Science

Class IV

Department of School Education
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Foreword

Today, science is an indispensable discipline of learning that shapes the lives of humankind and their wellbeing. The enduring engagement of people in the scientific world of exploration, inquiry and investigation has culminated in the addition of an ever-growing repository of scientific knowledge and milestones. Through the time, how science works and affects the world has been influencing the way we view and deal with the subject.

Unfortunately, many a times, the subject is seen as very complex and difficult, hard to comprehend and demanding to learn, thereby posing challenges in our effort in instilling scientific beliefs and attitudes in young learners. Such generalisation has influenced the learners to shy away from the experiential learning and the scientific endeavour in favour of a discipline that is perceived to be easier. Therefore, it is time that concerted efforts are pursued in making learning of science a way of igniting the fire of curiosity and investigation in the minds of learners.

Towards making education meaningful and relevant for students, it is imperative to link the scientific concepts to the real world through rigorous engagement of learners in the scientific processes of observation, inquiry, investigation, experimentation and generalisation. The timely revision of science textbooks is an attempt to align learning outcomes with the emerging global view of science and educational philosophies, accentuate the development of scientific skills of doing science, and foster the scientific temper and literacy in young minds. However, the endeavour in science education in our context emanates from the national, social, cultural and religious belief system imperative to nurturing nationally rooted and globally competent citizens who can productively contribute to the nation building initiatives and development of a dynamic global society.

Therefore, it is our sincere hope that the science curriculum provides a limitless avenue for every learner as a young scientist to explore continuously and engage in doing science. The meaningful participation is crucial in the development of transversal competencies of critical thinking, creativity, communication and collaboration along with other essential life skills fundamental to succeed and excel in the 21st century world as productive and socially responsible individuals.

I would like to wish all our teachers and students, a fulfilling social and academic engagement and experiential experiences through enduring and enterprising learning and doing science as part of every learner's life.

Tashi Delek

Kinga Dakpa
Director General

Contents

INTRODUCTION

Science is the study of everything around us, including our body. It includes studies about plants, water, soil, stones, wind, air, and how they work and influence us. We also study about our body, how each part of our body works, and how we can lead a healthy life. We develop a good understanding of our world, ourselves by observing the characteristics of things around us and their patterns by actively engaging in the processes of doing science. This is fundamental to assimilate indispensable scientific knowledge and skills that not only for the well-being of people, natural and social environment but also treasuring and conserving them for the future generations.

Science is the body of knowledge developed through the human activities. The volume of scientific knowledge with which we live and make meaning of this world can be attributed to the hard work of many people whom we call scientists. The contribution of science in the field of medicine and technology has always been a boon for the entire living organism on this Earth. Machines, simple or complicated, help people to work easily. Further, the scientific knowledge and skills developed through the learning of science are vital; making people as critical thinkers whose actions on the environment and society are based on sound scientific ideas and knowledge. This makes people to take good care of the environment and create a peaceful and prosperous society. On the contrary, the accelerated pace of development in the fields of science and technology also brings drastic changes on the Earth in the form of climate changes and human conflicts.

The learning of science, therefore, should equip young minds with the scientific knowledge and skill to make educated decisions in their everyday life. In this context, the study of primary science for class IV to VI is critical in laying a sound foundation. With this in mind, the science textbooks for these classes contain a variety of learning activities, embedded with the basic scientific concepts and ideas instrumental in helping learners to make good sense of the world around them. The basics that the learners acquire in these classes serve as stepping stones to pursue higher studies in the field of science.

The constructivist theory of learning informs the varieties of learning experiences in science for these classes. It ensures the active engagement of learners in the scientific processes and share responsibility in their learning. Rather than learning as a complacent listener waiting for their teachers, learners experience experiential learning through active engagement in the scientific processes.

Scientific Process

The scientific process is an inquiry approach that involves a systematic understanding of the natural and physical world. It forms the basis of experimentation for scientific knowledge. It entails asking relevant questions related to observation, testing ideas

and communicating the findings. Learners in sciences practice the following scientific process:

1. **Observation:** It is the fundamental skill that enables learners to view the world objectively and systematically by using the senses. It consists of gathering information, evidence and ideas about different phenomena. This facilitates learners to compare, contrast and generalise ideas about the world around. These experiences foster inquisitiveness in them.
2. **Questioning:** Reflective and enquiry approach develops the competency to link the known with the unknown ideas. It enhances the ability of the learners to put their observations in the form of a question that is clear, concise, and testable.
3. **Hypothesis:** It is an educated guess and possible explanation about the observation and question. Based on the limited evidence as a starting point, learners carry out further investigation. Therefore, hypothesis is a specific and testable prediction about what may happen in a study.
4. **Design:** It is an experimental set-up that allows investigation of the relationship between variables. This allows learners to manipulate the variables and test whether their prediction is accurate.
5. **Data collection:** It is the systematic observation, measurement and recording of information of various phenomena happening in the experimental set-up. It allows learners to gather evidence to answer stated research questions, test hypotheses, and evaluate outcomes.
6. **Analysis:** It is an interpretation of data through the use of analytical and logical reasoning to determine pattern, relationship and trends. The learner makes sense out of information recorded to establish a relationship between variables, based on which results and conclusions are drawn.
7. **Conclusion:** It is the step where the learner makes generalisation of the information based on the data analysis and interpretation. The generalisation may or may not support the hypothesis. This facilitates learners to develop the skills of articulating diverse information to draw a comprehensive conclusion about the phenomena.
8. **Sharing:** This is the final step wherein the learner presents their findings in the form of a final report, display or presentation as asked by the subject teacher. The learners explore and learn to use different forms of communication such as graphic, audio, visual, etc. to share their ideas or findings.

Based on the premise that, no book, by itself, can make learner gain knowledge and skills unless the learner meaningfully engages himself or herself with its contents, each topic has several activities that learners are required to do in fulfilling the learning

objectives outlined in the syllabus. Therefore, this textbook is developed based on the following learning experiences and plans.

Textbook content

The elements of textbook are arranged in the following sequence.

1. **Test Yourself:** This is to check what learners already know about the topic to be taught. This helps the teacher to understand the diverse experiences and knowledge of learners on the topic.
2. **You already know:** Set of questions provided to recapitulate the earlier ideas and scientific concepts learnt or known on the topic from the earlier lessons. This is to ensure that the teacher takes into consideration of the prior knowledge and experiences of learners in planning the teaching.
3. **You will learn:** This lists the expected learning objectives to be achieved in the lesson. At the end of the lesson, one can use this list to evaluate the learning.
4. **Learning activities:** This describes how the learning activities are carried out, either individually or in groups, and things needed for each activity in making generalisation of the scientific phenomena.
5. **Check your progress:** The questions determine the progressive learning of learners on the topic. The results help learners and teachers determine interventions needed in learning.
6. **Think again:** This part is to check the understanding and learning of learners on the chapter. It has different type of questions to test learning in terms of scientific knowledge, skills, and values and attitude towards science and the society.
7. **Do you know:** Wherever relevant, there is additional information provided as "Do you know" to add to your general knowledge in science. This is not for testing.
8. **Community involvement:** To vary the teaching process, wherever relevant, local community is invited to take science classes to share the local knowledge on various topics. This is to help learners keep abreast of the local knowledge vital in conserving the local knowledge and practices which, if not preserved, can disappear from the society.
9. **Model Question:** The model question paper with the sample answers is provided at the end of the textbook to help learners to understand the type of questions that are expected in the summative assessment. This also provides the cue of the range of cognitive levels of learning, skills, and the values and attitudes that the science curriculum are expected to achieve.

The science as a body of knowledge and as one of the essential learning areas in school education stimulates learners to wonder and explore extensively in the field of science and technology. Through the active engagement in scientific processes, learners develop the 21st century education skills of critical thinking, creativity, collaboration and communication. These skills are inter-disciplinary and transferable into other learning areas and influence the intellectual development and overall performance of learners in school education.

In spite of the noble intention of every textbook, it has the limitation of fostering inspirational and experiential science learning. Cognizant of meaningful doing of science transcends beyond the science classroom and textbooks, it is imperative that both teachers and learners explore to use diverse resources and strategies of teaching and learning science through all grades and lessons.

STEM Unit

Royal Education Council

CHAPTER 1

Materials in Our Surrounding

1.1. Everyday Materials

Test Yourself

1. Name two things that we use while brushing our teeth.
2. Name five things that we use everyday.
3. What are the uses of five things you have named?
4. Name two things that we get from animals.
5. What is a chair made up of?

You already know:

- different things that we use everyday.
- different things are used for different purposes.

You will learn:

- things are made up of materials.
- group of materials.

A. Every day we see and use different things made up of different materials as shown in Figure 1.1.

Wooden table

Steel pot

Earthen pot

A steel plate

A wooden bowl

Plastic plates

Figure 1.1. Things we use everyday.

In Figure 1.1 the table and a bowl are made up of wood, the pot is made up of clay or metal, and the plate is made up of metal or plastic.

Work in groups

Your teacher will provide you a list of things.

Copy Table 1.1 in your notebook. Classify the list of things into different groups.

Table 1.1 *Classifying Things*

Plant Product	Animal Product	Metal	Plastic	Rock	Glass

Present your work to the class.

Which material is used to make a mirror?

Name two things which are made of metal.

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B. Work in pairs

Look around your classroom.

Make a list of five things that you see. Name the materials they are made up of.

Share your findings with other pairs.

Check Your Progress

i. List ten things that you find at home.
ii. Write down their uses.

1.2. Sorting Materials

Test Yourself

1. What is a bottle made of?
2. Name a few materials used to build houses.
3. Name five things made of wood.
4. Give two examples of materials that we can see through.
5. Why are plastic bags easily blown away by the wind?

You already know:

- stones are used to build houses.
- wood is used to make tables and chairs.
- bottles are made from plastic or glass.

You will learn:

characteristics of materials like:

- heavy.
- light.
- transparent.
- opaque.

A. You see many things around you. You might have seen papers being blown away by wind but not the stones. You can clearly see through the glass window but not through the walls of your classroom.

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Work in pairs

Use MS Word to create Table 1.2. Sort the classroom objects under different materials.

Table 1.2 *Classifying Objects*

Material	Wood	Glass	Plastic	Cloth	Paper	Metal
Classroom objects						

Which material is mostly used in making the classroom objects?

What materials are used other than the ones given in Table 1.2?

B. Work in groups

Use the list of objects given in the box.

1. Identify the materials that are used to make the objects.
2. Sort these materials into heavy and light materials.
3. Copy and write them in Table 1.3.

ruler, eraser, pencil, pen, book, window pane, curtain, broom, wall, table, chair, duster, chalk, light bulb, chalkboard, door hinge, floor, bag, shoes and dust bin.

Heavy and light are the two characteristics of materials.

Now sort these materials into transparent (can be seen through) materials and opaque (cannot be seen through) materials. These are two other characteristics of materials.

Observe and feel the classroom objects. Identify two more characteristics of materials.

Table 1.3 *Characteristics of Material*

Characteristic	Material from which Classroom Object are Made
Heavy	metal, stone
Light	
Transparent	
Opaque	
.....	
.....	

What do you mean by characteristic of material?

Write the characteristics of a feather.

Check Your Progress

i. Define the terms transparent and opaque in your own words.

ii. Sort the objects given below. Copy and complete Table 1.4.

cotton, spade, plastic bottle, crowbar, wool, leaf, hammer, log, axe, stones, paper, and feather.

Table 1.4 *Classifying Objects into Heavy and Light*

Heavy Object	Light Object

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1.3. Floating and Sinking

Test Yourself

1. Which is heavier: a pencil or a book?
2. Name three objects we use everyday that float in water.
3. What will happen if a paper boat is placed in a bucket of water?
4. What will happen when a small stone is put in a beaker of water?
5. Why do some objects float while others sink in water?

You already know:

- paper boat floats on water.
- stone sinks in water.
- different things that we use everyday.

You will learn:

- objects that sink and float in water.

A. Work in groups

You may need:

- a bucket of water.

Collect some small objects that you find in and around your classroom. Some of the objects are shown in Figure 1.3(a). Predict whether the objects float or sink in water and write your prediction after copying table 1.5.

Now, put them in water one at a time as shown in Figure 1.3(b).

Observe whether they float or sink in water and record your observation in table 1.5.

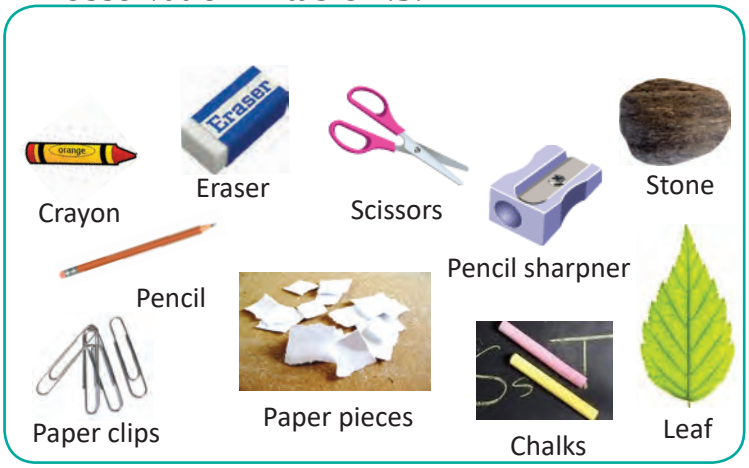

Figure 1.3 (a). Objects

Figure 1.3 (b). Objects in bucket of water

Table 1.5 *Floating or Sinking Objects*

Object	Prediction	Observation

Why do some objects float?

Why do some objects sink?

B. Design and carry out an experiment to find whether an object filled with air floats or sinks.

Write about your experiment and include the followings:

what you needed.

what you did.

what you observed.

what are the variables you have identified.

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Check Your Progress

i. Why does a football float in water?

http://www.primaryresources.co.uk/science/science4b.htm

1.4. Natural and Human-made Things

Test Yourself

1. Mention a few things heavier than the science textbook.
2. Name the materials used to make the things mentioned in question 1.
3. Name one natural thing.
4. Name a few things made by human beings.

You already know:

- things are made from different materials.
- people make many things to use in their daily lives.

You will learn:

- natural and human-made things.
- raw materials.

A. We find many things in nature. For example: the sun, the moon, stones, trees, water, etc. These things exist or occur in nature and are called **natural things**.

There are other things like bicycles, cars, pens, shoes, bags, etc., made by humans from natural materials as shown in Figure 1.4. These things are called **human-made things.**

Bicycle

Books

Bag

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Pens

Car

Shoes

Figure 1.4. Human-made things.

Work in groups

Copy and complete Table 1.6. List five natural things and five human-made things that you see in your school campus.

Table 1.6 *Natural and Human-Made Things*

Natural Thing	Human-made Thing
1. 2. 3. 4. 5.	1. 2. 3. 4. 5.

Write one difference between natural and human-made things.

B. Natural things can be used to make human-made things.

Materials from which other things can be made are called **raw materials**. To build a house; we need raw materials such as wood, stone, and mud.

Name the raw materials required to make the following things:

- paper
- pen
- **gho** and **kira**
- table
- brick

Use presentation software and share your work in the class.

Make your favourite toy and display it in the class.

List the raw materials you used.

Do You Know?

Nylon *was the first synthetic material developed in 1935. Nylon materials are much stronger than other natural materials.*

Check Your Progress

i. What are natural things? Give two examples.

ii. What are human-made things? Give two examples.

iii. List the raw materials you get from the forest to build a house.

iv. What are the raw materials made by human, which are used to build a house?

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1.5. Degradable and Non-degradable Things

Test Yourself

1. What is paper made from?
2. Is paper a natural or a human-made thing?
3. What will happen to the food kept in open for a long period?
4. Which one do you think will decay faster, a plastic or a paper?
5. Why is it important to dispose waste properly?

You already know:

- materials we use everyday.
- things are made of different materials.
- natural and human-made things.

You will learn:

- degradable and non-degradable things.

A. Pieces of dead plant and animal waste decay in the soil. Find out the meaning of 'decay' in the dictionary.

Worms and insects in the soil help things decay. Worms and insects are organisms.

There are other organisms in the soil which cause decay. Some of them are so small that you cannot see with our naked eyes. These are called **micro-organisms**. Some kinds of micro-organisms are bacteria and fungi as shown in Figure 1.5.

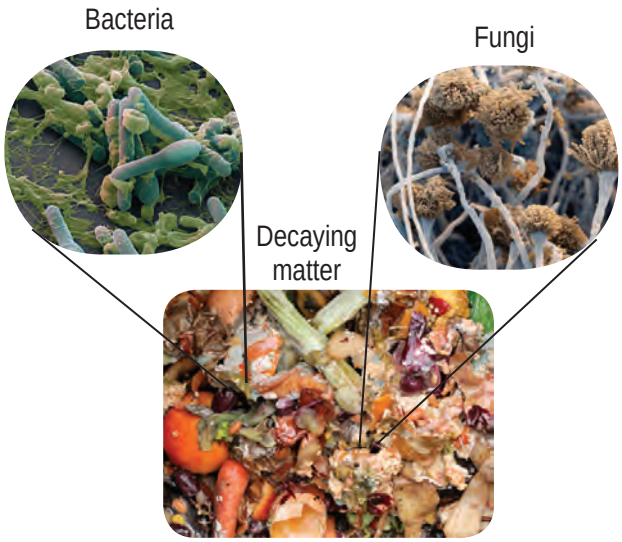

Figure 1.5. Micro-organisms in decaying matter.

Work in groups

You will need:

- jar, bread, water, and hand lens.

Follow the steps as shown in Figure 1.6.

Step 1: Put a slice of bread in a jar.

Step 2 : Sprinkle some water.

Step 3 : Cover the mouth of the jar with the lid. Keep the jar in a warm place. Leave it for a week.

Step 4 : Observe the bread using a hand lens everyday for a week.

Figure 1.6. Observing micro-organism.

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What do you see on the bread?

What happens to the bread?

Design a control experiment.

B. Things that decay are called **degradable**. Things that do not decay are called **non-degradable**. Both degradable and non-degradable things form waste. However, non-degradable waste pollutes the environment.

Which of the following things in Figure 1.7 are degradable and non-degradable?

Figure 1.7. Degradable and non-degradable things.

C. Find out what type of materials make compost.

Dig two small pits.

Go around the school campus and collect the waste materials.

Put plant and animal wastes in one pit (Pit 1).

Put plastic bottle, plastic bag and pieces of metal in the other pit (Pit 2).

Cover the pits with soil. Check the pits after every two weeks and note the changes, such as colour, size and smell.

Copy Table 1.7 and fill it in.

Table 1.7 *Observing Decay*

Pit	Waste Material	Changes Observed			
		Day 1	After 2 Weeks	After 4 Weeks	After 6 Weeks
Pit 1					
Pit 2					

In which pit did the materials decay?

Which ones are degradable materials?

Which ones are non-degradable materials?

Where can we use the compost?

Why should we have separate pits for degradable and non-degradable wastes?

Check Your Progress

i. Define degradable and non-degradable things.

ii. What causes decay?

http://www.biology4kids.com/files/micro_main.html

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THINK AGAIN

1. Fill in the blanks.
   a. Things that are made by humans are called _____.
   b. Small organisms which we cannot see with our naked eyes are called_____.
   c. An example of a non-degradable thing is_____.
   d. Materials from which other things can be made are called_____.
   e. Stone and iron nail sink in water because they are _____.
2. Write one difference between degradable and non-degradable things.
3. Why is glass a good material for window panes?
4. Why are plants and animals natural things?
5. Plastic is a handy material, but using plastic is bad for the environment. Why?
6. Why do people use rubber tube while swimming?

CHAPTER 2

Matter

2.1. What is matter?

Test Yourself

1. Differentiate degradable and non-degradable things.
2. Name two objects which sink in water.
3. What is a human-made things?
4. Name two objects that occupy space.
5. Do these objects have mass?

You already know:

- different things we use everyday.
- heavy and light things.
- degradable and non-degradable things.

You will learn:

- matter has mass and occupies space.

A. Book, pen, cow, table, dog, man, chair, rose, plant, tree, duster, chalk are all examples of matter.

Matter is anything that has mass and occupies space. **Mass** is the quantity of matter contained in a body. Mass of an object is measured with the help of a pan balance as shown in Figure 2.1.

Give five more examples of matter.

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B. Does matter have mass?

Work in groups

You may need:

- pan balance or any other balance.
- lock or any other objects.

Figure 2.1. Pan Balance.

Take a pan balance.

Take the lock and place it on a pan balance. The needle moves.

What does the movement of the needle show?

Remove the lock from the pan balance and place it on a new page of your note book.

Draw the outline of the lock as shown in Figure 2.2.

Figure 2.2. Drawing outline of a lock.

Do You Know?

Every object in the universe from elephant to dust particle is a matter.

Does it occupy any space?

Is lock a matter? Give reasons.

Now your teacher will provide you a set of objects.

Find whether they are matter.

Check Your Progress

a. Is shadow a matter? Why?

b. Give two characteristics of a matter.

2.2. Is solid a matter?

Test Yourself

1. What is matter?
2. What is the use of a pan balance?
3. How do we determine that an object is a matter?
4. Give three examples of solids.
5. Is paper a matter?

You already know:

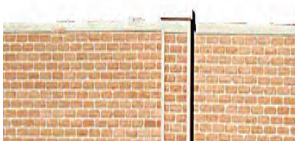
- matter has mass and occupies space.

You will learn:

- solid as one of the forms of matter.

A. Look at the pictures in Figure 2.3.


Stone


Wall


Chair


Pencils


Bricks


Table


Books

Figure 2.3. Solids.

They are all solids.

Let us investigate that solid occupies space.

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Work in groups

You may need:

- measuring cylinder
- stone
- water
- thread

Put some water in the measuring cylinder.

Place the measuring cylinder on a flat surface.

Record the level of the water.

While recording, read the level of water by viewing the cylinder at eye level as shown in Figure 2.4.

