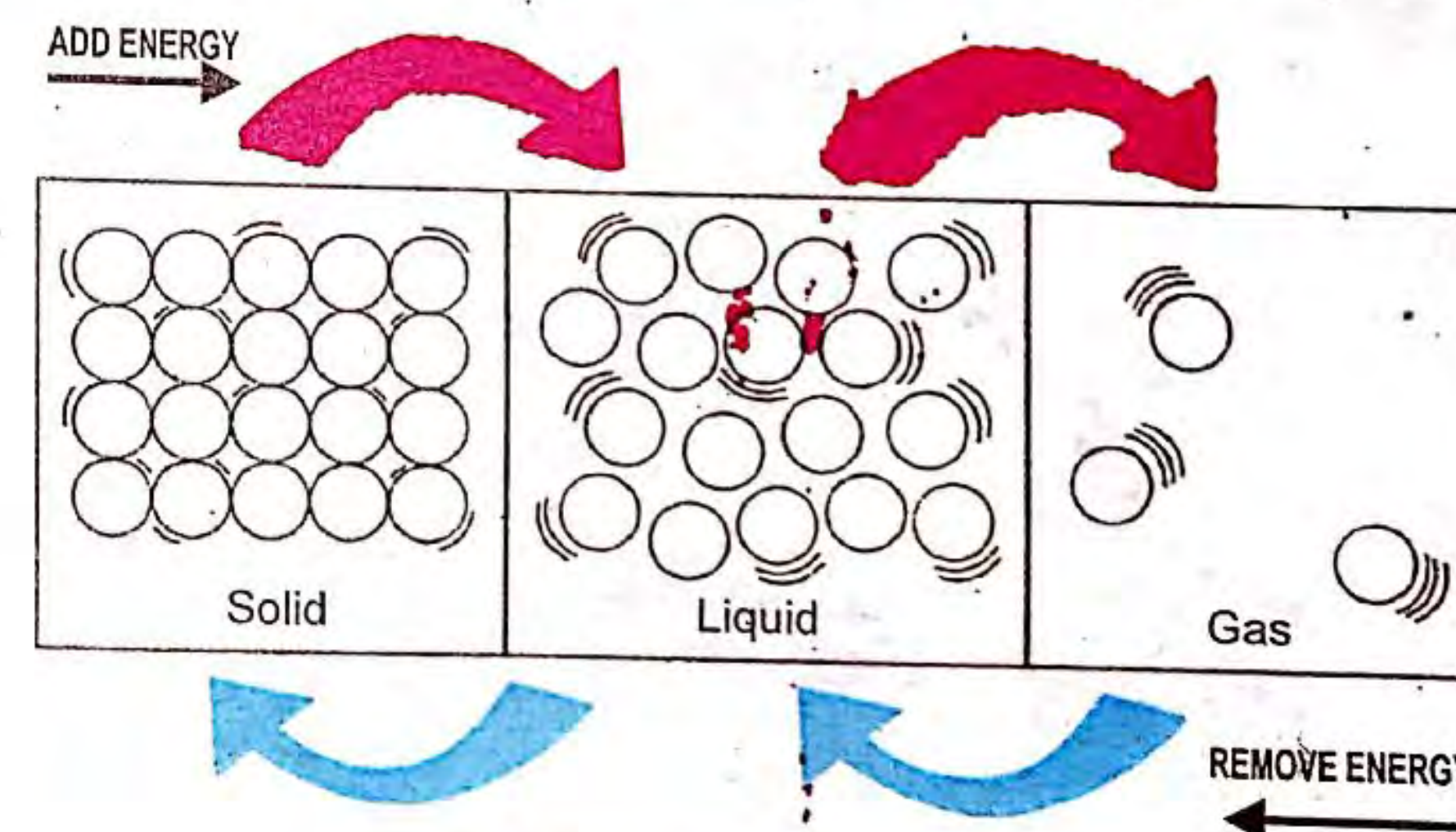


5.4 CHANGES IN STATES OF MATTER

Matter can change from one state to another by heat gain or loss as shown in figure.



The phenomena is further shown at an atomic level change in figure.



5.6 Changes in States of Matter

UNIT 5

MATTER AS PARTICLES

Looking closely at the figures on the right, figure shows an ice cube melting into water.

While next figure shows liquid boiling into vapour.

You may have seen changes in the state of matter, but have you ever thought of why or how such changes in their form occur? When any form of matter gains or loses energy, the condition changes. In this chapter we will refer to this energy as Heat energy. When a substance gains energy, internal changes occur. Molecules or atoms start moving faster, and particles are pushed at a sufficient distance apart from each other, which results in their shape change. While the opposite reaction occurs when energy is lost, particles start coming together, and movement of the particles becomes slower, steady, and in their respective positions.

Now we will dig deeper into the science behind this change of state.

Changes of State:

Any physical changes in matter are known as the changes in their condition. All these changes are reversible changes, meaning, they can be brought back to their original conditions. These changes are brought by different processes, shown in figure.

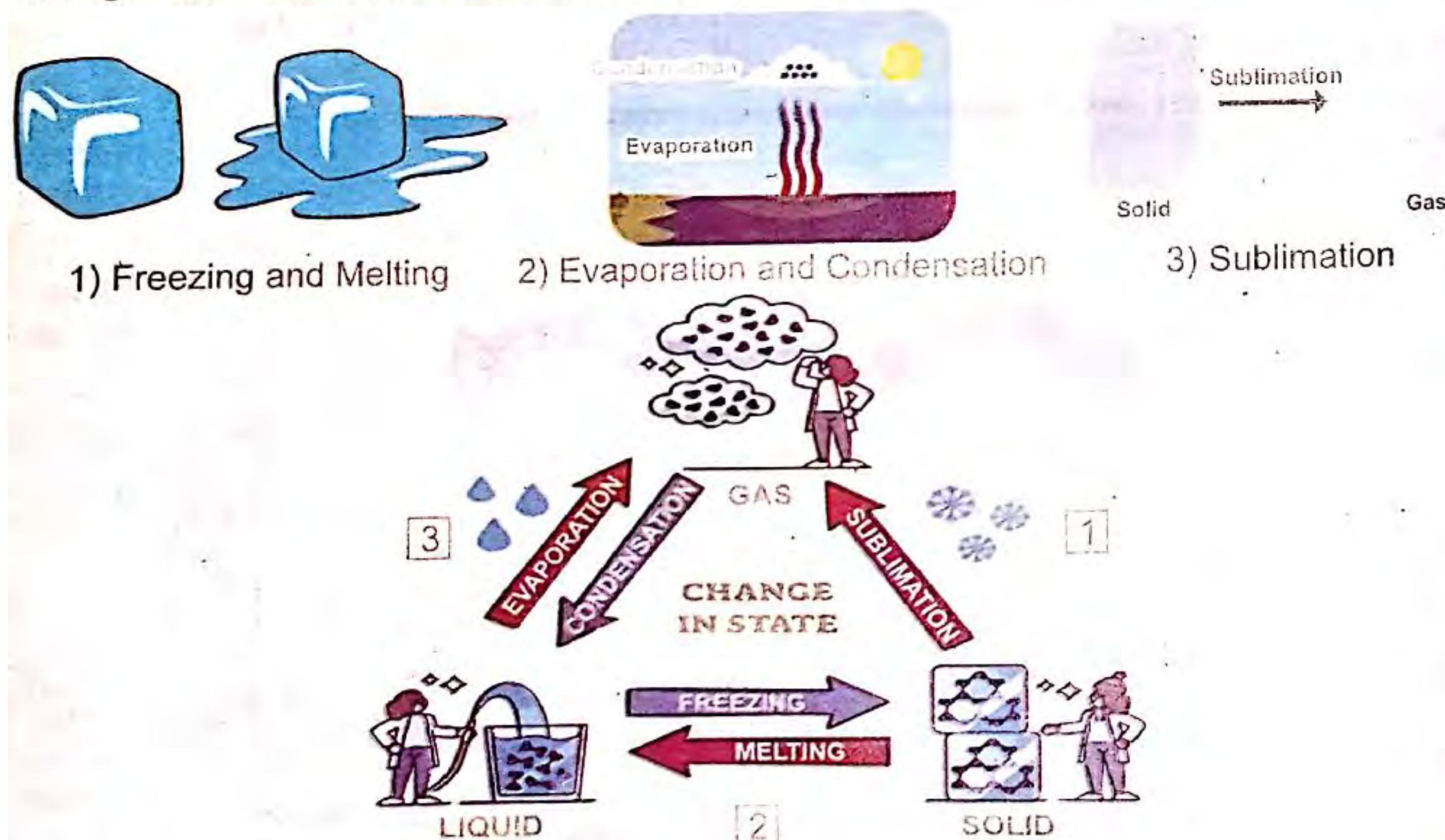


Figure 5.7 Change in States



Melting



Boiling

Change of phase between solids and liquids

How do you form ice at home? Refrigerators often have freezer compartments, which include an ice tray. To begin the process, water is poured into the ice tray, which is then cooled by placing it into the freezer compartment. So, what happens next? The process is shown in figure 5.8.

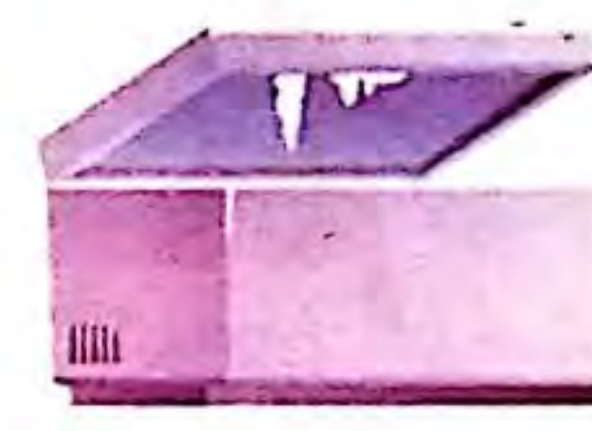
Freezing: Our surrounding environment is warmer in comparison to the freezer's cooler air. The warm water placed inside the freezer loses heat to the cold air inside. The heat transfer occurs continuously, resulting in the particles to lose their energy, resulting in no energy for them to freely move. The particles are brought closer to each other, and they are forced to remain in their fixed place. Water (liquid) is then transformed into Ice(solid). The process is known as freezing.



A



B



C

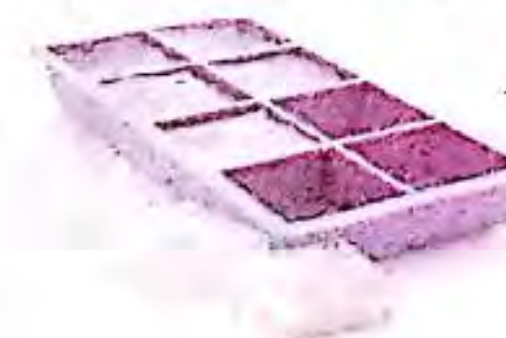


D

Figure 5.8 Freezing

Melting:

Now, if the ice cubes are removed from the freezer and kept outside in the air, which we discussed previously to be warmer than the cold air inside the freezer, the ice cubes will absorb the warmer air. This heat gain breaks the bonds of the particles of the solid, the molecules start moving faster pushing each other at some distances apart. Ice (solid) is transformed into water (liquid). The process is known as melting. An example can be seen in figure.



A



B



C

Figure 5.9 Melting

Example:
A melting
ice cream cone

Where else have you seen melting? Make a list of your observations.

Change of phase between gases and liquids

Tea is enjoyed in almost every household, but what do we do first? We pour cold water in our pot and then put the pot on the stove to heat it up. Heat energy is absorbed by the water, but what happens to the water after that?

UNIT 5

MATTER AS PARTICLES

Evaporation:

When the water is heated, it starts bubbling which indicates evaporation. Notice: If you ever place your hand at a safe distance from the pot, you can feel your hands becoming watery. Once water is heated, water vapours are formed. This is because the water particles have gained heat energy, which results in particle motion, they start moving faster and push the particles further apart than they already are. The bubbles of water vapour rise and exit as steam (which we can feel on our hands). Water (liquid) is transformed into steam/ water vapours (gas). The process is known as evaporation. Shown in the figure 5.10.



Figure 5.10 Evaporation

Have you noticed that clothes are hung in a sunny place for quick drying? Give your reason.

Think and share your answer with your friend. Suggest other ways for drying the clothes faster than the regular time?



Condensation:

Have you ever noticed the fog on the mirror when you take a hot shower in a closed bathroom? It might have made you curious as to why this happens. The hot water in the shower evaporates as we previously learnt. It then cools down and loses energy when it comes in contact with colder surfaces such as the bathroom mirror. As a result, the particles come closer together forming water droplets. Water vapours (gas) formed because of evaporation are transformed to water droplets (liquid). The process is known as condensation.



Figure 5.11 Condensation

DO YOU KNOW?

97% of the water on earth is saline. Salt water is also known as saline water as it contains a high amount of dissolved salts.

Ever wondered how salt is extracted through seawater? The extraction of salt water from seawater is done through the oldest harvesting method.

In this method, seawater is collected in salt marshes and then the water in the oceans is retrieved so that the salt formation would take place after the **evaporation** of water.

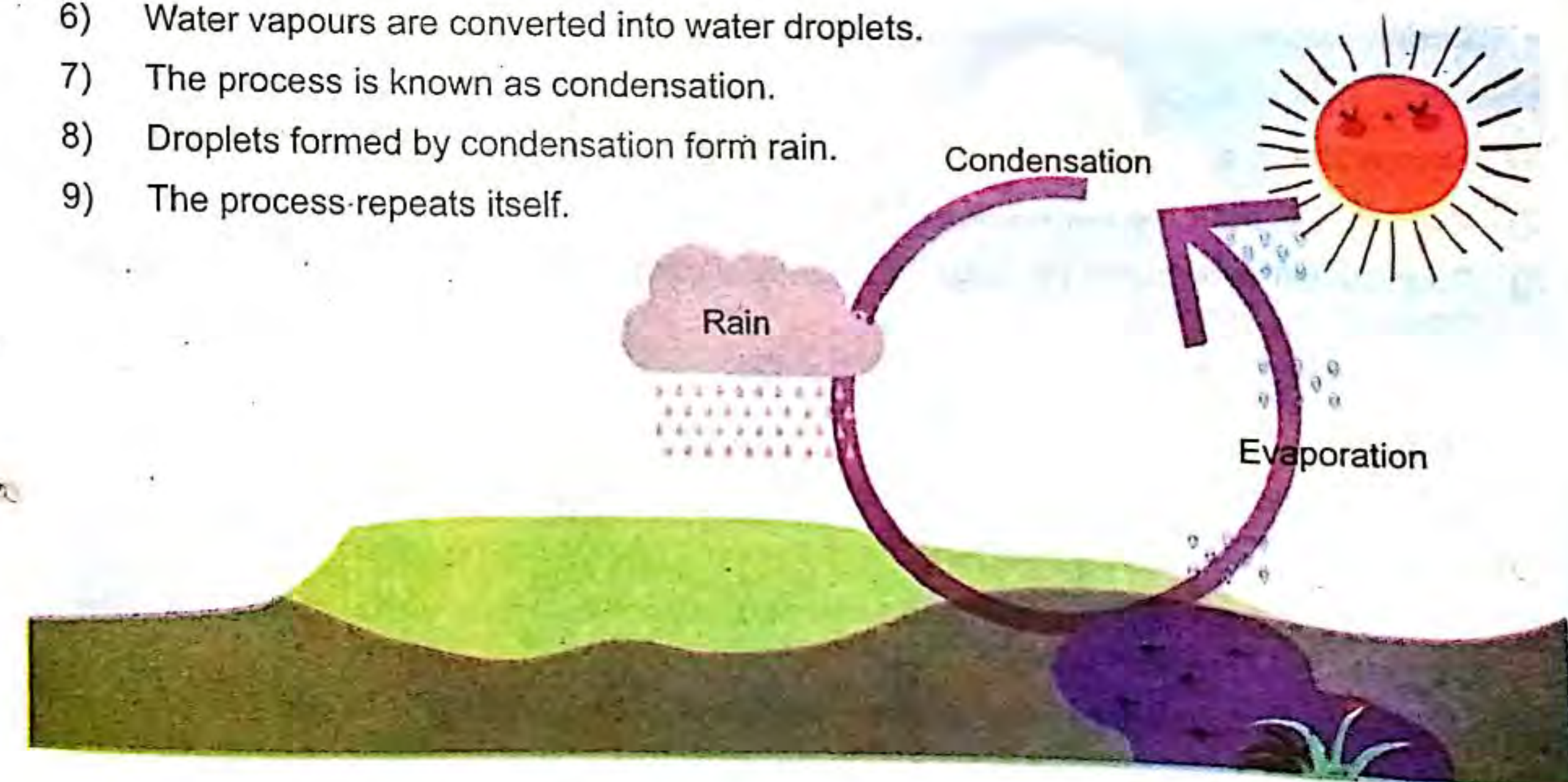


DO YOU KNOW?

Water Cycle

Have you ever wondered where rain comes from?

- 1) Water, which is in liquid state from the lakes/streams absorb heat from the sun.
- 2) The Process of evaporation takes place due to heat of sunlight.
- 3) Water is converted into water vapour/ gaseous form.
- 4) As we go up, the temperature drops.
- 5) The water vapours lose heat.
- 6) Water vapours are converted into water droplets.
- 7) The process is known as condensation.
- 8) Droplets formed by condensation form rain.
- 9) The process repeats itself.



UNIT 5

MATTER AS PARTICLES

Change of phase between solid to gas:

It is not always necessary for the solids to first convert into a liquid state, and then into gaseous state, they can directly transform to the gaseous state. The process is known as sublimation.

Sublimation: It is the process in which a solid is converted directly into gas. When the solid matter absorbs sufficient energy, attraction between the particles is completely finished, allowing the particles to move to farther distances apart. Example: A solid substance known as dry ice. When it is exposed to heat, it is directly transformed into gaseous state.



Figure 5.12 Sublimation

Activity 5.4 Changes in three states of matter

Aim: To be able to see and record the changes in the states of matter: Solid, Liquid and Gas.

Materials needed:

- Large Bowl
- Jelly Powder
- Hot water
- Pot
- Wooden Spoon

Method:

- 1) Pour water in a pot and boil on a stove.
- 2) Very slowly, pour the hot water into the bowl.
- 3) Pour the jelly powder in the bowl, constantly stirring with the wooden spoon until all the powder has dissolved.
- 4) Place bowl into fridge to set.

Conclusion:

- Q1) What was the state of matter of the jelly powder before we put it into the water?
- Q2) What happens to the jelly powder when it is poured into the boiling water?
- Q3) What do you think will happen to the water and jelly powder mixture after it has been in the fridge for the next few hours?
- Q4) What observations were made when the water was boiling?

NOT FOR SALE



Activity 5.4 Cont...

Q5) List the changes in states of matter the jelly went through in this experiment:

- 1) _____ 2) _____ 3) _____

Key Points

- States of matter are the conditions that every material in existence have, and it is how they are identified
- All matter has mass and occupies space
- Matter exist in three states. solid, liquid, gas
- Solids: 1) definite shape 2) definite volume 3) does not change shape
- Liquids: 1) no definite shape 2) definite volume 3) they can change their shape according to the shape and size of the container they are placed it
- Gases: 1) no definite shape 2) no definite volume 3) always changing shape and volume
- Every material we know undergoes a change in state, depending simply on how much heat is gained or lost



END OF UNIT ASSESSMENT

A. MCQs (Choose the correct option)

- 1) What happen when ice cream changes from solid to liquid?
 - a. Freezing
 - b. Melting
 - c. Burning
 - d. Evaporation
- 2) A gas
 - a. has a definite volume but no definite shape.
 - b. has a definite shape but no definite volume.
 - c. has fast moving particles
 - d. has a definite volume and shape
- 3) Which statement about the particle theory of matter is true?
 - a. Arrangement of particles in matter determine the state of matter
 - b. When a solid melts, its particles no longer exist
 - c. A solid object cannot move because its particles are at rest
 - d. Particles in liquids are the farthest apart.

NOT FOR SALE 5

UNIT 5

MATTER AS PARTICLES

4) What happens when a liquid becomes a gas?

- a. Particles slow down b. Particles push away each other
c. Particles move closer together d. Particles make a pattern

5) Butter melts because it

(i) _____ heat and an ice cube melts because it (ii) _____ heat.

- a. i) absorbs ii) releases b. i) releases ii) absorbs
c. i) absorbs ii) also absorbs d. i) releases ii) also releases

B. Match the column

a) Melting

Conversion of liquid into vapour or gas

b) Evaporation

Conversion of liquid into solid

c) Condensation

Conversion of solid into a liquid on heating

d) Freezing

Conversion of vapor to liquid

C. Put the following materials and objects into the column of their natural state of matter

rock, pepsi, smell of popcorn, air, nitrogen, water, rope, tomato juice, football, vacuum cleaner, milk, hydrogen, steam, chicken, sand, rain, spoon, brick, wire, sweat, oxygen, smoke

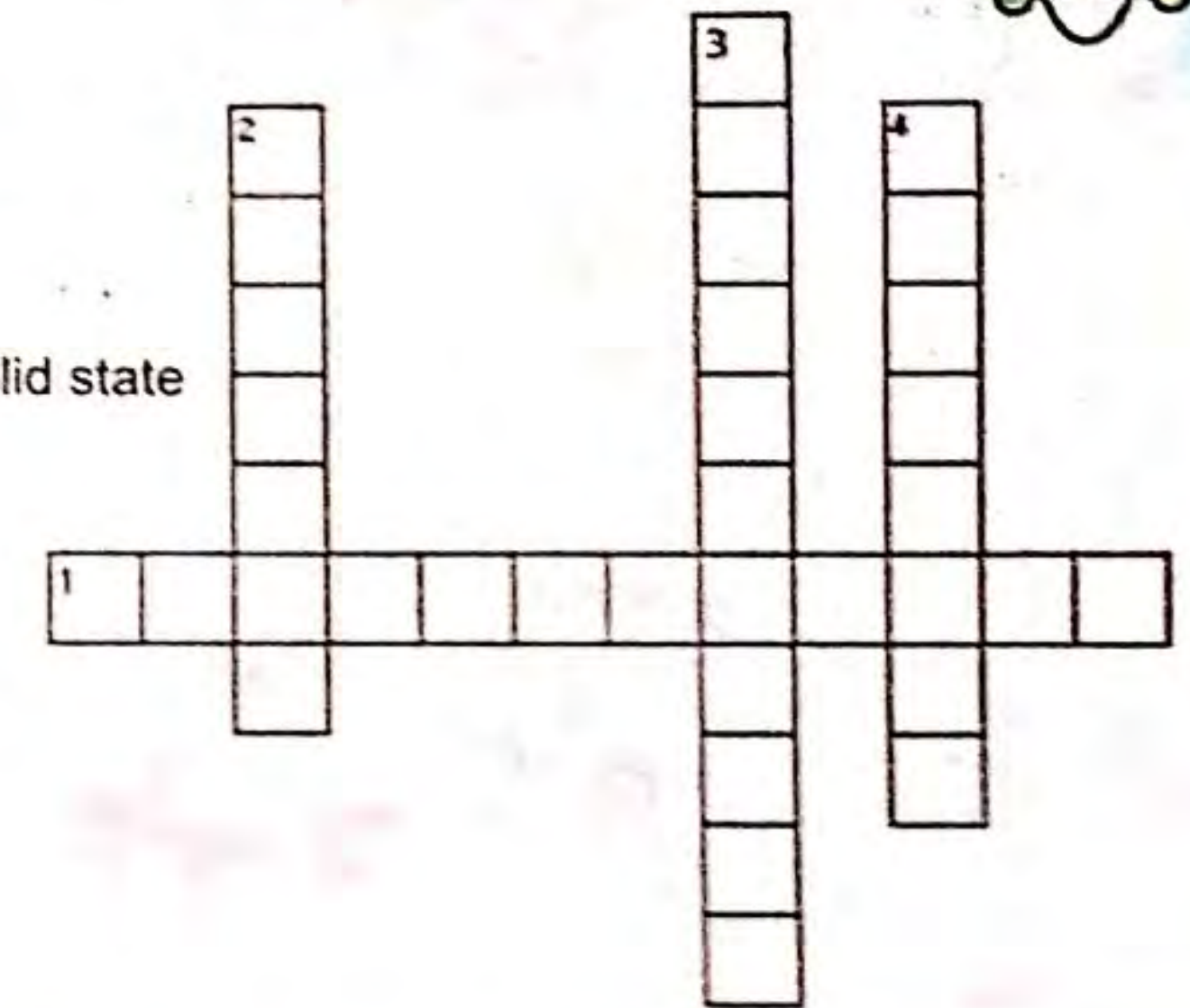
SOLIDS	LIQUIDS	GASES

MATTER AS PARTICLES



D. Fill in the cross word:

- 1) Change of water vapour into water
- 2) Change of ice into water on heating
- 3) Change of water into gas on heating
- 4) Change of substance from liquid to solid state



E. Short questions:

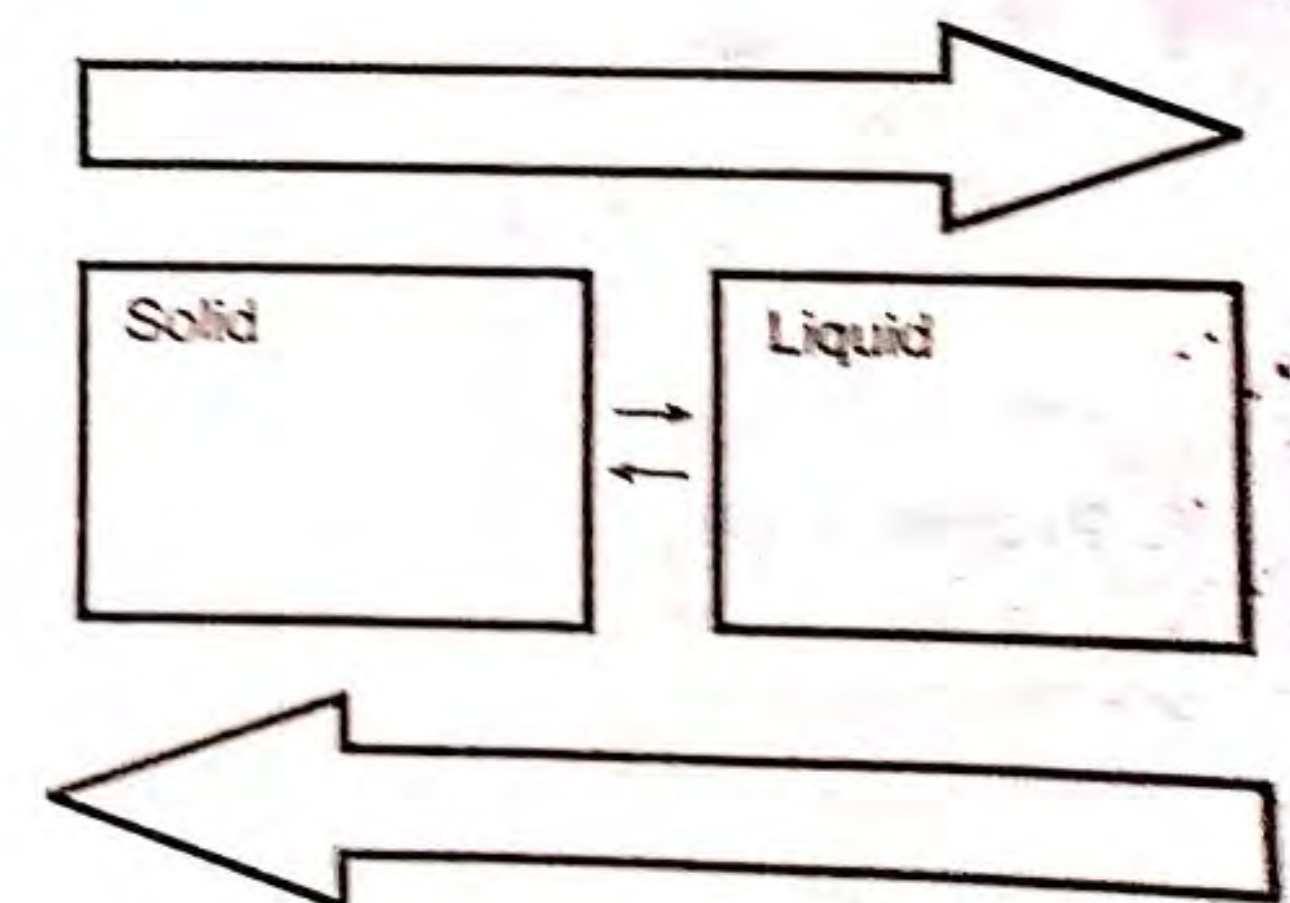
1. What is the mechanism through which solids convert into gases directly?
2. Choose any object of your choice, mention its state, and describe it in terms of the particle theory of matter.
3. Describe the difference between movement of particles in liquids and gases.
4. Are particles closer together in a solid, liquid, or a gas?
5. What happens to atom when heat is added to them?

F. Long questions:

1. Explain the particle theory of matter.
2. In light of the particle model, explain why does a balloon deflate slowly?
3. Compare the three states of matter with examples.

G. Structured response questions:

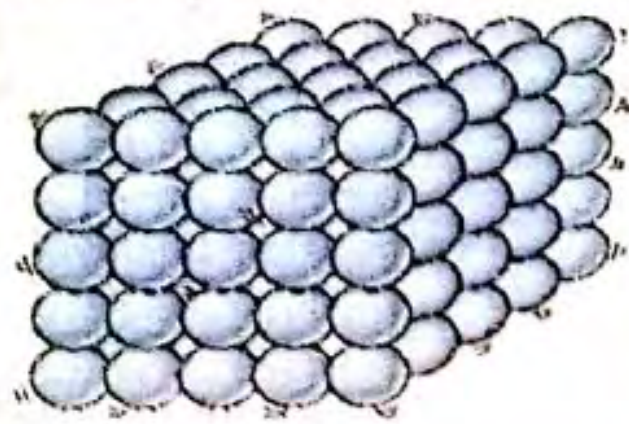
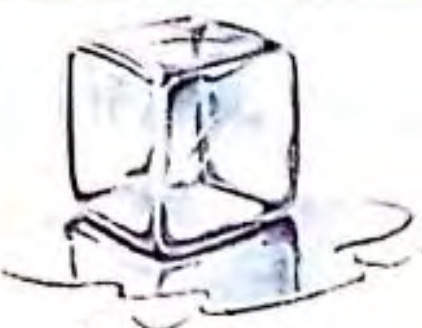
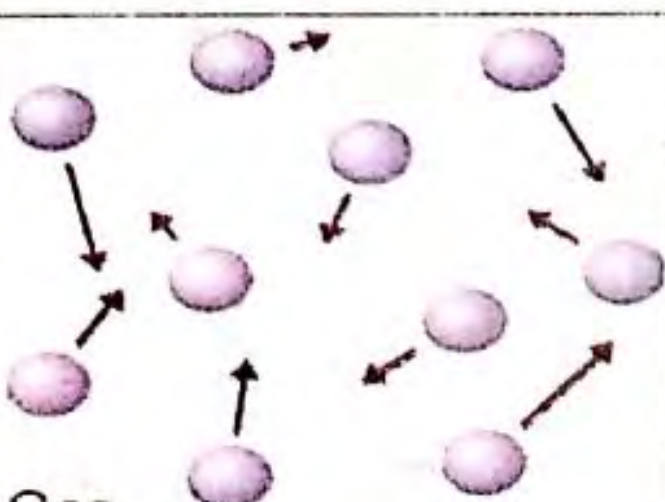
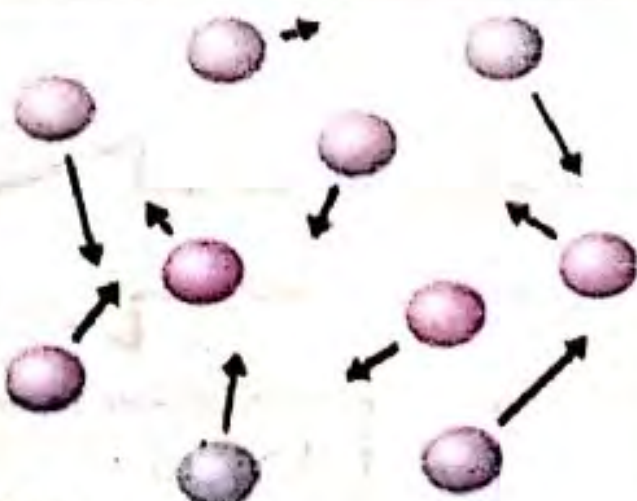
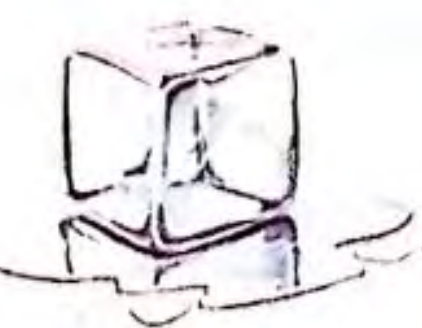
1. Use the boxes given on the right side to draw the particle arrangements that will occur when a solid is changed to a liquid. Write the name of the respective processes in each arrow.



UNIT 5

MATTER AS PARTICLES

- Discuss an example of diffusion from your everyday life. Explain what is happening with the help of illustrations in terms of the particle movement.
- Complete the following with illustrations and writing, first row is completed for you

State	Heat gain/ heat loss	New state	Example from daily life
 Solid	 Heat gain	 Liquid	Melting of ice cream on a hot day
 Liquid	 Heat loss		
		 Gas	Water evaporates from a puddle or a pool during a hot summer's day.
 Gas	 Heat loss		

F. Project work

Make 2D models on a chart paper showing particles in three states of matter. Your project should include the following:

- A description of the particle model
- A description of the particle behaviour in solids, liquids and gases

UNIT 6

ELEMENTS AND COMPOUNDS

Learning outcomes:

At the end of this unit, students will be able to:

- Describe the structure of matter in terms of particles (i.e., atoms and molecules).
- Describe molecules as a combination of atoms (e.g., H_2O , O_2 & CO_2).
- Recognize the names and symbols for some common elements (first 10 elements of the Periodic Table) and recognise their physical properties.
- Differentiate that some elements are made of atoms and some elements exist as molecules and have different properties to a single atom of the element.
- Explain that compounds are formed by different types of elements joining together chemically forming a new substance.
- Illustrate the formation of a compound with the help of a word equation.
- Distinguish between elements and compounds.
- Explore the common elements and compounds in our daily life (Carbon, Nitrogen, Hydrogen, Aluminum, Water, Common salt, Sugar).
- Categorize elements into metals and non-metals of first 10 elements based on their physical properties.



UNIT 6

ELEMENTS AND COMPOUNDS

DO YOU KNOW?

There are about 6-hundred billion trillion (600,000,000,000,000,000,000) water molecules in one tablespoon of water.



All that we see around us is matter, or we can also say the entire universe is made up of matter. The matter is referred to anything that has mass and occupies space.

It will not be wrong if we say that all the living and the non-living world is matter.

The smallest unit into which matter can be divided is called an atom. Atoms are very tiny and cannot be seen without a special microscope. Atoms can be grouped into larger structures called molecules.

INTERESTING FACTS

In 1869, Russian Scientist Dimitri Mendeleev started arranging elements in order of increasing atomic mass in the periodic table as they were discovered. He predicted the discovery of other elements, and left spaces open in the periodic table for them. The modern periodic table is shown in the right side.

Alkali Metal Alkaline Earth Transition Metal Basic Metal Semimetal Nonmetal Halogen Noble Gas Lanthanide Actinide															
1	2											3	4	5	6
IA	IIA											IIIA	IVA	VA	VIIIA
H	He											B	C	N	O
1.008	4.003											10.81	12.01	14.01	16.00
Hydrogen	Helium											Aluminum	Carbon	Nitrogen	Oxygen
3	4											13	14	15	16
Li	Be											Al	Si	P	S
6.941	9.012											26.98	28.09	30.97	32.06
Lithium	Beryllium											Aluminum	Silicon	Phosphorus	Sulfur
11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Na	Mg	Al	Si	P	S	Cl	Ar	K	Ca	Sc	Ti	V	Cr	Mn	Fe
22.99	24.31	26.98	28.09	30.97	32.06	35.45	39.95	39.10	40.08	44.96	47.88	50.94	52.00	54.94	55.85
Sodium	Magnesium	Aluminum	Silicon	Phosphorus	Sulfur	Chlorine	Argon	Potassium	Calcium	Scandium	Titanium	Vanadium	Chromium	Manganese	Iron
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te
85.47	87.62	88.91	91.22	92.91	95.94	98.91	101.07	102.91	106.42	107.87	112.41	114.82	117.3	120.91	127.60
Rubidium	Strontium	Yttrium	Zirconium	Niobium	Molybdenum	Technetium	Ruthenium	Rhodium	Palladium	Silver	Cadmium	Indium	Tin	Antimony	Tellurium
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
Cs	Ba	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb
132.91	137.33	138.91	140.12	140.91	144.24	144.91	150.36	151.96	157.25	158.93	162.50	164.93	167.26	168.93	173.05
Cesium	Barium	Lanthanum	Cerium	Praseodymium	Niodymium	Promethium	Samarium	Europium	Gadolinium	Terbium	Dysprosium	Holmium	Erbium	Thulium	Ytterbium
87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102
Fr	Ra	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No
223.02	226.03	227.03	232.04	231.04	238.03	237.05	244.06	243.06	247.07	247.07	251.08	252.08	257.10	258.10	259.10
Francium	Radium	Actinium	Thorium	Protactinium	Uranium	Neptunium	Plutonium	Americium	Curium	Berkelium	Californium	Einsteinium	Fermium	Mendelevium	Nobelium

Try it

- 1) Can you derive your own definition of atom?
- 2) Find out what type of a microscope is needed to see an atom.



6.1 ELEMENTS:

The matter which consists of the same types of atoms is called Elements.



Figure 6.1 Elements

Gold, copper, and silver are all elements. They retain the same properties even if broken down. If we kept hitting a bar of gold into pieces with a hammer, every tiny piece will always be gold. This makes gold an element and all the atoms of gold are the same.

There are a total of **118 elements**. Most of the elements are found naturally on Earth; however, some are created in a laboratory by scientists.

● = atom



An element

Figure 6.2 Atoms in an Elements

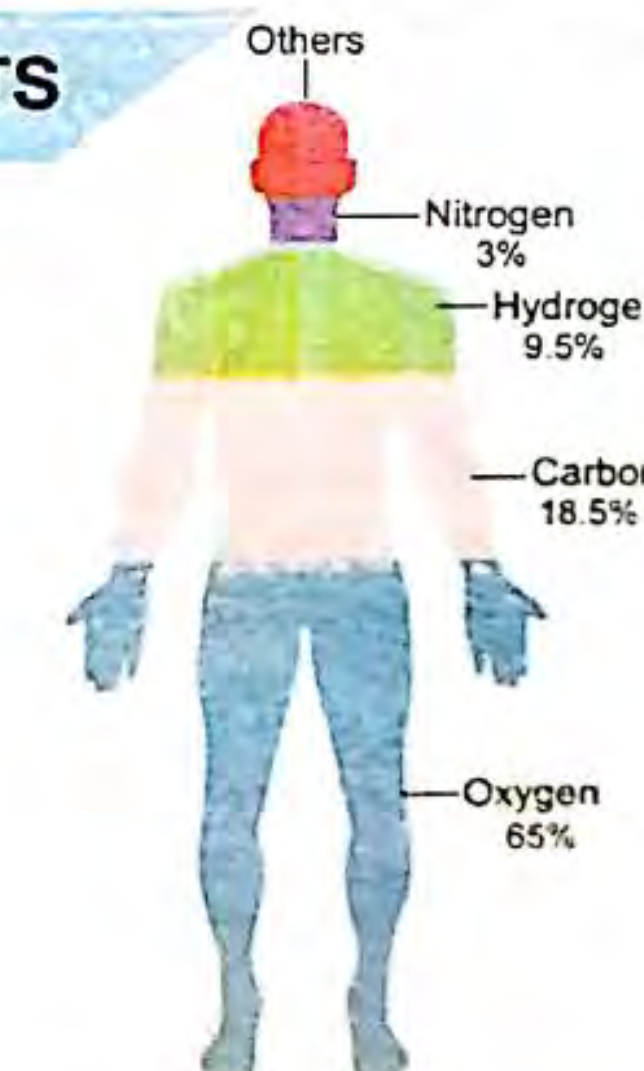
Names of elements are written as symbols:

- In some elements, the first letter is used as a symbol i.e., C for Carbon
- In others, the first two letters i.e., Ca for Calcium
- However, in some the symbol is written using their Latin/old name i.e., Na for Sodium (Natrium is the Latin name)

Symbols of the first ten elements are shown in the table below

INTERESTING FACTS

Did you know that 99% of the human body is made up of six elements?



