Science

Class V

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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.

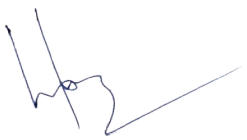
Unfortunately, many a times, the subject is seen as very complex and difficult, hard to comprehend and demanding to learn, thereby posing challenges in our effort in instilling scientific beliefs and attitudes in young learners. Such generalisation has influenced the learners to shy away from the experiential 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

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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

Matter

1.1. What is an element?

Test Yourself

1. Name three states of matter.
2. Give two examples of matter.
3. What happens when liquid is heated?
4. Name two elements that water is made up of.

You already know:

- matter has mass and occupies space.
- states of matter.

You will learn:

- element and compound.

You have learnt that there are three states of matter. Matter is made up of particles. If a matter is made of only one kind of particles, it is known as an **element**. Some examples of elements are gold, silver, iron, copper, oxygen and hydrogen.

Figure 1.1. Elements.

Different elements join together to form other substances. For example, water is made of two elements, hydrogen and oxygen. Therefore, water is not an element. It is a **compound**.

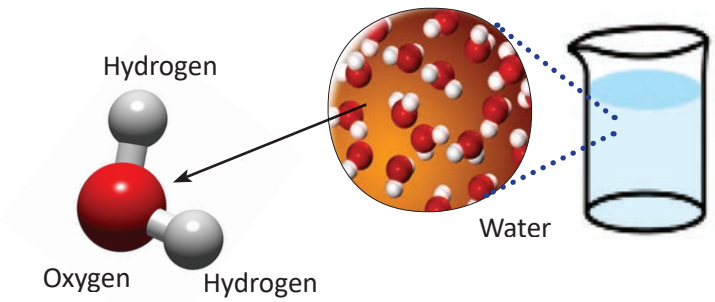

Figure 1.2. Compound.

A. Go to your school library or browse internet to know more elements. List down ten elements and display in the classroom.

B. Identify elements and compounds from Figure 1.3. Copy and complete the Table 1.1.

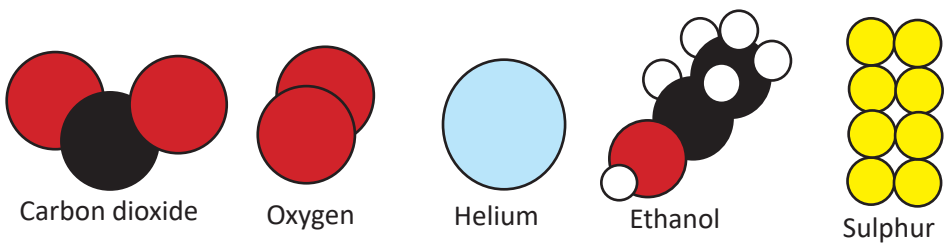

Table 1.1 *Identifying Elements and Compounds*

Element	Compound

Figure 1.3. Models of elements and compounds.

How did you identify elements and compounds in Table 1.1?

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C. Work in Groups

Let's make a model!

Design and build a 3D Model of a compound using everyday materials found in your locality.

Write:

what you needed.
what you did.

Make the presentation of the model to the class.

Check Your Progress

i. What is an element?

ii. Sort out elements and compounds from the pictures given in Figure 1.4.

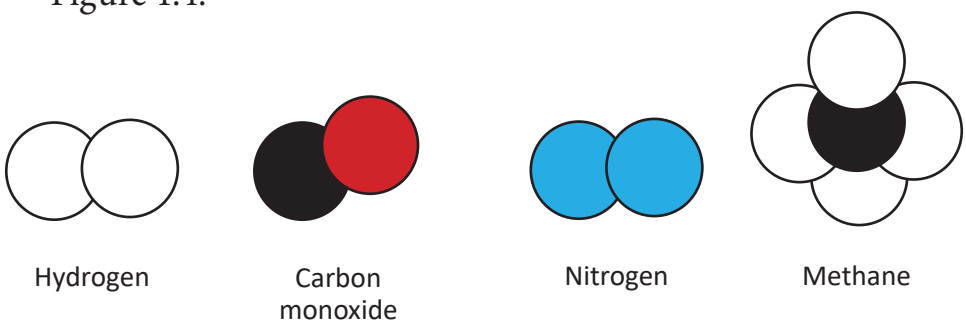

Figure 1.4.

Do You Know?

Until the year 1800, people thought water was an element.

WEBLINK

http://www.nyu.edu/pages/mathmol/textbook/compounds.html
http://www.chem4kids.com/files/elem_perTable.html

1.2. Change of State

Test Yourself

1. Give two examples of an element.
2. Is water an element?
3. What is an element made of?
4. What happens to butter when it is heated?
5. How can you change water into ice?

You already know:

- element and compound.

You will learn:

- change of state of matter.

A. Matter can change from solid to liquid and liquid to gas.
Matter can also change from gas to liquid and liquid to solid.
Some solids can change directly to gas and back to solid.
These processes are called **change of state**.
These changes are usually caused by heating or cooling.
When solids melt they change to liquid.
This process is called **melting** or **fusion.**
Heat a spoon of butter in a container. The butter melts.

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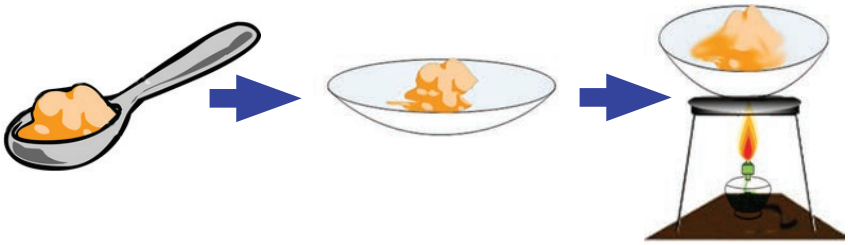

Figure 1.5. Melting of butter.

What makes the butter melt?

Figure 1.6 shows the processes of change of state.

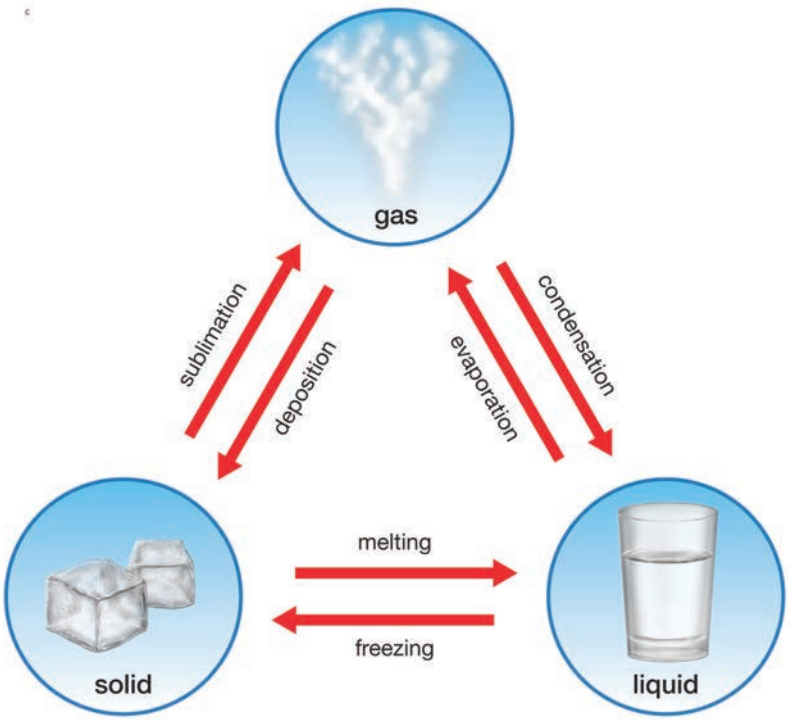

Figure 1.6. Change of state.

Work in groups

Study Figure 1.6.

Copy and complete Table 1.1.

Table 1.1 *Processes of Change of State*

Change of State	Process of Change
1.Solid to liquid	
2. Liquid to gas	
3. Liquid to solid	
4. Gas to liquid	
5. Solid to gas	
6. Gas to solid	

B. Your teacher will demonstrate the process of sublimation.

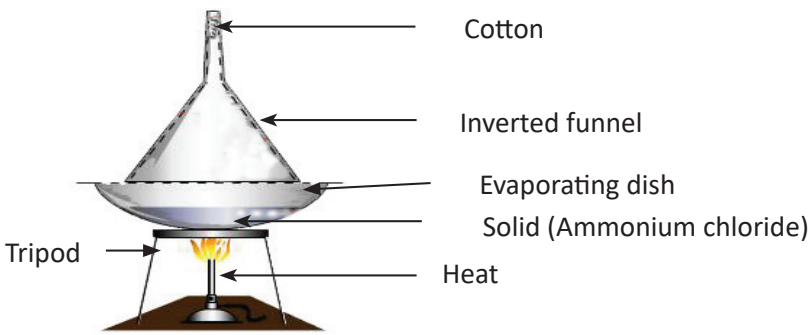

Figure 1.7. Sublimation.

List down the materials used by your teacher.

What happens to the solid on heating?

What happens to the vapour when it touches the cold surface of the funnel?

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What is collected on the walls of the inverted funnel?

Why is the funnel plugged with cotton?

Give two examples of sublimation in our daily life.

PRECAUTION

Do not try this with iodine crystals and naphthalene ball.

Do You Know?

Evaporation takes place at all temperatures.

Check Your Progress

i. What is condensation?

ii. What is sublimation?

1.3. Properties of Solid

Test Yourself

1. Why is liquid a matter?
2. Give one condition to change solid into liquid.
3. The change of state from liquid to gas is called _____ and the change of state from liquid to solid is called _____.
4. Do all solids have same shape?
5. State one characteristic of a solid.

You already know:

- solid, liquid and gas are three states of matter.
- matter can change states.

You will learn:

- shape and volume of a solid.
- particle arrangement in a solid.

A. You have learnt that solid, liquid and gas are three states of matter.

These states of matter are different in many ways. This is because they have different properties.

Work in groups

You may need:

- metal block
- metre rule

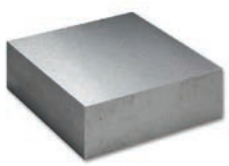

Figure 1.8. Metal block.

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Look at the metal block shown in Figure 1.8.

What is its shape?

Measure the length, width and height of the metal block with the metre rule.

Copy Table 1.3 and record your readings

Table 1.3 *Volume of a Metal Block*

Length (cm)	
Width (cm)	
Height (cm)	

Find the volume of the metal block using your readings.

Volume = length x width x height

B. There is another method of finding the volume of solid by using measuring cylinder and water.

1 mL = 1 cm^3 or 1 cc (cubic centimetre)

Work in groups

You may need:

- measuring cylinder
- metal block used in Activity A
- water
- thread

Pour some water in a measuring cylinder.

Record the level of the water. Make sure you read the lower meniscus.

Tie the metal block with a thread.

Slowly lower the metal block into the water.

Record the level of the water again.

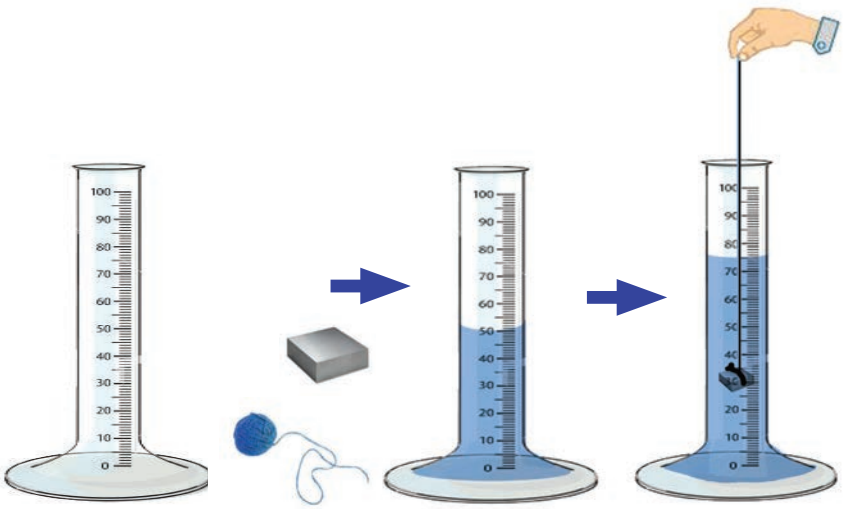

Figure 1.9. Measurement of volume of solid.

Copy and complete Table 1.4.

Table 1.4 *Finding the Volume of Solid*

Observation	Level of Water in mL
Before putting the metal block (initial reading)	
After putting the metal block (final reading)	

Find the volume of metal block using the following relation.

Volume of metal block = volume of water with metal block - volume of water without metal block.

What is the volume of the metal block in cm^3?

Compare the volume of metal block measured in Activity A and Activity B.

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What can you say about the property of a solid?

Design and carry out an experiment to find the volume of an irregular object.

Write about:

- what you needed.
- what you did.

Volume of an object can be measured by measuring the volume of water displaced by the object when immersed in it.

Volume of an object = volume of water displaced.

C. Work in groups

You may need:

- metal block
- beaker

Put a metal block into beakers of different sizes.

What happens to the shape of the metal block when placed in different beakers?

What happens to the volume of the metal block when placed in different beakers?

D. All solids, liquids and gases are made of tiny particles.

Particles cannot be seen with our naked eyes.

Look at Figure 1.10.

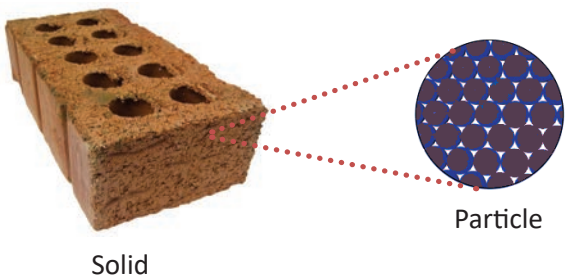

Figure 1.10. Arrangement of particles in solid.

How are the particles arranged in a solid?

Describe the properties of a solid.

Check Your Progress

i. Figure 1.11 shows the arrangement of particles in a _____ , because the particles are _____.

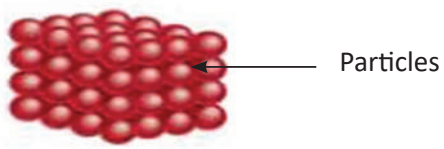

Figure 1.11.

ii. Is our body solid? Why?

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1.4. Properties of Liquid

Test Yourself

1. Does solid have fixed shape?
2. How are particles arranged in a solid?
3. How will you find the volume of a regular metal block?
4. What is the shape of a liquid?
5. How are the particles arranged in a liquid?

You already know:

- properties of solid.

You will learn:

- shape and volume of a liquid.
- particle arrangement in a liquid.

A. Properties of liquid are different from the properties of solid.

Work in groups

You may need:

measuring cylinder, beaker, conical flask, flat bottom flask, U-shaped tube, round bottom flask, large size test tube, water trough, glass bottle, and water.

Take glass containers of different shapes and sizes.

Pour equal volume of water into each container with the help of the measuring cylinder and observe.

Figure 1.12. Water in different containers.

Based on your observation, correct the following sentences.

i. Different containers contain different volume of water.

ii. The level of water in different containers is same.

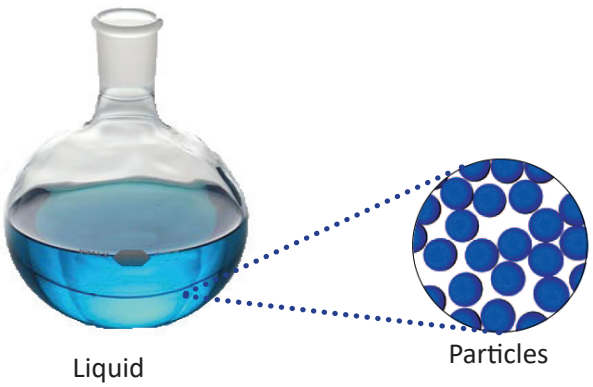
iii. The shape of water is same in all the containers.

Does liquid have a fixed shape? Why?

Now, take a measuring cylinder and measure the volume of the water in each of the above containers separately.

Does liquid have a fixed volume?

B. Figure 1.13 shows the arrangement of particles in a liquid



Do You Know?

Glass is a super cooled liquid

Figure 1.13. Arrangement of particles in liquid.

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i. How are particles arranged in a liquid?
ii. Describe the properties of a liquid.

Check Your Progress

i. Is milk a liquid? Why?
ii. Describe the particle arrangement in liquid.

1.5. Floating Liquid

Test Yourself

1. Have you seen leaves floating on water? Why do you think they float?
2. Why does stone sink in water?
3. Give an example of a liquid which floats over another liquid.
4. Why does oil float on water?
5. Does milk float on water? Why?

You already know:

- sinking and floating solids.

You will learn:

- sinking and floating liquids.

A. Work in groups

You may need:

- vegetable oil
- honey
- water
- measuring cylinder
- cork
- test tube
- test tube stand

Figure 1.14. Mixture of liquids.

Take a measuring cylinder.

Measure equal volume of vegetable oil, honey and water.

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Pour them into a test tube.

Close the mouth of the test tube with the cork.

Shake the test tube.

Place it in the test tube stand and observe.

Draw a picture of the test tube with the liquids.

Label the layers of the liquid.

Which liquid is the lightest?

Which liquid is the heaviest?

Check Your Progress

i. In places where kerosene lamp is used, people usually add water in the kerosene lamp when the oil is less. Why?

ii. List down three liquids which are used in daily life that float on water.

https://www.thoughtco.com/make-a-density-column-604162

1.6. Properties of Gas

Test Yourself

1. Give two properties of a solid.
2. Give two properties of a liquid.
3. How are particles arranged in a liquid?
4. Is water vapour a gas?
5. Why are gases lighter than liquids even if their volumes are equal?

You already know:

- properties of solid.
- properties of liquid.

You will learn:

- shape and volume of gas.
- particle arrangement in gas.

A. Properties of gas are different from the properties of solid and liquid. Air is a mixture of gases.

Work in groups

You may need:

- balloon
- thread

Blow a balloon and tie it with the thread.

What is the shape of the air inside the balloon?

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What will happen to the shape of the air when the balloon is gently squeezed or twisted?

Now, in the same group, try this.

You may need:

- matchbox
- paper
- glass jar with lid

Light the paper and drop it into a glass jar. Cover it with a lid.

What happens to the smoke inside the glass jar?

What is the shape of the smoke?

Figure 1.15. Balloon filled with air.

Figure 1.16. Closed jar of smoke.

Remove the lid.

What happens to the smoke now?

Does the shape of the smoke change when the lid is removed?

Does the volume of the smoke change when the lid is removed?

Describe the shape and the volume of the gas.

Figure 1.17. Opened jar of smoke.

B. Look at Figure 1.18.

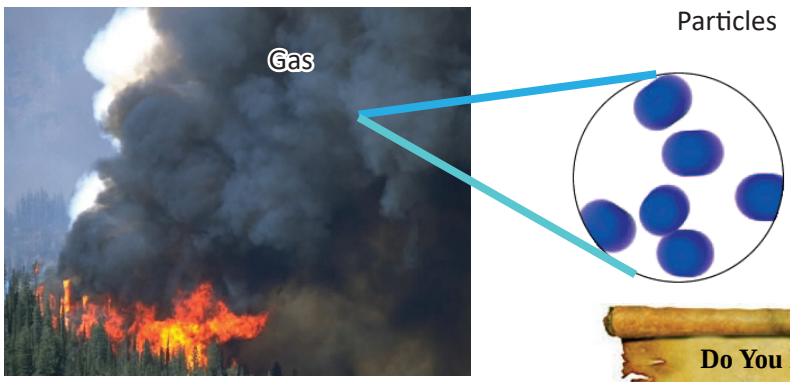

Figure 1.18. Arrangement of particles in gas.

How are particles arranged in gas?

Describe the properties of gas.

Do You Know?

The particles in solids, liquids and gases are always moving but at different speed. This movement is due to the difference in the energy of the particles.

C. Work in groups

Use presentation software to write the characteristics of solid, liquid and gas. Present it to the rest of the class.

Check Your Progress

i. Gas does not have fixed shape and volume. Explain.

ii. The smoke from burning wood spreads over an area. Why?

WEBLINK

http://phet.colorado.edu/en/simulation/gas-properties

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Think Again

1. State whether the following sentences are **true** or **false**:
   a. Matter is made of particles.
   b. Solids take the shape of the container.
   c. The change of ice into water is called evaporation.
   d. An element is made of single substance.
   e. Particles are closely packed in gas.
2. Write two differences between sublimation and evaporation.
3. Describe water cycle using the following words.

evaporates, sea, condenses, rises, river, rain, water vapour, heat

4. Draw a diagram showing particle arrangement of solid, liquid and gas.
5. Why does butter float in suja?
6. How will you find the volume of an irregular solid which floats in water?

CHAPTER 2

Physical Change

2.1. Natural and Human-made Changes

Test Yourself

1. List three natural things.
2. Name some of the things built by humans.
3. What causes change of states of matter?
4. What changes do you see when a mango ripens?
5. What are the changes that occur when a raw egg is boiled?

You already know:

- change of state

You will learn:

- natural change.
- human-made change.

A. Many changes happen around us. Leaf changes its colour and a chick turns into a hen. Changes take place not just around us, but also within us. You grow from a baby to an adult. You grow in height. Your weight increases. These changes are called **natural changes** because these changes happen naturally.

Figure 2.1. Natural change in human.

Give three more examples of natural changes that you see in your day-to-day life.

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Besides natural changes, many changes are brought about by humans. Construction of road, building of houses, felling of trees are some examples. Changes brought about by humans are called **human-made changes**.

Give three more examples of human-made changes.

B. Some examples of changes that you see happening around us are:

growth of plants, cooking, changes in weather, making of **suja**, making ice in a refrigerator, and burning of wood.

Burning of wood

Melting of ice

Making of Suja

Growth of plants

Figure 2.2. Examples of change.

From the list of changes given above, sort them into natural and human-made changes.

Copy and fill in Table 2.1.

Table 2.1 *Types of Changes*

Natural Change	Human-made Change

Give some more examples of human-made change.

Name any three natural changes in plants.

Check Your Progress

i. Name three natural changes that take place in a growing plant.

ii. Define human-made change with two examples.

Do You Know?

All changes involve energy.

http://www.edinformatics.com/math_science/p_change.htm

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2.2. Physical Change

Test Yourself

1. What is a natural change?
2. Water exists in three states. Name them.
3. Give one example of change that is temporary.
4. Is melting of wax a physical change? Why?
5. Give one example of change that is permanent.

You already know:

- natural and human-made changes.

You will learn:

- physical change.

A. Ice melts into water when heated. Water freezes back to ice when it is cooled. This is an example of a reversible change. All reversible changes are temporary.

Milk can be changed into curd, but curd cannot be changed back into milk. This is an example of an irreversible change. All irreversible changes are permanent.

Take a sheet of paper.

Fold it to make a toy aeroplane.

Unfold the toy aeroplane.

Do you have the same paper?

Has any new substance been formed during the change?

Has the paper lost its identity during the change?

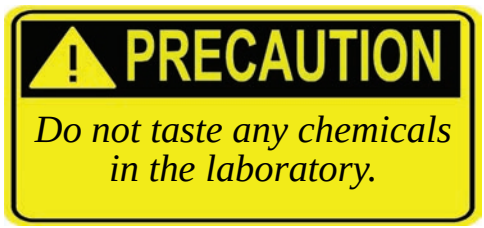
Is the change reversible or irreversible?

Is the change permanent or temporary?

B. Work in groups

You may need:

- sugar crystals
- mortar and pestle
- watch glass
- spatula
- water
- beaker
- glass rod
- measuring cylinder



Take a spatula of sugar crystals in a clean watch glass. Observe its colour.

Add the sugar crystals in a beaker containing 20 mL water.

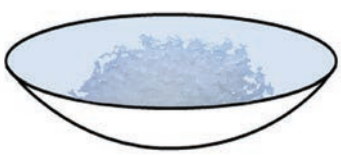


Figure 2.3. Sugar crystals.

Figure 2.4. Sugar crystals in water.

Stir with a glass rod and observe.

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Copy and complete Table 2.2.