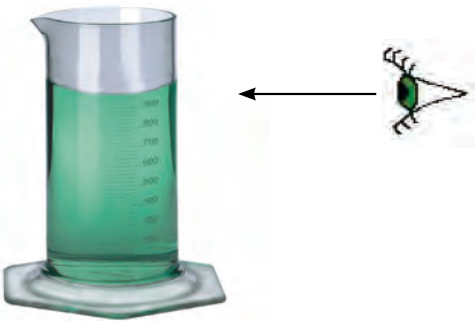

Figure 2.4. Reading the meniscus.

The curve seen at the surface of the water in the measuring cylinder is called meniscus.

Look at the lowest point of the meniscus while reading the volume.

Now slowly lower the stone into the water with the help of a thread as shown in Figure 2.5.

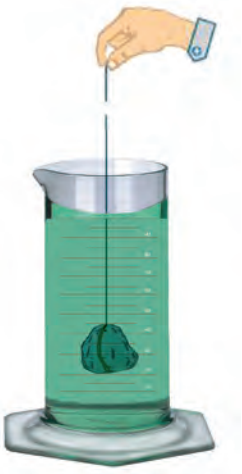

Figure 2.5. Change in volume.

What happens to the level of water on lowering the stone in the cylinder?

Why does the level of water in the cylinder change?

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B. Work in groups

Design and carry out an experiment to prove solid as a matter.

You may need:

- Pan Balance
- Thread
- Measuring cylinder
- Any solid

Write:

what you did.

what you observed.

Check Your Progress

i. Are all solids matter? Why?

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2.3. Is liquid a matter?

Test Yourself

1. Give three examples of liquid that you use at home.
2. Why is solid a matter?
3. What is mass?

You already know:

- all solids are matter.

You will learn:

- liquid as one of the forms of matter.

A. Look at the pictures in Figure 2.6.

Water Milk Rain Oil Kerosene

Figure 2.6. Liquids.

They are all liquids.

Let us investigate if liquid has mass.

Work in groups

You may need:

- empty bottle
- pan balance
- water

Take an empty bottle.

Place it on a pan balance as shown in Figure 2.7.

Figure 2.7. Pan balance.

Copy Table 2.1 in your notebook and record the mass of the empty bottle.

Now fill water in the bottle and weigh again.

Record the mass of bottle filled with water in the table.

Table 2.1 *Mass of Liquid*

Mass of Empty Bottle	Mass of Bottle Filled with Water	Mass of water

What is the mass of the water?

B. Work in groups

Design and carry out an experiment to show that liquid occupies space using water and empty containers.

Write:

what you needed.

what you did.

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what you observed.

is water a matter? Why?

Check Your Progress

i. Name four liquids that you use other than water.

ii. Are all liquids matter? Why?

2.4. Is gas a matter?

Test Yourself

1. Why is liquid a matter?
2. Mention two similarities between a solid and a liquid.
3. What is present inside an inflated balloon?
4. Give two examples of gas.

You already know:

- solid is a matter.
- liquid is a matter.

You will learn:

- gas has mass and occupies space.
- gas is a form of matter.

A. When incense sticks are burnt, dense white fumes are seen coming from it. This is an example of a gas.

Does gas have mass?

Work in groups

Set up the experiment as shown in Figure 2.8.

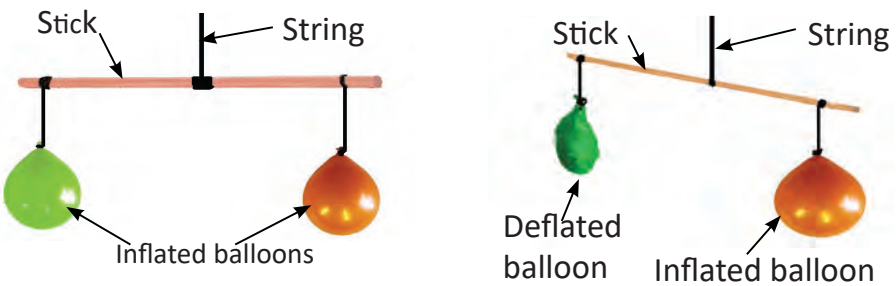

Figure 2.8. Balancing balloons.

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Deflate one of the balloons and observe.

Write:
what you did.
what you observed.

B. Let us have fun with air.

Work in groups

Predict what will happen to a crumpled paper in a beaker as shown in Figure 2.9 when it is placed upside down in a bowl of water.

a. Stay dry
b. Get wet
c. Fall apart
d. Absorb all the water in the bowl

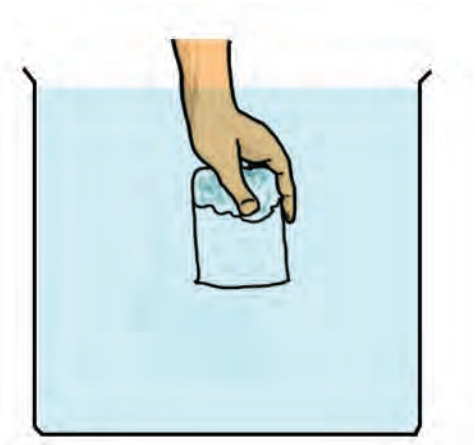


Figure 2.9. Paper in a bowl of water.

Now check your prediction.

Crumple a piece of paper and place it into the bottom of the beaker as shown in Figure 2.9. Make sure it does not fall down when you turn the beaker upside down. Turn the beaker over and push it straight down into a bowl of water.

What happens to the paper? Give reasons.

Plasma is the fourth state of matter. Recently, scientists have discovered many other states of matter such as Bose-Einstein condensate, Quark-gluon plasma, Degenerate matter, etc.

Use internet to explore other states of matter.

Check Your Progress

i. Why is gas a matter?
ii. Are empty bottles really empty?

2.5. Heating and Cooling of Substances

Test Yourself

1. Is ice cream solid, liquid or gas?
2. What happens to an ice cream when it is kept in the sunlight?
3. What will be observed when water is heated?
4. What will happen to water when it is kept in a freezer?
5. Name any everyday material which changes on heating.

You already know:

- solid is a matter.
- liquid is a matter.
- gas is a matter.

You will learn:

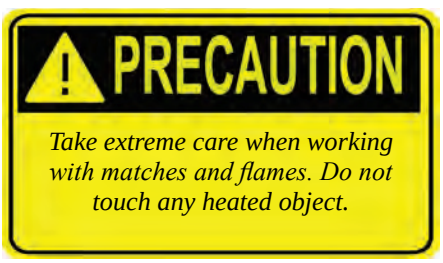
- effect of heating and cooling on substances.

A. All substances change on heating or on cooling. The change can be in colour, taste, size, shape and state.

Work in groups

You may need:

- butter
- test tube
- test tube holder
- spatula



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- spirit lamp
- match box

Take a spatula of butter in the test tube.

Heat it gently over the spirit lamp for about two minutes.

Copy Table 2.2 in your notebook. Observe the changes and record the observation in the table.

Table 2.2 *Heating of Butter*

Characteristic	Before Heating	After Heating
1. Colour 2. State (solid, liquid, or gas)		

Allow the test tube to cool.

What happens to the butter on cooling?

B. Heat can also bring about changes in liquids.

Your teacher will demonstrate the changes that occur on heating a liquid.

List the materials used by the teacher in the demonstration.

Write the steps involved in the demonstration.

What happens to the liquid when heated?

Many people use refrigerators at home to preserve food at low temperature. When liquids such as water, milk, fruit juice, etc., are kept in the freezer, they change into solids.

C. Gas expands on heating and contracts on cooling.

Work in groups

You may need:

- balloon
- beaker
- hot water
- test tube

Fix a balloon on the mouth of a test tube tightly.

Now place the test tube into a beaker containing hot water.

Keep it for some time.

What happens to the size of the balloon?

Why does the size of the balloon change?

Now remove the test tube from the beaker and cool it.

What do you observe?

What happens to the gas inside the balloon?

Check Your Progress

i. What will happen when ice is heated?

ii. What will happen when gas is heated?

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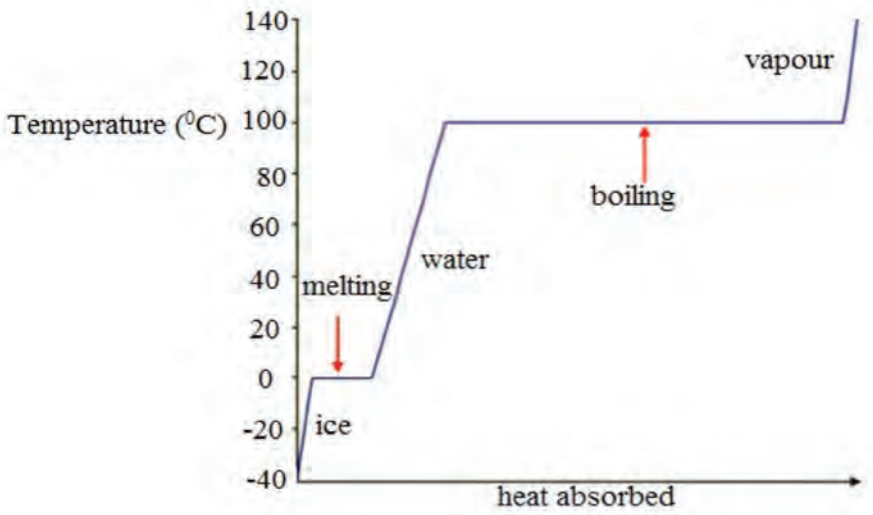
THINK AGAIN

1. State whether the following statements are TRUE or FALSE.
    i. Matter has mass and occupies space.
    ii. Gas expands on heating.
    iii. The level of water in a beaker decreases when a stone is immersed into it.
    iv. Milk is a solid form of matter.
    v. Pan balance is used for measuring weight.
2. Classify the following as solid, liquid, and gas.

    book water pencil smoke air kerosene

3. Give two examples of non-matter.
4. Give two properties that are common in all matter.
5. What is meniscus?
6. How will you measure the volume of a liquid correctly in a measuring cylinder?

7. The graph below represents the change of state of water at different temperatures. Answer the questions that follow:



a. Should the temperature increase or decrease for water vapour to change into water?

b. At what temperature does water change into ice?

c. What is the boiling point of water?

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CHAPTER 3

Materials in Mixture

3.1. Pure Substance and Mixture

Test Yourself

1. What are different forms of matter?
2. Give an example for different forms of matter.
3. Name an object made up of different materials and name the materials..
4. What is a mixture?
5. What is the substance called when it is free from impurities?

You already know:

- different materials we use everyday.
- things are made up of different materials.

You will learn:

- differences between pure substance and mixture.

A. Most substances around us contain impurities.

Impurities are substances which lower the quality of another substance or make it dirty.

Example: Rice contains impurities like stones, husk, and sand.

Air contains impurities like smoke, dust particles, and water vapour.

Name two more substances that contain impurities.

A substance consisting of two or more different substances mixed together is called **mixture**.

A substance which contains impurities is called **impure substance**. An impure substance is a mixture.

A pure substance is made up of a single substance.

Sugar, iron, gold are some examples of **pure substances.**

B. Work in groups

You may need:

- beaker
- watch glass
- glass rod
- tea spoon
- water
- salt
- measuring cylinder

Take two beakers with 20 mL of water in each.

Label them as beaker A and beaker B.

Take some salt in a watch glass.

Add a teaspoon of salt in beaker A.

Stir it to dissolve.

Do not add anything in the beaker B.

Which is a mixture? Why?

Which is a pure substance? Why?

Name two more pure substances that you see in your classroom.

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C. Study the list of substances given in the box.

air water soil cake gold ice cream
sawdust suja tea leaves

Copy and complete Table 3.1.

Table 3.1 *Classifying Substances*

Pure Substance	Mixture

Check Your Progress

i. Why is **ema-datsi** not a pure substance?
ii. Differentiate between pure substance and mixture.

http://www.chem4kids.com/files/matter_mixture.html

3.2. Soluble and Insoluble Substances

Test Yourself

1. Name three things that are used to make tea.
2. Give two examples of pure substance.
3. Give two examples of mixture.
4. What happens when sugar is added to water and stirred?
5. What happens when sand is added to water and stirred?

You already know:

- sugar is used in making tea.
- salt is used in cooking.

You will learn:

- soluble substance.
- insoluble substance.

A. A substance which dissolves in liquid is called **soluble substance**.

A substance which does not dissolve in liquid is called **insoluble substance**.

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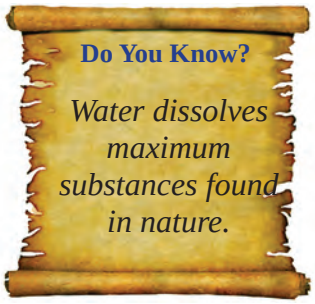
Work in groups



You may need:

- beaker
- water
- measuring cylinder
- glass rod
- sugar, chalk powder, copper sulphate, glucose, and flour.

Predict how many substances are soluble in water.

Copy Table 3.2 and record your predictions.

Table 3.2 *Investigation of Soluble and Insoluble Substances*

Name of Substance	Prediction before Experiment	Observation after Experiment
Sugar		
Chalk powder		
Copper sulphate		
Glucose		
Flour		

Now take a pinch of sugar in a beaker and add 100 mL of water.

Stir the mixture with glass rod.

Similarly, make the mixture of each substance and water in separate beakers.

Record your observation in Table 3.2.

How many predictions were correct?

Name two other substances that are insoluble in water.

Check Your Progress

i. Define soluble substance. Give one example.

ii. Define insoluble substance. Give one example.

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3.3. Solid-solid Mixture

Test Yourself

1. What is a pure substance?
2. Give two examples of insoluble substance.
3. Name one solid which does not dissolve in water.
4. What is formed while mixing two or more substances together?
5. Give an example of a mixture that contains two solids.

You already know:

- soluble substances.
- insoluble substances.

You will learn:

- solid-solid mixture.

A. A mixture is formed by mixing of two or more substances. If two or more solids are mixed, the mixture formed is called **solid-solid mixture**.

Mixture of sand and gravels

Mixture of sweets and candy

Figure 3.1. Solid-solid mixture.

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Work in groups

You may need:

- rice
- maize
- gravel
- peas

Mix rice and gravel, rice and maize, gravel and peas, maize and peas.

What kind of mixtures are these?

Mix rice, gravel, maize, and peas.

What kind of mixture is this?

Give some more examples of such type of mixtures.

B. List five different solid-solid mixtures.

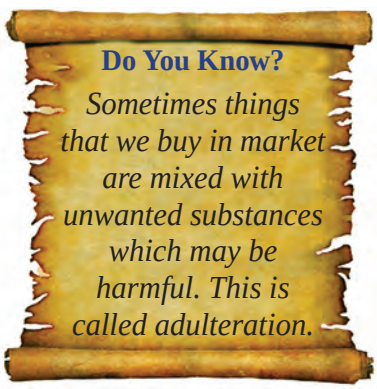
Share your list of mixture with the class.

Check Your Progress

i. Define solid-solid mixture.

ii. Give two examples of solid-solid mixtures that you find at your home.

https://www.science-sparks.com/making-mixtures/



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3.4. Solid-liquid Mixture

Test Yourself

1. What type of mixture is tea leaves and salt?
2. Name one soluble substance.
3. Is salt in water a mixture?
4. Give two examples of mixture that contain solid and liquid.
5. What is the mixture of solid and liquid called?

You already know:

- solid-solid mixture.
- some solids dissolve in liquid.

You will learn:

- solid-liquid mixture.

A. Work in groups

You may need:

- beaker
- teaspoon
- glass rod
- rice
- water
- measuring cylinder

Take 50 mL of water in a beaker and add a teaspoon of rice to it.

Stir it with the help of a glass rod.

What do you observe?

Is this a mixture? Why?

When any solid is mixed with a liquid, it forms **solid-liquid mixture.**

Name some more examples of such mixtures.

B. Design and carry out an experiment to show solid-liquid mixture using ammonium chloride and water.

Write:

what you needed.

what you did.

what you observed.

How is the mixture in this experiment different from the mixture obtained in the previous activity?

Check Your Progress

i. Define solid-liquid mixtures. Give two examples.

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3.5. Liquid-liquid Mixture

Test Yourself

1. Give three examples of liquids.
2. What is solid-liquid mixture?
3. Does oil mix with water?
4. What is the mixture called when milk and water are mixed?
5. Give two examples of mixture containing two or more liquids.

You already know:

- solid-solid mixture.
- solid-liquid mixture.

You will learn:

- liquid-liquid mixture.

A. If two or more liquids are mixed, the mixture formed is called **liquid-liquid mixture**.

Work in groups

You may need:

- test tube
- dropper
- juice/milk
- water

Take half a test tube of water.

Add 3-5 drops of juice/milk into it with the help of a dropper.

Shake the test tube.

Does juice/milk mix with water?

What type of mixture is this?

Name some more examples of such type of mixtures.

B. Carry out an experiment to show liquid-liquid mixture using oil and water.

Write:

what you needed.

what you did.

what you observed.

Does oil mix with water?

Can it be called a liquid-liquid mixture? Why?

Check Your Progress

i. Define liquid-liquid mixture.

ii. Give two examples of liquid-liquid mixture that we use in our day to day life.

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Think Again

1. State whether the following statements are TRUE or FALSE.
   i. Chalk powder is a soluble substance.
   ii. Oil and water is a liquid-liquid mixture.
   iii. Sand and sugar is a solid-liquid mixture.
   iv. Dissolving of salt in water is a solid-liquid mixture.
   v. A mixture contains different types of pure substances.
2. Is orange squash a mixture? Why?
3. What type of mixture is tea that we drink?
4. What do you observe when you open a bottle of fizzy drink? What type of mixture is it?
5. Differentiate between soluble and insoluble substances.
6. What is a pure substance? Give two examples.

CHAPTER 4

Separating Mixture

4.1. Sedimentation and Decantation

Test Yourself

1. What is a soluble substance?
2. Give two examples of liquid-liquid mixture.
3. Give two examples of solid-solid mixture.
4. What will happen if sand is put in water?
5. Can the mixture of sand and water be separated easily?

You already know:

- solid-liquid mixture.
- soluble and insoluble substances.

You will learn:

- sedimentation and decantation.

A. Substances that we eat, drink, or use contain soluble and insoluble substances. Some of them are not useful to us and some may even be harmful. Therefore, we need to remove them.

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Work in groups

You may need:

- beaker
- watch glass
- glass rod
- mud
- water

Take 100 mL of water in the beaker.

Add some mud into it and stir.

Let the beaker stand undisturbed for three to five minutes.

What do you observe?

Is mud soluble in water?

The mud that settles at the bottom is called **sediment**.

The settling of solid at the bottom of liquid in a container is called **sedimentation**. The process of sedimentation is shown in Figure 4.1.

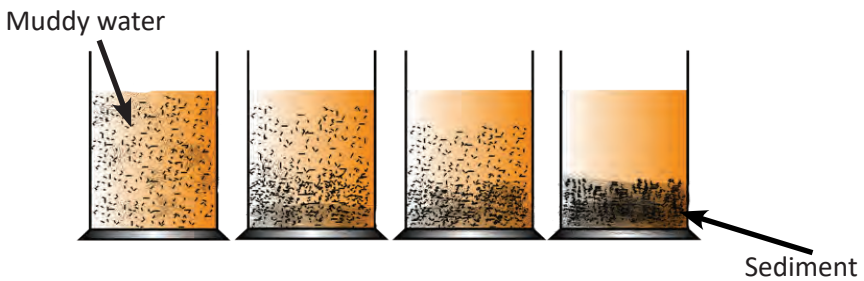

Figure 4.1. Sedimentation.

Now look at the Figure 4.2.

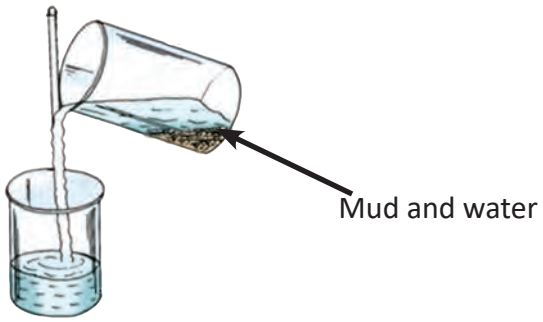

Figure 4.2. Decantation.

How is water separated from the mixture of sand and water?

What precaution should you take?

Why do you use the glass rod?

The method of separating an insoluble solid by pouring the liquid carefully, leaving the sediment is called **decantation**.

Check Your Progress

i. What is sedimentation?

ii. What is decantation?

WEBLINK

http://www.ekshiksha.org.in/eContent-Show.do?documentId=77

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4.2. Separating Insoluble Substances by Sedimentation and Decantation

Test Yourself

1. Give one example of soluble substance.
2. Give one example of insoluble substance.
3. If a mixture of soil and water is kept undisturbed for some time, what will happen to the soil?
4. What type of mixture is commonly separated by decantation.
5. How would you separate insoluble substance from a mixture?

You already know:

- sedimentation and decantation.
- some substances are insoluble in water.

You will learn:

- separating insoluble substances by sedimentation and decantation.

A. Work in groups

You may need:

- beaker
- water
- rice
- glass rod
- cup

Take a cup of rice and put it in a beaker of water.

Stir it.

Allow it to stand for one minute.

What do you observe?

How will you separate water from rice?

B. Work in groups

You may need:

- water
- tea leaves
- sugar
- chalk powder
- sawdust
- beaker
- glass rod

Prepare the following mixtures.

Tea leaves and water.

Sugar and water.

Chalk powder and water.

Sawdust and water.

Find out which mixtures can be separated by sedimentation and decantation.

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Check Your Progress

i. Why is it possible to separate cheese from whey?

ii. Copy Table 4.1 and write the difference between sedimentation and decantation.

Table 4.1

Sedimentation	Decantation

4.3. Separating Insoluble Substances by Filtration

Test Yourself

1. Give two examples of mixture that can be separated by sedimentation and decantation.
2. What is the difference between sedimentation and decantation?
3. In summer, drinking water is usually muddy. How would you make it clear and clean?