Symbols of First 10 Elements

1 H Hydrogen	2 He Helium	3 Li Lithium	4 Be Beryllium	5 B Boron
6 C Carbon	7 N Nitrogen	8 O Oxygen	9 F Fluorine	10 Ne Neon

UNIT 6

ELEMENTS AND COMPOUNDS

ELEMENTS AND COMPOUNDS



6.2 CLASSIFICATION OF ELEMENTS:

Elements have different appearances and properties at room temperature. Based on their properties elements are divided into two groups; metals and non-metals.

Metals

- Metals are mostly solids
- Metals are mostly shiny
- Metals are hard and strong
- Metals are good at conducting heat
- Metals can be bent (ductile) and stretched (malleable)
- Metals can be mixed as mixtures (alloys) and used for different purposes
- Metals can conduct electricity
- Metals have high melting and boiling point
- Metals are sonorous (when beaten, produce sound)

Examples of metals are iron, zinc, copper

Non-Metals

- Non-metals are mostly dull in appearance
- Non-metals are soft
- Solid non-metals do not conduct electricity
- Non-metals are brittle they can easily be bent or stretched
- Non-metals are poor conductors of heat
- Non-metals have low melting and boiling points
- Non-metals are Non-sonorous (when beaten, do not produce sound)
- Examples of non-metals are chlorine, sulphur, oxygen and carbon

DO YOU KNOW?

Mercury is the only elemental metal that is liquid at room temperature.



Elements are widely used in daily life. The use of elements depends on their properties. For example, some metals are very good conductors of electricity and heat so these are used for making wires, cables and utensils. Helium is a very light and inactive gas, it is used to fill airships and balloons.

Physical Properties

Metals

Hard solids having Lustre



Gold

Malleable



Ductile



Copper Metal

Copper Wire

Sonorous



High melting and boiling points



Good conductors of Heat and electricity



Figure 6.3 Metals

Non-Metals

Solids, Liquids or gases



Sulphur



Bromine



Chlorine

Do not have Lustre



Phosphorus

Non-Malleable
Non-Ductile,
Non-Sonorous



Carbon

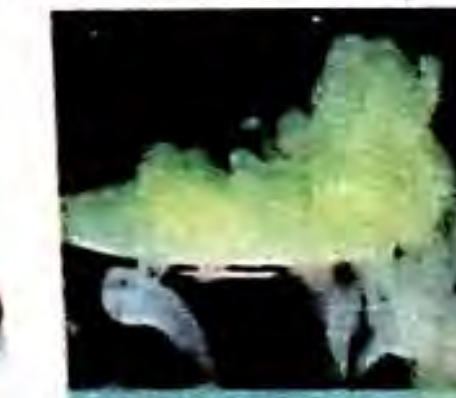
Low melting and boiling points
Bad conductors of Heat and Electricity



Hydrogen Balloon



Bromine



Chlorine

Figure 6.4 Non Metals

6.3 USES OF ELEMENTS

Carbon:

- Carbon is found in all living things, it makes up 18% of our body mass. Carbon is used in almost every industry in the world. It is used in fuels, plastics, paints, tools, lead pencil and many more. Carbon as diamond is used in the jewellery industry.



UNIT 6

ELEMENTS AND COMPOUNDS



Figure 6.6 Uses of Carbon

DO YOU KNOW?

Carbon is in your favourite fizzy drinks



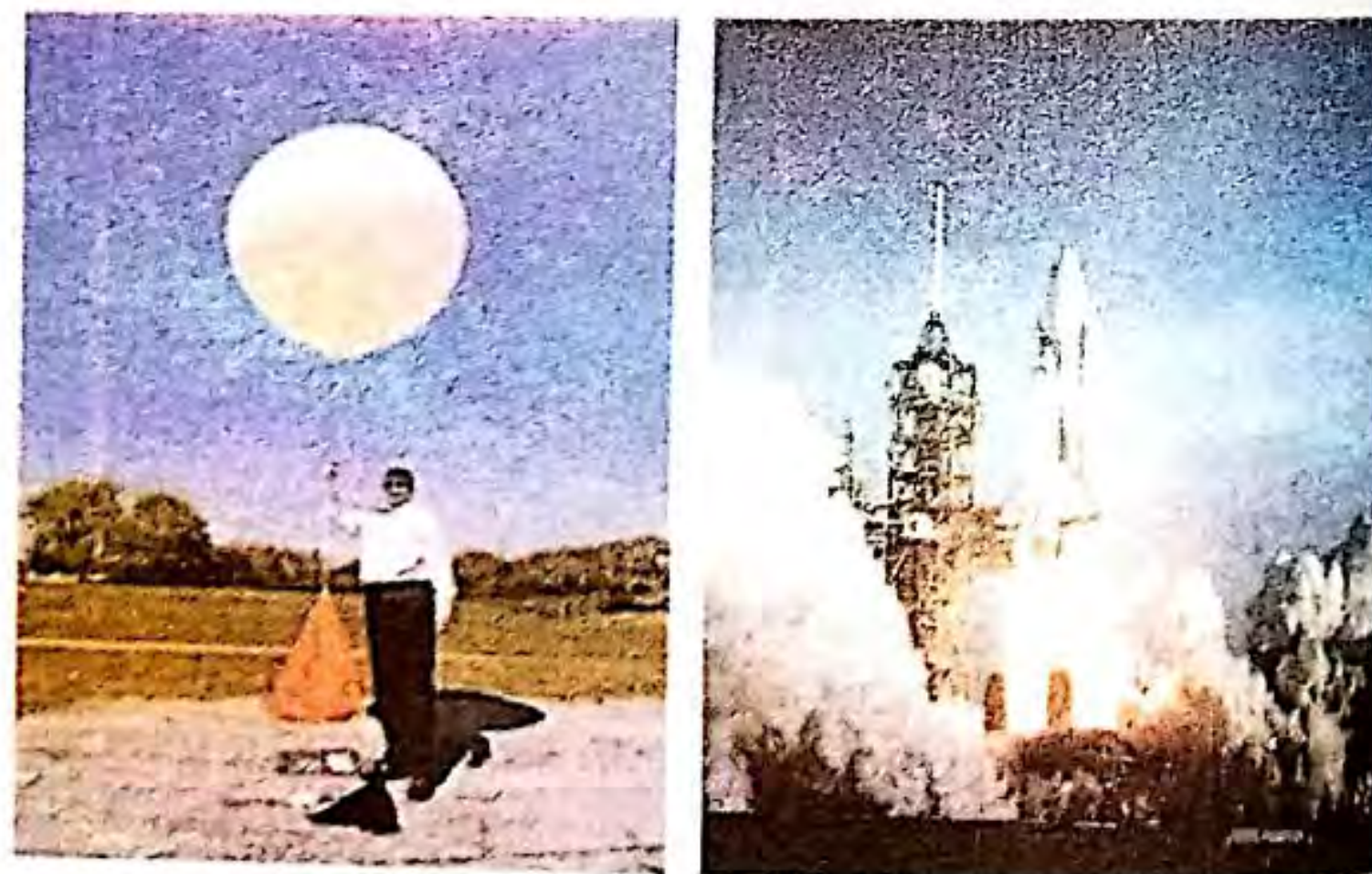
Hydrogen:

The most abundantly found element in the universe is Hydrogen, which is about 75% of the total mass. It is also present in the human body. Hydrogen is used in fertilizers, rocket fuels and processing industries.

H

DO YOU KNOW?

As hydrogen is light, scientists use it with weather balloons. Meteorologists' weather balloons have this element installed. These balloons are fitted with equipment to record information necessary to study the climate. During the First World War, these were utilized in balloon airships.



Nitrogen:

Nitrogen is almost everywhere around us, constituting 78% of the Earth's atmosphere. It is colourless, odourless and is used in dyes, foods, fertilizers and explosives. It is present in all living things including human beings. It is very vital for life but its excessive use can be dangerous.

6

N



Figure 6.7 Fertilizers rich in Nitrogen

Aluminium:

Aluminium is a lightweight silver-white metal. It is naturally found in abundance in the Earth's crust. Aluminium is very popular in the modern construction industry used in high rise buildings, window frames and structural units. Other uses include household and industrial appliances, parts of motor cars, aircraft, spacecraft and ships.

Al



Figure 6.8 Aluminum abundantly use in High-rise buildings

UNIT 6

ELEMENTS AND COMPOUNDS

6.4 DIFFERENCE IN ATOM, ELEMENT AND MOLECULE:

Atoms

The smallest particle of a matter

Elements

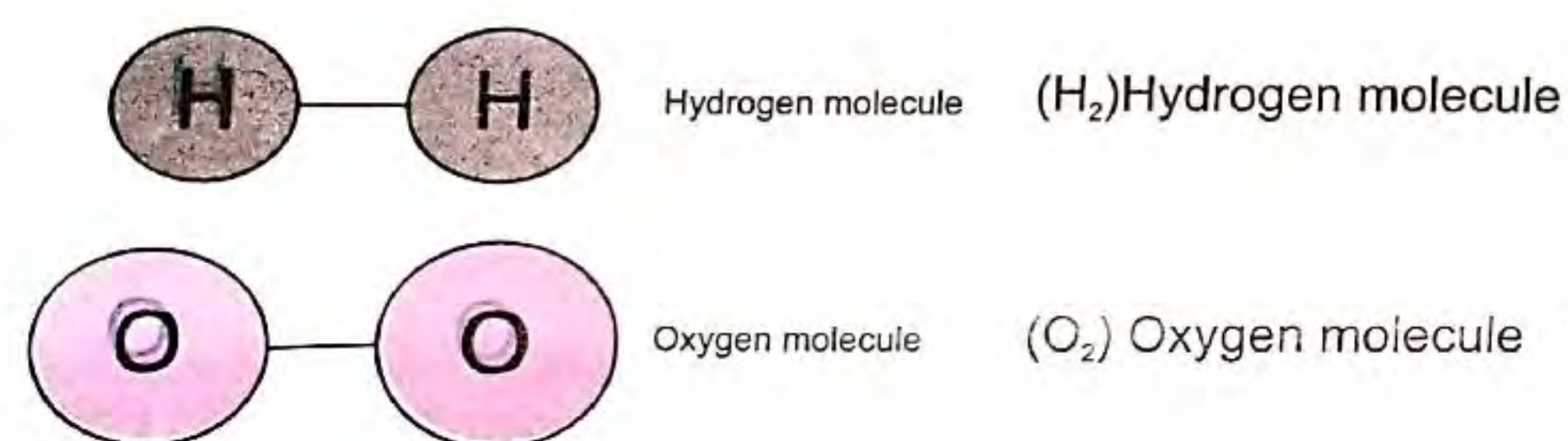
Made of only one type of atom

Molecules

Two or more atoms joined together

Some elements exist as individual atoms, Helium (He) is one such example.

Atoms of some elements, like oxygen cannot exist on their own as an individual atom, they pair as a molecule. For example hydrogen, nitrogen, oxygen, fluorine, chlorine, bromine, iodine and astatine.



The atoms of hydrogen and oxygen found in nature are usually in molecular form, with two atoms combining to make one molecule.

Figure 6.9 Hydrogen and Oxygen molecules

He (helium) can exist as a single atom, whereas some exist as elemental molecules like Hydrogen H₂, oxygen O₂ and chlorine Cl₂ they are also called diatomic molecules whereas Ozone O₃ and Sulphur S₈ exist with 3 and 8 atoms in a molecule respectively

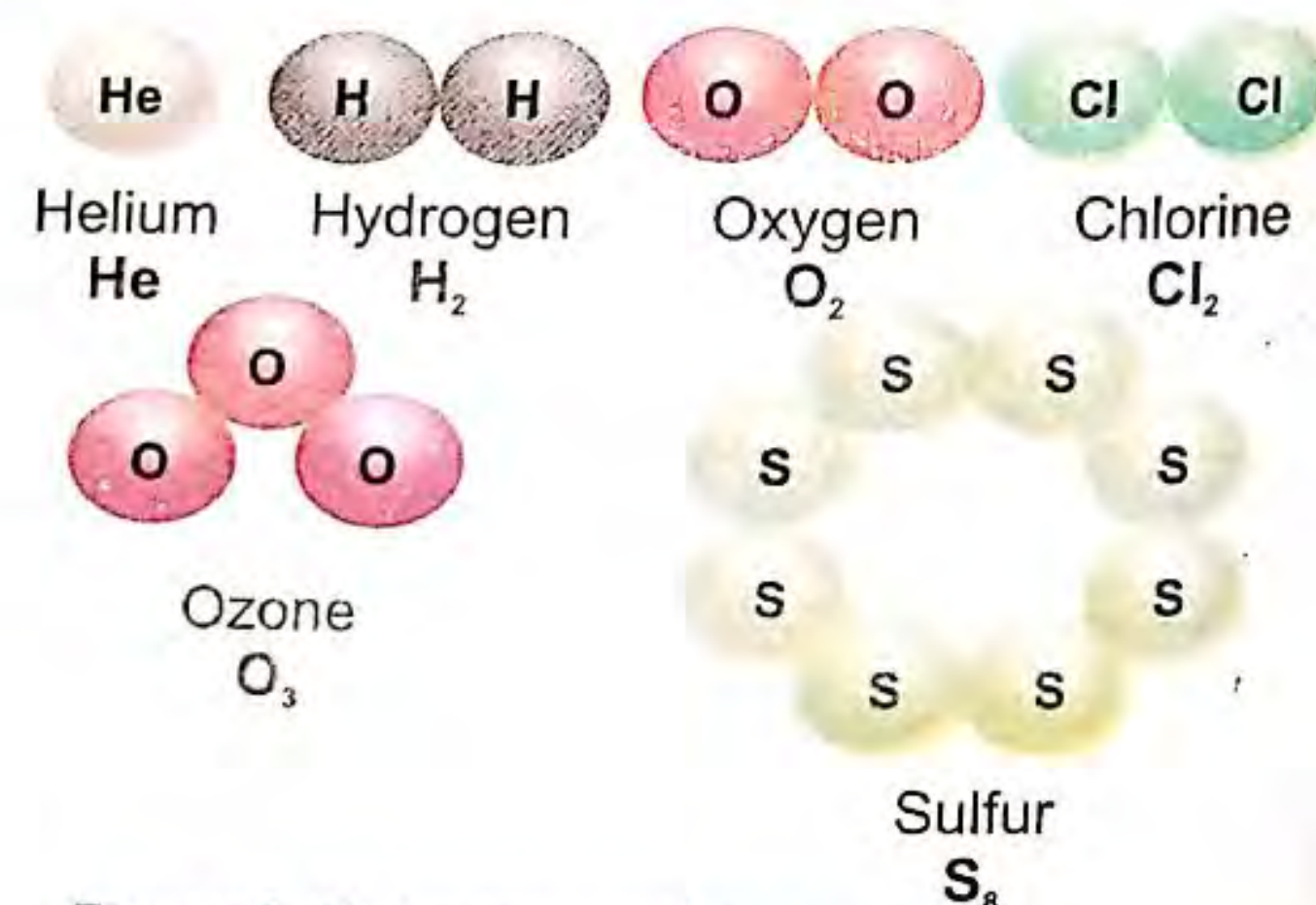


Figure 6.10 Atoms and Molecules



6.5 COMPOUND

A compound is a substance that is made up of two or more different elements. For example, water (H₂O) consists of two hydrogen atoms and one oxygen atom bonded together. Compounds are pure substances with more than two atoms of different elements chemically combined in a fixed ratio. For example, a molecule of carbon dioxide gas CO₂ contains one atom of carbon bonded with two atoms of oxygen.

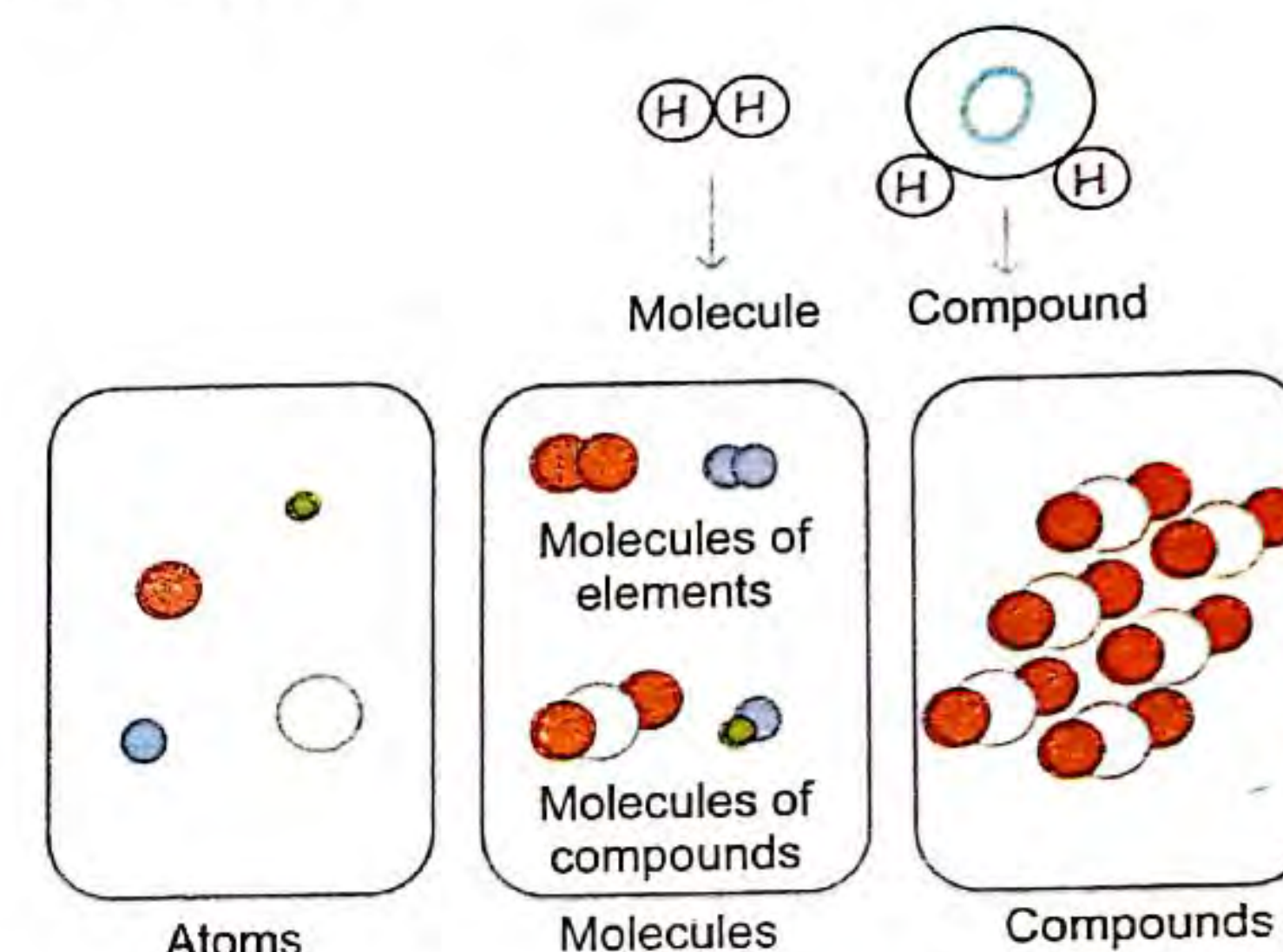
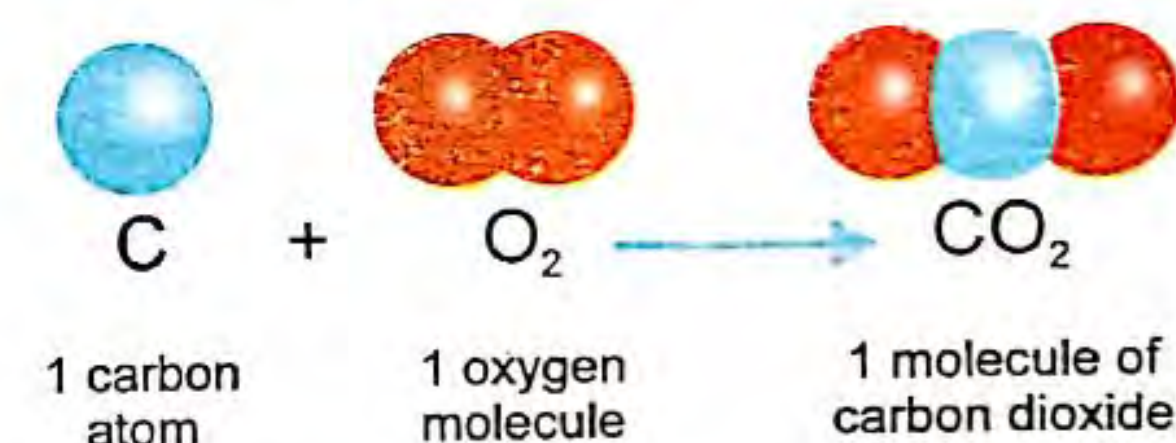


Figure 6.11 Atoms, Molecules and Compounds

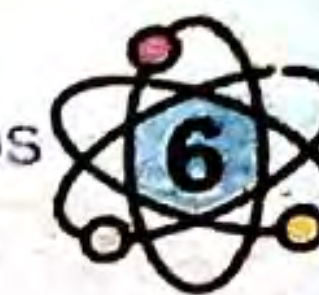


Formation of compounds can be shown with word equations

Reactants	Products
Magnesium + oxygen	Magnesium oxide
Sodium + Chlorine	Sodium Chloride (common salt)
Hydrogen + oxygen	dihydrogen monoxide (common name water)
Carbon + oxygen	Carbon dioxide

UNIT 6

ELEMENTS AND COMPOUNDS



Compound	Formula	Elements	Number of atoms
Sugar	$C_{12}H_{22}O_{11}$	Carbon	12
		Hydrogen	22
		Oxygen	11
Table salt	NaCl	Sodium	1
		Chloride	1
Water	H_2O	Hydrogen	2
		oxygen	1

Water H_2O

Water is composed of the chemical elements hydrogen and oxygen and can exist in gaseous, liquid, and solid states. It is liquid at room temperature and allows many substances to dissolve and mix in it. It has no taste and odour but is yet the most important compound. It is used for drinking, washing, cleaning, cooking and growing food. It is used in industries and also in generating electricity.

Water is a natural resource but can also be chemically made in laboratories in small quantities.

Table salt NaCl

Table salt is a compound of elements sodium and chloride. It naturally occurs as rock salt or sea salt. It not only gives taste to our food but is also important to human and animal health. Table salt is used in many industries like food preservation.



Figure 6.12 Common Salt

Sugar

Sugar is a compound that is formed by bonding carbon, hydrogen and oxygen found in fixed proportions of a general formula $C_n(H_2O)_n$. The simplest sugar is sucrose represented by the formula $C_{12}H_{22}O_{11}$. Sugar is made by plants in the process called photosynthesis

Did you know that the sugar that comes to our homes comes from sugarcane?



Figure 6.13 Process of Sugar

Key Points

- Matter is referred to any thing that has mass and occupies space.
- The smallest unit into which matter can be divided is called an atom
- Atoms can be grouped together into larger structures called molecules
- The matter which consists of the same types of atoms are called Elements
- Elements are made of only one type of atom/atoms whereas molecules are made by joining two or more atoms together
- A compound is a substance that is made of two or more different elements with fix ratio by weight
- Elements are classified as metals and non-metals based on their physical properties

UNIT 6

ELEMENTS AND COMPOUNDS

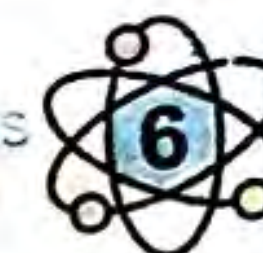


END OF UNIT ASSESSMENT

A. MCQs (Choose the correct option)

- CO₂ is the chemical formula of carbon dioxide. What is the ratio of carbon and oxygen in carbon dioxide?
a. 3:1 b. 2:1 c. 1:2 d. 1:1
- The symbol of Sodium is
a. Ni b. Ne c. N d. Na
- Which of the following is an element?
a. Carbon dioxide b. Water c. Copper d. Salt
- Sugar is a compound of
a. Carbon, Hydrogen, Oxygen b. Hydrogen, Oxygen, Sodium
c. Calcium, Carbon, Oxygen d. Molecule, Atom, Compound
- Which of the following is a compound?
a. Cl b. C c. NaCl d. O₂
- Sodium and Chlorine combine to form
a. Sand b. Chalk c. Sugar d. Salt
- A combination of atoms is called:
a. Atom b. Molecule c. Element d. Gas
- What type of matter is made up by combining elements?
a. Solid b. Element c. Molecule d. Atom
- Which of these is the correct symbol for aluminium?
a. Al b. aL c. AL d. al
- How many elements have been discovered so far?
a. 100 b. 118 c. 112 d. 114

ELEMENTS AND COMPOUNDS



B. Match the columns by drawing arrows.

Column A

- A substance that cannot be broken into a simpler form
- When two or more elements join together chemically, forming a new substance.
- A substance is made up of two or more atoms
- Have shiny surface
- One or two letters used to represent an element

Column B

Symbol

Metal

Element

Compound

Molecule

C. Short questions

- Carbon is an element while carbon dioxide is a compound. Why?
- Classify the following substances into elements and compounds.
(i) mercury (ii) sulphur (iii) sugar (iv) water
(v) gold (vi) salt (vii) oxygen
- Write three uses of Aluminium.
- Give symbols of sodium, calcium, cobalt, gold and mercury?
- Differentiate between elements and compounds. Elaborate your answer with examples
- Identify five compounds found at your home and write down their uses.
- Give the similarities and differences between metals and non-metals.

D. Long questions

- Differentiate between elements and compounds. Elaborate your answer with examples
- Identify five compounds found at your home and write down their uses.
- Give the similarities and differences between metals and non-metals.

E. Structured response questions

The table given below shows the number of elements that are present in the human body. Most of them are non-metals (take help from the table).

UNIT 6**ELEMENTS AND COMPOUNDS**

Element	Symbol	Percentage	Element	Symbol	Percentage
Oxygen	O	65.0	Potassium	K	0.4
Carbon	C	18.5	Sulphur	S	0.3
Hydrogen	H	9.5	Sodium	Na	0.2
Nitrogen	N	3.2	Chlorine	Cl	0.2
Calcium	Ca	1.5	Magnesium	Mg	0.1
Phosphorus	P	1.0	Copper	Cu	Less than 1

- Which three elements are most abundant in our body?
- Identify the metals and mention the ones that have the least and the most percentages in the human body.
- Identify the non-metals.
- From the table can you identify the elements that exist in a gaseous state?

F. Project work

Atoms are represented in colourful spheres, which makes it easy to study them (sizes will vary according to the size of the atom).

- Make models of water (H_2O), carbon dioxide CO_2 , methane CH_4
- Use different materials like coloured plasticine clay or tennis balls
- Straws or toothpicks to form bonds

UNIT 7**MIXTURES****Learning outcomes:**

At the end of this unit, students will be able to:

- Demonstrate that mixtures are formed when two or more substances mix with each other without the formation of a new substance.
- Identify different types of mixtures.
- Describe the difference between elements, compounds, and mixtures
- Differentiate between pure substances and mixtures on the basis of their formation and composition
- Describe alloys as mixtures of metals and some other elements.
- Identify and explain examples of common mixtures from daily life.
- Justify why air is considered as a mixture of gases.
- Demonstrate ways of separating different mixtures.
- Demonstrate the process of solution formation (using water as universal solvent)

UNIT 7

MIXTURES

7.1 MIXTURE

Many substances around us are not in their pure form. They can be made up of two or more substances. Mixture may consist of an element, compound or both. **A mixture consists of two or more substances that are not chemically combined together. It is mostly a physical combination. In a mixture every substance retains its properties.**

Physical methods can be used to separate mixtures. The components in a mixture may or may not be in a fixed proportion and can vary in quantity.



Figure 7.1 Mixture

Activity 7.1 Mixture sorting

Can you think of some more examples of mixture. Look at the given pictures for some more ideas?



Different Mixture

7.2 TYPES OF MIXTURES

What would happen if you dissolve salt into water?

Would the salt be visible?

Activity 7.2 Homogenous and heterogeneous mixtures

Take two table spoons of rice, sugar and beans each. Mix them and observe. What do you observe? Are the materials clearly visible.



Add two table spoons of salt in a glass of water. What do you observe? Can you see the salt particle inside the water?



Think, what is the main difference between these two mixtures?

There are two types of mixtures

1. Homogeneous mixtures
2. Heterogeneous mixtures

Homogeneous mixture

It has a uniform composition throughout the mixture. We cannot see separate particles. For example a mixture of salt and water, a mixture of sugar and water, air, lemonade, soft drink water. These type of mixtures are mostly called solution.



Figure 7.2 Homogeneous mixture

Heterogeneous mixture

It does not have uniform composition throughout the mixture. The material in the mixture can be seen easily. For example pebbles in sand, sulphur and iron filings, oil and water etc.



Figure 7.3 Heterogeneous mixture

Teaching Point: Teacher will demonstrate the formation of Homogeneous mixtures and heterogeneous mixtures by using different materials like sugar, salt, lemon juice, sand, coffee, sand and oil etc.

UNIT 7

MIXTURES

DO YOU KNOW?

- Do you know mineral water is a mixture of different substances?
- Try to find out what other substances does it contain?



7.3 DISTINGUISH BETWEEN ELEMENTS, COMPOUNDS AND MIXTURE

Look at the given picture. It is a mixture of iron and sulphur elements. When this mixture is heated, a compound of iron sulphide is formed. How can you tell whether a substance is an element, compound or a mixture?



Elements, compound and mixtures have specific melting and boiling points. Their melting and boiling points depend upon their composition. Below is the comparison of elements, compounds and mixtures.

Figure 7.4 Difference between Elements, Compounds and mixtures

Element	Mixture	Compound
An element consists of same type of atoms that cannot be broken down into simpler substances.	It is made up of two or more substances that are not chemically combined.	The elements are chemically combined together to form a compound.
All atoms of an element are same	The components of a mixture retain their original properties.	The properties of the compounds are different from its elements.
It can exist as either atom or molecule	The components can be separated easily.	It is difficult to separate the elements of compounds.
Fixed melting and boiling point	No fixed melting and boiling point.	Fixed melting and boiling point.
	No new substance is formed.	New substances are formed.



DO YOU KNOW?

The melting point of a substance is a temperature at which a substance melts (from solid state to liquid state). The temperature at which a substance boils (change its state from liquid to gas) is called boiling point.



Activity 7.3 Sorting of elements, compounds and mixtures

Look at the given examples and categorize the material in their respective column.



Juice



Mercury



Water



Aluminum



Iron filing



Table Salt

Element

Mixture

Compound

7.4 DIFFERENCE BETWEEN PURE SUBSTANCES AND MIXTURES

A pure substance is a form of matter that has the same composition and properties throughout the matter, e.g. elements and compounds are examples of pure substances. A mixture is made up of two or more substance that are not chemically combined together.

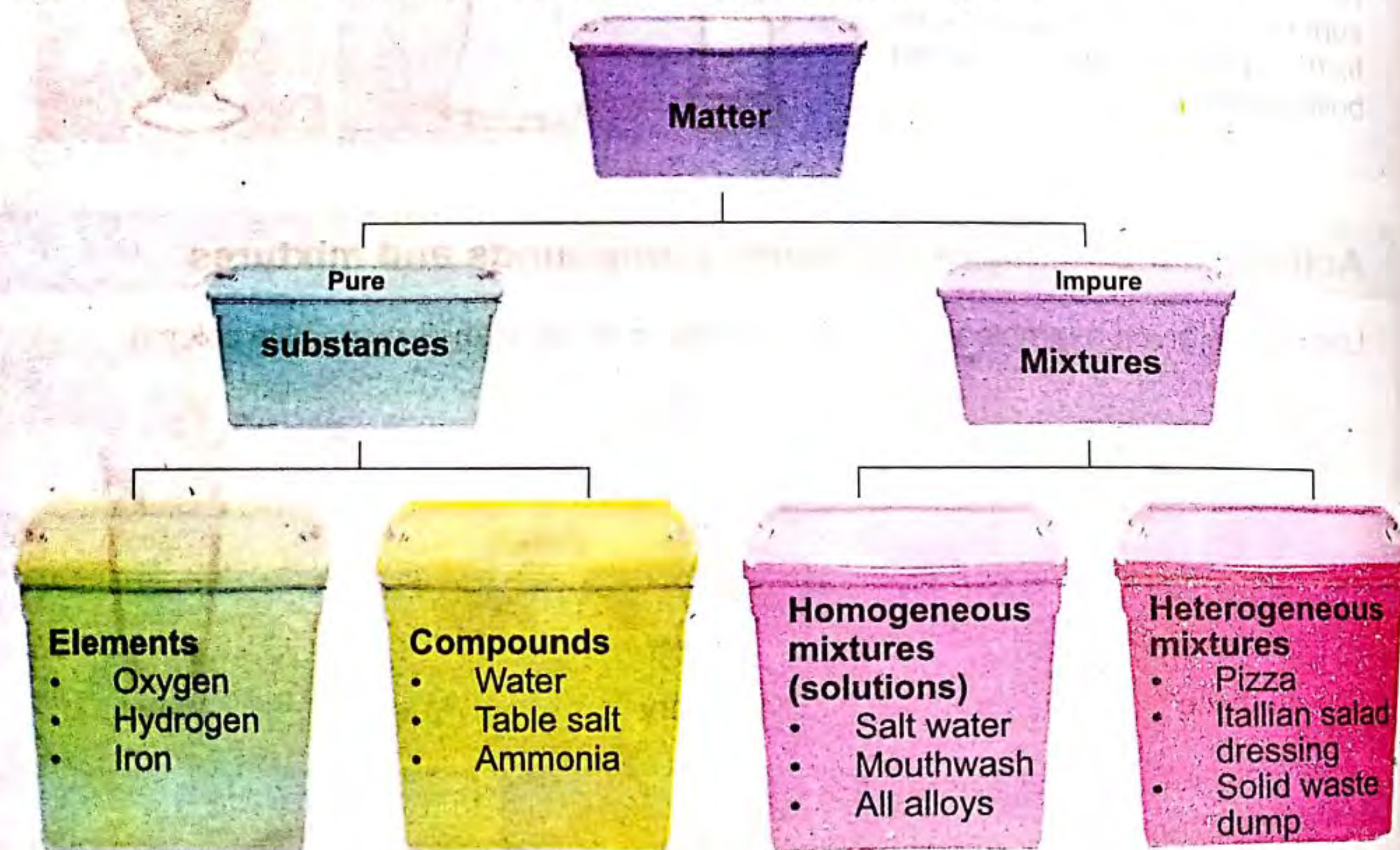


Figure 7.5 Difference Between Pure Substances and Mixtures

7.5 ALLOYS

Can you think of any material that is made up of steel?
Is steel an element, compound or mixture?

Alloys are mixtures of metal with another element either metal or non-metal. For example, cast iron is an alloy. It is a mixture of iron and carbon. The most important component of an alloy is metallic that is present in large quantity. This part is called main metal or base metal. The other component of alloy can be metal or non-metal and it is present in smaller quantity and called alloying agents.



Figure 7.6 Alloys

Characteristics of Alloys

- I. Alloys are stronger and harder as compared to the pure metals. Pure metals are mostly soft in nature.
- II. They are more resistant to corrosion than pure metals.
- III. The conductivity of alloys is lower than that of pure metals.

Alloys are used to make ornaments, utensils, air crafts and surgical instruments etc.



Figure 7.7 Uses of Alloys

Activity 7.4 Find uses of alloys

Brass is an alloy. It is a mixture of copper and zinc. Find three uses of brass in daily life.



UNIT 7

MIXTURES

7.6 APPLICATION OF MIXTURES IN DAILY LIFE

The mixtures are all around us in our daily life. The air we breathe, food we eat, the clothes we wear all are examples of mixtures.

Try to find some other examples of mixtures from daily life

- Milk is a mixture of water with various proteins and fats.
- Concrete road is a mixture of cement, water, sand and gravels.
- Black coffee is a homogeneous mixture of coffee beans and water. Similarly, milk coffee is a mixture of milk and black coffee.
- Vinegar is a homogenous mixture of acetic acid and water.
- Cylinder gas or LPG gas is a mixture of hydrocarbons.
- Stainless steel is a mixture of iron and carbon. It is used to make sinks, kitchen utensils and medical instruments.



Concrete Road



Milk



Vinegar



LPG

Figure 7.8 Application of Mixtures in Daily Life

MIXTURES



DO YOU KNOW?

Hydrocarbons are organic compounds composed of carbon and hydrogen elements. **Air is a mixture of gases**



Air is all around us. Air has all the properties of a mixture. Air is a mixture of different gases (nitrogen, oxygen, carbon dioxide etc.) smoke and dust particles. These substances are not chemically combined. The components of air retain their properties and can be separated easily by using physical methods.

DO YOU KNOW?

Nitrogen makes 78% of the air that is around us. It is colourless and odourless and does not combine with other substances.

DO YOU KNOW?

On high mountains the concentration of oxygen is very low that's why the climbers take oxygen cylinder with them.

Point to Ponder

- What would happen if the percentage of carbon increases in the air?

7.7 SEPARATING MIXTURES

Let's suppose if you were given a basket of fruits. How would you sort them? You would probably sort them by hands. But what do you think: would you be able to sort sand and grain mixture by hand.



Figure 7.9 Mixture of fruits



Figure 7.10 Mixture of Sand and Grains



There are several methods to separate the mixture into its components. But remember the substances in a mixture have not combined chemically. They are the same as before the mixing substance.

Some commonly used method of physical separation are given below

- Hand sorting
- Sieving
- Filtration
- Evaporation
- Distillation
- Chromatography

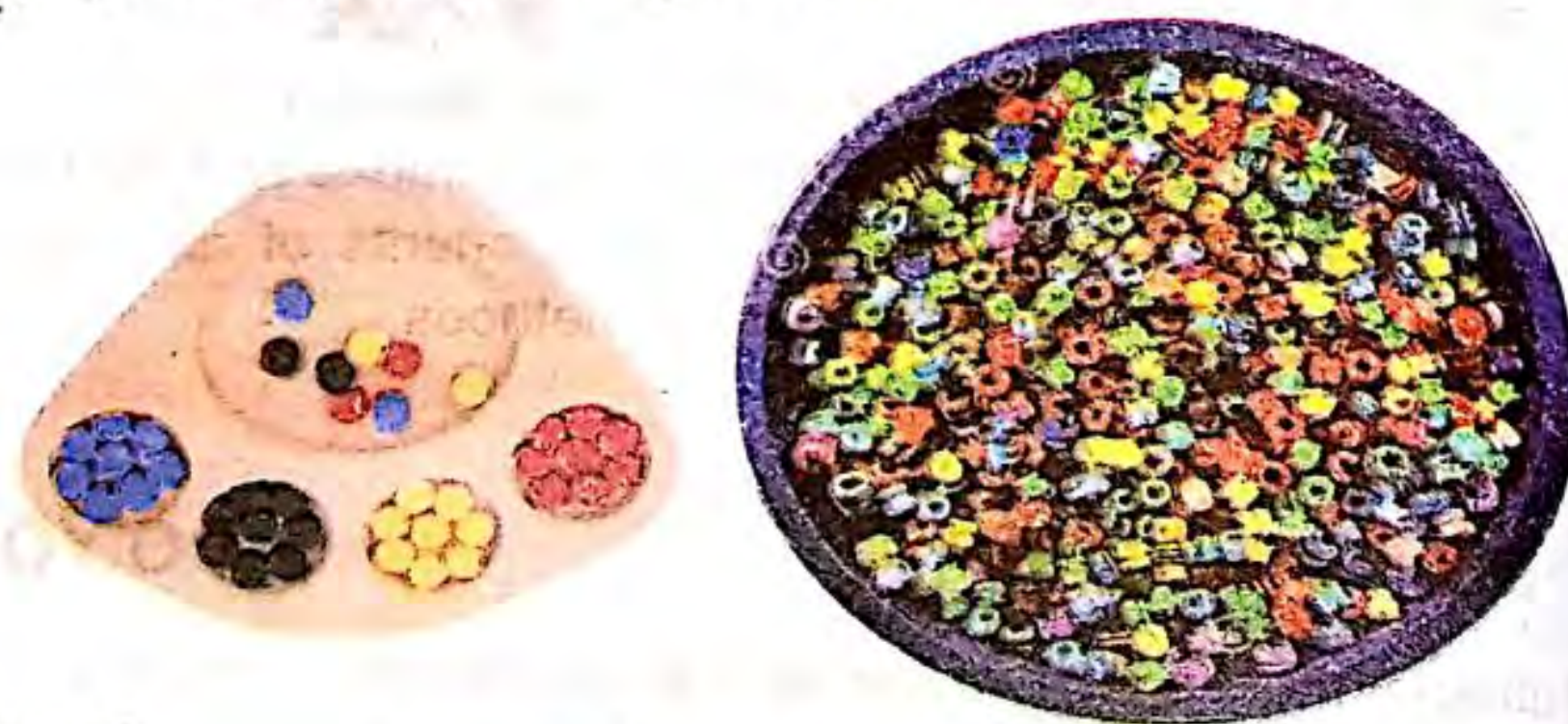


Figure 7.11 Hand Sorting

Hand sorting:

This method involves the separation of different substances by hand

In figures 7.11 how would you sort different colours?