Table 2.2 *Characteristics of Sugar*

Characteristic	Sugar Crystal	Powdered Sugar
Colour		
Taste		
Soluble or insoluble		

Now, crush the sugar crystals into powder using mortar and pestle.

Place the powdered sugar in a watch glass.

Observe its colour.

Add powdered sugar in a beaker containing 20 mL of water.

Stir it with a glass rod and observe.

Record your observation in Table 2.2.

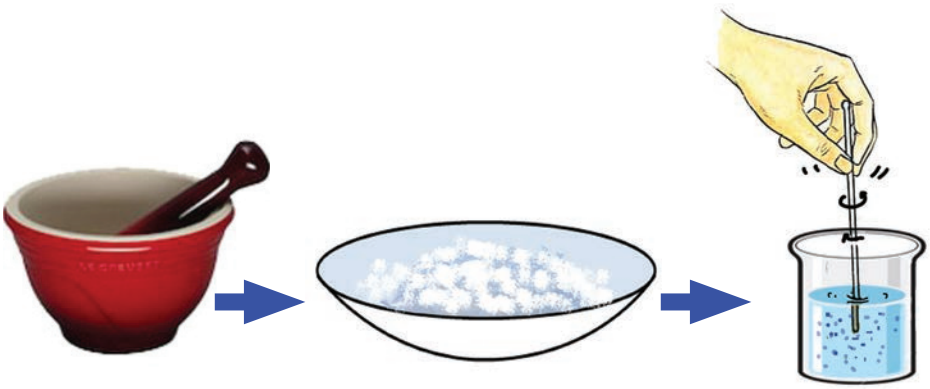

Figure 2.5. Sugar powder in water.

Has any new substance been formed when sugar crystals are crushed into powder?

Has the identity of the sugar crystals been lost when crushed into powder?

The sugar crystals have changed its shape into powdered sugar crystals. However, there is no new substance formed and the identity of the sugar remained the same. This type of change is called **physical change.**

C. Design and carry out an experiment to show that no new substances are formed during a physical change.

Write about:

what you needed.

what you did.

what you observed.

Do You Know?

The water we drink has been circling around in the water cycle for millions of years. This means the same water exists now on the Earth which was there during the time of dinosaurs.

Check Your Progress

i. Define physical change.

ii. Give two examples of a physical change.

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2.3. Is dissolving a physical change?

Test Yourself

1. State two properties of physical change.
2. Give two examples of physical change.
3. Name two solids that are soluble in water and two solids that are insoluble in water.
4. How can you get back the salt from salt solution?

You already know:

- characteristics of physical change.
- soluble and insoluble substance.

You will learn:

- dissolving is a physical change.

A. You have learnt about soluble and insoluble substances. For example, sugar dissolves in water to form sugar **solution**. Therefore, sugar is a soluble substance.

Work in groups

You may need:

- matchbox
- tripod stand
- wire gauze
- evaporating dish

- teaspoon
- spirit lamp
- water
- salt
- measuring cylinder
- glass rod

Figure 2.6. Salt solution.

Take 15 mL of water in an evaporating dish.

Add one teaspoon of salt.

Stir it to dissolve.

Heat the solution until the water is completely evaporated.

What do you observe?

Is dissolving of salt in water a physical change? Explain.

Figure 2.7. Heating salt solution.

PRECAUTION

Take care when working with matches and flames.
Do not touch any heated object.

Check Your Progress

i. Explain the term dissolving.

ii. Why is dissolving considered a physical change?

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2.4. Are melting and freezing a physical change?

Test Yourself

1. What is a physical change?
2. Define melting.
3. Define freezing.
4. Why is melting of ice a physical change?
5. What are the sources of water for the streams and rivers in Bhutan?

You already know:

- melting and freezing.

You will learn:

- changes taking place during melting and freezing.

A. Let us find out if melting and freezing are physical changes.

Work in groups

You may need:

- evaporating dish
- candle wax
- tripod stand
- matchbox
- spirit lamp
- wire gauze
- tongs

Take some candle wax in an evaporating dish.

Heat it over the tripod stand for three to five minutes. What do you observe?

Do You Know?
Addition of impurities usually lowers the freezing point.

Now, remove the evaporating dish from the tripod stand and cool it.

What do you observe?

Has any new substance formed during the process?

Has the identity of the candle wax lost during the process?

Is it reversible change or irreversible change?

Is the change permanent or temporary?

B. Design and carry out an experiment using hydrogenated vegetable oil to show that melting and freezing are physical change.

Write:

what you needed.

what you did.

what you observed.

What conclusion can you draw from this experiment?

Check Your Progress

i. Why is melting of ice a physical change?

ii. What happens when water freezes?

http://www.chemteam.info/Matter/PhysicalChemChanges.html

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2.5. Are boiling and evaporation a physical change?

Test Yourself

1. What is evaporation?
2. What is the use of thermometer?
3. Why is melting a physical change?
4. What happens to water when it boils?
5. How do our clothes dry?

You already know:

- melting and freezing as physical change.

You will learn:

- changes taking place during boiling and evaporation.
- normal boiling point of water.

A. You might have seen water boiling in a container.

Boiling is the rapid **vaporisation** of liquid on heating.

The temperature at which a liquid starts to boil is its **boiling point**.

Predict the boiling point of water in your school campus.

The boiling point of water that you predicted is_____.

Work in groups

You will need:

- thermometer
- tripod stand
- wire gauze

- matchbox
- spirit lamp
- beaker
- clamp stand
- water
- measuring cylinder
- stopclock

PRECAUTION

The bulb of the thermometer should not touch the bottom of the beaker while heating.

Pour 100 mL of water in a beaker.

Set up the experiment as shown in Figure 2.8.

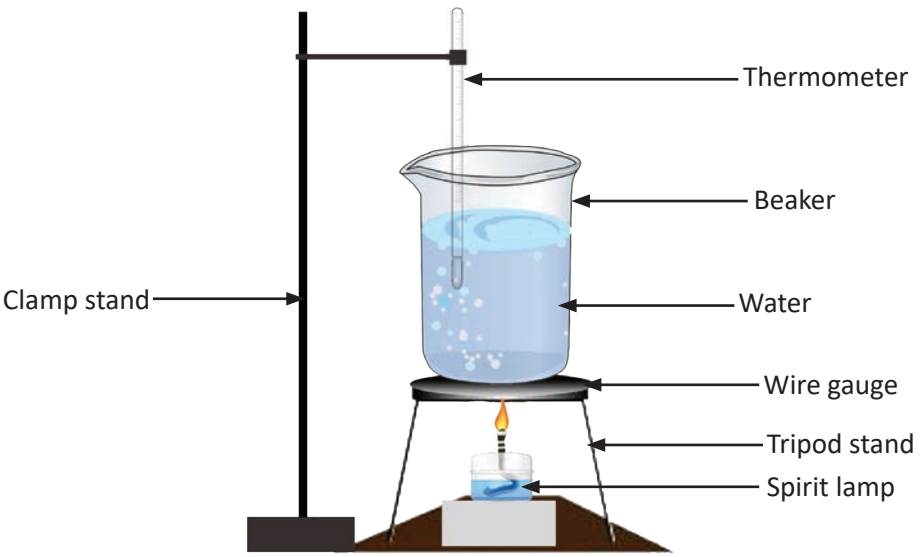

Figure 2.9. Boiling of water.

Measure the temperature of the water every three minutes until water begins to boil.

Copy and record your observations in Table 2.3.

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Table 2.3 *Measurement of Temperature*

Time (minute)	Temperature (^{0}C)
0.0	
3.0	
6.0	
9.0	
12.0	
15.0	
...	
...	

Use data from Table 2.3 and plot a line graph using spreadsheet representing the change in temperature against the time.

Find the boiling point of the water from the graph.

Compare the boiling point of water that you predicted with the observed boiling point.

What does the graph show about the time and temperature?

Has any new substance formed during the boiling?

Has the identity of water lost during the boiling?

Is boiling a physical change?

B. Your teacher will demonstrate this experiment.

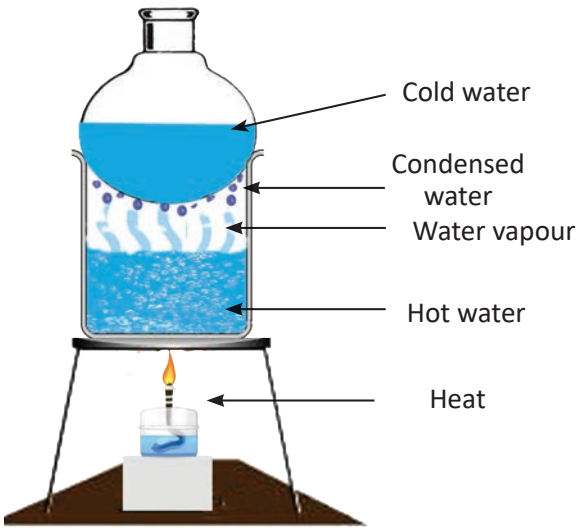

Figure 2.10. Evaporation of water.

Observe carefully.

Name various processes that are taking place.

Are evaporation and boiling a physical change? Explain.

Check Your Progress

i. Differentiate between evaporation and boiling.

ii. Miss Dema kept a beaker of water in the sunlight for a week. The level of water decreased every day. Why do you think the level of water decreased?

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Think Again

1. Choose the correct answer:

   i. Which of the following is a reversible change?
   - A Food being cooked
   - B Dissolving salt in water
   - C Making curd
   - D Rusting of iron

   ii. Growth of a child is an example of
   - A irreversible change and natural change.
   - B reversible change and human-made change.
   - C human-made change and natural change.
   - D natural change and physical change.

   iii. Which is a physical change?
   - A Growth of plants
   - B Melting of snow
   - C Formation of curd
   - D Burning of papers

   iv. The example of human-made change is
   - A ripening of fruit.
   - B formation of cloud.
   - C construction of road.
   - D growth of a baby.

   v. Which is a natural change?
   - A Blooming of flowers
   - B Cutting down trees
   - C Burning of firewood
   - D Making a cake

1. Why does morning dew disappear after the sunrise?
2. Is the formation of ice from water a physical change? Why?
3. Blowing a balloon is a physical and reversible change. When the balloon bursts, it is also a physical change.
   a. Explain, why it is a physical change.
   b. Give more examples of physical change.
4. Draw a water cycle and indicate all the physical processes taking place in it.
5. We often feel cold immediately after taking bath. Explain.

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CHAPTER 3

Separation of Mixture

3.1. Types of Solid-solid Mixture

Test Yourself

1. What is solid-solid mixture?
2. Give one example of solid-solid mixture.
3. How are solids different from each other?
4. Give two examples of mixtures containing solids of different colours.
5. In what ways are solid-solid mixtures categorised?

You already know:

- solid-solid mixture.

You will learn:

- types of solid-solid mixtures.

A. You have learnt that stone in rice is a solid-solid mixture.

Solid-solid mixtures are of various types depending upon the nature of solids forming the mixture.

Solid-solid mixtures are classified based on:

Weight - heavy or light.

Example, mixture of rice and husk.

Colour - colour of the substances.

Example, mixture of maize and peas.

Size and shape - big or small, various shapes.

Example, maize and rice.

Give one more example for each type of solid-solid mixture.

B. Work in groups

Collect four different solids of different colours and make as many solid-solid mixtures from them.

How many mixtures could you make.

Display your mixtures in your classroom.

Can they be separated?

Check Your Progress

i. How do you classify solid-solid mixtures?

ii. What type of solid-solid mixtures do people use in the construction of house?

Figure 3.1. School bell.

Do You Know?

Your school bell is a solid-solid mixture. It is brass, which is made up of copper and zinc.

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3.2. Separation by Hand Picking

Test Yourself

1. State two properties of solid.
2. Give one example of solid-solid mixture based on colour.
3. How can you separate stones from rice?
4. Why do we need to separate the components of mixtures?

You already know:

- different types of solid-solid mixtures.

You will learn:

- separation by hand picking.

A. For separating the constituents of a mixture, we make use of their properties like colour, size, shape, weight, solubility, melting point, boiling point, quantity, etc.

Study Figure 3.2.

What method of separation is shown in Figure 3.2 ?

Which properties of the mixture shown in the picture help us to separate them by this method?

Figure 3.2. Mixture of rice and stones.

B. Let us investigate whether all solid–solid mixtures can be separated by hand picking.

C. Let's separate the waste

The hand picking method can be used in separating waste at home. Through this method, we can separate our waste into wet, dry and hazardous wastes. The wet waste includes kitchen waste and can be decomposed easily. The dry waste can be recycled. The hazardous waste cause health problems to the living things.

Study the list of waste given below.

- Plastic bag
- Used blade
- Battery
- Paper
- Onion peel
- Used syringe
- Glass bottle
- Potato peel
- Leftover food
- Broken tube light
- Broken chair

2. Copy and complete Table 3.2.

Table 3.2 *Waste Separation*

Wet	Dry	Hazardous

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Work in groups

You may need:

- gravel
- teaspoon
- rice
- maize
- sugar
- salt
- watch glass

Take a teaspoon each of the given solids and make the following mixtures in a watch glass.

Mixture of salt and sugar.

Mixture of gravel and rice.

Mixture of rice and maize.

Mixture of sugar and rice.

Try separating the above mixtures using your hand.

Copy and complete Table 3.1.

Table 3.1 *Separation of Solid-solid Mixtures.*

Mixture	Can be Separated by Hand Picking	
	Yes	No
Salt and sugar		
Gravel and rice		
Rice and maize		
Sugar and rice		

Which mixtures are easy to separate? Why?

Which mixtures are difficult to separate? Why?

Check Your Progress

i. When can hand picking be an effective method of separation?

ii. What kind of mixtures do you separate by hand picking at home?

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3.3. Separation by Sieving

Test Yourself

1. Give an example of mixture which can be separated by hand picking.
2. Is hand picking an easy method to separate a mixture of maize and sugar?
3. Why is the method of hand picking not used for separating all types of mixtures?
4. How is a mixture of husk and flour separated?
5. What is a sieve used for?

You already know:

- separation by hand picking.

You will learn:

- sieving as a method of separation.

A. Look at Figure 3.3.

Figure 3.3. Sieves.

What are sieves usually used for?

A sieve is used for separating the small particles from the big particles.

This method of separation is called **sieving.**

B. Work in groups

Make a sieve using locally available materials.

Use the sieve to separate mixtures.

Write:

what you needed.

what you did.

Which mixtures can be separated using your sieve?

Do You Know?

Sieving is based on the principle of filtration.

Can you separate chalk powder and sand using the same sieve? Explain.

Check Your Progress

i. Write the uses of sieve at home.

ii. Pema was given to separate a mixture of solids by using a sieve. However, he could not separate the mixture. Suggest what might be the possible reasons for not being able to separate the mixture.

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3.4. Separation by Winnowing

Test Yourself

1. What is sieving?
2. Give two examples of mixture that can be separated by sieving.
3. What is the difference between sieving and hand picking?
4. What type of mixture can be separated by wind?
5. Name some of the things used to separate mixtures with the help of wind.

You already know:

- separation by sieving.

You will learn:

- winnowing as a method of separation.

A. Wind is used for various purposes like generating electricity and running windmills. Wind can also be used for separating solid–solid mixtures. The method of separating solid-solid mixtures using wind is shown in Figure 3.4.

Usually, lighter solids are separated from heavier ones with the help of wind. This method is called **winnowing.**

Figure 3.4. Winnowing.

B. Work in groups

Design and carry out an experiment to demonstrate winnowing.

Write:

what you needed.

what you did.

what you concluded.

Check Your Progress

i. What is winnowing?

ii. Mention the factors that affect winnowing.

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3.5. Magnet as Separator

Test Yourself

1. What agent is used for winnowing?
2. Name a mixture which can be separated by winnowing.
3. How will you separate a mixture of tea and tea leaves?
4. What is a magnet?
5. Give one use of a magnet.

You already know:

- winnowing as a process of separation .

You will learn:

- magnet as a separator.

A. Work in groups

You may need:

- sand
- iron filings
- paper
- bar magnet

Mix sand and iron filings on a sheet of paper.

Is it possible to separate the components of the mixture by hand picking? Why?

Is it possible to separate the components of the mixture by winnowing? Why?

Now, move a bar magnet over the mixture.

What do you observe?

The method in which magnet is used to separate the components of a mixture is called **magnetic separation.** It is based on the property of a magnet to attract magnetic substances towards it.

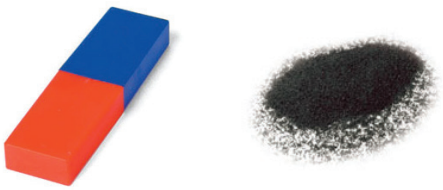

Figure 3.5. Bar magnet and iron fillings.

B. Work in groups

You may need:

- bar magnet
- pin
- pieces of paper
- nail
- dry leaves

Make three different types of mixtures with the materials provided.

Which types of mixture can be separated by using the magnet?

What properties of components of the mixture make the separation possible?

What other separation methods can be used to separate your mixtures?

Do You Know?

Electromagnet is used to separate iron scraps from plastics and other metals in industries.

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Check Your Progress

i. Name some materials that are attracted by a magnet.

ii. Do you think a mixture of salt and sugar can be separated by a magnet? Explain.

Think Again

1. Match items of Column A with correct answers of Column B

Column A	Column B
1. Iron from sand	a. Winnowing
2. Stone from rice	b. Magnetic separation
3. Flour from husks	c. Hand picking
4. Mud from water	d. Sieving
5. Grain from husk	e. Filtration

2. A pin falls into a heap of straw. Suggest an easy way of finding the pin.
3. Write one similarity and one difference between filtration and sieving.
4. You are provided with a mixture of iron filings, sand and sawdust. Explain how will you separate each of these substances from the mixture.
5. Which method is better for separating husk from wheat flour, sieving or winnowing? Why?
6. What are the different properties that you would consider to separate a solid–solid mixture?
7. What method is used to separate degradable and non-degradable solid wastes that come from our homes?

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CHAPTER 4

Frictional Force

4.1. Force that Opposes

Test Yourself

1. What makes an object move?
2. Name the force which pulls an object towards the Earth.
3. Name the force that exists when seated on a chair.
4. What happens when you rub your palm against a table?
5. Why does a rolling marble stop after sometime?

You already know:

- force.
- types of force.

You will learn:

- friction as an opposing force.

A. Friction is a force that tries to stop a moving object. It can slow down the movement of an object or stop it from moving altogether.

Work in groups

You will need:

- smooth board
- wooden blocks
- cloth piece

Figure 4.1. Smooth and rough surface of wooden block.

Wrap one of the wooden blocks with a cloth piece.

Keep the board inclined as shown in Figure 4.1.

Place both the blocks at the top of the board and release it.

Figure 4.2. Wooden block on an inclined plane.

Which wooden block reached the end of the board first?

Which wooden block moved slowly? Why?

The wooden block which reached the end of the board first experiences less friction.

The wooden block wrapped with the cloth experiences more friction.

Check Your Progress

i. What is friction?

ii. Why do we slip on a muddy path?

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4.2. Frictional Force in Everyday Life

Test Yourself

1. We cannot climb wet poles easily. Why?
2. What force helps us to hold an object in our hands?
3. Why are the soles of shoes rough?
4. In which case do we experience more friction, while walking or running?
5. Where do we use friction in day-to-day-life?

You already know:

- friction.

You will learn:

- friction in everyday life.

A. Strike a coin to slide across a table. You will notice that the coin gradually slows down and stops. Some force is acting on the coin making it to stop. This force, which is acting on the coin is called **frictional force**. The frictional force acts at the surface of contact between the coin and the table.

Frictional force helps us to 'walk, run, write, etc.'

Work in groups

Discuss each activity given in Table 4.1 and find out where the friction is.

Copy and complete Table 4.1.

Table 4.1 *Friction in Action*

Activity	Where is the Friction?
Walking	Between your feet and ground
Writing	
Erasing the pencil mark	
Moving vehicle	
Rolling football	

In the same group, come up with three examples of daily activities where friction is present. Share your findings with the class.

Check Your Progress

i. What happens if you step on a banana peel? Why?
ii. Why are the handles of spade and sickle made smooth?

https://ed.ted.com/on/Q8Uo4LyA

Reprint 2023

4.3. Increasing Friction

Test Yourself

1. How does friction help us to write homework?
2. Pema finds it difficult to walk on a wet floor. Why?
3. Where does the friction exists while sitting on a chair?
4. Why do we sprinkle sand on a wet ground?
5. What will you do to walk on a slippery path?

You already know:

- friction in everyday life.

You will learn:

- ways to increase friction.

A. Friction is felt when two surfaces slide against each other.

Rub your palm on the table.

Can you feel the friction?

The tyres of a vehicle have treads that help to increase friction and prevent from slipping on roads. Similarly, your shoes have grooves to increase friction.

Figure 4.3. Vehicle tyres.

Figure 4.4. Shoes sole.

Work in groups

You may need:

- chalk box
- sandpaper
- book
- smooth board
- glue

Make an inclined plane as shown in Figure 4.5.

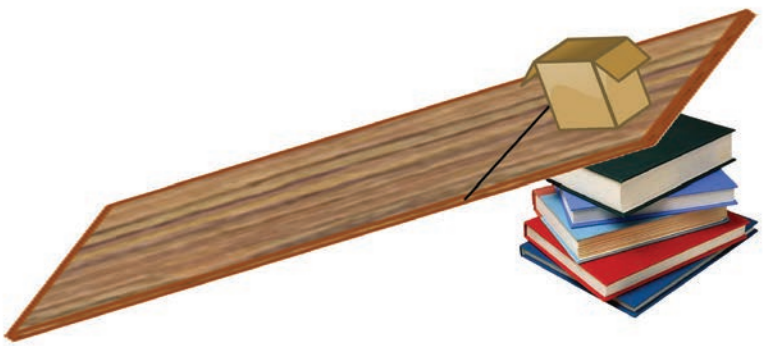

Figure 4.5. Chalk box on an inclined plane.

Slide the chalk box over the inclined plane.

Now paste the sandpaper on the underside of the chalk box.

Again slide the chalk box.

In which case does the chalk box slide slowly?

What can you conclude from this experiment?

B. Discuss in pairs how you can increase friction in the conditions given in Table 4.2.

Copy and complete Table 4.2.

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Table 4.2 *Ways to Increase Friction*

Condition	How to Increase Friction
Muddy footpath	
Wet floor	
Worn-out tyres	

How can you increase friction on footpath?

Check Your Progress

i. How can we increase friction?

ii. If you are planning to go for hiking on the mountains, what type of shoes would you wear? Why?

4.4. Decreasing Friction

Test Yourself

1. Why is sandpaper used by a carpenter?
2. What will you do to climb faster on a pole?
3. Name the force which slows down the moving objects.
4. Why is oil applied to the joint on which the prayer wheel turns?
5. Why do trolleys have wheels?

You already know:

- ways to increase friction.

You will learn:

- ways to decrease friction.

A. Sometimes friction makes work more difficult. We need to find ways to decrease it.

What happens if a hinge on a door is rusty and rough? Why?

One of the ways of reducing friction is by applying oil on the hinges.

Figure 4.7. Reducing friction.

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What are the other ways of reducing friction?

B. Friction as an opposing force is measured by **spring balance or newton-metre**. This instrument is named after a famous scientist Sir Isaac Newton.

To lift a body of mass 1 kg, you need at least 1 kgf of force.

1 kg = 1 kgf = 10 N

1 kgf = 1000 gf

Do You Know?

Friction causes wastage of energy in all machines! For example, about one fifth of energy used in a car is wasted by friction of the moving parts.

Work in groups

You may need:

- spring balance
- box
- stones
- talcum powder or flour

Put a few stones inside the box.

Then place it on one end of the table.

Pull it to the other end with a spring balance.

Note the reading on the spring balance.

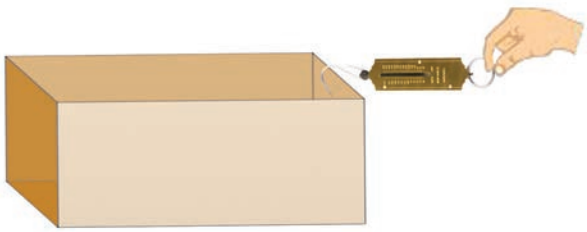

Figure 4.8. A box pulled on rough surface.

