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शिक्षा, विज्ञान तथा प्रविधि मन्त्रालय

पाठ्यक्रम विकास केन्द्र

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श्री ग्रीन बुक्स,
ललितपुर ।

प्रस्तुत विषयमा त्यस प्रकाशनबाट मूल्याङ्कन र स्वीकृतिका लागि तोकिएको अवधिभित्र पेस हुन आएका तपसिलबमोजिमका पाठ्यसामग्री आवश्यक निर्णयार्थ पाठ्यसामग्री व्यवस्थापन तथा मूल्याङ्कन समितिमा पेस हुँदा विद्यालय शिक्षाको राष्ट्रिय पाठ्यक्रम प्रारूप २०७६, आधारभूत शिक्षा (कक्षा ४-५) पाठ्यक्रम २०७८, पाठ्यसामग्री विकाससम्बन्धी विद्यमान प्रावधान, ऐन, कानून, निर्देशिका, कार्यविधि, प्रकाशन शैलीका प्रावधान, पाठ्यक्रम विकास केन्द्रले विभिन्न समयमा जारी गरेका र पाठ्यसामग्री सुधार/परिमार्जन/पुनर्लेखनका लागि दिइएका सुझाव र निर्देशनको परिपालना गरी स्वीकृति दिन सिफारिस भएअनुसार यस कार्यालयको मिति २०७८/१२/१४ गतेको निर्णयानुसार तपसिलमा उल्लिखित निर्देशनको पूर्ण परिपालना गरी शैक्षिक वर्ष २०७९, २०८० र २०८१ गरी तीन शैक्षिक वर्षका लागि गुणस्तरीय एवम् बृटिरहित पाठ्यसामग्री विकास गरी प्रकाशन गर्न स्वीकृति प्रदान गरिएको छ । विद्यमान संवैधानिक व्यवस्था, ऐन, कानून, निर्देशिका, कार्यविधि, पाठ्यक्रम विकास केन्द्रले विभिन्न समयमा जारी गरेका निर्देशनलगायतका प्रावधानहरूको पूर्ण परिपालना नगरी गुणस्तरहीन पाठ्यसामग्रीको विकास, प्रकाशन र विक्री वितरण गरेको पाइएमा, पाठ्यक्रम परिवर्तन भएमा वा यस केन्द्रबाट अन्य निर्णय भएमा यो स्वीकृति जुनसुकै बेला रद्द हुने छ ।

तपसिल

(क) पाठ्यसामग्रीको नाम

१	Science and Technology	आधारभूत तह/ कक्षा ४
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तारा पाण्डे तिवारी
पाठ्यक्रम अधिकृत

(ख) निर्देशन

१. पाठ्यसामग्री विकाससम्बन्धी विद्यमान प्रावधान तथा पाठ्यसामग्री सुधार र परिमार्जनका लागि यस अधि दिइएका निर्देशनको पूर्ण परिपालना गर्ने ।
२. पाठ्यक्रमको मूल मर्म र भावनाअनुरूप पाठ्यक्रमका सम्पूर्ण पक्ष एवम् विषयवस्तु समावेश गरी पाठ्यसामग्रीलाई गुणस्तरीय बनाउने ।
३. आवरण पृष्ठको अघिल्लो (Front) भागको दायाँ (Verso) पृष्ठमा नेपालको आधिकारिक नक्सा र आवरण पृष्ठको पछिल्लो (Back) भागको दायाँ (Recto) पृष्ठमा कोभिड १९ सङ्क्रमण रोकथामसम्बन्धी सूचना यस केन्द्रको वेबसाइटबाट डाउनलोड गरी समावेश गर्ने । विषयवस्तुको प्रकृति र आवश्यकताका आधारमा पाठ्यसामग्री भित्रका विषयवस्तु र पाठमा समावेश गरिने तथ्यांक तथा नक्सा आधिकारिक र प्रामाणिक हुनुपर्ने ।
४. स्वीकृति पत्र स्वयं गरी पाठ्यसामग्रीको शीर्षक पृष्ठभन्दा पछि दायाँ (Recto) पृष्ठमा समावेश गर्ने । पाठ्यसामग्रीको प्रत्येक पृष्ठको पुच्छर (Footer) मा पाठ्यक्रम विकास केन्द्रबाट स्वीकृत भन्ने व्यहोरा उल्लेख गरी प्रकाशन गरेका पाठ्यसामग्रीका तीन प्रति यस केन्द्रमा पेस गरेपछि मात्र विक्री वितरण गर्ने । शिक्षा, विज्ञान तथा प्रविधि मन्त्रालयको निर्णयअनुसारको मूल्य कायम गर्ने तथा मूल्य र मुद्रण प्रतिको सङ्ख्या सर्वाधिकार पृष्ठमा अनिवार्यरूपमा राख्नुपर्ने । प्रतिलिपि अधिकार (Copy right) को सम्बन्धमा लेखक र प्रकाशक स्वयम् जिम्मेवार हुने ।
५. राष्ट्र, राष्ट्रिय एकता, सार्वभौमिकता, भौगोलिक अखण्डता, स्वाधीनता, राष्ट्रिय हित, पहिचान, सम्मान र समृद्धिमा आँच आउने तथा विभिन्न जातजाति, भाषा, धर्म, संस्कृति, सामाजिक सहिष्णुता, सद्भाव, सांस्कृतिक मूल्यमान्यता, रहनसहन आदिमा प्रतिकूल प्रभाव पार्ने कुनै पनि विषयवस्तु, उदाहरण, चित्र, अभ्यास, सिकाइ क्रियाकलाप समावेश नगर्ने ।
६. जातजाति, भाषा, धर्म, संस्कृति, वर्ण, क्षेत्र, लैङ्गिकता, अपाङ्गता, पेसा, व्यवसाय, सामाजिक सांस्कृतिक अवस्थाका आधारमा भावनात्मक रूपमा छोट प्याउने, आक्षेप लाने, होच्याउने र विभेदीकरण गर्ने किसिमका विषयवस्तु, उदाहरण, चित्र, अभ्यास, सिकाइ क्रियाकलाप समावेश नगर्ने ।
७. पाठ्यसामग्रीमा समावेश गरिएका चित्र, नक्सा, चिह्न, सङ्केत आदि शुद्ध, स्पष्ट र बोधगम्य हुनुपर्ने ।
८. विद्यार्थीलाई थप भार पर्ने गरी पाठ्यक्रममा समावेश नगरिएका विषयवस्तु, अभ्यास तथा सिकाइ क्रियाकलाप पाठ्यसामग्रीमा समावेश नगर्ने ।
९. पाठ्यक्रम एवम् दिइएका सुझाव र निर्देशनबमोजिम पूर्णरूप दिइएको बृटिरहित गुणस्तरीय पाठ्यसामग्री मात्र प्रकाशन र विक्री वितरण गर्ने ।

पुनश्च : यो स्वीकृति शैक्षिक वर्ष २०७९, २०८० र २०८१ का लागि प्रदान गरिएकाले सोहीबमोजिम प्रकाशन, विक्री वितरण र प्रयोग गर्नु गराउनहुन सम्बन्धित सरोकारवाला सबैमा अनुरोध छ ।

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Green

Science and Technology

4

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Science and Technology

4

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Preface

It gives us an immense pleasure in presenting this book- Green Science and Technology for class 4. This book is written specially to meet the requirements of the new syllabus introduced by the Government of Nepal, Ministry of Education, Science and Technology, Curriculum Development Centre, Sano Thimi, Bhaktapur, Nepal.

Our aim and effort while writing this book has been to help students understand, enjoy and appreciate the fascinating subject of Science and Technology by making the process of learning enjoyable and stimulating. We have attempted to present the subject matter covering the entire prescribed syllabus in a simple language and interesting style with a large number of illustrative examples for easy understanding and application of the fundamental principles of Science and Technology. Each unit of the book has been carefully planned to make it student-friendly and present the subject matter in an interesting, understandable and enjoyable manner. A **Structural Programme Learning Approach** (SPLA) has been followed and exhaustive exercises are given at the end of each unit to test knowledge, understanding and applications of concepts taught/ learnt.

The text is supplemented with weighting distribution, learning objectives, word power, teaching instructions, sample test papers and a large number of well-labelled accurate pictures. We sincerely hope that this book will serve its intended purpose and be received enthusiastically by both the students and teachers concerned.

We wish to express our sincere gratitude to Green Books Team for publishing this book. Our hearty thank goes to Focus Computer for excellent type setting and layout.

We also wish to acknowledge my great indebtedness to many teachers for their valuable suggestions and advice concerning the textbook. We are confident that as result of their suggestions this book will be more useful than any other textbooks. However, sympathetic criticisms and constructive suggestions for further improvement of the book, if any, will be welcomed and with warm regards incorporated in the subsequent editions.

Author and Editor
Kathmandu, Nepal

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UNIT 01

Scientific Learning

Estimated teaching hours : 10

Before You Begin

Today's era is the era of science and technology. **Science refers to the study of nature and behaviour of natural things.** It also includes the knowledge we obtain from natural things. Science is the knowledge gained by systematic and logical study. It is the knowledge about natural world which is based on facts. **The learning gained by observation and experimentation is called scientific learning.**

To know exact quantity of a certain object, we need to measure it. Measurement refers to the comparison of an unknown physical quantity with the known standard quantity of the same kind. We can measure the length, time, mass, volume, temperature, etc. Measurement is very important in our daily life.

Learning Outcomes

After completing the study of this unit, students will be able to:

- describe the importance of research, observation and practical work in scientific learning and adopt it.
- state and adopt precautions while doing practical work in science.
- state the facts of necessity of measurement to distinguish long-short, thick-thin, more-less or equal amount of matter.
- demonstrate the fact of comparing things as the measurement.
- identify more or less amount of matter by measuring them.
- draw schematic diagrams of scientific tools.

Syllabus

- Introduction to scientific learning
- Scientific learning process
- Scientific experiment
- Measurement
- Rules for drawing schematic diagrams

Glossary

comparison	: an estimate of the similarities or differences between two things
derived	: the thing obtained from something else
learning	: knowledge acquired through study, experience or being taught
mass	: the total quantity of matter present in a body
measurement	: the comparison of an unknown physical quantity with a known standard quantity of the same kind
observation	: the action or process of closely monitoring something or someone
scientific	: based on or characterized by the methods and principles of science
time	: the duration between any two events
weight	: the force with which a body is pulled towards the surface of the earth

1.1 Introduction to Scientific Learning

Activity 1

Study the given figures and discuss the answer of following questions.

Fig.

1.1.1

a.



Questions :

1. What do you see in fig. (a)?
2. What do you see in fig. (b)?
3. Who invented the aeroplane?
4. How did scientists invent the aeroplane?
5. Which living being on the earth is similar to the aeroplane?

Learning is the process of gaining knowledge or skill by various ways. **Learning is gained by studying, practicing or being taught.** We can learn new things by observation, experimentation and critical thinking. Experiencing new things is also a learning. In other words, **learning is a process that results in change in knowledge or behaviour as result of experimentation.**

Curiosity is the key of learning. We become curious when we observe new things or events. Human beings are being curious since ancient time. So they are being able to invent new things. The humans of stone age invented fire when they observed flashes during collision of two objects. Human beings studied the flying mechanism of birds and invented aeroplane. Such types of inventions are possible only due to continuous research works and experiences gained from the practical works. Such types of learning is called scientific learning.

Scientific learning includes observation, curiosity, prediction, research works, comparison, experimentation, drawing conclusion and application. So the learning gained through observation and experimentation is called scientific learning.

1.2 Scientific Learning Process

Read the given story and discuss.



Fig.
1.1.2



One day, Prinsha was going to school with her mother. She saw a beautiful insect walking slowly on the leaf of a plant. She became curious and observed the insect very carefully. She asked the name of the insect to her mother. But her mother did not know the actual name of the insect. The insect was red with black spots, six black legs and a small head with two antenna. Prinsha compared antenna with that of butterfly. She asked

her mother to catch the insect and take to the school. At school, Prinsha showed the insect to her science teacher and asked the name of the insect. Her teacher became happy and described about the insect. The insect was a ladybird beetle. Prinsha knew the name of the new insect and she also became happy. Prinsha thought that curiosity helps us to know new things.

Questions for discussion

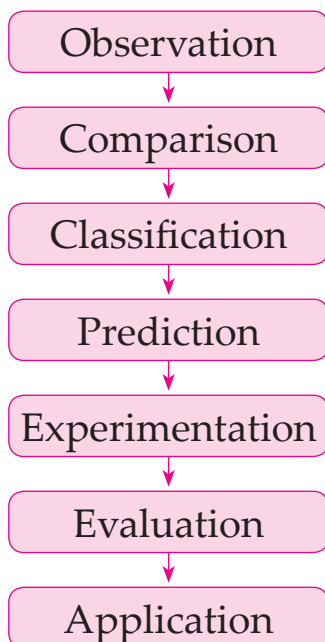
- i. How did Prinsha know the insect is red with black spots?
- ii. How did Prinsha know the real name of the insect?
- iii. How did Prinsha know that the antenna of the insect are similar to that of a butterfly?
- iv. How did Prinsha know about new insect?
- v. What type of learning is it?
- vi. What will you do when you see a new thing in your locality?

In above story, Prinsha saw a new insect. She became curious to know about the new organism. She observed the insect carefully and found that the insect is red with black spots. She counted the legs of the insect and knew that it has six legs.

Prinsha became curious to know the actual name and asked her mother about the name of the insect. She asked her teacher about the insect and gained detailed knowledge about the new insect.

From this story, we know that curiosity triggers us for finding new things. Similarly, observation is the first step of scientific learning. **Learning new things in a systematic way through observation and experimentation is called scientific learning process.**

Steps of Scientific Learning Process



Activity 2

Observe the various materials present in your bag and classroom. Observe each of them and complete the given table.

Name of materials		Shape	Size	Colour	Texture	Made of
1.	Eraser	Rectangular	Small	Green	Soft	Rubber
2.						
3.						
4.						
5.						
6.						
7.						
8.						

Activity 3

- Take a bucket full of water, a jug, a beaker and a glass rod.
- Collect the objects like salt, sugar, piece of brick, eraser, piece of plastic, piece of wood, a crystal of copper sulphate, sand and a piece of paper.
- Make prediction and note down whether these substances dissolve in water or not.
- Now, immerse each of them in water one by one. Observe whether they dissolve in water or not.

Complete the given table on basis of observation and findings.

Name of objects	Prediction		Result	Prediction	
	Dissolves	Does not dissolve		Correct	Incorrect
1. Salt	√		Dissolved	√	
2. Plastic	√		Does not dissolve		×
3.					
4.					
5.					
6.					
7.					
8.					

- How did you predict that whether these objects dissolve in water or not?
- Did your prediction match or not?
- Do all substances dissolve in water?
- What can you conclude from this activity?

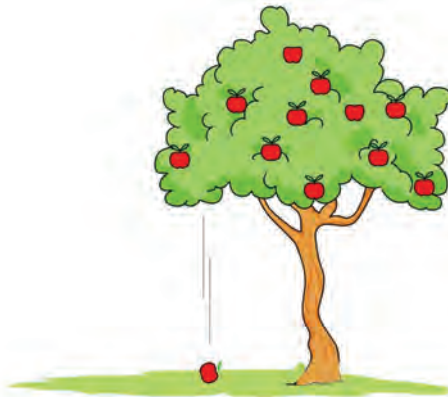
1.3 Know Your Scientists

1. Sir Issac Newton

Newton was an English mathematician, physicist and astronomer. He saw an apple falling down from a tree and propounded the law of gravitation. He invented the mystery of falling of objects downwards due to effect of gravity.



Sir Issac Newton



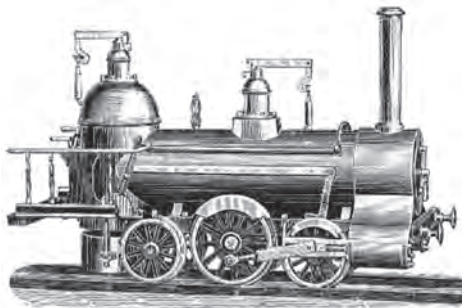
Apple falls down due to the gravity of the earth

2. James Watt

James Watt was a Scottish inventor, mechanical engineer and chemist. He performed so many experiments and invented steam engine.



James Watt



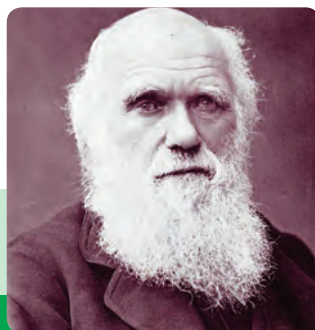
Steam engine

3. Charles Darwin

Charles Robert Darwin was an English naturalist, geologist and biologist. He is known for his contribution regarding evolution of organisms. He is credited for his theory of natural selection.

Fig.

1.1.5



Charles Darwin

4. Thomas Alva Edison

He was an American inventor and businessman. He invented many things like light bulb, phonograph and motion picture camera. He is best known for the invention of light bulb.

Fig.

1.1.6



Discuss and Tell

Among above scientists, which one do you like the most?
Discuss in the classroom.

1.4 Scientific Experiment

Look, Observe and Discuss.





Questions:

- What do you see in the above figures?
- What are the places shown in the above figures?
- Why should we be careful while doing practical works in science?

We can study science at home, at school or in our surroundings. We can do many experiments in science. **Practical works in science help in understanding the facts and principles of science.** Scientific learning remains incomplete without observation and experimentation. We use various objects or equipment while doing practical works. We have to handle harmful chemicals. We have to work with hot objects or electric wires. Therefore, we should be careful while doing practical works to avoid possible accidents.

Some of the precautions that we should adopt while doing practical work or experiments are given below:

- We should adopt safety measures at any place.
- We should follow the instructions given strictly.
- We should not play and make noise in the science laboratory.



- iv. We should not touch plants and animals.
- v. We should not take food and drinks in the science laboratory.
- vi. **We should not touch or taste any substance in the laboratory.**
- vii. We should use apron while doing practical work in science.
- viii. We should not perform any activity in laboratory without teacher's supervision.
- ix. We should keep all equipment in their own place after doing practical work.

Project Work

- Take a chart paper and write the precautions that should be adopted while doing practical works in science.
- Demonstrate the chartpaper in the classroom.

Key Concepts

1. Science refers to the study of nature and behaviour of natural things.
2. The learning gained by observation and experimentation is called scientific learning.
3. Curiosity is the key of learning. We become curious when we observe new things or events.
4. Scientific learning includes observation, curiosity, prediction, research works, comparison, experimentation, drawing conclusion and application.
5. Practical works in science help in understanding the facts and principles of science.
6. We should not touch or taste any substance in the laboratory.

Exercise

1. Tick (✓) the correct statements and cross (×) the incorrect ones.

- a. Observation is very important in scientific learning process. ☐
- b. Curiosity is the key of learning. ☐
- c. We should make noise in the science laboratory. ☐
- d. Sir Issac Newton invented steam engine. ☐
- e. Scientific learning is not meaningful without observation and experimentation. ☐

2. Fill in the blanks using appropriate words.

steam engine

observe

taste

precautions

experimentation

- a. We things with the help of sense organs.
- b. James Watt invented
- c. We should adopt while doing practical works in science.
- d. We should not touch and the things in science laboratory.
- e. Scientific learning remains incomplete without

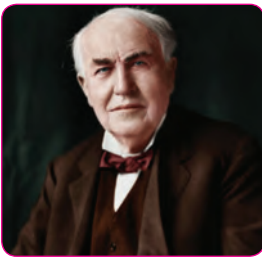
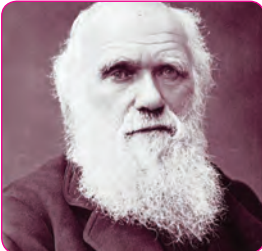
3. Answer the following questions.

- a. What is science?
- b. What is scientific learning?
- c. What is scientific learning process?

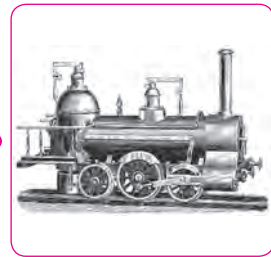
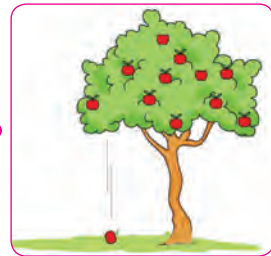
- d. What are the steps of scientific learning process?
- e. Why is observation important for scientific learning process?
- f. How does research help in scientific learning?
- g. Why is experimentation important for scientific learning?

4. Match the following.

A



B



5. Write any five precautions that should be adopted in the science laboratory.
6. When you see a new animal in your garden, what will you do to know more about it? Explain.
7. Sarita burned her fingers with a chemical while working in science laboratory. What is the main reason of this accident? What should we do to avoid such types of accidents?
8. Observe the given figures and write any three sentences for each. Also, write similarities and differences between them.

a.



b.