Activity 7.5 Hand sorting

Can you give more examples of hand sorting from daily life

Sieving

How would you separate a large mixture of sand with pebbles?

Would hand sorting be easy?

For larger quantities of mixture, we use sieve to separate it.

When we sieve the material with different size of particles, the smaller particle will fall through the sieve and the larger particles will stay in the sieve.



Figure 7.12 Sieving

Activity 7.6 Separation of mixture

Give two more examples of mixtures that could be separated by using sieve.
What are some other ways / techniques to separate mixture?

Point to Ponder

For what type of mixtures sieving can be good.

If the mixtures are in different states (solid, liquid and gases) how can we separate them?

DO YOU KNOW?

Winnowing is a method that is used to separate a mixture of two solids. The lighter solid is separated from the heavier one with the help of wind. This method is used to separate chaff from grain.



Filtration

How would you separate a mixture of mud, water and other substances?

Filtration is a method of separating an insoluble solid from a liquid. Mix a small amount of sand in water by stirring. The sand will not dissolve in the water. We can separate this type of mixture by filtration. Pour the mixture into a filter paper. The filter paper has tiny pores which act like a sieve. The sand particles cannot pass through the filter paper hence they are left on the filter paper. The sand particles left on the filter paper are called residue and the liquid (water) that passes through the filter paper is called filtrate.

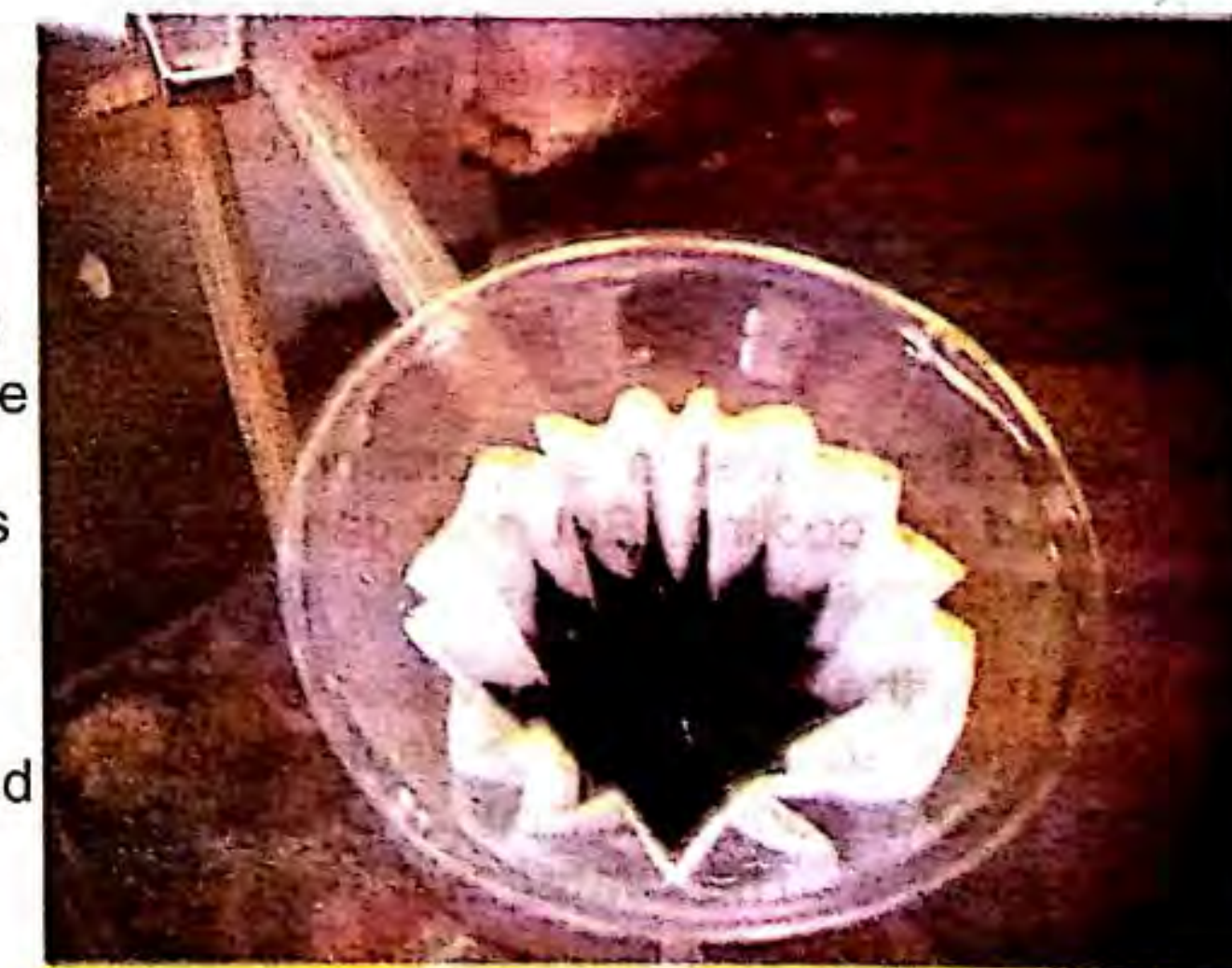


Figure 7.13 Filtration

Teaching Point: Teacher will explain what methods of separating mixtures are commonly used in daily life. Teacher will provide examples of different mixtures and ask them which method and ask them which method is suitable for separating this mixture and why?

Point to Ponder

Why do fire fighters wear a mask?

**Evaporation**

How would you distinguish between water and salt solution without tasting it?

Add 2 table spoon of salt in one glass of water. Stir the solution gently. The salt is dissolved in water to form a homogeneous mixture. Now can you separate the salt from the solution by using filtration? No, to separate a soluble solid from a solution evaporation is used. Pour the solution into an evaporating basin. Evaporation is a process that is used to separate a soluble solid from a liquid. Heat the salt solution gently. The water evaporates leaving the salt behind.

DO YOU KNOW?

Decantation is a process to separate the mixtures by removing the liquid layer. In this process a liquid is separated from a solid by allowing the solid to settle down at the bottom of the mixture and pouring the solid free part of a liquid from it.

Distillation

The water that is lost in evaporation can be condensed by cooling. But how can we get pure water from salt solution.

Distillation is the process of evaporation and condensation to separate a liquid from a solution. Pour muddy water into a beaker and start heating it. The water will evaporate leaving the impurities in the beaker. The water vapours are passed through the tube which is cooled down by cold water around it. The water vapours will change into clear water. This clear water is called a distillate.

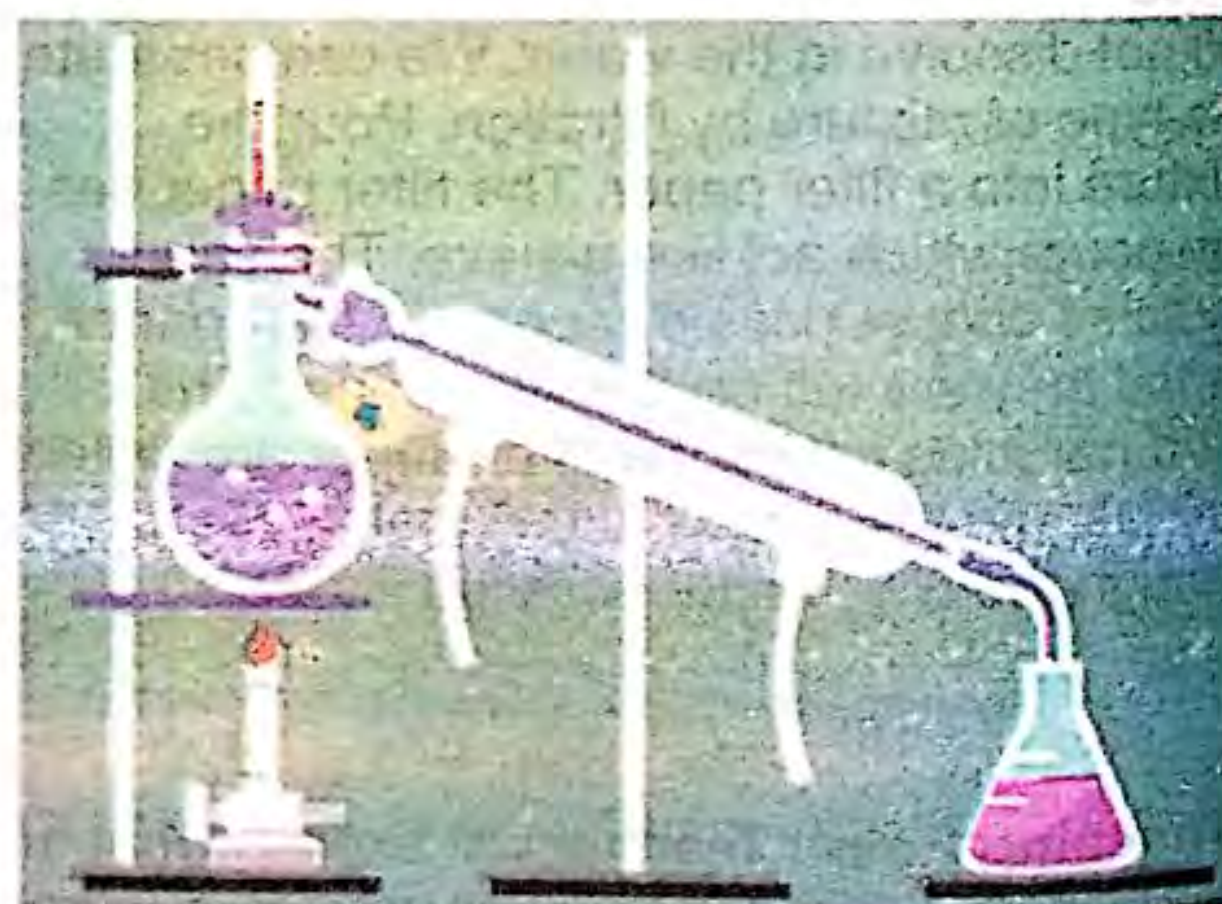
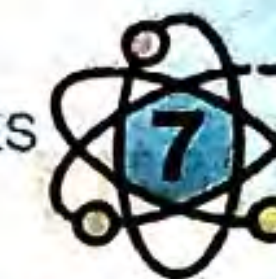


Figure 7.14 Distillation

**Chromatography**

It is separation technique that is used to separate the mixtures into its components. It is used to separate different types of mixtures by using filter paper. For example ink is the mixture of different dyes, which are soluble in water and alcohol. With the solvents these dyes move up with different rates. In this ways dyes are spread out into different colours on the filter paper. The paper that is obtained is called chromatogram.



Figure 7.15 Chromatography

Activity 7.7 Types of dyes

What types of dyes are present in ink?

7.8 SOLUTIONS

Have you ever tried to make lemonade?

When you stir sugar into lemonade it is dissolved because water has the solvent properties. A solvent is a substance that can dissolve other molecule and compounds which are known as solute. A homogeneous mixture of solute and solvent is called a solution. Water is a good solvent and it can dissolve a wide range of solutes. Due to this quality it is called a universal solvent.



Figure 7.16 Coffee Solution

In our kitchen many things require water to make solution for example tea, coffee and soup etc. Water is able to dissolve many substances because the molecules that make up water can bind or stick with other molecules or atoms of other substances. River and lake water dissolves many minerals from rocks through which it flows.

DO YOU KNOW?

Suspension is another type of mixture in which solid particles do not dissolve. They are suspended in the liquid and after some time they settled down. e.g. water and chalk.



Teaching Point: Teacher will demonstrate the formation of Homogeneous mixtures and heterogeneous mixtures by using different materials like sugar, salt, lemon juice, sand, coffee, sand and oil etc.

UNIT 7

MIXTURES

MIXTURES



Formation of solution

In a solution, different kinds of particles are mixed together. As these particles are too small to be seen, so when we look at the solution, it just looks like one liquid. According to the particle theory particles will separate and there will be spaces between these particles. The liquid particles take the spaces among the solid particles and form a link that is why the solution looks homogeneous.

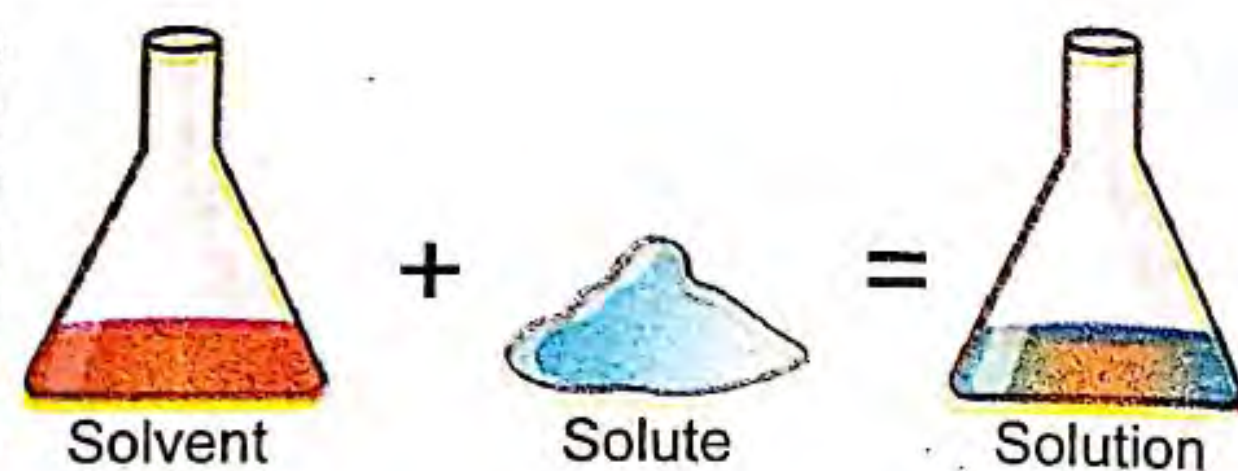


Figure 7.17 Formation of Solution

Point to Ponder

Do all the substances dissolve in water?

DO YOU KNOW?

Solubility is the amount of solute dissolved in specific amount of solvent at a particular temperature. A solution that has very little amount of solute is called dilute solution. The solution with greater amount of solute is called concentrated solution.

Key Points

- A mixture consists of two or more substances that are not chemically combined
- All components in the mixtures keep their individual properties
- Air is a mixture of different gases
- Mixtures can be separated by using physical methods, such as evaporation, distillation, filtration and chromatography
- A homogeneous mixture is called solution
- A dilute solution has low amount of solute
- A concentrated solution has high amount of solute
- Solubility is the amount of solute dissolved in specific amount of solvent at a particular temperature



END OF UNIT ASSESSMENT

A. MCQs (Choose the correct option)

- When sugar is mixed in water it becomes:
 - Element
 - Compound
 - Alloy
 - Mixture
- The process used to purify oil is called:
 - Evaporation
 - Distillation
 - Filtration
 - Winnowing
- Which one is Not an example of alloy?
 - Brass
 - Steel
 - Iron
 - Bronze
- The percentage of Nitrogen in air is:
 - 35%
 - 78%
 - 87%
 - 21%
- The maximum amount of solute that can be dissolved in a solvent at specific temperature is called:
 - Solubility
 - Solution
 - Concentration
 - Mixture
- Which of the following is the property of mixtures?
 - The substance lose their original properties
 - The substances are mixed in a fixed amount
 - The substances can be separated by physical methods
 - Only one type of substance is mixed
- The solid particles which are left on filter paper while filtration are called:
 - Residue
 - Filtrate
 - Solvent
 - Solute
- Air is a mixture of different gases. This combination is an example of
 - Chemical combination
 - no chemical combination
 - no physical combination
 - both chemical and physical combination
- A mixture of sugar and grains is an example of:
 - Homogeneous mixture
 - Heterogeneous mixture
 - Colloids
 - Solutions
- Soup powder is mixed with water, in this soup powder is an example of:
 - Solute
 - Solvent
 - Solution
 - Mixture

UNIT 7**MIXTURES****B. Short Questions:**

1. Give one example of mixtures with the following combination. One is done for you

- Liquid-liquid (Vingar in Water)
- Solid-Solid ()
- Liquid-Liquid ()
- Solid-Liquid ()
- Gas-liquid ()
- Solid-gas ()

2. Which process would you use to separate the following? Give the reason

- Sand & water
- alcohol and water
- Vinegar (a solution of acetic acid (liquid) in water)

3. Why water is considered as a universal solvent?

4. Can you use a polythene bag for filtration. If not Why?

5. Why air is considered a mixture and not a compound?

6. Identify substances in the following table:

Mixture	Is this a heterogeneous mixture or a solution?
Oil and water	
Flour and water	
Milk and water	
Honey and water	
Orange juice	

C. Long Questions:

- Explain the different separation techniques to get a pure substance from a mixture?
- Justify why the process of filtration cannot be used for separating soluble solids.

D. Project work

Take a mixture of salt and sand. Perform an experiment to separate the salt from sand.

UNIT 8**ENERGY****Learning outcomes:**

At the end of this unit, students will be able to:

- Recognize energy as a physical quantity
- Relate potential energy and kinetic energy
- Demonstrate an energy transfer such as bouncing ball by energy transfer diagram, e.g. gravitational potential energy ---- kinetic energy ----elastic potential energy +thermal + sound ----kinetic ----gravitational potential energy etc.
- State the law of conservation of energy and explain how the law applies to different situations
- Compare the renewable energy sources (Wind, water, Sun and plants) Non-renewable sources of energy (coal, natural gas, crude oil).
- Identify the advantages of using renewable energy resources
- Assemble and demonstrate a solar panel to operate a small fan
- Design and make a solar water heater



UNIT 8

ENERGY

8.1 ENERGY

Energy is used for performing many day-to-day tasks. We need it for transportation, for running the fans and lights at home and for watching our favourite shows on TV. It is also used on a larger scale in industries and factories for manufacturing different products. So energy does things for us. Scientists define energy as, "the ability to do work". Work is done when a force causes movement of an object.

Energy can be measured that is why it is considered as physical quantity. Its unit is "Joule".



Figure 8.1 Walking Man



Figure 8.2 Wind Blows



Figure 8.3 Spinning of Clock's hand

8.2 CATEGORIES OF ENERGY

Energy can be studied in different forms like heat, light, sound, electrical, thermal etc. but interesting point is that all energy types can be classified into two categories i.e Kinetic energy and Potential energy.

1. KINETIC ENERGY (KE):

Energy of a body due to its motion is called kinetic energy. It can be in the form of heat, light, sound, electricity or motion of any object.



Figure 8.4 Truck is at rest



Figure 8.5 Horses are running

In above figures, truck is in state of rest so its kinetic energy is zero while horses are running so they have kinetic energy. When the truck will move, its kinetic energy will increase. It means that when truck starts motion its kinetic energy increases gradually. Kinetic energy also depends upon mass of an object, for example a truck has more kinetic energy as compared to a car moving at the same speed. Because truck has more mass as compare to car.



2. POTENTIAL ENERGY (PE):

Energy possessed by a body due to its position is called potential energy. It can be in the form of stored energy, gravitational potential energy (GPE) or elastic potential energy (EPE). When something is at high position, its GPE is high e.g., a brick lying on the roof of a house has high GPE. EPE is the energy stored in something when you push, pull or force it out of shape e.g., a stretched bow has EPE. In batteries, energy stores in the form of chemical energy.

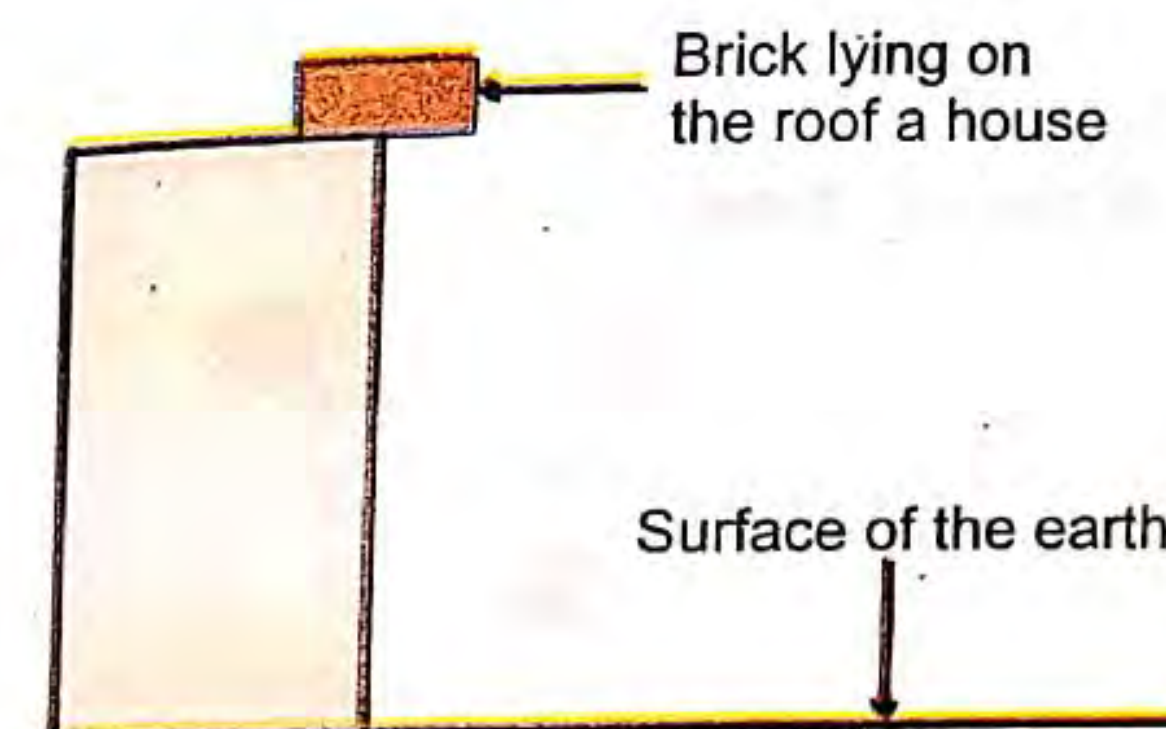


Figure 8.6 Gravitational Potential Energy

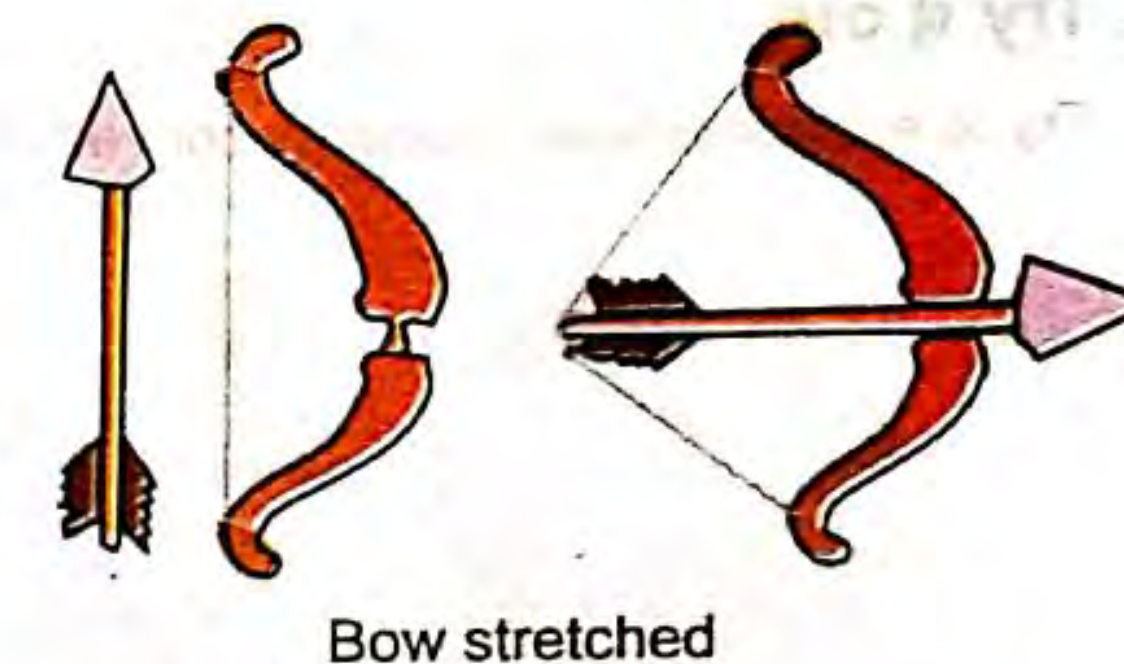


Figure 8.7 Elastic Potential Energy

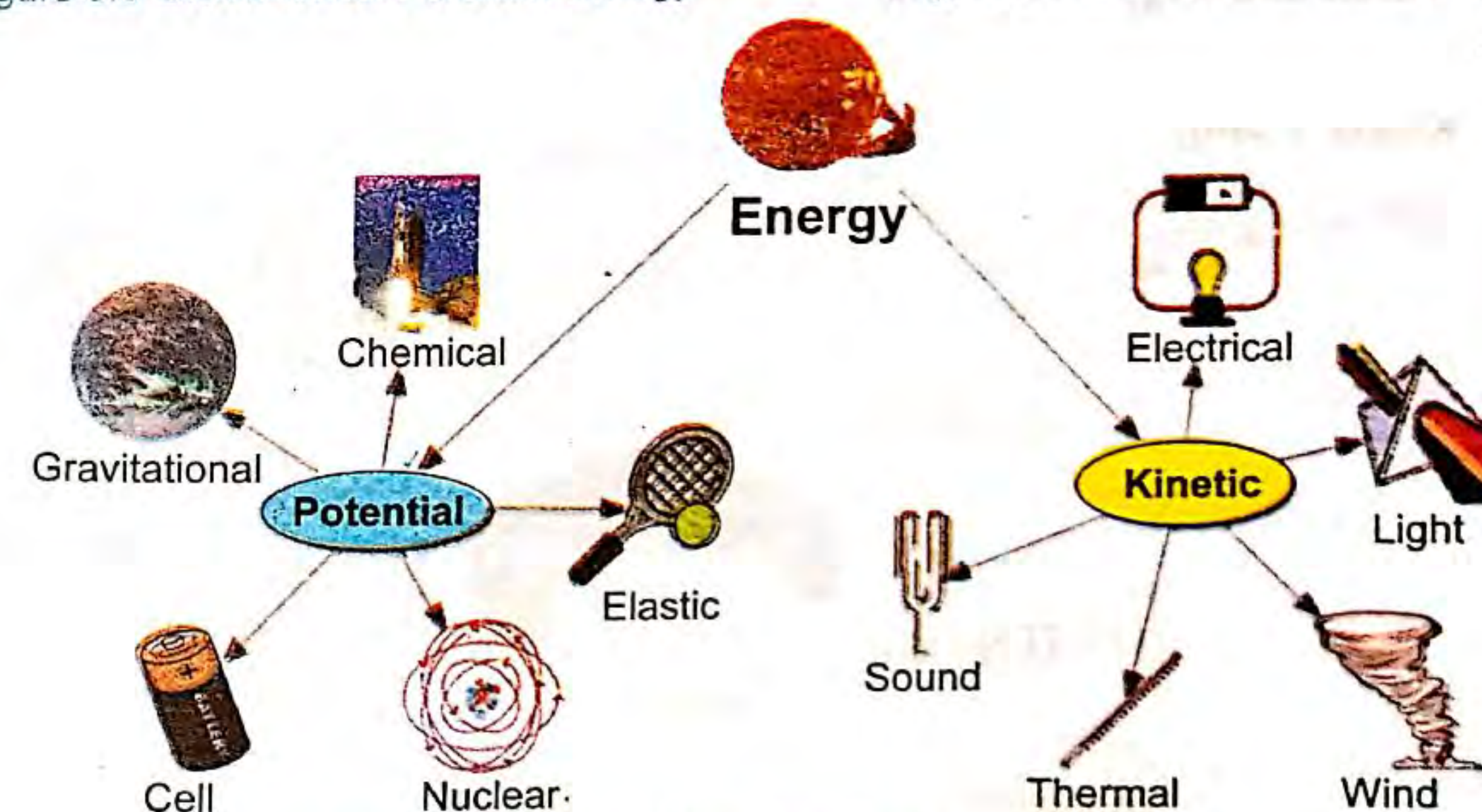


Figure 8.8 Types of Kinetic and Potential energies

Teaching Point: Before delivering lecture on energy, teacher should demonstrate some examples by having a student run, turn on a light, make a sound, etc.

UNIT 8

ENERGY

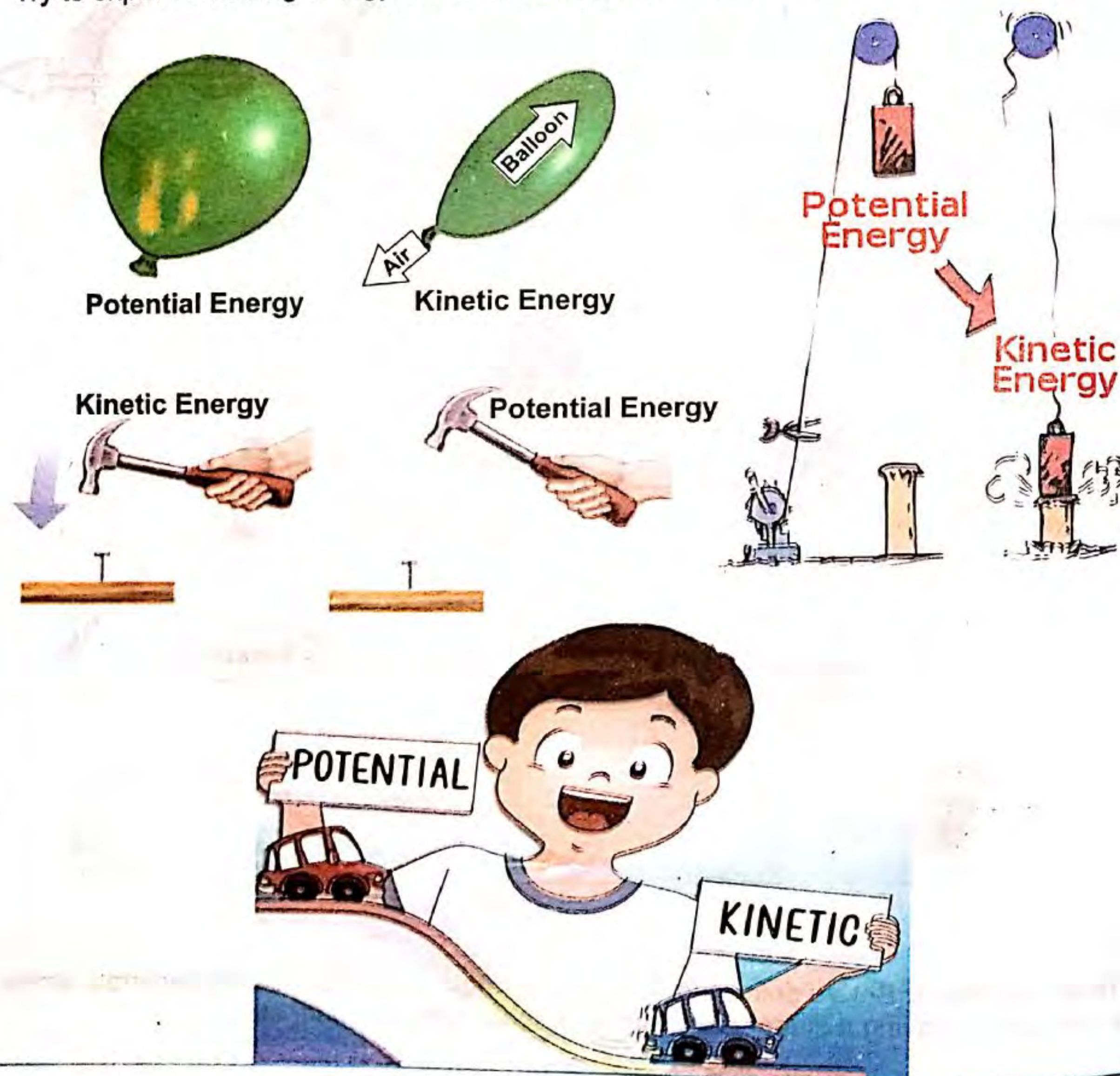


8.3 CONVERSION OF ENERGY

Think of a book lying on a shelf. The book has potential energy when it is on the shelf. What happens if the book falls off the shelf? Its potential energy changes into kinetic energy. This change in energy from one form to another is transformation of energy. In conversion total amount of energy remains conserved.

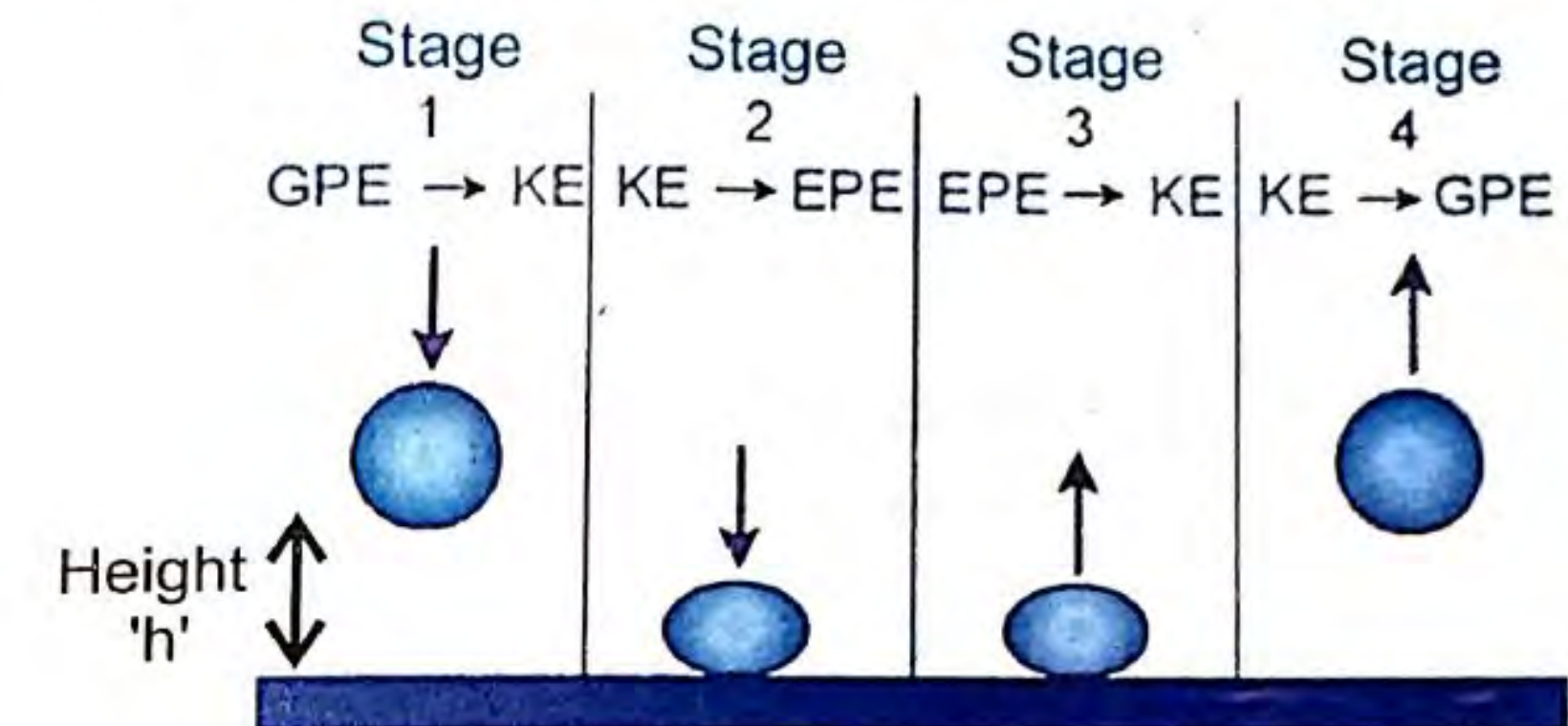
Try it out

Try to explain following energy conversions. Think, pair and share.



Activity 8.1 Transformation of energy

What are the Energy Changes when a Ball Bounces?



By the help of this example of bouncing ball, we can study the transformation of energies from one form to another form. There are 4-different stages of energy changes.

STAGE-1: At height 'h' ball has GPE. When it drops, its GPE converts into kinetic energy due to its motion.

STAGE-2: Due to kinetic energy ball moves down and hits the ground. As it hits the ground it changes the shape of ball. Here kinetic energy is converted to EPE. Here some kinetic energy is lost as heat energy and sound energy.

STAGE-3: EPE is converted into kinetic energy. As a result the ball bounces back to height 'h'.

STAGE-4: Due to kinetic energy ball will move up and will reach height 'h'. Kinetic energy will be converted into potential energy.

CONCLUSION

From above example we can conclude that energy can be converted into any other form of energy but overall energy remains conserved. If the energy transfers were perfect and there were no energy losses, the bouncing ball would always return to the same height at which it started. It would carry on bouncing like this forever.

Point to Ponder

It must be noted that during energy conversion process all the energy is not converted into useful forms. Some of its part is lost. For example, in an automobile only a small portion (10%) of the chemical energy of gasoline is converted into energy that moves the car. The remaining portion (90%) is lost to the environment as heat and other forms of energy.

UNIT 8

ENERGY

8.4 TYPES OF ENERGY

The different types of energy include Mechanical energy, thermal energy, radiant energy, chemical energy, nuclear energy, electrical energy, motion energy, sound energy, elastic energy and gravitational energy.

GRAVITATIONAL ENERGY

Gravitational energy is a form of potential energy. It is the energy held by an object when it is in a high position compared to a lower position.

CHEMICAL ENERGY

Chemical energy is stored in the bonds of compounds. It can be released during a chemical reaction often as heat e.g., when you burn match stick heat is released due to chemical reaction.

NUCLEAR ENERGY

Nuclear energy is stored in the nucleus of atoms. This energy is released when the nuclei are combined (fusion) or split apart (fission). e.g., fission reaction of atom bomb, fusion reaction of sun.

ELASTIC ENERGY

Elastic energy is a form of potential energy that is stored in an elastic object - such as a coiled spring or a stretched elastic band.

MECHANICAL ENERGY

Mechanical energy is the energy that is possessed by an object due to its motion it is the sum of kinetic and potential energy e.g., wind, a flowing river, a moving car, or a person running.

SOUND ENERGY

Sound energy comes from the vibrations moving through medium and received by listener. It travels in the form of waves.

ELECTRICAL ENERGY

Electrical energy is a type of kinetic energy caused by moving electric charges. All home appliances depend on electrical energy e.g., fans, lights, refrigerator etc.

LIGHT ENERGY

Light energy is a form of electromagnetic radiation. Light consists of photons. Light travels in the form of waves as well as particles.