Now, sprinkle talcum powder on the table.

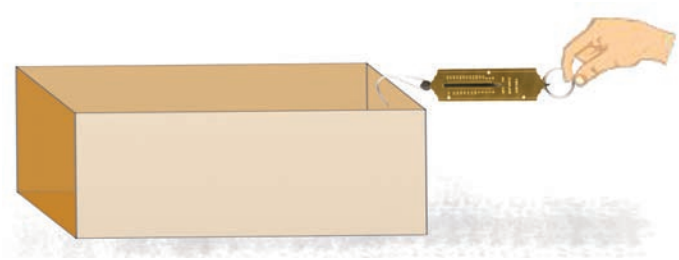

Figure 4.9. A box pulled on surface with talcum *powder.*

Again, pull it with the spring balance.

Note the reading.

Copy Table 4.3 and record the readings.

Table 4.3 *Measurement of Force*

Setup	Force Needed to Pull (in gf)
Box sliding on the table without talcum powder.	
Box sliding on the table with talcum powder.	

In which case is greater force required to pull the box? Why?

Give another condition in which the force needed to pull the box is lesser than the force that you recorded in your investigation.

Work in pairs

C. Use downloaded PhET simulation or weblink https://phet.colorado.edu/sims/html/forces-and-motion-basics/latest/forces-and-motion-basics_en.html to answer the given questions.

What happens to the speed when you increase friction?

Which variables remain constant?

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Check Your Progress

i. Why do we sprinkle talcum powder on a carom board?

ii. Why do we need to reduce friction?

iii. Yeshey's father and mother are trying to move a box of grain from their common room to the store room. They are finding it very difficult to move. They have the choice of using straight and round firewood logs or gravels from outside their house. What would you suggest and why?

THINK AGAIN

1. Choose the correct answer

   i. Force that opposes motion is called

   A magnetic force.
   B gravitational force.
   C frictional force .
   D electrostatic force.

   ii. We can increase friction by

   A polishing.
   B oiling.
   C greasing.
   D making treads.

   iii. Ball bearings are used in prayer wheels. This is to

   A make prayer wheel to turn easier.
   B reduce sound.
   C support the prayer wheel.
   D reduce the mass of the prayer wheel.

   iv. Which one of the following is a disadvantage of friction?

   A Wearing out of the shoe sole.
   B Walking on the path.
   C Running on the ground.
   D Lighting a matchstick.

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v. We add grease in machines to

A increase friction.
B increase weight.
C decrease friction.
D decrease weight.

2. Why should we change worn-out tyres?
3. Give two examples where friction is useful.
4. Why is heat produced when we rub our hands together?
5. Why is it easier to write on a chalkboard than on a whiteboard?
6. Give one example where friction is a hindrance.

CHAPTER 5

Light and Sound

5.1. Colour in Nature

Test Yourself

1. Name an object which gives light.
2. What is the colour of the sky?
3. When do you usually see a rainbow?
4. How many colours do you see in a rainbow?
5. Why is light important?

You already know:

- light travels in a straight line.

You will learn:

- composition of white light.

A. In our daily life we see many different colours. Our houses, **dzongs, lhakhangs,** and temples are painted with different colours. During **tshechu**, we see beautifully coloured **thangkas** and **thongdrels**. Bhutanese wear **ghos** and **kiras** of various colours. In nature, plants, flowers, birds, and animals are also of various colours.

Figure 5.1. Birds.

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Have you seen a rainbow?

Figure 5.2. Rainbow.

A rainbow appears when it drizzles and the Sun shines at the same time. The light coming from the Sun is white light. When the white light enters the raindrop, it gets separated into seven colours forming a rainbow. This separation of white light is called dispersion.

You can make your own rainbow.

Work in groups

You may need:

- mirror
- bowl or tray
- water

Put water in a bowl.

Place the bowl in a bright sunlight.

Rest the mirror at the edge of the bowl as shown in the Figure 5.3.

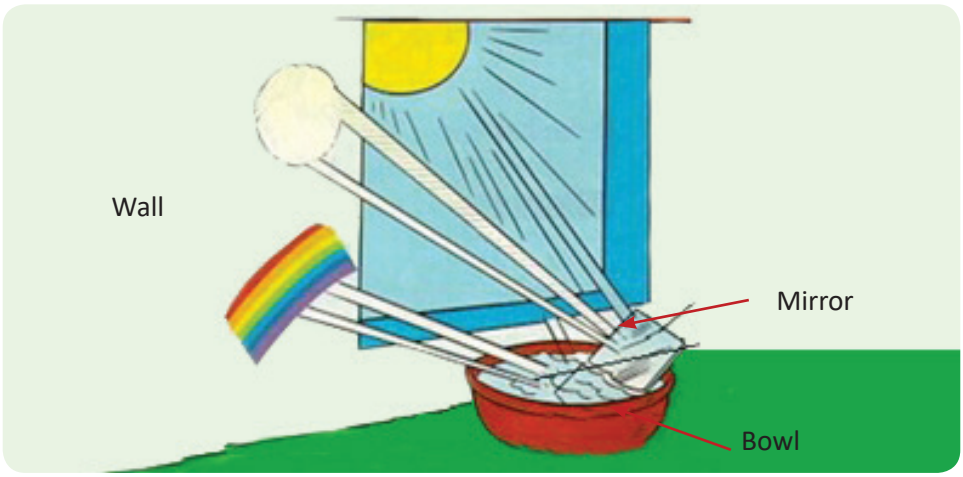

Figure 5.3. Making a rainbow.

Gently move the mirror till you see the colours on the white wall.

How many colours can you see?

List down the colours you see.

How can you make the colours appear more distinct?

B. Work in groups

You may need:

- torch
- compact disc

Design and carry out an experiment to show that white light is composed of seven colours by using a torch and a compact disc.

Write about:

what you did.

what you observed.

what can you do to make the colours distinct?

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Sunlight consists of seven colours: violet, indigo, blue, green, yellow, orange, and red (VIBGYOR). This set of colours make up a **spectrum**. When we combine these colours, it looks white.

One way of showing that white light is composed of seven colours is by using a **Newton's disc**.

C. Work in groups

Make a Newton's disc at home like the one shown in Figure 5.4.

You may need:

- cardboard
- pencil
- pair of scissors
- crayons
- protractor
- compass

Figure 5.4. Newton's disc.

Cut out a disc of 5 cm radius from a cardboard.

Divide it into seven equal parts.

Colour each part as shown in Figure 5.4.

Insert the pencil through the centre of the circular disc.

Spin your disc.

What can you see?

How does the speed of the disc affect the colour?

Do You Know?

Isaac Newton was the first scientist to split white light into seven colours using a prism.

Check Your Progress

i. How is rainbow formed?

ii. What is spectrum?

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5.2. Bouncing of Light

Test Yourself

1. What is the composition of white light?
2. Why do we see ourselves in the mirror?
3. Why is a room with pink wall brighter than a room with brown wall?
4. We see objects in the presence of light. Why?

You already know:

- white light and its composition.

You will learn:

- reflection of light.

A. Sunlight reaches to us in a beam of light. This beam is composed of many rays of light. For example, when you shine a torch, you will see a beam of light.

Work in groups

You may need:

- mirror
- torch

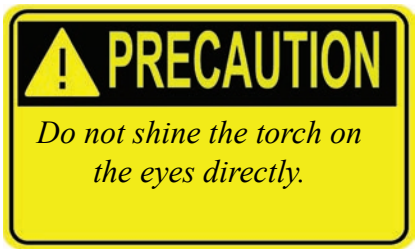
Make your classroom dark.

Ask one of your friends to hold mirror.

Light the torch on the mirror.

Adjust the mirror till the light from the mirror falls on your friend.

Does the mirror give out its own light?



How does the light reach to your friend?

The light travelling from torch to mirror and falling back on your friend is due to bouncing of the light. The bouncing of light from shiny surfaces and mirrored glasses is called **reflection**.

B. Work in groups

You may need:

- bucket
- water

Take a bucket of water.

Let it stand still for a few minutes.

Now, look into the water in the bucket without disturbing it.

What can you see?

This is due to the reflection of light from the surface of water.

Gently disturb the water.

Again, look into the bucket of water.

Is the reflection of your face the same? Why?

Uneven surface reflects light in all directions. Therefore, we do not get clear image of an object. Even surface reflects light in one direction. Therefore, we get a clear image of an object.

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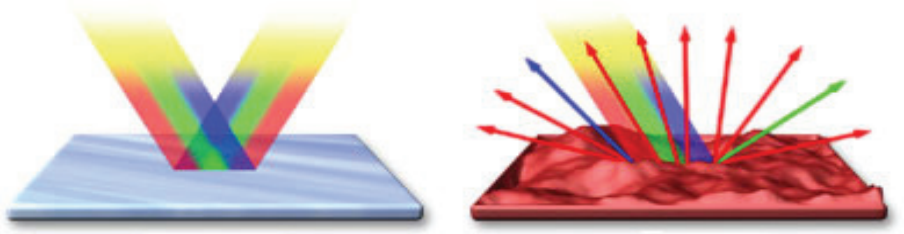

(a) Reflection from an even surface (b) Reflection from an uneven surface

Figure 5.6. Reflecting surfaces.

Check Your Progress

i. What is reflection?

ii. What type of surface reflects a clear image?

5.3. Musical Sound

Test Yourself

1. What causes sound?
2. What is vibration?
3. Name two musical instruments.
4. Which musical instrument do you like the most? Why?
5. What vibrates in the musical instrument that you like?

You already know:

- name of few musical instruments.

You will learn:

- musical sound.

A. A pattern of sounds intended to give pleasure to people listening to it is called **music**.

Musical instruments produce music.

Work in groups

You may need:

- twine thread
- sticks
- woollen thread
- rubber band
- metal wire

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Tie the ends of the twine thread to two sticks.

Pull the sticks apart to stretch the thread.

Pluck the thread with fingers.

Listen to the sound produced.

What will happen to the sound if you change the length of the string?

Figure 5.7. Stretched string.

Which length of the string makes sharper sound?

Carry out the experiment by replacing the twine thread with:

- woollen thread
- rubber band
- metal wire

How is sound produced in each case different?

Check Your Progress

i. What is music?

ii. How can you increase the sharpness of a musical sound?

WEBLINK

http://www.sciencekids.co.nz/sciencefacts/sound.html

5.4. How Sound Differs

Test Yourself

1. How does the sound from your teacher in the class reach your ears?
2. How does sound vary with distance?
3. How is the sound produced by whispering and shouting different?
4. How is the sound produced by musical instruments different?

You already know:

- cause of sound.

You will learn:

- how sound differs.

A. Work in groups

You may need:

- drinking glass
- water
- stick
- measuring cylinder
- notebook

Pour different amount of water into each glass.

Tap the glass with the stick.

Which glass produces the sharpest sound?

Reprint 2023

Which glass produces the most flat sound?

How will sound change if the glasses are covered with a notebook?

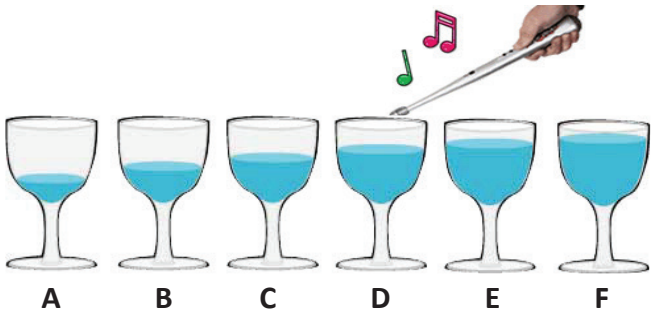

Figure 5.8. Sharpness of sound.

B. Work in groups

You may need:

- beakers of different size
- rubber bands

Wind the rubber band around each beaker firmly as shown in Figure 5.9.

Pluck the rubber band at the mouth of the beaker.

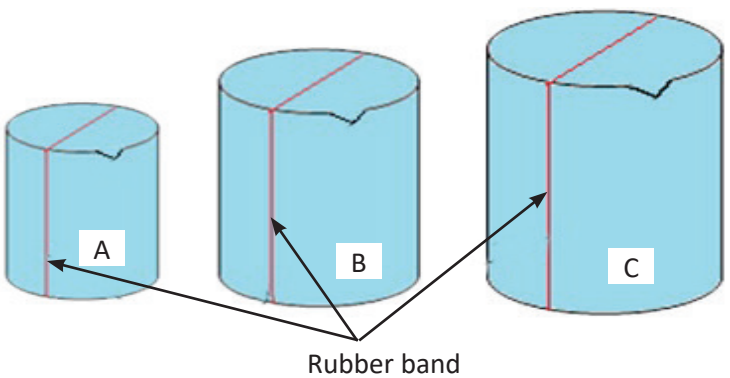

Figure 5.9. Beakers with rubber bands.

Which beaker produces the loudest sound?

Which beaker produces the faintest sound?

How does the loudness of the sound change with the size of the containers?

Musical instruments which have larger soundbox will have more air for vibration. When more air vibrates, it produces a louder sound.

Do You Know?

Whales in the ocean sing to each other. The sound of their song can travel to a distance of 800 km.

Check Your Progress

i. Why do you use bigger soundbox during your school's cultural events?

ii. How can you increase the loudness of sound?

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5.5. Making Music

Test Yourself

1. How can you decrease the loudness of the sound?
2. What is a soundbox?
3. Name two objects that produce sharp sound?
4. How does a **dhung** produce a loud sound?
5. Name some religious musical instruments used during our local **tshechu**.

You already know:

- loudness and sharpness of sound.

You will learn:

- what makes music.

A. Sounds with a pattern that is pleasing to hear is called music.

Stringed Instruments

In stringed instruments, sound is produced when the stretched string vibrates between two fixed points on the instrument.

Some examples of stringed instruments are **drangyen (lute),** guitar, **yangchen**, **chiwang (fiddle)'** or **'pewang (fiddle)'**, and violin.

Figure 5.10. Musical instruments.

Wind Instruments

In wind instruments, the air vibrates to produce sound. Examples of wind instruments are flute, whistle, **gezkang** (slide whistle), trumpet, **bjaling, dhung,** conch, etc,.

Figure 5.11. Wind instruments.

Percussion Instruments

In percussion instruments, the sound is produced when you strike on the instrument. For example, when you beat a drum with a stick, its membrane vibrates to produce sound.

Examples of percussion instruments are drum, **nga** and **tangti.**

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Drum


Nga


Tangti

Figure 5.12. Percussion instruments.

Copy and complete Table 5.1.

Table 5.1

Instrument	What Vibrates?
Yangchen	
Drum	
Flute	
Conch	
Tangti	
Guitar	

Check Your Progress

i. Why is soundbox important in a musical instrument?

ii. Name the type of instrument held by **Lhamo Yangchenma**, the goddess of song and music.

WEBLINK

http://www.sciencekids.co.nz/experiments/makemusic.html

Think Again

1. State whether the following sentences are true or false:
   a. Trumpet is a percussion instrument.
   b. Flute is a stringed instrument.
   c. Sunlight is composed of seven different colours.
   d. Even surface reflects light in all directions.
   e. Sounds are produced when materials vibrate.
2. Write two uses of reflection of light in our day-to-day life.
3. List down the colours of the spectrum.
4. Name one instrument which does not have a sound box.
5. Describe the reflection of light from a regular surface.
6. Why is music important in cultural and social life of Bhutanese?
7. A student fills one bottle with water to half of its volume. In another, he fills it with water to three fourth of its volume. Then, he attempts to produce sound by blowing air into them. Explain the sound produced in each case.

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CHAPTER 6

Electricity and Magnetism

6.1. How We Generate Electricity

Test Yourself

1. What are the sources of electricity?
2. What is the main source of electricity in Bhutan?
3. Name the device that uses sunlight to produce electricity.
4. Mention three uses of electricity.
5. Name three power stations in Bhutan.

You already know:

- we generate electricity from water.

You will learn:

- generation of electricity.

A. Our country has many hydropower stations where electricity is generated. For example, Chukha Hydropower Station. Can you name some more hydropower stations in our country?

We do not use all the electricity generated by our hydropower stations. We export electricity to other countries.

Study Figure 6.1 and Figure 6.2.

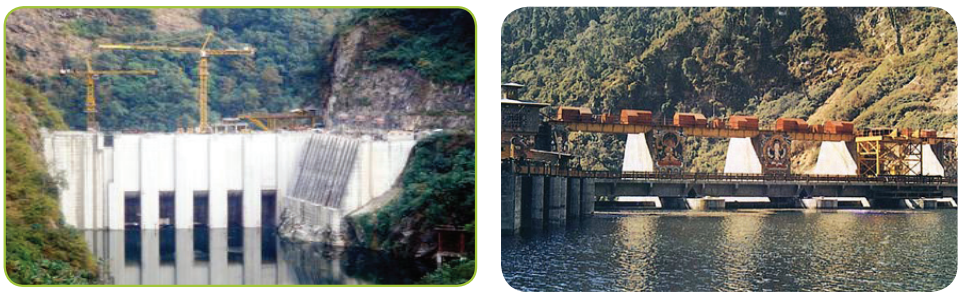

Figure 6.1. Dams.

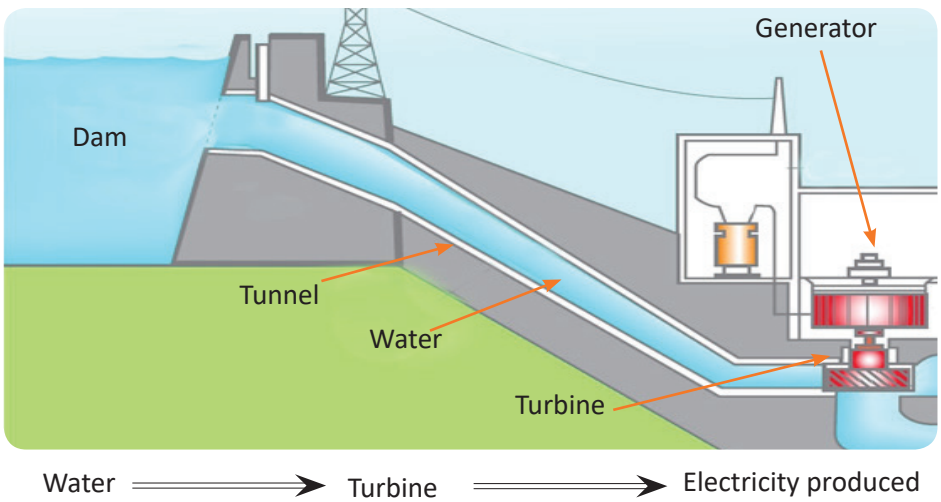

Figure 6.2. Generation of electricity.

Write a paragraph on how electricity is generated.

Why do we need to build a dam?

What makes a turbine move?

What is produced by the generator?

Can the water that comes out of the turbine be used again? Why?

How does dumping of waste into the river affect income generation from hydropower plant?

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B. Table 6.1 *Generation of Electricity in Different Months*

Month	Jan	Feb	March	April	May	June	July	Aug	Sept
Electricity generated (MW)	**14**	**12**	**20**	**35**	**34**	**45**	**49**	**44**	**40**

Use data from Table 6.1 and plot graph using spreadsheet.

In which month is the maximum electricity generated? Why do you think?

In which month is the least electricity generated? Why?

C. Figure 6.3 shows two other sources of electricity.

Windmill

Solar panel

Figure 6.3. Other sources of electricity.

In the windmill, wind is used to turn the turbine to generate electricity.

Solar panels convert energy from sunlight into electricity.

Water, wind, and the Sun are renewable sources of energy. They are clean sources of energy, so producing electricity using them does not result in pollution.

In some countries, non-renewable sources like coal and nuclear materials are used to generate electricity. The use of these sources cause pollution.

Check Your Progress

i. Describe briefly how electricity is produced in a hydropower station in Bhutan.

ii. Why do we have large number of hydropower stations?

iii. Name two renewable sources of energy.

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6.2. Connection in Series

Test Yourself

1. What is electric current?
2. What is electric circuit?
3. When does electricity flow?
4. What is the purpose of a switch?
5. What are open circuit and closed circuit?

You already know:

- simple connections.

You will learn:

- switch.
- series connection.

A. A switch is an electrical device. Turning off a switch breaks the circuit and the flow of current stops. This is called **open circuit**. Turning a switch on completes the circuit and allows the current to flow. This is called **closed circuit**.

Work in groups

You may need:

- paper clip
- bulb
- dry cell
- wire
- scissors
- iron nail

- ruber band
- dry stick
- coin
- plastic pen
- aluminium foil
- steel spoon
- paper
- copper wire

Make a circuit as shown in Figure 6.4.

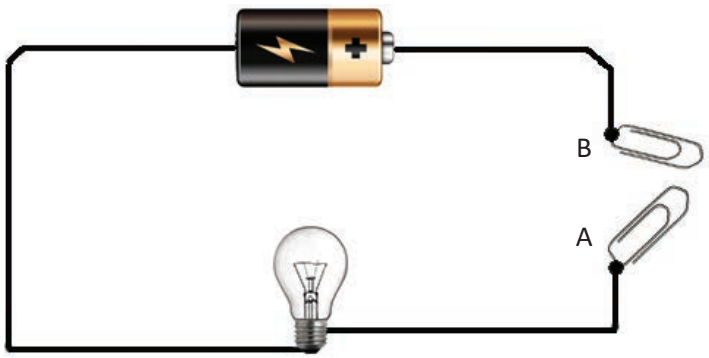


Figure 6.4. Electric circuit.

Connect a paper clip at point A and another paper clip at point B. Touch the clips.

Observe what happens to the bulb.

Detach the clips and observe what happens to the bulb.

What is the function of the clips in the above experiment?

Complete Table 6.2.

Use the same circuit that you have used in the above activity.

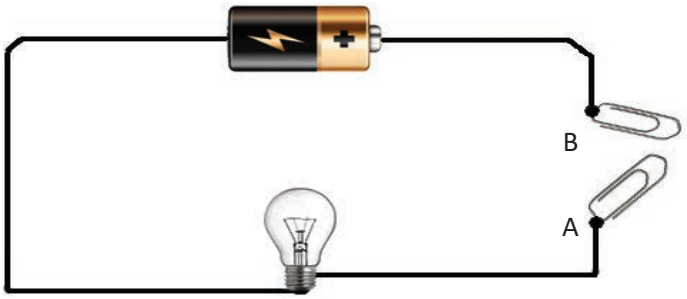


Figure 6.5. Electric circuit test.

Table 6.2 *Materials Test*

Materials used	Connects the Circuit [Yes/No]
Scissors	
Iron nail	
Rubber band	
Dry stick	
Coin	
Plastic pen	
Aluminium foil	
Steel spoon	
Paper	
Paper pin	
Copper wire	

Name the materials that make the bulb glow.

Suggest two materials that can be used to make a switch.

The materials that allow the current to flow are called **conductors**.

The materials that do not allow the current to flow are called **insulators**.

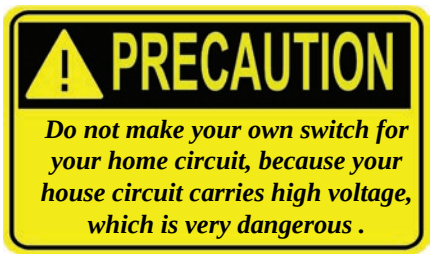
Name the conductors in Table 6.2.

Name the insulators in Table 6.2.

B. **Voltage** is the difference in level of charge between the two ends of the cell, i.e the positive end and the negative end. A common dry cell has a voltage of 1.5 volts. You can see the voltage written on the cell.

The amount of voltage that an appliance require is usually written on the appliance.

Work in groups



You may need:

- dry cell
- wires
- torch bulb
- bulb holder
- paper clip
- sellotape

Make a circuit as shown in Figure 6.6.

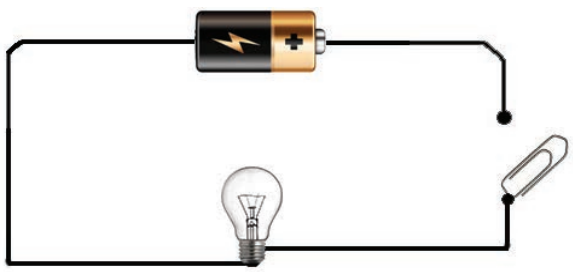


Figure 6.6. Circuit with one dry cell.