You already know:

- sedimentation and decantation as method of separation.

You will learn:

- separating insoluble substances by filtration.

A. You have learned that muddy water can be separated by the process of sedimentation and decantation.

By decantation, a liquid is not completely separated from an insoluble solid.

The better method to separate insoluble solid mixed in a liquid is **filtration**.

In the laboratory, filtration is done with the help of a filter paper which is a special type of paper with pores in it.

The liquid can pass through the holes of the filter paper but the solids are held back on the filter paper. The liquid that passes through the filter paper is called **filtrate**.

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The solid left behind on the filter paper after filtration is called **residue.**

Your teacher will demonstrate how to fold a filter paper correctly as shown in Figure 4.3 and use the filter paper for the process of filtration of muddy water as shown in Figure 4.4.

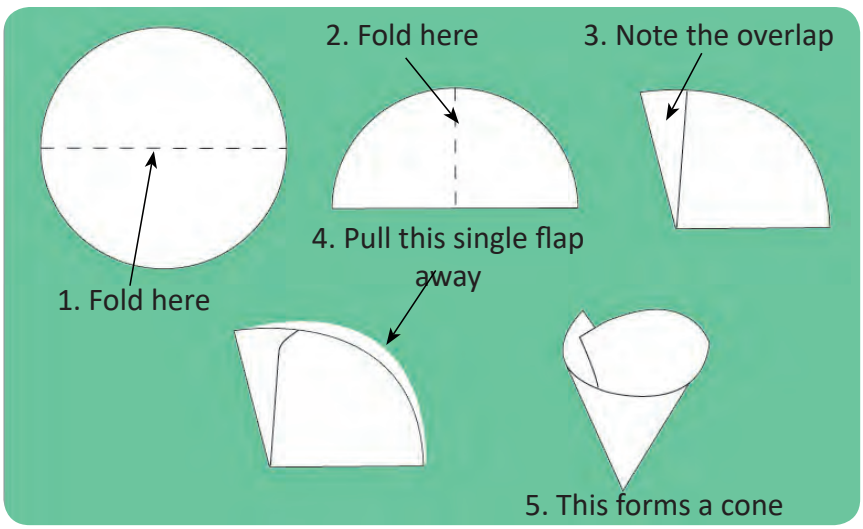

Figure 4.3. Steps for folding filter paper.

List down the materials used by your teacher for filtration.

What was collected on the filter paper?

What is the colour of the filtrate?

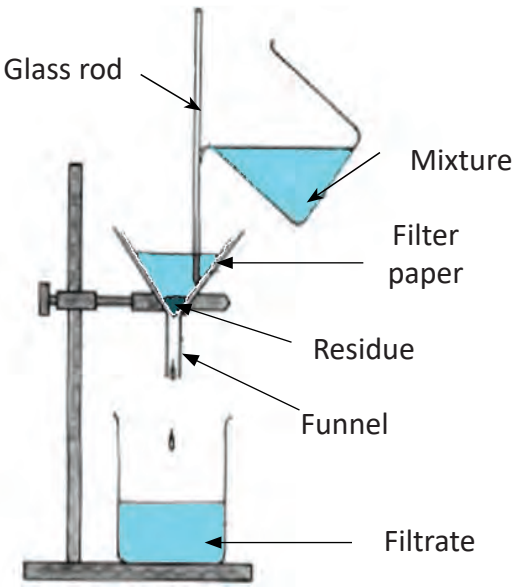

Figure 4.4. Filtration.

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B. Work in groups

You may need:

- filter paper
- beaker
- funnel
- stand
- glass rod
- spatula
- mud
- water
- measuring cylinder

Do You Know?

Clean water can save 4.6 million children who die each year of diarrhoea. Clean water improves health and sanitation.

Fold a filter paper correctly as shown in Figure 4.3.

Now arrange the materials as shown in Figure 4.4.

Take 10 mL of water in the beaker.

Add a spatula of mud in it and stir.

Carry out the filtration.

What do you get on the filter paper?

What is the colour of the filtrate?

Is filtration a better process than sedimentation and decantation? Explain.

Check Your Progress

i. What is a filtrate?
ii. What is a residue?
iii. What is the importance of filtration?

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4.4. Making Water Safe for Drinking

Test Yourself

1. What is filtration?
2. Give one example of mixture that can be separated by filtration.
3. Describe the process of filtration.
4. Name two methods to make water safe for drinking.
5. Name a method used at home to make water safe for drinking.

You already know:

- process of filtration.

You will learn:

- making water safe for drinking

A. Bhutan has freshwater flowing from snow-capped mountains.

Although this water is clean at the source, on the way downstream people and animals use it for various purposes.

This makes the water unsafe for drinking.

Discuss in groups.

Figure 4.5

1. What is the boy in the figure 4.5. doing?
2. Is it good to throw waste in water?
3. Is this water safe to drink? Why?
4. What are other ways by which water gets contaminated?
5. How can we make the water safe for drinking?

In many houses, we use special water filters to remove impurities from water. This generally makes the water safe for drinking.

B. Follow the steps given in Figure 4.6 and design a water filter that can be used at home.

You may need:

- water bottle with cap
- nail
- charcoal
- knife

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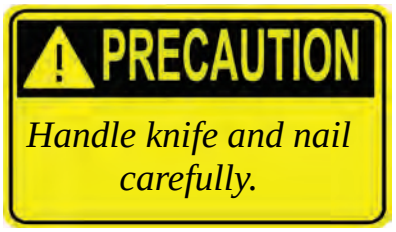
- sand
- gravels
- cloth piece

Figure 4.6. Designing water filter.

Show your home made filter to your teacher.

Discuss the use of charcoal, sand and gravel in your filter.

Is your water safe for drinking? Why?



Check Your Progress

i. Why is it unsafe to drink water straight from the tap?

ii. What can you do to keep water clean?

WEBLINK

http://hendrika.hubpages.com/hub/Homemade-Water-Filtration-Using-Charcoal-And-Sand

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THINK AGAIN

1. Match item of Column A with the correct answer in Column B

Column A	Column B
1. Separates insoluble solid mixed in a liquid	a. Decantation
2. Solid left behind after filtration	b. Sedimentation
3. Separating by pouring out the top liquid	c. Pure substance
4. Heavy materials settle down	d. Filtration
5. Same kind of substance	e. Residue

2. The following are the steps to obtain clear water from a bucket of muddy water. Arrange the steps in the correct order.

   (filtration, sedimentation, decantation)

3. Explain why decantation cannot be used to separate the mixture of salt and water.
4. Define the terms:
   a. Filtration
   b. Sedimentation
5. Why is it advisable to boil and filter water before drinking?
6. Why is diarrhoea common among children during summer?
7. A teacher provides a student with 150 mL of water containing sand and sawdust. Write the steps that you will use to separate the water, sand and sawdust.

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CHAPTER 5

Force

5.1. Let us Look at Forces

Test Yourself

1. How do you open the door when you enter the house?
2. How do you pass a football to your friend?
3. How can you move an object with hands?
4. What would you do to lift a bucket of water from a tank?
5. Will it be easier to push a log or to pull a log?

You already know:

- many objects move in our surroundings.
- objects move when we push or pull.

You will learn:

- push and pull as force.

A. When we look around us, we can see leaves falling from trees, prayer flags fluttering in the wind and people moving lots of things. What causes things to fall, flutter and move?

Work in groups

Look at each picture carefully, given in Figure 5.1.

What do the following pictures represent?

(a)

(b)

(c)

(d)

(e)

(f)

(g)

(h)

(i)

Figure 5.1. Push and pull

Categorise the pictures into Column A and Column B based on pull or push actions. Copy and complete Table 5.1.

Table 5.1 *Pushing and pulling of the Objects*

Column A	Column B
a. People pulling a rope in a tug of war.	b. A woman pushing a wheel chair.

What is the common action in column A?

What is the common action in column B?

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The common action in column A and B describes force.

Now, define force.

B. Work in pairs

In Table 5.2, identify the force applied and write it down in your notebook.

Table 5.2 *Forces in Action*

Sl. No	Action	Force Applied (pull or push)
1	Stretching an elastic band	
2	Throwing a ball	
3	Squeezing toothpaste from the tube	
4	Loading logs onto a truck	
5	Lifting a bucket of water	
6	Kicking a football	

Which one of the above activities would require the maximum force?

What does your body need to pull or push things?

Check Your Progress

i. What causes a football to move when it is kicked?

ii. What makes a plough move?

5.2. What can a force do

Test Yourself

1. What is force?
2. What makes a ball move when it is thrown?
3. What happens to a carom striker when it strikes on carom board?
4. What happens to a piece of paper when you crumple it?

You already know:

- force is push or pull.

You will learn:

- effects of force.

A. We cannot see force, but we can feel and see what it does. The change that force brings on an object is called the **effect of force**. Let us examine the changes that force can bring on objects.

Work in groups

You may need:

- empty plastic bottle
- ball
- marble

Perform the following actions:

a. crumple the plastic bottle
b. kick a ball
c. stop a rolling marble

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Write down the different effects of force you have observed from the activities.

B. In groups come up with some more examples on effects of force. Copy and complete Table 5.3.

Present your work to the class.

Table 5.3 *Examples of Effects of Force*

Effect	Example
Stop a moving object	
Change the shape of an object	
Speed up a moving object	
Start moving an object at rest	
Slow down a moving object	
Change the direction of a moving object	

Check Your Progress

i. Write the changes that a force can bring to an object.

5.3. Contact Force

Test Yourself

1. What can a force do?
2. What is the effect of force when you knead a dough?
3. What is the effect of force when you kick a ball back?
4. Is it possible to kick a football without touching it?

You already know:

- effects of force.

You will learn:

- contact force.

A. Can you perform the following activities without touching?

i. move a table

ii. close a door

iii. lift your bag

iv. clean the chalkboard

What should you do to carry out the above activities?

When we touch an object to move, a force is applied. This force is called **contact force**.

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B. Think at least four examples of contact force that you come across in your daily life. List down in your notebook.

Check Your Progress

i. What is contact force?

ii. Write three examples of contact force.

iii. How is contact force useful in your life?

5.4. Non-contact Force

Test Yourself

1. What type of force do you apply when you write?
2. Can you move an object without touching it?
3. Give one example of non-contact force.
4. Why do leaves fall from a tree?

You already know:

- Contact force.

You will learn:

- Non-contact force.

A. There is another kind of force called non-contact force. This force helps us to push or pull the objects without touching. Force that act between two bodies even when they are not in contact with each other is called **non-contact force**.

Work in pairs

You may need:

- magnet
- paper clip
- string
- sellotape

Tie a paper clip to a short length of string.

Tape the other end of the string on the table.

Figure 5.2. Non-contact force between magnet and paper clip.

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Bring a magnet close to the clip.

What happens?

Slowly slide the magnet away from the clip separated by about 4 mm as shown in Figure 5.2. Lift and turn the magnet by keeping fixed distance from the pin.

What happens?

The magnet does not touch the pin. The force of the magnet pulls the pin towards the magnet. This force is known as **magnetic force**. Magnetic force is one of the examples of non-contact forces.

B. Throw an eraser in the air.

What happens?

We always see objects falling on the ground. This happens because of the pull of the Earth. The pull of the Earth is called **gravitational force.** Gravitational force is another example of non-contact force.

Check Your Progress

i. What is non-contact force?

ii. Write two examples of non-contact force.

iii. Dechen combs her wet hair and Choki combs her dry hair with same type of comb. Choki is surprised to see her hair stand straight upward as she combs her hair, while Dechen does not experience the same.

a. What type of force exists between comb and Choki's hair?

b. What condition made it suitable for this type of force to act on Choki's hair?

c. Why do you think Dechen's hair is not attracted?

Think Again

1. Fill in the blanks. Use scratch programming prepared by your teacher to answer these questions.
    i. Push or pull on an object is called _____.
    ii. The force that moves things without touching them is called _____ force.
    iii. The _____ force of the Earth is an example of non-contact force.
    iv. Closing the door is an example of _____ force.
    v. The change brought about by a force on an object is called _____ of force.
2. What are the effects of force?
3. Compare contact force and non-contact force.
4. If you kick a ball in the air, will it stay in the air? Why?
5. What happens when a ball of cotton is squeezed?
6. A force can make a moving object stop. Give one example.
7. Where can you use the non-contact force in your life?

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CHAPTER 6

Light and Sound

6.1. Sources of Light

Test Yourself

1. What is the difference between day and night?
2. Why are we not able to see in the dark?
3. What do you use to see in the dark?
4. What helps you to see during the day?
5. What do you use at home to see at night?

You already know:

- light helps us to see in the dark.
- we use torch to see in the dark.

You will learn:

- sources of light.
- use MS Excel to analyse the sources of light in the locality.

A. Sun is the main source of light on the Earth. There are different sources of light we use in our daily lives. We use light to see things in the dark.

Work in pairs

Look at the pictures in Figure 6.1.

Figure 6.1. Things that gives light and that do not.

Copy and complete Table 6.1 given below:

Table 6.1 *Identifying Sources of Light*

Object Which Give Light	Object Which Do Not Give Light

An object which gives out light is called **source of light.**

Which sources of light do you use at home?

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B. Work in groups

Carry out a survey.

Find out the different sources of light used in your locality.

Copy and use Table 6.2 given below to record your information.

Table 6.2 *Different Sources of Light Used in the Locality*

House Number	Light Source Used
1	a. b. c. d.
2	
3	
4	
5	

Which is the most common source of light used in your locality? Why?

Check Your Progress

i. Name two sources of light that are used outside your home.

ii. What is the main source of light on the Earth?

6.2. How Light Travels

Test Yourself

1. Mention two uses of light.
2. Name some sources of light that you use at home.
3. Which source of light is used in your school?
4. Why do you feel cool when you sit under a shade?

You already know:

- sources of light.

You will learn:

- how light travels.

A. Work in pairs

You may need:

- drinking straw
- candle
- matchbox

Place a lighted candle on a table. Hold the drinking straw straight in front of the candle flame.

Look through the other end of the drinking straw.

Can you see the light?

Now bend the straw.

Can you see the light? Why?

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Figure 6.2. Observing light through a straw.

B. Work in groups

You may need:

- cardboard
- candle
- matchbox

Take three cardboards A, B and C each with fine hole at the centre.

Arrange the cardboards and the candle as shown in Figure 6.3

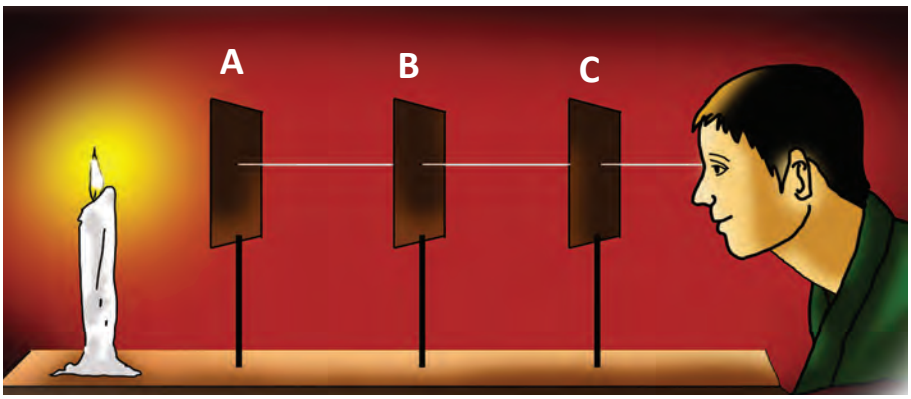

Figure 6.3. Path of light

Look through the hole in cardboard C.

Can you see the flame of the candle?

Move any one of the cardboard slightly from its position.

Look through the hole of cardboard C.

Can you see the flame now? Why?

What can you conclude on the path travelled by light?

Check Your Progress

i. Why are you not able to see the light through a bent straw?

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6.3. Light and Shadow

Test Yourself

1. How does the light travel?
2. When do you see your shadow?
3. Why are you not able to see the Sun on a cloudy day?

You already know:

- sources of light.
- light travels in a straight line.

You will learn:

- formation of shadow.

A. Shadow is formed only when light is present. The darkness of shadow depends on the brightness of the light. Shadow formed by a dimmer light is less dark than the shadow formed by a brighter light.

Work in groups

You may need:

- torch
- tree made from cardboard

Shine the torch at the wall.

Can you see the spot of light on the wall?

Do You Know?

There were no watches in olden days. People could tell the time by looking at the position of shadows made by the Sun.

Place a cardboard tree between the torch and the wall as shown in Figure 6.4.

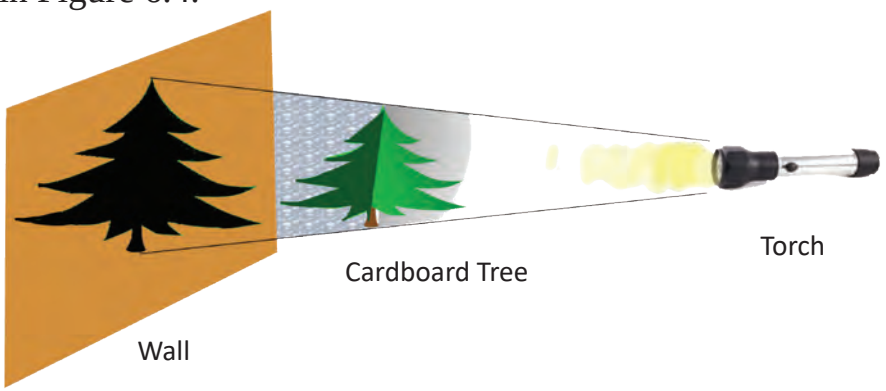

Figure 6.4. Making a shadow.

What do you see on the wall?

The dark shape of the tree that you see on the wall is called shadow. A shadow is formed when light is blocked by an object.

Switch off the torch.

Can you see the shadow now? Why?

What can you say from this investigation?

B. Work in pairs

You may need:

- metre stick/ruler
- clock/watch

Choose a spot in an open ground on a sunny day.

Mark and use the same spot for all the measurements. Measure the length of your shadow in turns.

Figure 6.5. Your shadow.

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Record your measurements in Table 6.3 using MS Excel sheet.

Table 6.3 *Length of Shadow at Different Time of the Day*

Observation Time	Recorded Time	My Guess (length of shadow in cm)	Observed Length (length of my shadow in cm)
8:00-8:30 a.m.			
10:00-10:30 a.m.			
12:00-12:30 p.m.			
2:00-02:30 p.m.			
3:00-04:00 pm			

Plot a bar graph from the information recorded in Table 6.3. Use time on X-axis and observed length of the shadow on Y-axis.

At what time interval of the day is your shadow the longest? Why?

At what time interval of the day is your shadow the shortest? Why?

Check Your Progress

i. Why does the length of the shadow change?

ii. How is shadow formed?

6.4. Making a Sound

Test Yourself

1. What is music?
2. What is produced when the teacher taps on the table?
3. Which sense organ is used for hearing?
4. How can you make a sound?
5. Is whispering a sound?

You already know:

- different sounds in your surrounding.
- you hear sound with your ears.

You will learn:

- vibrations and sound.

A. Sound is a form of energy. It is produced by vibrations.

Go outside the classroom.

Listen carefully for 2 minutes.

Write all the sounds that you hear.

Are all the sounds same?

Place your finger tips gently on your throat. Now speak or sing for about ten to twenty seconds.

What do you feel?

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A vibration is the back and forth movement of an object. When we speak, the **vocal cords** vibrate and produce sound. Figure 6.6 shows the diagrammatic representation of the vocal cords.

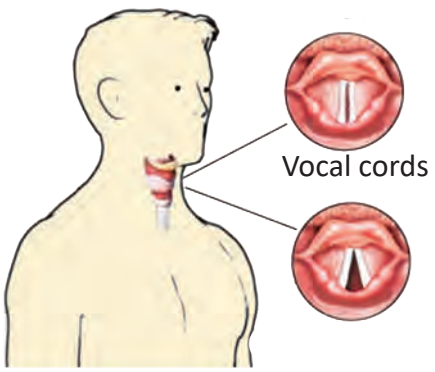

Figure 6.6. Vocal cords.

B. Work in pairs

You will need:

- metre ruler
- table

Fix a metre ruler at the edge of the table as shown in Figure 6.7

Now flick the ruler.

What do you see?

What do you hear?

Construct a simple instrument that produces sound by vibrations.

Figure 6.7. Flicking ruler.

Check Your Progress

i. Why does metre ruler produce sound when it is flicked?
ii. List five sources of sound.
iii. How is sound useful in our life?

6.5. Fading Sound

Test Yourself

1. What is vibration?
2. How can you produce sound?
3. What vibrates when you ring a bell?
4. How do you communicate with your friend who is standing far away from you?
5. Why do you talk very softly with your friend who is close to you?

You already know:

- sound is caused by vibrations.
- some sources of sounds.

You will learn:

- fading sound.

A. Sound travels through the air to reach our ears. The sounds made closer to us are loud; and the sound made far away is faint.

Work in groups

- measuring tape
- source of musical sound
- smart phone

Download and install decibel metre app in smartphone.

Your teacher may take you to an open place.

Your teacher will play a song from a music player.

Stand at different distances from the source of sound.

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Record the loudness of sound in Table 6.4 from decibel metre app.

Table 6.4 *Change in Loudness of Sound*

Distance (m)	Loudness of Sound in Decibel (dB) Metre
1	
2	
3	
4	
5	

Check Your Progress

i. Why are you not able to hear the music from a certain distance?

ii. What can you do to hear a song from a farther distance?

THINK AGAIN

1. Fill in the blanks.
    i. Sound is produced by_____.
    ii. Light travels in a_____ line.
    iii. The main source of light is _____.
    iv. Sound made close to us is _____.
    v. Sound is a form of _____.
2. Name one source of light which your grandparents might have used for lighting homes.
3. How can we make shadow bigger?
4. Distance can make sound fainter. What else can make sound fainter?
5. If light travels around the corner, how will it affect the life on the Earth?
6. You can hear a television programme in the other room but cannot see it. Why?
7. Compare the shadow of transparent and translucent glasses.