9. What is the role of sense organs in scientific learning? Describe.
10. How does research help in scientific learning? Describe.

2.1 Introduction to Measurement

Activity 1

Study the given figures and discuss the answers of the following questions.



Fig.

121

Questions :

1. What do you see in the above figures?
2. Why do we use watch?
3. Why do we use ruler or scale?
4. Why is beam balance used?
5. Can we measure time by using a ruler?
6. Can we measure time by using a watch or clock?

7. What is the process shown in the above figures called?
8. Can we use the same measuring device to measure all quantities?
9. Why is measurement important in our daily life?

We measure various quantities like length, mass, area, time, temperature, speed, etc. in our day to day life. We measure things while buying and selling goods. We measure various quantities to do experiments in the science laboratory.

To measure a physical quantity, we compare that physical quantity with a known standard quantity of the same kind. So, **measurement is the comparison of an unknown physical quantity with a known standard quantity of the same kind.**

Different tools or instruments are used to measure different physical quantities. A beam balance is used to measure the mass of a body. A spring balance is used to measure the weight of a body. A watch is used to measure time and a metre rod or scale is used to measure the length of a body.

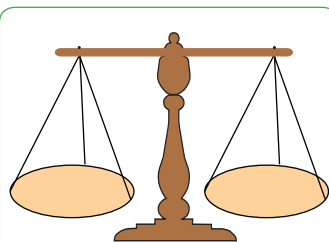


Fig.

122

Fig.

1.2.3



Beam balance



Spring balance



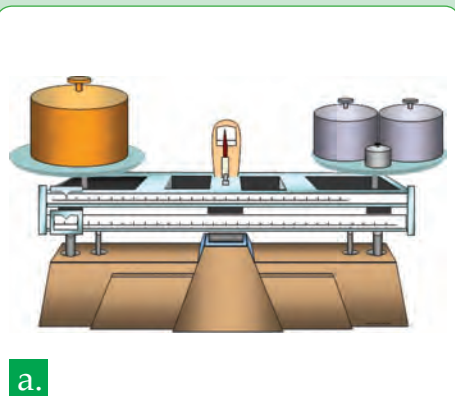
Watch

Activity 2

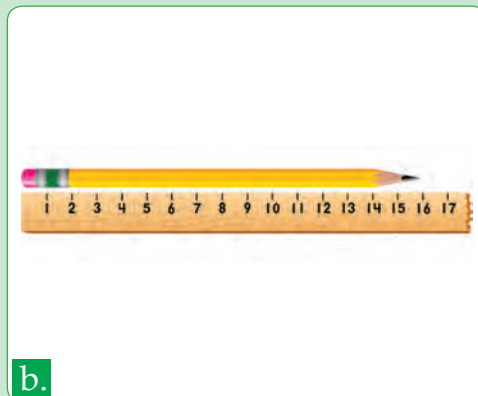
- Study the given figures. What is shown in each of them? Discuss in the classroom.

Fig.

124



a.



b.

Activity 3

- Take a measuring tape and measure the length and breadth of your classroom and writing board.
- Take a digital balance and measure the mass of your bag, science book, geometry set and pen.
- Take a stop watch and measure the time taken by your friends to write the 'definition and importance of measurement'.

2.2 Importance of Measurement

The importance of measurement in our daily life is given below:

1. Measurement makes buying and selling goods easier.
2. It helps to get the accurate amount of physical quantities.
3. It is important to perform experiments in a science laboratory.
4. It is important in laboratories for getting proper amount of medicines.
5. It is important in construction of roads, buildings, bridges, etc.

Activity 4

- Observe your science book carefully and estimate (guess) its length, breadth and thickness.
- Now, take a ruler or a scale. Measure the length, breadth and thickness under the guidance of your science teacher. Complete the given table after measuring it.

Science Textbook's	Estimated Measurement	Actual measurement	Difference
Length	20 cm	24 cm	4 cm
Breadth			
Thickness			

What can you conclude from this activity?

From this activity, it becomes clear that we cannot say exact amount of a substance without measuring it. When we measure a physical quantity using a specific device, we get the actual magnitude. Therefore, we need to measure things in order to know their exact amount.

Activity 5

- Take two cups of almost same size. Predict which on them will contain more water.
- Now, fill both of them completely with water.
- Take a measuring cylinder and measure the amount of water from both cups.
- Which cup contains more water? Draw the conclusion of this activity.

Fig.

125



Some containers may appear of the same size. But their size may not be the same. So, we need to measure them using appropriate devices to know the exact amount. We may borrow things

from our neighbours. If we measure the thing borrowed, we know the exact amount of the thing to be returned. Similarly, we need to measure the amount of milk, tea and sugar while making tea. We should measure the amount of tea, milk and sugar according to the number of the persons that drink tea.

We buy things like sugar, vegetables, pulses, rice, etc. by measuring their mass. We buy milk, oil, petrol, etc. by measuring their volume. We evaluate the amount of things with measuring devices. So, evaluation is a very important step of scientific learning. Measurement is also an evaluation. It is also a comparison. So, **the comparison of an unknown physical quantity with a known quantity of the same type is called measurement.** It is very important for scientific research or experimentation.



Fig.

1.26

Activity 6

- Measure the length of your classroom using your cubit (haat) and outstretched palm. Ask all the students of your class to measure the length of the same room one by one and keep the record. Do you get the same measurement? Why?
- Now, take a measuring tape and measure the length of the same classroom. Ask your friends to measure the length of the classroom using the same tape? Do all friends get the same length? Why?
- Discuss in the classroom and draw the conclusion.

Activity 7

- What types of local units are used in your locality? Discuss in the classroom and fill in the given table.

Physical quantities	Mass	Length	Time	Area	Volume	Temperature
Local units of measurement						
Standard units of measurement						

Fig.

1.2.7



a.

Pathi



b.

Outstretched palm



c.

Foot

Fig.: Some local devices of measurement

2.3 Length and its Measurement

A tailor measures the length of cloth for sewing or stitching. A carpenter measures length of wood while making furniture. **The distance between any two points is called length.** For example the length of a stick is 2 metre means that the distance between the upper tip and lower tip of the stick is 2 times of the metre rod.

Fig.

1.2.8



Do You Know

1 metre (m) = 100 centimetre (cm)
 1 centimetre (cm) = 10 millimetre (mm)
 1 kilometre (km) = 1000 metre (m)
 12 inches = 1 foot

In our practical life, we use different forms of length like breadth, thickness, depth, radius, height, diameter, etc. **We use different measuring devices such as scale, inch tape, metre rod, measuring tape, etc. to measure length.** The units of length are metre (m), kilometre (km), centimetre (cm), millimetre (mm), inch, etc.



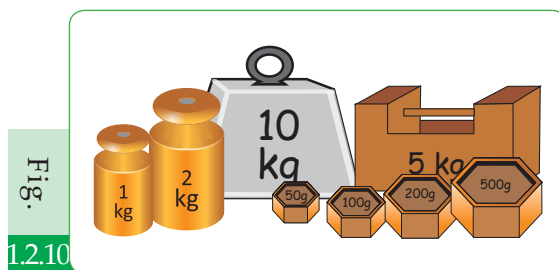
Ruler



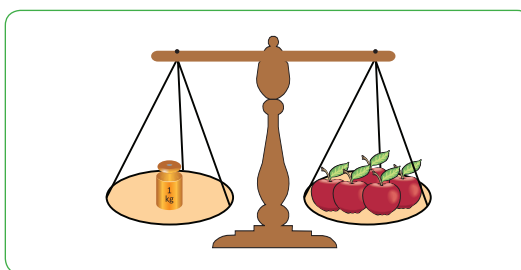
Measuring tape

2.4 Mass and its Measurement

When we ask 5 kg of rice, the shopkeeper measures the mass of rice for selling. When we ask 1 kg of sugar, the shopkeeper measures the mass of sugar and gives us. **The total quantity of matter contained in a body is called mass of the body.** The common unit of mass (m) is kilogram (kg). Mass is also measured in gram (g), milligram (mg), etc. **The mass of a body does not change from place to place.** The mass of a body is measured by a beam balance or physical balance.



Measuring masses



Measuring the mass of apples

Activity 8

- Take a beam balance or pan balance with measuring weights. You can take the help of your science teacher or seniors.
- Measure the mass of your bag, science book, notebook, instrument box, apple, water bottle, etc. one by one.
- Find out which object is heavy and which object is light.

2.5 Time and its Measurement

How much time do you take to reach school from your home? What is the duration between first period and second period in the school? **Time is defined as the duration between any two events.** A watch or clock is used to measure time. Time is measured in second, minute, hour, day, week, month, year and so on.

Fig.

1.2.11



Quartz watch



Mechanical watch



Atomic clock

One solar day has 24 hours. It is the time taken by the earth to complete one rotation around the sun. This time duration is divided into 24 intervals. One interval out of 24 intervals of a solar day is called one hour. The duration of one hour is divided into 60 equal intervals, one interval of which is called one minute. One minute time is divided into 60 equal intervals, one interval of which is called one second.

Do You Know

60 seconds = 1 minute	60 minutes = 1 hour
24 hours = 1 day	7 days = 1 week
12 months = 1 year	365 days = 1 year
10 years = 1 decade	100 years = 1 century

Activity 9

- Take a wrist watch and calculate the time taken to reach from school to home.
- Convert that time into hour and seconds.

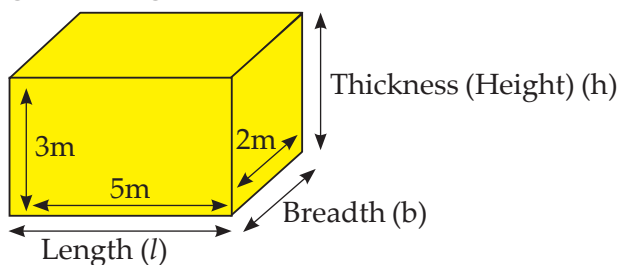
Project Work 1

- Observe different types of clocks kept at your home and school.
- Study their structure carefully. Draw a neat and labelled figure of each in a chart paper. Display your work in the classroom.

2.6 Volume and its Measurement

Volume of a body is defined as the total space occupied by the body. Its common unit is cubic metre (m^3). The volume of a solid object is measured in mm^3 , cm^3 , m^3 , etc. Similarly, the volume of liquid substances is measured in millilitre (ml), litre (l), kilolitre (kl), etc.

The volume of a book or a rectangular block can be calculated by multiplying its length, breadth and thickness or height.



$$\begin{aligned}\text{The volume of the block (v)} &= \text{length (l)} \times \text{breadth (b)} \times \text{height (h)} \\ &= 5\text{m} \times 2\text{m} \times 3\text{m} \\ &= 30\text{m}^3\end{aligned}$$

The volume of liquids can be measured by using measuring can or measuring cylinder.



Activity 10

- Calculate the volume of the given objects using proper measuring devices:
 - a. Science textbook
 - b. Chalk box
 - c. Duster

Activity 11

- Go to the science laboratory with your science teacher and learn the method of measuring the volume of liquids.
- Now, take a measuring cylinder and measure the volume of water.

Activity 12

- Take two buckets of different size.
- Fill both of them with sand or soil.
- Take a jug and measure the amount of sand or soil using the jug.
- Now, compare the capacity of the jug and buckets.
- What can you conclude from this activity?

Activity 13

Make a list of any five measuring devices and write their uses.

S.N.	Name of measuring devices	Uses
1.		
2.		
3.		
4.		
5.		

2.7 Physical Quantities and Units of Measurement

We can measure the mass of a body. We can measure the length of a body. Similarly, we can measure the time, volume, etc. The quantities like length, mass, time, area,

Do you know?

Length is called a physical quantity because it can be measured. But love is not a physical quantity because we cannot measure it.

volume, temperature, etc. can be measured. These quantities are known as physical quantities. Thus, **those quantities which can be measured are called physical quantities.** Some other examples of physical quantities are force, speed, pressure, energy, power, electric current, etc. We cannot measure love, feeling, kindness, anger, beauty, desire, experience, happiness, etc. So they are not called physical quantities.

Mass of a body is measured in kilogram (kg). Here, mass is a physical quantity and kilogram (kg) is the unit of mass. Kilogram is a standard quantity to measure mass. **A unit is a standard quantity which is used to compare an unknown physical quantity.** Similar physical quantities are measured in terms of unit. Metre (m), second (s), kilogram (kg), litre (l), etc. are some examples of units.

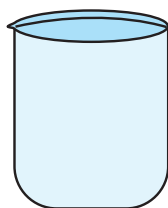
Here, meter (m) is the unit of length. Second (s) is the unit of time, kilogram (kg) is the unit of mass and litre (l) is the unit of volume.

2.8 Schematic Diagrams

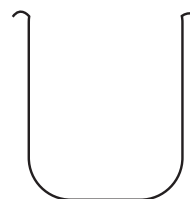
Observe the given figures and identify them.



a



b




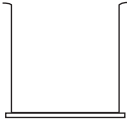


c


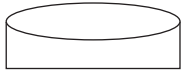

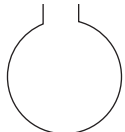



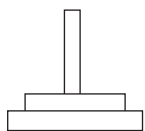





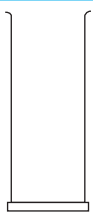

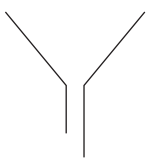
All three figures a, b and c represent the same object beaker. Which one will be easiest to draw?

We use many equipment in science laboratory while doing practical work. We can draw these equipment using straight or curved lines. The symbolic figure drawn by lines is called line diagram or schematic diagram.

Schematic diagrams are drawn by adopting scientific technique. These diagrams are widely used in science as they can be drawn easily and within a short period of time.

2.8.1 Diagrams of some Scientific Equipment

Diagram of real equipment	Schematic diagram	Schematic diagram drawn by you
1. Beaker 		
2. Test tube 		

3. Petri dish			
4. Round bottom flask			
5. Tripod stand			
6. Bunsen burner			
7. Compound microscope			
8. Lens (convex)			
9. Gas jar			
10. Glass funnel			

Project Work 2

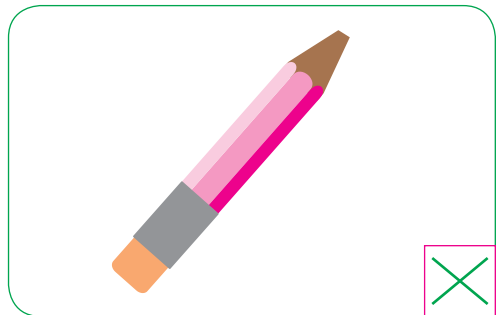
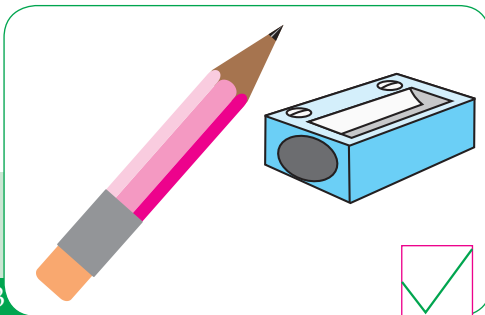
- Go to the science laboratory and observe various equipment.
- Draw schematic diagrams of any ten equipment in a chart paper. Submit it to your science teacher.

2.8.2 Rules of Drawing Schematic Diagrams

1. We should use a sharp pencil for drawing diagrams. We should not use blunt and coloured.

Fig.

12.13



2. We should always use a ruler to draw straight lines.

Fig.

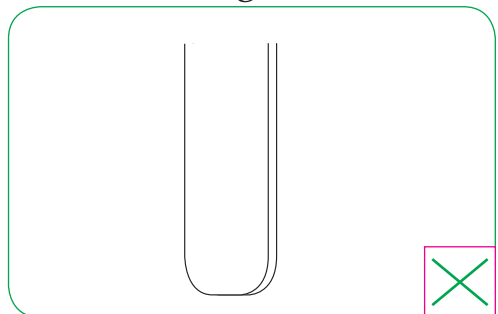
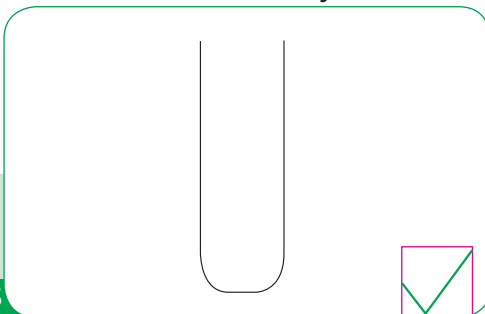
12.14



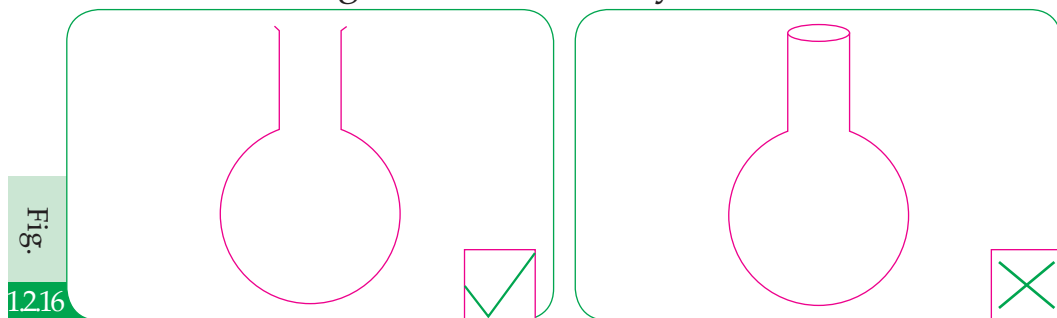
3. We should draw only one line while drawing.

Fig.

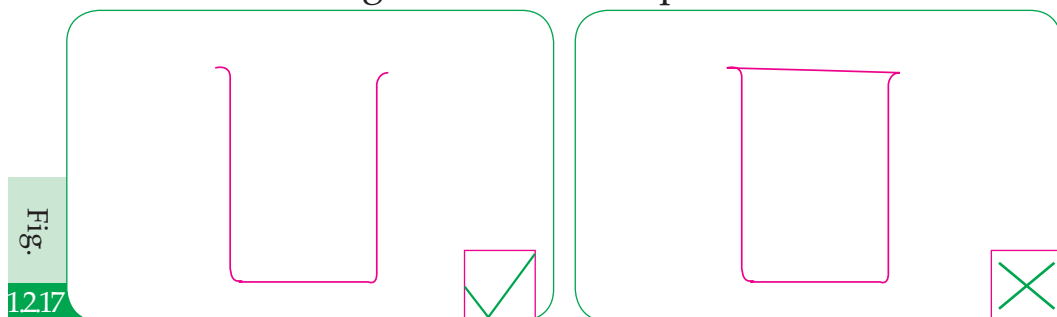
12.15



4. The schematic diagram should always be two-dimensional.

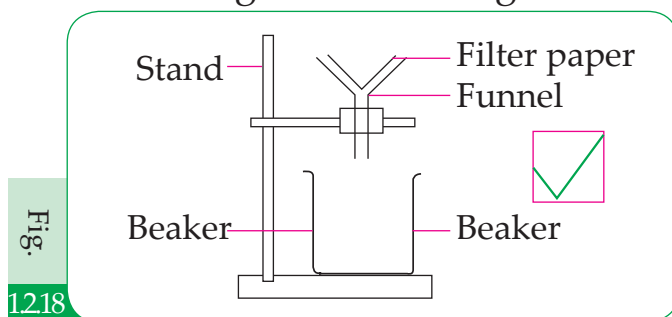


5. The mouth of the figure should be open.



6. We should not colour and shadow the figure.

7. We should label the figure with straight lines.



Key Concepts

1. The comparison of an unknown physical quantity with a known quantity of the same type is called measurement.
2. The distance between any two points is called length.
3. The total quantity of matter contained in a body is called mass of the body. The standard unit of mass is kilogram (kg.)
4. The mass of a body does not change from place to place.

5. Time is defined as the duration between any two events. The standard unit of time is second (s).
6. Volume of a body is defined as the total space occupied by the body. It is measured in cubic metre, litre, etc.
7. Those quantities which can be measured are called physical quantities. Examples, mass, length, time, etc.
8. A unit is a standard quantity which is used to compare an unknown physical quantity. Examples, kilogram, metre, second, etc.
9. The symbolic figure drawn by lines is called line diagram or schematic diagram.
10. The schematic diagram should always be two dimensional.
11. We should label the figure with straight lines.

Exercise

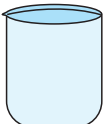

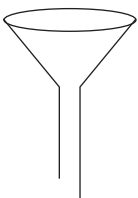
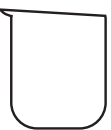
1. Tick (✓) the best answer from the given alternatives.