What voltage is supplied to the circuit?

Observe the brightness of the bulb when the switch is turned on.

Turn off the switch.

Add one more cell to your circuit as shown in Figure 6.7.

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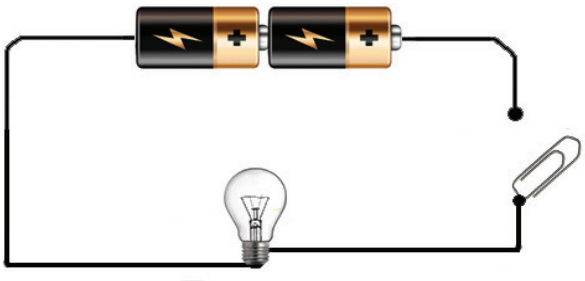

Figure 6.7. Circuit with two dry cells.

What voltage is supplied to the circuit?

Turn on the switch.

What happened to the brightness of the bulb? Why?

Turn off the switch.

Now add one more bulb near the first bulb as shown below in Figure 6.8.

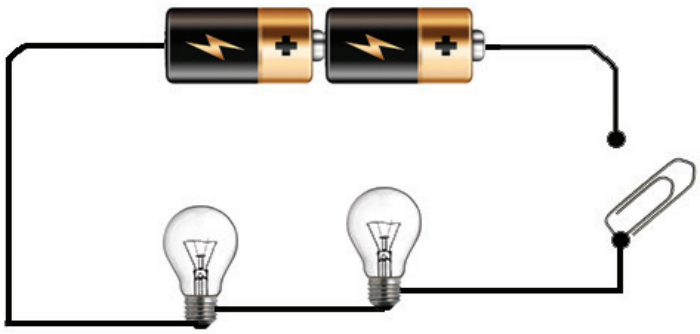

Figure 6.8. Series connection.

Turn on the switch.

Observe the brightness of both the bulbs.

What difference do you see in the brightness of the bulbs? Why?

Turn off the switch.

Add one more bulb near the second bulb.

Turn on the switch.

Do all the bulbs glow with the same brightness?

What happens if one of the bulbs is removed from the circuit? Why?

The kind of circuit in which the appliances (bulbs) are connected one after the other in the same circuit is called a **series circuit**.

In the series circuit, the voltage from the battery is distributed among the bulbs.

The bulb which is connected to the positive terminal of a battery receives the maximum voltage. Therefore, it is the brightest.

Check Your Progress

i. Why do we use switch in a circuit?

ii. Why does the brightness decrease when you connect more bulbs in the circuit?

http://www.sciencemadesimple.com/static.html
http://www.ducksters.com/science/static_electricity.php

6.3. Static Electricity

Test Yourself

1. What is a conductor?
2. What is voltage?
3. What amount of voltage is supplied by an ordinary cell?
4. You hear a crackling sound made by clothes while removing them. Give reason.
5. What is static electricity?

You already know:

- series connection.

You will learn:

- static electricity.

A. There is another kind of electricity that does not require a circuit. It is called **static electricity**. During the rainy season, you must have seen lightning followed by thunder. Lightning is caused due to static electricity.

Similarly, when we take off woollen or nylon clothes that we are wearing, sparks and crackling sounds are produced due to the charges developed by friction. Therefore, static electricity is also called **frictional electricity**.

Work in groups

You may need:

- balloon

Figure 6.10. Objects.

- woollen cloth piece
- plastic comb
- jug of water
- plastic pen
- small pieces of paper

1. Rub a balloon on a piece of woollen cloth. You could use your gho or kira. Rub it for one minute. Hold the balloon up to the wall and release it.

What happens?

2. Comb your dry hair with a plastic comb several times. Hold the comb a few centimetres above your friend's head.

What happens?

3. Rub the balloon on a piece of woollen cloth. Hold it near running water from a jug or tap.

What happens?

4. Rub a plastic pen on a piece of woollen cloth. Hold the pen very close to small pieces of paper.

What happens?

Figure 6.10. Static electricity.

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Rubbing the balloon, the pen, and the comb builds static electricity.

The static electricity pulls the hair towards the comb, the water towards the balloon, and the pieces of paper towards the pen.

Similarly, before a thunderstorm, static electricity builds up in the clouds which escape as a flash of lightning. When lightning strikes, it may start a fire. It is dangerous to be outside when there is lightning.

Check Your Progress

i. What is the difference between static electricity and current electricity?

ii. Give an example where you experience static electricity.

6.4. Which Part of the Magnet is Strong

Test Yourself

1. Where do you find magnets at home?
2. Differentiate magnetic and non-magnetic material?
3. How does distance affect magnetic attraction force of a magnet?
4. Name different types of magnets.
5. Describe two characteristics of a magnet.

You already know:

- magnet attracts magnetic material.

You will learn:

- poles of a magnet.

A. Magnets have magnetic force around them.

Work in groups

You may need:

- iron filings
- magnet
- sheet of paper
- plastic bag

Figure 6.11. Test for magnetic force.

Use a plastic bag as glove.

Spread a thin layer of iron filings on a sheet of paper.

Roll the magnet on the iron filings.

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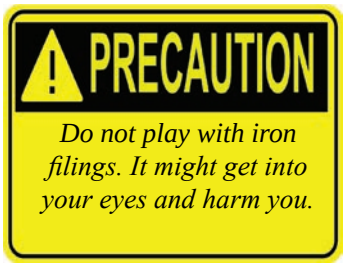
Write about your observation.

Which parts of the magnet attract more iron filings?

Why do you use plastic bag as glove?

The parts of the magnet that attract more iron filings are called poles of the magnet.



B. Work in groups

You may need:

- twine thread
- bar magnet
- chalk
- magnetic compass

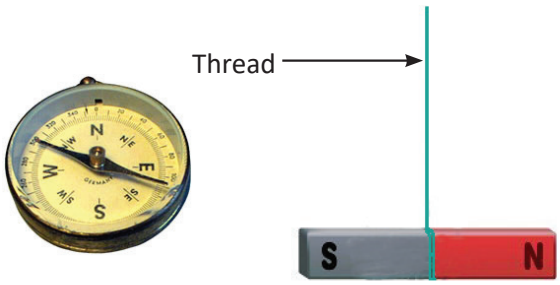


Figure 6.12. Magnet and magnetic compass.

Hang the magnet with the help of thread as shown in the Figure 6.12.

Make sure the magnet is hung horizontally to the ground and can turn freely.

Wait for the magnet to stop moving.

With the help of magnetic compass, mark the end of the magnet pointing to the geographical North as N.

Repeat one more time.

One end of the magnet always points North and the other end points South. This is why the ends of the magnet are called **North-seeking pole** or **North Pole** and **South-seeking pole** or **South Pole**.

Check Your Progress

i. How many poles are there in a magnet? Name them.

ii. Which part of the magnet is strong?

https://www.thoughtco.com/magnetmagnetic-force-the-strongest-607864

6.5. Like Poles and Unlike Poles

Test Yourself

1. How many poles does a magnet have?
2. Which part of magnet attracts more pin?
3. What happens when two magnets are brought closer to each other?
4. What are like poles and unlike poles of magnets?

You already know:

- North Pole and South Pole of a magnet.

You will learn:

- like poles and unlike poles.

A. You have learnt that a magnet has two poles, North Pole and South Pole. In a group of two or more magnets, similar poles are called **like poles**, and opposite poles are called **unlike poles**.

Work in groups

You may need:

- bar magnets

What happens when you put two bar magnets near each other as shown in Figure 6.13. Record your observation in Table 6.3

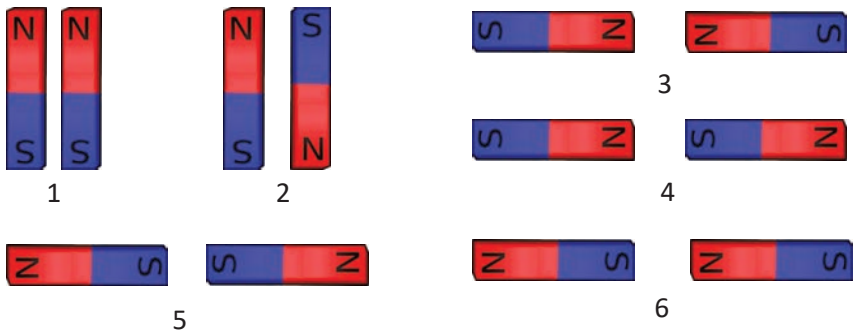


Figure 6.13. Arrangement of magnets.

Table 6.3 *Like and Unlike Poles*

Diagram No	Like/Unlike Pole	Attract or Repel
1		
2		
3		
4		
5		
6		

Which poles attract each other?

Which poles repel each other?

B. Work in groups

You may need:

- thermocol
- bar magnets
- paper
- pieces of stick

- bowl
- water

Make a boat out of thermocol.

Put a bar magnet inside the boat.

Attach a paper sail.

Let it float in a bowl of water.

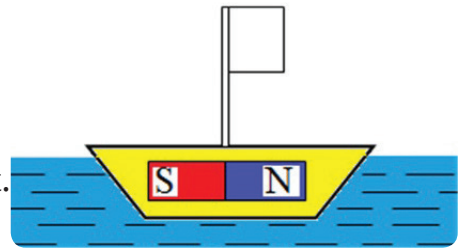


Figure 6.14. Magnetic boat.

Hold another magnet close to the boat.

What happens?

Change the pointing pole of the magnet towards the boat.

Explain what happens. Why?

Check Your Progress

i. Two magnets are placed as shown below. Identify the poles of magnets marked as X and Y.

ii. Nima and Dawa are trying to find the geographical North. Both of them hang a bar magnet each, with threads. They suspend the magnets very close to each other. What is wrong with their experiment?

THINK AGAIN

1. Fill in the blanks with correct words.
   i. Like poles _____and unlike poles _____.
   ii. Lightning is caused by _____electricity.
   iii. The south-seeking pole of a magnet is called _____.
   iv. A circuit is complete when the _____ is turned on.
   v. In a hydropower station electricity is generated using _____.

2. Dorji, Tshomo and Yeshi made circuits as shown in Figure 6.14.

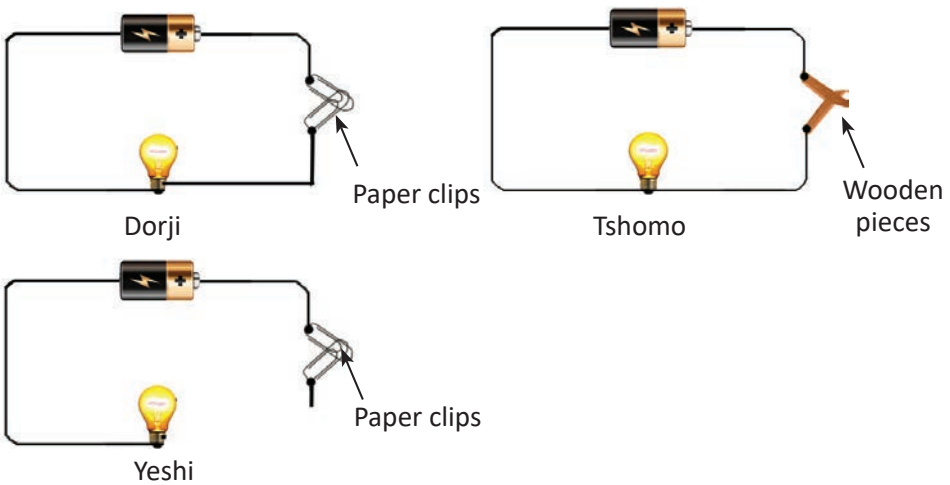


Figure 6.15.

i. Whose bulb will glow?

ii. What is wrong with the circuits in which the bulbs do not glow?

3. How do we construct a series circuit?

4. Differentiate between conductor and insulator. Give one example each.

5. Static electricity can be dangerous. Explain.

6. Why is hydroelectricity considered as clean energy?

CHAPTER 7

Energy

7.1. What is Energy

Test Yourself

1. What do we get from food?
2. Write two examples of energy giving food?
3. Why do we need energy?
4. Clothes dry faster on a sunny day. Why?
5. In winter, why do you sit near the fireplace or a heater?

You already know:

- we need food to live, work and play.

You will learn:

- definition of energy and what energy does.

A. You cannot see energy but you can see what it does. Energy from the Sun helps to dry our clothes, vegetables, fruits, etc. Energy from firewood helps in cooking food. Energy from running water turns the prayer wheel.

Work in groups

All the activities in Figure 7.1 are examples of what energy does.

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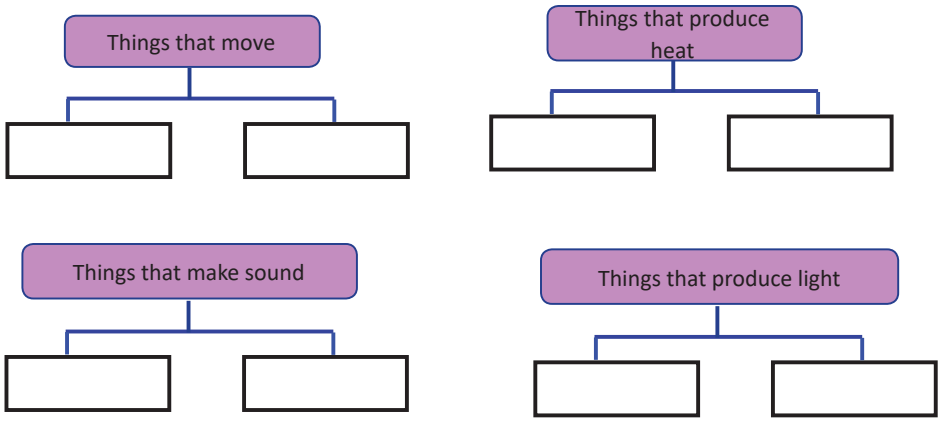
Figure 7.1. What energy does.

Look at the pictures given in Figure 7.1. Sort and write the activities under the following headings in your notebook.

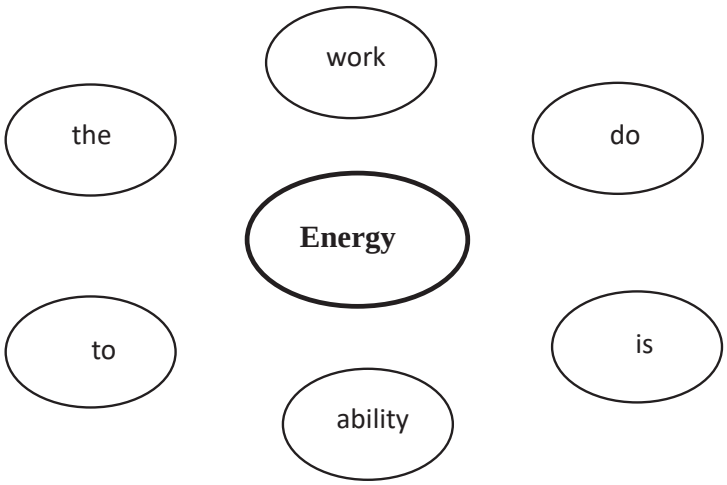


What are the various uses of energy in the pictures given in Figure 7.1?

Now, explain energy in your own words.

Share your answer with the class.

Observe the words in the circles.



Define energy by using all the words.

Energy is measured in joules. The symbol used is J. However, energy in food is measured in calories (cal).

Check Your Progress

i. What is energy?

ii. Write four examples of what energy can do.

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7.2. Forms of Energy

Test Yourself

1. What is energy?
2. What can energy do?
3. What is the unit of energy?
4. Why does a falling boulder crush a small tree?
5. What energy in water is used to generate electricity?

You already know:

- definition of energy.

You will learn:

- forms of energy.

A. Energy is required to do work. Different works require energy in different forms.

Investigate with a partner.

You may need:

- torch

Copy and complete Table 7.1.

Table 7.1 *Forms of Energy*

Activity	What is Produced?	Form of Energy
Rubbing your hands		
Switching on the torch		
Clapping your hands		

Copy and name the activities where the forms of energy are produced as given in Table 7.2.

Table 7.2 *Energy and Activity*

Form of Energy	Activity
Heat energy	
Light energy	
Sound energy	

B. There are other forms of energy.

Chemical energy is stored energy. It is found in foods, fuels and batteries.

Figure 7.2. Foods, batteries and fuels.

Potential energy is the stored energy due to the position or condition of the object.

Figure 7.3. Ice, snow and water on high mountains.

Figure 7.4. A stretched rubber band.

Chemical energy and potential energy are both stored energy. What is the difference?

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Kinetic energy is the energy present in moving objects.

A bouncing ball

A running boy

A flowing river

Figure 7.5. Examples of kinetic energy.

Electrical energy is a form of energy that comes from electricity.

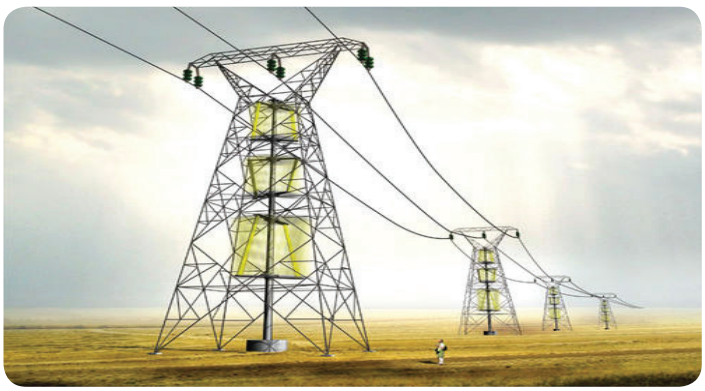

Figure 7.6. Electrical energy.

Work in groups

Using the clues given in the box, find the forms of energy hidden in the word puzzle. Do not mark in the text book.

computer, moving car, kerosene, **bhukhari**, girl singing, sun, stone on hillock

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

List down all the forms of energy found in the puzzle.

Which form of energy does television use?

Check Your Progress

i. What form of energy will a rolling stone have?

ii. What form of energy is present in the following?

a. Ringing a bell

b. Plate of rice

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7.3. Saving Energy

Test Yourself

1. What is potential energy?
2. What is the form of energy found in food?
3. Kinetic energy is possessed by a _____ body.
4. Why is it necessary to switch off the light when not in use?
5. Why do your parents turn off the stove when nothing is cooked?

You already know:

- forms of energy.

You will learn:

- ways of saving energy.

A. We need energy for everything that we do in our lives.

All energy resources need to be used wisely.

Why do we need to be aware of how much energy we use?

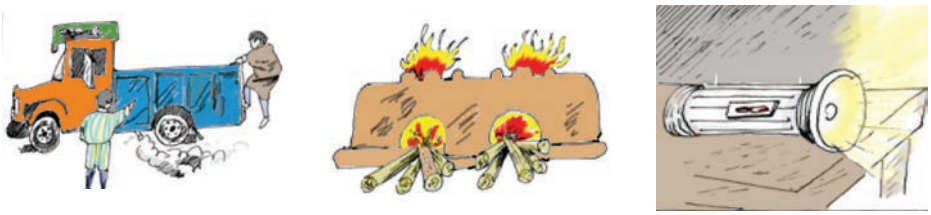
Work in groups

Look at the pictures in Figure 7.7.

(a)

(b)

(c)



(d) (e) (f)

Figure 7.7. Wasting energy.

How is energy being wasted in the pictures in Figure 7.7?

How can you save energy in the pictures in Figure 7.7?

Take help of your parents. Make a list of at least five ways in which you can save energy at home.

B. Vehicles need fuel like petrol and diesel . We get petrol and diesel from oil, found under the ground. There is only a limited amount of oil under the ground. So, we must save and use them wisely.

Work in pairs

Find out the cost of a litre of diesel and petrol. If a person uses 5 litres of diesel in a day. How much will he spend in a week?

What are the impacts of burning diesel and petrol?

Why does the government encourage to use electric car?

How can we save fuel?

We use electricity at school and at home. Find out:

Where does it come from?

Who pays for it?

How much is paid for it every month?

What can be done to stop electrical energy from being wasted?

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C. Work in groups

Design and make a poster for saving energy using Paint.NET. Print poster and display in place like classroom, library, shop, and home.

Check Your Progress

i. How is energy wasted in your school?

ii. We should not waste energy. Why?

WEBLINK

http://energy4me.org/all-about-energy/sustainability/energy-conservation/

7.4. Things that Save Energy

Test Yourself

1. Why do we need to save energy?
2. List down ways by which energy is wasted at home.
3. Suggest two ways of saving energy.
4. What is the advantage of using pressure cooker to cook food?
5. What is the advantage of using tube light over a bulb?

You already know:

- ways of saving energy.

You will learn:

- things that save energy.

A. We have to pay for every unit of energy that we use. Firewood, gas, petrol, diesel, and electricity are bought. If we use more energy, then we need to pay more. We can save energy using different energy saving devices.

Work in groups

Look at Table 7.3 and find out how energy is saved in each case.

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Table 7.3 *Energy Saving Devices*

Things that Consume More Energy	Things that Consume Less Energy	How Energy is Saved?
 Pot	 Pressure cooker	
 Incandescent bulb	 Compact Fluorescent Lamp (CFL)	
 Car	 Bicycle	
 Gas stove	 Electric induction stove	

B. Work in groups

Discuss and list down a few more energy saving devices.

Explain how these things that you have listed saves save energy.

Compact Fluorescent Lamp (CFL) and Light Emitting Diode (LED) lights use less electric energy and generate less heat. It lasts several times longer than the incandescent bulbs.

Buy appliances and electronics with the ENERGY STAR ® Label as shown in Figure 7.8. More stars on the label mean that more energy is saved.

Figure 7.8. Example of energy star label.

Check Your Progress

i. List two appliances at your home which save energy.

ii. Why should we choose star-labelled electronic appliances?

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7.5. Energy Change

Test Yourself

1. Name the different forms of energy.
2. Riding a bicycle is better than driving a car. Why?
3. From where do you get energy to carry out daily activities?
4. What happens to the light energy absorbed by plants during photosynthesis?
5. Explain the energy changes taking place when you put on a television.

You already know:

- things that save energy.

You will learn:

- energy change.

A. When you walk to school, when you deliver a speech in the morning assembly or when you plant a flower in your school garden, you are changing energy from one form to another.

If you look around, you will notice many energy changes taking place. Energy can be changed from one form to another forming an **energy chain**. The chemical energy of the food you eat is changed into kinetic energy when you play or work. The energy chain is written as:

chemical energy ⟶ kinetic energy

Let us study how energy changes from one form to another.

Work in groups

You may need:

- candle
- matchbox

Light a candle. Observe carefully.

What form of energy is present in the candle?

What energies are formed when the candle burns?

Write the energy chain that occurs when you burn the candle.

B. Work in groups

Study the pictures in Table 7.4. Copy and complete the Table.

Table 7.4 *Energy Chain*

Picture	Energy Chain
(a) A girl playing guitar. 	
(b) A boy kicking a ball. 	
(c) Solar panel connected to TV. 	
(d) Water turning the prayer wheel. 	

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Picture	Energy Chain
(e) Rubbing hands. 	

Check Your Progress

i. Why is energy change important?

ii. Draw an energy chain for the generation of hydroelectricity.

Think Again

1. Match items of column 'A' with correct answers of column 'B'.

Column A	Column B
1. Kinetic energy	a. Stretched rubber band
2. Ability to do work	b. Flying bird
3. Chemical energy	c. Energy
4. Saves energy	d. Battery
5. Potential energy	e. Compact fluorescent lamp

2. Name three appliances used at home that save energy.
3. Write the energy chain for the following cases:
   a. Battery powered radio.
   b. Lighted torch.
4. What is the importance of transformation of energy?
5. Suggest five ways of reducing the electricity bills.
6. Which one of the following would you prefer to use at home in order to save energy? Why?
   a. Incandescent bulb
   b. Compact Fluorescent Lamp
7. Kinley winds the spring of a toy car and releases it on a smooth floor.
   a. What does the toy car do? Trace the energy chain.
   b. After covering some distance, the car stops. Why?

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8. Copy and complete the table below.

Looking Back on Our Lives

Mission: Let's reduce CO_2 by 1 kg per day per person!

In the "Until Today" column, please recall your everyday life until today, and mark a circle for the actions you are already doing.