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CHAPTER 7

Electricity and Magnetism

7.1. Sources of Electricity

Test Yourself

1. Where do we get light from?
2. Do you use electricity at home?
3. What are the things in your house that use electricity?
4. Where do you think we get electricity from?
5. What do people use to produce electricity?

You already know:

- source of light.
- electrical appliances at home.

You will learn:

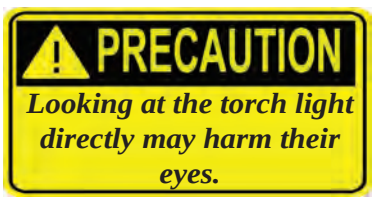
- sources of electricity.

A. You have seen a bulb glowing, rice being cooked in an electric cooker, water being boiled in a water boiler, etc. These are all done with the help of **electrical energy**. Electrical energy is obtained from electricity.

Work in groups

You may need:

- torch
- batteries



Step 1

Put on the switch of the torch without batteries.

What do you observe?

Put off the switch.

Step 2

Now put the batteries in the torch in the correct sequence.

Put on the switch.

What do you observe?

In which step did you see the torch bulb glowing?

Why do you think the torch bulb was glowing?

Name the source of electricity used in this experiment.

B. The electricity we use is not found naturally. We have to produce electricity with the help of machines. In Bhutan, we have many places where we produce electricity. For example, electricity is produced in Chukha, Tala, Basochhu, Kurichhu, etc. These places have power stations where electricity is produced.

Look at the Figure 7.1.

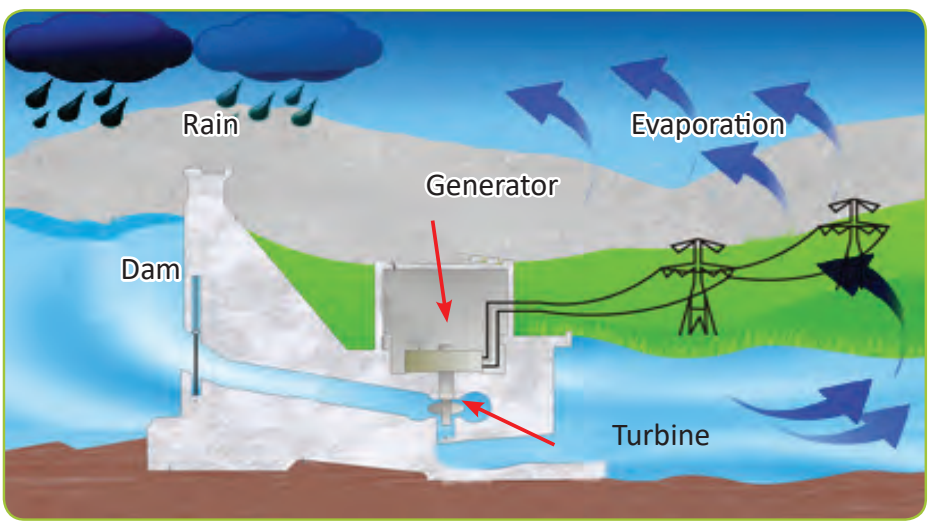


Figure 7.1. Generation of electricity.

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Find out the main source of electricity from Figure 7.1.

Write a paragraph on the process of generation of electricity.

C. Work in pairs

Discuss and write different sources of electricity.

After the discussion, share your information with the whole class.

List all the sources of electricity shared in the class in your notebook.

Write two sources of electricity which are eco-friendly.

Check Your Progress

i. Name the main source of electricity in our country.

ii. Why do you think your answer in (i) is the main source of electricity in our country?

Do You Know?

A scientist called Benjamin Franklin was the first person to discover static electricity.

7.2. Where Electricity is Used

Test Yourself

1. Name two power stations in Bhutan.
2. Mention three sources of electricity.
3. Name five places where electricity is used.
4. How is electricity important in our life?
5. The devices that use electricity is called _____.

You already know:

- electricity is used in your house.
- source of electricity.

You will learn:

- places and things where electricity is used.

A. Electricity has increased the comfort and services of humans to a very high level. Electricity is used to do different kinds of work. It is used to cook our food, wash our clothes, clean our house, light our home and street, drive vehicles, etc.

Name the things given in Figure 7.2 that use electricity?

(a)

(b)

(c)

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(d) (e) (f) (g)

Figure 7.2. Things that use electricity and that do not.

Name ten things which use electricity.

B. Most of the things you have listed become unusable after sometimes. These things form a type of waste called an e-waste.

1. Name five e-waste you find at home and school.
2. Suggest two ways to reduce e-waste.

Check Your Progress

i. Design a poster on the theme 'Save water, save electricity.'
ii. Explain how your life would be without electricity.

7.3. Making Connections

Test Yourself

1. Name two things which use electricity.
2. What is the source of electricity at your home?
3. Do you know how electricity is brought to our house?
4. Name three places where electricity is used.
5. What are the things that you use to light a bulb in your house?

You already know:

- electricity is used in many things.

You will learn:

- electrical connections.

A. **Circuit** is the continuous pathway through which electricity flows. Circuit is made of wires, source of electricity and an electrical appliance. Electricity will flow only when the circuit is complete. Wires are used to make connection between source of electricity and electrical appliance in a circuit.

Work in groups

You may need:

- torch bulb
- battery
- wires

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Make the bulb glow using the things given in Figure 7.3.

Name the source of electricity.

Name the electrical appliance used.

Figure 7.3. Things needed to make a circuit.

B. Work in groups

You may need:

- torch bulb
- battery
- wires
- computers

Try each connection given in Figure 7.4. using wires, battery and bulb.

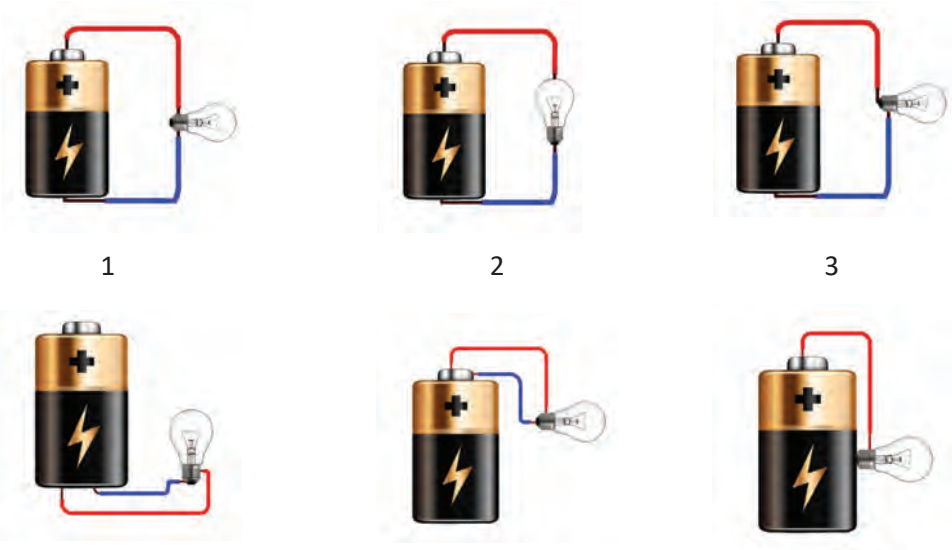

Figure 7.4. Types of connection.

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Use PhET simulation to try different connections shown in Figure 7.4.

Copy and fill Table 7.1.

Table 7.1 *Investigating Connections*

Diagram No	Will the Bulb Glow?	Is the Circuit Complete?
1		
2		
3		
4		
5		
6		

C. Work in groups

Samten has made a connection as shown in Figure 7.5, but the bulb does not glow.

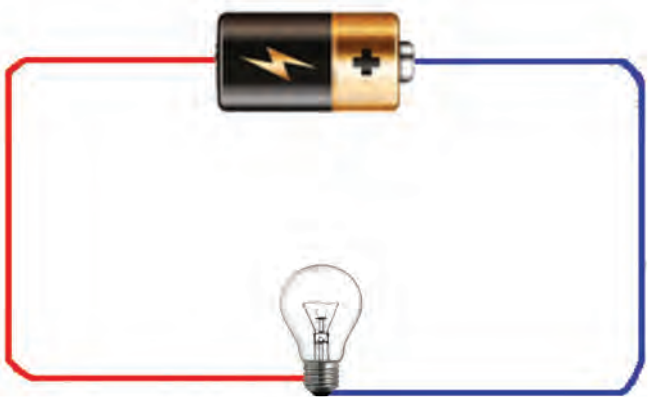

Figure 7.5. Simple circuit.

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Discuss in small groups:

Why is the bulb not glowing?

What can you do to make it glow?

How can you make the bulb glow brighter?

Exhausted battery and fused bulb need proper disposal. Why?

When the circuit is complete, the electricity will flow. The flow of electricity is called **current.**

Check Your Progress

i. Write the uses of wire, bulb and battery in a circuit.

ii. Electricity may not flow even if the circuit is complete. Why?

7.4. Things that are Magnetic

Test Yourself

1. What is magnetic force?
2. Is magnetic force a contact or non-contact force? Why?
3. Where do we use magnetic force?
4. What materials are attracted by magnet?
5. Why is a pencil not attracted by magnet?

You already know:

- magnet attracts magnetic things.

You will learn:

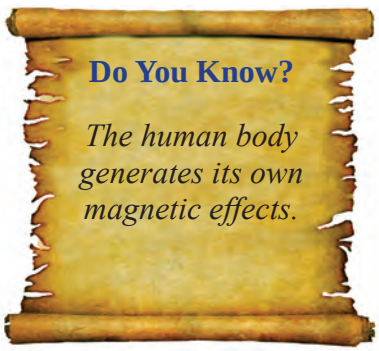
- magnetic material.

A. Magnets have a magnetic force. We cannot see this force but we can see the effect of the magnetic force.

Work in groups

You may need:

- magnet
- copper wire
- plastic tray
- stone
- pin
- eraser
- iron nail
- pencil



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- pen
- paper clips
- compass

Put all the above things in a plastic tray.

Touch each object in the tray with a magnet.

Copy and record your observation in Table 7.2.

Table 7.2 *Things Attracted and not Attracted by Magnet*

Sl No	Things Attracted by Magnet	Things Not Attracted by Magnet
1		
2		
3		
4		
5		
6		

Why are some objects attracted by magnet and some are not? Those things that are attracted by magnet are called **magnetic materials**. Those things that are not attracted by magnet are called **non-magnetic materials**. Usually things made out of iron are attracted by magnet. Materials made up of cobalt and nickel are also attracted by magnets.

Go outside the classroom.

Touch different objects that you find with the magnet.

List the objects which are magnetic in your notebook.

Check Your Progress

i. Why is your note book not attracted by a magnet?

ii. Name two metals which are not attracted by magnet.

http://www.zephyrus.co.uk/magneticmaterials.html

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7.5. Magnets at Home

Test Yourself

1. Give two examples of magnetic materials.
2. Name two non-magnetic materials.
3. Name two magnetic materials in your class.
4. Name five things in your home that have magnet inside them.

You already know:

- magnetic material.
- non-magnetic material.

You will learn:

- things that use magnet.

A. We have many things where magnets are used. Generally all electrical devices use magnets. These magnets are usually located inside the device.

Figure 7.6 shows a few electrical devices that use magnet.

(a) Television

(b) Refrigerator

(c) Laptop

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(d) Radio set (e) Water boiler cable (f) Ceiling Fan (g) Mobile phone

Figure 7.6. Electrical devices.

There are several non-electrical things where magnets are used.
For example.

(a) Drawer

(b) Cupboard

(c) Window

(d) Hand bag

(e) Geometry box

(f) Mobile phone cover

Figure 7.7. Non-electrical things with magnet.

What is the main purpose of magnet in the non-electrical things?

Design and make a simple magnetic game or toy.

Check Your Progress

i. Differentiate magnetic and non-magnetic material.

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THINK AGAIN

1. Choose the correct answer.
   i. The main source of electricity in Bhutan is
      A. battery.
      B. sun.
      C. water.
      D. wind.
   ii. Which one of the following is attracted by magnet?
      A. Copper wire
      B. Nickle wire
      C. Pencil
      D. Stone
   iii. Which set of things use electricity?
      A. TV, magnet and pin
      B. Pressure cooker, rice cooker and radio
      C. Electric bulb, spoon and electric kettle
      D. Computer, fans and radio
   iv. Which one of the following supply electricity in a circuit?
      A. Bulb
      B. Wire
      C. Fan
      D. Battery

v. Which of the following is an example of e-waste?

A. Plastics.

B. Papers.

C. Glasses.

D. Batteries.

2. Write three things that use electricity from battery.
3. What is an electric current?
4. Why are some utensils not attracted by magnet?
5. Will a strong magnet wrapped in a cloth attract pins? Why?
6. If water had not been the main source of electricity in our country, what would be the other source?

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CHAPTER 8

Living Things and their Environment

8.1. Living Things and Non-Living Things

Test Yourself

1. Name any two natural things that are found in our forest.
2. Why are cell phones, smart watches and computers called artificial things?
3. What are the three things that you can do but a robot can't?

You already know:

- natural and human-made things.
- degradable and non-degradable things.

You will learn:

- living and non-living things.

A. The things that have life are called **living things** and those things that do not have life are called **non-living things.**

Go around your school campus.

List the names of things that you see around.

Sort them out into living and non-living.

Circle the smallest living thing from your list.

Underline the biggest non-living thing in your list.

B. Describe the characteristics of a horse and a chair.

Complete Table 8.1 and play the online Kahoot game designed by your teacher . Compare the characteristics of living things and non-living things. (www.kahoot.it)

Table 8.1 *Characteristics of Living and Non-living Things*

Sl No	Characteristic	Living	Non-Living
1	Can grow	Yes	No
2	Can breathe		
3	Can feel		
4	Need food and water		
5	Can move on their own		

In groups, discuss other differences between living things and non-living things and present your findings to the class.

Check Your Progress

i. What are living things? Name five examples of living things.

ii. What are non-living things? Name five non-living things.

Do You Know?

There are different kinds of living things on the Earth that people have not finished counting them.

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8.2. Plants and Animals in their Habitat

Test Yourself

1. Give four examples of living things.
2. Give four examples of non-living things.
3. Mention one difference between living and non-living things.
4. Where do birds live?
5. Name a living thing that lives in both land and water.

You already know:

- plants and animals are living things.
- cats and dogs are domestic animals.

You will learn:

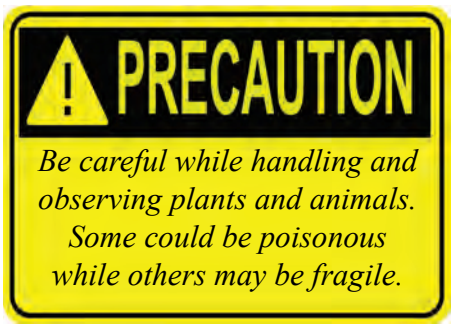
- plants and animals in your locality.
- habitat of plants and animals.

A. The place where plants and animals live is called **habitat**. A habitat provides plants and animals with air, food, and shelter.

Work in groups

You may need:

- garden hoe
- hand lens
- safety gloves
- blunt forceps



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Go outside and visit the places mentioned in Table 8.2 and Table 8.3.

List down the plants you observe in Table 8.2 and the animals in Table 8.3.

Put on safety gloves and handle fragile animals like earthworms with blunt forceps.

Use a hand lens to observe small organisms.

You may use garden hoe to explore and look for organisms living in the soil.

Table 8.2 *Habitats for Plants*

Plant Habitat			
Flower Garden	Stream/Brook/ Rivulet/ Creek/Eco-pond	Agriculture Garden	Forest
1. 2. 3....			

Table 8.3 *Habitats for Animals*

Plant Habitat			
Flower Garden	Stream/Brook/ Rivulet/ Creek/Eco-pond	Agriculture Garden	Forest
1. 2. 3....			

Using the data from Table 8.2 and 8.3, plot a graph each in spreadsheet or a graph paper.

Which habitat has more number of plants and animals? Why?

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B. Work in groups

Discuss habitats for the following plants and animals. Copy and complete Table 8.4.

Table 8.4 *Habitats for Plants and Animals*

Plant	Habitat	Animal	Habitat
Orchid		Fish	
Fern		Frog	
Rose		Ant	
Pine tree		Caterpillar	
Bean		Dung beetle	

Define habitat in your own words.

Check Your Progress

i. Name a wild animal and describe its habitat.
ii. Name three plants that are found in the same habitat.

8.3. How Plants Adapt in their Habitat

Test Yourself

1. Define habitat.
2. Name some plants which grow in your locality.
3. State the characteristics of plants that grow in your locality.
4. Are the plants in your locality surviving well? Why?

You already know:

- plants in your locality.
- plants grow in different habitat.

You will learn:

- adaptive characteristics of plants.

A. The natural process by which plants and animals adjust to their surrounding is called **adaptation.**

Plants growing in different places have adapted to their environment.

Cactus is usually found in dry places. In cactus, leaves are reduced to sharp pointed pin-like thorns to prevent the loss of water and to protect itself from being eaten by animals.

Pines also have needle-shaped leaves to reduce the loss of water.

Some water plants have large leaves to absorb more sunlight and to float. Figure 8.1 shows some plant adaptations.

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Cactus


Pine leaves


Lotus

A. *Figure 8.1.* Adaptations in Plants.

Go to the library or browse the internet and write the adaptive features of plants.

Share your information with the whole class.

B. Work in groups

Go around the school campus. Locate plants in different habitats.

Write the habitat and adaptive characteristics of plants in Table 8.5.

Table 8.5 *Adaptive Characteristics of Plants*

Plant	Habitat	Adaptive Characteristic

How does adaptive characteristics of an organism help it to survive in its habitat?

Do You Know?

In desert, there is very little water. A place in the desert which has a natural supply of water is called an oasis. An oasis has enough water to grow a variety of plants.

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Check Your Progress

i. What is the habitat of the plant in Figure 8.2?

ii. What are the adaptive features of this plant?

A. *Figure 8.2.* Orchid.

WEBLINK

http://www.mbgnet.net/bioplants/adapt.html

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8.4. How Animals Adapt in their Habitat

Test Yourself

1. Name three plants that are found in your school.
2. Why do some plants have thorns?
3. Why do different animals live in different habitats?
4. Yak is usually found in cold places in Bhutan. Why?
5. Birds find it difficult to locate a green grasshopper among green leaves. Why?

You already know:

- animals in your locality.
- different plants have different adaptive characteristics.
- fishes live in water.

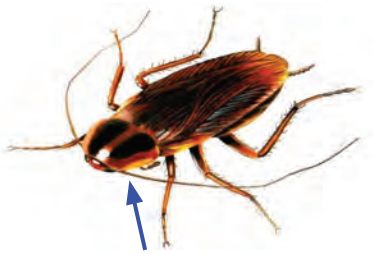
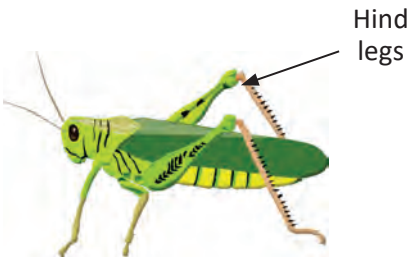
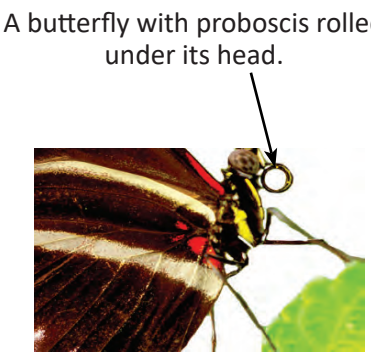
You will learn:

- adaptive characteristics of animals.

A. All animals are well-adapted to live in their habitats. When animals cannot adapt to their habitat(s), they either move to places where they adapt.

Some adaptive features of animals are as given in Table 8.6.

Table 8.6 *Adaptive Features of some Animal.*

Cockroach Cockroach is usually found in dark places. It has small eyes and long antenna. The long antenna helps them to feel in the dark.	
Grasshopper Grasshoppers have long, strong hind legs that help them jump. This adaptation helps them to jump and escape from predators. How does a grasshopper hide from its predators?	
Butterfly Butterflies have a feeding tube instead of mouth. This tube is called proboscis. It works like a straw and helps butterflies to suck nectar from flowers. Proboscis is long and can be rolled under head when not needed.	
Yak Some animals like yak live in very cold places like Laya, Lunana, Merak and Sakteng. They have thick hair on their body to protect them from the harsh cold. Why do yaks have broad and strong hooves? What will happen if a yak is taken to hot places like Phuentsholing, Samdrup Jongkhar or, Gelephu?	

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B. Animals adopt colour or shape of their surrounding to hide from their predators.

Work in groups

You may need:

- 40 matchsticks
- paint (red, green, blue)
- a stop clock

Paint a set of 10 matchsticks with each colour listed above. Let them dry.

Keep one set uncoloured.

Choose one of your friends as the timekeeper.

Spread out the red matchsticks in the grassy place of about one square metre.

Ask the timekeeper to record the time taken by you to find all the matchsticks

Repeat this for the other set of matchsticks.

Copy and fill Table 8.7.

Table 8.7 *Time taken to find the match sticks*

Matchstick	Time taken to collect all the Matchstick
Red	
Green	
Blue	
Uncoloured	

Which coloured matchsticks are the most difficult to find in the grass?

What can you conclude from the above activity?

Camouflage is a kind of adaptation which helps an animal to hide from its predator or prey.

Green caterpillar camouflages amongst green leaves, which makes it difficult for the predators to see them.

The stick insects resemble the leaves or twigs. They are green or brown in colour. They tend to remain motionless for a long time and hang from the plants. In this way, they escape from enemies.

Name some other animals which can camouflage.