- a. The comparison of an unknown physical quantity with a known quantity is called.....
 - i. length
 - ii. measurement
 - iii. volume
 - iv. mass
- b. We use a ruler to measure the
 - i. mass
 - ii. weight
 - iii. length
 - iv. volume
- c. Which of the following is the unit of length?
 - i. kilogram
 - ii. meter
 - iii. gram
 - iv. litre

d. Which of the following device is used to measure the volume of milk?

- i. ruler
- ii. measuring cylinder
- iii. beam balance
- iv. watch

e. Which of the following is a correct schematic diagram?

- i. 
- ii. 
- iii. 
- iv. 

2. Tick (✓) the correct statements and cross (×) the incorrect ones.

- a. Measurement is very important in our daily life.
- b. Kilogram is the unit of length.
- c. We use a watch to measure time.
- d. Schematic diagrams are easy to draw.
- e. The schematic diagrams should be coloured.

☐

☐

☐

☐

☐

3. Fill in the blanks using appropriate words from the given box.

second volume measurement mass two dimensional

- a. The process of comparison is called
- b. Beam balance is used to measure the

- c. The standard unit of time is
- d. We use measuring cylinder to measure
- e. The schematic diagram should be

4. Answer the following questions.

- a. What is measurement?
- b. Why is measurement necessary?
- c. What is length? Write its unit.
- d. What is mass? How can we measure the mass?
- e. What is time? Write any two units of time.
- f. What are physical quantities? Give any three examples.
- g. What is a schematic figure?

5. Why is measurement important? Write any three points.

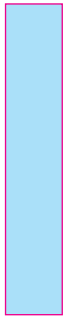
6. Identify given equipment/devices and write their use.



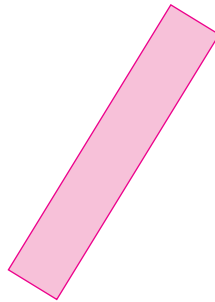
7. Draw the schematic diagrams of following equipment.

- a. Beaker
- b. Test tube
- c. Conical flask
- d. Round bottom flask

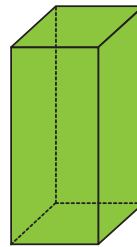
8. You have two beakers full of water of different size. How can you find the volume of water present in each? Explain.
9. How can you find out the length, breadth and thickness of your science book? Describe.
10. Measure the length of the given objects.



a.



b.



c.

11. Describe the importance of measurement in our daily life.
12. Write down the rules of drawing schematic diagrams.

UNIT 02

Information and Communication Technology

Estimated teaching hours : 30

Before You Begin

The word 'information' refers to the meaningful data that gives us some knowledge and sense. A computer can produce information by processing data stored on the computer. When a person gets information at a time, he or she can take correct decisions. So we need to transfer information to the needy people. The transferring of information from one person to another is called communication. We use different means of communication like newspapers, letters, television, radio, telephone, mobile phone, computer, Internet, etc. to communicate between and among people.

Learning Outcomes

After completing the study of this unit, students will be able to:

- identify newspapers, letters, television, radio, telephone, mobile phone as sources of information and means of communication.
- give a general introduction to computer.
- use paint software and typing software.
- implement personal security while using computer.
- adopt computer security measures.
- search information on the Internet.

Syllabus

- Means of Information and Communication
- Introduction to Computer
- Paint Software and Typing Software
- Computer and Our Health
- Introduction to Internet

Glossary

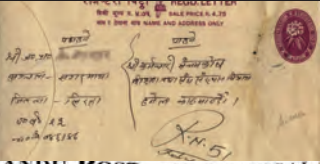




communication	: exchanging of information
data	: any number, letter or word that you give to a computer is data. the data is the input to the computer
drive	: a storage device
e-mail	: electronic mail
hardware	: a physical part of a computer that can be touched and seen
information	: the processed data what you get after processing the data according to the instructions
internet	: the largest network of computers
program	: a set of instructions for doing tasks
software	: a collection of programs

Means of Information and Communication

1.1 Introduction

Activity 1

Identify and write the names of the following means of communication, then discuss their uses with your friends.

S.No.	Means of Communication	Name	Uses
1.			
2.			
3.			
4.			
5.			

- Have you ever conveyed a message or information to anyone?
- Which means of communication have you used to convey messages?

- c. Have you talked with your friends using telephone?
- d. Have you talked with your friends on mobile phone?

You get messages or information from different sources. When you read newspaper, you get some information. When you listen to radio you get some information. Similarly, when you watch television, you get some information. When you get information you may have to tell or give the information to someone.

Fig.

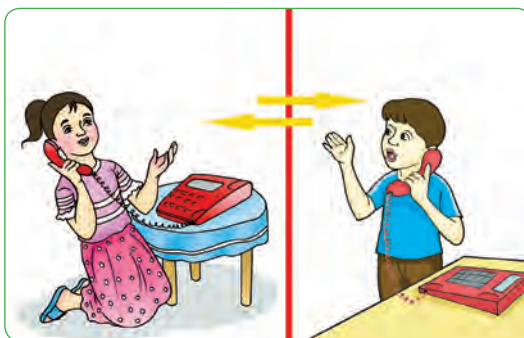
2.1.1



If your friend lives nearby, you can talk and tell messages or information directly to him. And your friend may tell or give you some other messages or information. Normally, people use real face-to-face communication to exchange information.

Fig.

2.1.2



After the development of telephone, people had started to communicate using the telephone. Many other technologies like newspapers, letters, pamphlets, notice boards, radio, television, etc. are developed for sending messages or information. Nowadays, people use mostly smart phones, computers and the Internet for sending or receiving messages or information.



Exchanging of information through newspapers, letters, radio, television, telephones, mobile phones, computers, the Internet, etc. is known as communication. A technology involves in the exchanging of information is known as communication technology. Telephone, smart phone, computer, the Internet, radio and television are fast communication devices. These devices are advanced technological devices. All the devices and systems that are used in communication are means of communication. It is also known as ICT tools. Newspaper, letter, radio, television, telephone, mobile phone, computer and the Internet are the means of communication.



Telephone



Smartphone



Radio



Television



Projector

ICT Tools

In this ICT age, computers and other advanced technology are used in health, business, education, banking, agriculture, and in many other sectors. Advanced technology enables us to do tasks easily, quickly, accurately, and in an organized way.

Fig.

2.1.5



Activity 2

Look the pictures given below and discuss the following questions with your friends.



a.



c.



Fig.

2.1.6

c.



d.

- What do you see in above figures?
- What is the use of mobile phone?
- What is the use of television?
- What are the other means of communication that you have seen?

We get information by reading newspapers, talking on the telephone, listening to the radio, and watching television. We can only get information from radio, newspaper, television and letters. These means of communication can transmit

information in one way. These devices are called one way communication devices.



Fig. One-way means of communication



Fig. Two-way means of communication

You can get messages or information from a person or people, and can give messages or information to other people at the same time through the telephone, mobile, computer, and Internet. So computers, telephones, mobile phones, and the Internet are two-way communication devices.

Activity 3

Discuss with your friends and complete the following table.

S. No.	Tasks to be done	Communication Devices
1.	To communicate with your father or mother who is in another place or country	
2.	To get the latest news	

3.	To inform the Nepal Electricity Authority regarding a power failure at your home	
4.	To give precautionary information to people about communicable diseases like Covid-19	
5.	To send document file	

Key concepts

1. Exchanging of information through newspaper, radio, television, telephone, mobile phone, computer, etc. is known as communication. Example, radio, television,, mobile, telephone, etc.
2. A technology involves in the exchanging of information is known as communication technology.
3. All the devices and systems that are used in communication are called means of communication. Examples, radio, television, mobile, telephone, etc.
4. Newspapers, pamphlets, radio, telephone, television, computers, email, chat, web, etc. are means of communication.
5. Newspaper, television and radio are the one-way communication devices.
6. Computer, telephone, mobile and Internet are the two-way communication devices.

Exercise

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

- a. When you watch a radio you get some information. ☐
- b. You can give information to your friend who lives nearby through a radio. ☐

- c. You can give information to many people through a radio. ☐
- d. Radio and television are one way communication devices. ☐
- e. Computer, smart phone and TV are ICT tools. ☐

2. Fill in the blanks by using the following words:

(Communication, radio, television, one-way, two-way, computer)

- a. The process of exchanging information through different means is called
- b. You can get information by watching a
- c. Telephone and mobile are communication devices.
- d. Radio and television are communication devices.
- e. enables us to do tasks quickly, easily, accurately and the organized way.

3. Choose the correct option from the following:

- a. You can exchange information with your friend who lives far from you through
☐ Mobile phone ☐ Magazine ☐ Radio
- b. Exchanging of information is
☐ Communication ☐ Email ☐ Monitor
- c. Students at school get information through
☐ Newspaper ☐ Telephone ☐ Notice Board
- d. is a two-way communication device.
☐ Radio ☐ Newspaper ☐ Smart phone

e.is a one-way communication device.

☐

Radio

☐

telephone

☐

mobile phone

f. You can send or receive messages or information through
.....

☐

Mobile phone

☐

Radio

☐

Television

4. Answer the following questions:

- What is communication?
- What is information technology?
- List any four means of communication.
- Write any four sources of information.
- What are means of one-way-communication? Give any two examples.
- What are means of two-way communication? Give any two examples.
- Name any three means of information and communication.

5. Match the following:

Group 'A'

Listen to

Watch

Fast communication

Two-way communication

Group 'B'

television

radio

newspaper

telephone

6. Identify given tools and find-out whether they are means of one-way communication or two-way communication.



7. Give reason:

- a. Smart phone and computer are called ICT tools.
- b. Radio and letter are means of one-way communication.
- c. Smart phone and telephone are means of two-way communication.

8. Draw pictures of any two ICT tools that you have used.

9. Make a list of sources of information and communication that you have seen.

Introduction to Computer

2.1 Introduction

A computer is a useful electronic device. It can be programmed. It works as it is programmed and instructed. It cannot do any task for which it is not programmed and instructed. The required programs are installed on a computer. It performs a task in three steps:

- i. It takes data and instructions from a user.
- ii. It processes the data according to the instructions.
- ii. It gives the output as useful information.

A computer can store data, information and programs in its storage devices.

Fig.

2.2.1



Now, let's learn the definition of computer. A computer is a programmable electronic device which takes data and instructions, processes them and gives the information.

2.2 Applications of Computer

Computer has made our life more comfortable. It can perform various tasks quickly and accurately in an organized way. It can do tasks repeatedly for a long time without losing accuracy. Computers are used in almost all the areas. It can be used at home, in hospital, in the office, in school, in the bank, and many other places. The major application of a computer are as follows:

1. You can take online classes through a computer.
2. You can send or receive messages through a computer.
3. You can listen to music, watch videos or movies on a computer.
4. You can search for information on the Internet using a computer.
5. You can draw and colour pictures on a computer.
6. You can prepare documents on a computer.
7. You can record your voice on a computer.
8. You can play games on a computer.

2.3 Need of a Computer

Activity 1

Look at the pictures given below and discuss with your friends about the need computer.





Computers are needed for doing the following tasks:

- To store data, information and programs safely
- To listen to songs and watch videos
- To communicate with friends and relatives
- To take online classes
- To draw pictures and modify photos
- To prepare documents, presentations, etc. in a better and more organized way

2.4 Parts of a Computer

Activity 2

Identify the computer parts and complete the table given below:

 <p>a.</p>	 <p>b.</p>	 <p>c.</p>



A computer has mainly two parts. They are software and hardware. A computer needs both hardware and software for performing tasks.

Software is the collection of programs that makes computer hardware workable. You cannot see software on a computer.

Computer hardware is the physical part of a computer. You can see and touch computer hardware. Keyboard, mouse, monitor, printer, hard disk, pen drive, etc. are computer hardware.

There are four types of computer hardware. They are Input unit, Central Processing Unit (CPU), Output Unit and Storage Unit.

a) Input Unit

An input unit is a device through which data and instructions are entered into a computer. It is also called an Input device. Keyboard, mouse, touch pad, joystick, microphone, etc. are Input devices.



Keyboard

Mouse

Joystick

Microphone

Keyboard : A keyboard is an input device through which we can enter data and instructions into a computer. A keyboard has alphabet keys, number keys and other character keys. We can enter text, numbers, and other characters in a computer by pressing the keys on the keyboard.

Mouse : A computer mouse is also an input device. It is also called a pointing device. It enables us to open a drive, file or program on the computer and to give instruction by selecting the command. It is oval in shape. It has one scrolling wheel and two buttons on the top side and a sensor on the bottom side. When we move the mouse on the mouse pad, the cursor, i.e. mouse pointer moves on the monitor and we can point and select the command.

To use the mouse, follow the given steps:

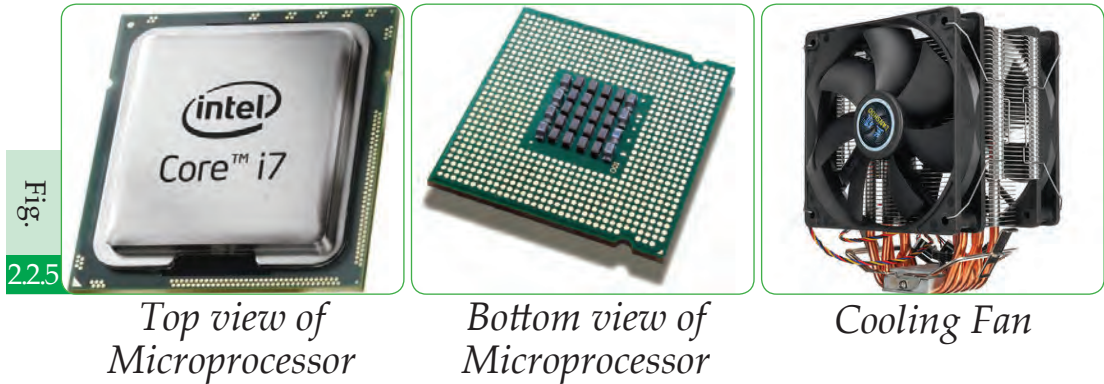
- i. Place the mouse on the mouse pad.
- ii. Hold the mouse lightly by using the thumb, little finger and ring finger.
- iii. Place the index figure on the left mouse button and middle finger on the right mouse button.
- iv. Move the mouse slowly and point to drive, file, program or command.
- v. Press the left mouse button twice to open the drive, file, program or execute the command.



b) Central Processing Unit

A central processing unit (CPU) is the brain of the computer. It is also known as a microprocessor. It controls all the functioning

of a computer. It does all the arithmetic and logical tasks.



c) Output Unit

An output unit is a device that displays or presents output. It is also known as an output device. Monitor, printer, speaker, etc. are the output devices. A computer monitor is an output device. A monitor looks like a television. A monitor has a non-touchable or touchable screen. It displays text, images and videos on its display screen. It also displays the result of processing.



d) Storage Unit

A storage unit of a computer stores data, information and programs. Once the data and programs are stored in the computer, we can use them whenever they are needed. Hard disk, optical disk (CD, DVD, BD) and pen drive are storage devices.

Fig.

2.2.7



Hard disk



Optical disk



Pen drive

Activity 3

- Visit the computer lab and identify the parts of computer.
- Prepare a chart to show different parts of computer.
- Prepare a chart to show uses of computers.
- Practice mouse to move, select and open drive, file and program under the guidance of your computer teacher.

Project Work

- Take a chart paper and draw different parts of a computer. Colour the picture and demonstrate in the classroom.

Key concepts

1. Computer is a programmable electronic device which takes data and instructions, processes them and gives the information.
2. A computer helps you to do tasks easily, quickly, accurately and in the organized way.
3. Computers are used in schools, hospitals, offices, banks, homes, and many other places.
4. A computer has mainly two parts. They are hardware and software.
5. Software is the collection of programs that makes computer hardware workable.

6. Computer hardware is the physical part of a computer that can be touched and seen. For examples, Keyboard, mouse, monitor, etc.
7. Input unit is the computer hardware that allows you to enter data and instructions on a computer.
8. Keyboard, mouse, touch pad, microphone, etc. are input devices of a computer.
9. CPU is the brain of the computer that does all the arithmetic and logical tasks.
10. Output unit displays or presents the output or information.
11. Monitor, printer, speaker, etc. are output devices of a computer.
12. Storage unit stores data, information and programs.
13. Hard disk, Compact disk (CD), Digital Video Disk (DVD), Blu-ray disk (BD), Pen drive, etc. are storage devices.

Exercise

1. Write 'T' for True statements and 'F' for False ones.

- a. A computer can be programmed. ☐
- b. A computer can do any task. ☐
- c. A computer gives correct information even if the data is incorrect. ☐
- d. A computer can store data and programs safely. ☐
- e. You can take online classes on a computer. ☐
- f. You can enter letter, words and numbers through a mouse. ☐

- g. A computer monitor is the basic input device. ☐
- h. You need to hold a computer mouse tightly otherwise it runs away. ☐
- i. CPU is the brain of a computer. ☐
- j. A pen drive can store programs. ☐

2. Fill in the blanks with the suitable words given below.

(electronic, CPU, data, hard disk, input, monitor)

- a. A computer is a useful machine.
- b. A computer takes and instructions from a user.
- c. A computer stores information in
- d. Keyboard and mouse are devices.
- e. The device that controls all the functioning of a computer is
- f. The displays the result of processing.

3. Choose the correct option from the following:

- a. A computer is a useful device.
 - i) mechanical ☐
 - ii) electronic ☐
 - iii) electrical ☐
- b. A computer takes data, processes them and gives
 - i) input ☐
 - ii) information ☐
 - iii) instruction ☐
- c. A computer can perform various tasks
 - i) fast, accurate and in the organized way. ☐
 - ii) fast, inaccurate and in the organized way. ☐

- iii) fast, accurate and in the random way. ☐
- d. You can use computer at home to
- i) play games, listen to music and watch videos. ☐
- ii) play games, send messages and read the notice board. ☐
- iii) send message, prepare drawings and play football on the ground. ☐
- e. You can prepare on a computer.
- i) documents ☐ ii) houses ☐ iii) hard disks ☐
- f. is a computer hardware.
- i) Mobile phone ☐ ii) Microphone ☐ iii) Mouse ☐
- g. You can enter data and instructions into a computer using
- i) Monitor ☐ ii) Pen drive ☐ iii) keyboard ☐
- h. A stores data and programs.
- i) hard disk ☐ ii) monitor ☐ iii) keyboard ☐

4. Answer the following questions.

- a. What is a computer?
- b. Is a computer fast and accurate? How does it make our life more comfortable?
- c. List the places where computers are used.
- d. How do you use a computer at home?
- e. Write four tasks that you can do using a computer.
- f. What are two main components of a computer?

- g. What is software? Can you touch software on a computer?
- h. What is computer hardware? List any two computer hardware.
- i. What is an input device? List any two input devices.
- j. What does a CPU do? What is the full form of CPU?
- k. What is an output device? List any two output devices.
- l. What does a storage unit do? List any two storage devices.

5. Identify the given parts of a computer. Also, write the major function of each.

a.



b.



c.



d.



6. Draw a neat figure showing:

a. CPU

b. Pendrive

c. DVD

d. Monitor

e. Keyboard

Paint and Typing Software

A. Paint Software

3.1 Introduction to Paint Software

You can draw, color or modify pictures easily on a computer. Paint software is used to draw, color, and modify pictures on a computer. Some popular paint software are Microsoft Paint, Tux Paint, Adobe Photoshop and Paint Shop.



Fig.
2.3.1

Microsoft Paint is a simple paint program. It is easy to use. It has all the facilities to draw, color, and edit pictures. You have to use the mouse to draw pictures in Microsoft Paint.

3.2 Opening Microsoft Paint

To open Microsoft Paint, you have to follow these steps.

- Click on the Start button.
- Point to All Programs.
- Point to Accessories.
- Click on the Paint.

Now you will see the Paint Window.