THERMAL ENERGY

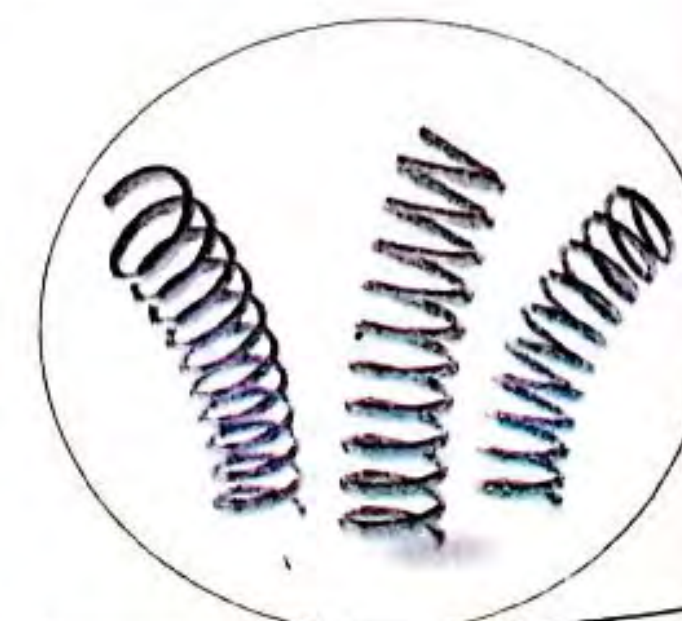
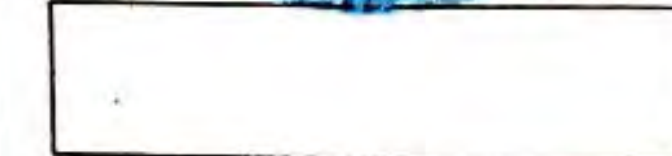
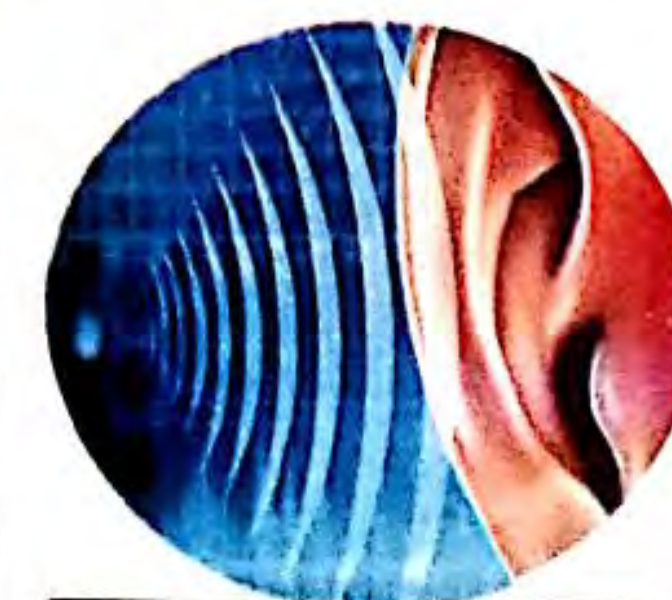
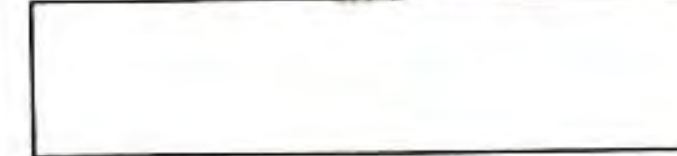
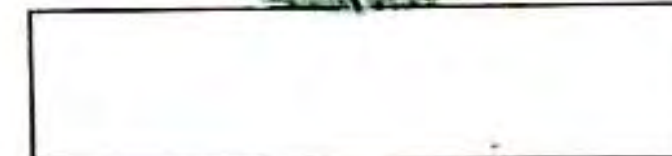
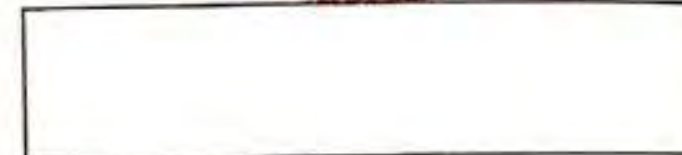
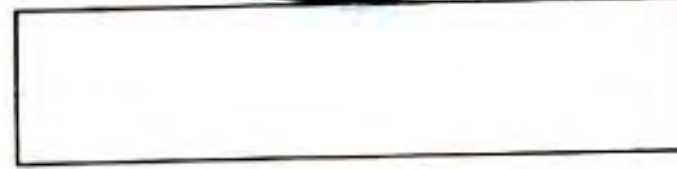
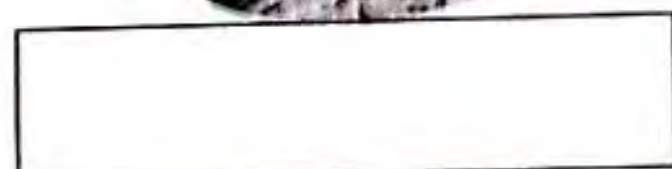
Thermal energy is produced when increase in temperature cause particles to move faster. Hot objects have more thermal energy.

Figure 8.9 Types of Energy

UNIT 8

ENERGY

Activity 8.2: Identification of forms of energy



8.5 LAW OF CONSERVATION OF ENERGY

The law of conservation of energy states that energy can neither be created nor destroyed i.e. it is only converted from one form of energy to another. This means that a system always has the same amount of energy.



Figure 8.10 A car engine changes chemical energy to mechanical energy, heat energy and sound energy.



Figure 8.12 A tree changes light energy to chemical energy.



Figure 8.14 Hammering a nail changes kinetic energy to deformation, sound and heat energy.



Figure 8.11 A nuclear reaction changes nuclear energy to light energy, heat energy and sound energy.



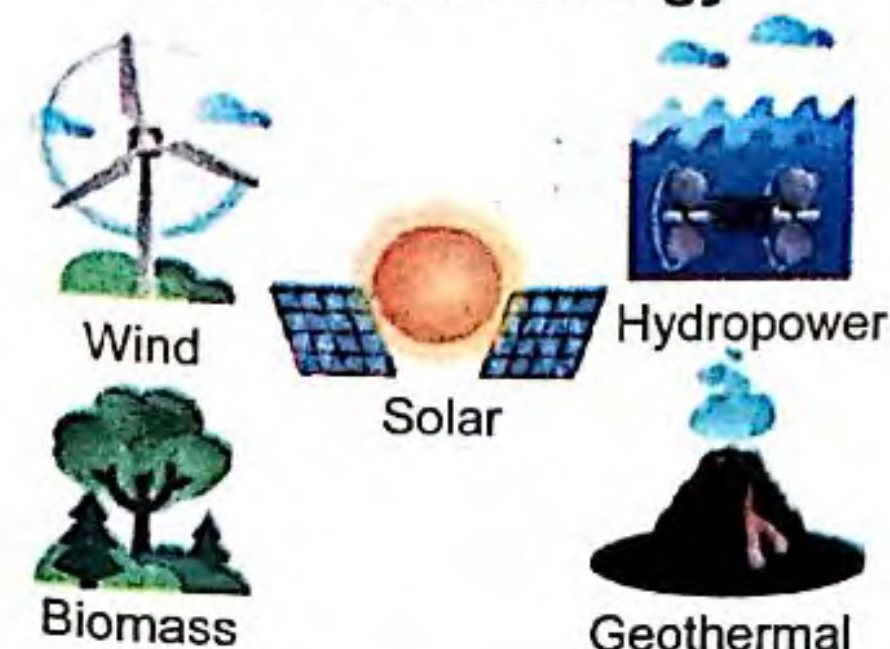
Figure 8.13 An electric mixer changes electrical energy to mechanical and heat energy.



Figure 8.15 A lamp changes electrical energy to light and heat energy.

Information

Renewable Energy



Non-renewable Energy



UNIT 8

ENERGY



8.6 ENERGY SOURCES

Energy is the capacity to do work and is required for life processes. An energy resource is something that can produce heat, move objects, or produce electricity. Matter that stores energy is called a fuel. Human energy consumption has grown steadily throughout human history. Early humans had less energy requirements, mostly food and fuel for fires to cook and keep warm. In today's society, humans consume as much as 110 times more energy per person as early humans. Most of the energy we use today come from fossil fuels. But fossils fuels have a disadvantage in that they are non-renewable on a human time scale, and cause other potentially harmful effects on the environment.

8.7 RENEWABLE ENERGY SOURCES

Renewable energy comes from sources or processes that are constantly replenished. These sources of energy include solar energy, wind energy, geothermal energy, hydroelectric energy and energy of biomass.

Solar Energy:

Sunlight can produce electrical energy by using a photovoltaic cell. They are usually arranged in frames known as solar panels. This is a free and unlimited source of energy. However, its effectiveness is determined by the number of hours of daylight, cloud and weather conditions.



Figure 8.16 Solar panel



Figure 8.17 Wind farm

Wind Energy:

Wind turbines turn wind into electrical energy. Sites for wind farms are chosen carefully in the windy regions to effectively generate electricity.

Hydroelectric Energy:

Hydroelectric energy generates electricity from flowing water using turbines and other devices. It is renewable and can be generated from rivers or dams.



Figure 8.19

Biomass Energy:

Biomass is renewable energy material that comes from plants and animals. It can be used as fuel to produce heat or electricity e.g., biodiesel, biogas plant etc.



Figure 8.18 Dam

Geothermal Energy:

As the core of the earth is hot, we can use its geothermal energy to generate electricity. This heat is accessible just a few kilometers below the earth's surface in some parts of the world.

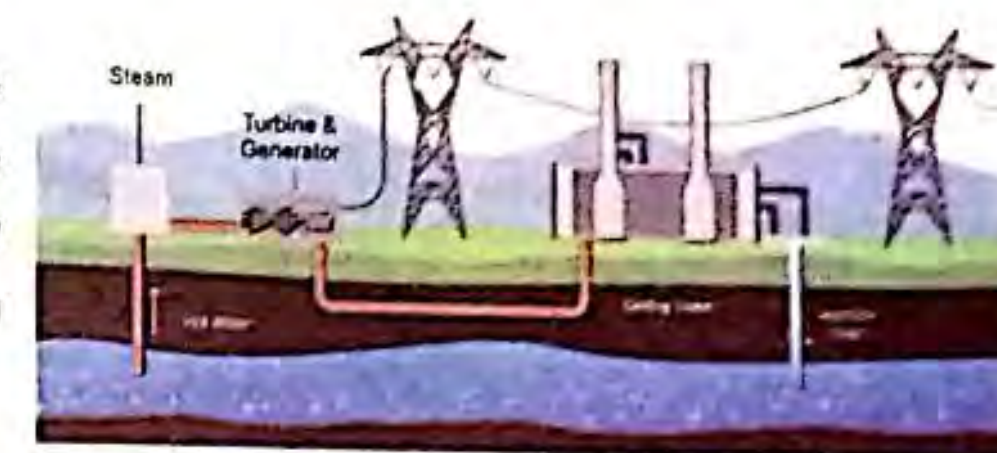


Figure 8.20 Geothermal Energy

8.8 NON-RENEWABLE ENERGY SOURCES

Non-renewable energy source comes from natural sources that does not replenish quickly. These sources typically take millions of years to develop. Fossil fuels and nuclear energy are non-renewable energy sources. This means that they will run out eventually, that is why its cost is increasing. Coal, oil and natural gas are examples of fossil fuels. They are burnt to generate electricity - however, carbon dioxide is released during this process. Carbon dioxide contributes to global warming. Both fossil fuels and nuclear energy are harmful for the environment. Burning of fossil fuels cause air pollution, global warming, smog and acid rain.



Figure 8.21 Nuclear Energy



Figure 8.22 Fossil Fuels

Renewable Energy Sources

These are replenished naturally and over short period of time

These are available continuously

These can be used again and again

These are environment friendly

Cost is low

Examples: energy from solar, wind, hydroelectric, biomass and geothermal sources

Nonrenewable Energy Sources

These are available in limited supplies because it takes very long time to replenish them

These are not available continuously

These cannot be used again and again

These are very harmful for the environment

Cost is high

Examples: nuclear energy and fossil fuels

UNIT 8

ENERGY

ENERGY

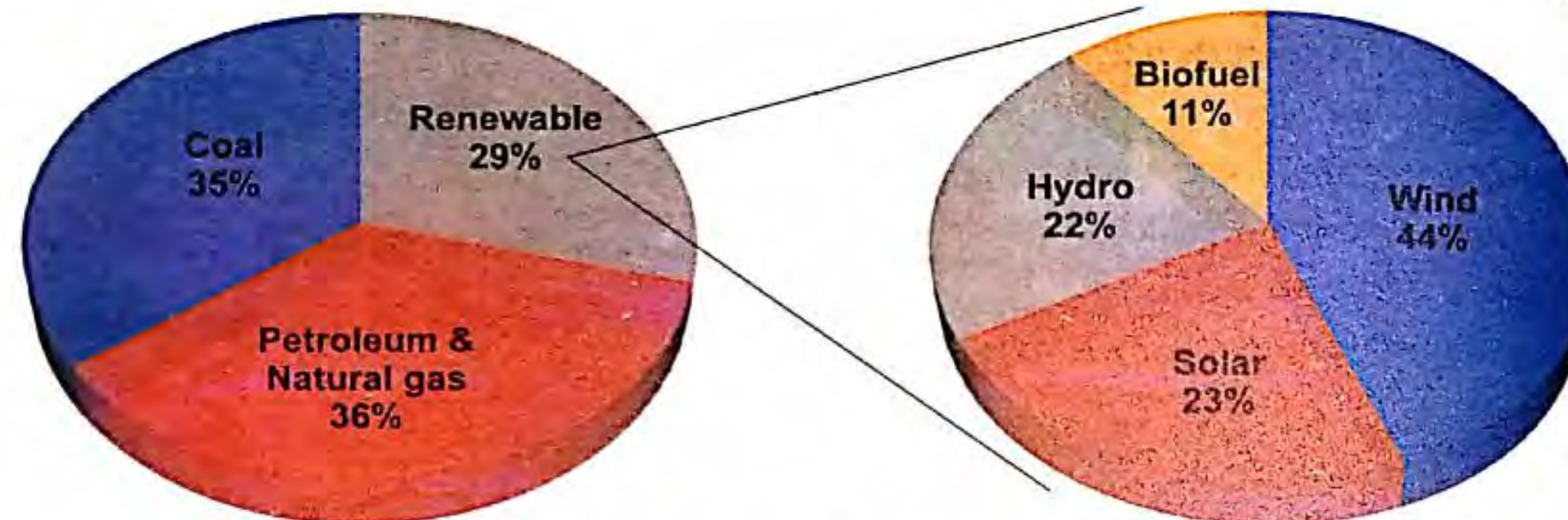
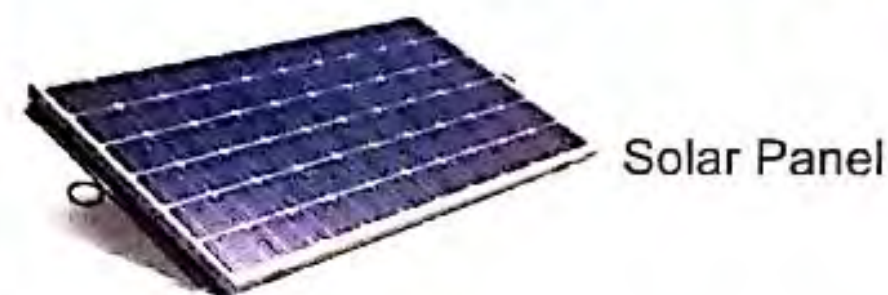


Figure 8.23 Global energy consumption of Renewable and Nonrenewable sources
Source: Global energy review 2021, IE, Paris

Activity 8.3 Conversion of light energy into mechanical energy

To Assemble and demonstrate a model of a solar panel to operate a small fan



Solar Panel



Electric Wires



Switch



Fan

Materials:

- Solar panel
- Electric wires,
- A small fan.
- A Switch

Procedure:

- Take a solar panel
- Connect one of the wires to the negative terminal of the solar panel and the fan.
- Cut the other wire in half and connect both parts to the switch.
- Now connect both ends of this wire to the solar panel and the fan.
- Expose the solar panel to sun light.
- Turn on the switch to allow current to flow in the circuit.
- The fan will start spinning due to solar energy.

Activity 8.4 Solar water heater

Sunlight brings heat and light to earth. You can use this heat to make solar water heater. Which substance heats up quickly? Which colour absorbs more heat? Which substance can reflect heat effectively? Have you observed that if water is left in a hose pipe in the sunshine it becomes hotter? Can you keep long rubber pipe in a small space?

- Select an area of your home where plenty of sunshine falls throughout the day.
- Cover that area with silver reflective material like windscreen sunshade.
- Place a black, long rubber pipe on this reflective material.
- Coil it in tight circles and make sure that these coils stay in place.



- Connect one end of the pipe with water supply and at the other end connect a tap or flow valve. Keep the tap close for one hour.
- After one hour open the tap and check the temperature of water.

Predict what will be the temperature of water after one hour.

Predict the efficiency of this water heater at night.

Why black coloured pipe is used?

Why reflective sheet is used?

What will happen if a small pipe is used instead of long pipe?

Why pipe is coiled in tight circles?

UNIT 8

ENERGY



Key Points

- Energy is the capacity to do work.
- Energy can be studied in different forms like heat, light, sound, electrical, thermal etc.
- All types of energy can be categorized in basic two types of energy, Kinetic energy and Potential energy.
- Energy of a body due to its motion is called kinetic energy.
- Energy possessed by a body due to its position is called potential energy.
- The change of one form of energy into another form is called transformation of energy.
- Energy can be converted into any other form of energy but overall energy remains conserved.
- The law of conservation of energy states that energy can neither be created nor destroyed but its forms can be changed from one to other.
- Energy resources are of two kinds: conventional (non-renewable) and non-conventional (renewable) energy resources.
- Renewable energy resources are solar, wind, hydroelectric, biomass and geothermal sources.
- Non-renewable energy source comes from natural sources that does not replenish quickly.



END OF UNIT ASSESSMENT

A. MCQs (Choose the correct option)

- Which of the following is a non-renewable resource?
a. Wind b. Water c. Wild life d. Natural gas
- Rida lit a matchstick, what form of energy did she use?
a. Electrical b. Chemical c. Elastic d. Light
- Kamran is sitting motionless on a chair; his kinetic energy is
a. Maximum b. Minimum c. Zero d. Twice
- When ice-cream is melting down, what type of energy is melting it?
a. Electrical b. Thermal c. Chemical d. Light
- The energy used to cook food in a microwave oven is a form of
a. Electrical energy b. Thermal energy c. Elastic energy d. Light energy
- Which of the following energy conversions take place in a battery-operated flashlight?
a. Electrical → Mechanical → Light b. Chemical → Mechanical → Light
c. Chemical → Electrical → Light d. Thermal → Electrical → Light

- 'Fossils fuel' is regarded as an energy resource which is
a. Renewable b. Non renewable c. Generating d. Producing
- If you are using biomass as a source of energy you might be heating with
a. Coal b. Natural gas c. Petroleum d. Wood
- Of the following choices, which best describes or defines electrical energy?
a. Moving charges b. Moving water c. Electric meter d. Light source
- Which of the following has nothing to do with hydropower?
a. Burning b. Gravity c. Sun d. Water cycle

B. True or false (correct the statement if it is False).

- Moving car is an example of potential energy

- In thunder bolt the light energy is converted into sound energy and electricity.

- We get energy from petrol to move a car.

- Coal is a renewable energy source.

- A loose spring possesses elastic potential energy.

C. Short questions:

- How is potential energy stored in an object? Give one example.
- Suppose you drop a ball. It bounces a few times and then stops. Does the energy disappear? Explain your answer.
- How are renewable energy resources environmental friendly?
- Can a body possess energy even when it is not in motion? Explain your answer with an example.
- Why does most of the energy we use come from non-renewable energy resources?

D. Long questions:

- What do you understand by the term "ENERGY"? Also, write the names of different forms of energy.
- What is Potential Energy? Give one example of a body that has potential energy, in each of the following : (i) due to its position, (ii) due to its state.

UNIT 8

ENERGY

3. A bucket full of water is on the first floor of your house and another identical bucket with the same quantity of water is kept on the second floor. Which of the two has greater potential energy? Justify your answer.
4. State and discuss the law of conservation of energy. Give one example to show the conversion of potential energy to kinetic energy when put in use.

E. Structured response questions:

1. Wind is blowing across a windmill. The windmill is converting energy in wind to electrical energy. After passing through the windmill, will there be any change in the speed of the wind? Why?

Wind Speed before
hitting the blades of
windmill

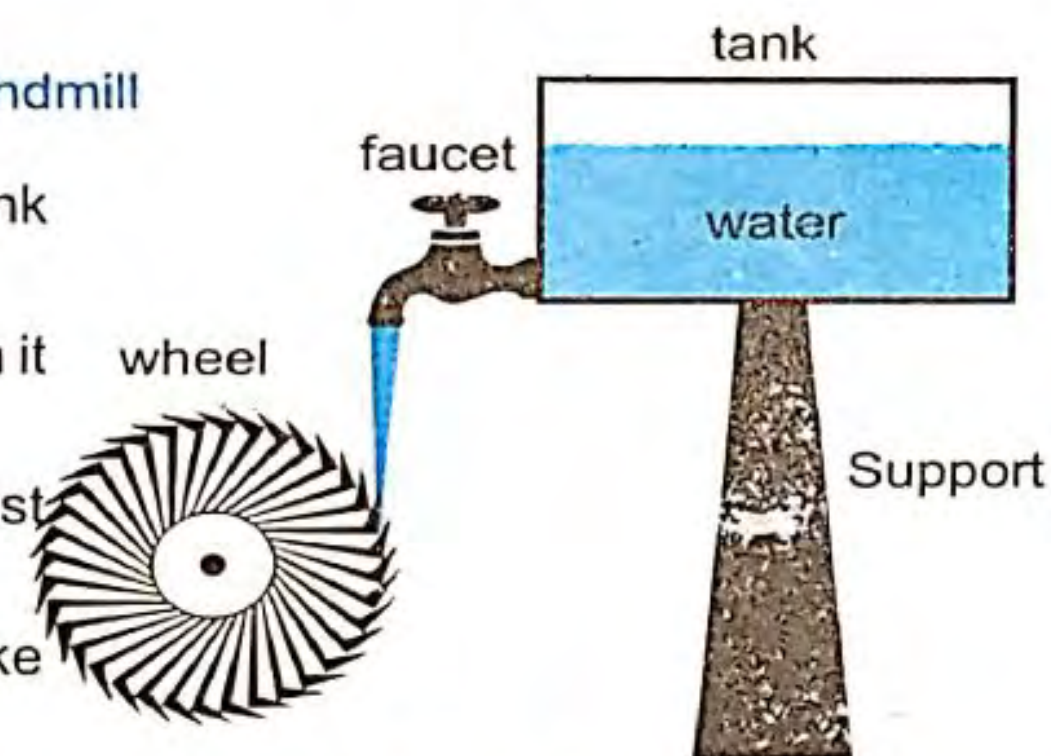


Wind Speed after
passing the blades of
windmill

Windmill

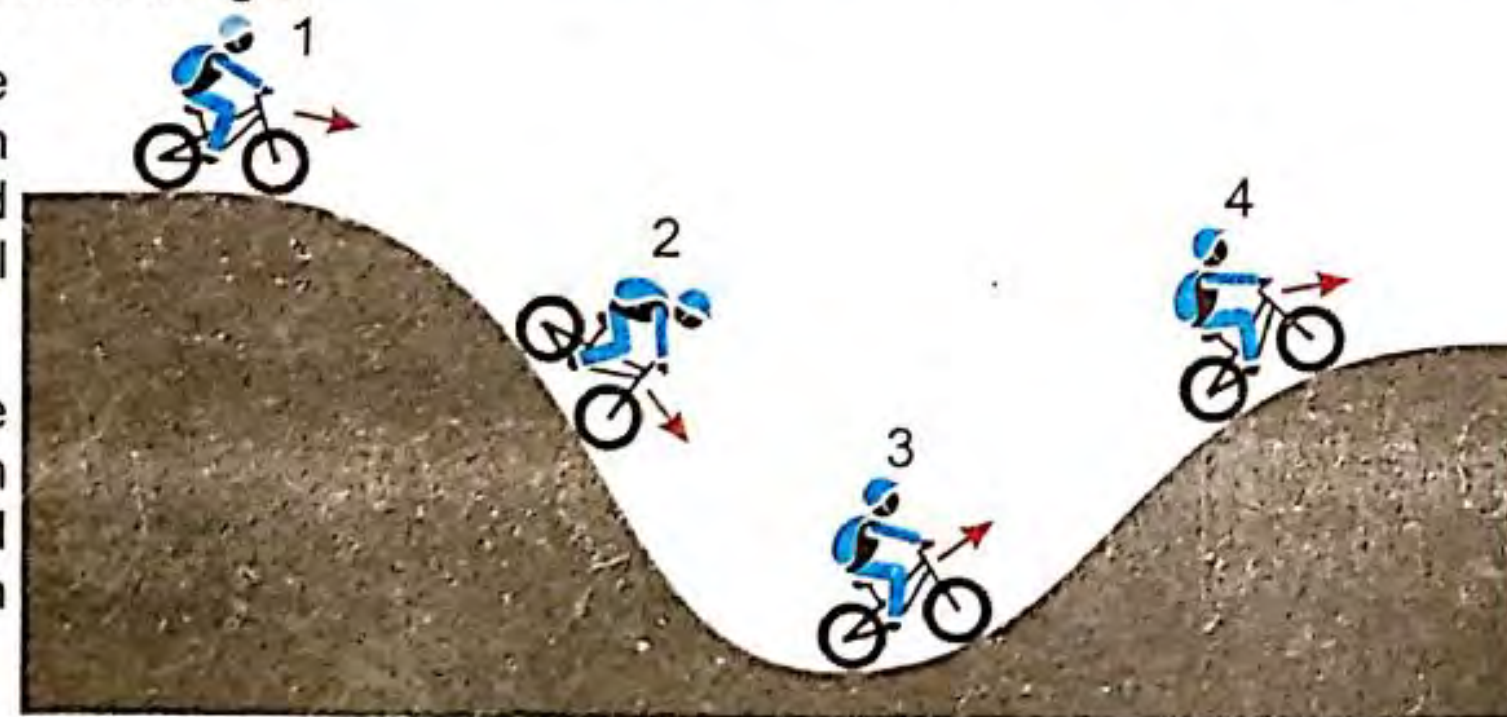
2. The diagram shows water flowing from a tank through a faucet and rotating a wheel.

- a. What kind of energy does the water have when it is in the tank?
- b. What kind of energy does the water have just before it hits the wheel?
- c. Suggest one change to the system that will make the wheel rotate faster.



3. A biker is going from rest at position 1. The diagram shows the biker in four positions as s/he moves along a track from left to right.

- a. In which position does the biker have minimum kinetic energy and maximum gravitational potential energy? Why?
- b. In which position does the biker have minimum gravitational potential energy and maximum kinetic energy? Why?



F. Project work

Make a poster of comparison of renewable and nonrenewable energy resources.

UNIT 9

ELECTRICITY

Learning outcomes:

At the end of this unit, students will be able to:

- Explain the phenomenon of static electricity in everyday life.
- Recognize electric current as the flow of charges
- Describe the simple circuit as path for flow of charges
- Differentiate between open and closed circuits
- Draw and interpret simple circuit diagrams` (using symbols)
- Describe the characteristics of series and parallel circuits
- Draw and construct a series and parallel circuit
- Identify the use of series and parallel electric circuits in daily life
- Investigate the factors that affect the brightness of bulbs
 - I. number of batteries
 - II. number of bulbs
 - III. types of wire
 - IV. length of wire
 - V. thickness of wire
- Assemble and operate a trip wire security alarm system using simple items. (STEAM)

UNIT 9

ELECTRICITY

9.1 STATIC ELECTRICITY

Look at the picture Figure 9.1: why does this thing happen? Is it magic? No, it's not magic; even you can do this activity with your pet cat because it's due to static electricity!

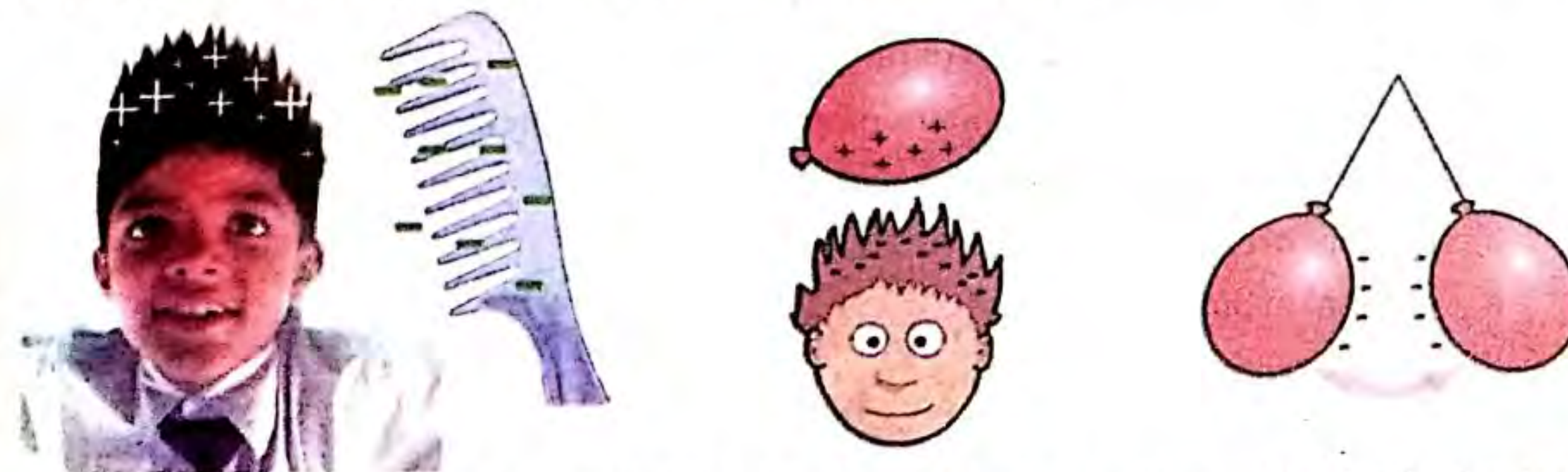
Cat hair stand up due to static electricity when you rub balloon on it.

Some objects can be charged by rubbing, like in winter season, when we sleep in the wool blanket; it gets charged by rubbing with our body and after some time when we touch the blanket it gives tiny sparks. Objects acquire charges when they are rubbed

with any other object. For example, when you use a plastic comb in your hair it becomes negatively charged while the charges on your hair are positive. Your hair repel each other as they have the same charge. Rubbing two bodies together cannot same charges on both bodies. On rubbing, bodies become charged as electrons transfer from one body to another. Electrons has some mass(although negligible). So with transfer of charge, some mass is also transferred. Therefore, mass of each body changes slightly. Since mass is transferred from one body to another, it is not lost anywhere else, So total mass remains same.



Figure 9.1 Effect of static electricity on cat hair



Using plastic comb on dry hair create negative charge on comb and positive charge on hair

Rubbing balloon on hair create positive charges on balloon and negative charges on hair, so balloon attracts hair

Two bodies having same charges, repel each other

Figure 9.2 Effect of static electricity

Teaching Point: To help students understand the properties of static electricity, rub a balloon on your hair or a wool blanket or sweater, and watch how it sticks to the wall for a few moments.

9.2 TYPES OF CHARGE

There are two types of charges; Positive charge and Negative charge. The similar/like charges repel each other. Opposite/unlike charges attract each other.

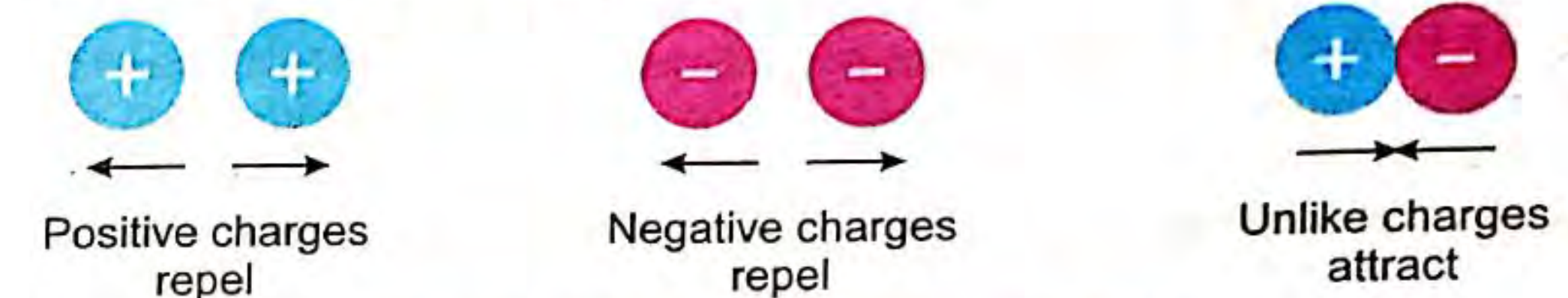
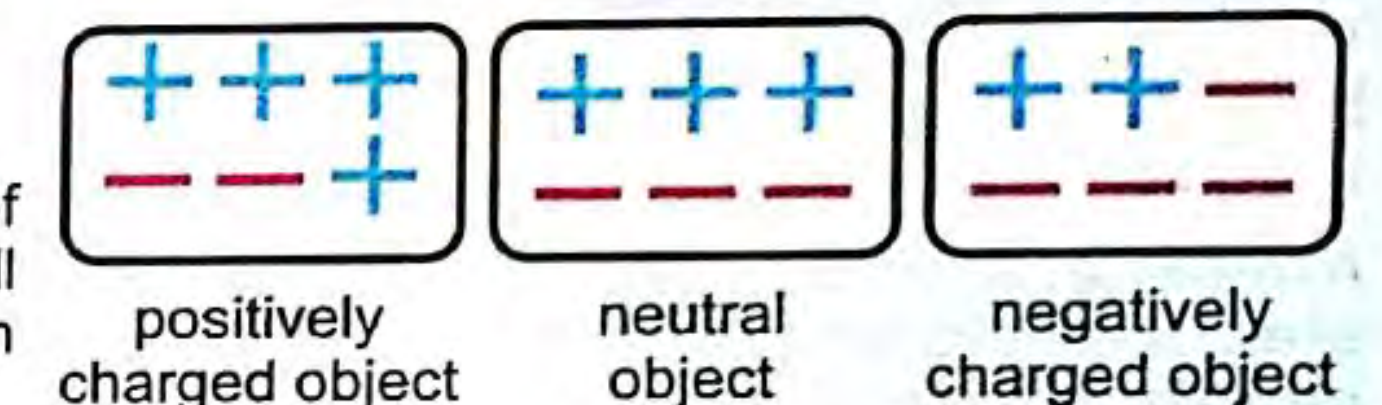


Figure 9.3 Interaction between charges

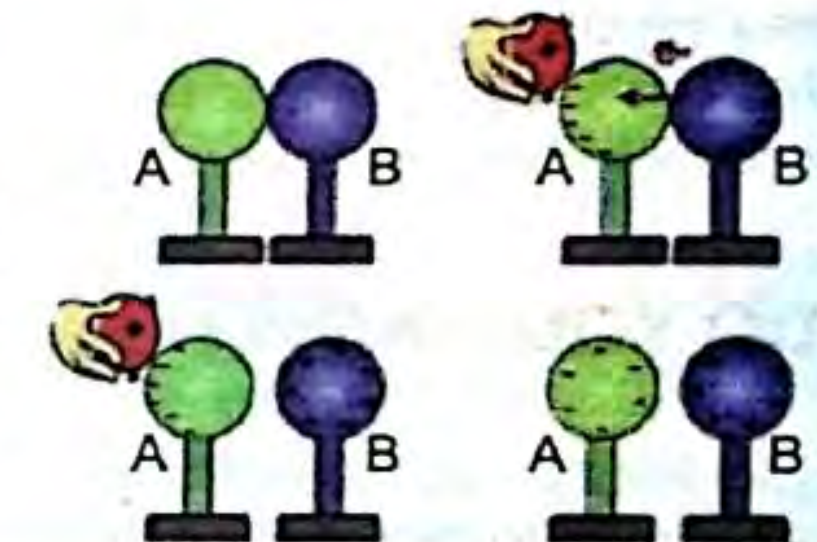
DO YOU KNOW?

If a body contains equal number of positive and negative charges, then all charges will cancel the effect of each other and the body becomes neutral.



INFORMATION

Electrostatic induction is a method to create or generate static electricity in a material by bringing an electrically charged object near it. This causes the electrical charges to be redistributed in the material, resulting in one side having an excess of either positive or negative charges.



Activity 9.1 Demonstration of Static electricity

Separate salt and pepper with a "magic" spoon



- Take a plastic spoon.
- Rub it on a blanket of wool or fleece for 10 seconds.
- Hold it on a small pile of salt and pepper.
- Pepper will jump and stick to the bottom of spoon.

This is because of electrostatic induction. Pepper is lighter than salt, which makes it quicker to jump to the electrically charged plastic spoon, it is practical demonstration of static electricity.

UNIT 9

ELECTRICITY

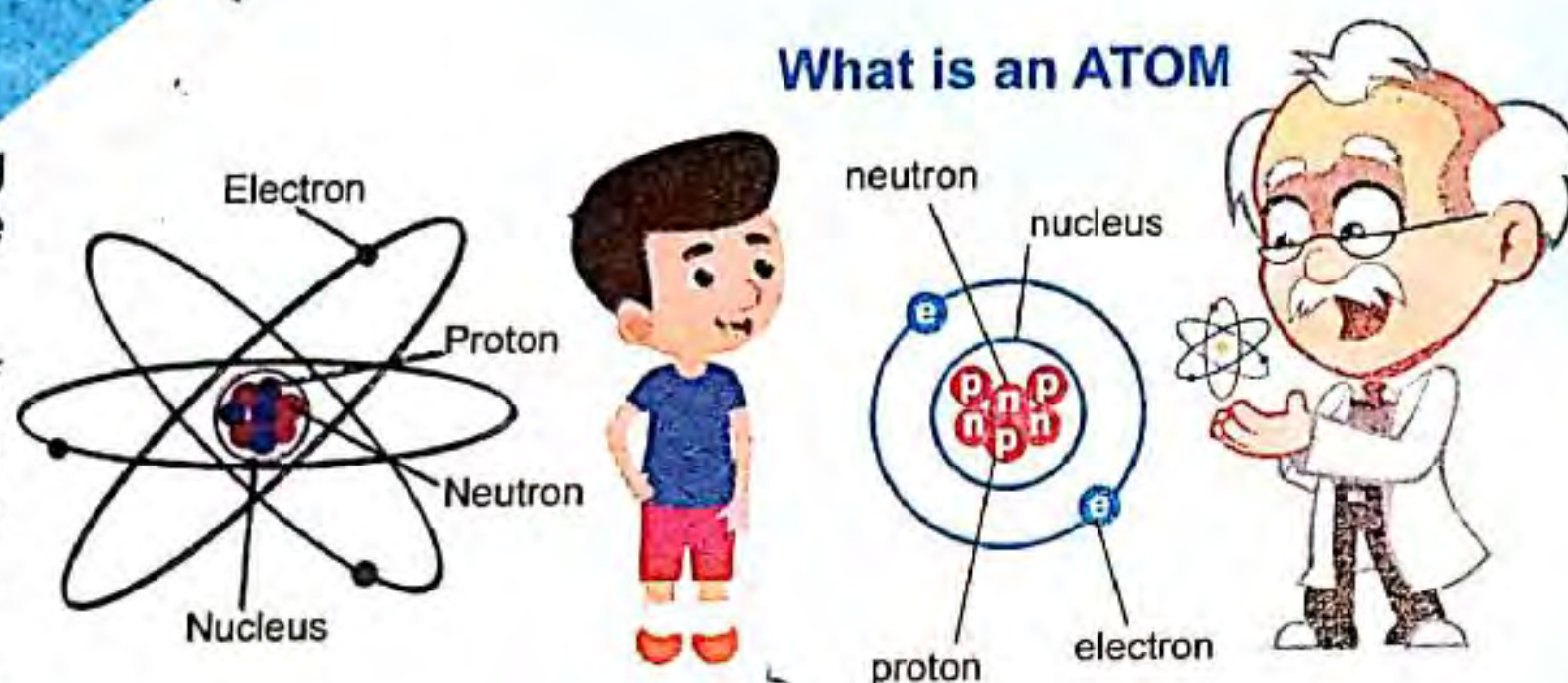
9.3 ELECTRICITY

Electricity is a form of energy. Many things around us make use of electricity to work. Electricity can build up in one place or flow from one place to another. When electricity stays in one place it is known as static electricity; electricity that moves from one place to another is called current electricity. Current electricity is the flow of negative charges are called electrons.