In the "Challenge Days" column, write down the date you took the challenge and mark the circle on the item you challenged.

Eco check items	Mark the circle if you are trying to do it in your daily life. Also, mark the circle if you don't have an electric appliance mentioned in each item.	Until Today	The day you challenged		
			/	/	/
1	Turn off the TV when not watching.	80	80	80	80
2	Pull the TV or PC cord out of the wall before you go to bed.	20	20	20	20
3	Do not leave the air-conditioner or fan turned on.	60	60	60	60
4	Turn off the lights of the rooms not being used.	40	40	40	40
5	Try not to put too many things in the refrigerator and try not to overcool.	110	110	110	110
6	Put boiled water into the flask after you boiled water using an electronic pot.	110	110	110	110
7	Don't waste water when you shower.	80	80	80	80
8	Don't let water run when you wash your face or brush your teeth.	10	10	10	10
9	Bring your own bag and try not to ask for supermarket plastic shopping bags.	70	70	70	70
10	Sort out refuse in accordance with disposal rules of the City and reduce refuse.	30	30	30	30
11	Walk or use a bicycle instead of using an automobile when you go out or go to work.	170	170	170	170
	If all items are marked with a circle, you can achieve CO_2 reduction by 780g per day per person!	Write down the total amount of CO_2 emissions circled.→	/780g	/780g	/780g	/780g

* The values shown above are rough values.

a. How has your score changed?
b. What does the change in your score indicate?

CHAPTER 8

Characteristic of Living Things

8.1. Animal Characteristics

Test Yourself

1. From the list given below, identify the living things:
   pig, wood, mug, stone, cat, horse, and chair.
2. Name five animals which are helpful to us.
3. Why are all types of animals not found in your locality?
4. Animals move from one place to another. Why?
5. What are the similarities between a cow and a dog?

You already know:

- animals are living things.
- different types of animals live around us.
- some animals are helpful to human beings .

You will learn:

- characteristics of animals.

A. If you happen to keep a pet, what animal will that be? Write about your pet in three lines and share it to the class.

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Dog


Cat


Horse

Figure 8.1. Animals.

B. Characteristics are certain unique features of plants and animals. Animals have their own characteristics. Animals cannot prepare their own food. They grow, but the growth stops after a certain age.

Work in groups

Go around your school campus and observe some animals.

Copy Table 8.1 and write the name of the animals you have observed and their characteristics.

Table 8.1 *Characteristics of Animals*

Name of Animal	Characteristic
	1. 2. 3.....

List down the common characteristics from the table and use presentation software to present to the class.

Check Your Progress

i. Ants and elephants are both animals. Why?

ii. Human and a dog have certain common characteristics. What are those characteristics?

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8.2. Plant Characteristics

Test Yourself

1. Tell three characteristics of animals.
2. What are the differences between plants and animals?
3. Animals depend on _____ for food.
4. Mention the common features of plants.
5. Do you see plants moving from one place to another? Why?

You already know:

- plants are living things.

You will learn:

- characteristics of plants.

A. Plants are living things. Green plants prepare their own food. They do not move from place to place.

Go around your school campus and observe some plants. Write their characteristics.

Copy Table 8.2 and write the name of the plants and their characteristics after your observation.

Table 8.2 *Characteristics of Plants*

Name of Plant	Characteristic
	1. 2. 3....

List down the common characteristics from the table and use presentation software to present to the class.

B. Collect a leaf from five different plants from the list and include them in your scrap book.

Do You Know?

The world's tallest trees are the coast redwood trees found in California.

Fig.8.2. Redwood trees.

Check Your Progress

i. Both grass and pine tree are plants. Support this statement with reasons.

ii. Why is it not necessary for a plant to move from place to place?

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8.3. Individuals are Different

Test Yourself

1. State one similarity between plants and animals.
2. Animals need to move from place to place but plants do not. Why?
3. Name three characteristics of plants.
4. Do all the dogs in the school campus look alike? Why?
5. Every plant and animal in this world is different from each other. Explain.

You already know:

- animals are different in shape, size, colour, etc.

You will learn:

- differences amongst individuals.

Work in groups

A. Compare yourself with your friends and note down how you are different from them.

1. Do the features look same or different?
2. Why are the features same or different?
3. We are all different from each other. We have differences in our ability, shape, size, etc. These differences make us special in our own ways.

Read the passage or watch the video clip using the link given at the end of the passage.

Being Different is Beautiful

My parents say that we are all different. This makes us all beautiful. We all come from different cultures and religions. It will be boring if we all look alike. Every day at my school, I see everyone different and it makes me special. Our skin colour, body shape and size are all different but we are all growing each day. Some of our hairs are short, long, straight or curly. Our eyes have different shape and size; some of us wear glasses and some do not but we all see beautiful things. Some of us use our feet to walk, some use walking stick or even wheelchair but we all get to different places. Some like football, while others like archery but after all we all like to play. We all like different kinds of food but we all like to eat. We may even dance to different songs, but we all like to enjoy. We are all different and special in many ways. When we see someone different, it is important to respect and treat everyone the same. After all it is beautiful to be different and learn many things from each other.

https://www.youtube.com/watch?v=KJ1ygFknjYo

a) What did you understand from the passage/video?

b) Why is it important to respect different individuals?

Measure the height of each person in your class.

You may need:

- chart paper
- metre rule
- pencil

Cut a long thin strip of chart paper using scissors.

Paste it on the wall of your classroom.

Measure 1 metre from the floor and mark it with the pencil.

Figure 8.3. Measurement of height.

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Above 1 metre, measure in centimetres and make a scale.

Let each person in the class stand against the scale.

Record the heights in Table 8.3.

Table 8.3 *Measurement of Height*

Sl No.	Range of Height (cm)	Tally	Number of Student
1	<=120-125		
2	126-130		
3	131-135		
4	136-140		
5	141-155		
6	156 -		

Make a bar graph to show the heights of the students in your class.

Which range of height has the maximum number of students?

Which range of height has the minimum number of students?

How many students are there in your height range?

What can you conclude from the graph?

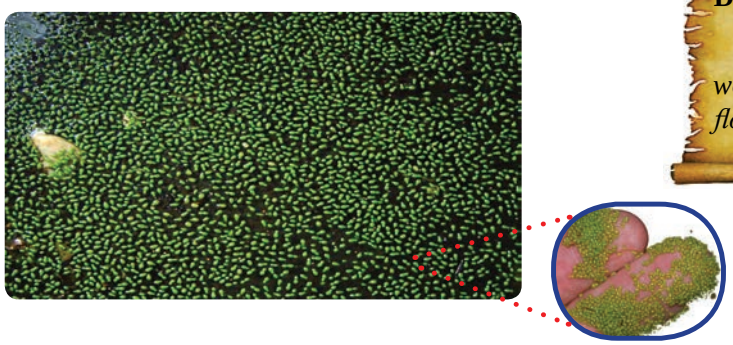
Mention some more differences other than height.

There are differences in characteristics among other animals and plants belonging to the same group. For example, all cats do not look alike. They differ in shape, size, colour, etc. These differences among individuals belonging to the same group are called variation.

Check Your Progress

i. What is variation?

ii. What are the common variations that you observe among your family members?



Do You Know?

Wolffia is the world's smallest flowering plant.

Fig 8.4. Wolffia.

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8.4. Variation in Plants and Animals

Test Yourself

1. What are the ways in which you are different from your friends?
2. Why do yaks have thick hair on their body?
3. What are the different types of dogs that you have seen?
4. Mention the colours of flowers that you have seen.
5. Why is variation important?

You already know:

- individuals are different.

You will learn:

- variations in plants.
- variations in animals.

A. Variation is common in nature. It helps the living organisms to adapt and survive. It also helps to produce new varieties.

Work in groups

Visit a flower garden. Observe different kinds of flowers carefully.

Copy and complete Table 8.4.

Table 8.4 *Comparison of Flowers*

Flower	Size of Flower (small/medium/ large)	Colour of Petal	Number of Petal
Flower 1			
Flower 2			
Flower 3			
Flower 4			

Do the flowers look alike? Why?

How would your school garden look like if all the flowers are same?

Work in groups

Mention your favourite animal.

Browse the internet or library books. Find the varieties of animals you have mentioned.

You can also ask your elders or visit RNR centre.

One example is shown in Table 8.5.

Table 8.5 *Types of Fish*

Type of Animal	Variety
Fish	Trout Catla Salmon Carp Mackerel

Share your findings to the class.

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Check Your Progress

i. What variations do you see in plants?
ii. How does variation help animals?

Figure 8.5. Types of rhododendrons.

Fig 8.6. Types of orchids.

8.5. Life Cycle of Animals

Test Yourself

1. Name the animals which lay eggs.
2. Mention the animals which give birth to young ones.
3. How do animals reproduce?
4. Name the young one of the following animals:
   cow, goat,cat, and elephant
5. A fully grown organism is called _____.

You already know:

- living things reproduce.

You will learn:

- life cycle of some animals.

A. Living things have the ability to produce its own kind. This process is called **reproduction**. The process of an animal or a plant beginning its life, growing, and reproducing is called **life cycle**. In animals, male produce sperm and female produce ovum**.** The fusion of an ovum and sperm is called **fertilisation**.

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Let us look at the life cycle of a bird in Figure 8.7.

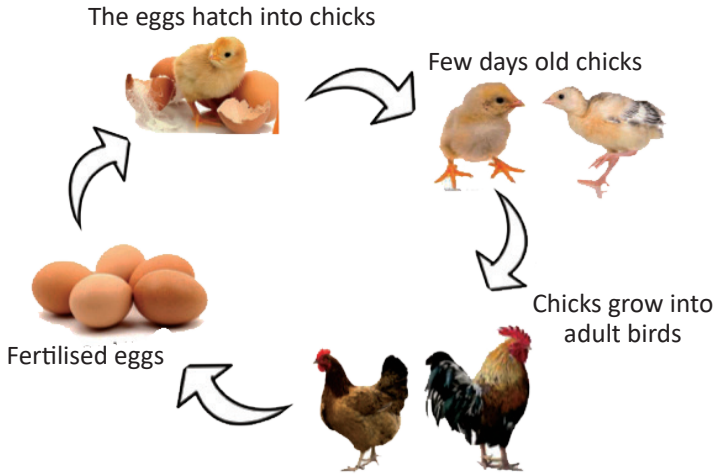

Figure 8.7. Life cycle of a bird.

Hens lay fertilised eggs. The fertilised eggs hatch into chicks after incubation for about 21 days. The chicks grow into adult birds.

How many stages are there in the life cycle of a bird? Name the stages.

B. Work in groups

Browse the internet or library books.

Draw and describe the life cycle of a cow.

What is the difference between the life cycle of a bird and a cow?

Check Your Progress

i. Define the following:
   a. life cycle
   b. reproduction
   c. fertilisation

ii. Write down the similarities between the life cycle of a cow and a bird.

http://www.kidzone.ws/animals/lifecycle.htm

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THINK AGAIN

1. Write whether the following statements are true or false:
   a. Plants grow throughout their life.
   b. Animals cannot reproduce.
   c. Animals can make their own food.
   d. The human population shows variation.
   e. Flowers have equal number of petals.
2. Nima and Dawa are brothers, yet they look different. Why?
3. Write three characteristics of plants.
4. What is the importance of variation in living things?
5. How are animals different from plant?
6. Draw and describe the life cycle of housefly.
7. Read the story of an organism given below:

   I *am an organism. I can breathe, reproduce and grow. But I can not move from place to place. What type of organism am I?*
8. An experiment is set up in the science class. A small plant is placed in a conical flask. The conical flask is connected to a test tube that contains clean lime water. After one day, students observe that the clean lime water contained in the test tube turned milky indicating that the carbondioxide flowed into it. What characteristic of the plant is demonstrated by this experiment?

CHAPTER 9

Green Plant

9.1. Parts of a Plant

Test Yourself

1. Plant is a living thing. Explain.
2. What do plants need for their proper growth?
3. Which part of a flower is brightly coloured?
4. Which part of a plant is usually green?
5. Name the part of the plant that normally grows underground.

You already know:

- plants are living things.

You will learn:

- parts of a plant.

A. Like human body, plants also have many parts.

Look at the plant in Figure 9.1.

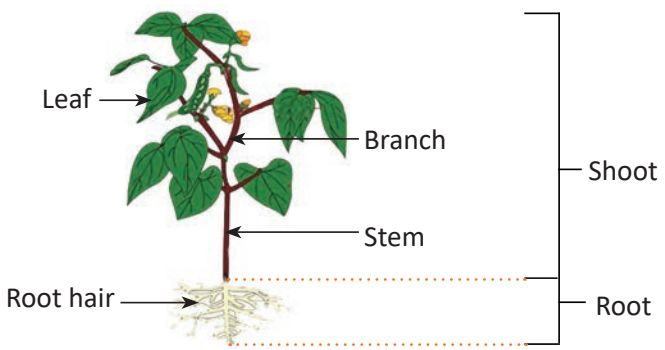

Figure 9.1. Parts of a plant.

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The part of a plant above the ground is called **shoot** and the part below the ground is called **root**. The shoot has branches, leaves, flowers and fruits. The root has **root hairs**.

Work in pairs

Collect a plant with its shoot and root.

Compare it with the plant given in Figure 9.1.

Identify the different parts of the plant.

Draw a labelled diagram of your plant.

Does your plant have some other parts that are not shown in the Figure 9.1?

Add them in your diagram.

B. Mounting a plant.

Work in groups

You may need:

- chart paper
- duplicating paper
- marker pen
- sellotape
- water

Collect a plant with all its parts.

Gently wash the roots with water.

Spread the plant carefully on a duplicating paper.

Put some more papers on top of it and press gently to dry.

Mount it on the chart paper with the help of a sellotape.

Label the parts using a marker pen.

Write the names of your group members and display it in the class.

Do You Know?

The first plant on the earth was a water plant. It lived in the sea over 3000 million years ago.

Check Your Progress

i. What do you call the part of a plant below the ground?

ii. What are the different parts of a shoot?

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9.2. Function of Root

Test Yourself

1. What is shoot of a plant?
2. Name different parts of the shoot of a plant.
3. The part of the plant below the ground is called _____.
4. Which part of a plant absorbs water from the soil?
5. Name the edible roots found in your locality.

You already know:

- different parts of a plant.

You will learn:

- functions of root.

A. There are two main functions of a root.

Work in groups

You may need:

- test tubes
- measuring cylinder
- young leafy plant with roots intact
- water
- vegetable oil
- marker pen

Take two test tubes and fill them with equal volume of water.

Put a young leafy plant with its roots in one of the test tubes.

Add ten drops of oil into both the test tubes and mark the levels of water.

Label the test tube with plant as set-up A and the other as set--up B.

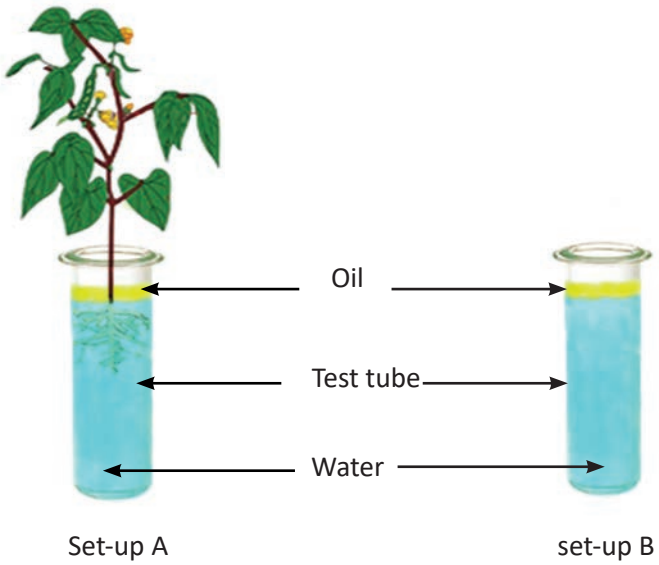

Figure 9.2. Experiment showing function of root.

What is similar between the two set-ups?

What is different about the two set-ups?

Why is oil added into the test tubes?

Leave the set-ups in the sun for a few hours.

What do you observe in set-up A and set-up B? Give reasons for your observations.

What function of the root does the experiment show?

Roots also absorb mineral nutrients present in the soil.

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B. Let us find out the other functions of roots.

Where do plants usually grow?

Why is it difficult to uproot a plant?

Why is soil easily washed or blown away from a barren land?

Besides absorbing water and mineral nutrients, the root also holds the soil.

Check Your Progress

i. What are the two functions of roots in plants?

ii. Why do people plant trees in landslide prone areas?

9.3. Functions of Stem

Test Yourself

1. What are the two main parts of a plant?
2. Which part of the plant absorbs water?
3. What do you think will happen to plants if there are no roots?
4. Why is stem important for a plant?
5. What holds leaves and flowers in a plant?

You already know:

- functions of root.

You will learn:

- functions of stem.

A. Stem has two major functions. One function is to hold up the leaves and flowers of the plant.

Let us investigate the other function of the stem.

Do You Know?

Stem of young plants are green and performs photosynthesis.

Work in groups

You may need:

- herbaceous plant
- red ink
- water
- blade
- beaker
- hand lens

PRECAUTION

Be careful while using blade.

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Take a herbaceous plant.

Cut its fresh leafy shoot under water and dip it immediately in a beaker containing red ink solution.

Keep the set-up for few hours.

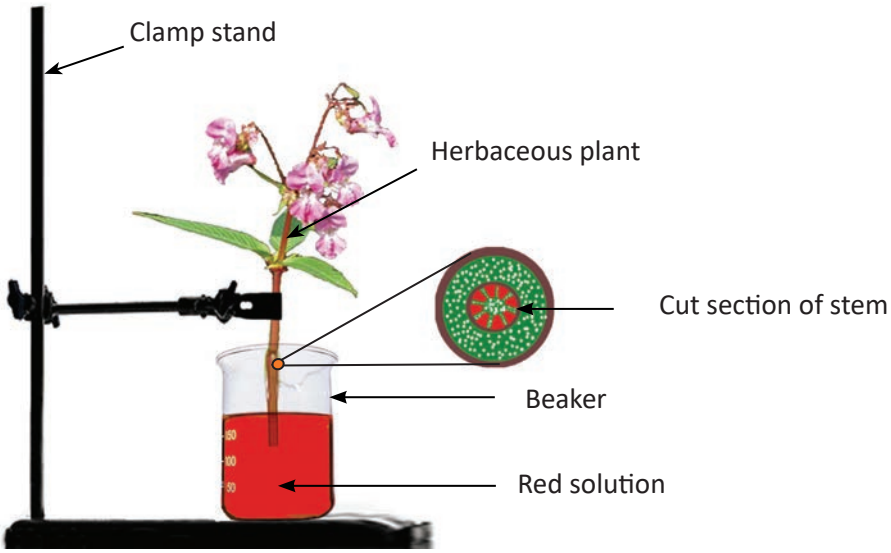

Figure 9.3. Experiment showing the function of stem.

Cut a thin circular section of the stem as shown in the figure 9.3 and observe using hand lens.

What do you see?

Why do we need to cut the stem under the water?

What can you conclude from the experiment?

The nutrients needed by the plants are present in the soil.

These nutrients are dissolved in water.

They are absorbed by roots and conducted to leaves through stem.

Check Your Progress

i. Write two functions of a stem.
ii. Name three stems that grow underground.

9.4. Parts of a Flower

Test Yourself

1. Which is the reproductive part of a plant?
2. Write the names of any two flowers.
3. Name different parts of a flower.
4. Name the male parts of a flower.
5. Name the female parts of a flower.

You already know:

- parts of a plant.

You will learn:

- parts of a flower.

A. Figure 9.4 shows different parts of a flower. Refer Figure 9.4 and carry out the following activities.

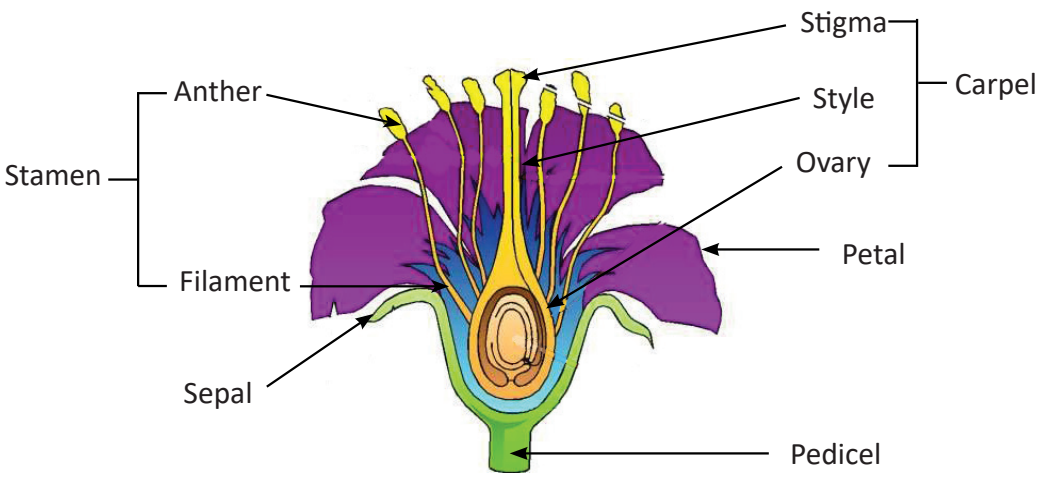

Figure 9.4. Parts of a flower.

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Work in groups

You may need:

- flower
- forceps
- hand lens
- blade

Take a flower.

Remove all the sepals carefully using the forceps.

Figure 9.5. Sepals of a flower.

What is the colour of the sepals?

How many sepals are there?

All the sepals together are called **calyx**.

Remove the petals from your flower.

Figure 9.6. Petals of a flower.

Do You Know?

Bamboo flowers only once in its entire lifetime.

What is the colour of the petals?

How many petals are there?

All petals together are called **corolla.**

Observe the stamen using hand lens.

Note that the stamen is made up of anther and filament.

Draw the stamen and label its different parts.

Now, observe the carpel using hand lens.

Note that the carpel is made up of stigma, style, and ovary.

Draw the carpel and label its different parts.

B. Many flowers have both male and female parts. They are called **bisexual flower.** However, flowers such as that of pumpkin, cucumber and maize, contain only male or female part. These flowers are called **unisexual flowers.**

Work in groups

Collect different types of flower from your locality. Observe them carefully and sort them into the following groups as shown in Table 9.1. You can use local or English name.

Table 9.1 *Sorting Flower*

Flowers containing only Male or Female part.	Flowers containing both Male and Female part.

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Share your work with the class.

What is the difference between unisexual flowers and bisexual flowers?

Check Your Progress

i. Draw a labelled diagram of a flower.

ii. Name three unisexual flowers.

http://www.crickweb.co.uk/ks1science.html
http://www.crickweb.co.uk/ks2science.html#
http://www.rabbitsabc.com/roots.html

9.5. Functions of the Parts of a Flower

Test Yourself

1. What are the three parts of a carpel?
2. Name different parts of the stamen.
3. All the sepals together are called _____.
4. Which part of the flower produces pollen grains?
5. What is the main function of a flower?

You already know:

- living things reproduce.

You will learn:

- functions of the parts of a flower.

A. Different parts of a flower carry out different functions.

Which part of the flower is usually brightly coloured? Why?

Which is the outermost part of a flower?

What is the function of sepal?

B. Bring a flower containing all the parts.

Work in groups

You may need:

- flower
- forceps
- hand lens
- chart paper
- sellotape
- marker pen

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Take the stamen of a flower.

Touch the anther with your finger.

Observe your finger with the hand lens.

Do you see anything on your finger?

The small particles that you see on your finger are called **pollen grains**.

Where are pollen grains produced?

What is the function of a filament?

Touch the stigma with your finger.

How does it feel?

Stigma receives pollen grains.

The style is a thin tube that leads from the stigma to ovary. The ovary contains ovules.

Figure 9.7. Pollen grains.

What is the function of a style?

Ovary forms fruit and ovules develop into seeds.

Paste different parts of the flower on a chart paper. Label the parts and state their functions. Display it in your class.

Do You Know?

Flower is the seat of sexual reproduction and helps in the formation of seeds first and then the development of fruits.

Check Your Progress

i. Write the function of anther.

ii. Why is stigma usually sticky?