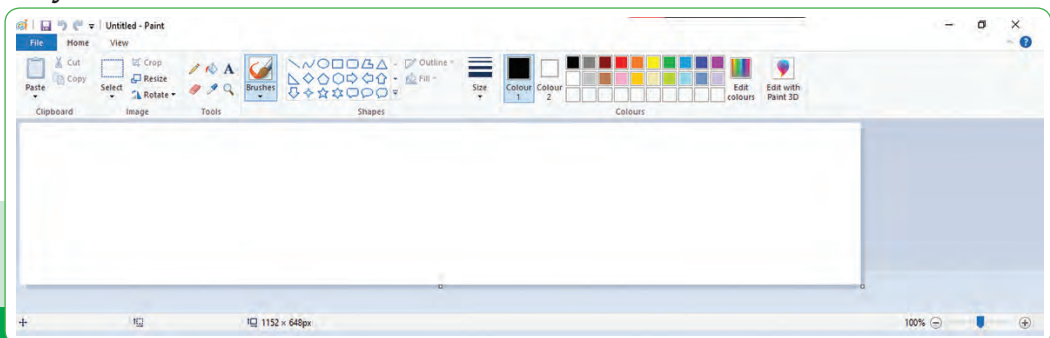
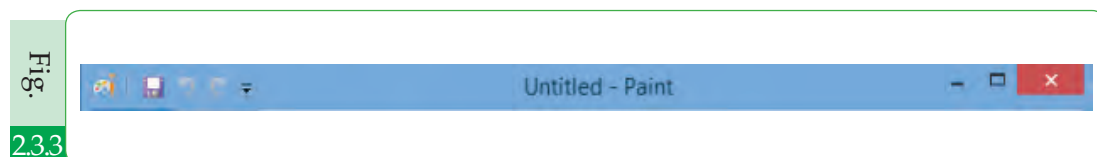


Fig.
2.3.2

The Paint Window has Title bar, Tab buttons and Drawing area.

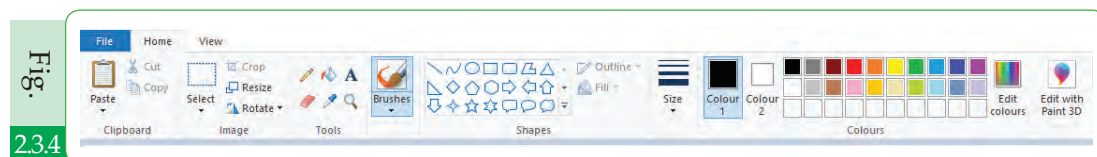
a. Title Bar



The Title bar of Paint displays the name of the currently opened drawing. It displays 'Untitled' for a new drawing that has not been saved. On the left of the Title bar, there are Save, Undo and Redo buttons.

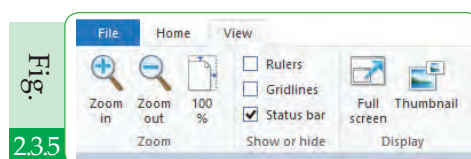
b. Tab Buttons

Just below the title bar, there are three tab buttons. Paint/File button, Home button and View button are the three tab buttons. The Paint/File Button has New, Open, Save, Save As, Print, Exit, etc. command buttons or sub menus.



The Home tab contains all the image editing tools.

The View tab contains zooming tools. It allows you to show or hide Rulers, Gridlines and Status bar.









c. Drawing Area

The Drawing Area is a blank canvas or area where you can draw pictures. This is the working area of Paint. It is like a blank sheet of paper.

3.3 Tools in Paint

The MS-Paint tools are found in the Tools group under the Home tab. Each tool on the MS-Paint has a different functions. The mouse pointer changes its shape when a tool is picked.

The following are some useful tools:







Tool	Icon	Use
Text		The Text tool is used for adding texts in the picture.
Pencil		This Pencil tool is used for drawing or writing text.
Color Pick Tool		The Pick Color tool selects the color of any portion of the drawing.
Eraser		The Eraser tool erases any part of a picture.
Fill With Color		The Fill With Color tool fills a selected color.
Brush		The Brush tool is used for drawing thick line and paint. It is similar to your painting brush.

3.4 Shapes in Paint




Different shapes tools are found in the Shapes group under the Home tab.

Shapes tools may be used to draw various shapes such as a circle, ellipse, rectangle, square, pentagon, hexagon, heart, lightning bolt, etc. With the Polygon tool, you can draw your own designed shapes.

The following are some of the Shape tools available in MS-Paint:

Tool	Icon	Use
Line		The Line tool draws a straight line.
Rectangle		The Rectangle tool draws a rectangle or square.
Rounded Rectangle		The Rounded Rectangle tool draws rectangles and squares with rounded corners.
Curve		The Curve tool is used to draw curved lines.
Polygon		The Polygon tool is used for drawing joined line segments.
Circle		The Circle tool is used for drawing circle.

Some other useful tools are as follows:

Tool	Icon	Use
Select		The Select tool is used to select a rectangular portion of a picture.
Crop		The Crop tool is used for removing unselected part of a picture. It changes the picture so that only the selected part of picture is visible.
Rotate		The Rotate tool is used to rotate or flip the whole picture or a selected part of the picture.

3.5 Drawing Pictures in MS-Paint

You can draw different pictures in MS-Paint by using Pencil tool and Brush tool. You can also draw different shapes like line, box, circle, star, etc. by using shape tools.

To make drawings in MS-Paint, you have to follow these steps:

- a. Select the tool. For example, click on the Pencil tool.
- b. Click on Size and select the required size. It allows you to change the width of selected tool.
- c. Select the desired color in the Colors group. For example, click on yellow color.

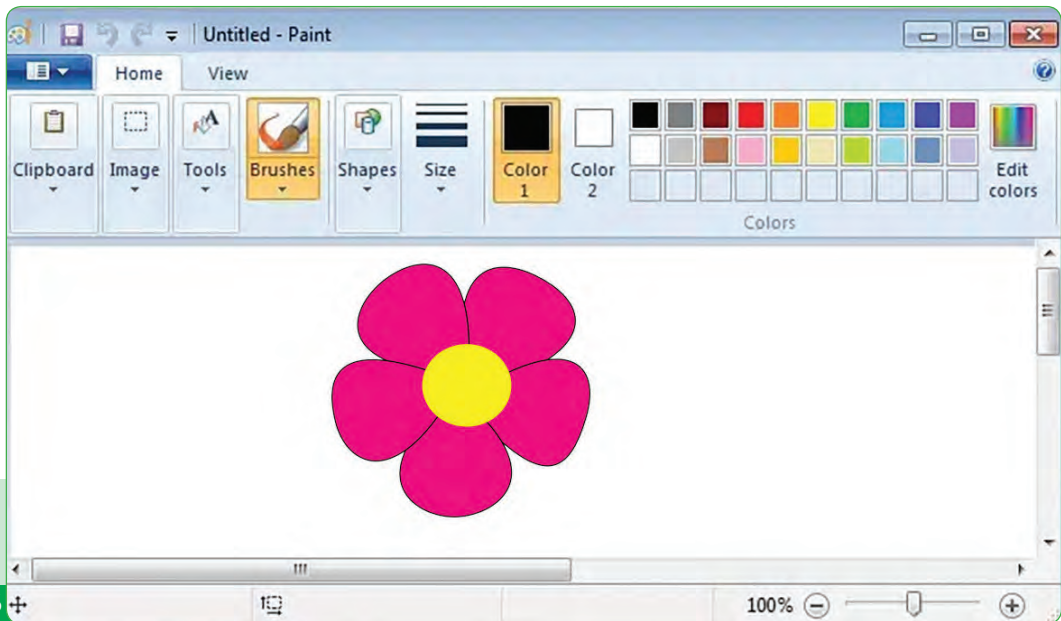


Fig.

236 +

- d. Place the mouse pointer on the Drawing Area and click the left mouse button and drag it to draw desired picture. For example, let's try to draw a flower.
- e. Use the Eraser tool to remove the unwanted part of the drawing, or use the Undo button to reverse the last performed action.
- f. Select the Fill with color tool and then click on the drawing. It will fill the drawing with color.

Activity 1

Open Ms-Paint program and try the following tasks :

1. Select Pencil tool, choose the width of a pencil, choose color of pencil and draw a picture on the drawing area.
2. Select Brush tool, choose the width of a brush, choose color of brush and draw a figure on the drawing area.
3. Select Eraser tool and erase some parts of the drawing.
4. Select Circle tool, draw three circles, choose color and fill the circles with colours of your choice.

3.6 Saving a Drawing

MS-Paint allows you to save complete drawing or incomplete drawing. You can open the saved drawing next time to complete it or show it to your family and friends. To save a drawing you have to follow these steps:

- a. Click the Paint or File button.
- b. Select Save option. The Save as dialog box appears.

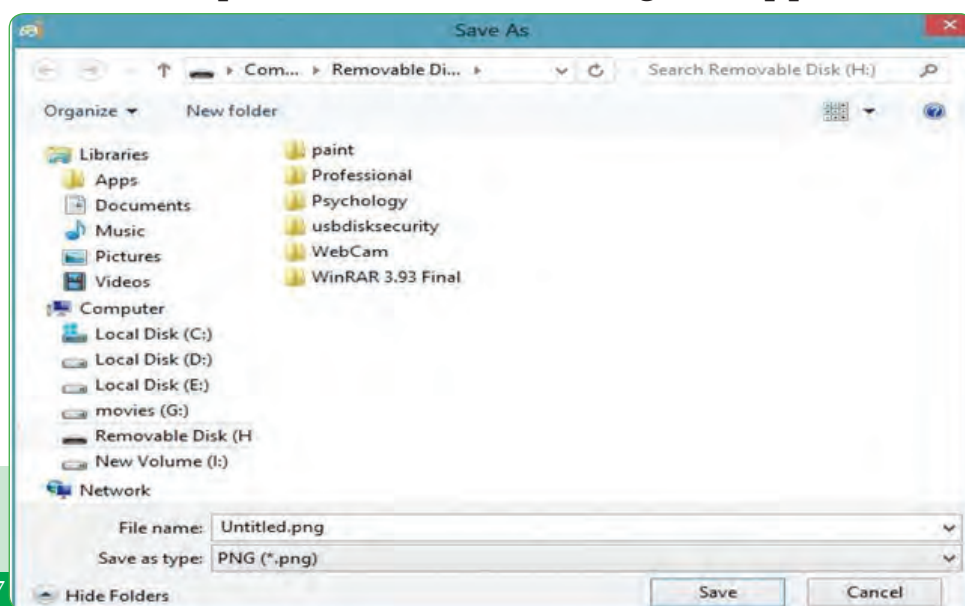


Fig.

2.3.7

- c. In the file name box, enter a name for drawing.
- d. Click on Save button or press Enter key.

3.7 Opening a New Blank Drawing Area

To draw a new picture, you always need a blank Drawing Area. The steps to open a blank drawing are as follows:

- a. Click on Paint or File button.
- b. Select New option. A new blank drawing area appears on the screen.

Note:

- If you are working on a drawing, the MS-Paint will ask you to save your drawing before opening a new drawing. Choose Yes to save, No to not to save, or Cancel to return to the drawing where you are working on.
- MS-Paint allows you to work on only one drawing at a time.
- To open a new blank drawing area, you can press Ctrl + N.

3.8 Opening a Saved Drawing

To open an existing drawing, follow these steps.

- a. Click the Paint or File button and select Open.

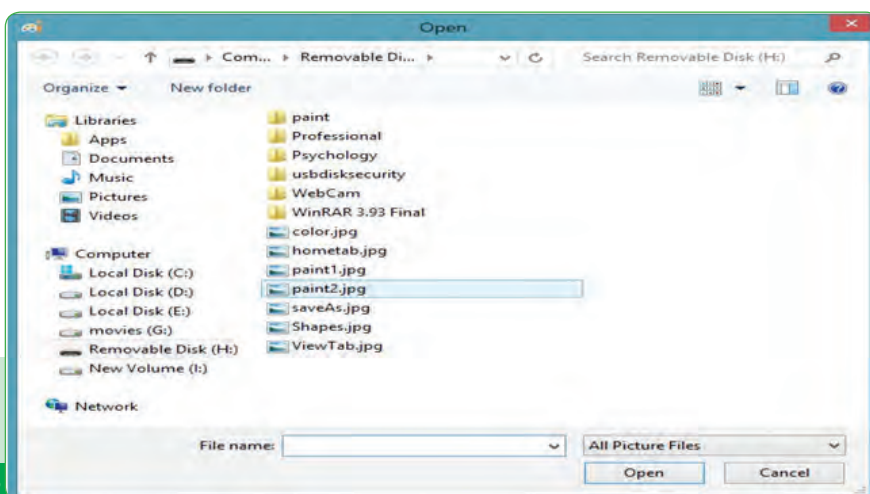


Fig.

23.8

- b. Select the file from the list of files or type the name of file in the file name box that you want to open.
- c. Click on Open or press Enter key.

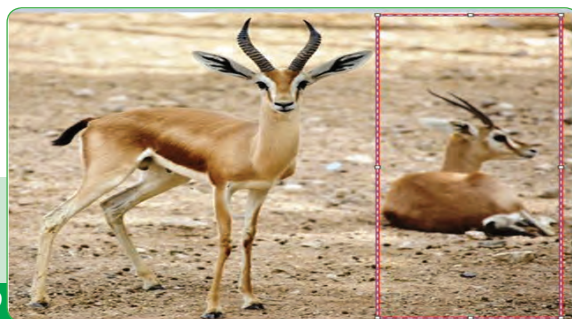
3.9 Selecting a Drawing

You can select a part of drawing or whole drawing. You can copy, move, delete, rotate, resize or crop the selected part of drawing or entire drawing. You can use the Select tool to select part of the picture.

- a. In the Image group under the Home tab, click the down arrow under Select.

- b. Click on Rectangular Selection and then drag the pointer to select the part or whole drawing.

Fig.
23.9



3.10 Copying or moving the image or a part of the image

In MS-Paint, you can easily make duplicate copy of any selected part or whole drawing. To make a duplicate of the drawing, you have to follow these steps:

- a. Select the part of drawing or whole drawing using Select tool.
- b. Do one of the following:
 - Click on Copy in the Clipboard group to make a duplicate copy.
 - Click on Cut in the Clipboard group to delete or move the selected drawing.
- c. Click on Paste in the Clipboard group. Now, the image you have copy or cut will reappear on the top left corner of the drawing area.

Fig.
23.10



- d. Click and drag the image to the desired location.
- e. Release the mouse pointer.

Note:

- To remove an image or a part of the image, select the image and press Del key.

B. Typing Software

3.11 Introduction to Typing Software

Activity 2

Open Microsoft Word program and type at least one paragraph of any text from your Science book. How fast have you typed? How many spelling mistakes have you made? Do you know how do you type fast and correctly?

You can type text fast and correctly if you have good typing skills. Typing software helps you to improve your typing skills. The typing software helps you to type text fast and correctly. The typing software provides

Fig.
23.11



training on how to type quickly and correctly. With the help of typing software, you can learn to type text in English and Nepali. Typeshala, Typing Master, Typing Guru, Rapid Typing, Key Hero, etc. are some typing software. Online Typeshala, Typing Sansar, etc. are some online typing tutors.

3.12 Positioning Fingers on the Keys

Which finger do you use to press the Spacebar in a keyboard? Middle finger or thumb?

Everyone should learn how to position their fingers on the keys of a keyboard. The proper position of fingers on the keys helps you to type text fast and correctly. Your left hand's fingers should be on A, S, D, and F keys and right hand's fingers should be on J, K, L, and ; keys. The keys (A, S, D, F, J, K, L, ; keys) on the middle row of a keyboard are known as the Home keys. They are also known as the Resting keys. You have to keep your left and right thumbs on the Space bar at all the times.

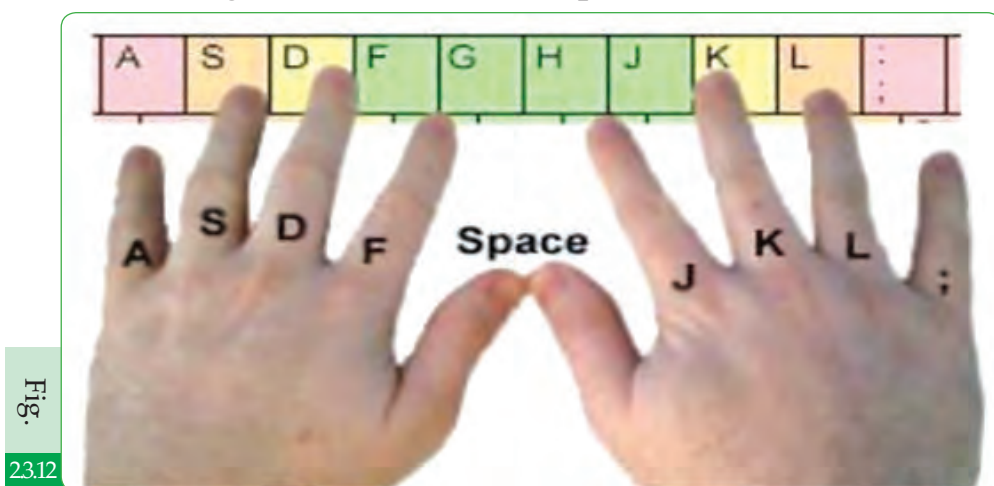
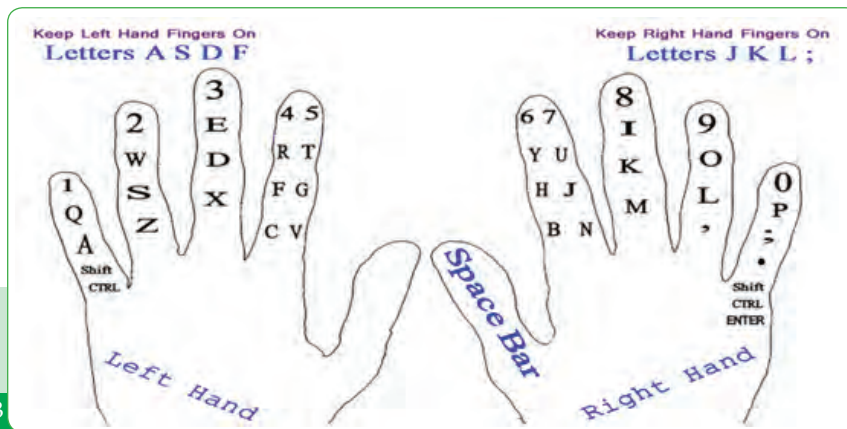


Fig.

23.12

The figure below shows what fingers that we need to use for typing characters on the keyboard.

Fig.
23.13



After typing characters you have to rest your left hand fingers on ASD F and right hand fingers on J KL ; throughout the typing.

Typing capital letters

You can type capital alphabet by pressing Shift key and the alphabet key. When you have to type a word in capital alphabets you need to press Caps Lock key and type the alphabets.

Editing character

You can use the Backspace key to delete a wrong character.

3.13 Typing Program - Typshala

Fig.
23.14



Typshala is a bilingual typing tutor that teaches you how to type in both English and Nepali scripts. It provides free hand typing lessons and lessons with a small game. It is developed by Softkey computers, Kuponhole, Lalitpur, Nepal.

Loading typeshala

To open Typshala program, you have to follow these steps:

- i. Click on Start button.
- ii. Choose All Programs and point out Typshala.
- iii. Click on Typshala. It opens typshala program.

Practice lessons in typshala

Typshala provides four different practice lessons having three levels. The four different lessons are for practicing keys on Home Row, Top Row, Bottom Row and All Rows. Level 1, Level 2, and Level 3 are the three levels based on the Easy to Hard scale.

Typing in English



To type text in English script, follow these steps:

- i. Select English Script from Options menu or click on English Flag.
- ii. Select the practice lessons of Home Row, Top Row, Bottom Row or All Rows.
- iii. Select Level 1, 2 or 3. You see the typing screen.
- iv. Type the Text appearing on the screen.

Note:

- Typshala allows a user to enter name if the user is new.
- Whenever a user enters a wrong letter, Typshala produces beep sound.
- As the user finishes typing letters across the screen, next lesson appears.
- At the Right corner on the Tool bar, it displays typing speed of a user.

Key concepts

1. Paint software is used to draw, colour and modify pictures on a computer.
2. Microsoft Paint, Tux Paint, Adobe Photoshop and Paint Shop are some examples of Paint software.
3. Drawing Area is the blank area where you can draw pictures.
4. Tool Box contains free hand tools like Pencil tool, Brush tool, Curve tool, etc.
5. The Shape group contains ready-made shape tools like rectangle, circle, pentagon, hexagon, heart, etc.
6. Typing software helps you to improve your typing skills.

7. Typshala, Typing Master, Typing Guru, RapidTyping, KeyHero, etc. are some typing software.
8. Your left hand's fingers should be on A, S, D, and F keys and right hand's fingers should be on J, K, L, and ; keys.
9. You have to keep your left and right thumbs on the Spacebar at all the times.

Exercise

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

- a. MS-Paint is the simple paint program. ☐
- b. Drawing Area is a blank canvas where you can draw pictures. ☐
- c. Each tool on the MS-Paint has same use. ☐
- d. A Pencil tool is used for drawing and writing text. ☐
- e. A Brush tool is used for drawing straight lines. ☐
- f. Rectangle tool is used for drawing circle. ☐
- g. Line tool can be used to draw a circle. ☐
- h. The crop tool can remove unselected part of a picture. ☐
- i. Typshala is typing software that allows you to practice typing in Nepali and English. ☐

3. Fill in the blanks with the suitable words given below.

(paint, drawing, brush, eraser, Fill With Color, Curve, Line)

- a. Microsoft Paint and Tux Paint are the popular software.
- b. The working area of MS-Paint is called area.