DO YOU KNOW?

The atom is the basic building block for all matter in the universe.

Atoms are made up of electrons, protons and neutrons. Electrons are negatively charged particles, they revolve around nucleus. Neutron and Proton are present in side nucleus.



What is an ATOM

DO YOU KNOW?

Electricity can move through some materials better than others. The materials that allow electrons to move are called **conductors**, while those materials which do not allow flow of electrons are called **insulators**.



INSULATORS

CONDUCTORS

9.4 ELECTRIC CURRENT

The continuous flow of electrons between two points is called electric current. When electrons move, they carry electrical energy from one place to another. Electricity can be stored in a cell. The direction of flow of electrons is from negative terminal to the positive terminal of a cell.

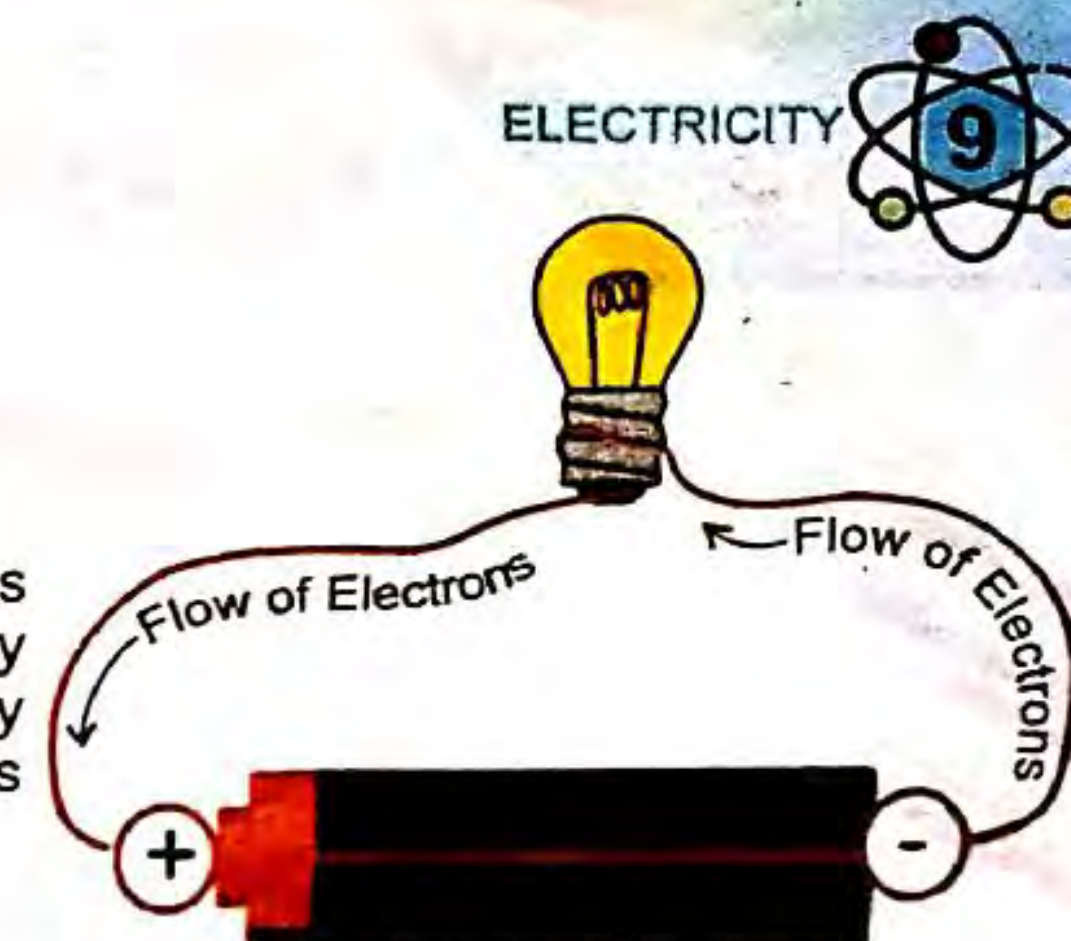
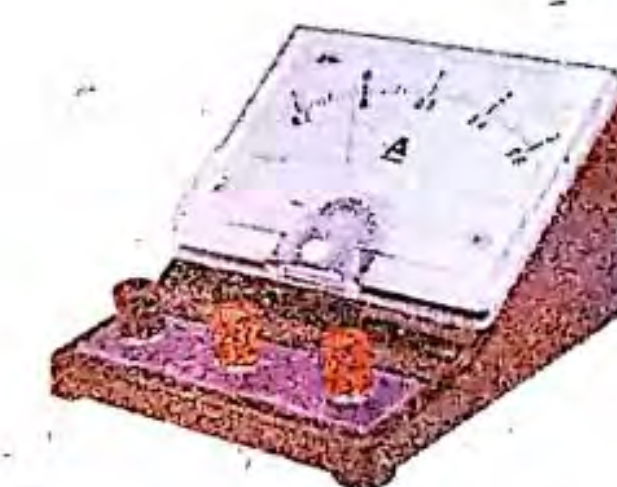


Figure 9.4 Electric Current

INFORMATION

An ammeter is a measuring instrument used to measure the flow of electric current in a circuit



DO YOU KNOW?

A cell is known as a single unit device that converts chemical energy to electrical energy, while a battery is a group of different cells.



9.5 ELECTRIC CIRCUIT

Electric circuit is a complete path around which electric current can flow. A circuit is made by linking electric components together. A simple circuit has following components.

- **Battery** or **Cell** pushes the charges through the circuit.
- **Wire** of conducting material that allows charges to flow through the electric circuit.
- **Bulb** is a device which produces light from electricity.
- **Switch** is used to connect or disconnect circuit.

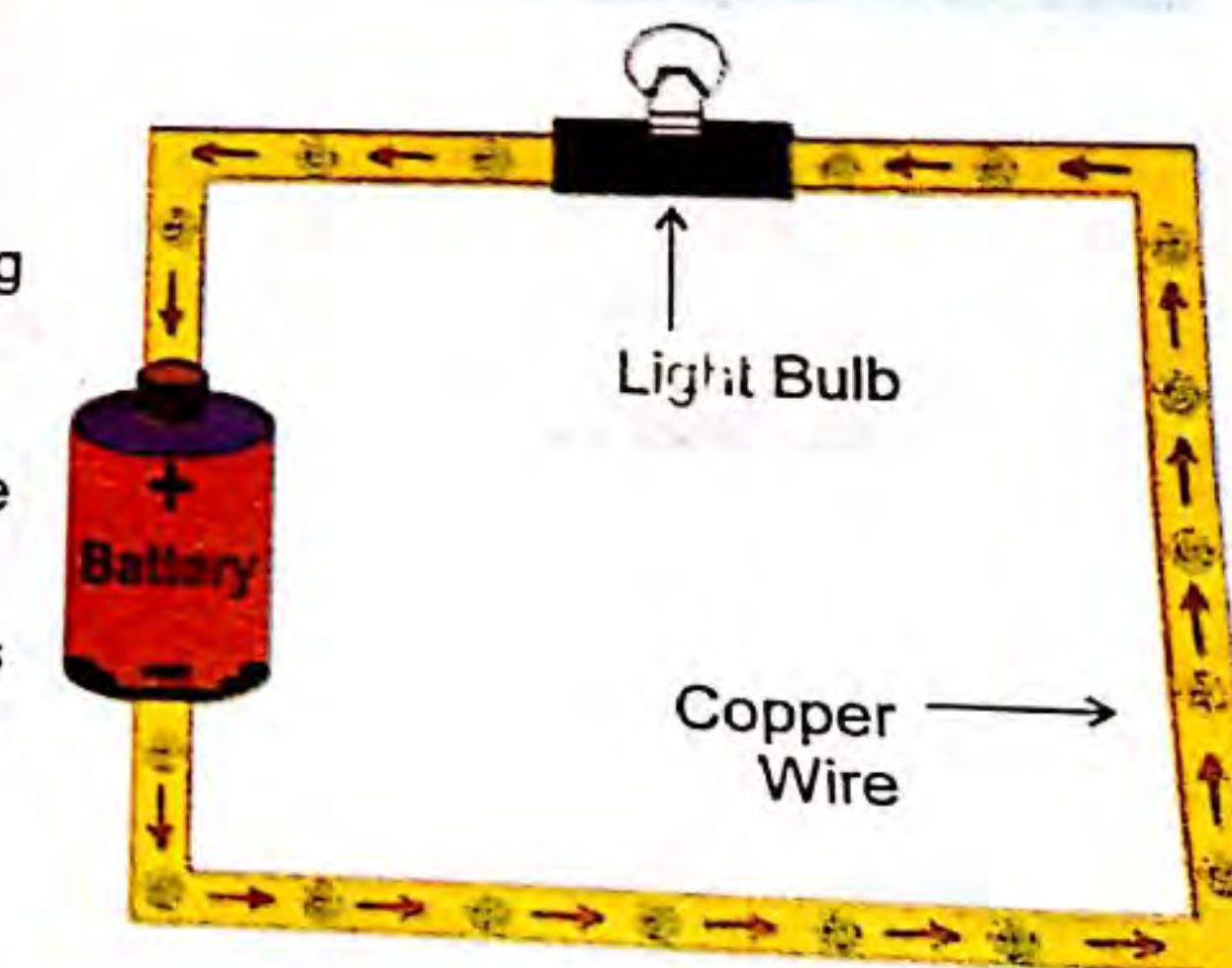


Figure 9.5 Electric Circuit

UNIT 9

ELECTRICITY



Wire is conducting material. It allows charges to flow through the electric circuit.

Bulb is a device which produces light from electricity.

A switch is an electrical component that can disconnect or connect the conducting path in an electrical circuit.

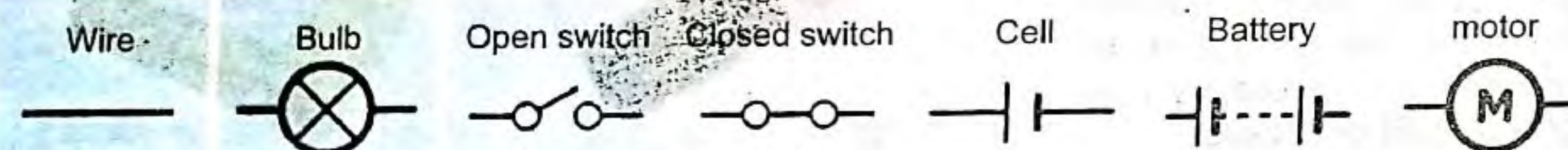
A battery OR Cell is a device that can make electricity, with the reaction of certain chemicals.

An electric motor changes electrical energy into mechanical movement.

Figure 9.6 Components of electric circuit

9.6 ELECTRIC SYMBOLS

We use electric symbols to draw diagrams of electric circuits, with straight lines to show the wires. Following are the commonly used electric symbols.



DO YOU KNOW?



Caution:

Your body is a conductor of electricity. Therefore, be careful when you handle an electrical appliance.



ELECTRICITY IS NOT FUN

9.7 OPEN AND CLOSED CIRCUITS

The basic difference between closed and open circuits is;

- Closed circuit means, electrons can move through the complete circuit.
- Open circuit means, electrons cannot travel through a circuit because the path is broken.

Closed circuit



Open circuit

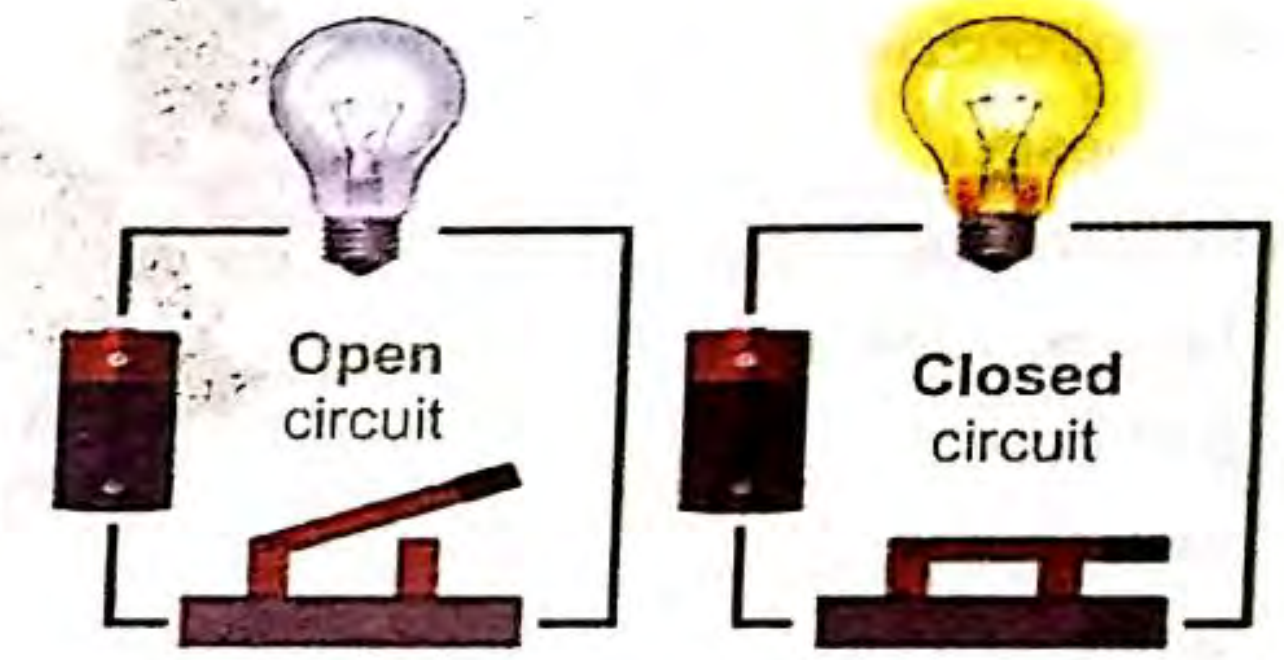


Figure 9.7 Open and closed circuit

Figure 9.8 Use of Switch

Activity 9.2 The flow of charges in a closed circuit

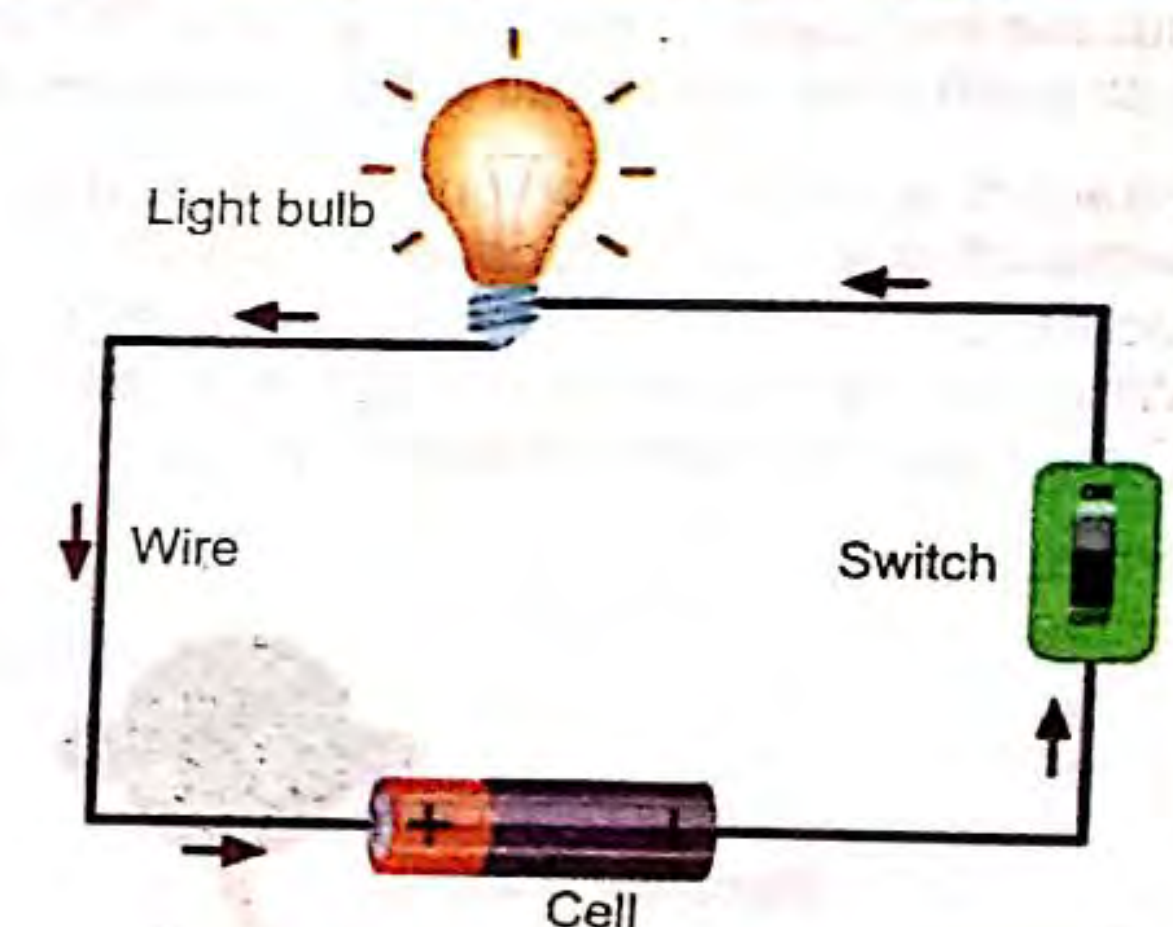
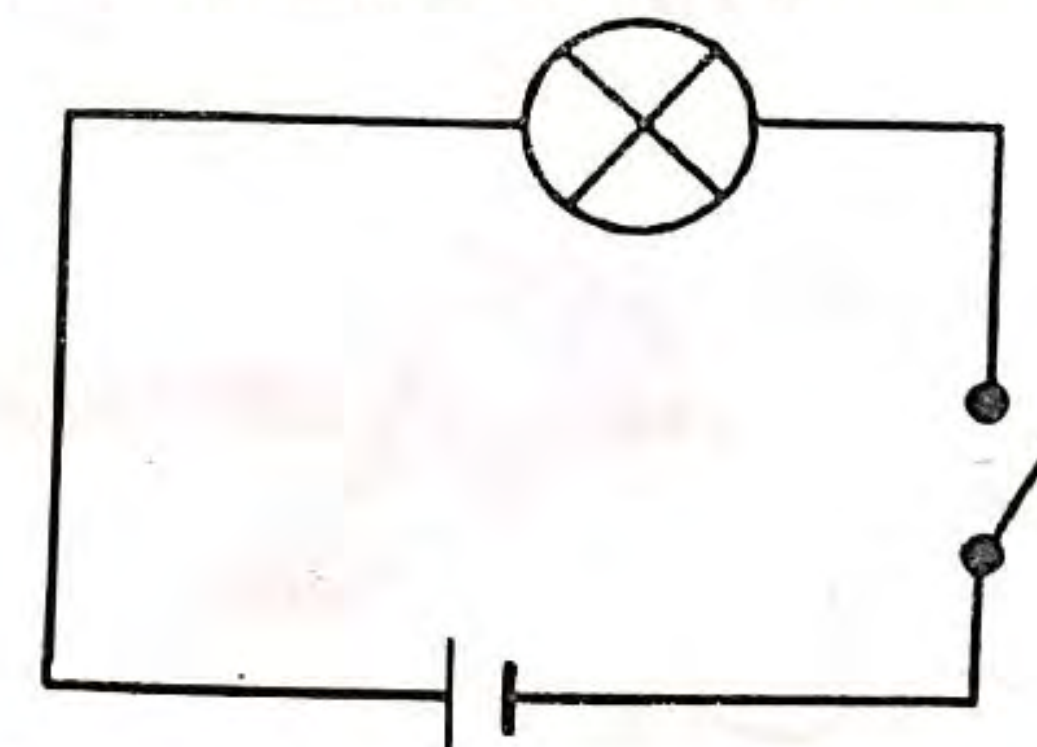
Make your own electric circuit:

Materials:

- Light bulb
- Cell
- Switch
- Connecting wires

Procedure:

Use the items provided to make an electric circuit as shown in diagram. Following circuit diagram is showing open circuit. Draw a circuit diagram to show closed circuit by using electric symbols.



UNIT 9

ELECTRICITY

ELECTRICITY



Activity 9.3 Trip wire security alarm

Materials:

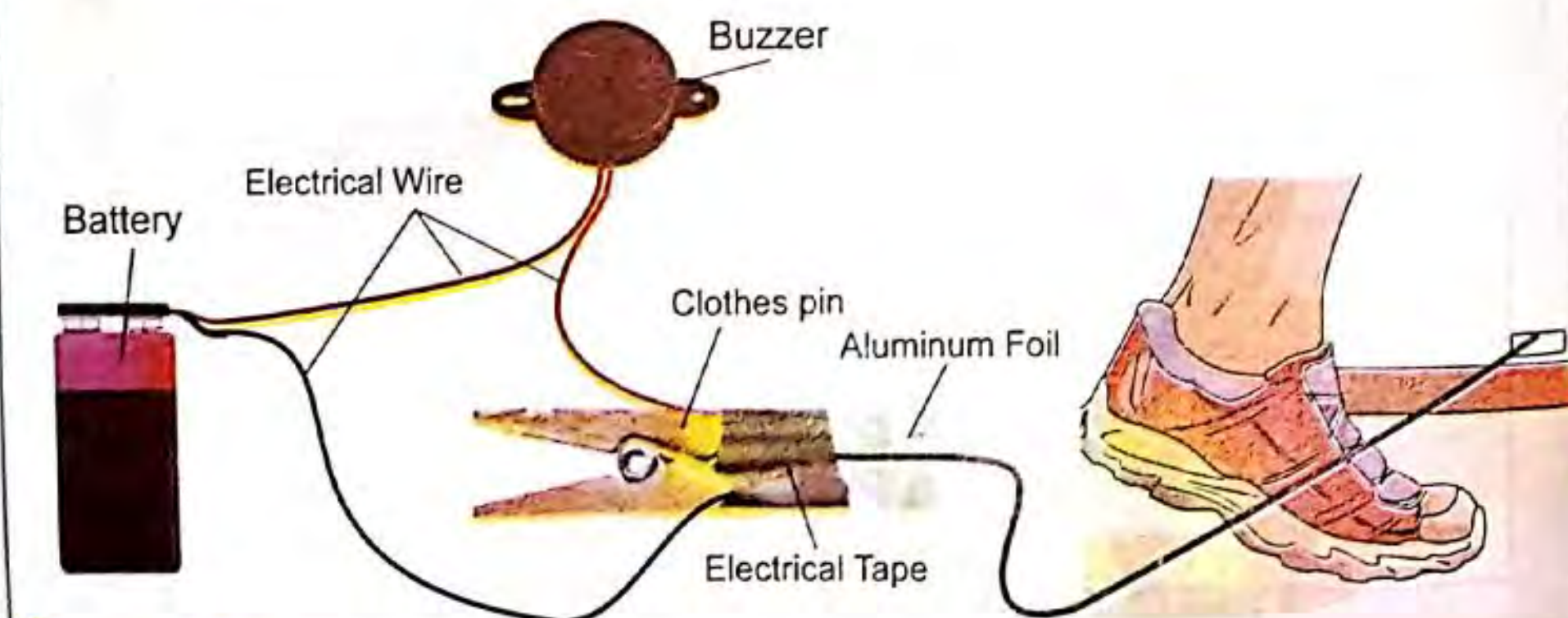
- A small buzzer
- Clothespin
- Electric wire
- Aluminum foil
- Battery
- Electric tape
- String



Procedure:

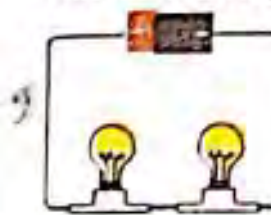
Wrap aluminum foil on the gripping ends of clothespin. Attach two wires with this aluminum foil using electric tape. Attach buzzer with one wire and a battery with other wire. Connect buzzer and battery with another wire. When the gripping ends of the clothespin connect with each other, the circuit will complete and buzzer will produce sound.

Attach this clothespin on one side wall of the door. Take a piece of a string according to the width of the door. Place one end of the string between aluminum covered ends of clothespin. Attach other end of the string on other side of door with the help of tape. Whenever someone will try to enter the door, this string will be pulled out of clothespin. Circuit will complete and buzzer will start producing sound.



9.1 SERIES AND PARALLEL CIRCUITS

Circuit Drawing



Circuit Diagram

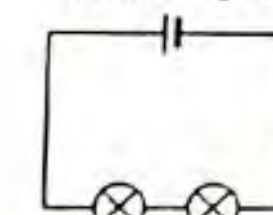


Fig. 9.10 Series Circuit



Fig. 9.10 Lights (a) series circuit

SERIES CIRCUIT

There is only one path through which charges can flow. If the circuit is interrupted at any point in the path, no current can flow through the circuit and no device in the circuit will work. If more lights are added in this circuit, they will become dim. This circuit is simple and less expensive to make. An example of a series circuit is a string of fairy lights. If any one of the bulbs is missing or burned out, no current will flow and none of the lights will go on. Refrigerator and freezer also use series circuits.

PARALLEL CIRCUIT

There are more than one path through which charges can flow. If the circuit is interrupted in one of the paths, current can still flow through the other path.

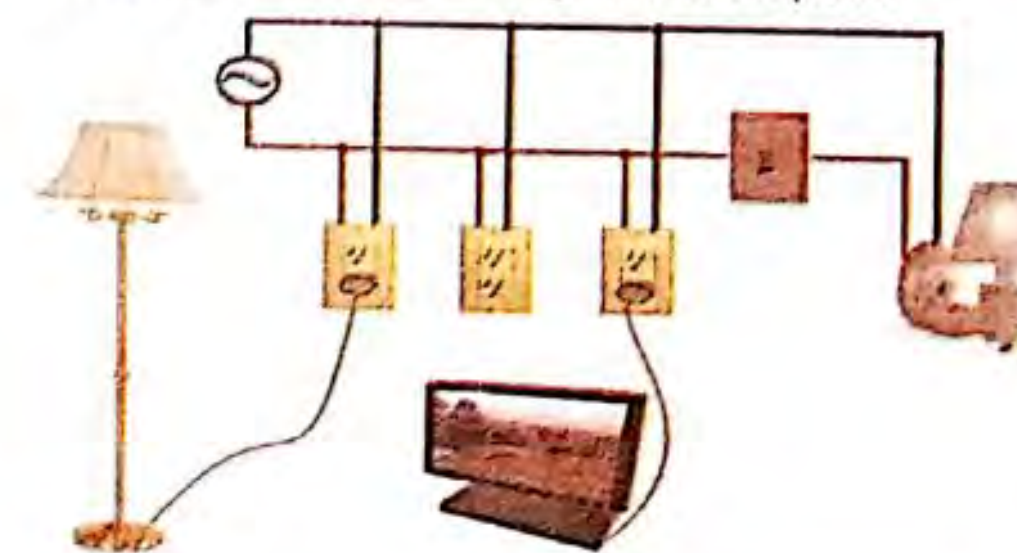
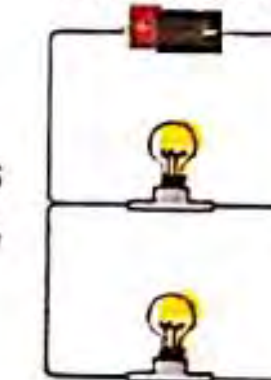


Fig. 9.11 Parallel circuit in home

Circuit Drawing



Circuit Diagram

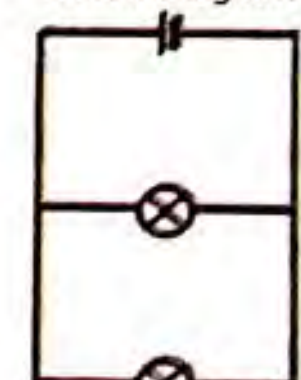
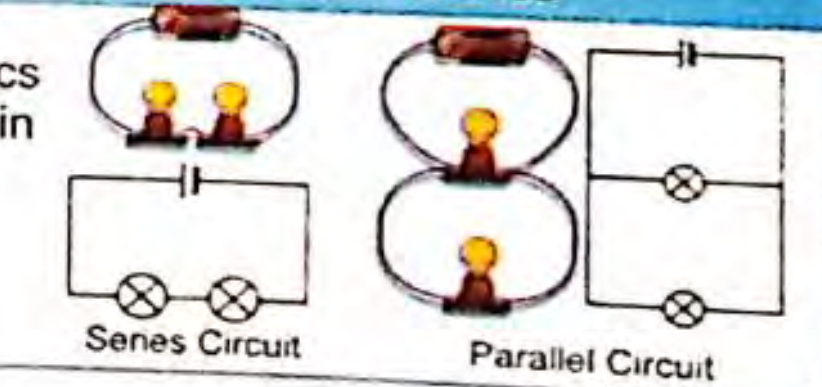


Figure 9.11 Parallel circuit

All paths receive same amount of current. If more lights are added in this circuit, they do not become dim. The electrical wiring to the power points in every household is in the form of parallel circuits. The computer hardware also uses parallel circuits.

Activity 9.4 Practical concept of series and parallel circuits

Set up the following circuits and test the characteristics of series and parallel circuits. Also label the symbols in both circuits.



Series Circuit

Parallel Circuit

UNIT 9

ELECTRICITY

ELECTRICITY



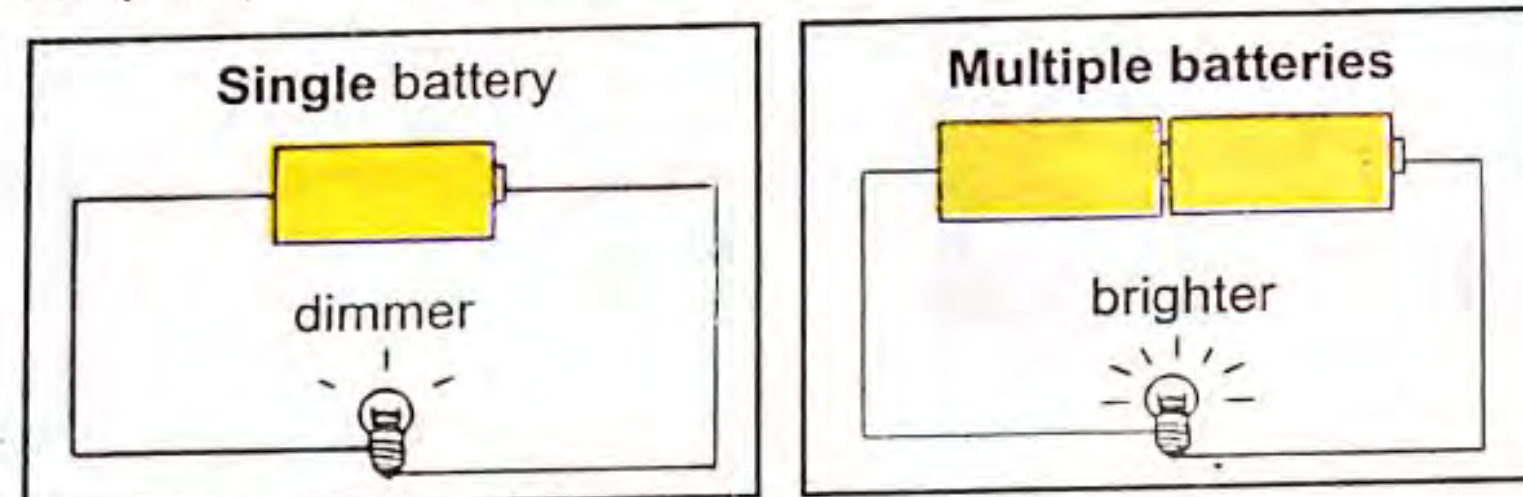
Activity 9.5 Testing of the brightness of bulbs

To Investigate the factors that affect the brightness of bulbs or speed of motors

- a. Number of batteries b. Number of Bulbs c. Type of wire
d. Length of wire e. Thickness of wire

Materials

- i. Batteries ii. Bulbs iii. Copper wire (thin)
iv. Copper wire (thick) v. Aluminium wire (thin)



Brightness of bulb in a circuit can be affected by many factors. Make six circuits according to the given table. As this is activity, so it will show that changing the nature of the wire, will change the conductivity or brightness of bulbs. Use first circuit as standard and compare the brightness of bulb in all circuits with the first one. Fill the last column with stars to show brightness.

Circuit set up	Number of Batteries	Number of Bulbs	Type of wire	Length of wire	Thickness of wire	Brightness Dim ☆ Bright ☆☆ V. Bright ☆☆☆
I	One	One	Copper	20 cm	Thin	
II	Two	One	Copper	20 cm	Thin	
III	One	Two	Copper	20 cm	Thin	
IV	One	One	Aluminium	20 cm	Thin	
V	One	One	Copper	40 cm	Thin	
VI	One	One	Copper	20 cm	Thick	

Which set up gives maximum brightness of bulb? _____

Which set up gives minimum brightness of bulb? _____

Which type of wire gives more brightness in this circuit?

Which thickness of wire gives more brightness in this circuit?



Try it out

Lemons can be used to light up a lightbulb or even power a digital clock.

Key Points

- When charges are in state of rest, it is called static electricity
- There are two types of charges. 1. Positive charge 2. Negative charge
- Like charges always repel each other
- Unlike charges always attract each other
- When charges are in state of motion, it is called current electricity
- Electricity is a form of energy
- Electricity is used daily in our electrical devices and appliances
- Cell is a device which converts chemical energy to electrical energy
- There are two terminals of cell or battery; a positive terminal and a negative terminal
- Wire is a conducting way in an electric circuit, through which charges flow
- An electric wire is a conducting path in an electric circuit, through which current flows
- Bulb is a device which produces light from electricity
- Electric motor changes electrical energy into mechanical energy
- When switch is open then, the circuit is open and the current does not flow
- Electrical devices can be connected by two ways; Series and Parallel combination
- In series circuits there is only one path through which charges can flow
- In parallel combination there is more than one path through which charges can flow



END OF UNIT ASSESSMENT

A. MCQs (Choose the correct option)

1. Cell is a device which converts
- a. Chemical energy into electrical energy b. Electrical energy into light energy
c. Electrical energy into magnetic energy d. Light energy into electrical energy

UNIT 9

ELECTRICITY

ELECTRICITY



2. A battery is
 - a. A single cell
 - b. A combination of cells in which cells are joined (+) to (-)
 - c. A combination of cells in which cells are joined (+) to (+)
 - d. Unlimited supply of electrical energy
3. A substance that allows electricity to pass through it is called
 - a. A conductor
 - b. An insulator
 - c. Semiconductor
 - d. Superconductor
4. All of the following are examples of conductors except:
 - a. Tap water
 - b. Salt solution
 - c. Metal wire
 - d. Plastic
5. Choose correct direction of current.

a.

b.

c.

d.
6. If a body is negatively charged, then it has:
 - a. Excess of electrons
 - b. Excess of protons
 - c. Deficiency of electrons
 - d. Deficiency of neutrons
7. Adding more bulbs to a circuit with one battery would:
 - a. Make them brighter
 - b. Make them sharper
 - c. Make them dimmer
 - d. Make them colorless
8. Cell is a device which converts:
 - a. Chemical energy into electrical energy
 - b. Electrical energy into light energy
 - c. Electrical energy into magnetic energy
 - d. Chemical energy into light energy
9. An electric device which easily closes or opens an electric circuit is:
 - a. Filament
 - b. Electric bulb
 - c. Electric switch
 - d. Electric cell

10. Bulb glows only in:
 - a. Closed circuit
 - b. Open circuit
 - c. In both circuits
 - d. Open circuit if bulb is not fused

B. Match the following items given in Column A with that in Column B:

Column A	Column B
(a) Cell	(i) Allows electricity to pass through it
(b) Battery	(ii) Either breaks or completes a circuit
(c) Conductor	(iii) Converts electricity into light
(d) Insulator	(iv) A combination of cells
(e) Switch	(v) A device that produces electricity
(f) Bulb	(vi) Is a path of electricity
(g) Circuit	(vii) Does not allow electricity to pass

C. Short questions

1. What is static electricity?
2. What is current electricity?
3. How many types of charges are there?
4. Which electrical appliances do we use daily?
5. Why does a cell stop producing electricity after some time?
6. Explain how the bulb glows in circuit when it is connected to an electric cell?
7. What is the purpose of using an electric switch?
8. What is electric circuit?
9. What electrical devices will be used in electric circuit to glow a bulb?
10. Define a cell.
11. What is open electric circuit?
12. What is closed electric circuit?
13. Draw circuit diagram for series combination of three bulbs.
14. Draw circuit diagram for parallel combination of three bulbs.

UNIT 9

ELECTRICITY

ELECTRICITY

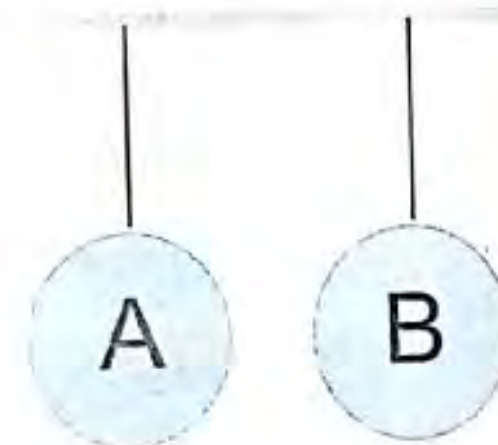


D. Long questions

1. Explain why it is not safe to go out with an umbrella when there is heavy rain, lightning or thunder.
2. How many types of charges are there? Also, discuss the characteristics of like and unlike charges.
3. What is an Electric circuit? Draw and discuss series and parallel combinations of the electric circuit.
4. Draw and discuss the components of an electric circuit for the flow of charges.

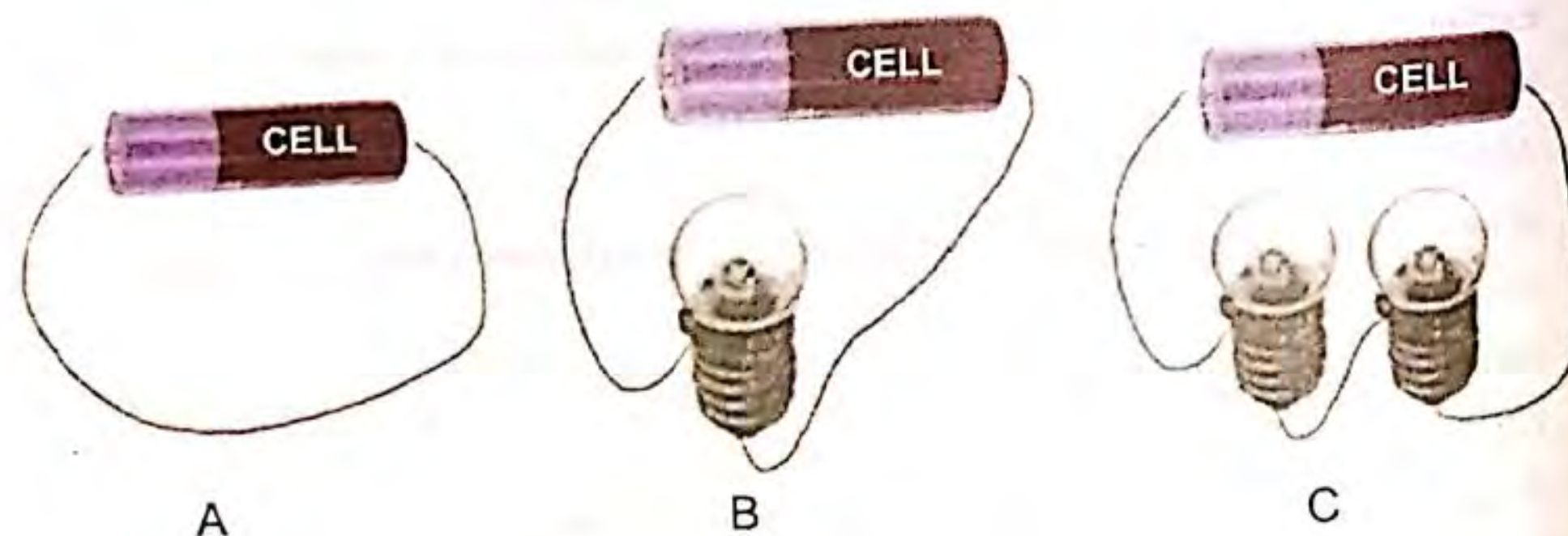
E. Structured response questions

1. Two plastic electrically charged spherical objects A and B are hung side by side. The given below table shows the charges given to each ball in two separate experiments. What will be the effect of these objects?