C. Work in groups

Copy and complete Table 8.8.

Table 8.8 *Adaptive Characteristics of Animals*

Animal	Habitat	Adaptive Characteristic
Sparrow		
	High cold mountains	
Monkey		Long tail and strong arms
		Fins and streamlined body

Check Your Progress

i. Why do tigers have stripes?

ii. What adaptive characteristics do the following insects have?

a. Bees

b. Shield bug [stinkbug]

c. Ladybird

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8.5. Living Together

Test Yourself

1. Why do fishes have streamlined bodies?
2. Do you think rabbits can live in water? Why?
3. Name the habitat of the following animals.
   a. Yak
   b. Monkey
   c. Sparrow
4. Why do we see snakes in the places where rats and frogs live?
5. Name an animal which can eat snakes?

You already know:

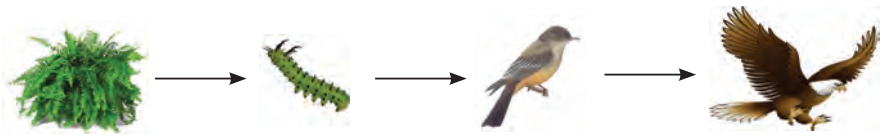
- habitat.
- adaptation of plants and animals.

You will learn:

- food chains.

A. All living things depend on each other for food and shelter. The feeding relationship of living organisms can be represented by a chain. This chain is called **food chain**.

Figure 8.3 shows an example of a food chain.



A. *Figure 8.3.* Food chain.

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The source of food for the caterpillar is_____.

The small bird eats the_____.

The source of food for the large bird is_____.

The food chain begins from _____ because they can produce their own food.

Grasshopper	Grass	Eagle	Frog	Snake

Animals which kill and eat other animals are called **predators** and their victims are called **prey**.

Name the prey and predators in the above food chain?

If we kill an animal or a plant, we also harm others by breaking their food chain. For example, if we kill frogs, snakes will not have food. There will also be lots of grasshoppers to eat the grass.

What will happen if all the snakes were killed?

Check Your Progress

i. What is a food chain?

ii. Animals should not be killed. Why?

iii. If we cut down many trees, all the other living things will suffer. Explain.

https://www.brainpop.com/science/ecologyandbehavior/foodchains/
http://primaryhomeworkhelp.co.uk/adaptation.htm
http://www.primaryhomeworkhelp.co.uk/adaptations/giraffe.htm

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8.6. Feeding Habits

Test Yourself

1. What is a food chain?
2. Do humans eat both plants and animals?
3. Name three animals which eat only plants.
4. Name three animals which eat other animals.
5. Why does a food chain always begin with a plant?

You already know:

- food chain.
- green plants are the main source of food.

You will learn:

- different types of feeding habits.

A. All animals have different ways of feeding. Some feed on plants. Some feed on animals, while others feed on both plants and animals.

Work in groups

Copy and complete Table 8.9.

Table 8.9 *Classification of Animals as per Feeding Habit*

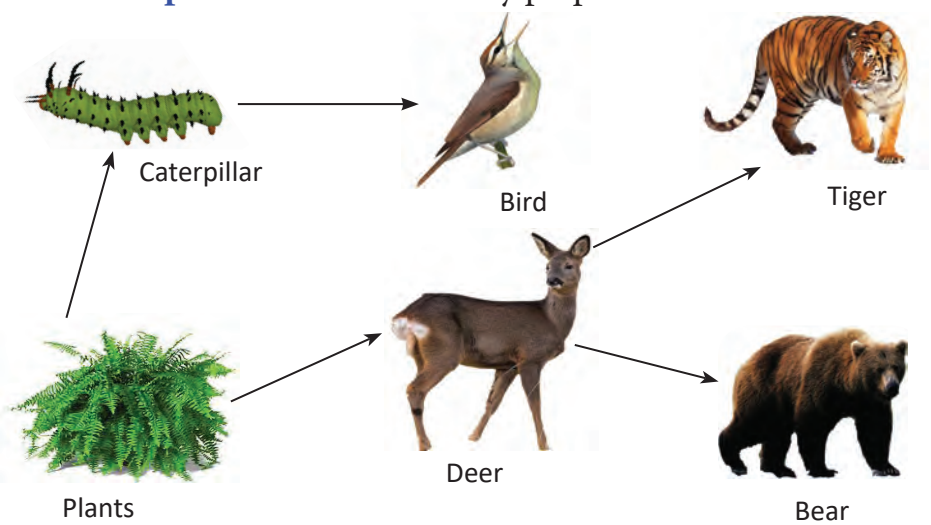
Animal	What do they eat?
Herbivore Examples: Cow, Deer	
Carnivore Examples: Tiger, Lion	
Omnivore Examples: Monkey, Crow	

What is a herbivore? Give three examples.

What is the difference between herbivore and carnivore?

Is cat an omnivore? Give reason.

B. Food chains usually have no more than four to five organisms. All herbivores, carnivores and omnivores are **consumers**. Green plants are called **producers** because they prepare their own food.



B. *Figure 8.4.* Producer and consumers in a food chain.

A.

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Study Figure 8.4 and answer the following questions.

a. Trace out as many food chains as possible. Identify the producer and consumers in each food chain.

b. Identify the following:

i producer
ii herbivore
iii carnivore
iv omnivore

Check Your Progress

i. Why are plants called producers?
ii. Why are human beings called omnivores?

Do You Know?

All omnivores are carnivores but all carnivores are not omnivores.

WEBLINK

http://www.nhptv.org/natureworks/nwep10.htm

Think Again

1. Match the following.

Column I	Column II
a. Eagle	i. Herbivore
b. Plant	ii. Carnivore
c. Eats only plants	iii. Predator
d. Eats only animals	iv. Omnivore
e. Eats both plants and animals	v. Producer

2. Why are animals known as consumers?
3. Represent each list in the form of a food chain:
   a. Caterpillar, cabbage, hawk, sparrow
   b. Grass, eagle, rabbit
   c. Paddy, snake, peacock, rat
4. Why are grasshoppers normally green?
5. Can a prey also be a predator? Give reasons.
6. A robot can move, but it is not a living thing. Why?

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7. Answer the following question with reference to Figure 8.5.

Figure 8.5.

a. What are the animals feeding on?

b. Why do you think animals are feeding on them?

c. How does waste affect animals?

d. What lesson can you draw from this picture?

CHAPTER 9

Green Plant

9.1. Effect of Light on the Growth of Plant

Test Yourself

1. State two differences between plants and animals.
2. What are the different parts of a plant?
3. Can plants grow without light? Why?
4. Why is the Sun important for living beings?
5. Why do plants need sunlight?

You already know:

- characteristics of living things.
- plants are living things.
- plants grow.
- sources of light.

You will learn:

- effect of light on the growth of plants.

A. We know that plants are living things. They need suitable conditions for proper growth.

We are going to investigate one of those conditions.

You may need:

- Two healthy potted plants of the same type and same height.

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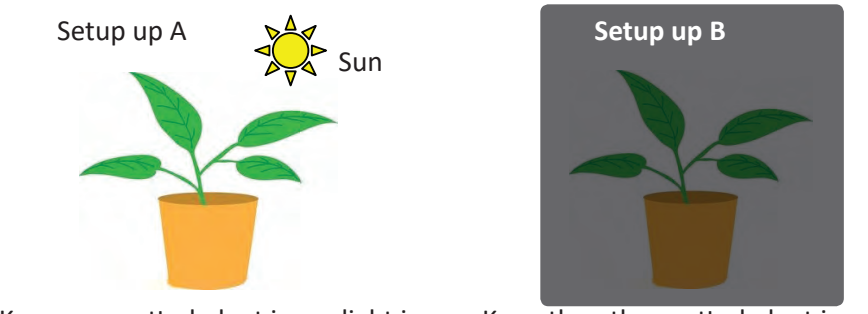

*Figure 9.1.*Set-up to observe the effect of sunlight on plant growth.

Set up the potted plants as shown in Figure 9.1. Water both the plants regularly with the equal volume.

Observe two plants for one to two weeks.

What is the main difference between Setup up A and Setup up B?

List down the changes that you have observed in the two plants.

Which plant showed proper growth?

What can you conclude from this experiment?

What would happen to a plant which receives sunlight from one direction?

Do You Know?

There are nearly 380,000 different kinds of plants on the Earth.

Check Your Progress

i. Why is light important for plants?

ii. Why do we need to take the same type of potted plants in activity A and B?

9.2. Effect of Air on the Growth of Plant

Test Yourself

1. What will happen to the plant if we keep it in the dark place?
2. Why is air important to us?
3. What do you think will happen if there is no air?
4. How is air important to plants?

You already know:

- effect of light on the growth of plants.

You will learn:

- effect of air on the growth of plant.

A. Like human beings, plants need air. Plants need air for two purposes. They use carbon dioxide to make their own food. They also need oxygen to break down the food for energy.

Work in groups

You may need:

- jars with lid
- cotton
- soaked chickpeas

Spread thin sheets of cotton in the inner bottom of both the jars.

Sprinkle equal amount of water on the cotton in both the jars.

Put ten soaked seeds in each jar.

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Label one jar as A and the other as B.

Keep both the jars on the window sill.

After a few days, the seeds will grow into new plants.

Once the plants are about 2 cm in height, cover jar B with its lid and make it airtight using a sellotape.

Leave jar A open.

How are the two set-up similar?

How are the two set-up different?

Observe the plants for about a week or two.

What happens to the plant in jar A?

What happens to the plant in jar B?

What does the experiment prove?

Check Your Progress

i. What will happen if plants do not get carbon dioxide?
ii. Which air is used by the plants to break down the food?

Figure 9.2. The roots of mangrove plants grow upward to take air from the surrounding.

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9.3. Effect of Temperature on the Growth of Plant

Test Yourself

1. What will happen to the plants if there is no sunlight?
2. What will happen to the plants if there is no air?
3. What is temperature?
4. If you play outside on a very hot day, what will happen to your body?
5. Why do you think heat is important for plants?

You already know:

- effect of light and air on the growth of plants.

You will learn:

- effect of temperature on the growth of plants.

A. Temperature of a body tells us how hot or cold the body is. The instrument used to measure temperature is called **thermometer**. The temperature of the body is measured in degree Celsius (^{0}C).

Work in pairs

You may need:

- thermometer
- tap water

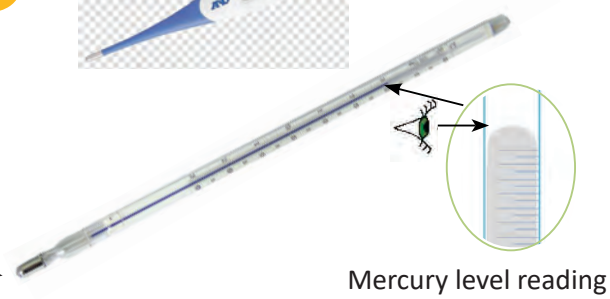

Figure 9.3. Temperature reading in thermometer.

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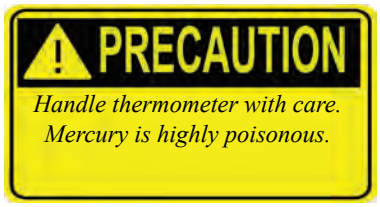
Your teacher will provide you a thermometer. Record the room temperature and the temperature of tap water in Table 9.1. While taking the reading, look at the upper meniscus as shown in Figure 9.3.



Do not touch the bulb as the heat of your finger will increase the reading.

Table 9.1 *Reading Temperature*

Room Temperature (degree Celsius)	Tap Water Temperature (degree Celsius)

Which reading is high?

B. Plants need suitable temperature for proper growth.

Work in groups

You will need:

- bean seeds
- trays
- soil
- transparent plastic sheet
- thermometer
- water

Take two trays and fill them in with soil.

Label them as Tray 1 and Tray 2.

Sow equal number of bean seeds in both the trays.

Sprinkle some water. After a day or two, new plants grow from

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the seeds. The growth of plant from a seed is called **germination**.

Once seeds have germinated, place a thermometer in each tray.

Copy Table 9.2 and record the initial temperature of each tray as shown in Figure 9.4.

Table 9.2 *Recording Temperature*

Tray 1 Temperature reading	Tray 2 Temperature reading

Cover Tray 2 with a transparent plastic. Make sure it is not airtight.

Keep both the trays in a safe place where there is sufficient sunlight for two weeks. Record their final temperature.

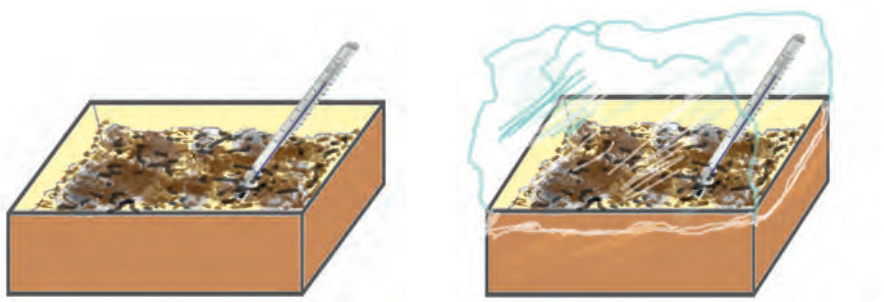

Figure 9.4. Set-up for temperature reading

Which thermometer has higher reading? Why do you think so?

In which tray do plants grow faster?

Why do you think this happens?

What does this experiment show?

Have you seen a greenhouse?

Greenhouse helps in increasing the temperature.

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Some farmers in Bhutan grow plants or vegetables in greenhouses as shown in Figure 9.5.

Figure 9.5. Greenhouse

Check Your Progress

i. Why would a greenhouse be useful in some parts of Bhutan?

ii. What do you think will happen to the growth of a plant if the temperature is very high or very low?

9.4. Effect of Water on the Growth of Plant

Test Yourself

1. Is temperature important for growth of the plant?
2. A potted plant kept near the window bends towards sunlight. Why?
3. Do plants grow properly during a very cold winter? Why?
4. What are the uses of water?
5. What will happen to living things if there is no water?

You already know:

- effect of light, air and temperature on the growth of plants.

You will learn:

- effect of water on the growth of plants.

A. All forms of life need water. About eighty to ninety percent of the plant body by weight is water. Water is essential for germination of seeds and growth of plants.

Work in groups

You may need:

- two young potted plants of the same type and of the same height.
- water

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Keep both the potted plants in a safe place as shown in Figure 9.5.

Label them as Set-up A and Setup B

Water the plant in Set-up A regularly.

Keep the plant in Setup B without watering.

Observe the plants regularly for about two weeks.

Copy and complete the Table 9.3 after the completing the observation. Draw graph using MS excel sheet or any other spreadsheets.

Set-up A

Set-up B

Figure 9.6. *Effect of water on growth of plant.*

Table 9.3 *Effect of Water on Plant Growth*

Observation	Set-up A	Set-up B
Height of the plant		
Number of leaves of the plant		
Number of shoots of the plant		

B. Work in groups

Discuss in your group the importance of water for both plants and animals.

Write your findings and present it to the class.

Plants prepare their own food using sunlight, water and air. Therefore, plants are called **autotrophs**. On the contrary, animals depend on plants for food therefore, animals are called **heterotrophs**.

Check Your Progress

i. What happens to the flowers if you do not water your garden regularly?

ii. What may happen to plants if there is excess of water?

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9.5. Flower

Test Yourself

1. Name the parts of a plant.
2. What are the necessary conditions for the proper growth of plant?
3. Which is the most attractive part of a plant?
4. Name different parts of a flower.

You already know:

- effect of light, air, water and temperature on the growth of plants.
- common types of flowers.

You will learn:

- different parts of a flower.

A. A plant is made up of roots, stems, leaves and flowers. Therefore, a flower is the reproductive part of a plant. The male part of a flower is called **stamen**. The female part of a flower is called **carpel**.

Flower develops into fruit and seed. New plants grow from seed.

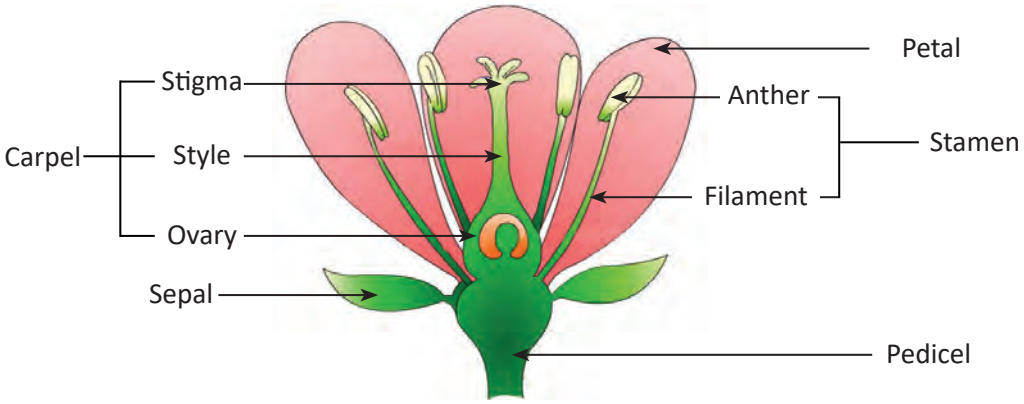

Figure 9.7. Parts of a flower.

Work in groups

You may need:

- flower
- forceps
- hand lens

Collect a flower from around your school.

Observe the flower carefully using hand lens.

Draw the flower in your exercise book.

Label the following parts:

1. Sepal. 2. Petal. 3. Stamen. 4. Carpel. 5. Pedicel.

What is the male part of a flower called?

Which part of a flower is brightly coloured?

Which part of a flower is normally green?

B. Remove each part of the flower carefully using forceps.

Paste all the parts in your scrap book and label them.

C. Draw the diagram of the flower using MS paint.

Label all the parts.

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Check Your Progress

i. Which is the reproductive part of a plant?
ii. What is the stalk of a flower called?

Figure 9.8. Rafflesia

Do You Know?

Rafflesia is the largest flower in the world. It grows up to one meter in diameter and weighs up to 11 kilograms.

Figure 9.9. Water lily

Do You Know?

Water lily always remains erect in the water because it has abundant supply of water. However, when water is not abundant the plant will droop and wilt.

THINK AGAIN

1. Choose the correct answer.
   i. All of the following are required by a plant for its proper growth, EXCEPT
      A. light.
      B. water.
      C. micro-organism.
      D. heat.
   ii. The part of a plant that makes fruit and seed is
      A. root.
      B. stem.
      C. flower.
      D. leaf.
   iii. The female part of a flower is called
      A. carpel.
      B. stamen.
      C. sepal.
      D. petal.
   iv. Greenhouse is useful to grow crops in places where there is
      A. lot of water.
      B. no water at all.
      C. low temperature.
      D. high temperature.
   v. In the absence of light, green leaves of a plant
      A. turns yellow.
      B. grows green.
      C. grows in number.
      D. grows in size.

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2. Why is greenhouse used to grow vegetables in cold places?
3. Why is the grass growing under stone yellow?
4. Plants do not grow well in dry soil. Why?
5. Why do farmers make soil loose around the plants?

CHAPTER 10

Food

10.1. Different Kinds of Food

Test Yourself

1. Human beings are generally omnivores. Explain.
2. What is the main source of food for animals?
3. Why do you eat different kinds of food?
4. Name the food that we eat?
5. Why do we need to eat food?

You already know:

- all living things need food to live.

You will learn:

- different kinds of food.

A. Every day we eat a variety of food. These foods include pulses, grains, fruits, vegetables, meat, and milk products.

Pulses are seeds of certain plants that grow within pods such as peas as shown in Figure 10.1. Other common pulses are beans, chickpeas and lentils.

Figure 10.1. Pea pod

Foods such as wheat, rice, barley are called grains.

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Work in groups

Make a list of food that you eat.

Classify the food that you have listed above under the food groups in Table 10.1.

Table 10.1 *Food Groups*

Pulses	Grain	Fruit	Milk product	Meat	Vegetable

Which pulses are grown in your locality?

Which foods are generally included in

i. breakfast
ii. lunch
iii. dinner

Check Your Progress

i. Name at least three examples of the following:
   a. fruits
   b. grains
   c. milk products
ii. List the food items that are common in your locality.

10.2. Food for Activity

Test Yourself

1. What are the different kinds of food that we eat every day?
2. We feel tired when we do not eat food. Why?
3. Name some pulses that we eat?
4. Which food do we eat as the major part of our diet?
5. Name three grains.

You already know:

- different kinds of food.
- we cannot work and play when we are hungry.

You will learn:

- some foods that help us to work and play.

A. Foods such as rice, wheat, maize, sugar, and potato give us the energy to work and play. If we do not eat enough of these foods, we feel tired and weak. The food that helps us to work and play is called food for activity or energy giving food.

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Use the data from Table 10.2 and plot a bar graph in your notebook.

Table 10.2 *Energy Contained in 10 grams Food*

Food type	Energy (kcal)
Boiled Egg	4
Salted Butter	730
Boiled Chicken	19
Walnut	263
Boiled Rice	8
Boiled Potato	7

Which food item gives us the most energy?

What kind of food helps us to do walk everyday?

Check Your Progress

i. Why should a heavy manual worker eat more rice than an office worker?

ii. Name five energy giving food found in your locality.

10.3. Food for Growth

Test Yourself

1. Why do we need energy?
2. Name three food items that give us energy.
3. Which food item gives us the most energy?
4. Why should we eat lentils regularly?

You already know:

- some foods that help us work and play.

You will learn:

- food that helps us grow.

A. Foods like lean meat, egg, fish, milk, and pulses help us to grow and build the body. These foods are called food for growth or body building food. We get these foods from both plants and animals.

Use the data from Table 10.3 and plot a bar graph using MS excel or any other spreadsheets.

Table 10.3 *Protein contained in 100 grams Food*

Food Type	Energy (kcal)
Boiled Egg	12.5
Salted Butter	0.7
Boiled Chicken	32.0
Walnut	14.7
Boiled Rice	2.6
Boiled Potato	1.9

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Which food item gives us the most body building food?