THINK AGAIN

1. Match items of column 'A' with correct answers of column 'B'

Column I	Column II
a. Attracts insects and birds.	i. Calyx
b. Male reproductive part of the flower.	ii. Carpel
c. Female reproductive part of the flower.	iii. Stigma
d. Protects the inner parts of the flower.	iv. Corolla
e. Receives pollen grains.	v. Stamen

2. List the importance of flowers for human beings.
3. When you cut a stem, a watery liquid may come out. Why?
4. The following are the parts of a flower:

   carpel calyx stamen corolla

   Arrange them in the sequence from outermost to the innemost parts.
5. Write three differences between stem and root.
6. Draw a flower and describe its parts.
7. A weeping willow tree has hard stem from which branches and leaves grow. Its roots grow long. What functions of the stem and root do the sentences describe?

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CHAPTER 10

Living Things and their Environment

10.1. Food Chains in a Habitat

Test Yourself

1. Define food chain.
2. There will be no food chain without plants. Why?
3. Why are animals called consumers?
4. Do all animals eat the same food? Why?
5. Why is it important to have different types of plants and animals in a habitat?

You already know:

- food chain.
- consumers and producers.

You will learn:

- food chains in a habitat.

A. Work in pairs

Study the following food chain and answer the questions.

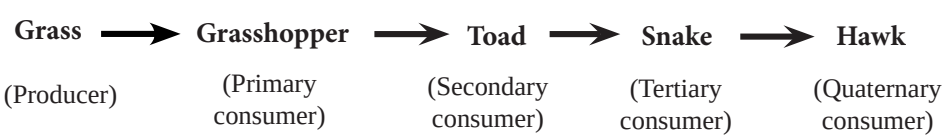

Figure 10.1. Food chain.

Which is the producer?

What does secondary consumer feed on?

What does tertiary consumer feed on?

What is a primary consumer?

Will the food chain be complete without quaternary consumer? Explain.

B. Work in groups

Study the food chain in Figure 10.2, and answer the questions that follow.

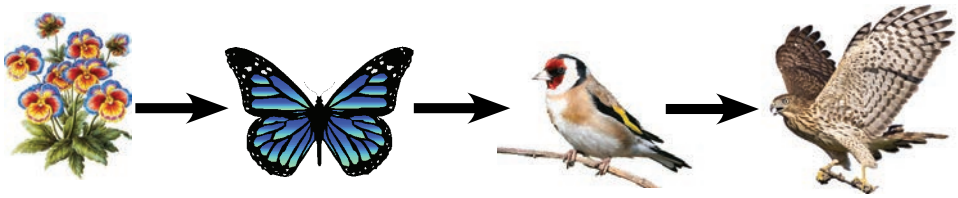

Figure 10.2. Food chain.

Which one is the secondary consumer in the food chain?

Is hawk a primary consumer? Why?

How is the producer different from the consumers?

C. Work in groups

Read the following story told by 'Singee', the lion and answer the questions that follow.

Hello everyone!

My name is Singee. People call me lion. I live in the savannah of Africa which is the largest grassland in the world. It covers about 20% of the Earth's area.

My family consists of several members. We live in small groups. We belong to a group of animals resembling cats. We have our

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cousins, cheetahs and leopards living in the savannah. All of us are carnivorous.

In the savannah, there is plenty of green grass. Along with the grass, there are several trees. Some are short while others are tall. Varieties of insects live in the grass. Many birds find their food from the grass. Trees are home to the birds and their leaves are the favourite food for elephants and giraffe.

Let me tell you more about life in the savannah. Grass is the favourite food of zebras, deer, gazelles, wildebeest, wild buffaloes, hippopotamuses and elephants. We depend for food on some of them. Lots of green grass in our savannah makes all of us happy and healthy.

Did I tell you about crocodiles and hippopotamuses here in the savannah? Well, crocodiles and hippopotamuses spend most of their time in the water. Water here in the savannah is very important. We all need water to quench our thirst. During some months of the year, there is water shortage in the savannah.

Figure 10.3. Savannah.

Crocodiles are carnivorous while hippopotamuses are herbivorous. Some animals lose their lives to the crocodiles while drinking water.

Do you have a savannah in your country?

The characters in the savannah make several important food chains.

Write three food chains based on the above story in your notebook. Identify the producer, primary consumer, secondary consumer, tertiary consumer and quaternary consumer.

What will happen in the savannah if Singee and his cousins were caught and taken to a zoo?

Check Your Progress

i. The food chain given below is not in proper sequence. Rearrange in correct sequence.

Hawk ➔ Frog ➔ Snake ➔ Caterpillar ➔ Plant

ii. Differentiate between primary consumer and secondary consumer.

http://www.enchantedlearning.com/subjects/foodchain/

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10.2. Food Web

Test Yourself

1. Name a primary consumer.
2. Why is frog a secondary consumer?
3. What will happen to the snakes if all the frogs were killed?
4. Why are consumers important in a habitat?
5. Name any other animals which eat grass.

You already know:

- food chain in a habitat.

You will learn:

- food web.

A. In nature, a single food chain does not exist in isolation. All the food chains are connected, and they intersect each other like the web of a spider. They form a complete feeding relationship called a **food web.**

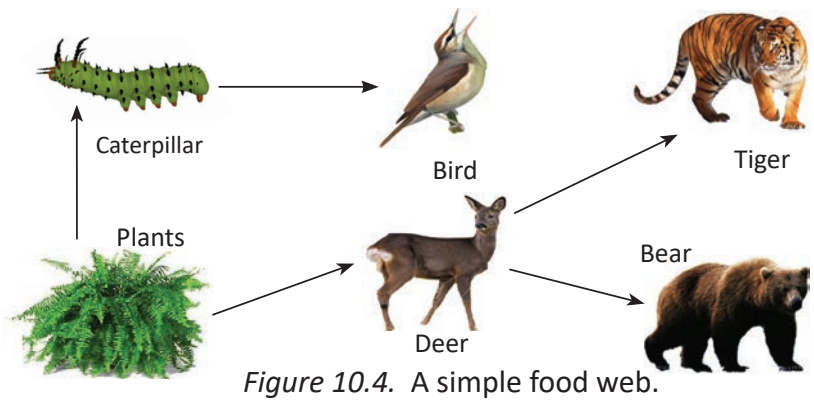

Figure 10.4. A simple food web.

For example, there are animals other than the caterpillar that eat

plants. There are also animals other than the tiger that eat deer.

Study the food web given in Figure 10.5.

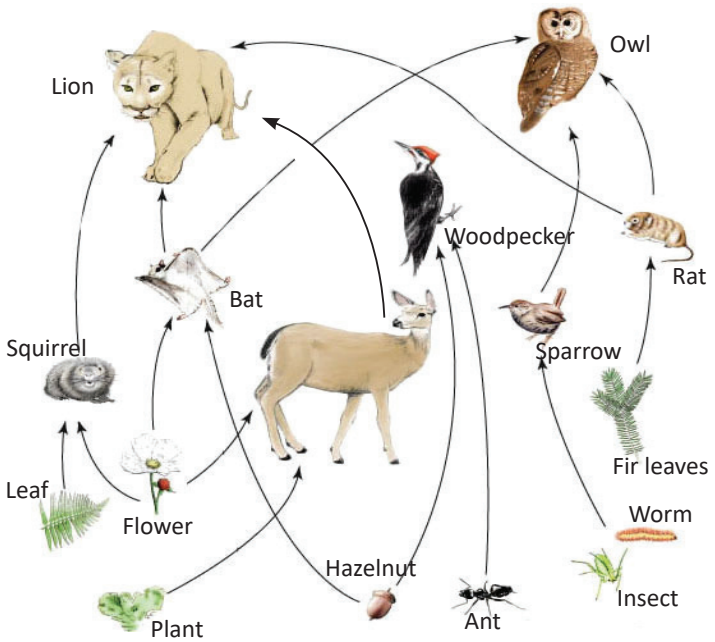

Figure 10.5. A complex food web.

From the food web in Figure 10.5 identify and draw at least three food chains.

B. Play the online game using the link provided. The game requires Adobe flash player. https://www.brainpop.com/games/foodchaingame/

How many food chains could you complete?

Note them in your notebook.

C. Work in groups

Read about Jigme Dorji National Park (JDNP).

Jigme Dorji National Park is Bhutan's second largest protected area of forest. This national park covers the entire Dzongkhag of Gasa and the north areas of Thimphu and Paro. Black bears,

tiger, leopard, wild dog, marmot, sambar, blue sheep, barking deer, red panda, takin, and musk deer are found in this area. This may be the only place in the world where the Royal Bengal Tiger and snow leopard habitats overlap. The park also has equally rich variety of plants.

JDNP is also the only park in Bhutan where the national animal (takin), the national flower (blue poppy), the national bird (raven), and the national tree (cypress) exist together.

What is a national park?

What are the special features of JDNP?

Construct five simple food chains that exists in JDNP.

Combine the above food chains and draw a food web.

Check Your Progress

i. What is a food web? Explain with an example.

ii. There are many animals which are harmful to us. However, all animals are important in a food web. Explain.

10.3. Saving Threatened Plants and Animals

Test Yourself

1. Define food web.
2. Name at least two preys for the following predators:
   a. tiger
   b. frog
   c. human beings
3. Can we live without plants? Why?
4. We do not see many animals in the forests near cities. Why?
5. What will happen to animals if we destroy their habitat?

You already know:

- food web.

You will learn:

- threatened plants and animals.

A. Work in groups

Imagine life on Earth without plants and animals.

One group will write about life on Earth without plants. The other group will write about life on Earth without animals.

Present your work to the class.

Combine the ideas of your group with the other group and write about life on Earth without plants and animals.

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B. Over millions of years, our Earth has lost varieties of plants and animals. Those plants and animals that are no longer found on the Earth are called **extinct** plants and animals. Example, dinosaurs, woolly mammoth, dodo, passenger pigeon, cry pansy, black Andean toad and Sri Lanka legume tree.

Black Andean toad

Dodo

Dinosaurs

Passenger pigeon

Cry pansy

Sri Lanka legume tree

Woolly mammoth

Figure 10.6. Extinct plants and animals.

C. Animals are an important part of our natural resources. They help in maintaining the balance in nature. If there are no tigers, the number of boar and deer will increase and they will destroy all the crops.

Similarly, plants help to purify air. If plants are destroyed, herbivores will have a shortage of food. Plants are also important source of medicine.

Following are the list of a few threatened plants and animals of Bhutan.

Asian elephant, golden langur, Bengal tiger, takin, black-necked crane, cordycep (**Yartsa Goenboop**), blue poppy, red panda, musk deer, agarwood (**agaru**), genntiana (pang goen metog), yew (kirang shing), ginseng (**bhreeng geera dza**).

(a) Yew **(Kirang shing)**

(b) Genntian**(Pang goen meto)**

(c) Blue poppy

(d) Asian elephant

(e) Bengal tiger

(f) Musk deer

(g) Black-necked crane

(h) Golden langur

(i) Red panda

(j) Cordyceps (**Yartsa goenboop**)

(k) Ginseng (**Bhreeng geera dza**)

(l) Agarwood (**Agaru**)

Figure 10.7. Endangered species.

These animals and plants are called **threatened** or **endangered** because their numbers are decreasing. People believe that one day they might disappear from the Earth.

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Go to your school library or browse the internet, and:

Write about any two threatened plants and animals.

Why do we need to save the threatened plants and animals?

Suggest some ways to save threatened plants and animals.

Check Your Progress

i. Name the three endangered plants and animals.

ii. Why do plants and animals become endangered?

10.4. Disappearing Forest

Test Yourself

1. Name some extinct plants and animals.
2. Why is black-necked crane an endangered species?
3. Why does our government put restriction on collecting cordycep?
4. List down three importance of forest.
5. What are some of the reasons for disappearing of forest?

You already know:

- endangered plants and animals.

You will learn:

- disappearing forest.

A. Forest is the habitat for plants and animals. We must take special care of them. Forest all over the world are disappearing fast. They are disappearing for many reasons.

A few reasons are mentioned below.

Money

Forest provide timber for building, paper making, and furniture. Many trees can be cut down quickly using modern machines. The person who sells them makes lots of money.

What will happen to the animals living in forest if all the trees are cut down?

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Shifting cultivation

Figure 10.8. Shifting cultivation.

Forest soil is very fertile. People clear forest to grow crops. Crops grow quite well for a few years only, and then people must clear another area of forest. This method of farming is called **shifting cultivation** (**tseri**).

.

Work in pairs

Discuss the advantages and disadvantages of shifting cultivation and write in your book.

Figure 10.9. Human settlement and its impact.

Human Settlements

The construction of houses,roads, industries, etc. destroy forest. In the urban areas, a huge amount of waste is generated. In the rural areas, the clearing and burning of areas to grow crops and fodder grasses destroy forest. If these situations continues, the forest will disappear**.**

According to the National Waste Inventory Survey (2019), the total solid waste generated in Bhutan is about 172,161 kg per day. The solid waste generated by each Bhutanese is about 0.23 kg per day .

Calculate the amount of waste generated by your class in a year.

What do you think will happen if the forest is filled with waste?

Fuel

People need fuel for cooking as well as to keep themselves warm. For most people in Bhutan, firewood is the main fuel. To get firewood people cut down trees.

Figure 10.10. Firewood.

Name some alternative source of fuel.

Animals

Animals such as cow,horse, goat, etc. go to the forest to graze .When these animals over graze, the forest gets destroyed.

Figure 10.11. Animals grazing in forest.

How can we control overgrazing in the forest?

Check Your Progress

i. What are the effects of shifting cultivation?

ii. How does the increasing human population affect habitat?

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10.5. Protecting Habitat

Test Yourself

1. What is habitat?
2. Write any three reasons why forests are destroyed.
3. How does habitat destruction endanger species?
4. Mention the ways to reduce our dependence on forest for firewood.
5. What steps will you take to protect forest?

You already know:

- threats to the habitat.

You will learn:

- different ways of saving habitat.

A. Plants and animals are important to maintain the balance in the natural environment. It is important to protect their habitat to prevent them from becoming endangered and then extinct. Therefore, national parks, sanctuaries, reserves, and wildlife corridors are created to provide natural habitat for plants and animals.

Work in groups

Discuss the impact on plants and animals if their habitats are destroyed.

List down the steps taken by our government to protect the habitat.

Present your findings to the class.

B. Invite the **Gewog** forest officials or the head of **Gewog (Gup)** to give a talk on community forestry. Prepare a list of questions like:

- When was community forestry introduced in your locality?
- What are the purposes of community forestry?
- What are the roles of students in the community forest?
- What are the roles of community in the community forest?

From your discussion with the forest officials, write how community forest helps in saving the habitat.

In small groups, design a poster on "Protecting Habitat for Better Future" and display in your school.

Check Your Progress

i. Why is Social Forestry Day important in protecting the habitat of plants and animals?

ii. What is the importance of protecting habitat?

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THINK AGAIN

1. Choose the correct answer.

   i. Interconnected food chains are also known as

      A special food chain.
      B food web.
      C food resource.
      D food producer.

   ii. Which of the following animal is extinct?

      A Woolly mammoth.
      B Asian elephant.
      C Bengal tiger.
      D Golden langur.

   iii. Which one of the following is not an advantage of planting trees?

      A Provide food.
      B Give oxygen.
      C Prevent soil erosion.
      D Destroys land.

   iv. Primary consumers include

      A herbivore only.
      B carnivore only.
      C herbivore and omnivore.
      D omnivore and carnivore.

v. Which one of the following is not an endangered animal of Bhutan?

A Golden langur.
B Red panda.
C Takin.
D Boar.

1. How does planting of trees prevent soil erosion?
2. Why is it important to save forest? Give three reasons.
3. Why is musk deer an endangered animal?
4. Explain how human beings damage the environment.
5. Why do you think a single food chain cannot exist in isolation?
6. Sonam is a biologist at the Jigme Dorji National Park in Punakha. She maintains the record of mammals in the park. A graph in Figure 10.12 is produced from her record.

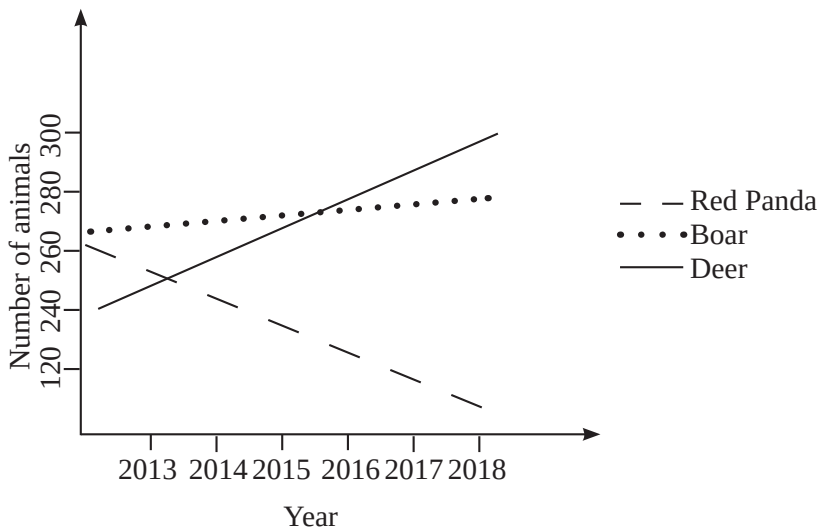

Figure 10.12.

i. Which animals are increasing in population?

ii. Which animal appears to be endangered?

CHAPTER 11

Nutrition and Human System

11.1. Food for Health

Test Yourself

1. What are the three groups of food?
2. Mention all the food that you have eaten.
3. Write a few examples of protective food.
4. Is it important to take all groups of food? Why?
5. What will happen if we only take the food for activity?

You already know:

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

You will learn:

- different food groups and their functions.

A. Work in groups

Look at the following pictures in Figure 11.1.

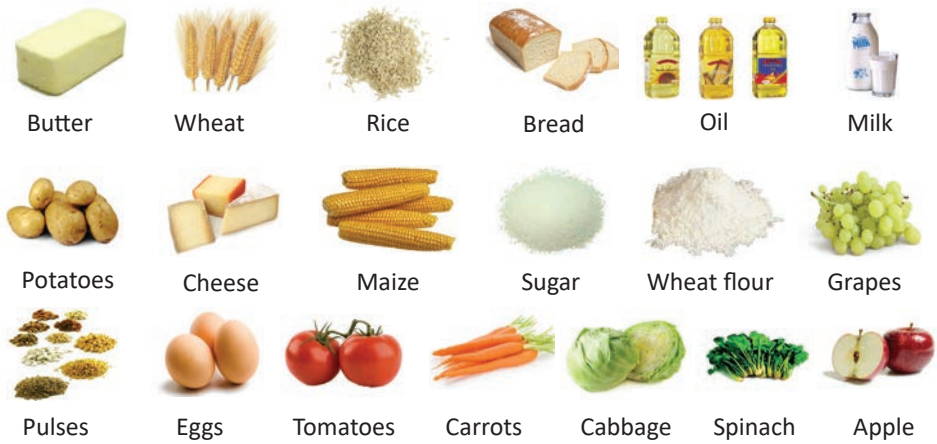

Figure 11.1. Kinds of food.

Classify the above food items into different food groups in Table 11.1.

Table 11.1 *Food Groups*

Energy Giving Food	Protective Food	Body Building Food

What are protective food?

Pulses and cheese are body building foods. Why?

Energy giving food contains **carbohydrates.**

Bodybuilding food contains **protein.**

Protective food contains **minerals and vitamins.**

Mention some examples of food that contain carbohydrate, protein, vitamins and minerals.

Fruits and vegetables also contain fibres. They help to remove the digestive waste out of the body. Other examples of fibre containing foods are corn, half crushed wheat, flour, brown rice, whole grain cereals, edible peels of fruits, nuts, and seeds. Cabbage is one of the vegetables which provides a lot of fibre.

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Water also helps us to digest food and to take digestive waste out of the body.

What happens if the major part of your diet is meat?

Check Your Progress

i. Is fibre good for health? Support your answer with reasons.

ii. Why are beans better for body building than rice?

11.2. Eating Habits

Test Yourself

1. Which food gives the maximum energy?
2. Why should we take food containing fibre?
3. How is water important for our body?
4. Which food item would you prefer, potato chips or rice? Why?
5. What do you think will happen if you keep on eating chips for a month?

You already know:

- different kinds of food groups.

You will learn:

- impact of junk food on our heath and lifestyle.

A. Foods are important for healthy living. They must contain all types of nutrients needed for growth, protection, and work. They must be taken at regular interval of time. Nowadays, foods are available in many forms, cooked and uncooked.

List down the various packaged food you take. Why do you take these foods? Are these packaged foods better than the fresh foods?

Food which is unhealthy but is quick, easy and ready to eat is called **junk food**. It has high fat content and little or no nutrients. Some harmful colours and **preservatives** are added for better storage and to make the food look attractive.

People eat junk food mostly at odd hours. This reduces appetite, if the person does not supplement his or her diet with the intake

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of healthy food then it leads to **malnourishment**. If a normal meal is taken after eating junk food, people can get fat. Junk foods or fast foods contain more salt and fat than the body needs. Too much fat in the body leads to obesity that can cause heart problems and other diseases. Besides causing health problems,the plastic wrappers, containers, cans, etc. litters our environment if not disposed off properly. So, it is important to reduce, reuse or recycle the waste.

Study the food chart in Figure 11.2 and answer the questions that follow:

Figure 11.2. Food chart.

1. Classify the food items given in the food chart into healthy and junk food.
2. How would regular eating of junk food increase the risk of getting diseases?

3. Explore the impact of eating junk food on our way of living.
4. How will you change your way of living to avoid junk food?

B. Work in groups

Interview people from your school or community using the following questions.

Where do you think the plastic waste in the community is coming from?

What do you do with the plastic waste?

Is it good to burn plastics? Why?

Suggest at least three ways to minimise plastic waste in your community.

How do you think we will be able to achieve zero waste?

Check Your Progress

i. Make a list of junk foods.
ii. Why should we avoid junk foods?
iii. How can we manage plastic waste?

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11.3. Human Transport System

Test Yourself

1. Give three examples of junk food
2. Junk food is bad for our health. Why do you think so?
3. Name the major parts of our body.
4. What do you observe when a part of your body gets injured?
5. What happens to your heart beat when you run fast?

You already know:

- junk food causes heart problem.

You will learn:

- organs in our body.
- heart, blood vessels and their functions.

Our body is made of **organs**. An organ is a part of the body which does special work. **Heart** and **lungs** are examples of organs.

The heart is about the size of your fist. The heart pumps blood around your body.

Feel your ribs. Your lungs fit inside your ribs. Ribs protect your heart and lungs.

Do You Know?

Our heart beats about 100,000 times a day.

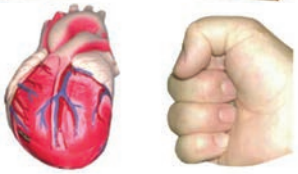

Figure 11.3. Heart.

Our heart is between our lungs. Lungs are for breathing.

A. Heart pumps blood through pipes called **blood vessels**. There are two kinds of blood vessels: **arteries and veins**. Figure 11.3 shows organs of transports and their functions.

Blood supplies the digested food and oxygen and collects waste from different parts of the body.

Heart, blood and blood vessels form the human transport system.