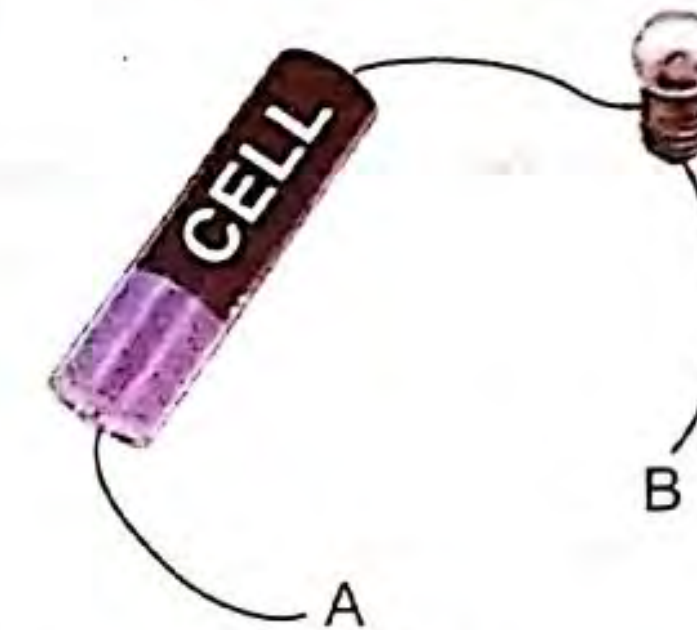


Experiment No.	CHARGE OF BALL A	CHARGE OF BALL B	ATTRACT/ REPEL
I	Positive	Negative	
II	Negative	Negative	

2. In which of the following circuits the cell will be used up rapidly? Explain.



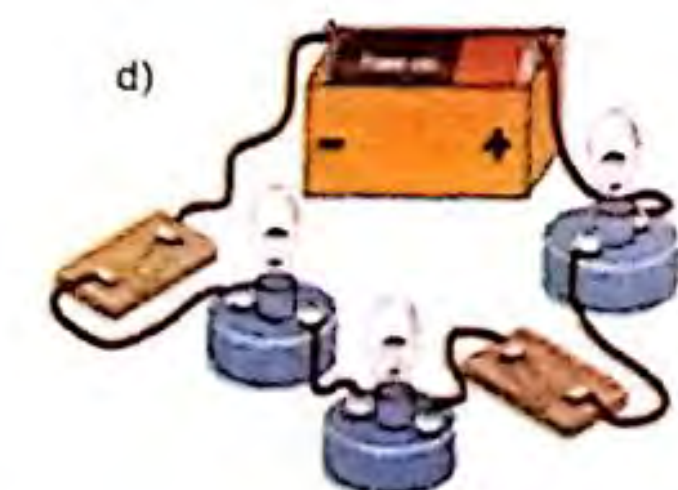
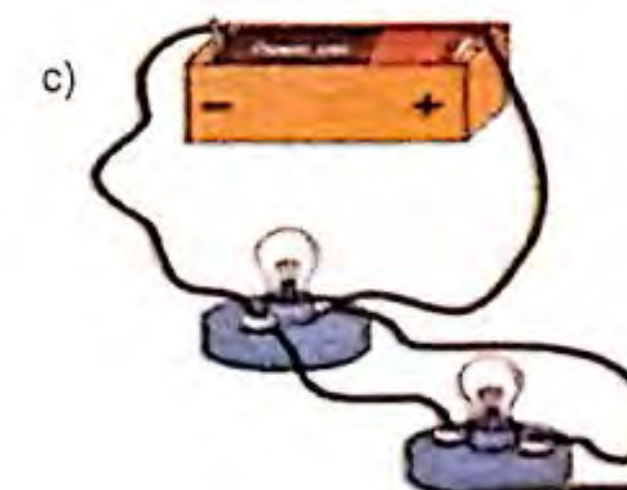
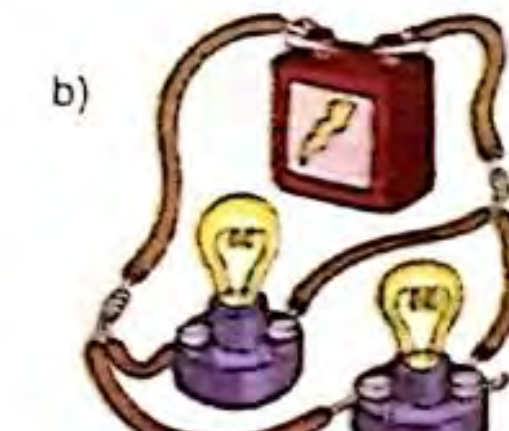
3. In the following arrangement, bulb will not glow if ends A and B are connected with



- a. A steel spoon b. A plastic clip c. A copper wire d. A silver spoon

Explain your answer with reason.

4. Examine each of the following given circuits. State whether it is in series or parallel. Explain.



UNIT 9

ELECTRICITY

5. Think of six activities that use electric current and also name the devices used to perform activity.

	Activity you perform	Device
Example:	Get light	Torch
	_____	_____
	_____	_____
	_____	_____
	_____	_____
	_____	_____
	_____	_____
	_____	_____

F. Project work

Run a campaign for saving electricity in your surroundings.

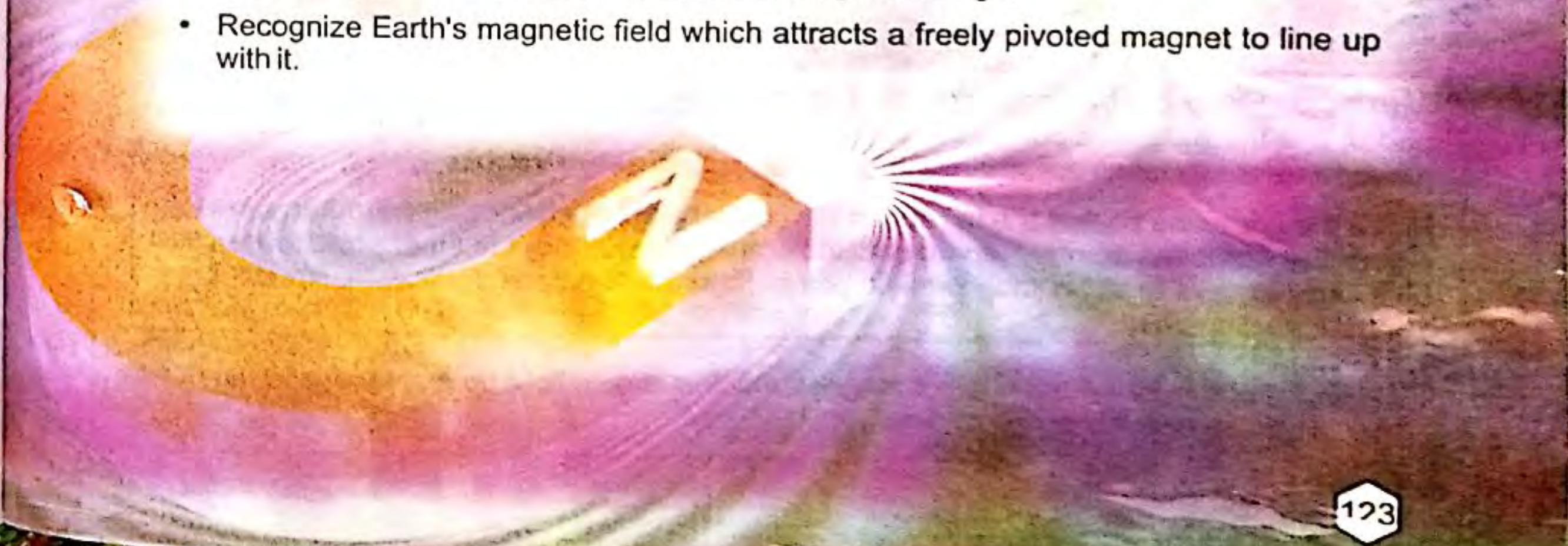
UNIT 10

MAGNETISM

Learning outcomes:

At the end of this unit, students will be able to:

- Recognize that electric current has a magnetic field around it using a magnetic compass
- Recognize that a freely moving magnet comes at rest pointing in a NORTH-SOUTH direction
- Describe how to magnetize a magnetic material
- Describe how to demagnetize a magnet
- Construct an electromagnet and identify its application in daily life
- Compare different types of magnet (Permanent, Temporary & Electromagnet)
- Recognize that there is a space around a magnet where effect of magnetic force can be observed
- Draw a magnetic field of a BAR MAGNET using iron fillings.
- Recognize Earth's magnetic field which attracts a freely pivoted magnet to line up with it.



UNIT 10

MAGNETISM



10.1 MAGNETIC FIELD

You learned about magnets and the properties of magnets in grade 5. A region around the magnet where a force acts on other magnets or magnetic materials is called magnetic field. Magnetic field lines are invisible but they can be displayed by using iron filings or magnetic compass. Place a paper on a bar magnet. Sprinkle iron filings on this paper. Iron filings will display the magnetic field in the form of magnetic field lines. Iron filings set themselves in a pattern because of magnetic field created by the magnet. Within a bar magnet, to a very good approximation, the magnetic field lines point from North to South (where N and S are the two respective ends of the bar magnet).

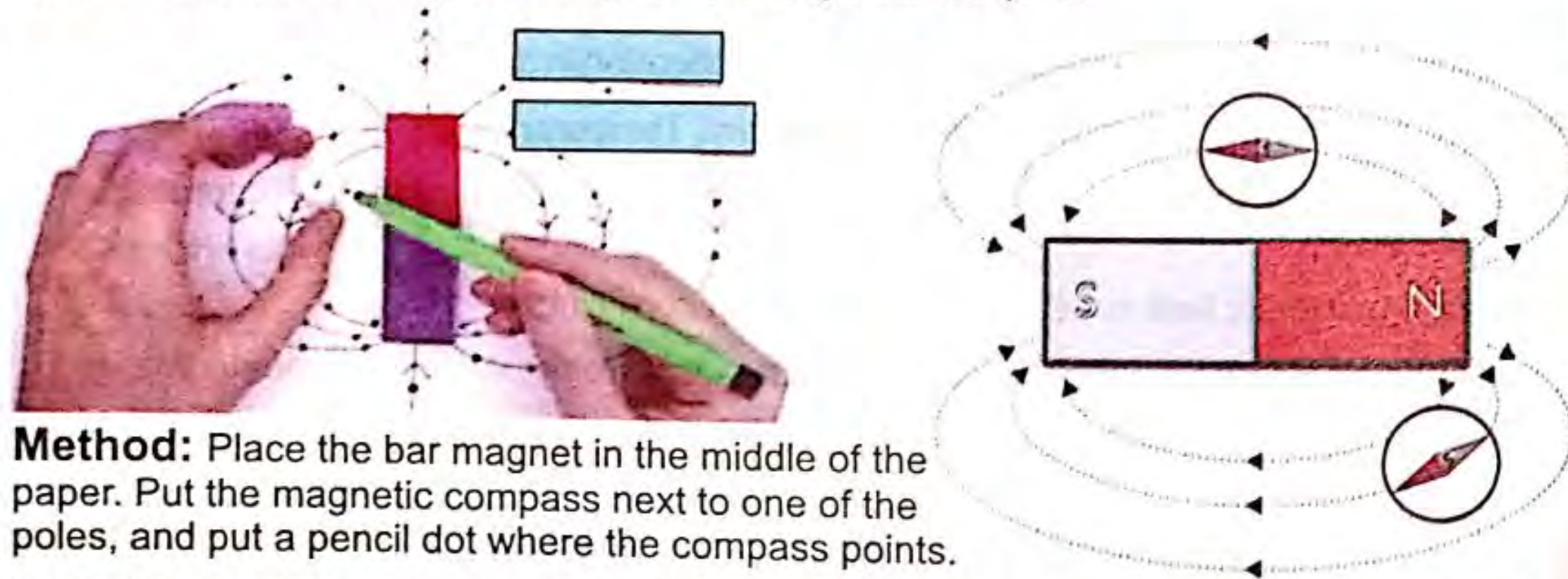
Magnetic lines of force always forms closed loops. The direction of magnetic field lines can be determined by using magnetic compass. These field lines seem to originate from the North pole (N) & end into the South pole (S) of a bar magnet outside the magnet and from South to North inside the magnet.



Figure 10.1 Magnetic field of a bar magnet

Activity 10.1: Formation of magnetic field

Plot the magnetic field lines of a bar magnet using a plotting compass. Magnetic field lines do not ever cross, they are continuous, and they go from North to South. The closer these lines are, the stronger the magnetic field it represents. Magnetic field lines can be plotted, and their direction can be determined by using a magnetic compass



Method: Place the bar magnet in the middle of the paper. Put the magnetic compass next to one of the poles, and put a pencil dot where the compass points.

Move the compass so that the tail end of the pointer aims at that dot. Again, put a pencil dot where the compass points. Repeat until the compass returns to the other pole. Join up the dots. Add arrows to show that the field points from the N pole to the S pole. Repeat from another starting point.

Teaching Point: For introduction of magnet; teacher should hold up a magnet and tell students' group about magnet's poles.

10.2 EARTH'S MAGNETIC FIELD

Earth acts as a giant magnet behaving as if it has a powerful bar magnet at its center. Just like an ordinary bar magnet, the Earth has two poles North and South. The magnetic poles of Earth match with the geographical poles of the earth. All the magnets align with the Earth's magnetic poles whenever they are freely suspended. You used this property of magnets to make magnetic compass in grade 5.

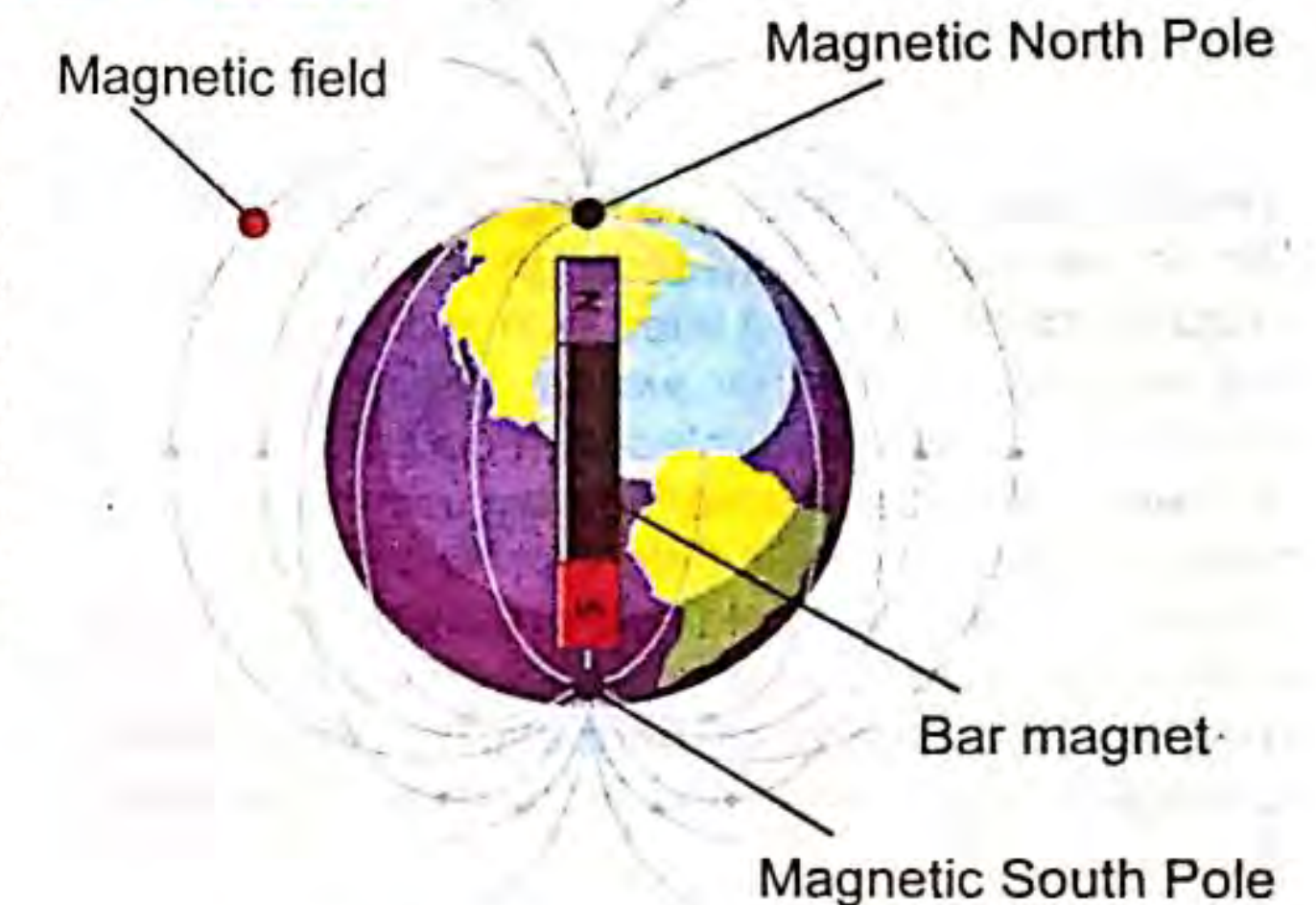


Figure 10.2 Earth's magnetic field

Activity 10.2 North and South poles of a bar magnet

Materials:

- Bar magnet
- Float
- Bowl of water
- Magnetic compass

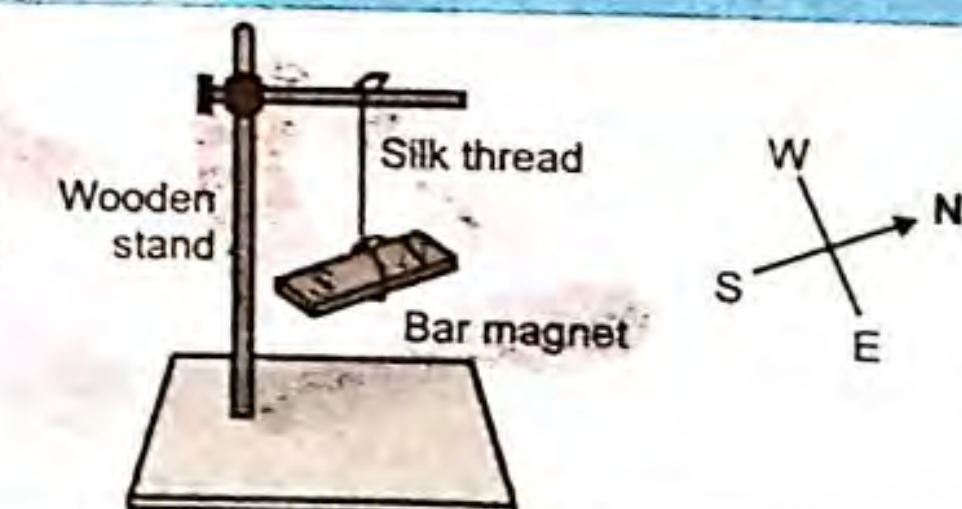


Procedure:

Find the North direction by using magnetic compass. Take a bowl of water. Place a piece of float on water. Place the bar magnet on float. Let it settle. The bar magnet turns the float and align with earth's North pole.

Activity 10.3 Natural alignment of magnetic poles

Suspend a bar magnet with a thread from a wooden stand. The magnet swings for some time and after that it comes to rest in a specific North-South direction. If we disturb the magnet a little, the magnet again comes to rest in the North-South direction.



UNIT 10

MAGNETISM

10.3 MAGNETIC FIELD AROUND A CONDUCTOR

Electric current produces a magnetic field around it. When we pass current through a straight wire, a circular magnetic field lines with a common centre the wire itself. In other words, the magnetic field lines are concentric circles with common centre of the wire. This can be verified by using a compass needle. This magnetic field can be visualized as a display of circular field lines enveloping a wire, which is similar to magnetic field lines around bar magnet. The strength of magnetic field increases on getting closer to wire and increases if the current increases.

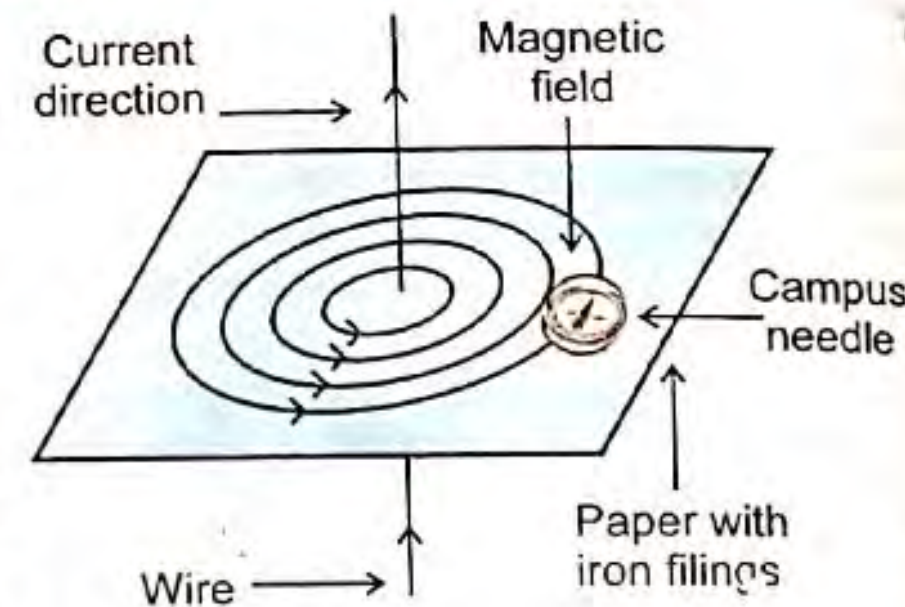
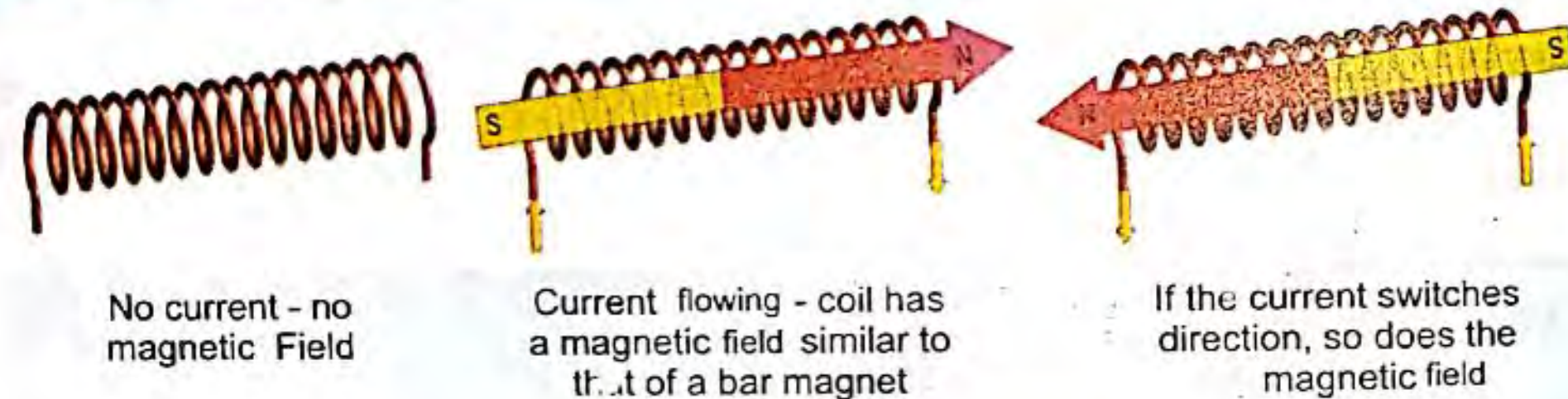


Figure 10.3 Magnetic field around a conductor

DO YOU KNOW?



10.2 a. Current and Magnetic field

10.4 TYPES OF MAGNET

Permanent Magnet

A permanent magnet retains its magnetic properties in the absence of any other magnet or current. It produces its own magnetic field. Permanent magnets are made from special alloys such as iron, nickel and cobalt.



Figure 10.4 Different shapes of permanent magnets

Temporary Magnet

Temporary magnets are those that simply act like magnets when they are within a strong magnetic field. They lose their magnetic properties in the absence of any other magnet or current. These are made of soft iron.

Electromagnet

An electromagnet is a type of magnet in which the magnetic field is produced by an electric current. The magnetic field disappears when the current is turned off.

When current passes through the coil around the steel nail, a magnetic field will be developed around it. So it will start to behave like electromagnet. When flow of charges through the coil stops then the developed magnetic field around it will also be vanished. It means that this magnet will behave like a temporary magnet.

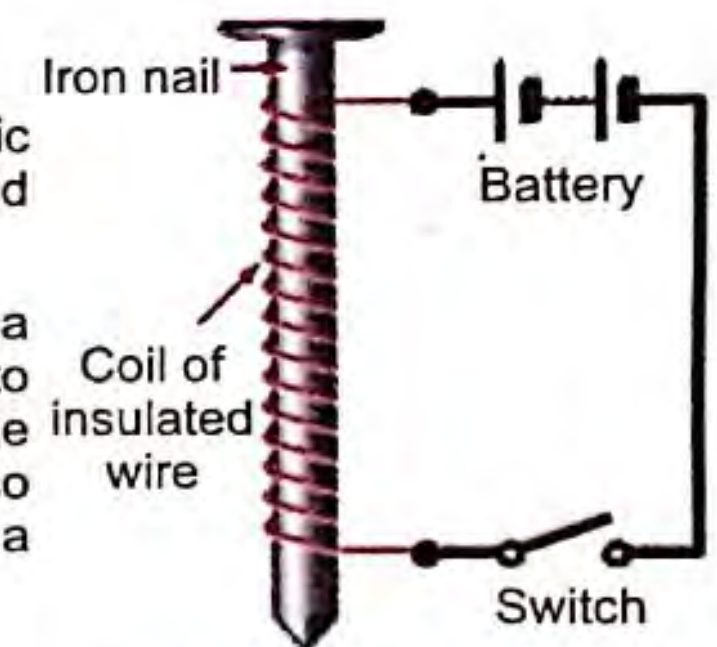


Figure 10.5 Electromagnet

10.5 APPLICATIONS OF ELECTROMAGNET

Electromagnetism serves as a basic principle of working for many of the home appliances in household applications. These applications include electric motors, generators, door bells, speakers etc.

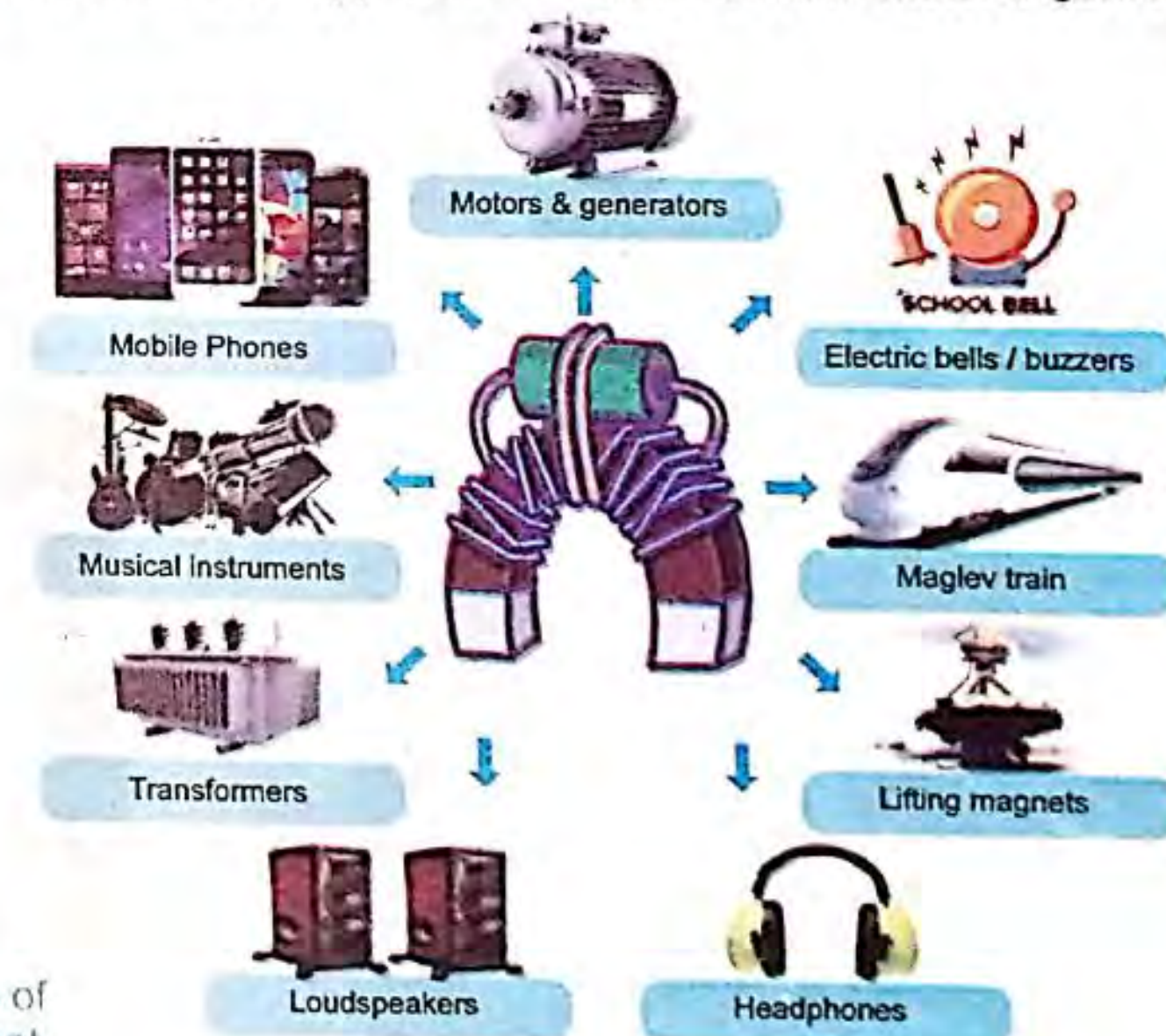


Figure 10.6 Applications of electromagnet

UNIT 10

MAGNETISM

10.6 HOW TO MAGNETIZE A MAGNETIC MATERIAL?

Temporary magnets do not have their own magnetic field. There are several methods to magnetize magnetic materials. The most commonly used are Single touch or double touch method and electrical method.

When a magnet is rubbed along the magnetic material like needle or iron piece from one end to another end lifted vertically upwards such method is called **single touch method of magnetization**. While when opposite poles of two magnets are placed next to each other at the center of the magnetic substance and rubbed in opposite directions, such method is called **Double Touch method of magnetization**.

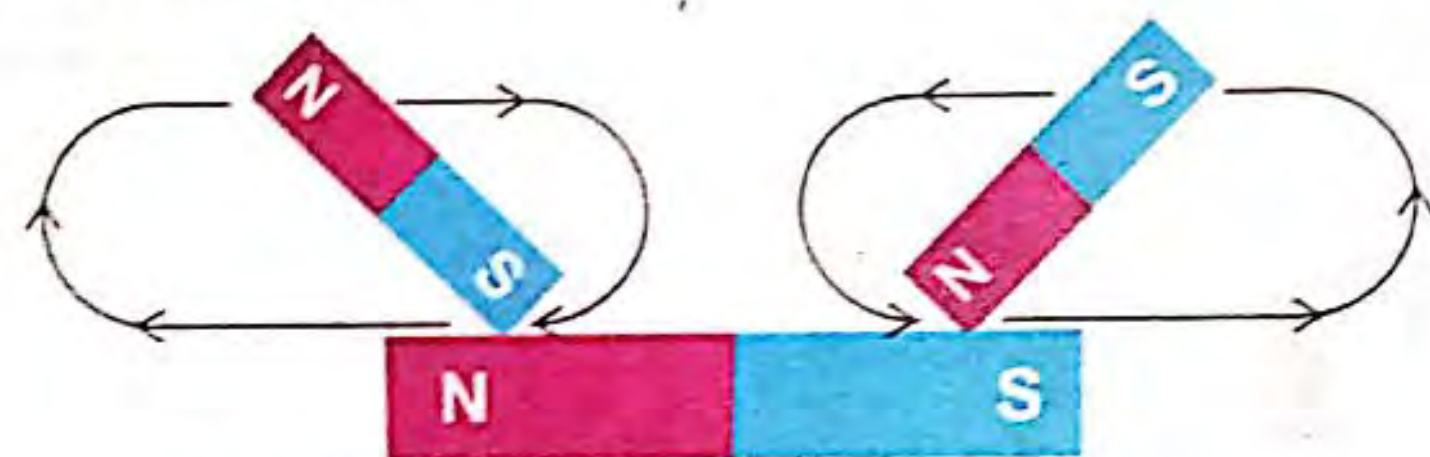


Figure 10.8 Double touch method of magnetization

In electrical method a bar of steel can be magnetized by placing it in a coil of wire. When current from batteries will pass through the coil, bar will be magnetized.

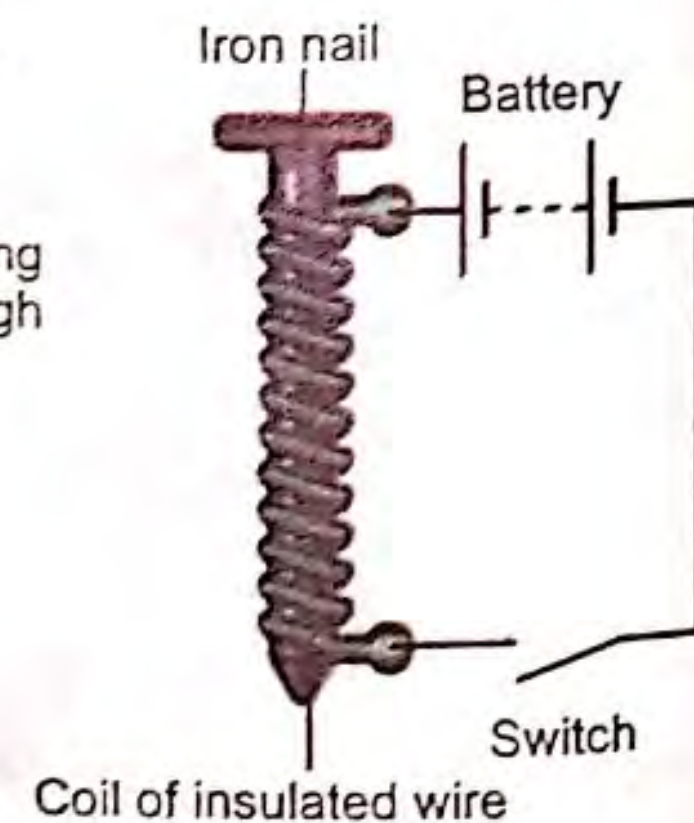


Figure 10.9 Electrical method of magnetization

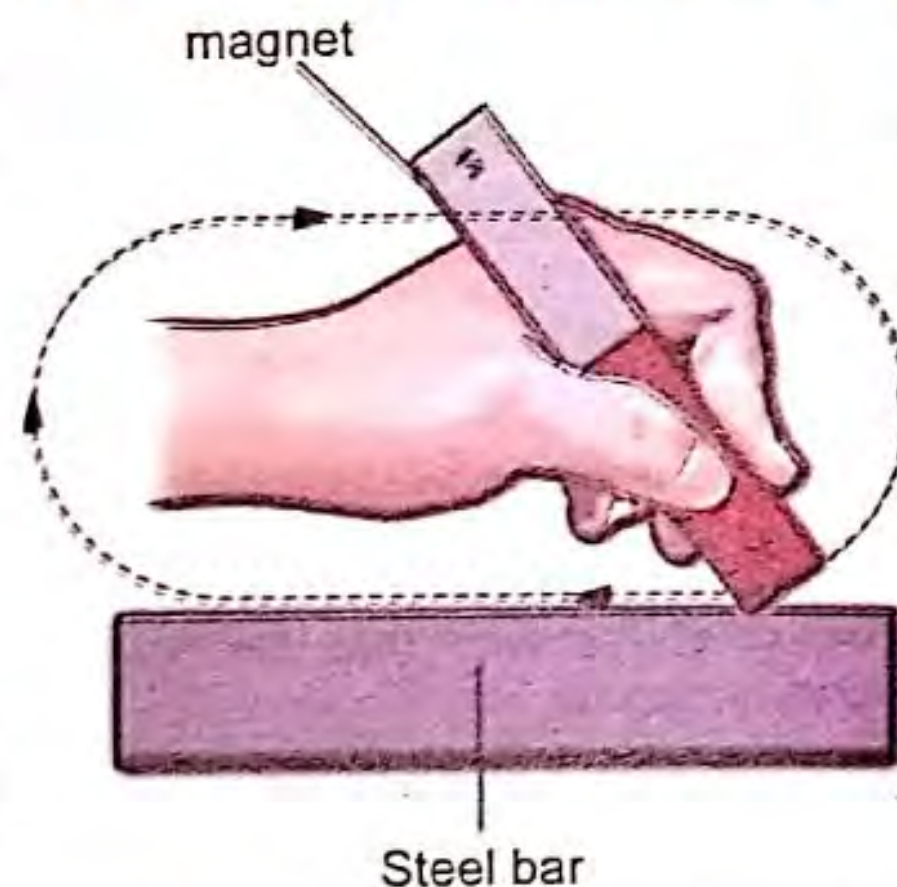


Figure 10.7 Single touch method of magnetization

10.7 DEMAGNETIZATION

Demagnetization is the process of removing the magnetic field from an object. Demagnetization occurs naturally over time. Three methods are very common to demagnetize the magnetic substances.

Heating

When temporary magnets are heated at high temperature on a burner they lose their magnetic strength.

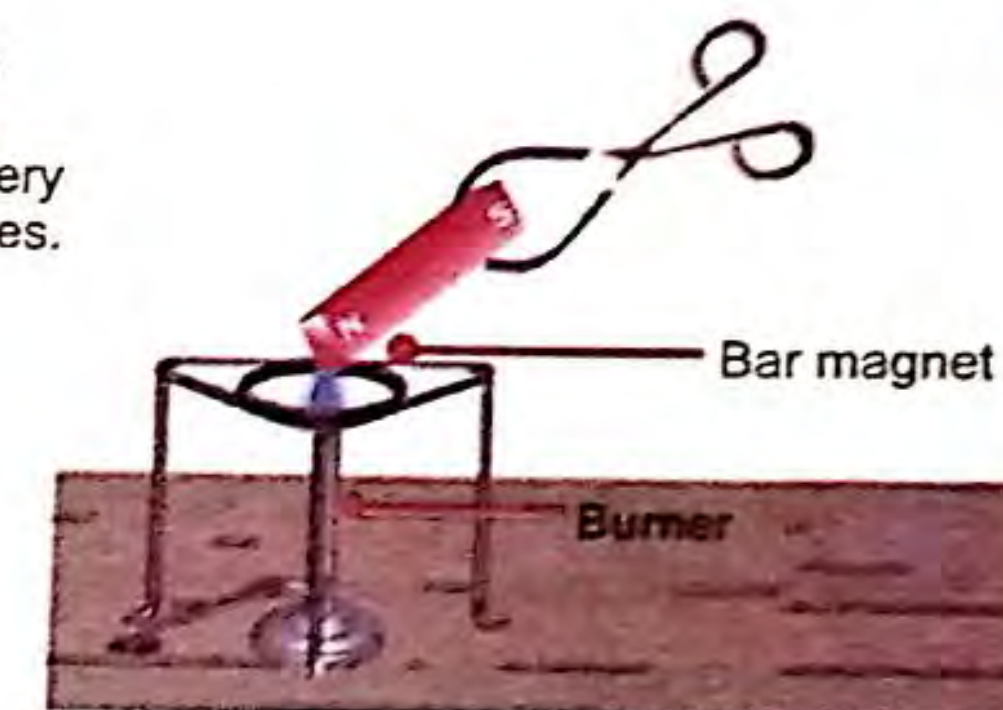


Figure 10.10 Demagnetization by heating



Hammering

Repeated hammering weakens the magnetic strength of a magnet. Similarly dropping magnets on hard surface can result in demagnetization.