What are body building food called?

Who needs more body building food, a father or a child? Why?

Check Your Progress

i. What would happen if we do not eat body building food?

ii. Name five body building food available in your locality.

http://www.indiadiets.com/foods/food_groups/food%20groups.htm

10.4. Food for Protection

Test Yourself

1. Name some foods that help us to grow?
2. Pork is an energy giving food as well as a body building food. Name any other food which gives energy and helps us grow?
3. What food items do we use for making curries?
4. Name two fruits and vegetables.
5. What are protective foods?

You already know:

- food is needed for growth and daily activities.

You will learn:

- food that protects us from diseases.

A. Foods like fresh fruits and vegetables help us to keep our body healthy and protect us from diseases. These foods are called protective food. Some foods like fish, lean meat and milk also protect our body from diseases.

Figure 10.2 shows foods that build our body, give us energy and protect us from diseases. Identify and list the foods that help to protect us from diseases in your notebook.

Lemon

Aubergine

Banana

Carrot

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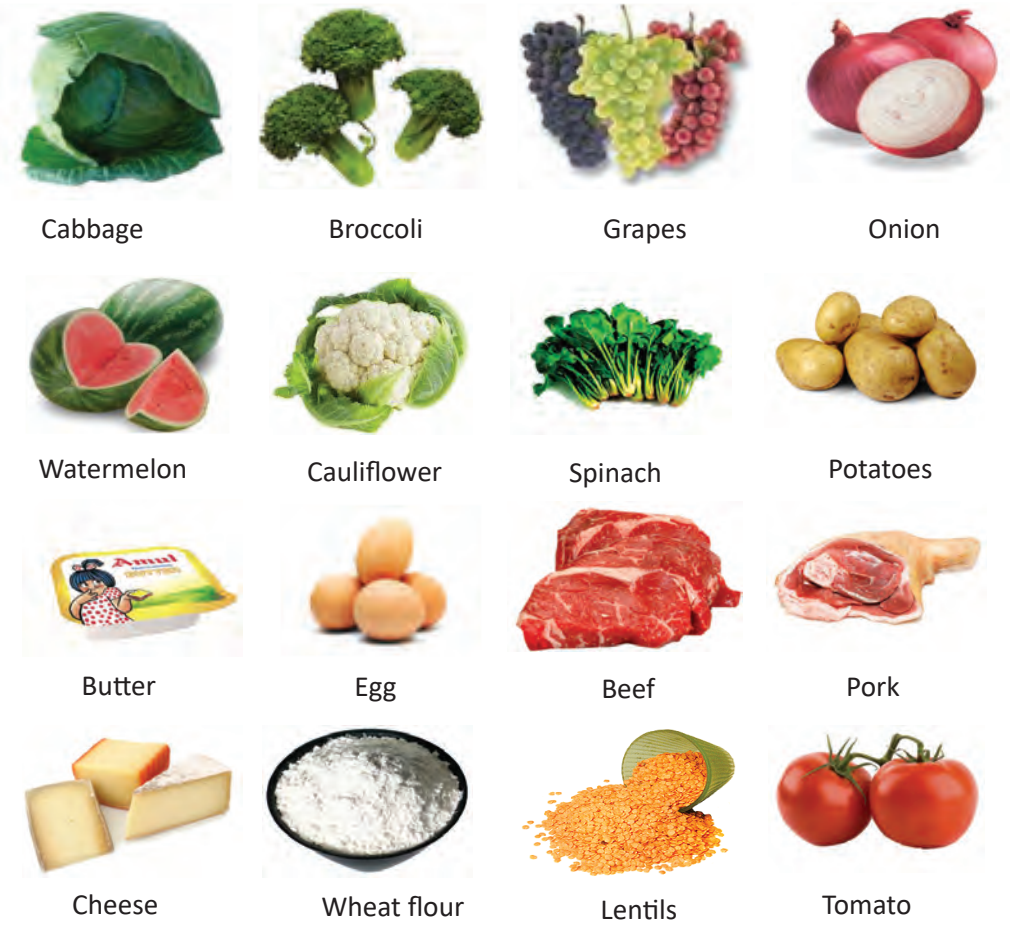

Figure 10.2. Different kinds of food.

Write some more examples of food for protection.

What would happen if protective food is not included in your meals?

Do You Know?

Lack of iodine causes goitre. Iodine is present in table salt.

Check Your Progress

i. Name the protective foods available in your locality?

ii. Why do we have to eat different types of vegetables and fruits?

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10.5. Eat all Types of Food

Test Yourself

1. What are the food that:
   - gives us energy
   - helps us grow
   - protects us from diseases
2. Name some fruits and vegetables available in your locality.
3. What food do you eat in your everyday life other than fruits and vegetables?
4. Why should we include different kinds of food in our diet?

You already know:

- food for activity.
- food for growth.
- food for protection.

You will learn:

- right kinds of food to eat.

A. Everyday, we should eat body building food, energy giving food and body protecting food.

Study Figure 10.3 and answer the questions that follows.

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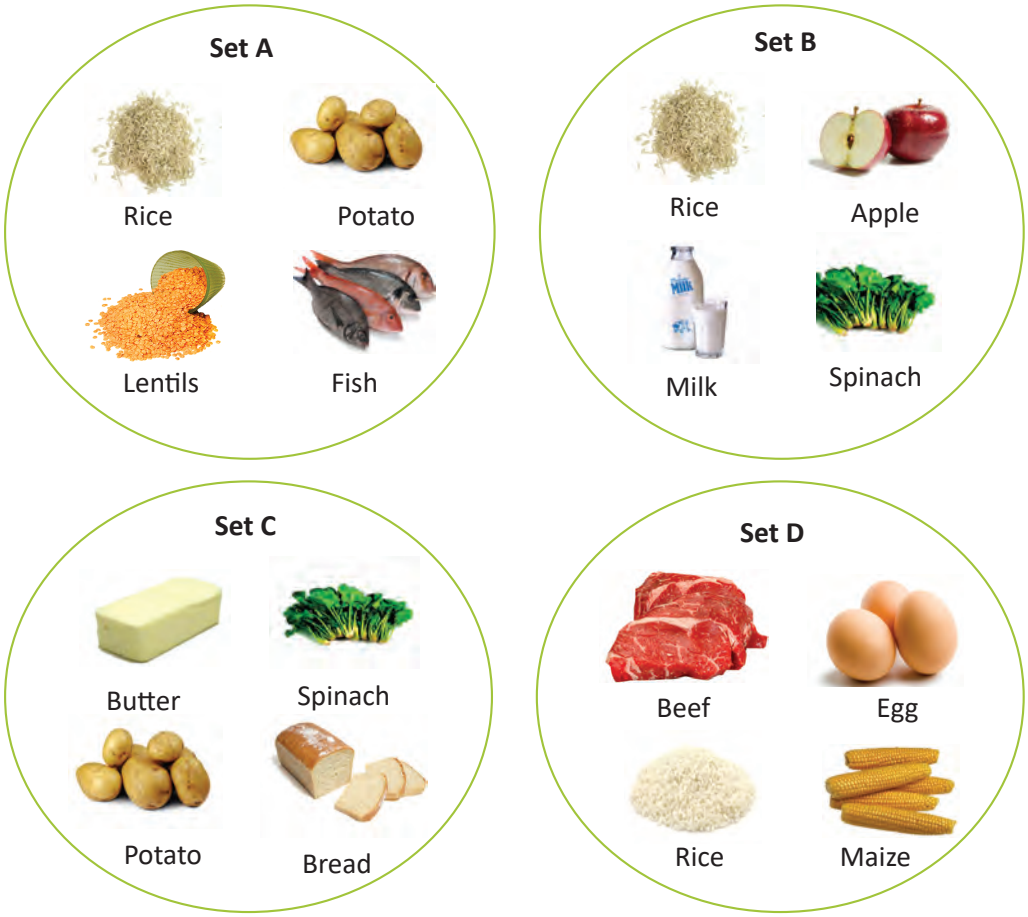

Figure 10.3. Sets of food

Identify the types of food present in set A,B,C,and D.

Which set of food is best for health? Why?

What did you eat in your breakfast today? Was it a balanced diet? (Refer the nutrition chart provided in the Annexure to support your answer)

B. Make a list of food that will keep us healthy. Fill in Table 10.4. Each meal should contain at least one food item from each food group.

Table 10.4 *Healthy Menu*

Day	Meal	Food for Growth	Food for Activity	Food for Protection
1	Breakfast			
	Lunch			
	Dinner			
2	Breakfast			
	Lunch			
	Dinner			
3	Breakfast			
	Lunch			
	Dinner			

Share your work with your friends. Find out whether your friend has at least one food item from each food group.

Check Your Progress

i. Why is it important to include a variety of foods in your meals?

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Think Again

1. State whether these statements are true or false.
   a. Lean meat is protective food.
   b. A farmer should eat less rice than a teacher.
   c. We should always include all the three groups of food in a meal.
   d. The food that helps us grow is body building food.
   e. Potatoes are also known as pulses.
2. Why do we need to eat green leafy vegetables?
3. Study the following meals. Which one is the best to eat? Give reasons.
   a. Rice, chicken, spinach, and oranges.
   b. Bread, butter, banana, and apple.
   c. Rice, egg, potatoes and butter tea (suja).
4. If we want to reduce fat intake, which food group should we eat less?
5. What is the common food that is eaten in your locality? Why?
6. Draw a food chart of a sports person showing the type of food he or she needs.

CHAPTER 11

Our Earth

11.1. Shape of the Earth

Test Yourself

1. What is the difference between day and night?
2. What is the main source of light during the day?
3. What is the shape of a football?
4. What is the most likely shape of the earth?

You already know:

- sun gives light.

You will learn:

- shape of the earth.

A. The sun is a star. There are a number of heavenly objects that move around the sun. These objects and the sun form a family called **solar system**. These objects include eight large bodies called **planets**. Our earth is a planet.

Earlier people used to think that the earth is flat like a book or table, but later, on scientists proved that it is almost round. It moves around the sun.

People who have travelled into the sky have seen that our earth is almost round.

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Look at Figure 11.1. This is how our earth looks like when observed from the space. It is slightly flat at the top and bottom. This shape is called **oblate spheroid**.

Figure 11.1. The earth.

Do You Know?

As the Earth spins around, the Sun appears to move across the sky.

Check Your Progress

i. What do you call the heavenly objects which revolve around the sun?

ii. Mention the shape of the earth.

WEBLINK

http://www.josleys.com/show_gallery.php?galid=313

11.2. Rotation of the Earth

Test Yourself

1. What is the shape of the earth?
2. State one difference between the shape of a ball and the shape of the earth.
3. Why does the sun rise in the morning and set in the evening?
4. How does our earth rotate?

You already know:

- the shape of the earth.

You will learn:

- rotation of the earth.

A. Do you know that the earth is moving all the time? It spins and moves around the sun at the same time.

Figure 11.2 shows the woollen ball of thread spinning about the knitting needle passing through its centre. Just like the knitting needle in the ball of thread, our earth spins about its imaginary line called an **axis**.

Earth's axis is slightly tilted like the knitting needle as shown in Figure 11.2.

Your teacher will demonstrate this activity.

You may need:

- globe

Figure 11.2. Thread ball with needle as axis.

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Spin a globe in counter clockwise direction as shown in Figure 11.3.

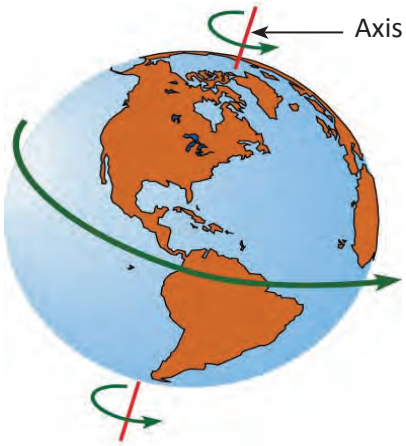

Figure 11.3. Spinning of globe

This is how our earth rotates on its axis. This spinning is called **rotation**. It takes about 24 hours to complete one rotation. The rotation of the earth causes day and night.

B. Work in groups

Design a model to show the rotation of the earth on its axis.

Explain the working of your model.

Check Your Progress

i. What is the axis of the earth?

ii. How long does it take for the earth to complete one rotation?

11.3. Day and Night

Test Yourself

1. When do we experience day?
2. What do we experience on the other side of the earth which is not facing the sun?
3. How does day and night occur?
4. Is the duration of day and night equal? Why?

You already know:

- rotation of the earth.

You will learn:

- cause of day and night.

A. We experience day and night. We know that the sun rises from the east and sets in the west. The duration of time from midnight to midday is called am. (ante meridiem). The duration of time from midday to midnight is called pm. (post meridiem). We have longer day in summer and shorter day in winter.

Let us find out how day and night are caused.

Your teacher will demonstrate this activity.

You will need:

- torch
- globe
- dark room

Place the globe where everyone can see it.

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Light the torch on one side of the globe as shown in Figure 11.4.

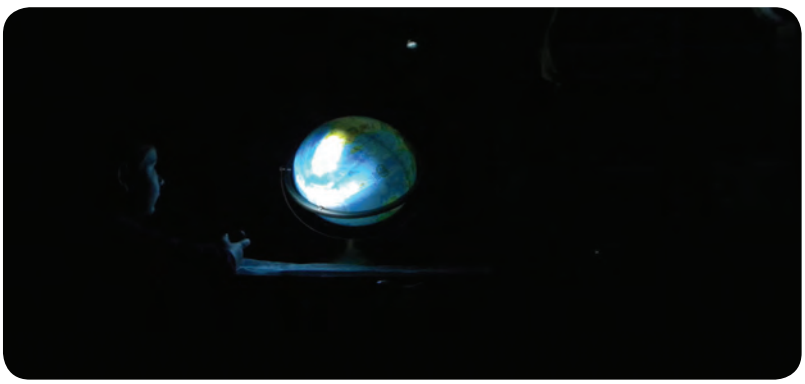

Figure 11.4. Set-up for day and night

What does the torch represent?
What does the globe represent?
What does the lighted part of the globe represent?
What does the dark part of the globe represent?

The part of the earth that receives the light experiences day and the part that does not receive the light experiences night.

Keep the torch on the same point.

Now turn the globe slowly in counter clockwise direction.

What do you observe?

What causes day and night?

What will happen if the earth does not rotate?

Check Your Progress

i. Differentiate between day and night.
ii. How many rotations will the earth make in 24 hours?

11.4. Revolution of the Earth

Test Yourself

1. Why do you think day and night are not of equal duration?
2. How many hours are there in a day?
3. Does earth revolve around the sun?
4. How many days make a year?

You already know:

- rotation of the earth.

You will learn:

- revolution of the earth.

A. The earth moves around the sun in a fixed path called **orbit**. The orbit is oval in shape. This movement of the earth in counter clockwise direction around the sun is called **revolution of earth**. The earth takes one year (about 365 days) to complete one revolution.

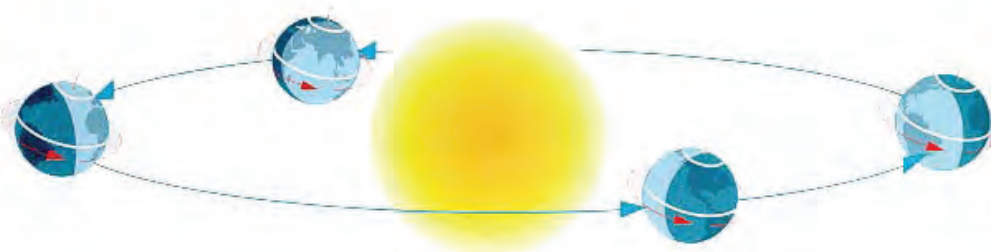

Figure 11.5. Revolution of the earth

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Demonstrate the revolution of the earth.

You may need:

- globe
- candle
- matchbox

Light the candle and place it at the centre of the table.

Then take the globe and go around the candle in counter clockwise direction.

This is how the earth revolves around the sun.

What does the globe represent?

What does the lighted candle represent?

What is the movement of globe around the candle called?

Check Your Progress

i. What is revolution of the earth?

ii. How long does the earth take to complete one revolution?

11.5. Seasons in a Year

Test Yourself

1. Where have you seen rotation and revolution taking place?
2. Why are seasons not same throughout the year in Bhutan?
3. Name the seasons.
4. What will happen if the earth does not revolve?

You already know:

- rotation and revolution of the earth.

You will learn:

- seasons of the year.

A. Spring, summer, autumn, and winter are the four seasons of the year. All these four seasons make a year.

For most places on the earth, year can be divided into four seasons: spring, summer, autumn and winter. Each season has differences in weather, temperature, and the length and amount of daylight as shown in Figure 11.6. Seasons are not same everywhere.

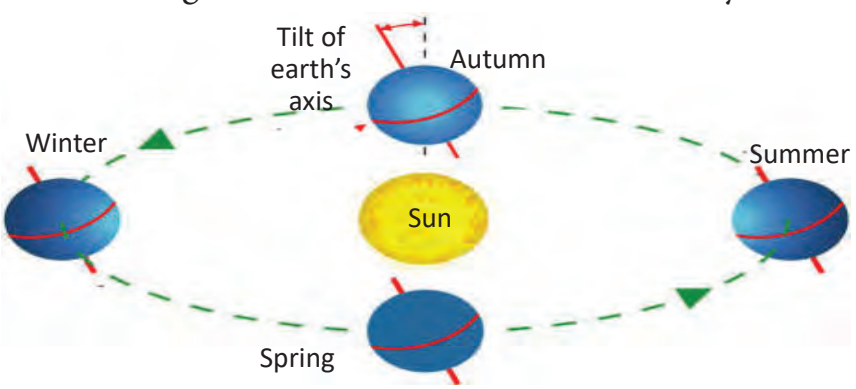

Figure 11.6. Change in seasons.

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We experience the seasons due to the revolution of the earth and the tilt of the earth on its axis. The tilt causes different parts of the earth to face directly to the sun at different times of the year. The distance between the earth and the sun differs at different times of the year, varying the amount of light received by earth.

What will happen if there is no tilt on the earth's axis?

What will happen if the earth revolves around the sun at same distance through out the year?

B. Work in groups

You will need:

- computer
- internet

Design power point presentation on four seasons by downloading related images from google website.

Write the characteristics of weather for each season.

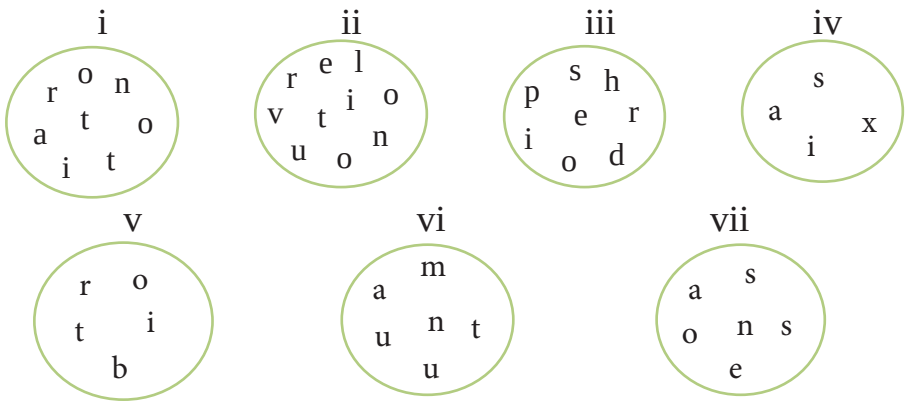
Check Your Progress

i. Name four seasons of the year.

ii. What causes the change in seasons on the earth?

THINK AGAIN

1. Choose the correct answer from the bracket and fill it in the space provided.
   i. Days and nights are caused by the…….....…. of the earth. (rotation/revolution)
   ii. The direction of the earth's rotation and revolution is in……..... direction. (clockwise/counter clockwise)
   iii. The movement of the earth around the sun is called ..... (revolution/rotation)
   iv. The earth moves around the sun in a fixed path called…..……. (orbit/axis)
   v. The earth takes about ……..... days to revolve around the sun. (365/24)
2. Rearrange the words in the bubble and write them down in your note book.



i……..... ii…….. iii……...

iv…….. v……..... vi…….....

vii…….....

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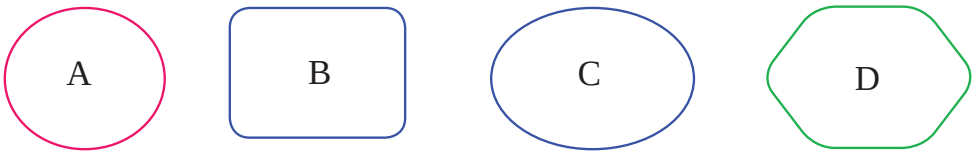
3. Which one of the following shape is oblate spheroid?



4. Earth rotates and yet we do not feel its movement. Why?
5. How many seasons are there in a year? Name them.
6. Write the features of the four different seasons.
7. Which movement of the earth is shown in the following Figure 11.7?

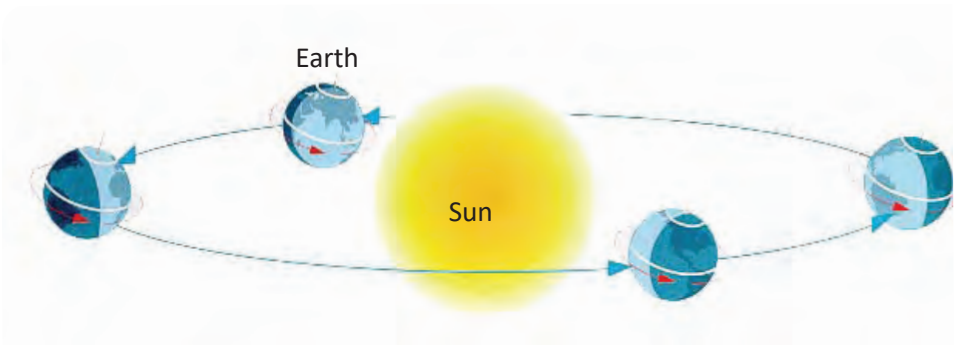


Figure 11.7.