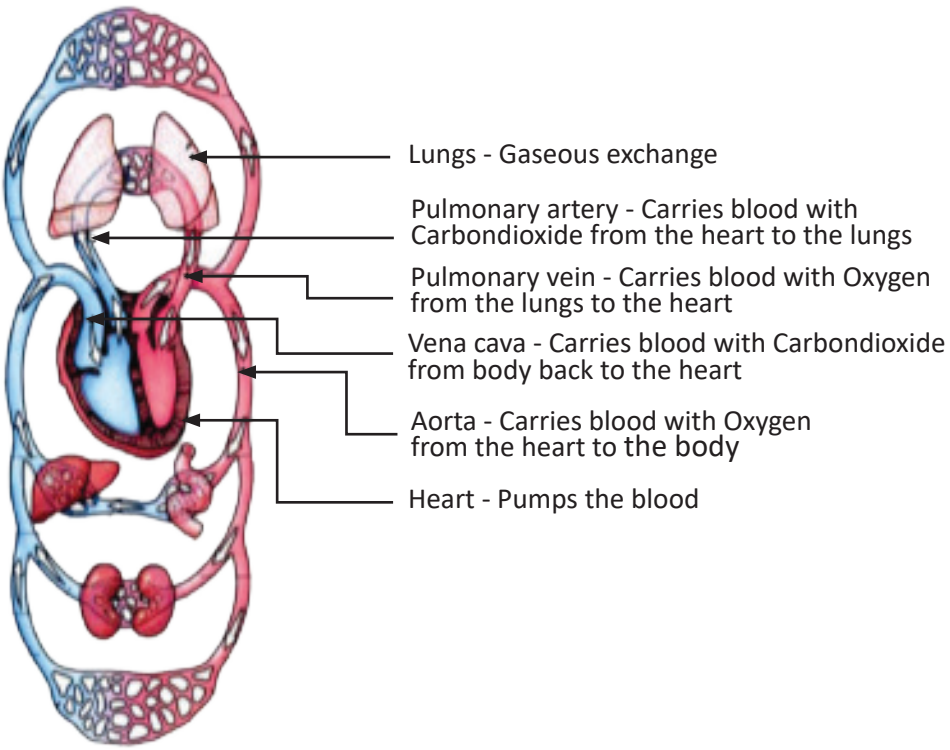

Figure 11.4. Human transport system.

What constitute the human transport system?

The half of human transport system is represented in red and the other half in blue. Why?

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Check Your Progress

i. Which organ in our body is like a pumping machine?
ii. Name the two types of blood vessels.

http://www.abcya.com/skeletal_system.htm
http://www.playkidsgames.com/games/wordFind/Skeletal%20System/default.htm

11.4. Skeleton and Muscle

Test Yourself

1. Define organ.
2. What are the three parts of human transport system?
3. Name the organ which pumps blood in our body.
4. What gives shape to our body?
5. What do you think are the functions of bones and muscles in our body?

You already know:

- heart and blood vessels.

You will learn:

- skeleton and its functions.
- muscle and its functions.

A. What holds you up?

A collection of bones that holds a body together is called **skeleton**. A skeleton supports a body. Use 3D model of a Human Skeleton and identify the different bones in our body as shown in Figure 11.5.

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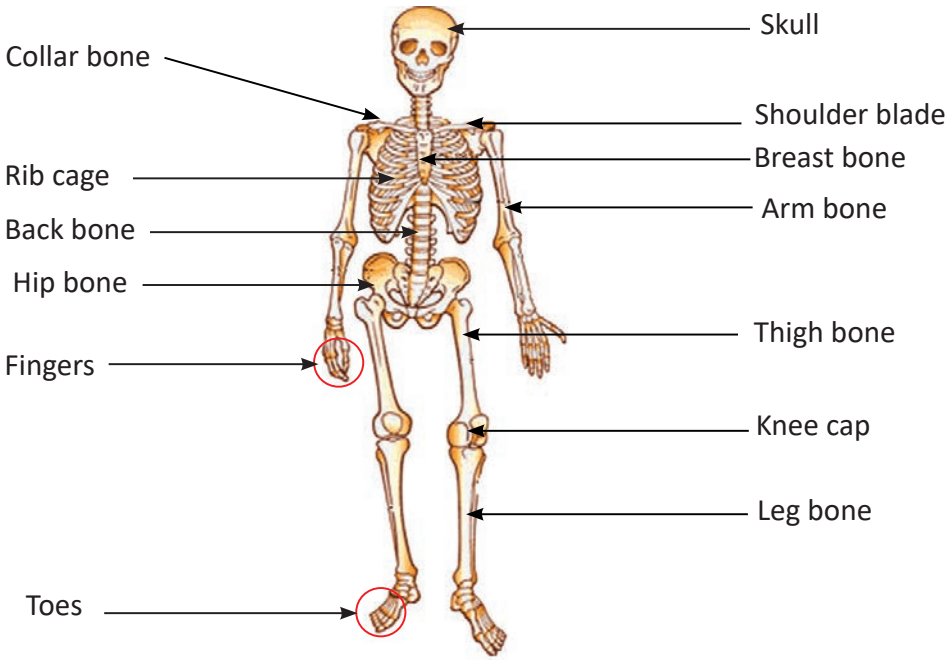

Figure 11.5. Human transport system.

Which bone do you find in the centre of the chest?

Which bone provides shape to the head?

Write the names of the bones that help in walking.

B. Feel the muscles of your upper arm of one hand with the other.

Name the parts of your body where muscles are present?

Muscles are attached to skeleton in our body. Muscles and skeleton give shape, protection, and help in movement.

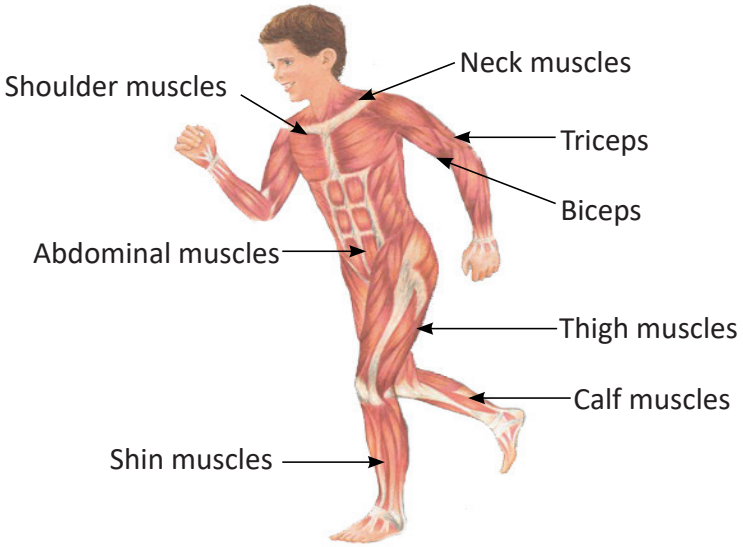

Figure 11.6. Human muscular system.

Name the muscle which help in lifting a book.

Let us make a model to see how the muscles work.

Work in pairs

You may need:

- scissors
- cardboard
- elastic bands
- drawing pins

Cut the cardboard into the shape of two bones that are shown in Figure 11.7.

Fix the cardboard as shown in Figure 11.7.

Attach the elastic bands to the bones with the help of pins.

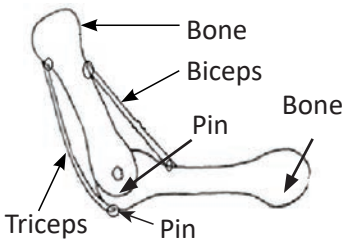

Figure 11.7. Model of hand muscle.

Do You Know?

A new-born baby has more than 300 bones. As the baby grows older, some bones join together. An adult human has 206 bones and over 600 muscles in the body.

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The elastic bands represent the muscles in our arm.

Make the bones and muscles move.

Which muscle is stretched when the arm moves up?

C. To make our muscles strong we need plenty of body building food.

Exercise is good for our muscles.

What happens if we do not exercise?

Work in groups

Discuss and write the muscles that are used while playing the games shown in the in Figure 11.8.

Figure 11.8. Playing games.

Share your answers to the class.

Check Your Progress

i. Can we move without the skeleton? Why?

ii. Name the longest bone in our body.

Think Again

1. Fill in the blanks with correct word/words.
   a. Carbohydrates give us _____.
   b. Blood is carried from the heart to all parts of the body by _____.
   c. Our bones are moved by _____.
   d. Proteins are needed for _____.
   e. Heart and lungs are protected by _____and _____.
2. Eating junk food makes people malnourished. Why?
3. What are the main functions of our skeleton?
4. Which of the following food groups contain fibre? milk, orange, sausages, bread, butter, egg, rice, spinach.
5. What are the main functions of our muscles?
6. Explain the circulatory system using the following terms: heart, blood, blood vessels, arteries, veins, food, oxygen.
7. An earthworm can wriggle around and move through the tiny holes in the ground, but cannot stand like a dog or a cat. Give reasons.

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CHAPTER 12

Our Moon

12.1. The Moon

Test Yourself

1. Describe the shape of the Earth.
2. What are the effects of rotation and revolution of the Earth?
3. How many moons does the Earth have?
4. Why do we see the Moon in different shapes?

You already know:

- Earth is the planet on which we live.

You will learn:

- the Moon.

A. The Moon is our nearest neighbour in space. It is smaller than the Earth. It is the Earth's only natural satellite. Heavenly bodies which move round the planets are called **natural satellites.** The objects which are placed into orbit in the space by human beings are called **artificial satellites.** From your school library or the internet, find out some of the uses of artificial satellites.

The Moon has no light of its own. It gets light from the sun. This light is reflected to the Earth as moonlight.

The Moon takes about a month to revolve round the Earth. It also takes about the same time to complete one rotation. This is why the same side of the Moon always faces us.

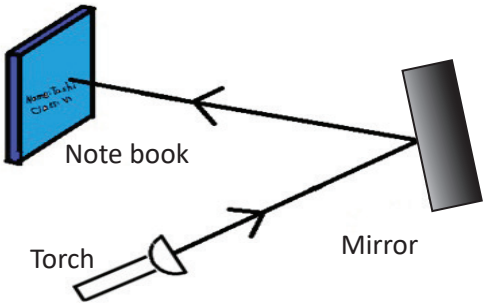

Figure 12.1. Reflection from moon.

Work in groups

You may need:

- mirror
- notebook
- torch
- curtain

Make your classroom dark.

Light the torch on the mirror.

Adjust the mirror till the light from the mirror falls on the notebook as shown in Figure 12.1.

How does the light reach the notebook?

Does the mirror give out its own light?

In what way does the mirror represent the Moon?

In what way does the torch represent the Sun?

B. The shape of the Moon appears to change continuously.

The Moon waxes (lit up portion increases in size) and wanes (lit up portion decreases in size) as it moves round the Earth. The waxing and waning of the Moon is called **phases of the Moon.**

PRECAUTION

Do not carry out the experiment with broken mirror. It might injure you.

The change in the shape of the Moon is due to the change in position of the Moon with respect to the Earth.

Phases of the Moon are shown in Table 12.1.

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Table 12.1. *Phases of the Moon*

Lunar Week	Phase of the Moon
1st week	Phase 1 (New moon) and Phase 2 (Waxing crescent)
2nd week	Phase 3 (First quarter) and Phase 4 (Waxing gibbous)
3rd week	Phase 5 (Full moon) and Phase 6 (Waning gibbous)
4th week	Phase 7 (Last quarter) and Phase 8 (Waning crescent)

Make a lunar calendar.

Your teacher will provide you a copy of calendar as shown in Figure 12.2.

Your observations should start from the first day of lunar (Bhutanese) calendar.

Draw the appearance of the Moon every night.

In case of cloudy nights leave the drawing blank.

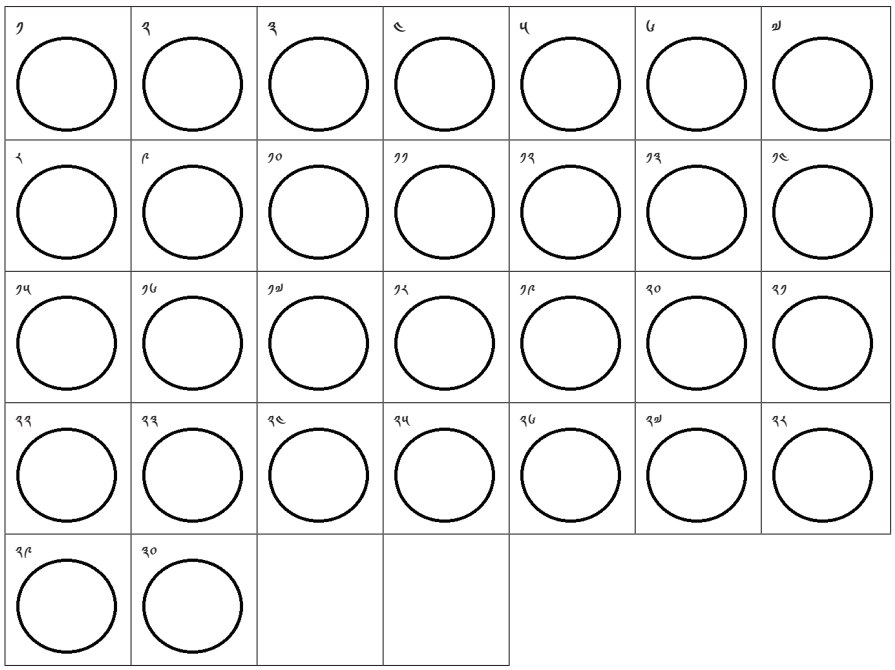

Figure 12.2. Lunar calendar.

Show this calendar to the teacher every week.

Compare your observations with that of your classmates.

Predict what will happen to the Moon in the next week?

Check Your Progress

i. What are satellites?

ii. What are some of the uses of artificial satellites?

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12.2. Moon in the First Week

Test Yourself

1. Name the natural satellite of the Earth.
2. Does the Moon have its own light?
3. The Moon appears to change its shape all the time. Why?
4. Predict the appearance of the Moon in the first week.

You already know:

- Moon is a satellite.

You will learn:

- Moon in the first week.

A. When the Moon is in between the Sun and the Earth, the side that faces the Earth does not get any sunlight. Therefore it is completely dark. This is called **new moon** (**Nam-gang**).

After a new moon, the Moon revolves round the Earth changing its position. A very small part of the Moon is visible from the Earth. This small visible part is called **waxing crescent moon**.

Work in pairs

You may need:

- scissors
- paper
- black crayon

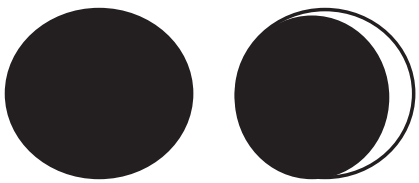

Figure 12.3. The Moon in its first week.

Draw two phases of first lunar week of 3 cm diameter each, on a sheet of paper. Cut and keep it for the next activity.

Check Your Progress

i. Name the two phases of the first lunar week.

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12.3. Moon in the Second Week

Test Yourself

1. What is new moon?
2. Does the Moon produce heat and light like Sun?
3. Define waxing crescent moon.
4. Predict the phases of the Moon in the second week.

You already know:

- the Moon in the first week.

You will learn:

- the Moon in the second week.

A. When the Moon is in the first quarter of its phase, half of the Moon is illuminated by the sunlight. It appears as half Moon. This is the **first quarter** of the Moon.

After the first quarter, more than half of the Moon is visible. This phase of Moon is called **waxing gibbous**.

Work in pairs

You may need:

- a pair of scissors
- paper
- black crayon

First quarter Waxing gibbous

Figure 12.4. The Moon in its second week.

Draw the two phases of second lunar week of 3 cm diameter each, on a sheet of paper. Cut and keep it.

Check Your Progress

i. Name the two phases of the second lunar week.

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12.4. Moon in the Third Week

Test Yourself

1. Draw the phases of the Moon in the second week.
2. What is waxing gibbous?
3. Why is the Moon fully visible on a full moon night?
4. Predict the phases of the Moon for the third week.

You already know:

- moon in the second week.

You will learn:

- moon in the third week.

A. Two weeks after the new moon, the moon reaches the opposite side of the Earth. We see the **full moon** (**Cho Nga Dawa**).

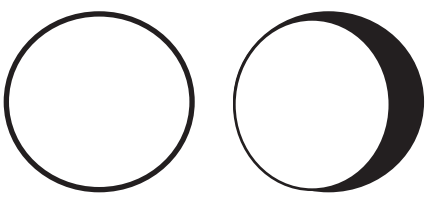
After the full moon, the lit portion of the Moon decreases. The Moon is now said to be **waning gibbous.**

Work in pairs

You may need:

- scissors
- paper
- black crayon

Draw two phases of third lunar week of 3 cm diameter each, on a sheet of paper. Cut and keep it.



Full moon Waning Gibbous

Figure 12.5. The Moon in its third week.

Check Your Progress

i. Name the two phases of the third lunar week.

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12.5. Moon in the Fourth Week

Test Yourself

1. What is a full moon?
2. Draw the phases of the Moon in the third week.
3. What is the difference between the full moon and the new moon phases?
4. Predict the phases of the Moon for the fourth week.

You already know:

- the Moon in the third week.

You will learn:

- the Moon in the fourth week.

A. The Moon continues waning until it reaches its last quarter. The one-fourth of the Moon is left illuminated. The Moon at this phase is known as **last quarter**.

After the last quarter of the Moon's phase, the size of the illuminated side of the Moon continues to decrease. This phase is called **waning crescent.** It ends with a new moon, when the phases begin again. This cycle takes about $29\frac{1}{2}$ days.

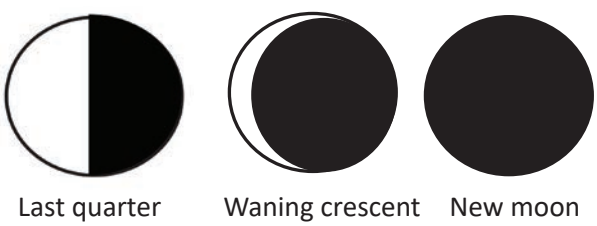

Figure 12.6. The Moon in its fourth week.

Work in pairs

You may need:

- scissors
- paper
- black crayon

Draw two phases of fourth lunar week of 3 cm diameter each, on a sheet of paper. Cut and keep it.

B. Work in pairs

You may need:

- chart paper
- compass with pencil

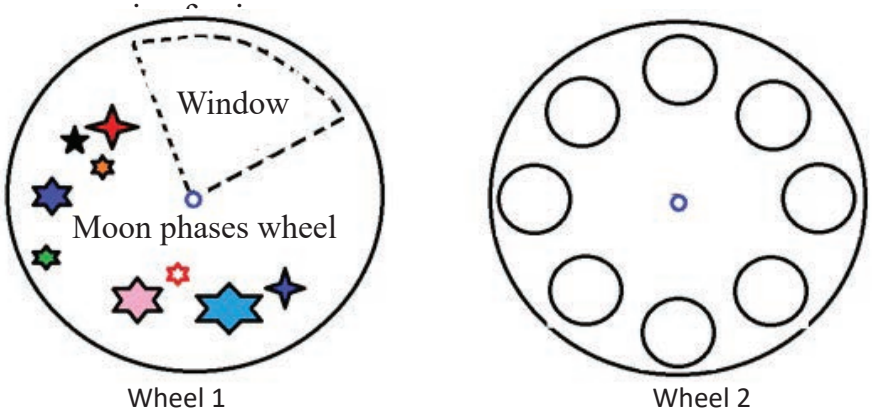

Figure 12.7. Wheels.

Draw Wheel 1 and Wheel 2 on a chart paper of a radius 10 cm each.

Cut out Wheel 1 and Wheel 2 as shown in the Figure 12.7.

In Wheel 1, cut a cone shaped window to fit two phases of the Moon.

Paste all the cut out phases of the Moon from activities 12.3 to 12.6 A on wheel 2.

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Place Wheel 1 on top of Wheel 2.

Attach the two wheels with thumb pin at the centre.

Now, rotate only Wheel 1 and observe the lunar weeks.

Display your work in the class.

How many phases of the Moon did you observe in one complete rotation of Wheel 1?

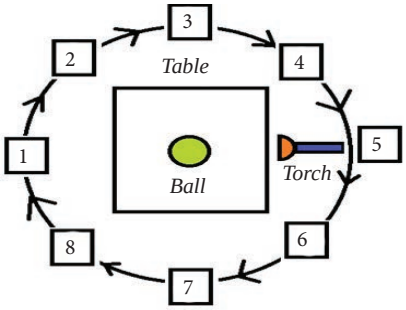

Figure 12.8. Model of phases of the Moon.

C. Work in pairs

You may need:

- computer
- internet

Play online simulation using weblink. https://www.google.com/url?q=https://astro.unl.edu/classaction/animations/lunarcycles/lunarapplet.html&sa=D&ust=1579590054979000&usg=AFQjCNFbBv8u5nlDh2-Ar9PP76WtWm8HYA

Mention phases of the Moon in lunar calendar?

What is the phase of the Moon on 15th day?

Why is it completely dark during the new moon?

.

Check Your Progress

i. Name the two phases of the fourth lunar week.

ii. What will happen if the Moon has its own light?

Think Again

1. Fill in the blanks.
   a. The Earth's natural satellite is the _____.
   b. The Moon takes about one _____ to complete one revolution around the Earth.
   c. Changing shapes of the Moon are called _____ of the Moon.
   d. When the Moon is not visible at all, it is known as _____ Moon.
   e. The Moon receives light from the _____.
2. What will happen if the Moon does not revolve round the Earth?
3. How many weeks does the Moon take to reach from first quarter to last quarter?
4. Arrange the phases of the Moon in the correct order.
   waning gibbous, new moon, last quarter, waxing gibbous, full moon, waxing crescent, waning crescent, first quarter.
5. Imagine and write a paragraph about life on the Earth if there are two moons.
6. We can not see the Moon on a cloudy night. This indicates that they are at different distances from the Earth. Of the two, cloud and the Moon, which one is the farthest from the Earth?

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7. Name the phases of the Moon given in Figure 12.9 and Figure 12.10.

Figure 12.9. *Figure 12.10.*

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.

- 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					
		SK	WS	SV		SK	WS	SV	Total	Examination	CSA + Exam
Assessment Modalities	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 for Class V

Chapter Number	Chapter	Time required (mins)	Weighting (%)
1	Matter	560	9
2	Physical Change	480	8
3	Separating Mixture	520	8
4	Frictional Force	360	6
5	Light and Sound	560	9
6	Electricity and Magnetism	600	9
7	Energy	520	8
8	Characteristic of Living Things	560	9
9	Green plants	600	9
10	Living Things and their Environment	600	9
11	Nutrition and Human System	480	8
12	Our Moon	480	8
	Total	**6320**	**100**

The actual teaching 6320 minutes or 158 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

Domains	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: V **Time: 2 Hrs**

Question 1

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

1. Table is a solid because it has

   A. no space and volume.
   B. definite shape and volume.
   C. indefinite shape and volume.
   D. definite volume but indefinite shape.

Answer: definite shape and volume.

2. The following liquids float on water **EXCEPT**

   A. kerosene.
   B. mustard oil.
   C. soya oil.
   D. honey.

Answer: honey.

3. Which of the following is not a human-made change?

   A. changing weather.
   B. cooking food.
   C. burning wood.
   D. constructing road.

Answer: changing weather.

4. Which sequence represents the order of life cycle of many plants?

   A. Development of seed → dispersal of seed → germination of seed → growth of plant.
   B. Dispersal of seeds → development of seed → germination of seed → growth of plant.
   C. Germination of seed → growth of plant → dispersal of seed→ development of seed.

D. Dispersal of seed → growth of plant → germination of seed → development of seed.

Answer: seed develops inside fruit → seed is dispersed → seed germinates → plant grows

5. Sand and pebbles can be separated by

A. sieving.
B. filtration.
C. decantation.
D. sedimentation.

Answer: sieving.

6. Winnowing is a process of separating

A. soluble and insoluble substance.
B. light and heavy objects.
C. big and small objects.
D. magnetic and non magnetic objects.

Answer: light and heavy objects.

7. We add oil to rusted things to

A. İncrease friction.
B. increase weight.
C. decrease friction.
D. decrease weight.

Answer: decrease friction.

8. The sunlight composes of seven colours and they are

A. violet, indigo, blue, green, yellow, pink and red
B. violet, indigo, black, green, yellow, orange and red
C. violet, indigo, blue, green, yellow, orange and red
D. violet, indigo, brown, green, yellow, orange and red

Answer: violet, indigo, blue, green, yellow, orange and red

9. The sharpness of a musical sound can be increased by

A. increasing the length of the string.
B. decreasing the length of the string.
C. decreasing the tension of the string.
D. increasing the thickness of string.

Answer: decreasing the length of the string.

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10. Static electricity is also known as

A. frictional electricity.
B. hydro electricity.
C. wind electricity.
D. thunder and lightning electricity.

Answer: frictional electricity.

11. The ends of a magnet are called North Pole and South Pole because they

A. always point to the North Pole and South Pole.
B. are the strongest part of a magnet.
C. never point to the Earth's Poles.
D. are the only poles in a magnet.

Answer: always point to the North Pole and South Pole.