Figure 10.11 Demagnetization by hammering

Electrical Method

If a bar magnet is pushed in a coil of wire and the ends of the wire are connected to alternating current, then it can demagnetize the bar magnet.

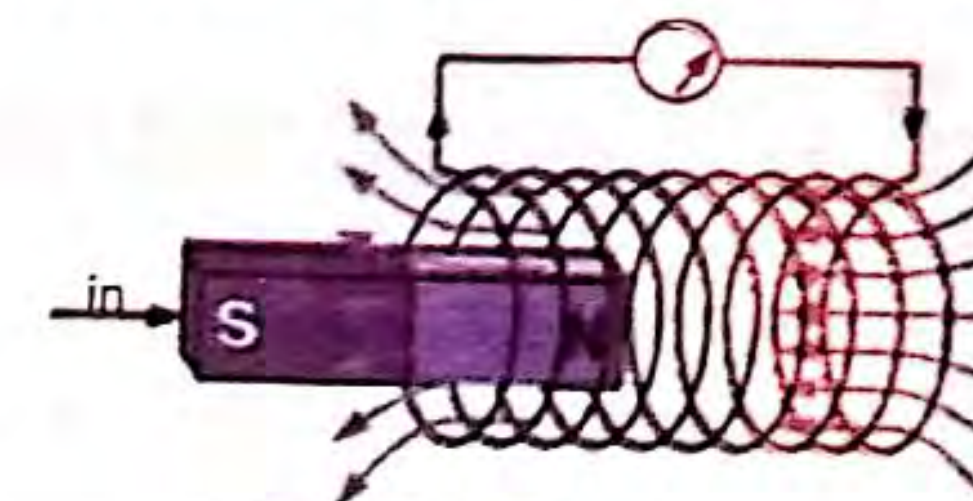
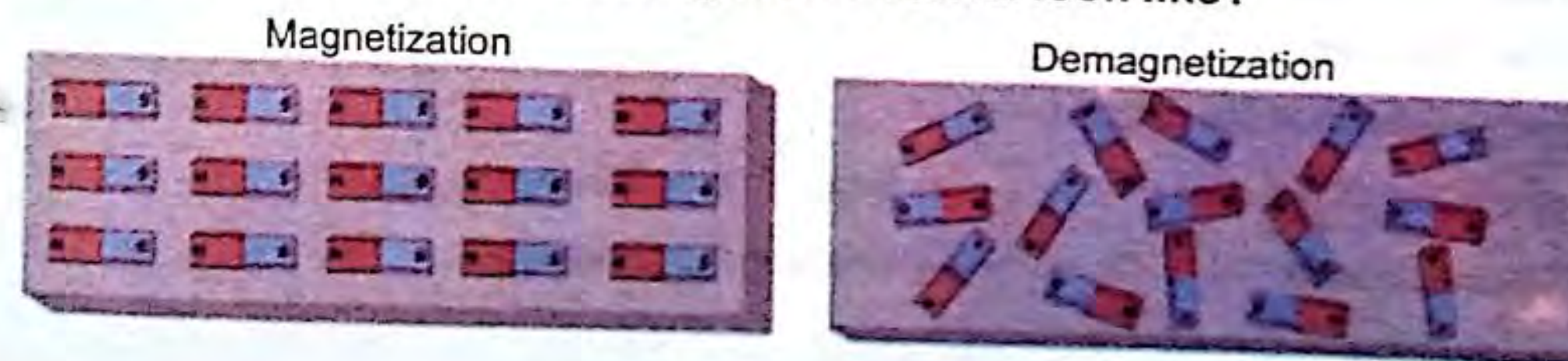


Figure 10.12 Demagnetization by electric current

DO YOU KNOW?

How does magnetic or nonmagnetic material look like?





UNIT 10

MAGNETISM

Key Points

- A magnet is a material or object that produces a magnetic field
- Magnetic field is space around magnet where the magnetic force is felt by another magnet
- Magnetic field lines start from North Pole and end at South Pole outside the magnet and from South to North inside the magnet.
- Earth acts as a giant magnet behaving as if it has a powerful bar magnet at its center
- Electric current produces magnetic field around it
- Permanent magnet retains its properties in the absence of any other magnet or current
- Compass needle aligns itself and points in the geographical North-South directions.
- An electromagnet is a type of magnet in which the magnetic field is produced by an electric current
- The meaning of demagnetize is to remove magnetic properties



END OF UNIT ASSESSMENT

A. MCQs (Choose the correct option)

- Which of the following gets attracted to a magnet?
a. Copy book b. Silver spoon c. Comb d. Common pins
- The pole of the magnet that points towards the geographical South is called:
a. North Pole b. South Pole c. East Pole d. West Pole
- When a bar magnet is brought near iron dust, most of the dust sticks:
a. Near the middle b. Equally everywhere
c. Near two ends d. At the middle and ends
- A freely suspended bar magnet rests in:
a. North-South directions b. East-West directions
c. Upside down d. Any direction by chance

- Attraction is seen between the poles of two bar magnets in the case of:
a. N-pole of one magnet with N-pole of other
b. N-pole of one magnet with S-pole of other
c. S-pole of one magnet with S-pole of other
d. All of these cases will show attraction
- A freely suspended magnet rests in:
a. East-west direction b. North-south direction
c. North-east direction d. North-west direction
- Which of the following materials is the most suitable for making a permanent magnet?
a. Soft Iron b. Nickel c. Copper d. Steel
- Magnetic lines of force of a bar magnet do not intersect because:
a. The lines have similar charges hence they repel each other
b. The lines always diverge from a single point
c. A point always has a single net magnetic field
d. The lines need magnetic lenses to intersect
- Which of the following process can not destroy magnet properties of magnet?
a. Hammering b. Heating
c. Dropping on a hard surface d. Boiling
- The purpose of a compass?
a. To tell you directions b. To tell how far you have walked
c. To tell what time you left d. To tell where the sun is

B. Short questions

- What is magnet?
- What is magnetic field?
- How can we detect magnetic field?
- If current is passing through any wire. How can magnetic field be detected around wire?

UNIT 10**MAGNETISM**

5. From which poles of a magnetic field lines will originate and terminate outside the magnet?
6. Differentiate between permanent magnet and temporary magnet?

C. Long questions

1. What do you understand by magnetic power and discuss briefly will magnets lose their power over time?
2. How many poles of magnetic are there and how can you tell which is the North Pole or South pole if it's not marked?
3. Describe an experiment to illustrate that like poles repel while the, unlike poles, attract.
4. Explain in your own words, how to make an electromagnet. Draw a labeled diagram to show the circuit of the electromagnet.

D. Structured response questions

1. How a temporary magnet can be designed?
2. What is electromagnet?
3. What are the applications of electromagnet?
4. How can you magnetize a magnetic material?
5. What is demagnetization?
6. How many methods are there for demagnetization of magnet?
7. A tailor is stitching buttons on his shirt, needle has slipped from his hand on the floor. How can you help the tailor to find the needle?

E. Project work

By using magnetic materials try different methods of magnetization and demagnetization.

UNIT 11**TECHNOLOGY IN
EVERYDAY LIFE****Learning outcomes:**

At the end of this unit, students will be able to:

- Grow seasonal plants and vegetables in earthen pots and demonstrate the effect of use of fertilizers on the growth of plants.
- Prepare yogurt and cheese from milk to demonstrate the beneficial microorganisms
- Design a solar oven to convert solar energy into heat energy.
- Assemble a circuit to demonstrate the working of an electric bell

11.1 EARTHEN POT GARDENING

We all know the importance of vegetables and fruits as they provide **vital nutrients** that maintain our health and body. Have you ever tried to grow vegetables and fruits at home?

Earthen pot gardening is one of the best way to grow vegetables and fruits. If one is lacking in yard space they can grow plants in the pots. If you have a small garden balcony, or rooftop, then you can enjoy the pot gardening.



Figure 11.1 Healthy Plants

Tips for Earthen pot Gardening

- It's better to choose the bigger pots because large plants need more space. Mostly smaller pots can't store enough water to get through hot days
- You can grow more plants in bigger pots.
- It is better to use barrels (a wooden half-barrel can yield an amazing amount of food), buckets, baskets, boxes, bath- and other tubs, and troughs—anything that holds soil. Whatever you are selecting make sure it has a drainage hole in the bottom.
- Choose good quality of potting commercial soil. It is filled with nutrients that a plant require to grow. Never use soil directly from your garden as it consist of my insects that can harm your plant and when it dry it changes into a hard mass.
- Put the plant in a proper sunlight.
- You can grow almost anything you want in a container But it's better to grow vegetables and fruits.
- Water regularly



Figure 11.2 Earthen Pot Plant

Use of Fertilizer

A fertilizer is a substance /chemical that is added into plants or soil to help them grow. They provide essential nutrients that make plants healthy. It can be natural or synthetic and are used to fulfill the nutritional needs of plants.

Does fertilizer Affect plant growth?



Figure 11.3 Use of Fertilizer

Activity 11.1 Do plants grow best with fertilizers?



Let's Explore

Materials Required

Bean seeds / any seed, Small pots, Potting soil, Paper tape, Marker Gloves



Seeds



Pots
Figure 11.4



Potting Soil

Direction

- Let's take three pots A, B and C
- Put equal amount of soil in each pot
- Place three bean seeds into each pot. Make sure that the soil in each pot is damp
- Add 5mg of fertilizer in pot B and 10 mg in pot C
- Name the A pot "control". This pot does not get any fertilizer
- Name the pots B and C which get fertilizer
- Plant A gets no fertilizer, Plant B gets 5 mg. of fertilizer each day, and Plant C gets 10mg. of fertilizer each day. All plants receive the same amount of sunlight and water

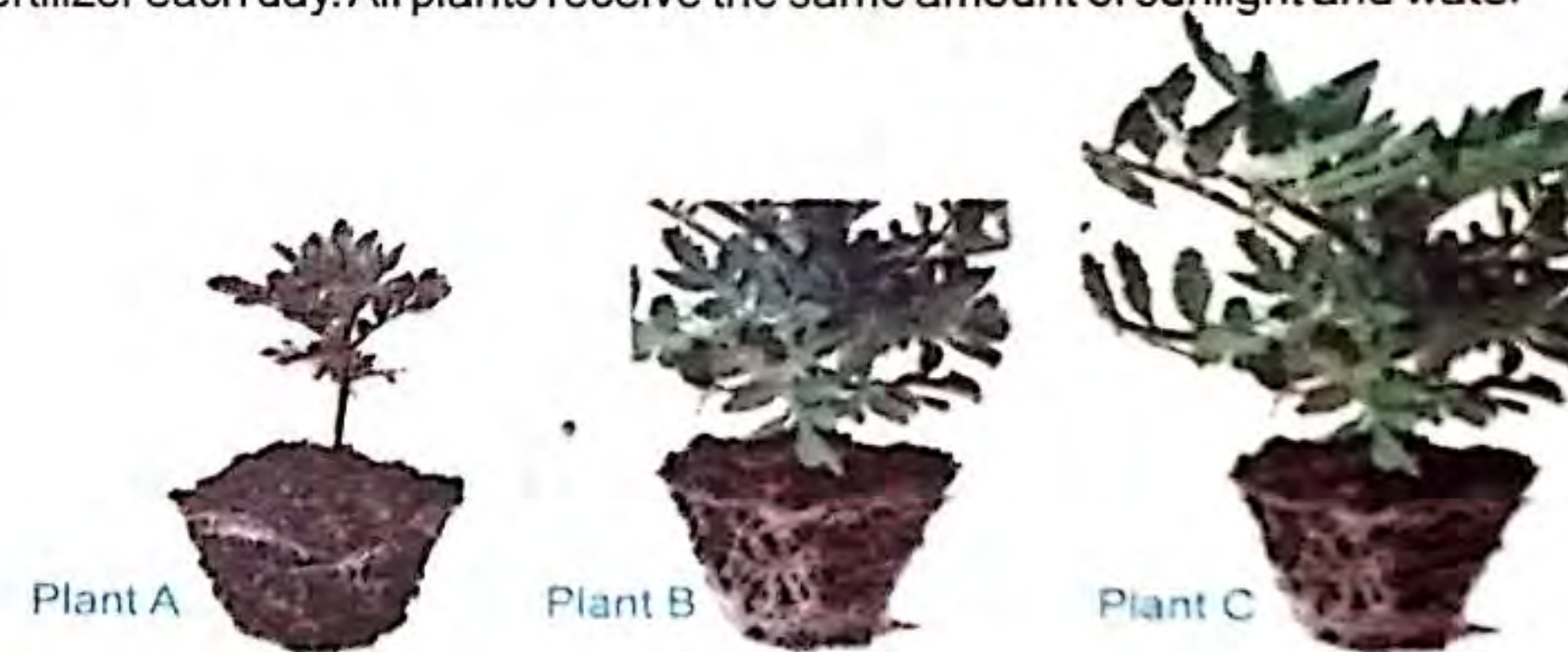


Figure 11.5

Teaching Point: Teacher will ask student to bring some seeds and let them grow in school. Add some fertilizer according to the directions given above. Observe these plants regularly for one month.

UNIT 11

TECHNOLOGY IN EVERYDAY LIFE

What do you think which plant grew better?
Write your prediction

1. Now, watch your beans grow! After one week.
2. Use a ruler to measure the length of each seed's sprout. What pot produced the seeds with the longest sprouts?
3. Keep on observing and record your data in given table
4. Repeat the same activity, replace the seeds and continue your observation for several more days.

Observation and Data Chart

Date of Observation	length of Stem (in cm)	Number of Leaves on Stem

Conclusion

Now write your conclusion which plant growth is better and why?

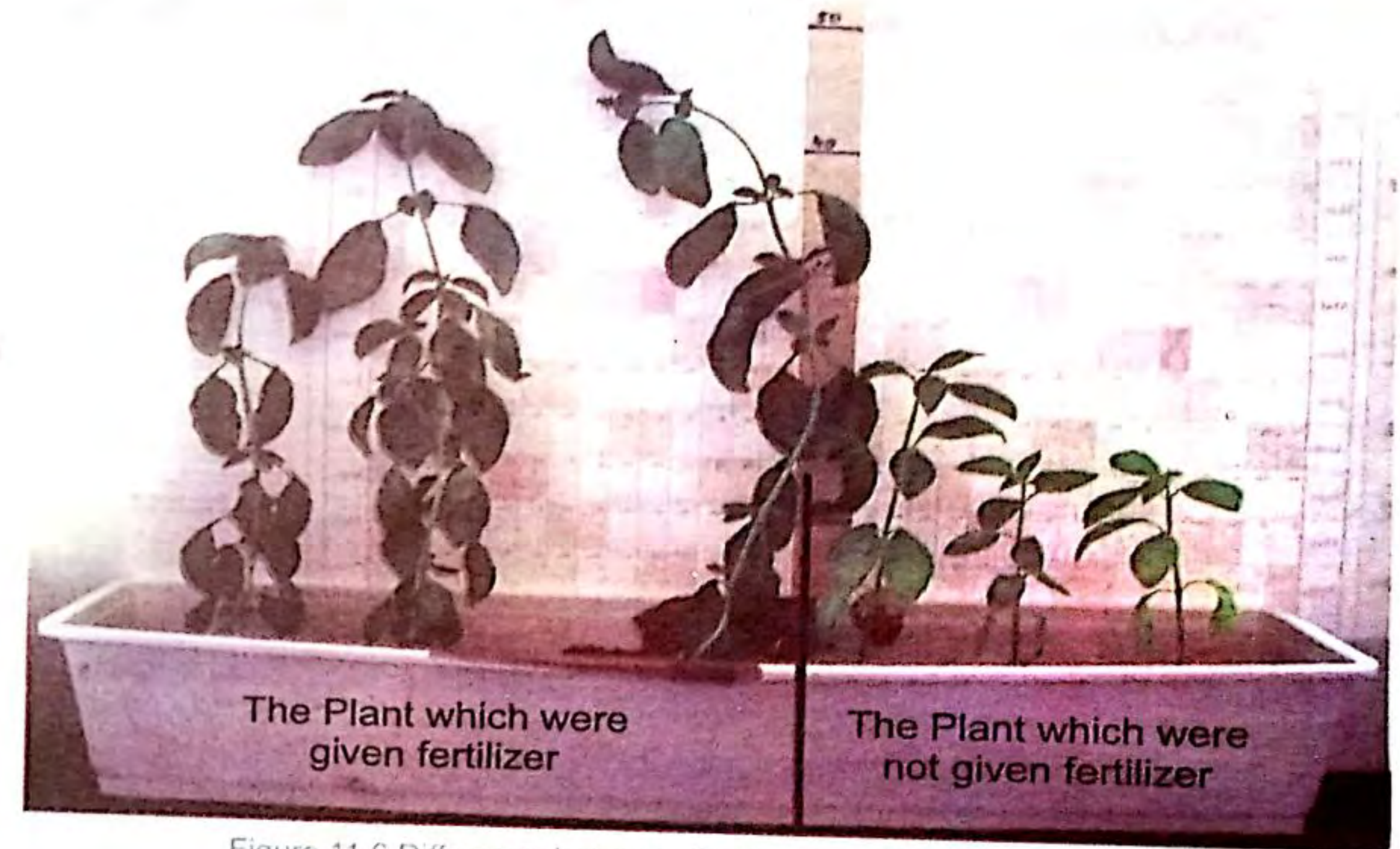


Figure 11.6 Difference between Fertilized and Unfertilized Plants

Try it out

Enlist name of some fertilizer that are commonly used for plants growth.

UNIT 11

TECHNOLOGY IN EVERYDAY LIFE

DO YOU KNOW?

Do you know you can make your own organic fertilizer at home? Compost is an organic matter that is made of decomposition of plants and food waste and fertilize the soil. Another interesting fact is that there is a bird who collects decaying material and then builds a mound. The compost heats up, allowing the bird to incubate many more eggs than it could sit on. This is not a build and leave system through – the bird checks the temperature of the compost with its beak and then adds or remove compost material to maintain an ideal incubation heat.

The piles can be up to 12.7 cubic meters and weigh nearly 7000 kilograms!



11.2 THE TUMMY TREAT!

FORMATION OF YOGURT AND CHEESE

Yogurt and cheese are fermented milk products and as such are means of preserving the nutrients in milk. A wide variety of yogurts and cheese are now available around the world, ranging from very-low-fat fruit yogurts to Greek-style yogurt. Yogurt and cheese can be made from cows', goats', or buffalo's milk.



Figure 11.7 Yogurt and Cheese

DO YOU KNOW?

Fermentation is a chemical process in which microorganisms convert carbohydrates such as starch and sugar into alcohol. For example in yeast fermentation sugar is converted into alcohol, in bacteria fermentation carbohydrates are converted into lactic acid. The process of fermentation is used in food processing. It develops unique flavours and textures. The term "ferment" comes from the Latin word *fervere*, which means "to boil." Fermentation was described by late 14th century alchemists, but not in the modern sense. The chemical process of fermentation became a subject of scientific investigation about the year 1600.



Ingredient of yogurt

- Main ingredient in yogurt is milk.
- Type of milk used depends on type of yogurt.
- Whole milk for full fat yogurt.
- Low fat milk for low fat yogurt.
- Skimmed milk for nonfat yogurt.

Sweeteners, flavours and fruit preparations are used in yogurt to provide variety to the consumer



Figure 11.8 Formation of Yogurt

DO YOU KNOW?

The sugar in milk (called lactose) is fermented to acid (lactic acid), this causes the characteristic curd to form.

How to make yogurt

Directions

1. Take two cups of milk in a pot and boil it for half an hour to sterilize it.
2. Let it cool to room temperature.
3. Add a spoon of yogurt in the milk
4. Mix it well.
5. Cover the pot with a towel /cloth and incubate it until it sets.
6. Open it after incubation and see the result.



Figure 11.9 Formation of Yogurt

Activity 11.2 Yogurt processing

Flow sheet diagram of yogurt processing

Try it out

Why do we heat the milk before preparing yogurt?
Enlist Some benefits of eating cheese.

UNIT 11

TECHNOLOGY IN EVERYDAY LIFE

DO YOU KNOW?

The lemon juice lower the pH, producing a sour flavour. It cause the proteins to denature and the milk to thicken. This process happens in the matter of a few minutes, rather than hours.



Cheese that please

How to prepare cheese

What is a common thing between yogurt and cheese making?

- **Material Required**
- Milk
- Saucepan
- Strainer
- Vinegar / lemon juice / starting culture

Direction

- Pour the half liter milk in a large sauce pan.
- Bring the milk to a boil.
- Turn the heat down to low.
- While stirring the milk continuously, pour one table spoon of vinegar or lemon juice.
- The milk will curdle, meaning that the milk fat (curds) separates from the liquid in the milk (whey).
- Allow the milk to cool slightly.
- Separate the whey from curd using cheese cloth or strainer
- Gently roll the curds up in the cheese cloth.
- Place the cheese cloth on a draining board and allow the cheese to drain for two hours.
- You can also hang the cloth until all the water drips down.

Enjoy. Place any uneaten cheese in the refrigerator. It is best to use the cheese within three days

Reference: <https://www.education.com/science-fair/article/cheese-making/>



Figure 11.10 Formation of Cheese



Figure 11.11 Draining of Cheese

DO YOU KNOW?

Coagulation is the process of transforming the liquid into a semisolid. When making cheese, an enzyme called rennet is added either as a liquid or paste to further encourage the milk to solidify.



Activity 11.3 How much lemon juice is necessary to make milk curdle?

Repeat the same activity as above but change the amount of juice that you add to your milk. Is one drop enough or do you need more? How many drops does it take to make the milk start to curdle? Record your observation.

No of drops of lemon juice	Observation

11.3 JOINT THE CIRCUIT

You have learned about circuits in previous chapter

Can you tell what a circuit is and how current is produced?

Do you know circuits are very important in everyday life? Circuits are used to provide power to lights, appliances and many other devices. For example a lamp can show us when a current is passed through the circuit.



UNIT 11

TECHNOLOGY IN EVERYDAY LIFE

Ring the Bell

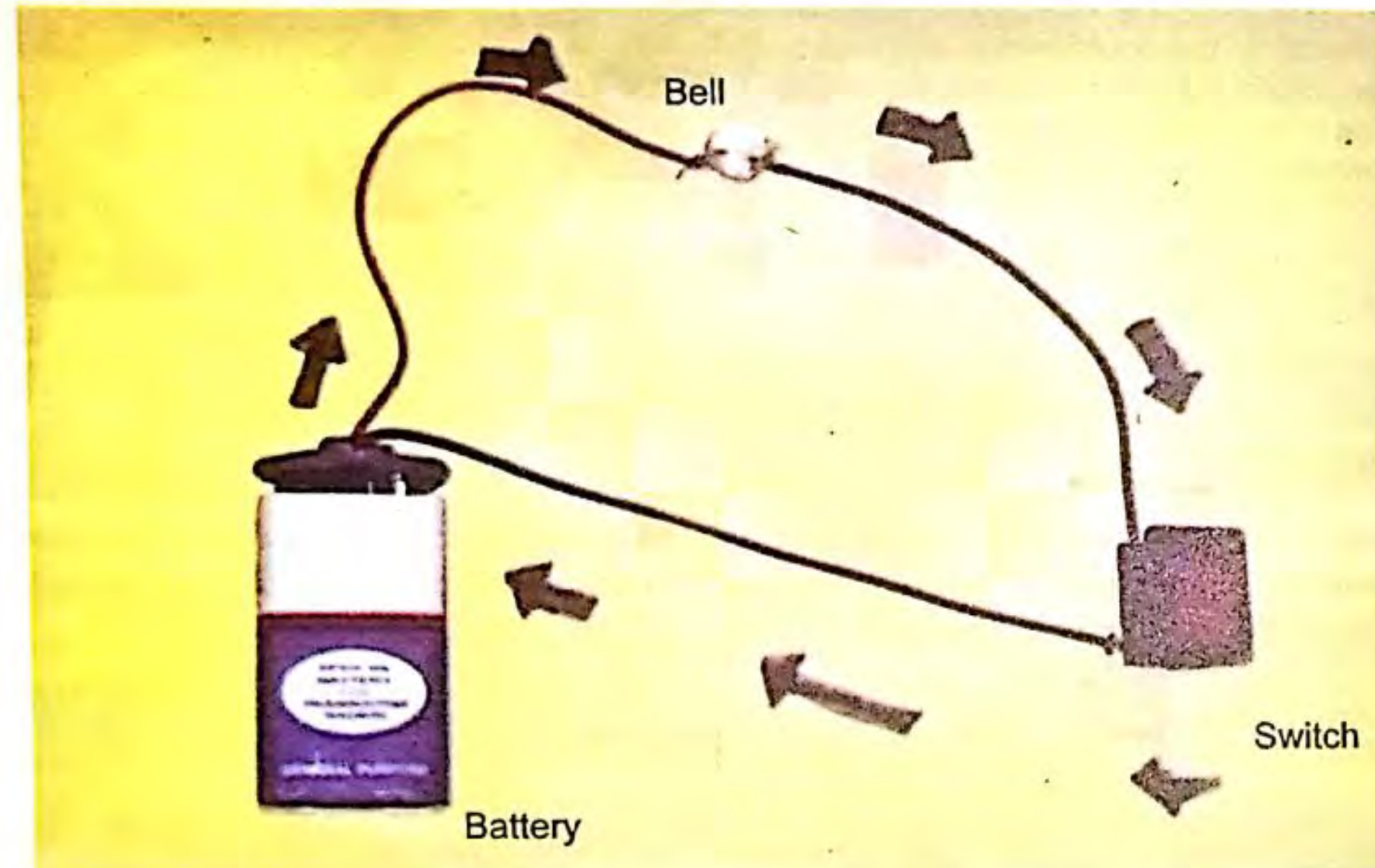


Figure 11.12 Circuit of Bell

Parts of electric circuit

A simple circuit consist of following parts



Figure 11.13 Parts of Electric Circuit

TECHNOLOGY IN EVERYDAY LIFE



Let's Do it

Study the given picture and follow the steps to construct it

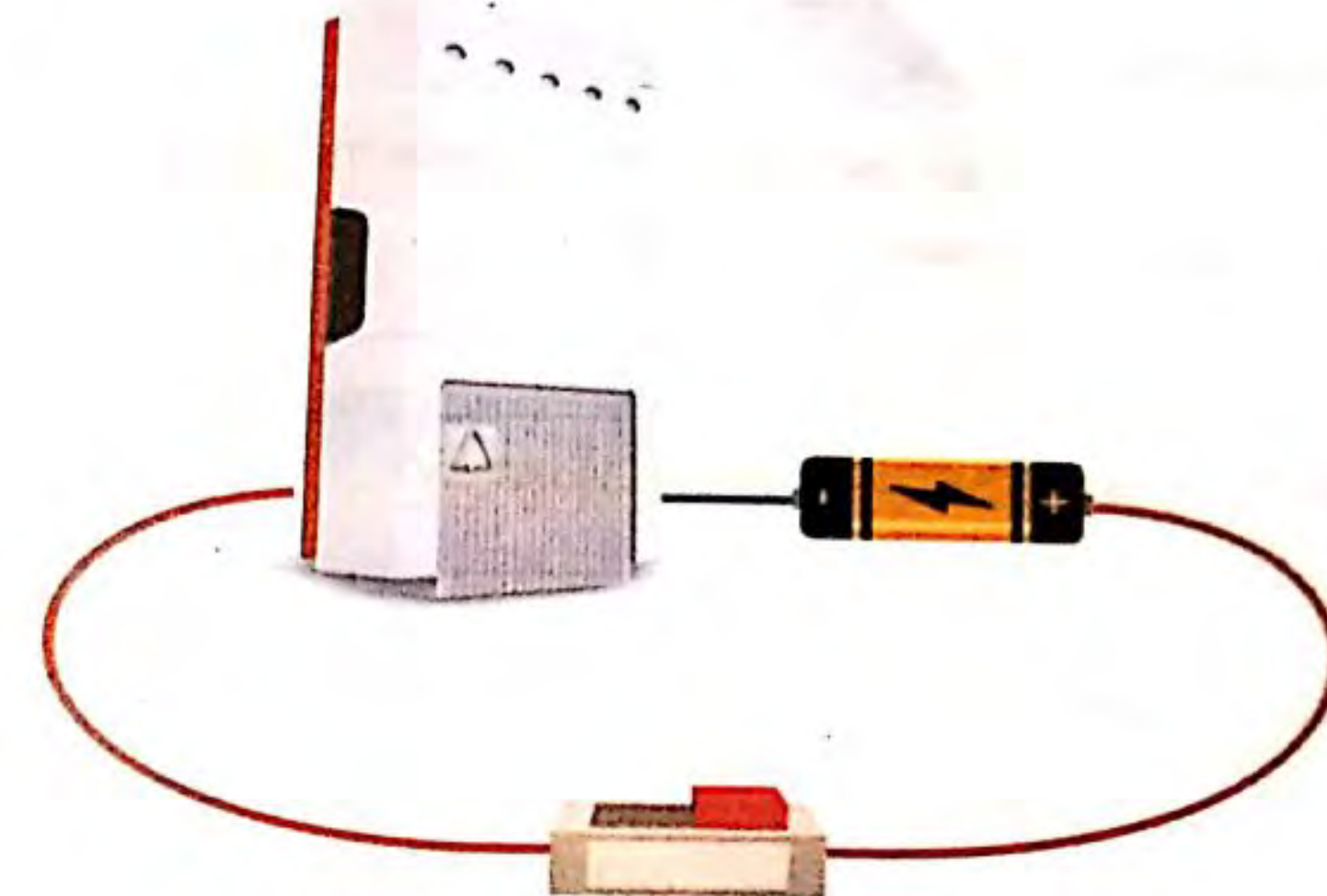


Figure 11.14 Circuit of Electric Bell

Make a simple connection between electric bell and battery

Connect the end of the wires with a battery.

Connect the switch by putting wires. Now What did you observe?

What would happen when you switch on and off the button?

Write your observation

Teaching Point: Teacher will demonstrate how to join a circuit and will also discuss the safety measures.

UNIT 11 TECHNOLOGY IN EVERYDAY LIFE



Activity 11.4 Electric circuit

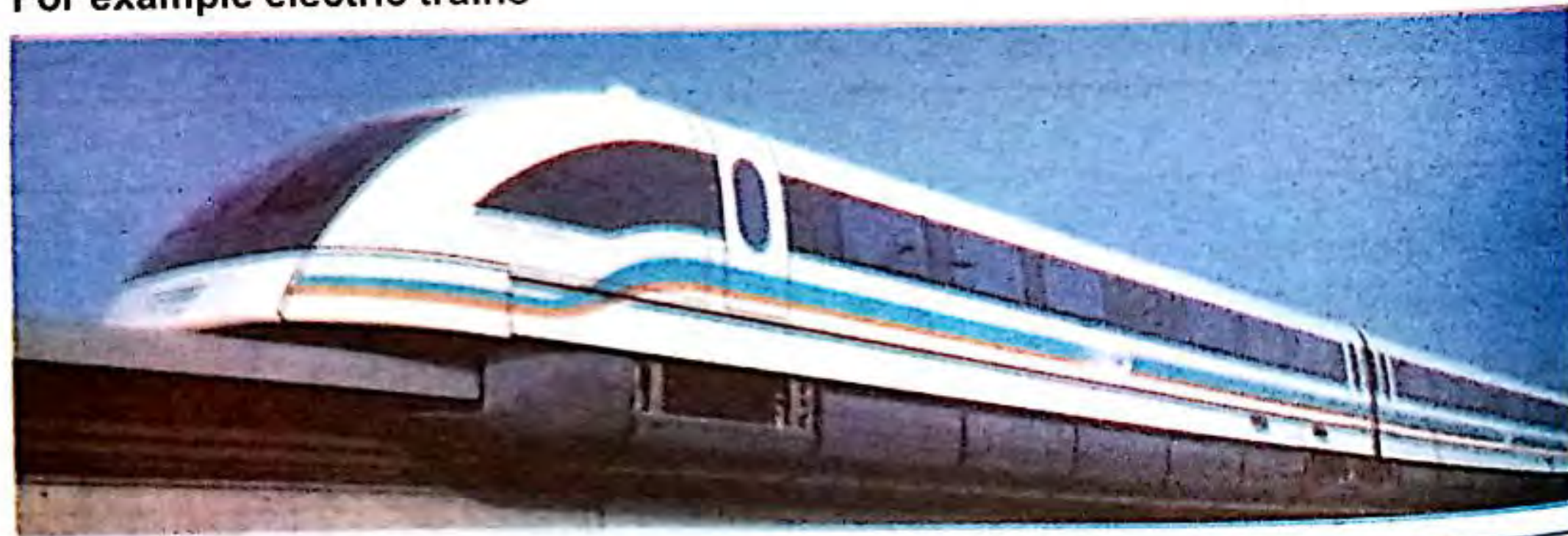
Try this activity with bulb or with any other device and observe the following
What would happen when you remove the power supply?

What would happen if you will change the size of the battery?

Will there be any change if you add more bulbs.

Try it out

Enlist more applications of electromagnet in daily life
For example electric trains



Solar Oven

Have you ever tried to cook something outside like BBQ? It can be a lot of fun to cook outside. But have you thought you can cook directly from sun light?
How?

Yes, this can be done by using a solar oven, which is a low-cost, and environment friendly. Sun light is the main source of energy that is used by everyone. Pakistan is rich with solar energy, build your solar oven to cook food with sun light from available resources (a sample solar oven is shown below)



Figure 11.15 Solar Oven

A solar oven is also called solar cooker. It is a device which uses the energy of direct sunlight to heat, cook or pasteurize drink and other food materials.

What do you think how can we use solar energy for cooking?

How hot do you think it will get inside the solar cooker?

Reference: <https://studylib.net/doc/18629595/the-solar-cooker-introduction-to-alternative-energy>

UNIT 11 TECHNOLOGY IN EVERYDAY LIFE

Key Points

- Earthen pot gardening is one of the best way to grow vegetables and fruits
- A fertilizer is a substance /chemical that is added into plants or soil to help them grow
- Fertilizers can be natural or synthetic
- Yogurt and cheese are fermented milk products
- Milk is the main ingredient of Yogurt and cheese
- Circuits are used to provide power to lights, appliances and many other devices
- Solar oven is a device which uses the energy of direct sunlight to heat, cook or pasteurize drink and other food materials



END OF UNIT ASSESSMENT

A. MCQs (Choose the correct option)

- The effective condition for solar oven is:
 - Cloudy
 - Sunny
 - Windy
 - Wet
- The material used in making of solar oven is:
 - Low cost
 - Expensive
 - Low cost inefficient
 - Expensive efficient
- The main ingredient of yogurt is:
 - Milk
 - Sugar
 - Cream
 - Egg
- Fruits, vegetables peeling, egg shells are all examples of what type of fertilizer?
 - Chemical
 - Organic
 - Inorganic
 - Pesticides
- How does a fertilizer help in plant growth?
 - Make them grow
 - Replenish nutrient in the plant
 - Stunted growth
 - Discolouration
- A path along which electric current flow is a:
 - Bulb
 - Conductor
 - Insulator
 - Circuit

B. Short questions

- Why do plants need fertilizer?
- Define compost.



- Enlist the components of a simple circuit.
- Solar oven takes longer time to cook as compared to the conventional method. Why?
- What is coagulation?
- Why do we use fermentation process?

C. Long questions

- Write down the steps of making yogurt and cheese.
- Define solar oven? write down steps to make solar oven from low cost material.

D. Project:

- Ali and Sara were growing plants in the pots. Ali used organic fertilizer for his plant while Sara used chemical/inorganic fertilizer for her plant. Whose plant will grow better and why?

Write a report on environmental problem caused by the excessive use of fertilizers.

- You are provided with the following materials

- | | | |
|------------------------|-----------------------|--------------|
| a. A packet of yeast | b. Empty water bottle | c. 1 balloon |
| d. 1 cup of warm water | e. 2 tbs of sugar | |

Directions

- Mix water, yeast and sugar in the bottle
- Fasten the balloon on the top of the bottle

What would happen?

- Try this experiment using different combinations.
- Try cold water.
- Try no sugar.
- Label each and record your results.
- What would happen if you will leave the sugar?
- What would happen if you will use cold water?
- What is the gas inside the balloon?
- Why do we use yeast in baking bread?

- You are provided with the following material

- | | | |
|--|-------------|----------------|
| a. A bulb | b. A switch | c. Copper wire |
| d. Connect the given material so that the bulb lights up | | |
| e. Draw the picture of the circuit. | | |

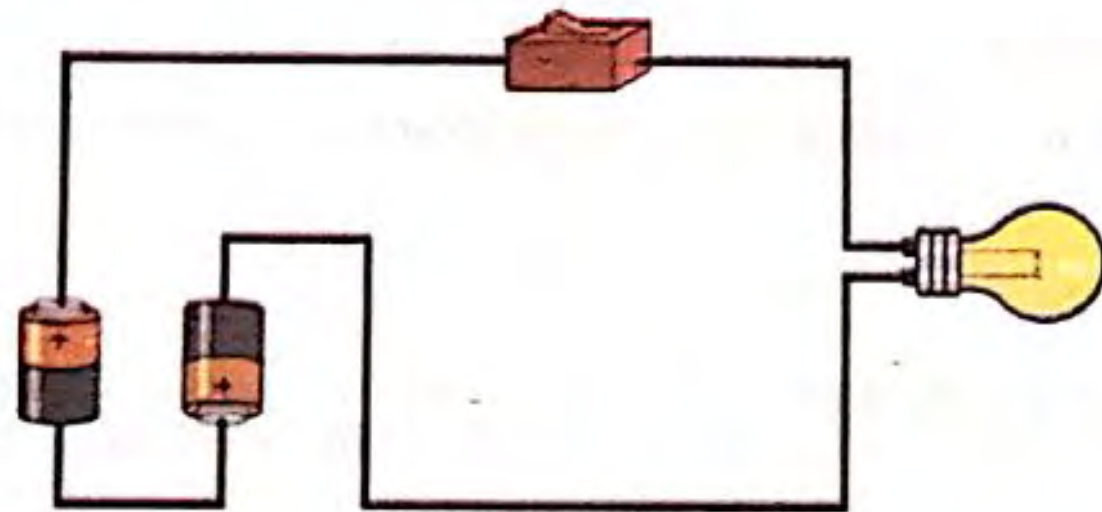


UNIT 11**TECHNOLOGY IN EVERYDAY LIFE**

What would happen if we join two batteries?

Does the same rule apply in machines who lift the cars.

If yes elaborate your answer.



4. Enlist how many energy resources are misused in our daily lives and brainstorm actionable steps they would take as responsible citizens.

UNIT 12**SOLAR SYSTEM****Learning outcomes:**

At the end of this unit, students will be able to:

- Differentiate between characteristics of different planets.
- Describe the characteristics of different planets.
- Describe the uses of various satellites in space i.e. geo-stationary, weather, communication global positioning system (GPS).
- Investigate how artificial satellites have improved our knowledge about space and are used for space research.
- Differentiate between planets and dwarf planets.
- Inquire into the sighting of Halley's Comet; describe what would they feel, they saw it?

UNIT 12

SOLAR SYSTEM

12.1 PLANETS

Any relatively large natural body that revolves in an orbit around the Sun or around some other star is called planet.