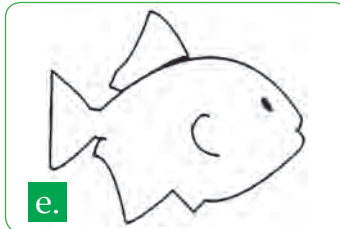
- c. The tool erases any part of a picture.
- d. The tool fills a selected color.
- e. The tool draws curved lines.
- f. The tool which is used for drawing straight lines is
- g. The image can be copied.

3. Answer the following questions.

- a. What is the use of Paint software?
- b. Write the name of any two paint software.
- c. What is Microsoft Paint?
- d. What is the use of **Drawing Area** in MS-Paint?
- e. What is the use of the Pencil tool?
- f. What is the use of Fill with color tool?
- g. What is the use of typing software?
- h. Write name of any two typing software.

LAB ACTIVITY

1. Draw the following pictures using Microsoft Paint and color them.

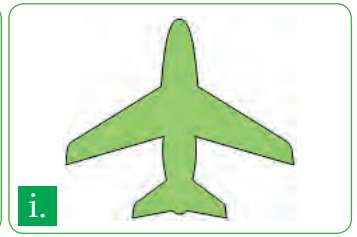




g.

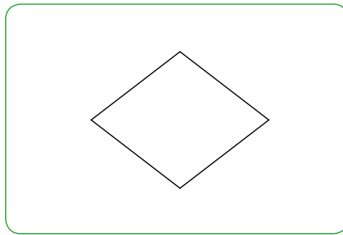


h.

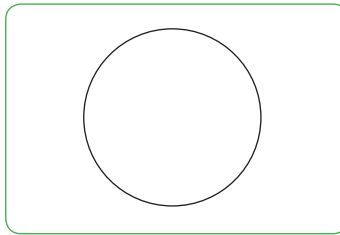


i.

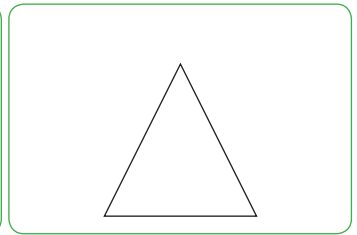
2. Draw pictures of computer mouse, monitor and CPU.
3. Draw the following pictures using Microsoft Paint and color them



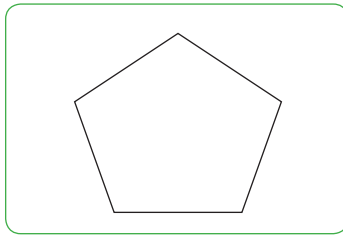
Diamond



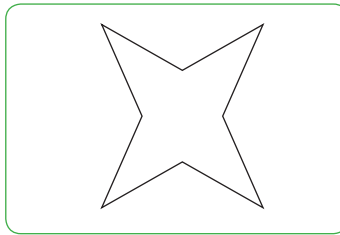
Circle



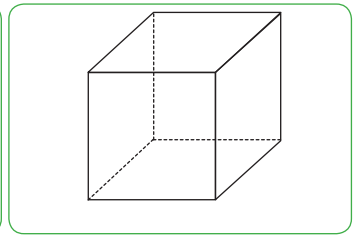
Triangle



Pentagon



Star



Box

4. Open Typshala typing program and practice the different levels of lessons.

Computer and Our Health

4.1 Introduction

While using a computer, you must take care of your health. If you do not use a computer properly, it may impact on your health. When working on a computer, you mostly use our hands and eyes. When you use a keyboard for a long period of time, you get pain in our wrists and fingers. If you use the computer sitting in wrong posture, you may get pain in the back of the neck. It may also harm your eyes if you do not maintain the right distance between your eyes and the monitor. So, improper ways of using computer can cause back pain, wrist pain, fingers pain, eye pain, and other health issues.

Fig.
241

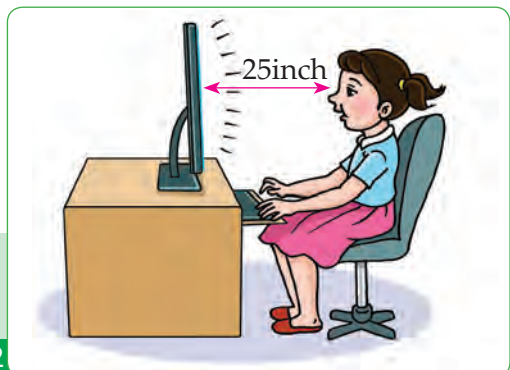


4.2 Safety Measures While Using Computer

To avoid the negative effect in health, you have to adopt the given safety measures.

- The distance between your eyes and the screen must be at least 25 inches.
- The letters must be black on a light background.

Fig.
242



- c. You should avoid working on screens that are too bright or too dark.
- d. You should sit straight in a chair to keep our backbone straight.
- e. You have to keep your head in little tilted position.
- f. The computer monitor and our eyes should be at the same level.
- g. There should be fresh air flow in the room.
- h. You should not use a computer for a long period of time.
- i. You should take a short visual break every 20 minutes to avoid strain.

4.3 Securing and Cleaning a Computer

A computer is a very delicate electronic machine. You must handle it with care to keep it in good operating condition. The improper use of a computer can decrease the lifespan of it and can damage it.

Activity 1

Discuss the ways of securing of a computer with your friends and list them.

4.3.1 Securing a Computer

The following are some measures for securing a computer:

- a. You should not try to repair or solve a problem in a computer yourself.
- b. You should use UPS (Uninterruptible Power Supply) or UPS inverter to supply electric power to a computer.
- c. You should press keys on a keyboard lightly.
- d. You should press mouse buttons lightly.
- e. You should not hit or bang the computer hardware. Hitting or banging the computer can damage computer hardware.

- f. You should not cover the CPU casing while working on it.
- g. You should not use a pen drive or any other external storage device haphazardly.
- h. You should not play game near a computer.
- i. You should not eat or drink near a computer.
- j. You should not connect heavy electric equipment in the same power outlet where you have connected a computer.
- k. A computer should be properly shut down.

Fig.

243



4.3.2 Cleaning of a Computer

A computer should be cleaned on a regular basis. Dust particles deposited on a keyboard or mouse can cause them to malfunction. Dust particles can slow down the speed of a cooling fan and a computer becomes hot. So, dust particles in a computer must be cleared.

Activity 2

With your friends, discuss the ways to clean a computer and make a list.

The following methods can be used to clean a computer:

- a. Use a soft brush or air blower machine to remove dust particles from a keyboard.
- b. Wipe away dust particles deposited on the mouse's bottom using the soft cloth.
- c. Clean the dust particles on the cooling fans with the air blower machine.

- d. Gently wipe the screen with a clean and soft cloth.
- e. Cover the computer when it is not in use.

Fig.

244



Key concepts

- Improper ways of using a computer can cause back pain, wrists pain, fingers pain, eye pain, and other health issues.
- You should not use a computer continuously for a long time.
- The distance between our eyes and the screen must be at least 25 inches.
- You should have to take a short visual break in the interval of 20 minutes.
- A computer is a very delicate electronic machine.
- You must handle it with care to keep it in good operating condition.
- You should follow the methods for securing a computer.
- A computer should be cleaned regularly to remove the dust particles from it.

Exercise

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

- a. The improper ways of using a computer can damage eyes of a user. ☐
- b. We should not work on the very bright or very dim screen. ☐
- c. You should press a key on keyboard hard to enter a character. ☐

- d. We should handle a computer roughly to keep it in good working condition. ☐
- e. The system unit of a computer should be covered while using a computer to avoid entering of dust. ☐
- f. A computer monitor can be cleaned with sandpaper. ☐

2. Fill in the blanks with the suitable word given below.

fingers backbone 25 20 failure damage

- a. When we use a keyboard continuously for a long time we feel pain in
- b. We need to keep at least inches distance from our eye to screen.
- c. We should take a short visual break every minutes to avoid strain.
- d. The frequent power or fluctuation in electric voltage can damage a computer.
- e. The dust particles deposited on a keyboard can it.

3. Answer the following questions.

- a. List two health issues that may occur due to the improper use of a computer.
- b. List any four ways to avoid the negative effects of computers on your health.
- c. Why should you use a computer properly?
- d. List any four ways of securing computer.
- e. Why should a computer be cleaned?
- f. Mention any two ways of cleaning a computer.

4. List any five safety measures while using a computer.

5. How do you secure a computer and clean at your home? Write.

5.1 Internet

The Internet, also known as Net, is the world's largest computer network. It is a technology that connects millions of computers all over the world. The computers on the Internet provide many services to people.

Fig.
25.1



People connected to the Internet can do the followings:

- a. They can quickly search information on a variety of topics and subjects.
- b. They can send or receive message, i.e. e-mail fast and at cheap price.
- c. They can sell or buy goods.
- d. They can do online text chatting and video chatting.
- e. They can play different online games.
- f. They can take online classes.

Fig.
25.2

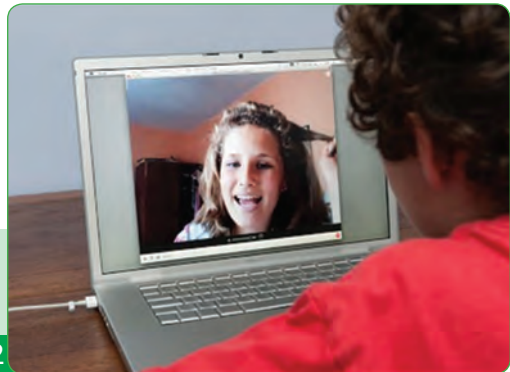


Fig.
25.3



- g. They can watch movies or any other video.

5.2 Website

There are millions of websites on the Internet. These websites provide information on different topics and subjects. Each website has unique Internet Address or web address. A web address is also known as Uniform Resource Locator (URL).

Some popular websites of Nepal are www.moecdc.gov.np, www.learning.cehrd.edu.np, www.onlinekhabar.com, www.esewa.com.np, www.hamrobazar.com, www.nagariknews.com, and www.dcnepal.com.

Some websites on the Internet help you to search and get the information. Such websites are called Search Engine. Some popular Search Engines are Google.com, Yahoo.com, and Bing.com.



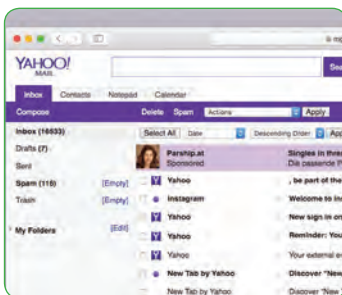
Fig.
254

5.3 Searching information through the Internet

To see the content of a website, a web browser is required on a computer or smart mobile. A web browser is a program that displays the content of a website. A web browser is also called Internet browser. Google chrome, Mozilla Firefox, Microsoft Edge and Opera are some popular web browsers.



Google.com



Yahoo.com



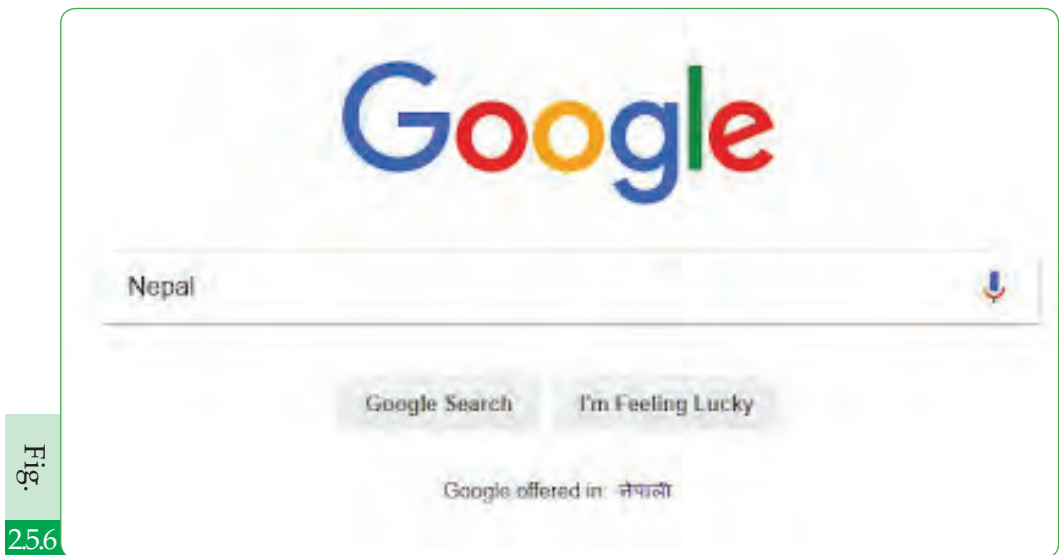
Bing.com

Fig.

255

To search the information on the Internet, you have to follow these steps:

- a. Open a web browser.
- b. Open a search engine www.google.com, www.yahoo.com, or www.bing.com.



- c. Type the text or keyword what you want to search in the search box.
- d. Click on Search button or press the Enter key. It displays a list of matching websites.
- e. Open a suitable website.

Key concepts

- The Internet, also known as Net, is a technology which connects millions of computers across the world.
- Website gives information about different topics or subjects.
- A search engine is a website that enables you to search and get information on web. Yahoo.com, google.com, bing.com, etc. are some popular search engines.

- A web browser displays the web pages of the website on a computer/mobile. Microsoft Internet Explorer, Mozilla Firefox, Google chrome, etc. are web browsers.

Exercise

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

- The Internet is also known as Net. ☐
- Search Engine is the website that helps you to search information. ☐
- Google chrome and Mozilla Firefox are two search engines. ☐
- Yahoo.com and Bing.com are web browsers. ☐
- A web browser displays web pages of website on the computer. ☐

2. Fill in the blanks using appropriate words.

- The Internet is the largest group of computers.
- Each website has unique Address.
- Google.com and bing.com are
- A displays the web pages of the specified website on the computer.
- Mozilla Firefox and Microsoft Internet Explorer are

3. Answer the following questions.

- What is the Internet?
- List any two things that you can do on the Internet.

- c. What is website? Name any two websites.
- d. What is search engine? List any two search engines.
- e. What is use of web browser? List any two web browsers.

4. Identify following web browsers and write their names.

a.



b.



c.



5. Write down the importance of internet in our daily life.

LAB Activity

1. Take permission from your teacher and search information about 'Internet' in the Google.
2. Visit different websites of Nepal like dcnepal.com, cybersansar.com, ekantipur.com, etc.
3. Create an email account in Yahoo or Gmail.
4. Send an email to your friend.

UNIT 03

Organisms and Environment

Estimated teaching hours : 10

Before You Begin

A variety of plants and animals are found around us. They breathe, grow, move, excrete and reproduce. They are also called living organisms. The things having life are called living organisms. Living organisms die after a certain time period.

The natural world around us which is made of living things and non-living things is called the environment. It consists of physical world, plants and animals. Living beings get food and shelter from the environment. Human

beings depend on the environment to get food, shelter, water, clothes and other useful materials. There is a close relationship between living beings and the environment.



Learning Outcomes

After completing the study of this unit, students will be able to:

- state the factors affecting organisms (sunlight, air, water, soil and other organisms) and describe interrelationship among them.
- prove the fact that living things depend on their environment for survival.
- explain the effect in environment due to increase in the number of organisms.

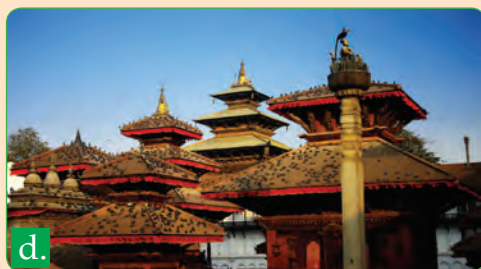
Glossary

carnivores	: the animals that feed only on flesh
environment	: the natural world around us which is made of living beings and non-living things
fertile	: capable of growing, developing or reproducing
herbivores	: the animals that feed only on plants
omnivores	: the animals that feed on both plants and flesh
photosynthesis	: the process of making food by green plants
shelter	: protection from rain, danger or attack
survival	: the state of continuing to live or exist

1.1 Introduction

Activity 1

Study the given figure and answer the following questions.



- What do you see in the above figures?
- What is the source of food for animals?
- How are animals and plants interrelated?
- How are non-living things and living things interrelated?
Discuss in the classroom.

We can see a large number of plants and animals around us. Plants and animals are living beings. We also see soil, water, rocks, sunlight, etc. around us. These are non-living things. Both living things and non-living things together form environment. So **the environment is made of non-living things and living things.**

A variety of plants and animals are found around us. They breathe, grow, move, excrete and reproduce. They are also called living organisms. **The things having life are called living organisms.** Plants, animals and micro-organisms are the living beings found around us. Living organisms die after a certain time of period.

1.2 Components of Environment

Environment mainly consists of two types of components. They are living components and non-living components. The living components of environment are different types of plants, animals and micro-organisms. Similarly, the non-living components include sunlight, air, water, soil, etc.

In this lesson, we will study the non-living components of an environment in brief.

1. Sunlight

Sunlight is the main source of energy for the earth. We get light and heat from the sun. Observe the given figures and discuss the role of the sun in an environment.

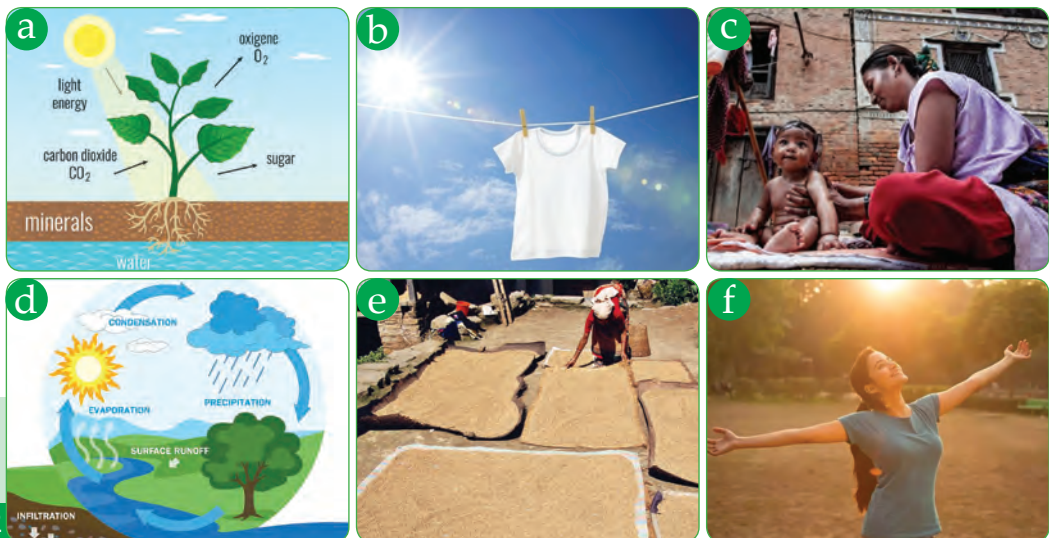


Fig.

312

All green plants need sunlight to prepare their food during photosynthesis. We get warm

and the entire earth remains warm due to the heat of the

sun. We dry clothes, grains and other items in the sun. The heat of the sun maintains water cycle on the earth. We can produce electricity using solar panel. The sun provides light to the earth. Due to these reasons, the sun is the most important component of the environment.

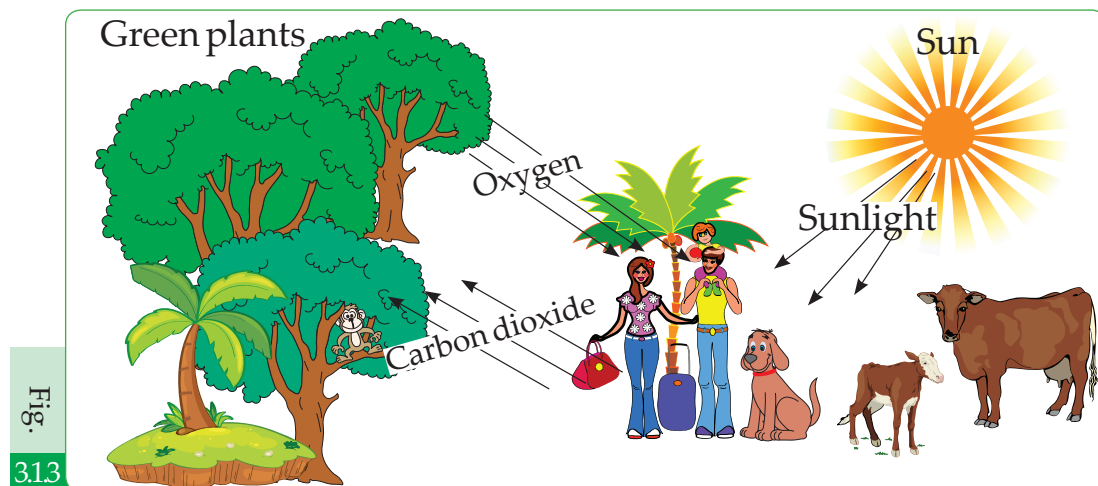
Do You Know

- The sun is the main source of energy for the earth. We cannot survive in the absence of the sun.