12. The unit of energy is

A. kilogram.
B. newton.
C. joule.
D. metre.

Answer:joule.

13. Which of the following are appliances that save energy?

I. pressure cooker
II. compact florescent lamp
III. bicycle
IV. aeroplane

A. I,II and III
B. I,II and IV
C. II,III and IV
D. I,III and IV

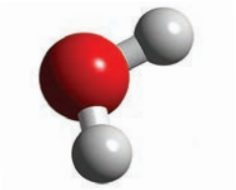
Answer:I, II and III

14. Variation in living things is

A. differences among individuals belonging to the same group.
B. differences among different groups.
C. similarities among individuals belonging to the same group.
D. similarities among individuals belonging to the different group.

Answer: differences among individuals belonging to the same group.

15. Water is an example of compound. The diagram below shows a molecule of water. How many element(s) does it contain?



A. Four
B. Three
C. Two
D. One

Answer: Two

16. Fertilization is the process of

A. producing new ones.
B. fusion of ovum and sperm.
C. beginning life.
D. ending life.

Answer: fusion of ovum and sperm.

17. Roots help to

I. hold the plant in the soil.
II. absorb water.
III. absorb minerals.
IV. make food.

A. I and II
B. I, II, and III
C. I,I I, and IV
D. I and III

Answer: I, II, and III

18. Stems help to

I. hold leaves and flowers.
II. conduct water and minerals to the leaves.
III. absorb water.
IV. make food.

A. I and II
B. II and III
C. III and IV
D. I and IV

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Answer: I and II

19. Which of the following statement is TRUE about food chain?

A. Primary consumers are greater in number than secondary consumers.
B. Secondary consumers are greater in number than primary consumers.
C. Tertiary consumers are greater in number than secondary consumers.
D. Quaternary consumers are greater in number than tertiary consumers.

Answer: Primary consumers are greater in number than secondary consumers.

20. The following statements are true about shifting cultivation EXCEPT

A. loss of habitat.
B. protection of habitat.
C. loss of soil fertility.
D. erosion of soil

Answer: .

21. We can protect habitat by

A. shifting cultivation.
B. deforestation.
C. hunting.
D. creating national parks.

Answer: creating national parks.

22. An example of a complete food is

A. meat.
B. butter.
C. rice.
D. milk.

Answer:milk.

23. Which type of energy in petrol is transformed into mechanical energy in a motorcycle engine?

A. chemical
B. magnetic
C. nuclear
D. electrical

Answer: chemical

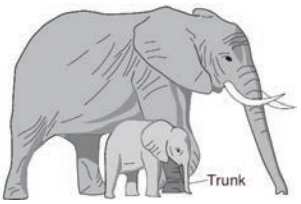
24. The food group that helps to remove digestive waste from the body is

A. carbohydrate.
B. fibre.
C. protein.
D. mineral and vitamin.

Answer: .

25. Which of the following behavior will help the student stay healthy?

A. watching television five hours a day.
B. sleeping three hours every night.
C. eating fruits and vegetables every day.
D. exercising once a month.



Answer: eating fruits and vegetables every day.

Question 2

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

1. A matter which is made of only one kind of particle is called……

Answer: an element

2. A process in which a substance disappears in a liquid is called.....

Answer: Dissolving

3. Mixture of iron filings and sand is ……. mixture.

Answer: solid-solid

4. The combination of violet, indigo, blue, green, yellow, orange, and red gives a .....

Answer: white light

5. The North seeking pole of a magnet is called… ……

Answer: North Pole

6. The energy of an object raised to a height is ……energy.

Answer: potential

7. The process of an animal or a plant beginning life, growing and reproducing is called a ……

Answer: lifecycle

8. The part of a plant above the ground is called.....

Answer: shoot

9. The intersection of food chains is called…….

Answer: food web

10. The waning and waxing of the Moon is called …….. of the Moon.

Answers: phases

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. Veins	a. fresh blood	*f*
2. Arteries	b. consumes lot of energy	*a*
3. Treads	c. iron filling	*h*
4. Oil	d. saves energy	*j*
5. Percussion instruments	e. conch	*g*
6. Wind instruments	f. used blood	*e*
7. Magnetic	g. drum	*c*
8. Like poles	h. increase friction	*i*
9. Compact florescent lamp	i. repel	*d*
10. Incandescent bulb	j. decrease friction	*b*
	k. guitar	
	l. attract	

Question 4

Direction: Write True or False against the number in your answer sheet.

(10 marks)

1. When a substance melts, its mass remains same while its shape changes.

Answer: True

2. Melting and freezing are not physical change.

Answer: False

3. We can separate solids having same size by sieving.

Answer: False

4. We slip on a wet floor because there is less friction.

Answer: True

5. The roots make food for the plant.

Answer: False

6. The energy stored in food and fuel is called kinetic energy.

Answer: False

7. Characteristics are unique features by which we describe animals and plants.

Answer: True

8. It is important to protect habitat to maintain balance in nature.

Answer: True

9. Fibre helps in removing digestive wastes from our body.

Answer: True

10. The increase in the lit up portion of the Moon is called waning.

Answer: 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. Why is a chair an example of solid? (1)

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Answer: Because it has definite shape and volume.

2. Study the experiment in Figure 1 and answer the following questions.

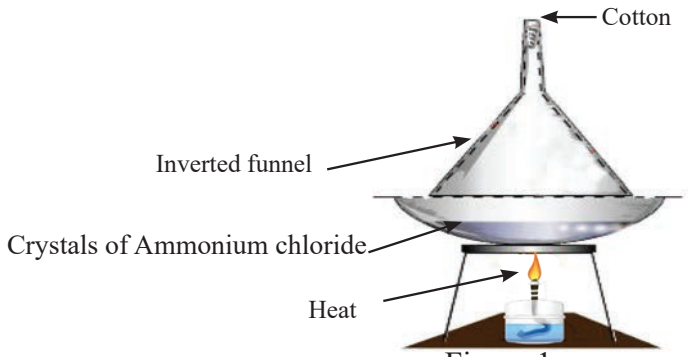

Figure 1

(i) What process do you observe in the experiment shown in fugure 1? (1)

Answer: On heating, ammonium chloride undergoes the process of sublimation.

(ii) What change is it? Why? (1)

Answer: It is a physical change because no new substance is formed and we can get back the original substance.

3. What is a physical change? Give **two** examples. (2)

Answer: A change in which no new substances are formed. For example, melting of an ice and heating of water

4. When is hand picking an effective method of separation? (2)

Answer: When the solids are of different colour, size and shape.

5. State one situation where friction is important in everyday life. (1)

Answer: Friction helps us to walk.

6. Why is the reflection of our body not clear on a frosted glass? (2)

Answer: Because it has uneven surface and the light is reflected in all direction.

7. Explain how electricity is produced in hydropower stations. (2)

Answer: The water from the dam flows through a tunnel. The water turns the turbine, which turns the generator, thus completing the energy conversion from potential energy of the water to kinetic energy of the turbine and to electrical energy (electricity).

8. Write the energy chain that occurs when you ring an electric bell. (2)

Answer : Electric energy ⟶ kinetic energy ⟶ sound energy

9. How do variations help animals? (2)

Answer: It helps animals to adapt and protect themselves from predators.

10. Which part of the flower is usually sticky? Why? (2)

Answer: Stigma is usually sticky so that the pollen grain sticks to it for fertilization to take place.

11. Make a food chain consisting four consumers.(2)

Answer: Dragonfly ⟶ frog ⟶ snake ⟶ hawk

12. Label the diagram shown in Figure 2. (2)

Answer:

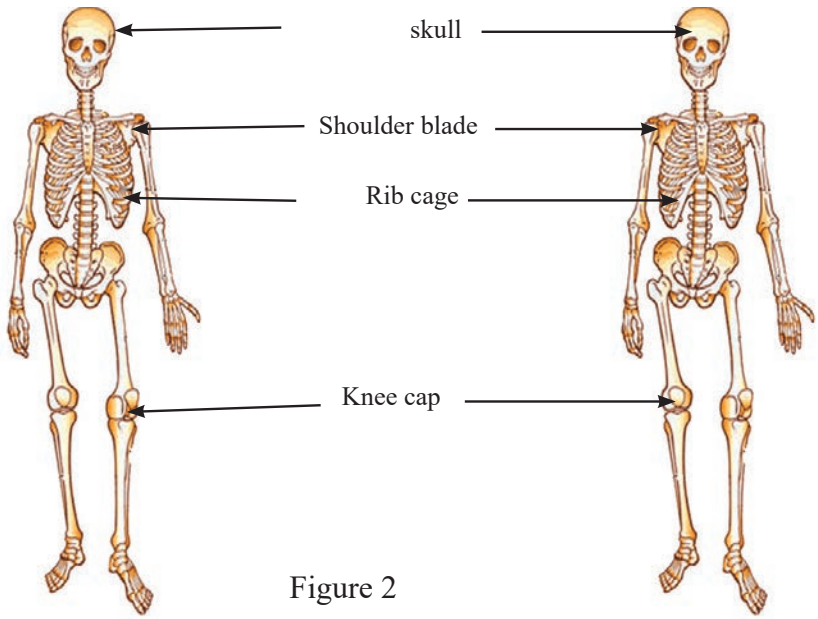

Figure 2

13. Why do we see the moon in different shapes?(1)

Answer: Because the moon waxes and wanes as it moves around the Earth due to the position of the moon with respect to Earth.

14. Explain why children should avoid junk food. (2)

Answer: The junk foods are easy to prepare but they do not contain all the nutrients required by the growing body of a child. Dependence on the junk food can lead to malnutrition and the body can become obese.

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Question 6:

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

1. Gas does not have fixed shape and volume. Why? (2)

Answer: Because the particles are far apart and free to move in all directions.

2. Why do dogs stick out their tongues during very warm weather? (2)

Answer: Dogs stick out their tongues to cool their bodies through the process of evaporation from the tongues.

3. We cannot separate rice and husks using a magnet. Why?(2)

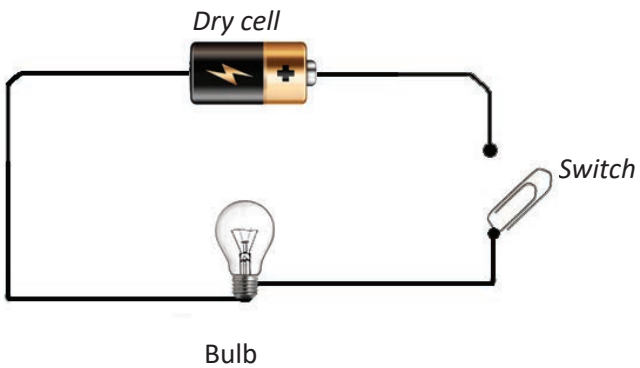
Answer: Because they are non-magnetic substances.

4. If you are to play music in an open air, what would you do to make the music loud? Why? (2)

Answer: Use a big sound box as, bigger the sound box louder the sound.

5. Draw an open circuit and label it.(2)

Answer:



6. Name the different phases of the moon in figure 4. (2)

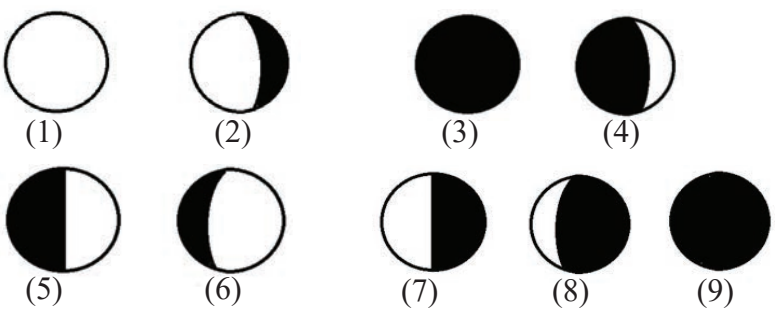


Figure 4

Answer:

1. *Full moon*	6. *Waxing gibbous*
2. *Waning Gibbous*	7. *Last quarter*
3. *New moon*	8. *Waning Gibbous*
4. *Waxing crescent moon*	9. *New moon*
5. *First quarter*	

7. The diagram given in figure 5 shows water boiling in a metal pan on a burning gas stove.

   Explain why the handle of the pan is made of wood. [1]

Answer: It is because wood is a bad conductor of heat. So the heat from the pan will not burn our hands.

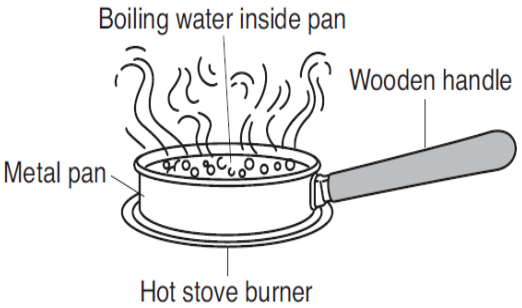


Figure 5

8. Read the following and answer the questions that follow.

   Benjamin Franklin was the first scientist to discover static electricity. This electricity does not use circuit to flow. It is produced by rubbing the two objects against each other. While rubbing, the friction produces positive and negative charges. Like charges repels and unlike charges attract. For example, rubbing of inflated balloons against wool will charge the balloons with negative charges and wool with positive charge. If we bring charged balloons together, they will repel each other as they have like charges. If we take the charged balloons to the wall, they stick on the wall as unlike charges attract.

   On the stormy day, clouds collide with each other creating massive charges which we see as lightning.

(i) What causes lightning on a stormy day? (1)

Answer: The collision of clouds in the atmosphere produces the lightning.

(ii) What is the type of electricity you see on the sweater on a night without rain and moisture? (1)

Answer: The electrostatic electricity is observed on the sweater on the night without rain and moisture in air.

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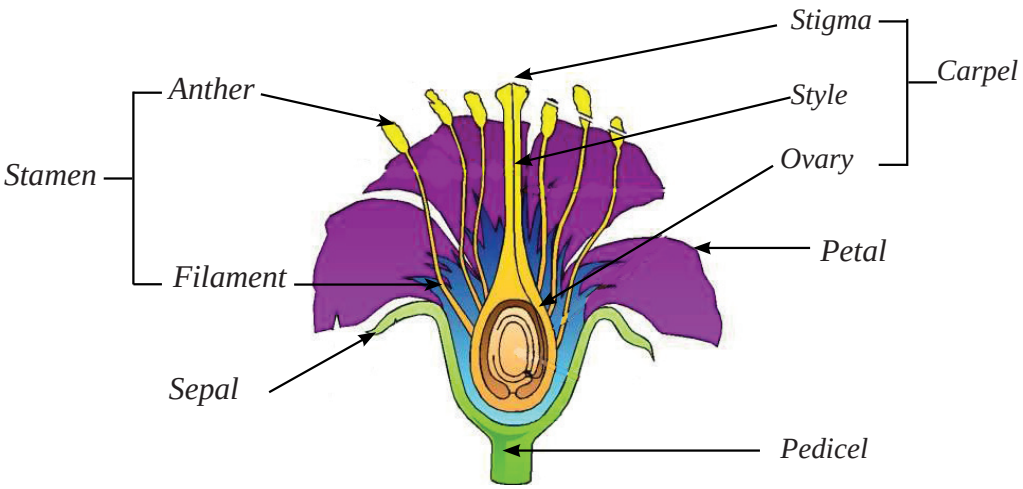
9. Bear is one of the endangered animal species in Bhutan. Why? What can we do to protect the endangered plants and animals? (2)

Answer: The bear is wanted for its bile which has medicinal values. So therefore it is hunted by many people. Owing to this, the number of bear is declining very fast and a day will come when there will be no bear in the forest. To put check on the habit of people hunting for bear we need to develop protected areas, stop hunting by providing alternative means of income, and reduce over harvesting of any endangered natural resources.

10. Draw and label the parts of a flower.(3)

Answer:



Annexure - C

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26	Mr. Namgyel Wangchuk	Lhamoizingkha MSS
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28	Mr. Nazim	Drukgyel HSS
29	Mr. Rinchen Thinley	Bjee CPS
30	Mr. Rinzin Dorji	Gaselo HSS
31	Mr. Robin Gurung	Shaba MSS
32	Mr. Sampa Tshewang	Drukgyel HSS
33	Mr. Samten	Pangna CPS
34	Mr. Sangay Phuntsho	Yurung LSS
35	Mr. Sangay Tshering	Drukgyel HSS
36	Mr. Santosh Kumar	Drukgyel LSS
37	Mr. Sonam Leki	Yebilaptsa MSS
38	Mr. Tashi Phuntsho	EMSSD
39	Mr. Tsheten	Drukgyel LSS
40	Mr. Tshewang Namgay	Pelrithang MSS
41	Mr. Tshewang Norbu	Moshi CPS
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43	Mr. Ugyen Tshering	Bajo HSS
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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

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)
OILS AND FATS	PALM OIL, RED	875	0.0	98.9	6	0.0		6,000	0.01	0.02	0.0	0
FRUIT	PAPAYA	32	0.4	0.1	21	0.6		475	0.03	0.03	0.5	52
CEREALS	PASTA, MACARONI	348	12.0	1.8	25	1.6		0	0.18	0.05	4.4	0
FRUIT	PAWPAW	32	0.4	0.1	21	0.6		475	0.03	0.03	0.5	52
PULSES & OILSEEDS	PEAS, DRIED	341	24.6	1.2	55	4.4	2	45	0.70	0.20	2.9	2
PULSES & OILSEEDS	PEAS, DRIED, SPLIT	341	24.6	1.2	55	4.4	2	45	0.70	0.20	2.9	2
VEGETABLES	PEPPERS, SWEET, GREEN, RAW	20	0.9	0.2	10	0.3		111	0.06	0.03	0.6	80
VEGETABLES	PEPPERS, SWEET, RED, RAW	26	1.0	0.3	7	0.4		940	0.05	0.09	1.2	190
VEGETABLES	PEPPERS, SWEET, YELLOW, RAW	27	1.0	0.2	11	0.5		60	0.03	0.03	1.1	184
FRUIT	PINEAPPLE	47	0.4	0.1	16	0.4	0	45	0.06	0.03	0.5	34
FRUIT	PLANTAIN	135	1.2	0.3	8	1.3		390	0.08	0.04	0.9	20
MEAT	PORK, CANNED	271	16.0	22.0	8	2.1		0	0.70	0.16	3.7	0
MEAT	PORK, FATTY	535	10.0	55.0	11	1.8	3	0	0.50	0.15	3.2	0
ROOTS AND TUBERS	POTATO, IRISH	77	2.0	0.1	12	0.8	3	1	0.08	0.03	1.6	20
ROOTS AND TUBERS	POTATO, SWEET, ORANGE	87	1.2	0.3	24	0.7	2	655	0.17	0.00	0.8	23
MEAT	POULTRY	139	19.0	7.0	15	1.5	10	0	0.10	0.15	9.5	0
CEREALS	RICE, LIGHTLY MILLED, PARBOILED	364	7.0	0.5	7	1.2		0	0.20	0.08	4.9	0
CEREALS	RICE, POLISHED	360	7.0	0.5	9	1.7		0	0.10	0.03	5.6	0
BLENDED FOODS	RYE SOY BLEND	400	19.5	7.5	535	8.0		528	0.33	0.53	6.0	30
SUGAR AND SALT	SALT	0	0.0	0.0	0	0.0	0	0	0.00	0.00	0.0	0
SUGAR AND SALT	SALT, IODISED (WFP SPECS.)	0	0.0	0.0	0	0.0	6,000	0	0.00	0.00	0.0	0
FISH	SARDINES, CANNED IN OIL	309	20.0	25.0	400	3.0	23	5	0.05	0.20	12.6	0
PULSES & OILSEEDS	SESAME SEEDS	573	17.7	49.7	975	14.6		3	0.79	0.25	11.0	0
MEAT	SNAIL	82	12.0	2.0	1,500	8.0		62	0.00	0.05	1.3	0
CEREALS	SORGHUM	335	11.0	3.0	26	4.5		0	0.34	0.15	5.0	0
PULSES & OILSEEDS	SOYA BEAN MEAL, DEFATTED	339	45.0	2.4	244	13.7		12	0.69	0.25	13.5	0
PULSES & OILSEEDS	SOYA BEANS	416	36.5	19.9	277	15.7	6	7	0.87	0.87	10.4	6
CEREALS	SOYA FLOUR, FULL FAT, RAW	436	34.5	20.7	206	6.4		36	0.58	1.16	12.7	0
BLENDED FOODS	SOYA FORTIFIED BULGUR WHEAT (USA)	350	17.0	1.5	110	2.9		662	0.44	0.26	3.5	0
BLENDED FOODS	SOYA FORTIFIED MAIZE MEAL (USA)	390	13.0	1.5	110	2.9		662	0.44	0.26	3.5	0
BLENDED FOODS	SOYA FORTIFIED ROLLED OATS	380	20.0	6.0	81	5.3		0	0.74	0.14	4.0	0

Nutrients per 100 grams of raw portion												
	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)
BLENDED FOODS	SOYA FORTIFIED SORGHUM GRITS (USA)	360	16.0	1.0	110	2.9		662	0.44	0.26	3.5	0
BLENDED FOODS	SOYA FORTIFIED WHEAT FLOUR	360	16.0	1.3	211	4.8		265	0.66	0.36	4.6	0
MISCELLANEOUS	SPICES MIXED, GARLIC	145	6.3	0.1	30	1.3	3	0	0.06	0.23	4.3	13
MISCELLANEOUS	SPICES MIXED, TUMERIC	349	6.3	5.1	150	14.8		30	0.00	0.00	2.3	0
SUGAR AND SALT	SUGAR	400	0.0	0.0	0	0.0	0	0	0.00	0.00	0.0	0
PULSES & OILSEEDS	SUNFLOWER SEED, DRIED KERNELS	570	22.8	49.6	116	6.8		15	2.29	0.25	10.3	
MISCELLANEOUS	TEA	40	10.0	0.0	30	1.0	0	0	0.10	0.37	6.0	0
BLENDED FOODS	TENAMIX (TANZANIA)	380	13.3	7.4	200	12.0	50.0		0.30	0.50	0.0	20
VEGETABLES	TOMATO PASTE	82	4.3	0.5	36	3.0		458	0.06	0.15	3.5	22
VEGETABLES	TOMATOES, RED, RIPE	18	0.9	0.2	10	0.3	2	250	0.04	0.02	0.2	13
VEGETABLES	TOMATOES, SUN DRIED	258	14.1	3.0	110	9.1		262	0.53	0.49	10.8	39
BLENDED FOODS	UNILITO (NEPAL)	400	14.0	6.0	100	15.0		400	0.10	1.00	5.0	50
FRUIT	WATER MELON	22	0.5	0.0	8	0.3	0	125	0.02	0.02	0.2	5
CEREALS	WHEAT FLOUR, FORTIFIED (USA)	364	10.3	1.0	110	4.4		662	0.76	0.44	8.7	0
CEREALS	WHEAT FLOUR, FORTIFIED (WFP SPECS.)	350	11.5	1.5	15	4.1		0	0.56	0.30	6.9	0
CEREALS	WHEAT FLOUR, WHITE	350	11.5	1.5	15	1.2		0	0.12	0.04	3.4	0
BLENDED FOODS	WHEAT PEA BLEND	425	15.0	6.0	100	8.0		500	0.13	0.45	4.8	48
BLENDED FOODS	WHEAT SOY BLEND (USA)	355	21.5	5.9	842	17.9	56.9	697	0.54	0.50	8.2	40
BLENDED FOODS	WHEAT SOY BLEND (WFP SPECS.)	400	20.0	6.0	159	12.0	1	600	0.41	0.66	7.9	49
BLENDED FOODS	WHEAT SOY BLEND (WSB)	370	20.0	6.0	750	20.8		498	1.50	0.60	9.1	40
BLENDED FOODS	WHEAT SOY MILK (USA)	357	25.1	5.8	1,031	17.9	56.9	699	0.60	0.73	8.3	41
CEREALS	WHEAT, GRAIN	330	12.3	1.5	36	4.0		0	0.30	0.07	8.9	0
ROOTS AND TUBERS	YAM, FRESH	114	1.5	0.3	15	0.7		0	0.16	0.01	0.5	4
MISCELLANEOUS	YEAST, DRIED	169	35.6	1.5	80	20.0		0	2.33	4.00	15.5	0

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