Annexure - A

Assessment

Assessment in science involves testing of scientific knowledge, skills, values and attitudes. The assessment should be able to diagnose the learning progress or gap of the learner in terms of expected core competencies and learning outcomes. Consequently, it is imperative to use appropriate assessment techniques and tools to provide relevant feedback to the learners and to assess the impact of teaching learning processes.

Holistic assessment entails assessing all the three domains of learning: cognitive, psychomotor and affective. Thus, the assessment practice in science assesses Scientific Knowledge (SK), Working Scientifically (WS), Scientific Values and Attitudes (SV) of the learners.

Purpose of Assessment

Assessment is used to:

i. inform and guide the teaching and learning process.
ii. gauge the efficacy of the teaching and learning process.
iii. assess the relevance of curriculum materials.
iv. help learner's set learning goals.
v. monitor learner's progress in achieving learning outcomes.
vi. generate reports on learner's performance.

Areas of Assessment

The assessment in science focuses on the three domains of learning reflected as scientific knowledge (cognitive), working scientifically (psychomotor) and scientific values and attitudes (affective) as detailed below:

i. **Scientific Knowledge (SK):** The learner meets the requirement reflected in the learning objectives and expected learning outcomes under each unit, chapter, and topic. The learner is able to provide expected scientific information through various ways as asked.

ii. **Working Scientifically (WS):** The learner demonstrates scientific skills such as observing, predicting, inquiring, questioning, investigating, experimenting, measuring, classifying, recording, analyzing, inferring, communicating, etc. and explain how science works.

iii. **Scientific Values and Attitudes (SV):** The learner exhibits interest, curiosity, intellectual drive, creativity, exploring possibilities, inquisitiveness, finding facts, coherent presentation of ideas, reasoning skills, collaborative skills, respect and concern for all, etc.

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Assessment Modalities

The assessment focuses on diagnosing the learning gap through Continuous Formative Assessment (CFA), Continuous Summative Assessment (CSA) and Summative Assessment (SA) using appropriate assessment tools.

Specifically, the assessment is carried out in the following ways:

i. **Home work:** The extended activities given to students encourages independent learning and responsibility to complete the task. The task is assigned only on important topics that require extra time and energy, and to be assessed using appropriate assessment tools such as rubrics, rating scale, and checklist.

ii. **Class work:** The learning activities such as group discussion, presentation, individual work, etc. are assessed using appropriate assessment tools.

iii. **Scrapbook:** It is a collection of pictures, specimens, photographs, etc. related to scientific concepts and ideas along with a brief description and student's personal expression of feelings. It is aimed at instilling a scientific attitude: such as creativity, critical thinking, and self-reflection. The scrapbook is maintained throughout the academic session with periodical assessments. An exercise book can be maintained by each student to make a minimum of 20 entries in their scrapbook. The following are the suggested entries, but NOT limited to:

- clippings from newspaper, magazines, comics, newsletters, fliers, pamphlets, and even including download from internet.
- specimens may include dry leaves, cereals, pulses, dyes, bird feathers, grains, exoskeleton of insects, dried flower petals, nuts, plant parts, etc. with a few statements of the students' reflection.
- write up on any interesting scientific events and natural patterns like rainbows, clouds, bird nests, leaf patterns, insect home, bird's sounds, stream, animal tracks, animal bones, animals caring their young ones, animal teeth with students' personal thoughts and reflections.
- report on any experiment or research work that the students have conducted during the school science activities or science exhibition. The student has to write about, how it has been done, why it is important and how it can benefit in his or her life.

While making entries, students are expected to follow the common format provided below:

- Date and time for each of the entries.
- The sources of the entries.
- Description of the entries.

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- Students personal expression.
- Every entry must contain teacher's comments and feedback.

iv. **Project work:** It is an opportunity for the learner to learn and explore the basics of science through the scientific process of observation, investigation, analysis, and synthesis to generate scientific knowledge and understanding. The project work is given based on the topic of the learner's choice and assigned at the beginning of the academic session to each grade. It is mandatory to assess both process and product of the project work. The product of the project work must be inclusive of write ups, illustrations, models or collection of real objects. The extent of the project work for each class can be guided by the minimum number of words suggested below:

- Class IV: 300-400 words
- Class V: 500-600 words
- Class VI:700-800 words

The format for the project work write-up must include observation, questioning, hypothesis, design, data collection, analysis, conclusion and sharing as explained in the scientific processes. The teacher may use the given sample rubrics to assess the students' project work.

v. **Practical work**: It is a hands-on experience given to the learner to test, develop, and apply the scientific theories learnt in the class. It enhances the deeper understanding of scientific ideas which culminates in the development of scientific skills, temper and positive attitudes and values. A practical work is conducted based on the requirement of the topic and concept.

vi. **Test and Examination**: It is a procedure intended to establish the quality, performance, or reliability of learner's learning. It is used to test the conceptual understanding and competencies of students in subject matters. Tests are generally administered at the end of every chapter while the examinations are conducted at the end of each term.

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Assessment Matrix

Assessment Matrix											
		CFA			CSA					SA	Grand Total
		Domains				Domains					
Assessment Modalities		SK	WS	SV		SK	WS	SV	Total	Examination	CSA + Exam
	Term I	Home work			Home work	1	1	3	5	20	45
		Class work			Class work	1	2	4	7		
		Project work			Project work	1	3	1	5		
		Scrapbook			Scrapbook	1	2	1	4		
		Practical work			Test	4			4		
	Term II	Home work			Home work	1	1	3	5	30	55
		Class work			Class work	1	2	4	7		
		Project work			Project work	1	3	1	5		
		Scrapbook			Scrapbook	1	2	1	4		
		Practical work			Test	4			4		
Grand Total						16	16	18	**50**	50	**100**

Topic-wise time allocation and weighting

Chapter Number	Chapter	Maximum time required (mins)	Total Weighting (%)
1	Materials in Our Surrounding	720	11
2	Matter	760	12
3	Materials in Mixtures	600	9
4	Seperating Mixtires	520	8
5	Forces	400	6
6	Light and sound	560	9
7	Electricity and Magnetism	560	9
8	Living thing and their environment	760	11
9	Green Plants	560	9
10	Food	520	8
11	Our Earth	520	8
	Total	**6440**	**100%**

Note: The actual teaching 6440 minutes or 161 periods of 40 minutes in a period.

Assessment Tool

It is important to use appropriate assessment criteria and tools to obtain the right information on the progress of the learners. This is because the quality of information acquired through assessment is determined by the tools and descriptors chosen for assessment. The assessment tools and samples are given below:

i. **Checklist:** It offers 'yes' or 'no' format in relation to the achievement of specific criteria by a learner. It can be used for recording observation of an individual, a group, or the whole class.

ii. **Rating scale:** It allows teachers to indicate the degree or frequency of the behaviours, skills, and strategies displayed by the learner. It has scale-based criteria to describe the quality or frequency of the work with precise and reliable descriptive words. The teachers can use it to record observations and the learners can use it for self-assessment.

iii. **Rubric:** It presents a set of criteria with a fixed measurement scale and a detailed description of each level of performance. It helps to increase the consistency and reliability of scoring.

iv. **Anecdotal Record:** It helps to record specific observations of a learner based on behaviour, skills, and attitudes in relation to the expected learning outcome. It provides cumulative information and direction for further instruction. It can be used for the ongoing observations.

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Sample Assessment Tools

i. Checklist

	Domains														Teachers feedback	Remedial Actions
	SK				WS						SV					
Name	Name everyday materials	Name some transparent and opaque materials	Categorize things into degradable and non-degradable things.	Classify things in our surroundings into natural and man-made things.	Observation	Experimentation	Recording	Analysis	Conclusion	Communication	Curiosity	Respect	Inquiry	Collaboration		
Dorji	✓	✓	✓	X	X	X	✓	✓	✓	X	✓	X	X	X	**SK**: 3 ticks **WS**: 3 ticks **SV**: 1 tick	

ii. Rating Scale

Do-mains	Key Areas	Performance Rating					
		Exceeding	Meeting	Approaching	Beginning	Feedback	Remedial Action
SK	Define living things						
	Define non – living things						
	Mention the characteristics of living things						
	Mention the characteristics of non-living things						
	Define habitat						
	State the importance of habitat						
	Define adaptation						
	Give example of the technique used by living things to adapt						
	State the importance of camouflage						
	Explain food chain						
WS	Observation						
	Experimentation						
	Recording						
	Analysis						
	Conclusion						
	Communication						
SV	Curiosity						
	Respect						
	Inquiry						
	Collaboration						

iii. Rubric

	Performance Rating					Remarks/ Feedback
Domains	**Key Areas**	**Exceeding**	**Meeting**	**Approaching**	**Beginning**	
Scientific Knowledge	Sources of light	Identify four or more sources of light	Identify three sources of light	Identify two sources of light	Identify only one source of light	
	Properties of light	Explain two properties of light in their own words	Explain one property of light in their own words but one as given in the book	Explain two properties of light as given in the book	Explain any property of light as given in the book	
	Properties of sound	Explain two properties of sound in their own words	Explain one property of sound in their own words but one as given in the book	Explain two properties of sound as given in the book	Explain any property of sound as given in the book	
Work Scientifically	Scientific skills	Demonstrate observation, experimentation, recording, and communication skills	Demonstrate any three skills	Demonstrate any two skills	Demonstrate any one skill	
Scientific values and attitudes	Scientific attitude and scientific inquiry	Demonstrate curiosity, respect, inquiry and collaboration	Demonstrate any three	Demonstrate any two	Demonstrate any one	

iv. Anecdotal Record

Anecdotal Records are detailed, narrative descriptions of an incident involving one or several learners. They are focused narrative accounts of a specific event. They are used to document unique behaviors and skills of a learner or a small group of learners. Anecdotal Records may be written as behavior occurs or at a later time and comprise of following components:

Anecdotal Record

Developmental Domain: …….

Learner's Name:…….. *Learner's Age:*……..

Time: ……
Observer:……

Setting:…….

Anecdotal:

(Describe exactly what you see and hear; do not summarize behavior. Use words conveying exactly what a learner said and did. Record what the learner did when playing or solving a problem. Use specific language to describe what the learner said and did including facial expression and tone of voice; avoid interpretations of the learner's behavior).

Interpretation:

(What specific inferences can you make from this anecdotal record? What does it tell you about this learner's growth and development? The inferences must be directly related to the domain designated in the anecdote and refer to a specific aspect of the domain.)

Implication for Planning:

(Give a specific activity that you would incorporate into curriculum planning as a result of what you learned about this learner. Make sure that the plan is directly related to the area of development described in the anecdote and the activity is different from the one in the anecdote. Include a brief explanation of why you would create this specific activity.)

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Rubric for Presentation

Domain	Key Areas	Criteria				Remarks
		Exceeding	Meeting	Approaching	Beginning	
SK	Preparedness	Demonstrate clear and logical flow of ideas supported by relevant visual aids.	Contains any three components.	Contains any two components.	Contains any one component.	
	Content	Present variety of ideas that are relevant to the topic.	Presents some ideas that are relevant to the topic.	Presents limited ideas that are relevant to the topics.	Presents ideas that are not relevant to the topic.	
WS	Presentation skills	Communicate the ideas, attains to all the audiences, uses proper gestures and completes within time.	Contains any three components.	Contains any two components.	Contains any one component.	
SV	Collaboration	Seek suggestions, responses to the queries and shows a positive learning attitude.	Contains any three components.	Contains any two components.	Contains any one component.	

Rubric for Homework

Domains	Criteria	Performance Rating			
		Exceeding	Meeting	Approaching	Beginning
SV	Completion	All of the assigned work is complete.	Most of the assigned work is complete.	Some of the assigned work is complete.	Little or a few of the assigned tasks are complete.
SK	Accuracy	All of the answers are correct.	Most of the answers are correct.	Some of the answers are correct.	Little or a few of the answers are correct.
WS	Presentation	Work is neat, error free and legible with relevant illustrations.	One component is missing.	Two components are missing.	Three or more components are missing.
WS	Originality	Display of original and creative ideas.	Partial display of original and creative ideas.	Little display of original and creative ideas.	No display of original and creative ideas.
SV	Submission date	Submitted on due date	Submitted one day after the due date	Submitted two days after the due date.	Submitted three days after the due date.

Rubrics for Scrapbook

Domains	Criteria	Exceeding(4)	Meeting(3)	Approaching(2)	Beginning(1)
WS	**Cover design**	Cover has title of the book, name of the author and grade, cover is very attractive.	Cover has all the three components but the cover is less attractive.	Cover has only two components and cover is less attractive.	Cover has only one of the components and cover is very simple.
SK	**Format**	The work contains date, reasons for the entry, source or place of collection, regular feedback from teacher and has critical reflections.	Missing 1 of the 4 components a n d reflection is less critical.	Missing 2 of the 4 components and poor reflection.	Missing 3 of the 4 components and reflection is absent.
WS	**Entries**	Included 16-20 entries with varieties. All the entries have detailed information.	Included 11-15 entries with few varieties. Few entries do not have detailed information.	Included 6-10 entries with fewer varieties. Most of the entries do not have information.	Included 1-5 entries with one or two varieties. Only one or two entries have information.
WS	**Presentation**	The scrapbook entries are well organised,	The scrapbook entries are less organized.	The scrapbook entries are poorly organized.	The scrapbook entries are not organized.
SK	**Creativity**	Scrapbook entries are unique and grab attention throughout.	Scrapbook entries are generally related to commonly observed phenomenon.	Scrapbook entries are mostly related to commonly observed phenomenon.	Scrapbook entries are not related to scientific Phenomenon.

Rubric for Project work

Domains	Key Areas	Performance Rating			
		Exceeding	**Meeting**	**Approaching**	**Beginning**
SV	Observe	Phenomena observed is systematic, objective and verifiable.	Phenomena observed is systematic, objective but not verifiable.	Phenomena observed is objective but not systematic and not verifiable	Phenomenon observed is subjective and not verifiable.
SV	Question	Clearly stated, focused, and relates to variables	Loosely stated, focused, and relates to variables	Loosely stated and relates to variables	Loosely stated and does not relates to variables
SK	Hypothesize	Feature variables and predict the relationship between variables	Predict the relationship between variables	Feature the variables	Makes no sense
WS	Design	Procedure is detailed and sequential.	Procedure is not detailed and sequential.	Lack detailed and sequential procedure	Procedure is not shown
	Collect data	Appropriate method, relevant and sufficient data	Appropriate method, relevant but not sufficient data	Inappropriate method, sufficient but irrelevant data	Inappropriate method, insufficient and irrelevant data
	Analyse	Appropriate mathematical procedures or appropriate charts with clear interpretation	Appropriate mathematical procedures or appropriate charts but no clarity in interpretation	Inappropriate mathematical producers or charts but no clarity in interpretation	Inappropriate mathematical producers or charts and unclear no interpretation
	Conclude	Restates the hypothesis, supports or refutes it, and explains the role of the test in making the decision.	Restate the hypothesis, supports or refutes it,	Supports or refutes the hypothesis	Restate the hypothesis
	Share	Focus on communicating the central idea, using evidences in the logical format	Focus on communicating central idea with evidences	Focus on central idea	No focus on central idea

Annexure - B

Model Question Paper

Subject: Science **Full Marks: 100**

Class: IV **Time: 2 Hrs**

Question 1

Direction: Each question is followed by four possible answers. Choose the correct answer and circle it. (25 marks)

1. All of the following are the examples of opaque objects **EXCEPT**

   A. stone.
   B. wood.
   C. book.
   D. glass.

Answer: glass.

2. Which is an example of human-made thing?

   A. Bridge
   B. Tree
   C. Air
   D. Mountain

Answer: Bridge

3. The space occupied by matter is called

   A. weight.
   B. height.
   C. volume.
   D. mass.

Answer: volume.

4. Which process is the best method of separating insoluble substance from a solid-liquid mixture?

   A. Floatation
   B. Filtration
   C. Distillation
   D. Sedimentation

Answer: Filtration.

5. Some solids such as bread, cotton, and dough can be compressed because they

   A. are light.
   B. have less mass.
   C. have less volume.
   D. have more air space.

Answer: have more air space.

6. Which one is **NOT** an example of a gas?

   A. Oxygen
   B. Carbon dioxide
   C. Water
   D. Nitrogen

Answer: Water.

7. Milk powder dissolves faster in

   A. oil.
   B. cold water.
   C. hot water.
   D. kerosene.

Answer: hot water.

8. When we dissolve sugar in water, it forms a

   A. solid-solid mixture.
   B. solid- liquid mixture.
   C. liquid- liquid mixture.
   D. liquid- gas mixture.

Answer: solid-liquid mixture.

9. An example of rotational force is

   A. turning of a steering wheel.
   B. kicking of a ball.
   C. pushing a door.
   D. pulling a rope.

Answer: turning of a steering wheel.

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10. All of the following are about sound **EXCEPT**

A. it produces vibration.
B. it travels in air.
C. ear can hear it.
D. it travels in vacuum.

Answer: it travels in vacuum.

11.The Sun is

A. solar system
A. heavenly body
B. a star.
C. a planet.

Answer: a star.

12. The main source of electricity in Bhutan is

A. water.
B. sun.
C. wind.
D. chemicals.

Answer: water.

13.Which of the following is a good conductor of electricity?

A. Wood
B. Plastic
C. Metal
D. Sand

Answer: metal

14. The animals found on trees are

A. monkeys.
B. seals.
C. fishes.
D. deers.

Answer: monkeys.

15. The maximum number of plants and animals are found in the forest because,

A. it has the largest number of habitats.

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B. they like the forest.
C. it has different types of climate.
D. forest gives them food.

Answer: it has the largest number of habitats.

16. Following are special adaptive features found in animals EXCEPT,
A. proboscis.
B. antenna.
A. webbed feet.
A. horn.

Answer: horn

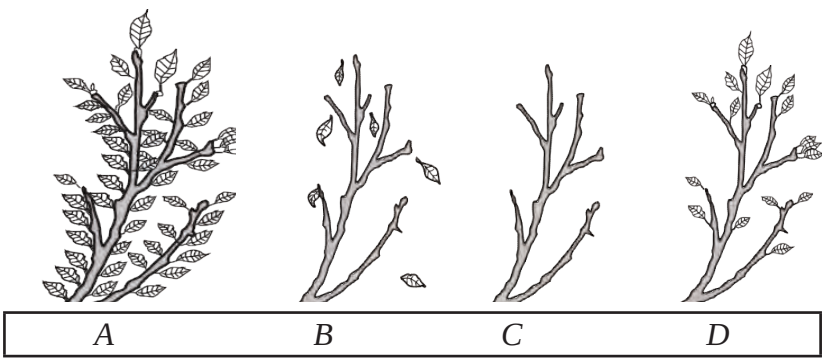
17. Organisms that make their own food by using sunlight are known as
A. heterotrophs.
B. autotrophs.
C. carnivores.
D. omnivores.

Answer: autotrophs.

18. The pine leaves are needle shaped to
A. reduce the loss of water.
B. absorb more water.
C. protect from animals.
D. receive less sunlight.

Answer: reduce the loss of water.

19. A, B, C, and D is the same tree branch during each of the four seasons.



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The season represented by B is

A. spring.
B. summer.
C. autumn.
D. winter.

Answer: autumn.

20. An example of an autotrophs is

A. mushroom.
B. algae.
C. tigers.
D. human beings.

Answer: algae.

21. The male part of the flower is called

A. ovary.
B. stamen.
C. style.
D. stigma.

Answer: stamen.

22. A student took four different types of seeds, and planted in identical pots filled with the same kind and amount of soil. The pots were placed in a warm, sunny place and were given the same amount of water each day for a month.

Which question about the seeds could be answered at the end of the month?

A. Which seeds grew well in the dark?
B. Which seeds produced the tallest plants?
C. Which seeds survived in cold temperatures?
D. Which seeds needed the least amount of water?

Answer: Which seeds produced the tallest plants?

23. Which one of the following is food for growth?

A. Rice
B. Meat
C. Spinach
D. Mango

Answer: Meat

24. The shape of the Earth is

A. rectangular.
B. flat.
C. round.
D. oblate spheroid.

Answer: oblate spheroid .

25. Which instrument would be the most useful for observing the details of an insect's wings?

A. thermometer.
B. balance.
C. hand lens.
D. graduated cylinder.

Answer: hand lens.

Question 2

Direction: Fill in the blanks. Write only the answer against the number in the answer sheet. (10 marks)

1. A chair is usually made from *wood or plastic*
2. Water vapour is in the form of *gas.*
3. Sand and water can be separated by *sedimentation and decantation.*
4. An apple falls on the ground because of the *gravitational force.*
5. The structures and behaviours of organisms that help them to survive in their habitat is called *adaptation.*
6. The organisms that eat only plants are known as *herbivores.*
7. The female part of the flower is *carpel.*
8. Foods rich in vitamins and minerals are termed as *protective foods.*
9. One rotation of the earth takes *24 hours.*
10. The method used to separate insoluble solids from a liquid is *filtration.*

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Question 3

Direction: Match the following. Write only the alphabet against the number in your answer sheet ***(10 marks)***

Answer:

Column A	Column B	Answers
1. The heavy objects	A. residue	*B*
2. Anything that occupies space and has mass	B. sink	*F*
3. A mixture of copper and zinc	C. sun	*I*
4. The push that makes the ball to move when it is kicked	D. plant	*J*
5. The substance that remains on the filter paper	E. photosynthesis	*A*
6. The food of caterpillar	F. matter	*D*
7. Process of preparing food by plants	G. pulses	*E*
8. Soya bean and pea nut	H. bulb	*G*
9. Primary source of light	I. brass	*C*
10. Electrical appliance	J. force	*H*

Question 4

Direction: Write True or False against the number in your answer sheet ***(10 marks)***

1. Plastic takes longer time to decay than a paper. *True.*
2. Solid varies in shape, but has fixed volume. *False.*
3. Glycerine is a miscible liquid. *True.*
4. Water with the impurities are safe to drink. *False.*
5. Pushing of a stone is an example of contact force. *True.*
6. Some cars run on electricity. *True.*
7. Aluminium and copper are metals, therefore, they are are attracted by magnet. *False.*

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8. A food chain helps to keep balance in the environment. *True.*
9. Light is an important factor in plant's growth. *True.*
10. Plants obtain food from soil. *False.*

Question 5:

Direction: Answer the following question as directed. All answer must be written in your answer sheet. The marks are given in the bracket for each question. (25 Marks)

1. Write two uses of forest as a source of raw material. (2)

Answer:

- ✓ *We get timber for furniture.*
- ✓ *We get fibres for making ropes.*
- ✓ *We get herbs for making medicine.*
- ✓ *We get bamboos for making huts and baskets.*
- ✓ *We get vegetables and roots to prepare food.*

2. Group the following things into degradable and non-degradable things. (2)

banana, plastic, leaves, thread, glass, flower, nail.