Project Work 1

- Take a chart paper and draw any four pictures showing the importance of the sun in the environment.
- Put suitable colour in the pictures and display the chart paper in the classroom.

2. Air



Air is another important component of the environment. Living beings use oxygen for breathing. No organisms can survive without air. All living beings breath in oxygen and release carbon dioxide. Green plants use carbon dioxide for making

food. Air helps in drying wet clothes, dispersal of seeds, etc. It also helps in pollination.



The fast moving air may break tall trees. It may blow roofs, dust particles, plastics, etc.



Activity 2

Take a chart paper and draw two figures showing advantages and two figures showing disadvantages of air.

3. Water

Water is another component of the environment. **Animals and plants cannot survive in the absence of water.** Plants cannot grow properly without water. Many animals live in water. Fish, frog, duck, crocodile, etc. live in water. Animals need water for drinking. We use water for drinking, bathing, washing clothes, cleaning, etc.

Fig.

3.16



4. Soil

Soil is another component of the environment. All plants grow in soil. Many animals live in the soil. Earthworm, rat, snake, etc. live in the soil. We make houses, roads, crop fields, parks, etc. on the soil.

Observe the given figures and discuss the importance of soil in the classroom.

Fig.

3.17



Activity 3

- Visit a nearby garden. Observe different types of animals and plants present there. How are plants, animals and non-living things interrelated to each other? Discuss.
- Prepare a list of any five organisms and write down their role in the environment.

Organisms	Role in environment
1.	
2.	
3.	

4.	
5.	

1.3 Interaction between Living things and Non-living things in the Environment

Plants and animals live in the environment. **The natural world around us where plants and animals live is called environment.** It consists of living beings (plants and animals) and non-living things. Plants and animals including microorganisms depend on each other for their existence on the earth.

Environment includes physical world and living things. Plants and animals depend on water, air, soil, sunlight, etc. Green plants depend on non-living things like water, carbon dioxide, etc. to prepare food. Animals depend on plants directly or indirectly for food. So, animals cannot survive in the absence of plants. Similarly, plants cannot exist in the absence of water, soil, air, sunlight, etc.



Fig.

318

When plants and animals die, they are broken down into simple non-living things by saprophytes like bacteria, fungi, etc. Similarly, animals discharge various waste materials like urine, stool, etc. in the environment. Those waste materials add nutrients to the soil. Saprophytes act on those waste materials and form simple substances which are mixed in soil.

Plants and animals get water, air, and other substances from the environment and again they release various substances in

the environment. In this way, all plants and animals are closely related to their environment.

Activity 4

- Take a chart paper. Draw a picture that describes the relationship between living things and non-living things.
- Colour the picture and submit to your science teacher.

Project Work 2

- Take some seeds of bean. Soak these seeds for 1 day.
- Sow some seeds in the garden with moist fertile soil. Water the seeds regularly. Observe them after every 3 days for two weeks.
- Prepare a short report on the basis of your observation.
- Submit the report to the science teacher.

Activity 5

Take a chart paper and draw a neat figure showing photosynthesis. Put suitable colour in the picture and display in the classroom.

Key concepts

- The environment is made of non-living things and living things.
- The things having life are called living organisms.
- Environment mainly consists of two types of components. They are living components and non-living components.
- All green plants need sunlight to prepare their food during photosynthesis.
- No organisms can survive without air. All living beings breathe in oxygen and release carbon dioxide.

- Animals and plants cannot survive in the absence of water.
- The natural world around us where plants and animals live is called environment.

Exercise

1. Choose the best answer from the given alternatives.

- a. Which of the following is the living component of the environment?

☐ Soil ☐ Water ☐ Plant ☐ Sunlight

- b. Which of the following is the non-living component of the environment?

☐ Sunlight ☐ Plant
☐ Animals ☐ Bacteria

- c. Air is useful for

☐ breathing ☐ drying wet clothes
☐ pollination ☐ all of them

- d. Which of the given things are essential for photosynthesis?

☐ sunlight, air and soil ☐ sunlight, air and water
☐ water, soil and air ☐ air and sunlight

e. Sunlight is essential for

☐ photosynthesis

☐ getting light on the earth

☐ running water cycle

☐ all of them

2. Fill in the blanks using appropriate words.

a. The natural world around us is called

b. Environment is made of living things and

c. The process of making food by green plants is called

d. The helps to run water cycle on the earth.

e. Many plants and live on the soil.

3. Put a tick (✓) for the correct statements and a cross (×) for the incorrect ones.

a. Environment does not contain animals.

☐

b. Sunlight is not required for photosynthesis.

☐

c. Plant can survive without water.

☐

d. We get food and timber from plants.

☐

e. Non-living things do not depend on living things.

☐

4. Answer the following questions.

a. Define organisms and environment.

b. Name the major components of environment.

c. Name any three non-living components of environment.

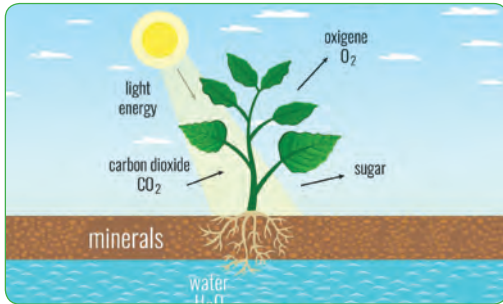
d. Write any two utilities of soil to organisms.

e. What are advantages of water?

f. Write any three advantages of air to human beings.

5. How do plants and animals get benefit from environment? Explain.

6. Study the given figures and write short note on each.

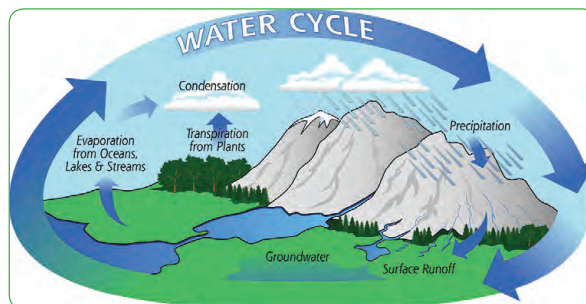


a.



b.

7. What is shown in the given figure? Describe the role of the sun to run this process.



8. There is a close relationship among plants, animals and environment. Justify this statement.

9. Prepare a list of the things essential for photosynthesis.

10. Why is water essential for plants and animals?



Interrelationship Between Organisms and Environment

2.1 Introduction

Observe the given figures and discuss the relation between living beings and environment.



Fig.

3.2.1

All living beings depend on their environment to get food and shelter. Similarly, plants and animals depend on one another to survive, grow and reproduce. Living beings depend on physical environment such as sunlight, air, water, soil, etc.

All living beings depend on non-living things of the environment like air, water, soil, sunlight, etc. Living beings cannot survive in the absence of non-living things in the environment.

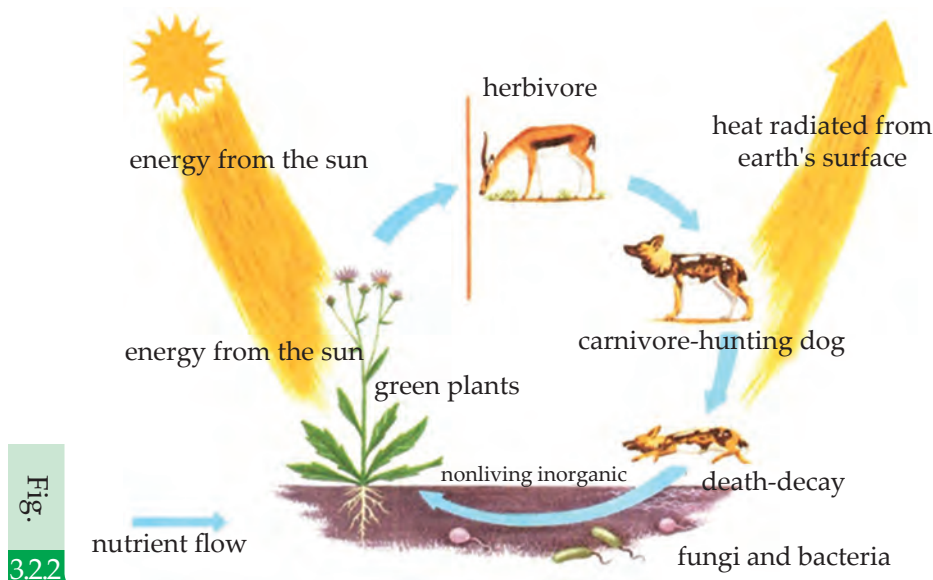


Fig.

3.2.2

Interrelationship between living beings and environment

The above figure shows the interrelationship between living beings and the environment. Living beings need air, water and food. They get these things from the environment.

Green plants can prepare their own food by using carbon dioxide and water in the presence of sunlight. They take carbon dioxide from the environment through the small pores (stomata) present in their leaves. Similarly, roots of plants absorb water and minerals from the soil. The chlorophyll present in leaves traps the solar energy to prepare food. So, all green plants depend on the environment to get the raw materials for photosynthesis.

Do You Know

- The process of making food by green plants by using carbon dioxide and water in the presence of sunlight is called photosynthesis.
- Green plants prepare food in their leaves.

In photosynthesis, green plants take carbon dioxide gas from the environment and they release oxygen gas. All living beings, i.e. plants and animals take oxygen gas for respiration and release carbon dioxide gas. In this way, there is a balance in the amount of oxygen gas and carbon dioxide gas in the environment.

Human beings depend on the environment for food and shelter. We depend on plants and animals to get a variety of food items. Similarly, we use a variety of non-living things from the environment to make our lives comfortable. Human beings depend on the environment to construct houses, schools, bridges, roads, etc.



Fig.

3.2.3

Human beings depend on plants and animals for food

When animals and plants die, they are decomposed into simple substances by the action of bacteria and fungi. These simple substances get mixed into soil. Similarly, the waste products of animals like urine, stool, etc. also get mixed into the soil and help to increase the fertility of soil.

Living beings take air, water and other substances from the environment and they release excess and unwanted materials in the environment. This process helps to maintain balance in the environment. Therefore, there is a close relationship between living beings and the environment.

Project Work

- Observe at least five animals and five plants around your home.
- Study the relationship between these plants and animals with their environment.
- Draw a neat figure to show the relationship among them and submit it your science teacher.

2.2 Interrelationship between Plants and Animals

All plants and animals are interrelated to each other for survival. All the animals depend on green plants directly or indirectly to get oxygen and food. For example, crow, goat, sheep, deer, rabbit, etc. are herbivores. They depend on grass and other plants for food. Similarly, carnivores like tiger, lion, etc. feed on herbivores. Carnivores do not eat plants directly but herbivores cannot survive without plants. Therefore, carnivores indirectly depend on plants to obtain food.



When animals and plants die, their dead bodies are decomposed into simple substances due to the action of bacteria and fungi. Those substances are mixed to the soil. Green plants absorb those materials through roots to prepare food. In this way, plants and animals depend on each other for their survival.

Green plants are autotrophs. They can prepare their own food by photosynthesis. But animals are heterotrophs. They cannot

prepare their own food like green plants. So they depend on green plants directly or indirectly for food.

Herbivores like cow, goat, sheep, deer, etc. feed on plants and these animals are eaten by carnivores. It shows that all animals depends on plants for their food.

Animals breathe in oxygen and breathe out carbon dioxide gas. Green plants use carbon dioxide gas for photosynthesis and release oxygen gas. So plants and animals depend on each other.

Human beings depend on plants to obtain food and shelter. Birds like woodpecker, parrot, etc. live in the holes of trees. Animals like monkey, baboon, tree frogs, etc. live in trees. Different types of birds make their nests on trees. We get different medicines from plants. Therefore, a close relationship exists between plants and animals.

Activity 1

- Observe some plants and animals in your surroundings. Study how they depend on each other for food.
- Draw a neat figure after your observation.

2.3 Effects on Environment Due to Population Growth

The population of human beings is increasing rapidly. Increasing population demands more food, more clothes and more space. Human beings fulfill all their necessities from the environment.

The amount of resources like air, water, soil, timbers, etc. is limited. Overuse of these resources affect the environment adversely. Ultimately, it degrades the natural environment. The negative impacts on the environment due to population growth are as follows :

1. Deforestation
2. Scarcity of water
3. Scarcity of fertile land
4. Global warming
5. Environment pollution
6. Urbanization
7. Industrialization
8. Loss of biodiversity

2.3.1 Population Growth and Overuse of Natural Resource

Human beings obtain food and shelter from environment. They use natural resources for various purposes like producing food, constructing shelters, operating industries and factories, etc.



Growth in population results in more use of natural resources. As a result, natural resources are getting destroyed to fulfill the demands of increasing population. It creates environmental imbalance resulting in environmental degradation. Thus, it is essential to control rapid population growth to conserve environment.

2.3.2 Industrialization

Industrialization is one of the major causes of environmental degradation. **The rapid growth in industries, factories, etc. is called industrialization.** With the advancement in science and technology, many industries and factories are in operation to meet the various demands of people.

Industries and factories are essential for economic development of the nation. But, unplanned and unmanaged rapid growth in industrialization causes environmental degradation. More natural resources as raw materials are needed to operate

industries. It results in degradation of natural resources.

Sound produced from industries or factories is the cause of sound pollution. Inorganic components like plastics produced from industries pollute land. Thus, unmanaged industrialization degrades natural environment. Hence it is necessary to control rapid growth of unplanned industrialization in order to conserve environment.

Fig.

3.2.6



Activity 2

Make a visit to an industry or a factory in your locality. Study its adverse effects on environment of the surrounding area. Prepare a short note on the basis of your study.

2.3.3 Urbanization

Urbanization is the process of establishing cities or towns by construction of large buildings. At present, people migrate to city areas in search of various facilities like employment, education, health, etc. It causes over population and is the cause of over pressure and over use of natural resources like water, air, etc. Unplanned urbanization is the main cause of pollution. It also degrades the natural environment.

Fig.

3.2.7



Key concepts

1. All living beings depend on their environment to get food and shelter. Similarly plants and animals depend on one another to survive, grow and reproduce.
2. In photosynthesis, green plants take carbon dioxide gas from the environment and they release oxygen gas.
3. Human beings depend on the environment for food and shelter. We depend on plants and animals to get a variety of food items.
4. All plants and animals are interrelated to each other for survival.
5. All the animals depend on green plants directly or indirectly to get oxygen and food.
6. Increasing pollution affect the environment adversely.
7. The rapid growth in industries, factories, etc. is called industrialization.

Exercise

1. Put a tick (✓) for the correct statement and a cross (×) for the incorrect one.

- | | |
|---|--------------------------|
| a. Environment is the natural world around us. | <input type="checkbox"/> |
| b. Animals do not depend on plants for food. | <input type="checkbox"/> |
| c. Green plants can prepare their own food. | <input type="checkbox"/> |
| d. Human beings do not depend on animals for food. | <input type="checkbox"/> |
| e. Overpopulation is the main cause of deforestation. | <input type="checkbox"/> |

2. Fill in the blanks with appropriate words.

- a. Living beings get food and shelter from the
- b. Cow, sheep and goat are
- c. The process of making food by green plants is called
- d. Animals breathe in gas and release
- e. The process of establishing cities and town is called

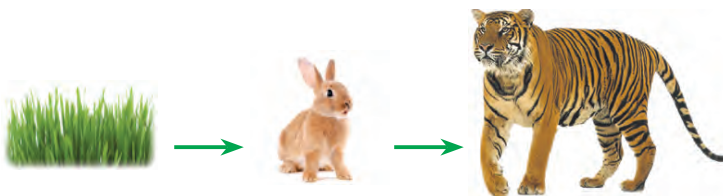
3. Answer the following questions.

- a. What is environment?
- b. What is photosynthesis?
- c. What are herbivores? Give any two examples.
- d. What are carnivores? Give any two examples.
- e. Why do human beings depend on the environment?

4. Match the following.

- | | |
|-----------------|---|
| a. Autotrophs | <input type="checkbox"/> Bacteria and fungi |
| b. Herbivores | <input type="checkbox"/> Goat and tiger |
| c. Carnivores | <input type="checkbox"/> Green plants |
| d. Heterotrophs | <input type="checkbox"/> Tiger and lion |
| e. Decomposers | <input type="checkbox"/> Cow and sheep |

5. Study the given figure and write down the interrelationship among them for food.



6. Describe the relationship between living beings and the environment in brief.
7. Describe the relationship between plants and animals.
8. Prepare a list of any five things that human beings get from the environment.
9. Study the given figure. Write its causes and effects to the environment.



10. Increasing population causes scarcity of water. Explain it.
11. Write a short note on :
 - a. Population growth and its effect
 - b. Industrialization
12. What are the main causes of urbanization? Write its three adverse effects.
13. Prepare a list of any five negative impacts on the environment due to rapid population growth.

UNIT 04

Classification of Living Beings

Estimated teaching hours : 25

Before You Begin

A variety of animals and plants live on the earth. The earth is the common home of millions of organisms. These organisms are broadly grouped into two categories. They are plants and animals. These organisms may be unicellular (having only one cell) or multicellular (having many cells), small or large and aquatic or terrestrial. It becomes difficult to study all plants and animals one by one. Therefore, living beings are divided into many groups and sub groups to make their study easier. This process is called classification.

Learning Outcomes

After completing the study of this unit, students will be able to:

- identify invertebrates and vertebrates and differentiate between them.
- identify oviparous and viviparous animals and differentiate between them.
- introduce terrestrial animals around us and explain their characteristics.
- define aquatic animals and state their characteristics.
- differentiate between aquatic animals and terrestrial animals.
- classify plants in terms of herbs, shrubs and trees.
- introduce terrestrial plants and explain their characteristics.
- identify aquatic plants and state their characteristics.
- identify various parts of a flowering plant.

Glossary

adhesive	: a substance that makes things stick together
amphibians	: the animals that can live on land and in water
aquatic	: found or living in water or near water
arboreal	: relating to trees, living in trees
backbone	: vertebral column
claw	: one of the sharp curved nails on the end of animal's or bird's foot
enemy	: anything that harm something or prevents it from being successful
extinct	: no longer in existence
flexible	: able to bend easily without breaking

gills	: the breathing organs of fishes and other aquatic animals
habitat	: the place where an organism is normally found
hatch	: to emerge from an egg
hollow	: having a cavity within
hooves	: the hard parts of the foot of animals like cow, buffalo, etc.
hump	: a large lump on the back of some animals, especially camels
hydrophytes	: the plants that grow in water
invertebrates	: the animals without a backbone
mammals	: the animals having milk producing glands, i.e. mammary glands
marine	: connected with the sea and the animals and plants that live there
multicellular	: the organism made of many cells
nourish	: to provide with food and other things that are needed to live, be healthy, etc.
oviparous	: the animals that reproduce by laying eggs
prey	: an animal or a bird that is hunted or killed by another
reproduction	: the process by which living beings produce their own kinds
resistance	: a force that stops something moving or makes it move more slowly
skeleton	: the framework of the body made of bones
slippery	: difficult to hold because of being smooth
spongy	: soft and full of cavities, porous
streamlined	: a smooth even shape so that it can move quickly and easily through air or water
submerged	: covered with water
suckle	: to give a baby or young animal milk from the breast or udder
terrestrial	: living on the ground or on the land
unicellular	: the organism made of only one cell
vertebrates	: the animals having a backbone
viviparous	: the animals that reproduce giving directly birth to young ones
webbed	: an area of skin that is between the fingers or toes of an animal or a bird

Observe, Discuss and Learn

A variety of animals are found around us. Some of them are given below. Observe them carefully and answer the following questions.

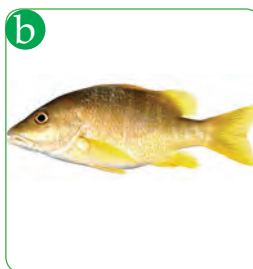
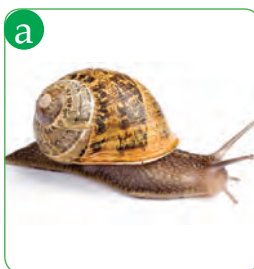


Fig.