As of June 2013, approximately 900 planets have been identified in the universe. In our solar system, there are eight planets, listed in order of proximity to the Sun, they are:

- | | | | |
|-------------|-------------|--------------|--------------------|
| (i) Mercury | (ii) Venus | (iii) Earth | (iv) Mars |
| (v) Jupiter | (vi) Saturn | (vii) Uranus | and (viii) Neptune |

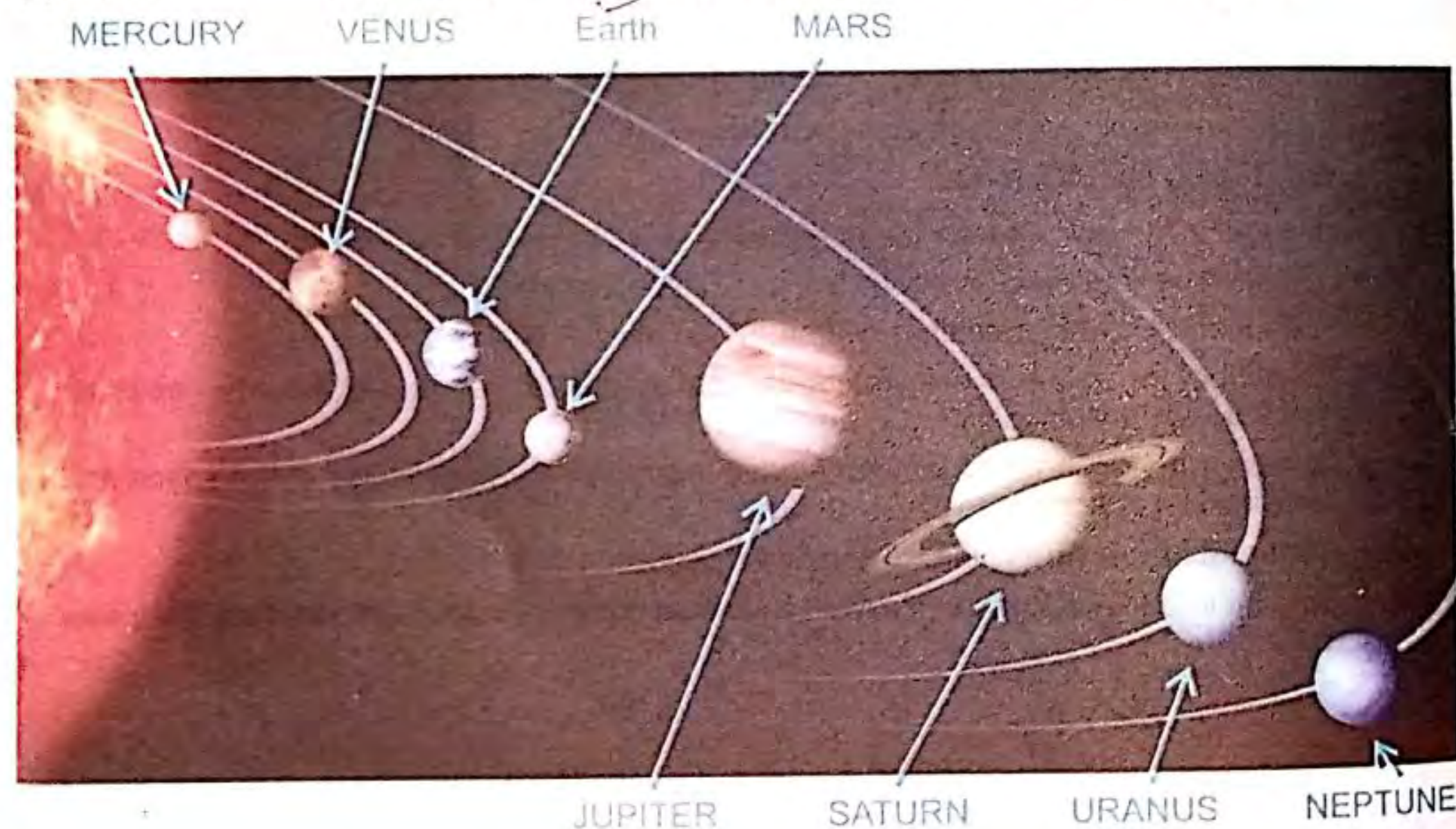


Figure 12.1 Planets of Solar System

Inner planets (Terrestrial planets)

The four rocky planets at the center of the solar system Mercury, Venus, Earth and Mars are known as the inner planets.

Outer planets (Gas giants)

Jupiter, Saturn, Uranus and Neptune are all composed of mostly gas and are known as the outer planets.

Teaching Point: Teach students the planets of our solar system starting with the planet closest to the Sun, Mercury. It is best to teach children the planets in order.

12.2 CHARACTERISTICS OF PLANETS

Size Comparison

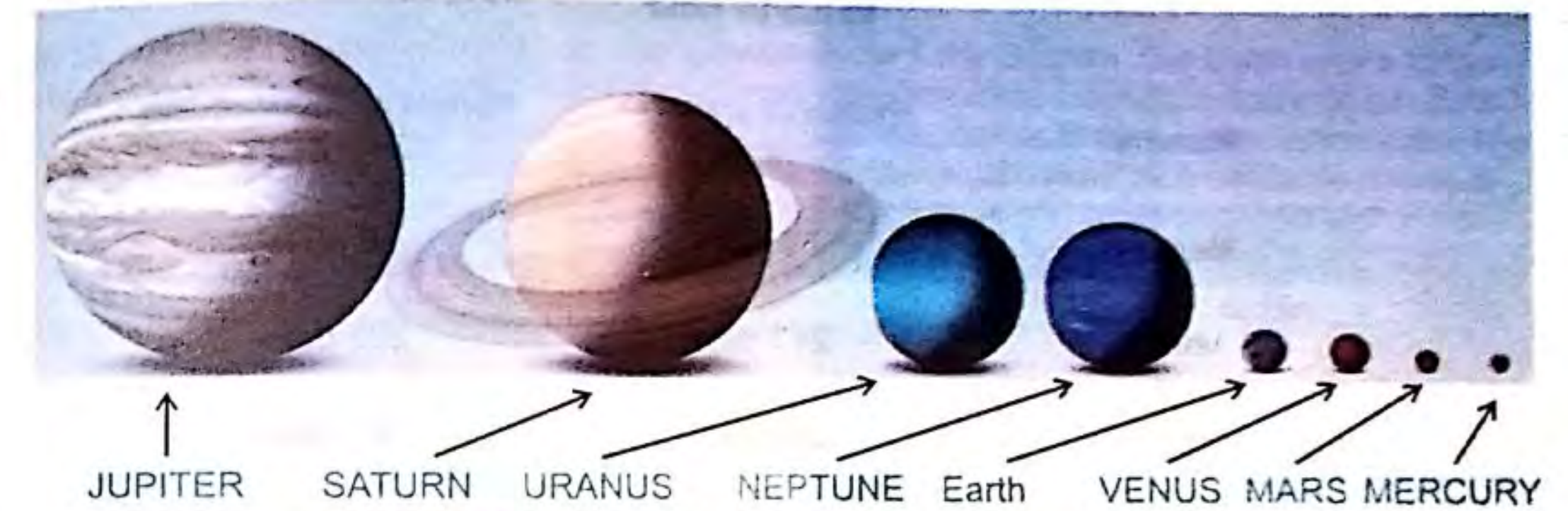


Figure 12.2 Comparison of Physical sizes of Planets

Planets 'Surface Temperature Comparison

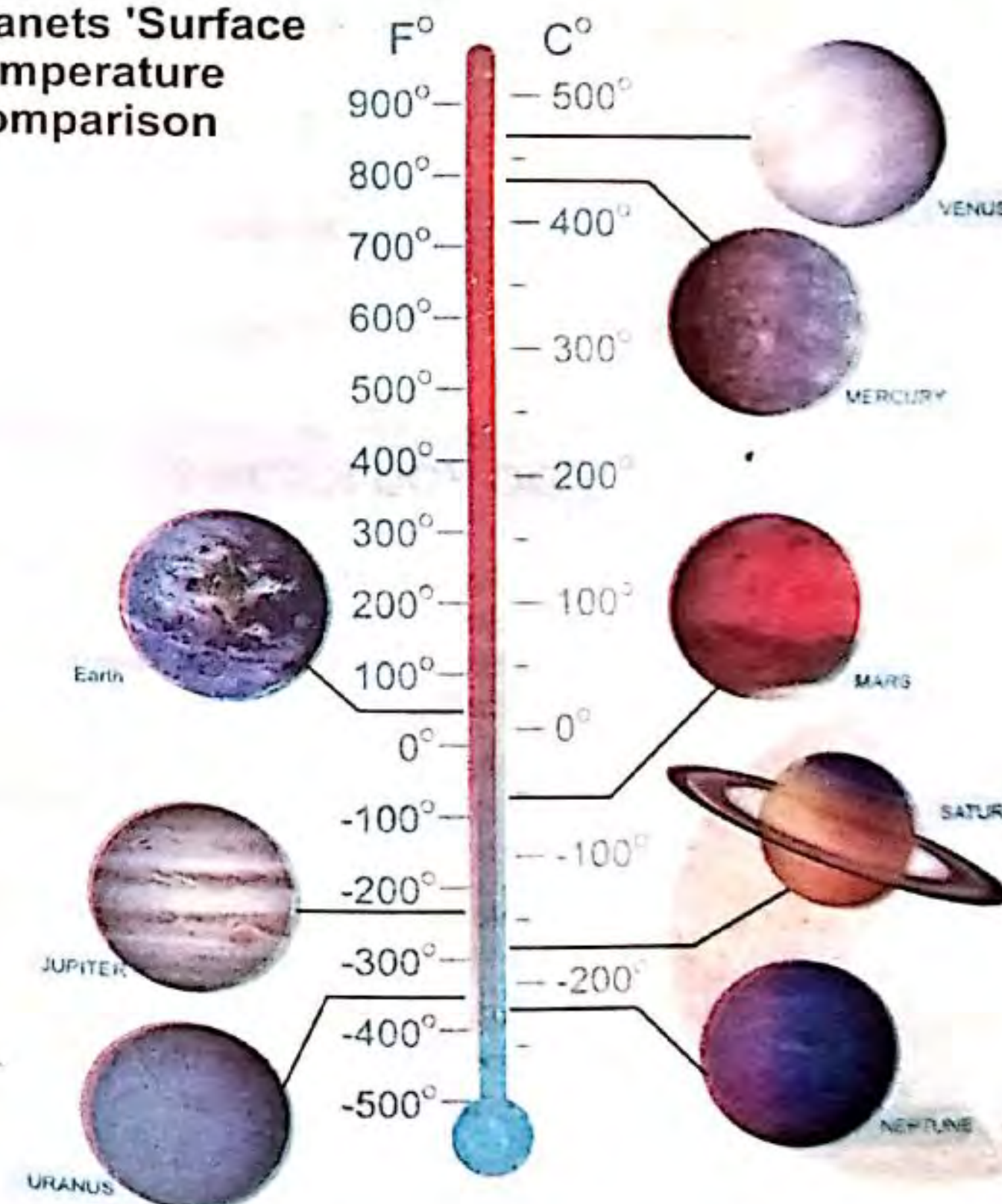


Figure 12.3 Planets 'Surface Temperature Comparison

DO YOU KNOW?

Memory Jingle (Mnemonics) for planets.

It will help you to remember the order of the planets.

My
Very
Educated
Mother
Just
Served
Us
Noodles

UNIT 12**SOLAR SYSTEM**

SOLAR SYSTEM



Comparison of Earth and other Planets days and years according to Earth time

Planets	Period of rotation (One day)	Period of revolution (One year)
Mercury	59 days	88 days
Venus	243 days	225 days
Earth	24 hours	365 days
Mars	25 hours	687 days
Jupiter	10 hours	12 years
Saturn	10 hours	29 years
Uranus	18 hours	84 years
Neptune	19 hours	165 years

Information

Jupiter has a diameter of about 88,695 miles (142,800 kilometers) which is more than 11 times the diameter of Earth. Its volume is over 1,300 times the volume of Earth. This means that Jupiter is so big that over 1,300 Earths could fit inside of it.

**DO YOU KNOW?**

- Jupiter is the largest planet in the Solar System. Its diameter is about 11 times the diameter of Earth.
- Mercury is the smallest planet of solar system. 18 Mercury planets can fit into Earth.
- Venus is the hottest and Neptune is the coldest planet.
- Venus rotates so slowly on its axis that its one day is almost equal to its one year.

12.3 PLANETS AND DWARF PLANETS**Planets**

The Sun and the cluster of bodies around it make up our Solar System. Our Earth is one of the eight planets in the Solar System of our Sun. These planets revolve around the Sun in fixed orbits that are almost circular. The gravity of the Sun holds all the planets in their orbits. Some planets have one or more moons. In 2006, the International Astronomical Union (IAU) defined a planet as having the following three essential criteria:

1. A celestial object that revolves around a star.
2. Is large enough that its gravity pulls it into the shape of a sphere.
3. It must be big enough that its gravity cleared away any other objects of a similar size near its orbit around the Sun.

Dwarf Planets

In addition to the eight planets there are other celestial bodies in the solar system that revolve around the Sun. Some of them are much smaller than the eight planets and hence are not classified as full-fledged planets. These are called the dwarf planets. There are five dwarf planets in the solar system. These are the same as normal planets, just smaller.

Dwarf planets are natural objects outside of Earth's atmosphere that:

- revolve around the Sun
- have enough mass so that their gravity pulls them to be nearly round
- are not moons
- share their pathway with other outer space objects



Figure 12.4 Size comparison of dwarf planets according to Earth's moon

Difference between planet and dwarf planet

PLANET	DWARF PLANET
It must orbit a star for example Sun.	It orbits the Sun.
It must have enough mass to assume a spherical shape.	It has enough mass to assume a nearly round shape.
It has sufficient mass for its self-gravity to overcome rigid body forces and has cleared the neighbourhood around its orbit..	It has not cleared the neighborhood around its orbit and is not a moon.

12.4 ASTEROIDS, METEORITES AND COMETS

Asteroids, Meteorites and Comets are small solar system bodies. They are not visible from Earth with the naked eye but many may be seen through binoculars or small telescopes.

Asteroid:

Asteroid is an object larger than a meteoroid that revolves around the Sun and is made of rock or metal.

Let's discuss the main characteristics of Asteroids:

- Asteroids are also called minor planets or planetoids, any of a host of small bodies, which orbit the Sun between the orbits of Mars and Jupiter in a nearly flat ring called the asteroid belt.
- They are rocky objects with either round or irregular shapes.
- Some of them are several hundred km across while others are much smaller.
- Scientists think that this debris may be the remains of an early planet, which broke up early in the solar system.



Figure 12.5 Asteroid

Meteorite:

A meteorite is a solid piece of debris from an object, such as a comet, asteroid, or meteoroid, which originates in outer space. It survives its passage through the atmosphere to reach the surface of Earth.

Let's discuss the main characteristics of Meteoroids:

- Meteoroids are pieces of rocks or irons that are found in the Solar System.
- Their size ranges from a few millimeters to thousands of kilometers in diameter.
- When they enter the Earth's atmosphere they become incandescent as a result of friction and appear as a streak of light and splash across the sky.
- We sometimes call it a falling star.



Figure 12.6 Meteorite

Comets:

Comets are a body of ice, rock and dust that can be several miles in diameter and revolve the Sun. Let's discuss the main characteristics of Comets:

- Comets are celestial bodies mostly made up of rock and dust stuck together with ice and gases.
- Sometimes light from the Sun hits the gases and is reflected to give a glowing tail millions of km long.
- Comets grow new tails each time they get close to the Sun.
- The tail of the Comet always points towards the Sun.

Halley's Comet:

Halley's Comet is comet visible from Earth every 75-76 years. Halley's Comet last appeared in 1986 and will next appear in 2061. It takes about 75 years to orbit the Sun. Edmond Halley identified it as a comet for the first time in 1758. It is the most famous comet because it marked the first time astronomers understood comets. Ancient people were afraid of this comet because they thought that it will bring floods and Earth quakes. Some people fear that it will hit the Earth or Moon, but with astronomical advancement we know that there is no chance of such events. Now most people are fascinated with the idea of seeing this rare astronomical event. How would you feel if you see it in the night sky?

DO YOU KNOW?

Our solar system has 08 planets, 176 moons, 05 dwarf planets and several Asteroids, comets and Meteoroids.



Figure 12.7 Halley's Comets

12.5 SATELLITES

A satellite is an object that moves around a larger object. Earth is a satellite because it moves around the Sun. The moon is a satellite which moves around Earth.

There are two different types of satellites;

Natural satellite

These satellites exist naturally in the universe for example Earth is a planet and moon is taken as its natural satellites.

Artificial satellite

A man-made satellite is a machine that is launched into space and orbits around a body in space for example Hubble Space Telescope.



Figure 12.8 Types of Satellites

UNIT 12

SOLAR SYSTEM

SOLAR SYSTEM



12.6 USES OF ARTIFICIAL SATELLITES

Artificial satellites are used for different purposes and they can be categorized as:



Figure 12.9
Research Satellites

Research satellites measure major properties of outer space e.g., Hubble Space Telescope

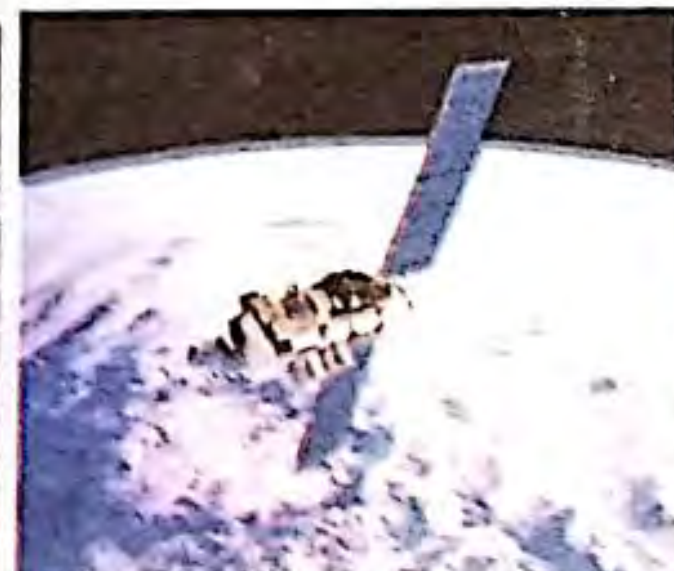


Figure 12.10
Weather Satellites

Weather satellites predict the weather



Figure 12.11
Communication Satellites

Communication satellites provide worldwide link for mobile, telephone, radio and television

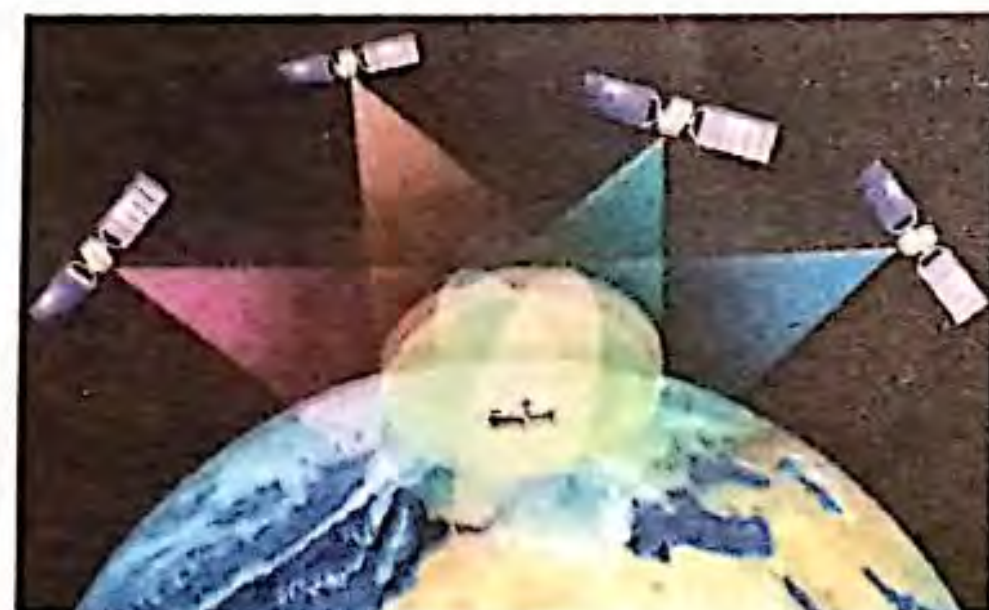


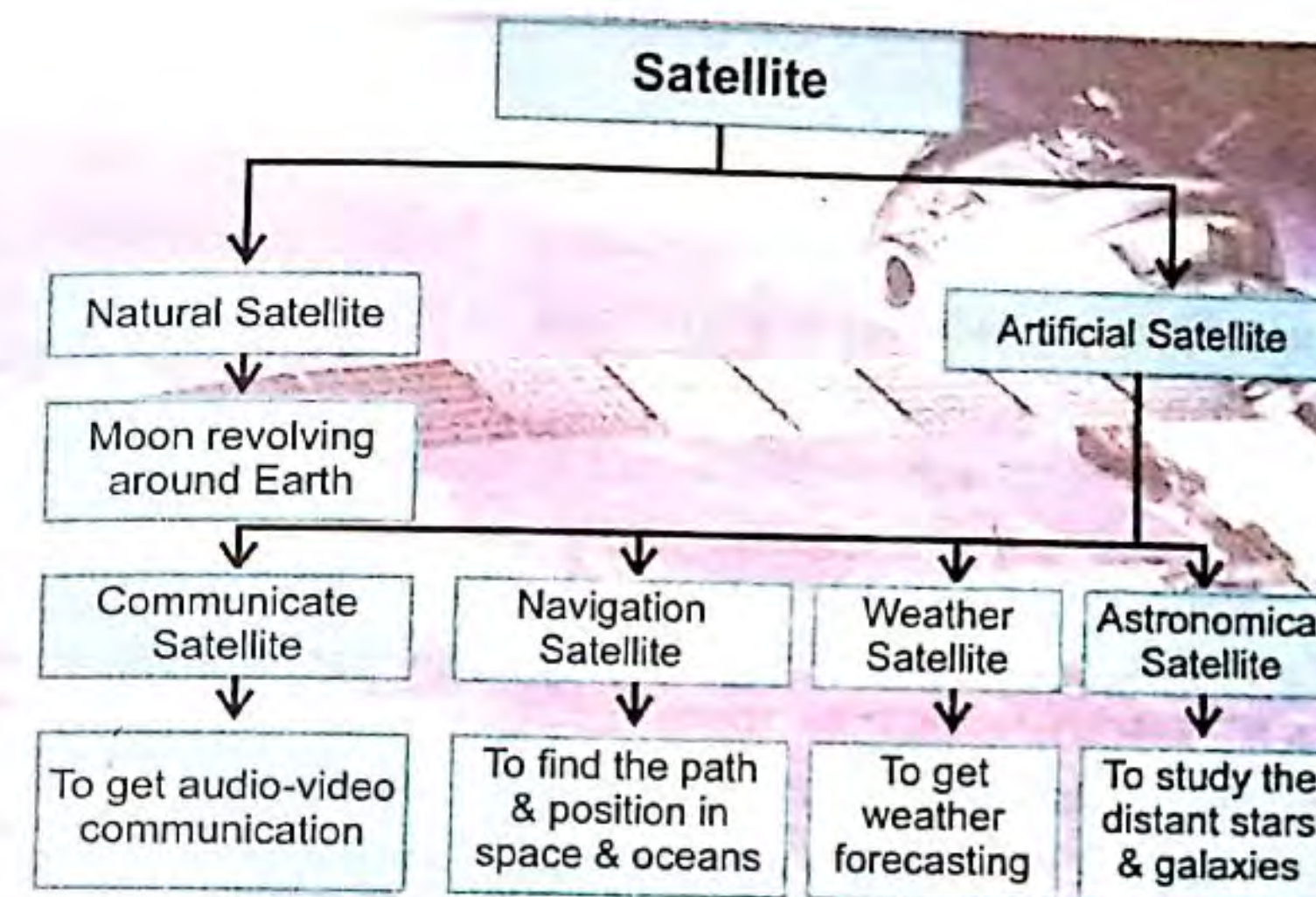
Figure 12.12 GPS Satellites

Global Positioning System is a highly accurate satellite based navigation and location system which can be used on land, sea and air.



Figure 12.13 Earth observation Satellites

Earth observation satellites map and display our planet's resources.



Try it out

Investigate how artificial satellites have improved our knowledge about space and are used for space research.

NASA and many space research organizations have sent many artificial satellites to improve our knowledge about space. All the space research by NASA is accessible, for free, to everyone. Go to www.nasa.gov and learn about space research. Find out about space probes and space telescopes. Look at images sent by Voyager 1, Voyager 2, Hubble telescope and James web telescope.

Activity 12.1 Formation of the 3-D model of the solar system

Material:

Recycle Newspapers or papers, Glue, Paint colors with brush, Chart paper or soft board

Procedure:

Carry out a mini research online and find sizes, shapes and color of each Planet (Inner, outer, Dwarf and small solar system bodies)

Use recycle papers to develop 3-D model of each planet and develop a model of a Solar System.

Be creative and come up with a 3-D Model that display your understanding of Solar system



UNIT 12

SOLAR SYSTEM

SOALR SYSTEM



Key Points

- A planet is a celestial body that a. is in orbit around the Sun, b. has sufficient mass
- The Sun and the cluster of bodies around it make up our solar system
- Dwarf planet is a small planetary-mass object
- Dwarf planets are natural objects outside of Earth's atmosphere
- Asteroids is an object larger than a meteoroid that revolves around the Sun and is made of rock or metal
- A meteorite is a solid piece of debris from an object, such as a comet, asteroid, or meteoroid, which originates in outer space
- A satellite is a body that orbits around another body in space
- An artificial satellite is man made object and launched into orbit using rockets



END OF UNIT ASSESSMENT

A. MCQs (Choose the correct option)

- What holds the planets in their orbits around the Sun?
 - Gravity
 - Speed
 - String
 - Air currents
- The largest planet in the solar system is known as:
 - Uranus
 - Saturn
 - Jupiter
 - Earth
- Balls of ice, dust, rocks, and gases form these:
 - Asteroids
 - Meteorites
 - Comets
 - Meteors
- Pluto was once called a planet. In 2006, it was reclassified with other nearly round bodies whose objects cross the path of other bodies. What term describes Pluto?
 - Meteor
 - Dwarf planet
 - Asteroid
 - Comets
- What makes the Sun more important than other stars?
 - Unlike other stars, the Sun is very large.
 - When compared to other stars, the Sun is the hottest.
 - Unlike other stars, the Sun is the right color for living things.
 - When compared to other stars, the Sun is very close to Earth.

- Which of the following is in the correct order?
 - Mercury-Mars-Venus-Jupiter
 - Mercury-Venus-Earth-Mars
 - Mars-Venus-Jupiter-Saturn
 - Venus-Earth-Jupiter-Saturn
- What is the position of Mars from Sun?
 - Second
 - Third
 - Fourth
 - Fifth
- A small solid rock travelling through the atmosphere is known as:
 - Meteor
 - Comet
 - Star
 - Asteroid

B. True or False (correct the statement if it is False).

- The Sun is a star.

- Earth has many moons.

- The four planets closest to the Sun are called the outer planets.

- Asteroids are icy objects that revolve around Earth

- There are nine planets in the Solar system.

C. Short questions:

- Into which two main groups can the planets in our solar system be classified? Describe two features of each group.
- What is an asteroid?
- Describe a meteoroid.
- What is the difference between planets and dwarf planets?
- Why is Sun considered as a star?
- Which planet of the solar system has people, plants and animals? Why?
- What are the dwarf planets and what do they have in common?
- Pick a planet (other than Earth) and describe five characteristics that you know about it. Be as specific as possible.

D. Long questions:

- What is the solar system? Write the names of planets of the solar system in sequence.
- Discuss the utilization of artificial satellites in daily life.

UNIT 12

SOLAR SYSTEM

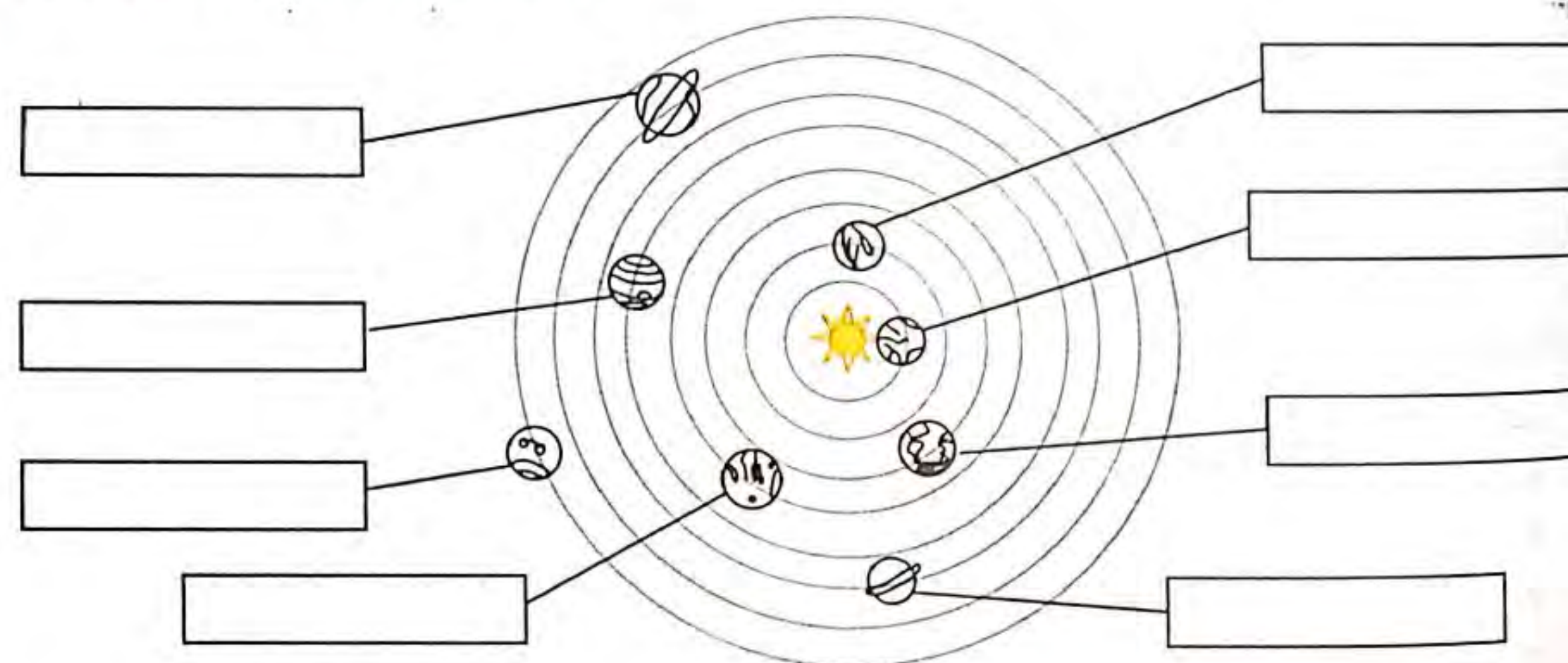
3. What is the importance of SUN in our solar system? Assume the distance between the earth and the sun becomes half of its present distance. What is likely to happen to life?
4. Differentiate between stars and planets.

E. Structured response questions:

1. Solve the riddles

Sr. No.	Riddle	Planet
1	I am between Earth and Saturn but I am not Mars. Which planet am I?	
2	Humans are constantly walking on me. Which planet am I?	
3	I have a huge "Red Spot" on me. Which planet am I?	
4	I have many rings. I am located between Jupiter and Neptune but I am not Uranus. Which planet am I?	
5	I am between Venus and Jupiter. Which planet am I?	

2. Label the names of the Planets.

**F. Project work**

Make model of any satellite by using recycled materials. (Group work).

GLOSSARY

Unit 1

Cell membrane: Thin skin surrounding the cell which allows substances to pass through.

Cell organelles: Small parts of cell in the cytoplasm e.g. mitochondria, ribosome, vacuole etc.

Cell wall: Rigid coat round the outside of plant cells which gives the cell support.

Cell: Building block from which living things are made.

Cellular respiration: The release of energy in a living organism when food materials are broken down into simpler substances.

Cellulose: A large molecule in the form of tough fibres; found in cell wall of plant cell; wood, paper, cotton and dietary fibre are mainly made up of cellulose.

Chlorophyll: Green chemical which traps sunlight energy needed for photosynthesis.

Chloroplast: Green structure inside the cytoplasm of plant cells; contains chlorophyll.

Cytoplasm: Jelly like substance between the cell membrane and nucleus where chemical reactions take place.

Leaf cell: Part of the photosynthetic tissue that make food.

Life process: Various functions carried out by living things.

Mitochondrion: Rod shaped cell organelle; responsible for cellular respiration.

Multicellular organism: Organism made up of millions of cells.

Nerve cell: Long, thin cells that carry messages in the nervous system.

Nucleus: Control centre of the cell.

Organ system: The body organs working together to carry on a complete life function.

Organ: Part of the organism, e.g., stomach, made from different tissues.

Organism: A living thing made up of a cell/cells.

Photosynthesis: The process by which green plants make food from carbon dioxide and water using light energy.

Red blood cell: Red, flat cells filled with haemoglobin to carry oxygen; found in blood.

Ribosome: Tiny round cell part that makes protein.

Root hair cell: Part of root epidermal tissue; responsible for absorption of water and salts.

Tissue: Group of cells that perform a similar function.

Unicellular organism: Organism that exists as a single cell.

Vacuole: A space in the cytoplasm of a cell containing air, liquid, or food; vacuoles in plant cells contain cell sap made up of water and salts mainly.

Unit 2

Asexual reproduction: The production of new organisms without gamete formation and fertilization; different vegetative parts of a single parent forms the new organism.

Bulb: A rounded underground storage organ found in some plants.

Clones: Genetically identical organisms produced from a single organism by using asexual

reproduction methods.

Fertilization: The fusion of male gamete with the female gamete to form a new organism.

Growth: The process of developing and getting bigger.

Plantlet: A young or small, undeveloped plant.

Reproduction: The process of producing new organisms.

Runner: A leafless shoot which grows along the surface of the ground and can grow daughter plants along its length.

Sexual reproduction: The production of new organisms by the formation and fertilization of gametes; two parents are required for this process.

Tissue culture: The growth, in an artificial medium, of cells from a living tissue.

Tuber: A much thickened underground part of the stem, serving as a food reserve and bearing buds from which new plants grow.

Variation due to sexual reproduction: Variety in the characteristics of the individuals of a species like eye colour in humans.

Vegetative parts: Plant parts not involved in seed production like roots, stem and leaves.

Vegetative propagation: The asexual reproduction by using vegetative parts of a plant.

Unit 3

Anaemia: The condition of having too few RBCs or haemoglobin protein in blood. Many types of anaemia, most common is Iron deficiency anaemia. Characterized by continuous fatigue, breathlessness, rapid heart rate and pale skin.

Eat well plate: It shows what kind of foods you should eat, and in what proportions, to have a healthy and balanced diet.

Night blindness: Due to vitamin A deficiency or some other eye problem. Characterized by difficulty seeing in the dark.

Obesity: A condition of overweight due to excess body fat.

Protein energy malnutrition: Malnutrition due to lack of protein and/or energy (calories). Characterized by weight loss, weak muscles, fatigue and slow growth.

Rickets: Vitamin D or Calcium deficiency disease. Characterized by pain in bones, bone fractures, bone softening and bending.

Scurvy: Vitamin C deficiency disease. Characterized by weakness, anaemia, gum diseases and skin problems.

Unit 4

Anus: The opening of rectum for removal of faeces.

Bile: A yellow-green fluid that is made in liver, stored in gall bladder. It helps in fat digestion.

Gall bladder: A small, muscular sac near liver, in which bile is stored.

Large intestine: A long tube-like organ that connects small intestine and anus. It reabsorbs water from digested food.

Liver: A large glandular organ in abdomen that cleans blood and secretes bile.

Mucus: A slippery, thick, sticky liquid that covers and protects different body parts e.g. stomach,

nose, lungs and intestines.

Oesophagus: A muscular food pipe that connects mouth cavity and stomach.

Pancreas: A long, flat gland near stomach that produces insulin and pancreatic JU1Ce with enzymes that help in digestion.

Rectum: Last part of large intestine that stores faeces until they are passed out through anus.

Rickets: Vitamin D or Calcium deficiency disease. Characterized by pain in bones, bone fractures, bone softening and bending.

Scurvy: Vitamin C deficiency disease. Characterized by weakness, anaemia, gum diseases and skin problems.

Small intestine: A long tube-like organ that connects the stomach and large intestine. It is main site of digestion and absorption of food.

Stomach: A muscular sac that stores and digests fat.

Unit 5

Solid: Has definite shape and volume.

Liquid: Has definite volume and takes the shape of the container.

Gas: No fixed shape and volume.

Diffusion: The phenomena of moving from a high concentration to low concentration.

Evaporation: The process when liquid to gas state.

Sublimation: Direct change of state from solid to gas.

Melting: The change of state from solid to liquid.

Freezing: The change of state from liquid to solid.

Boiling: The change of state from liquid to gas.

Unit 6

Atom: The smallest part of an element.

Molecule: Atoms of the element bonded together.

Compound: A pure substance consisting of two or more elements which have been chemically combined.

Element: A substance which cannot be broken down into simpler substances by chemical reaction.

Unit 7

Alloy: A mixture of two or more elements.

Distillate: The pure liquid obtained from distillation.

Distillation: A separation technique used to obtain a liquid from a solution.

Evaporation: A process in which a liquid changes into a gas. It can be used to obtain the dissolved solid from a solution.

Filtrate: The liquid obtained after the filtration process.

Filtration: The removal of solid particles from a liquid or air by passing it through a filter or sieve.

Unit 8

Conservation of energy: Energy can be converted from one form to another or transferred from one body to another, but the total amount remains constant.

Energy resource: Energy resource is a collection or stock of materials that can be drawn and used by humans.

Energy: Energy is the capacity of a body to do work.

Force: Any action that tends to maintain or alter the motion of a body or to distort.

Gravitational potential energy: The energy is stored as the result of the gravitational attraction of the Earth for the object.

Joule: Unit of energy.

Kinetic Energy: It is the energy of an object due to its motion.

Non-renewable energy resource: Non-renewable energy resource is an energy resource that is limited and cannot be replaced naturally in short time.

Potential Energy: It is the energy of an object due to its position.

Renewable energy resource: Renewable energy resource is an energy resource that is replaced rapidly by a natural process.

Unit 9

Battery: A device that stores and produces electricity from chemical cells. Connected by a conductive wire that allows for electric current to flow.

Electric current: It is the flow of electric charge through a material. The standard unit for electric current is the ampere.

Electric circuit: An electric circuit is a collection of electronic components.

Electric potential: The electric potential is the difference in electrical charge between two points in a circuit. It is also called the voltage. The standard unit for electric potential is volts.

Electron: A basic subatomic particle found in all atoms, electrons carry electricity by flowing from one atom to the next in a conductive material.

Insulator: A material in which an electronic charge does not flow freely and does not conduct the flow of electric current.

Volt: The standard unit of measure for electric potential (voltage).

Ohm: It is the unit of resistance.

Wire: An electric wire is a conducting path in an electric circuit, through which current flows.

Electric Bulb: It consists of a thin wire that glows due to the passage of current. This is known as the filament.

Repel: Objects pushing away from each other because they have like charges.

Attract: Objects pulling together because they have unlike charges.

Unit 10

Magnet: A material that has the property, either natural or induced, of attracting iron or steel.

Magnetic field: The space around a magnet in which the magnetic force can be detected.

Magnetic lines of force: A series of invisible lines passing from one pole to another of a magnet, which taken together form the magnetic field.

North pole: The pole of a magnet that when freely suspended would point to the north magnetic pole of the earth.

Magnet: A magnet is any material that has a magnetic field. It can attract certain materials such as iron and attract or repel other magnets.

Permanent magnets: Do not rely upon outside influences to generate their field. They retain their magnetism for a long time.

Electromagnets: Rely upon electric current to generate a magnetic field. When the current increases, so does the field.

Unit 11

Fertilizer: Chemical substances that are supplied to plants to increase their productivity.

Microorganism: An organism that can be seen only through a microscope. Microorganisms include bacteria, protozoa, algae, and fungi.

Technology: The application of science.

Electric Circuit: The path along which electric current flow.

Electric Current: The rate of flow of electric charges.

Solar Oven: solar oven, also called solar cooker, a device that harnesses sunlight as a source of heat for cooking foodstuffs.

Unit 12

Artificial satellite: It is an object that made by man and launched into orbit using rockets.

Density: Mass of a unit volume of a material substance.

Satellite: An object that has been intentionally placed into orbit.

Solar System: The Sun and the family of objects that orbit it. The solar system includes things like planets, moons, comets and asteroids.

Orbit: The circular or elliptical path of one object around another. The Sun's powerful gravity holds Earth and the other planets in orbit around it.

Rotate: To turn around a center point or axis. The Earth rotates on its axis.

Sphere: Any round object that has a surface that is the same distance from its center at all points. For example, a ball or globe.

Surface temperature: Surface temperature is the temperature at or near a surface.

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