Answer:

Degradable things	Non-degradable things
banana, leaves, thread, flower	*plastic, glass, nail*

3. A mixture of water and sand can be separated using sedimentation and decantation process. Suggest another way to separate sand from water. (2)

Answer: Filter the mixture to separate sand and water.

4. The paragraph below gives some facts about a deer. (3)

The places in which the timid deer is found are forest and grassland as it lives on grasses. The colour on its skin allow it to blend in with the forest vegetation. The deer is smaller than its predators, such as tigers. When the deer senses danger, it stays quiet in the bushes. However, when it is threatened, it flees by using its strong slender hind legs.

(i) Describe **two** ways that the deer is protected from predators.

Answer: Its ability to blend its body colour with the forest vegetation, and it has strong slender hind legs to sprint fast when threatened.

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(ii) What is the habitat of deer?

Answer: Forest or grassland.

5. Though husk in water is a solid-liquid mixture, we cannot use sedimentation and decantation to separate it. Why? (2)

Answer: Sedimentation and decantation will not work if the solid is lighter than liquid. Since husk is lighter than water, we cannot separate it by the above process. Here, we use floatation and filtration to remove the insoluble solids from the solid-liquid mixture.

6. Look at the Figure a, and answer the following questions. (3)

(i) Label the picture from 1 -3

Answer: 1. Dirty water 2. Mixture of charcoal, sand and gravels 3. Clean water.

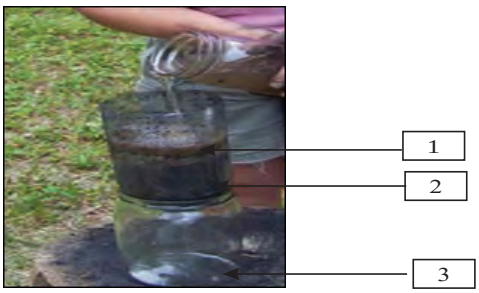

Figure a

(ii) What is the use of charcoal?

Answer: Charcoal absorbs gas, dust particles and makes the water colourless.

(iii) What is the use of sand and gravels?

Answer: Gravels will block the passage of bigger particles and the sand will further block the impurities filtered through the gravels. And also it will prevent the charcoal from getting displaced on adding water.

7. Write the changes a force can bring to objects.(2)

Answer: Force can stop a moving object, change a shape and size of an object, speed up or start motion, and slow down or stop the moving object.

8. How can you prove that light travels in a straight line? (2)

Answer: Take a long black polythene pipe of about one metre and light the torch from one end. We can see the light from the other end. Now bend the pipe and look from the other end. Light cannot be seen. This proves that light travels in a straight line.

9. Write down **two** differences between living things and non-living things. (2)

Answer:

Living things	Non-living things
They can move from place to place. *They reproduce their young ones.*	*They cannot move from place to place on their own.* *They cannot reproduce.*

10. Explain the importance of adaptation to animals. (2)

Answer: For animals, adaptation is a matter of life or death. If they cannot adapt to their surrounding, they will not survive as they may neither be able to get food and shelter, nor overcome the natural conditions.

11. Write down the kinds of food a farmer should eat.(2)

Answer: A farmer should eat food having more energy like rice, pork, butter, etc., because he or she has to do more physical work in the field.

12. A student takes 50 mL of water in a measuring cylinder. It is kept on a flat surface table. A stone of 15mL of volume is put into the cylinder. (1)

(i) What is the level of water in the cylinder?

Answer: 50 + 15= 65 mL

(ii) Why should the cylinder be kept on the flat surface?

Answer: So that the lower meniscus of the water can be clearly seen for accurate reading of the level of water in the cylinder.

Question 6:

Direction: Answer the following questions as directed in your answer sheet. (20 Marks)

1. What is micro-organism? Give **one** example. (1)

Answer: Micro-organisms are very small organisms which help other plants and animals to decay. We cannot see them with our naked eyes. Examples of micro-organism are bacteria and fungi.

2. State **one** importance of micro-organisms.

Answer: Micro-organisms help to decay the degradable substances and prevent pollution of the environment.

3. Explain how is a shadow formed. (2)

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Answer: When the light falls on an opaque object like stone or wood or our body, light cannot pass through them. The space behind the object appears dark because there is no light falling on it. This dark space formed behind the opaque object is called shadow.

4. Draw a diagram of a circuit and explain why it is important to have all of the following things. (3)

- Wire
- Bulb
- Battery

Answer: It is important to have wire, bulb and battery to have a complete circuit through which the current can flow and make the bulb glow. If any of these things are not connected properly or if we do not use any of these things, the circuit will not be complete and hence, the bulb will not glow.

5. From the lists of the organisms provided below, make two food chains consisting of at least four organisms in a chain. (2)

Grass, maize, deer, rats, snake, hawk, cow, tiger, goat, sheep, grains, vultures, small bird, large bird, eagle, hen, caterpillar, frog, insects.

Answer: (sample)

i. *Maize* → *rats* → *snake* → *hawk*

ii. *Grains* → *caterpillar* → *hen* → *eagle*

6. Explain the uses of sunlight to the Earth. (3)

Answer: Plants prepare food by using the light energy from the Sun. Light energy from the Sun causes change of states of matter. For example, ice changes to water, and water to water vapour by which the living organisms on the Earth are able to get water for their living.

7. Why is it important to eat all types of food?(3)

Answer: It is important to eat all types of food because the food that contains all the essential nutrients. It is important to eat a wide variety of foods and drinks from all the food groups in right amount, as it is essential to supply nutrition and energy for maintaining body cells, tissues, and organs.

It helps to support normal growth and development.

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Some help us to work and play, some help us to grow and some protect us from diseases.

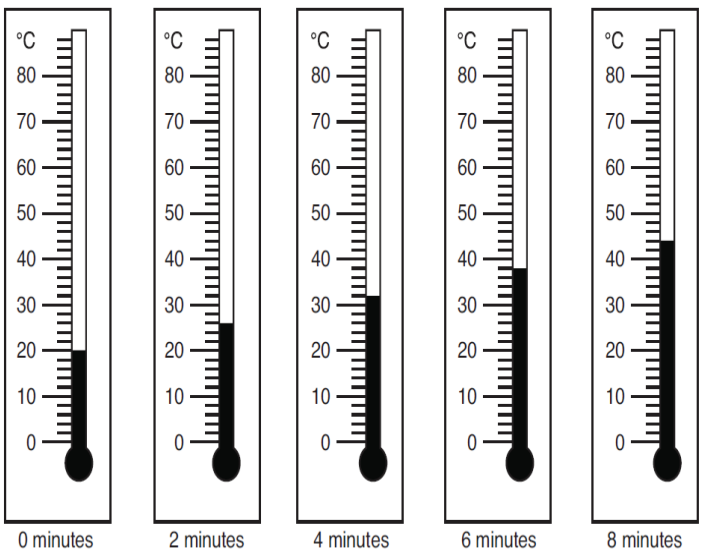
8. Design an experiment to make a piece of wood sink and a paper pin float in the water. (3)

Answer: Things needed: Wood, paper pin, stone (any heavy object), a piece of thread, a bucket of water, paper (or any object that floats).

Tie the piece of wood with the stone and put in the water. The wood sinks.

Place the paper pin on the paper and put in the water. The paper pins floats.

8. A beaker of water is heated for eight minutes. The thermometers below show the temperature reading during that time. (2)



Estimate the temperature when the water was heated for five minutes.

Answer: 34 degree Celsius.

Annexure - C

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Nutrients per 100 grams of raw portion												
Food Type	Food Commodites	ENERGY (kcal)	PROTEIN (g)	FAT (g)	CALCIUM (mg)	IRON (mg)	IODINE (µg)	VIT. A (µg RE)	THIAMINE (mg)	RIBOFLAVIN (mg)	NIACIN (mg NE)	VIT. C (mg)
VEGETABLES	AMLA	58	0.5	0.1	50	1.2		9	0.03	0.01	0.2	600
OILS AND FATS	ANIMAL FAT	900	0.0	100.0	0	0.0	0	0	0.00	0.00	0.0	0
FRUIT	APRICOTS, DRIED	270	4.0	0.5	62	4.5		300	0.08	0.09	2.9	5
FRUIT	AVOCADO PEAR	121	1.4	11.3	19	1.4	1	265	0.05	0.15	2.3	18
FRUIT	BANANA	88	1.5	0.1	9	1.4	8	60	0.03	0.03	0.7	9
CEREALS	BARLEY, DEHULLED	337	12.5	2.3	33	3.6		7	0.65	0.29	8.1	0
PULSES & OILSEEDS	BEANS, BLACK (USA)	341	21.6	1.4	123	5.0		5	0.80	0.19	6.2	0
PULSES & OILSEEDS	BEANS, BLACKEYE / COWPEAS (USA)	336	23.5	1.3	110	8.3		15	0.90	0.20	6.2	2
PULSES & OILSEEDS	BEANS, DRIED	335	20.0	1.2	143	8.2		0	0.50	0.22	6.2	0
PULSES & OILSEEDS	BEANS, GREAT NORTHERN (USA)	339	21.9	1.1	175	5.5		1	0.70	0.20	6.3	5
PULSES & OILSEEDS	BEANS, KIDNEY, ALL TYPES (USA)	333	23.6	0.8	143	8.2		2	0.50	0.20	6.6	5
PULSES & OILSEEDS	BEANS, NAVY / PEA BEANS (USA)	335	22.3	1.3	155	6.4		1	0.65	0.23	6.5	3
PULSES & OILSEEDS	BEANS, PINK (USA)	343	21.0	1.1	130	6.8		0	0.80	0.20	6.0	0
PULSES & OILSEEDS	BEANS, PINTO (USA)	340	20.9	1.1	121	5.9		2	0.60	0.20	5.6	7
PULSES & OILSEEDS	BEANS, SMALL RED (USA)	350	22.0	1.0	150	7.0		0	0.70	0.20	6.2	0
PULSES & OILSEEDS	BEANS, SOYA	416	36.5	19.9	277	15.7	6	7	0.87	0.87	10.4	6
MEAT	BEEF, MODERATELY FAT	237	18.2	17.7	11	3.6	6	0	0.07	0.15	6.6	0
MISCELLANEOUS	BP-5 COMPACT FOOD	458	14.7	17.0	600	10.0	100	470	0.52	0.52	6.5	40
MISCELLANEOUS	BREAD, WHITE	261	7.7	2.0	37	1.7	6	0	0.16	0.06	5.6	0
CEREALS	BULGUR WHEAT	350	11.0	1.5	29	3.7		0	0.28	0.14	4.5	0
CEREALS	BULGUR WHEAT, FORTIFIED, (USA)	342	12.3	1.3	110	2.9		662	0.44	0.26	3.5	0
OILS AND FATS	BUTTER	725	0.0	81.0	12	0.2	38	714	0.01	0.02	0.2	0
FISH	CANNED FISH	305	22.0	24.0	330	2.7	19	0	0.40	0.30	6.5	0
FISH	CANNED FISH IN WATER	150	20.0	8.0	36	1.0	19	33	0.03	0.06	5.4	0
MEAT	CANNED MEAT	220	21.0	15.0	14	4.1		0	0.20	0.23	6.6	0
PULSES & OILSEEDS	CASHEW NUT	566	18.2	46.9	37	6.7	11	0	0.42	0.06	5.8	1
ROOTS AND TUBERS	CASSAVA, FLOUR	342	1.5	0.0	55	2.0		0	0.04	0.04	0.8	0
ROOTS AND TUBERS	CASSAVA, FRESH	160	1.4	0.3	16	0.3		8	0.09	0.08	0.9	21
MILK & PRODUCTS	CHEESE, CANNED	355	22.5	28.0	630	0.2	39	120	0.03	0.45	5.4	0
MEAT	CHICKEN, CANNED	215	21.0	14.0	14	1.5		120	0.08	0.16	10.4	0

Nutrients per 100 grams of raw portion												
Food Type	Food Commodites	ENERGY (kcal)	PROTEIN (g)	FAT (g)	CALCIUM (mg)	IRON (mg)	IODINE (µg)	VIT. A (µg RE)	THIAMINE (mg)	RIBOFLAVIN (mg)	NIACIN (mg NE)	VIT. C (mg)
PULSES & OILSEEDS	CHICKPEAS	364	19.3	6.0	105	6.2		20	0.48	0.21	4.6	4
MISCELLANEOUS	COCOA	270	17.0	21.0	50	14.0			0.10	0.30	3.1	0
PULSES & OILSEEDS	COCONUT MEAT, RAW	354	3.3	33.5	14	2.4	3	0	0.07	0.02	1.2	3
MISCELLANEOUS	COFFEE, GROUND	56	8.0	0.0	30	1.0	0	0	0.00	0.01	27.0	0
BLENDED FOODS	CORN SOY BLEND (WFP SPECS.)	400	18.0	6.0	181	12.8	2	501	0.44	0.70	10.0	50
BLENDED FOODS	CORN SOY BLEND, (USA)	376	17.2	6.9	831	17.5	56.9	784	0.53	0.48	6.2	40
BLENDED FOODS	CORN SOY MASA FLOUR (USA)	365	9.3	3.8	110	2.9		662	0.44	0.26	3.5	0
BLENDED FOODS	CORN SOY MASA FLOUR, INSTANT (USA)	363	11.4	3.7	110	2.9		662	0.44	0.26	3.5	0
BLENDED FOODS	CORN SOY MILK (USA)	375	21.4	6.8	1,020	17.5	56.9	785	0.59	0.71	6.4	41
BLENDED FOODS	CORN SOY MILK, INSTANT (ICSM)	380	20.0	6.0	900	18.0	56.9	510	0.80	0.60	8.0	40
MEAT	CORNED BEEF, CANNED	233	25.5	14.0	56	4.0	14	0	0.02	0.20	4.5	0
FRUIT	DATES, DRIED	245	2.0	0.5	32	1.2		0	0.09	0.10	3.0	0
MILK & PRODUCTS	DRIED SKIM MILK (DSM)	348	36.1	0.6	1,280	0.3	0	9	0.38	1.63	9.5	13
MILK & PRODUCTS	DRIED SKIM MILK (DSM), FORTIFIED	360	36.0	1.0	1,257	1.0	0	1,500	0.42	1.55	9.5	0
MILK & PRODUCTS	DRIED WHOLE MILK (DWM)	500	25.0	27.0	912	0.5		280	0.28	1.21	6.8	0
EGGS	EGG, DRIED	594	47.4	41.0	231	6.8		270	0.20	1.54	9.9	0
EGGS	EGG, HEN, FRESH	149	12.5	10.0	49	1.4	53	191	0.06	0.51	2.6	0
VEGETABLES	EGGPLANT (AUBERGINE)	26	1.0	0.2	7	0.3	1	25	0.05	0.03	0.7	2
MILK & PRODUCTS	EVAPORATED MILK	151	8.4	9.4	290	0.3	11	105	0.07	0.42	2.2	1
BLENDED FOODS	FAMIX (ETHIOPIA)	402	14.7	7.0	100	8.0			0.10	0.40	5.0	30
FISH	FISH FILLET, COD, FRESH	76	17.4	0.7	16	0.3	110	2	0.08	0.07	4.9	0
FISH	FISH, DRIED, SALTED	270	47.0	7.5	343	2.8		0	0.07	0.11	8.6	0
FISH	FISH, DRIED, WHOLE, FRESHWATER	309	63.0	6.3	3,000	8.5		0	0.10	0.20	19.7	0
FRUIT	FRUIT IN SYRUP, CANNED	60	0.5	0.0	7	0.3		63	0.03	0.03	0.2	5
OILS AND FATS	GHEE, BUTTER OIL	862	0.0	97.8	0	0.0		600	0.00	0.00	0.0	0
MEAT	GOAT, MODERATELY FAT	357	15.2	32.4	11	2.0		0	0.07	0.13	8.9	0
PULSES & OILSEEDS	GROUNDNUTS, DRY	567	25.8	49.2	92	4.6	20	0	0.64	0.14	16.2	0
FRUIT	GUAVA	64	1.1	0.4	24	1.3		145	0.06	0.04	1.3	230
BLENDED FOODS	HEPS (ZAMBIA)	350	15.0	6.0	173	14		501	0.60	0.80	8.8	50
MISCELLANEOUS	HIGH ENERGY BISCUITS (WFP SPECS.)	450	12.0	15.0	250	11.0	75	250	0.50	0.70	6.0	20

Nutrients per 100 grams of raw portion												
Food Type	Food Commodites	ENERGY (kcal)	PROTEIN (g)	FAT (g)	CALCIUM (mg)	IRON (mg)	IODINE (µg)	VIT. A (µg RE)	THIAMINE (mg)	RIBOFLAVIN (mg)	NIACIN (mg NE)	VIT. C (mg)
VEGETABLES	LEAVES, DARK GREEN, e.g. SPINACH	25	2.8	0.8	170	2.1	2	589	0.07	0.09	1.9	26
VEGETABLES	LEAVES, LIGHT GREEN, e.g. CABBAGE	26	1.7	0.4	52	0.7		64	0.15	0.02	0.8	49
VEGETABLES	LEAVES, MEDIUM GREEN, e.g. PUMPKIN	19	3.2	0.4	39	2.2		583	0.09	0.13	1.7	11
FRUIT	LEMON	59	0.5	1.0	90	0.3	2	15	0.02	0.03	0.2	63
PULSES & OILSEEDS	LENTILS	338	28.1	1.0	51	9.0		12	0.48	0.25	6.8	6
FRUIT	LIMES	30	0.7	0.2	33	0.6		3	0.03	0.02	0.2	29
MEAT	LIVER	136	20.0	4.0	10	10.0	9	12,000	0.30	2.50	17.6	30
CEREALS	MAIZE GRAIN, WHITE	350	10.0	4.0	7	2.7		0	0.39	0.20	2.2	0
CEREALS	MAIZE GRAIN, YELLOW	350	10.0	4.0	13	2.7		141	0.39	0.20	2.2	0
CEREALS	MAIZE MEAL, FORT. (WFP SPECS.)	366	8.5	1.7	110	5.3		141	0.83	0.46	5.5	0
CEREALS	MAIZE MEAL, FORTIFIED (USA)	366	8.5	1.7	110	2.9		662	0.44	0.26	4.8	0
CEREALS	MAIZE MEAL, WHITE, DEGERMED	360	8.5	1.7	5	1.1		0	0.14	0.05	1.3	0
CEREALS	MAIZE MEAL, WHITE, WHOLE GRAIN	360	9.0	3.5	6	2.4		0	0.39	0.20	2.0	0
CEREALS	MAIZE MEAL, YELLOW, DEGERMED	360	8.5	1.7	5	1.1		124	0.14	0.05	1.3	0
CEREALS	MAIZE MEAL, YELLOW, WHOLE GRAIN	360	9.0	3.5	6	2.4		141	0.39	0.20	2.0	0
VEGETABLES	MAIZE, FRESH	86	3.2	1.2	2	0.5		84	0.20	0.06	0.9	7
FRUIT	MANGO	65	0.5	0.3	10	0.1		1,168	0.06	0.06	0.6	28
OILS AND FATS	MARGARINE, CORN (USA)	719	0.0	80.5	30	0.0		1,074	0.01	0.04	0.0	0
MILK & PRODUCTS	MILK, COW, WHOLE	66	3.2	3.9	115	0.1	15	56	0.03	0.17	0.8	1
MILK & PRODUCTS	MILK, GOAT, WHOLE	69	3.6	4.1	134	0.1		56	0.05	0.14	1.0	1
MILK & PRODUCTS	MILK, HUMAN	69	1.3	4.1	34	0.1	7	62	0.02	0.03	0.7	4
CEREALS	MILLET, BULRUSH	335	11.0	3.0	22	20.7		0	0.30	0.22	6.7	3
MEAT	MUTTON, MODERATELY FAT	249	15.0	21.0	10	2.4	5	0	0.15	0.20	7.9	0
CEREALS	OATS, ROLLED	370	13.0	5.5	30	3.4		0	0.20	0.08	4.9	0
CEREALS	OATS, WHOLE	375	17.0	7.0	60	4.6		0	0.35	0.09	4.9	0
OILS AND FATS	OIL, VEGETABLE (WFP SPECS.)	885	0.0	100.0	0	0.0		900	0.00	0.00	0.0	0
OILS AND FATS	OIL, VEGETABLE, UNFORTIFIED	890	0.0	100.0	0	0.0		0	0.00	0.00	0.0	0
OILS AND FATS	OIL, VEGETABLE, Vit A FORTIFIED (USA)	884	0.0	100.0	0	0.02		1,800	0.00	0.00	0.0	0
VEGETABLES	ONION	38	1.2	0.2	20	0.2	2	0	0.04	0.02	0.4	6
FRUIT	ORANGE, WHOLE	26	0.8	0.1	33	0.1		3	0.08	0.03	0.4	38