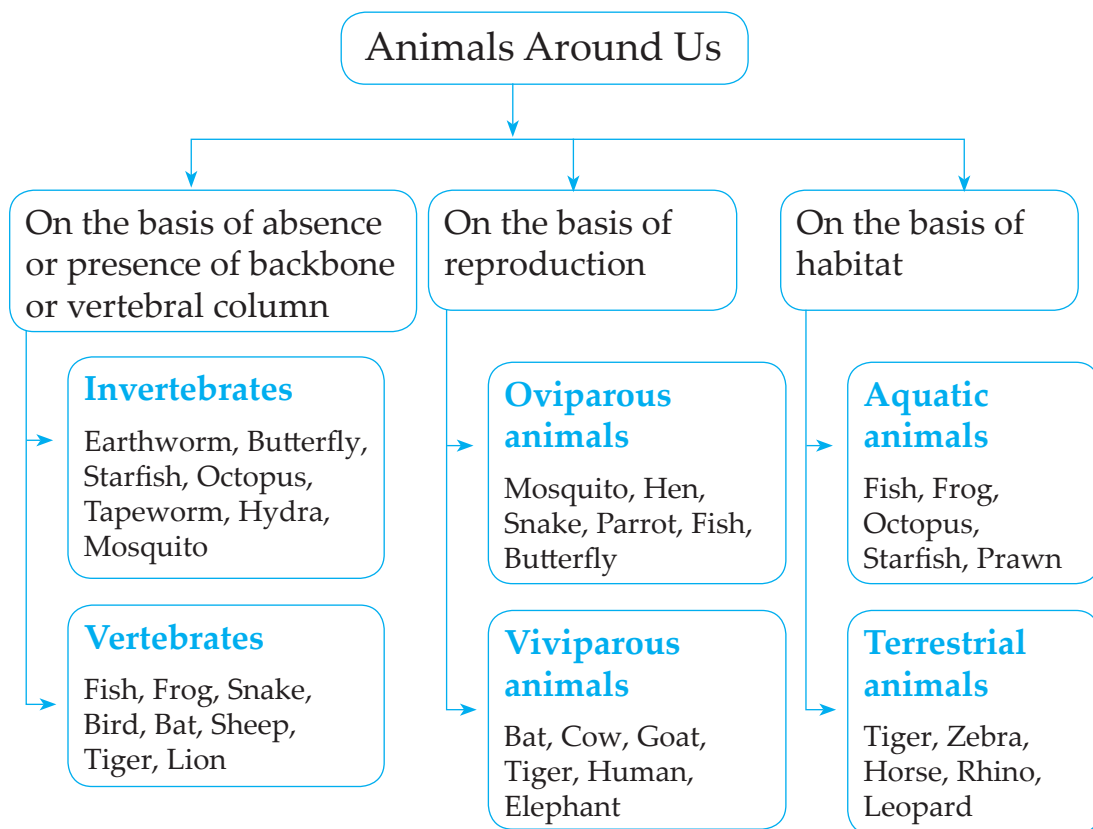
4.1.1

- What types of animals are shown in above figures?
- Do all of them have backbone?
- Which of them are found on land?
- Which of them lay eggs and which of them give birth directly to young ones?
- Divide these animals on the following groups after discussion.

S. N.	Groups	Name of animals
1.	Having backbone	
2.	Without backbone	

3.	Aquatic	
4.	Terrestrial	
5.	That lay eggs	
6.	That give birth directly	

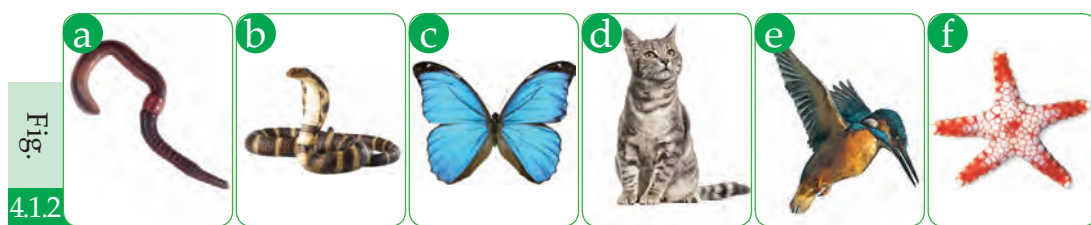
The animals around us can be classified as follows :



1.1 Invertebrates and Vertebrates

Observe, Discuss and Learn

Observe the given figures. Identify invertebrates and vertebrates among them.



Now, fill the given boxes after the discussion.

Animals having backbone	Animals without backbone	Animals having soft body	Animals without hard body

Different types of animals are found around us. Animals like cat, dog, cow, goat, buffalo, earthworm, snail, butterfly, slug, fish, frog, snake, etc. are found in our surroundings. Among these animals, some animals do not have a backbone and others have a backbone.

The animals which do not have a backbone are called **invertebrates**. Examples: Snail, butterfly, earthworm, slug, etc. Similarly, the animals having a backbone are called **vertebrates**. Examples: Cat, dog, cow, goat, buffalo, fish, frog, snake, etc. On the basis of absence or presence of a backbone, animals are divided into two groups. They are invertebrates and vertebrates.

1.1.1 Invertebrates

We can see a variety of animals around us. Among them animals like butterfly, cockroach, mosquito, crab, earthworm, leech, grasshopper and honeybee do not have a backbone or vertebral column. These animals are called invertebrates. Can you name some more invertebrates?

Some common invertebrates are given below:



Butterfly



Grasshopper



Spider



Octopus



Earthworm

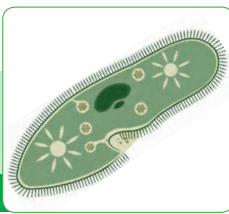


Snail

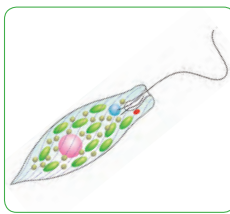
Fig.
4.1.3

Salient features of invertebrates

1. Invertebrates do not have a backbone.
2. They may be unicellular or multicellular.



Paramecium



Euglena

Fig.
4.1.4

Do You Know

The organisms having only one cell in their bodies are called unicellular organisms. Examples: Amoeba, paramecium, euglena, etc.

3. They live both in water (e.g. hydra, starfish, amoeba, octopus, etc.) and on land (e.g. snail, earthworm, butterfly, grasshopper, etc.).
4. They have a less developed body.
5. Most of invertebrates have a soft body. But the body of some invertebrates like snail, crab and beetle is covered with a hard protective cover.

Activity 1

- Observe some invertebrates present in your locality. Study their characteristics carefully.
- Draw neat and labelled figures of any five invertebrates and write any two features of each.

1.1.2 Vertebrates

Animals like cow, buffalo, rhinoceros, cat, dog, goat, sheep, crow, peacock, snake and crocodile have a backbone or vertebral column. These animals are called vertebrates. **The animals having a backbone or vertebral column are called vertebrates.**

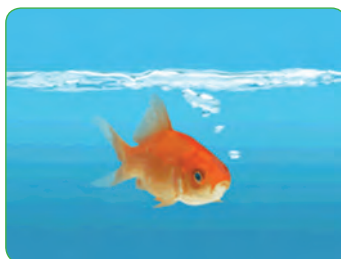
All the vertebrates are divided into five groups. They are fishes, frogs, reptiles (snakes, lizards, crocodiles), birds and mammals.



Dog



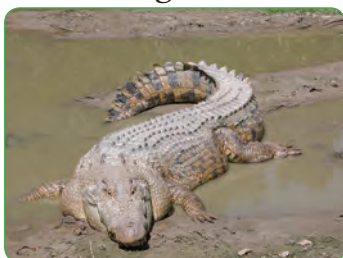
Pigeon



Fish



Buffalo



Crocodile



Elephant

Some vertebrates

The body of vertebrates is made of bones. These bones combine together to form the internal framework of the body. This framework is called the skeleton. The skeleton provides support to the body. We can stand with the help of bones. Have you seen an earthworm standing erect like us? Why?

Different vertebrates have different shapes and sizes. **The shape and size of a body depends on the arrangement of the bones.** The size of bones determines the size of the body. The skeleton also protects the vital body organs like brain, heart, eyes, etc.

Salient features of vertebrates

1. Vertebrates have a backbone or vertebral column.
2. They have bones in their bodies.
3. They have developed organs and systems.
4. They have well developed brain.
5. They breathe through gills (e.g. fishes, tadpoles) or lungs (frogs, snakes, birds and mammals).
6. Most vertebrates lay eggs (e.g. fishes, frogs, reptiles and birds) and some vertebrates (i.e. mammals) give directly birth to their young ones.



Fig.

4.1.6

*Human
backbone*

Activity 2

- Observe some vertebrates present in your surroundings and study their features.
- Take a chart paper, pencil and colour.
- Draw a neat and labelled figure of each with any two salient features.
- Submit the chart paper to the science teacher.

Activity 3

Classify given animals as invertebrates and vertebrates and complete the given table.

- Butterfly	- Frog	- Leech
- Tiger	- Snake	- Cow
- Starfish	- Octopus	- Parrot
- Human	- Tapeworm	- Earthworm

Invertebrates	Vertebrates

Activity 4

Differentiate between invertebrates and vertebrates on the basis of following parameters.

Parameters	Invertebrates	Vertebrates
Backbone		
Shape of body		
Size of body		
Toughness		
Life span		

Key Concepts

1. Invertebrates are the animals which do not have a backbone. They may be unicellular or multicellular.
2. The animals made of only one cell are called unicellular animals and the animals made of many cells are called multicellular animals.
3. The animals having a backbone or vertebral column are called vertebrates.
4. All the vertebrates are divided into five groups. They are fishes, frogs, reptiles, birds and mammals.
5. The internal framework of the body made of bones is called the skeleton.

Exercise

1. Tick (✓) the best answer from the given alternatives.

- a. Invertebrates do not have a
☐ backbone ☐ head ☐ leg
- b. Which of the given animals is an invertebrate?
☐ fish ☐ frog ☐ butterfly
- c. Vertebrates are the animals having
☐ gills ☐ backbones ☐ legs
- d. Which of the given animals lays eggs?
☐ fish ☐ cow ☐ buffalo
- e. Which of the given animal breathes through gills?
☐ fish ☐ dolphin ☐ bird

2. Put a (✓) for the correct statement and a cross (×) for the incorrect one.

- a. The animals having no backbone are called invertebrates. ☐
- b. Most invertebrates have a hard body. ☐
- c. Vertebrates breathe through gills and lungs. ☐
- d. Fishes, frogs and snakes lay eggs. ☐
- e. Mammals give birth directly to their young ones. ☐

3. Fill in the blanks using appropriate words.

- a. Backbone is absent in
- b. Invertebrates live in and on land.
- c. The internal framework of the body made of bones is called the

- d. Brain is well developed in
- e. Most invertebrates have body.

4. Answer the following questions.

- a. What are invertebrates? Give any four examples.
- b. Write any three salient features of invertebrates.
- c. Define vertebrates with any four examples.
- d. Write any three salient features of vertebrates.
- e. What is the skeleton? Write any two functions of the skeleton.

5. Write any two differences between invertebrates and vertebrates.

6. Name any two unicellular invertebrates and two multicellular invertebrates.

7. Name any two vertebrates that breathe through gills and two vertebrates that breathe through lungs.

8. Identify invertebrates and vertebrates from the following.

a.



b.



c.



9. Give reason:

- a. An earthworm is called an invertebrate.
- b. A snake is called a vertebrate.

10. Name any three vertebrates that lay eggs and three vertebrates that give directly birth to their young ones.

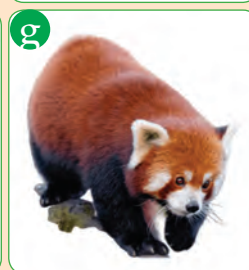
11. Name any three vertebrates that live on land and three vertebrates that live in water.

1.2. Oviparous and Viviparous Animals

Observe, Discuss and Learn

Activity 5

Observe the given figures and identify the animals that lay eggs and that give birth directly to their young ones.



**Animals that lay eggs
(Oviparous)**

**Animals that give directly birth
to young ones (Viviparous)**

Most of the invertebrates and vertebrates lay eggs to reproduce. These animals are called oviparous animals. Butterfly, mosquito, fish, frog, snake and parrot are some examples of oviparous animals. Some animals give directly birth to their young ones to reproduce. These animals are called viviparous animals.

All living beings reproduce to continue their races on the earth. **The biological process by which living beings produce their own kinds is called reproduction.** It is one of the major features of living beings. In the absence of reproduction, the existence of living beings on the earth would be impossible.

1.2.1 Oviparous Animals

Most invertebrates and vertebrates reproduce by laying eggs. These animals are called oviparous animals. Invertebrates like butterfly, mosquito, silkworm, grasshopper and honeybee lay eggs. Similarly, vertebrates like fishes, frogs, snakes, lizards and birds lay eggs.



Eggs of a butterfly



Eggs of a silkworm

Insects like butterfly and silkworm lay eggs on leaves. Most birds build nests and lay their eggs in the nest. The birds cover their eggs by spreading their wings. It helps to keep eggs warm. Warming of eggs is essential for hatching.



Hen with eggs



Chicks hatched from eggs

The animals that reproduce by laying eggs are called oviparous animals.

Some animals like fishes and frogs lay eggs in water. The eggs of a frog hatch into tadpoles in water. These tadpoles grow and finally develop into adult frogs. Some insects like mosquito also lay eggs in water. Most birds and some other animals take care of their babies. But insects, fishes, frogs and snakes do not take care of their babies.



Fig.
4.1.9

Eggs of a frog

Tadpole of a frog

Adult frog

1.2.2 Viviparous Animals

Some vertebrates like bat, cat, rat, cow, dog, sheep, elephant, goat and buffalo directly give birth to their young ones. These animals are called viviparous animals. These animals do not lay eggs. **In viviparous animals, babies develop inside the body of females.** Tiger, lion, bear, zebra, deer, chimpanzee, rabbit, squirrel and rhinoceros are some more examples of viviparous animals. **The animals that give directly birth to their young ones are called viviparous animals.**



Fig.
4.1.10

Dog with puppy

Sheep with lamb

Rhino with calf

Viviparous animals have milk producing glands (mammary glands or breasts). **Viviparous animals suckle their young ones and nourish them.**

Fig.
4.1.11



A cow is suckling its calf.



A dog is suckling its puppies.

Have you ever seen a cow licking its calf? Have you seen a dog taking care of its puppies? When we catch a puppy, its mother dog becomes angry and may bite us. **Viviparous animals take care of their babies and protect them from enemies.**

Activity 6

- Observe some invertebrate and vertebrate animals in your locality.
- Classify them as oviparous and viviparous animals.

PROJECT WORK

- Collect pictures of oviparous and viviparous animals from old books or internet.
- Paste them in a chart paper and submit to your science teacher.

Key concepts

1. The animals that reproduce by laying eggs are called oviparous animals. Examples: hen, crow, frog, snake, fish, butterfly, etc.
2. The animals that directly give birth to their young ones are called viviparous animals. Examples: cow, dog, human, goat, etc.

3. In viviparous animals, babies develop inside the body of females.
4. Viviparous animals suckle their young ones and nourish them.
5. Viviparous animals take care of their babies and protect them from enemies.

Exercise

1. Tick (✓) the best answer from the given alternatives.

- a. Which of the following is an oviparous animal?
☐ dog ☐ cow ☐ butterfly
- b. Which of the following is a viviparous animal?
☐ rabbit ☐ fish ☐ frog
- c. The process by which living beings produce their own kinds is called
☐ excretion ☐ reproduction ☐ respiration
- d. Which of the given animals has mammary glands?
☐ bat ☐ parrot ☐ snake
- e. Which of the given animal suckles its young ones?
☐ cow ☐ parrot ☐ fish

2. Put a (✓) for the correct statement and a cross (×) for the incorrect one.

- a. Living beings reproduce to continue their races. ☐
- b. Fishes and frogs are oviparous. ☐
- c. Snakes directly give birth to their young ones. ☐

- d. Cow and buffalo suckle their babies.
- e. Bat and dolphin are viviparous animals.

☐
☐

3. Fill in the blanks with appropriate words.

- a. The animals that lay eggs are called
- b. The animals which do not lay eggs are called
- c. Cow and goat are animals.
- d. The milk glands found in viviparous animals are called glands.
- e. The eggs of frog hatch into in water.

4. Answer the following questions.

- a. What is reproduction? Why do animals reproduce?
- b. What are oviparous animals? Write any four examples.
- c. What are viviparous animals? Write any four examples.
- d. What is the function of mammary glands?
- e. Name any four animals that do not take care of their babies.

5. Identify oviparous and viviparous animals from the following:

a.



b.



c.



d.

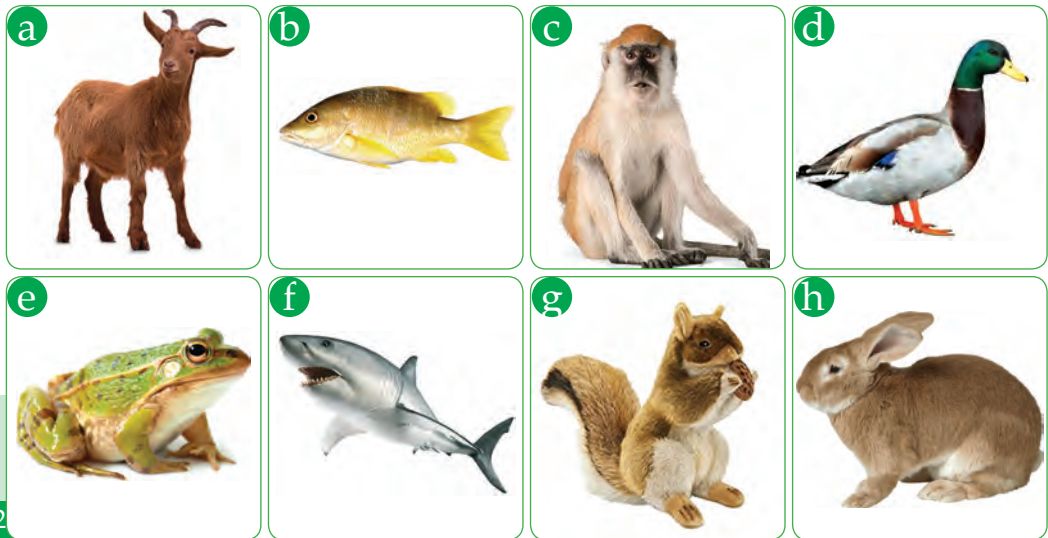


- 6. Write any two differences between oviparous and viviparous animals.
- 7. Write any two features of each oviparous animals and viviparous animals.
- 8. Cow is called a viviparous animal and fish is called an oviparous animal, why?

1.3. Terrestrial Animals

Observe, Discuss and Learn

Observe the given figures and identify the habitat of these animals.



- Where do these animals live?
- Name the breathing organs of these animals.
- Name the locomotory organs of these animals.
- Which of these animals can survive in water?

Animals live in different habitats on the earth. The earth has many habitats like forests, grasslands, cropfields, deserts, mountains, rivers, oceans, etc. **The environment where living beings live, grow and reproduce is called habitat.**

The animals that live on land are called terrestrial animals. Human, cow, tiger, rhinoceros, elephant, dog, lion, fox, etc. are some examples of terrestrial animals. These animals may be domestic or wild.

In this lesson, we will study various types of terrestrial animals and their characteristics.

1.3.1 Terrestrial Animals

The animals that live on ground or land are called **terrestrial animals**. Examples: tiger, lion, elephant, cow, buffalo, goat, human beings, fox, zebra, donkey, bear, etc. Terrestrial animals live in different habitats like forests, grasslands, cropfields, cold mountains, hot deserts, etc. Some of the terrestrial animals are given below:



Tiger



Elephant



Cow



Sheep



Zebra



Bear

Fig.

41.13

1.3.2 Characteristics of Terrestrial Animals

1. Carnivorous animals like tiger, lion, leopard, cheetah, etc. kill other animals and feed on flesh. These animals have long and powerful legs for running and pointed claws for catching their prey. They have sharp and pointed canines for tearing flesh.



Tiger is killing a deer.



Tiger is eating a deer.

Fig.

41.14

2. Herbivorous animals like cow, buffalo, goat, sheep, rabbit and deer feed on grass and plants. These animals have sharp front teeth (incisors) for cutting plants or leaves. They have strong and broad inner teeth (molars) adapted for grinding and chewing their food.

Herbivorous animals have long and strong legs to travel long distance in search of food. They have bilobed hooves for walking easily in a hilly region.

... ■ Do You Know ■ ...

The animals that feed on grass or plants are called herbivorous animals. Examples: cow, goat, sheep, rabbit, zebra, etc.



Fig.

41.15

cow



sheep



horse

Herbivores like horse, zebra, etc. have long and strong legs with non-lobed hooves which help them to run fast.



Fig.

41.16

Giraffe is picking the leaves of tall plant.



Elephant is breaking a tree branch.

3. Omnivores like fox, dog, crow, human, bear, etc. feed on both plants and flesh. These animals have well developed incisors and molar teeth for eating plants and flesh.

Fig.
41.17



A rat is cutting a sack.

Fig.
41.18



Fox is eating maize.



Fox is eating flesh.

4. Animals like rat, mole, squirrel, etc. have sharp and strong front teeth which help them for cutting their food.
5. Camel is a big desert animal. It has a hump on its back to store food in the form of fat. It has special tissues to store water.

Fig.
41.19



Camels

Do You Know

A camel is called the ship of desert. It can survive for 10-12 days without food and water.

6. Aerial animals like crow, peacock, sparrow, pigeon, vulture, hawk, etc. spend most time in the air. These animals have a pair of wings for flying. They have streamlined or boat-shaped body with light and hollow bones. Their body is covered with waterproof feathers.



Peacock



Pigeon

Some birds like pigeon, sparrow, hen, etc. feed on grains. They have a short and strong beak for eating grains. The beak of parrot is curved and strong for breaking covers of nuts or seeds.



Parrot is eating nuts.

Carnivorous birds like eagle, vulture, hawk, etc. have a strong and curved beak for tearing flesh. They have sharp and strong claws for catching their prey.



Vulture is tearing flesh.



Hawk is catching a bird.

7. Some insects like butterfly, dragonfly, mosquito, honeybee, etc. have wings for flying. Grasshoppers have strong jointed legs for jumping.

Fig.
4.1.23



Butterfly



Dragonfly



Honeybee



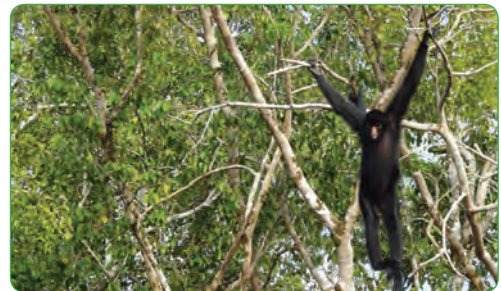
Grasshopper

8. Arboreal animals like monkey, baboon, squirrel, etc. have strong limbs for climbing and jumping. Monkeys have long and strong fingers for holding the branches of trees. Squirrel has a long tail and strong hind limbs for running. Squirrel, mole, etc. have powerful claws for digging and climbing.

Fig.
4.1.24



Squirrel is climbing a tree.



Monkey is hanging on a tree branch.

9. Animals like yak, polar bear, snow leopard, etc. live in cold places. These animals have thick and long fur on their skin. They have a thick layer of fat inside the skin to protect them from extreme cold.

Fig.
4.1.25



Yak



Polar bear



Snow leopard

10. Animals like house wall lizard, garden lizard, etc. have adhesive pads on their digits for crawling on the wall easily.



House wall lizard



Garden lizard

Project Work

- Observe different types of terrestrial animals present in your locality.
- Study their characteristics. Draw a neat figure of each and write their features in your project work notebook.

Key concepts

1. The animals that live on ground or land are called terrestrial animals.
2. Terrestrial animals may be herbivores, carnivores and omnivores.
3. Herbivorous animals have long and strong legs that help them to travel long distance in search of food.
4. Carnivorous birds like eagle, vulture, hawk, etc. have strong and curved beak for tearing flesh.
5. Arboreal animals like monkey, baboon, squirrel, etc. have strong limbs for climbing and jumping.

Exercise

1. Tick (✓) the best answer from the given alternatives.

- a. Cow, buffalo and sheep are animals.
☐ domestic ☐ wild ☐ aerial
- b. Sharp and pointed teeth are found in a
☐ goat ☐ buffalo ☐ lion
- c. Crow, pigeon and parrot are animals.
☐ wild ☐ aerial ☐ arboreal
- d. Which of the given animals has a hump?
☐ camel ☐ horse ☐ elephant
- e. Which of the given animal has adhesive pads on their digits?
☐ snake ☐ house wall lizard
☐ crocodile

2. Put a tick (✓) for the correct statement and a cross (×) for the incorrect one.

- a. The animals that live on land are called terrestrial animals. ☐
- b. Herbivorous animals have sharp and pointed teeth. ☐
- c. Monkeys and squirrels are called aerial animals. ☐
- d. Frogs have adhesive pads on their digits. ☐
- e. Yak and polar bear have thick fur. ☐

3. Fill in the blanks with appropriate words.

- a. The environment where living beings live is called
- b. The animals that live on land are called
- c. Carnivorous animals have and teeth for
- d. House wall lizards have..... pads on their digits.
- e. Birds have for flying.

4. Answer the following questions.

- a. What are terrestrial animals? Give any five examples.
- b. What is meant by habitat? Name any two habitats of animals.
- c. Define herbivorous animals with any three examples.
- d. Write any three characteristics of herbivorous animals.
- e. What are carnivorous animals? Give any two examples.
- f. Write any three characteristics of carnivorous animals.
- g. What are aerial animals? Write any two characteristics of aerial animals.
- h. What are arboreal animals? Give any two examples.

5. Write any two characteristics of each of the given animals.

a.



b.



c.



d.



e.



f.



6. Write any two differences between herbivores and carnivores on the basis of food and feeding habit.

7. Name any two terrestrial animals having each of the following characteristics.

- a. Having webbed feet
- b. Having feathers and wings
- c. Having thick fur
- d. Having sharp and pointed teeth
- e. Having sharp and curved beak.

1.4. Aquatic Animals

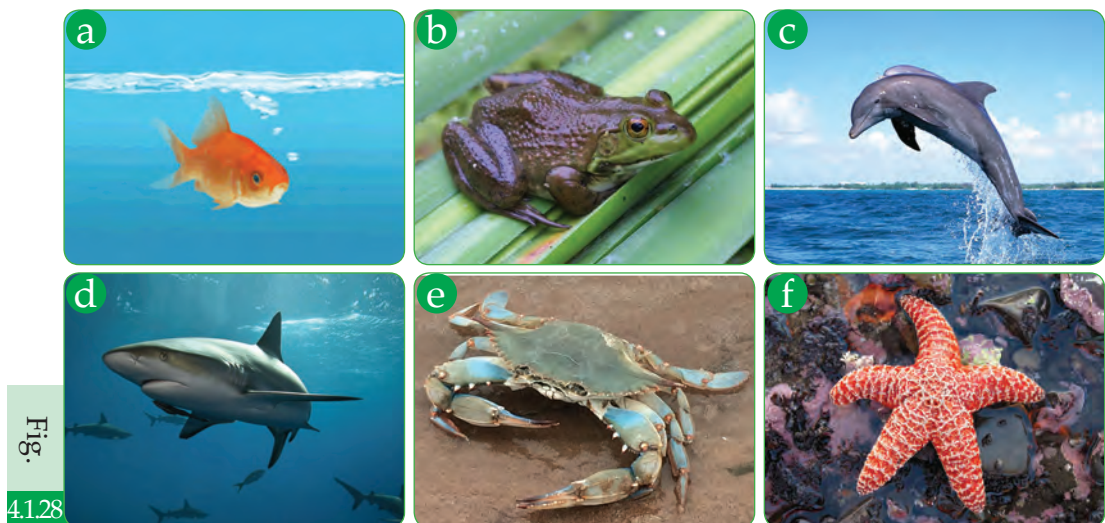
Observe, Discuss and Learn

Observe the given animals and discuss the answer of the following questions.



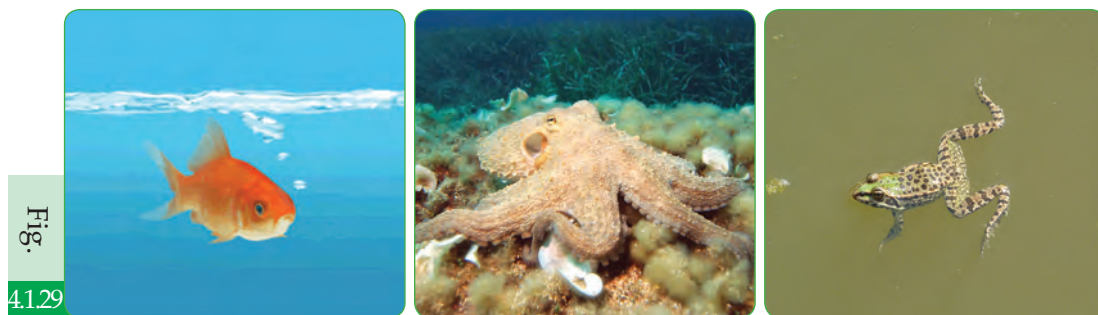
- Identify the animals that live in water.
- A frog can live on land and in water, why?
- A goat cannot live inside water, why?
- A fish dies when taken out of water, why?

Different types of animals like fish, shark, dolphin, starfish, crab, octopus, turtle and frog live in water. These animals are called aquatic animals. These animals have special features which help them to live in water. Some of the aquatic animals are shown below:



1.4.1 Characteristics of Aquatic Animals

1. Aquatic animals like fish, shark, dolphin, etc. have a boat-shaped or streamlined body. It helps them to swim easily in water.
2. Fishes have fins which help them to swim easily in water.
3. The body of aquatic animals is covered with smooth, slippery and water-proof scales or mucous coat. It helps them to reduce water resistance while swimming.



Fish

Octopus

Frog

4. Most aquatic animals breathe through gills. Their gills absorb oxygen dissolved in water. However, aquatic animals like dolphin, whale, frog, water snake, turtle and crocodile breathe through lungs. So they come out of water for breathing.



Gills of fish

5. Animals like frog and toad live on land and in water. These animals are called amphibians. They can breathe on land and in water. Amphibians breathe through lungs on land and through skin in water.
6. Animals like frog, duck, etc. have webbed-feet which help them to swim easily in water.

Fig.
4.1.31



Webbed feet of frog



Webbed feet of duck

7. Some birds like cranes, flamingos, king fishers, herons and ducks live in water or near rivers or ponds. Cranes, flamingos, etc. have long legs and beaks for fishing. Kingfisher has a long beak for catching fish.

Fig.
4.1.32



Crane



Flamingo



Kingfisher

Activity 7

- Visit a nearby pond or river along with your science teacher.
- Catch a fish and a frog. Study their adaptational characteristics.

Activity 8

- Observe at least five aquatic animals in your locality.
- Study the adaptational characteristics of each.

Activity 9

- Study the terrestrial and aquatic animals from your locality. Differentiate between them on the basis of given parameters.

Parameters	Aquatic Animals	Terrestrial Animals
Habitat		
Breathing organ		
Organ for movement		
Covering in the body		
Shape of the body		

Project Work

- Take a chart paper and glue stick.
- Collect the pictures of any five aquatic animals from old books.
- Paste these pictures on a chart paper and demonstrate in the classroom.

Key concepts

1. The animals that live in water are called aquatic animals. Examples: fish, frog, dolphin, octopus, starfish, etc.
2. Aquatic animals have boat-shaped or streamlined body, fins and gills. These features help them to live in water.
3. The animals that can live on land and in water are called amphibians. Examples: frog, toad, salamander, etc.
4. Amphibians can breathe on land and in water. Most aquatic animals breathe through gills.
5. Most aquatic birds have long legs and beaks which help them for fishing.

Exercise

1. Tick (✓) the best answer from the given alternatives.

- a. The animals that live in water are called animals.
☐ aquatic ☐ terrestrial ☐ wild
- b. Which of the given animals breathes through gills?
☐ frog ☐ fish ☐ dolphin
- c. Which of the given animals has fins for swimming?
☐ shark ☐ duck ☐ frog
- d. Which of the given animals does not have webbed-feet?
☐ frog ☐ duck ☐ crocodile
- e. Which of the given birds has long legs and beak for fishing?
☐ crane ☐ kingfisher ☐ duck

2. Put a tick (✓) for the correct statements and a cross (×) for the incorrect ones.

- a. The animals that live in water are called terrestrial animals. ☐
- b. Aquatic animals have a streamlined body. ☐
- c. Frogs breathe through gills in water. ☐
- d. A kingfisher has a long beak adapted for fishing. ☐
- e. Most aquatic animals breathe through gills. ☐

3. Fill in the blanks with appropriate words.

- a. Aquatic animals have body.
- b. Frogs breathe through in water and on land.

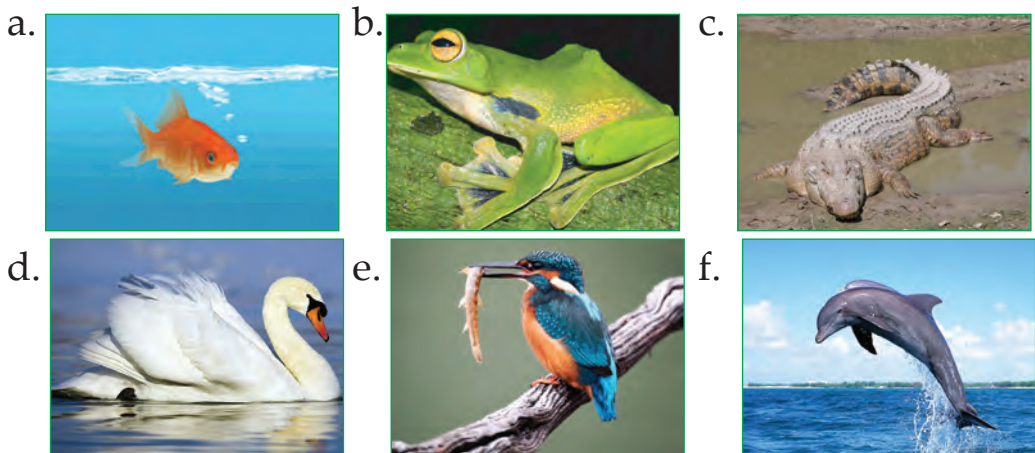
- c. The animals that can live on land and in water are called
- d. Ducks and frogs have feet.
- e. Water snake and crocodile breathe through

4. Answer the following questions.

- a. What are aquatic animals? Give any four examples.
- b. Write any three characteristics of aquatic animals.
- c. Write any three characteristics of fishes that help them to live in water.
- d. What are amphibians? Give any two examples.
- e. Write any two characteristics of amphibians.
- f. Write any two characteristics of aquatic birds.

5. Write any two differences between fish and frog on the basis of characteristics.

6. Write any two characteristics of each of the following animals.



7. Write one advantage of the given features to the aquatic animals.

- | | |
|-----------------------------|-------------------------|
| a. Streamlined body in fish | b. Webbed feet in frogs |
| c. Gills in aquatic animals | d. Fins in fish |
| e. Long beak in kingfisher | |

Observe, Discuss and Learn



Fig.

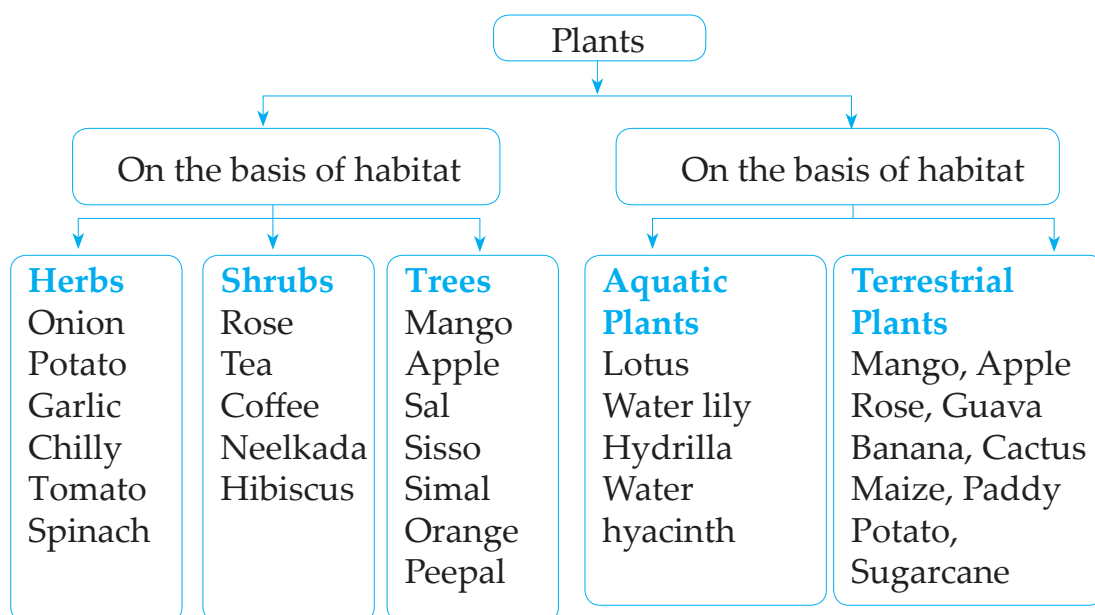
421

Classify above plants on the basis of given parameters.

Parameters		Name of Plants
Habitat	Land	
	Water	
Size of the plant	Small	
	Medium	
	Large	
Woody stem	Present	
	Absent	
Remarks		

2.1 Classification of Plants

A variety of plants are found around use. These plants can be classified as follows:



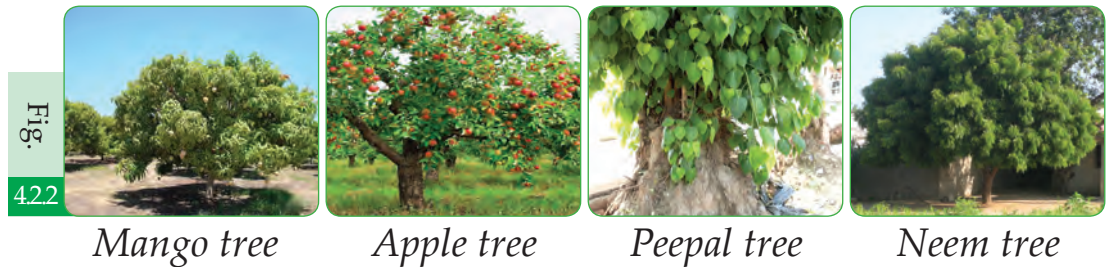
2.2 Terrestrial Plants

Project Work

- Observe at least ten terrestrial plants present in your locality and study their characteristics.
- Draw a neat and labelled figure of each.
- Write any two characteristics of each plant in your project work notebook.
- Submit your work to the science teacher.

The plants that grow on land are called terrestrial plants. We can see a variety of terrestrial plants around us. These plants differ in shape, size and appearance due to difference in altitude, soil, rainfall, temperature, etc. In different climatic conditions, different types of plants are found.

The plants that grow in hot places do not grow in cold places and vice-versa. Different plants need different climatic condition to grow and reproduce. Therefore, different types of plants are found in plains, hills, deserts and mountains. Some common terrestrial plants are given below.



1. In hot climate of Terai or plains, plants like sal, sissoo, jamun, simal, mango, banyan, guava, etc. are found. Most of them are tall and strong having many branches. In winter, these plants shed their leaves to protect them from cold.



2. Some plants like coffee, sugarcane, coconut, teak, khayar, bamboo, rubber, etc. grow in hot and moist climate. These plants are evergreen. They do not shed their leaves.



3. In desert or dry places, plants like cactus, aloe, opuntia, etc. are found. These plants are called xerophytes.

Xerophytes have a thick and fleshy stems modified to store water. Their leaves are reduced into thorns to reduce loss of water. These plants have long and branched roots modified to absorb water.

Fig.
4.2.5



Aloe



Cactus

Some Xerophytes

4. Some plants like mushroom, liverworts, fern, etc. grow in moist and shady places. These plants do not need much sunlight.

Fig.
4.2.6



Mushroom



Fern

Plants that grow in moist and shady places

5. In cold and dry places, plants like pine, dhupi, deodar, spruce, etc. are found. These plants have cones. So they are called conifers. They have needle-shaped leaves. These plants are tall and strong.

Fig.
4.2.7



Pine tree



Spruce tree



Deodar tree

2.3 Types of Plants on the Basis of Structure and Growth Pattern

Terrestrial plants are divided into three categories on the basis of structure and growth pattern. They are (i) Herbs (ii) Shrubs, and (iii) Trees.

(i) Herbs

Herbs are very small plants with soft and weak stems. Onion, garlic, tomato, potato, brinjal, tulsi, mint, ginger, maize, wheat, barley, marigold, dahlia, tomato, mustard, cabbage and lettuce are some examples of herbs. The stem of a herb is weak and can be broken easily. Herbs have short and weak roots. They survive for only one season.



Lettuce plants Tomato plants Dahlia plants Potato plants

(ii) Shrubs

Shrubs are medium-sized plants having bushy and woody stems. They are larger than herbs and smaller than trees. Rose, coffee, hibiscus, cotton, pomegranate, etc. are some examples of shrubs.



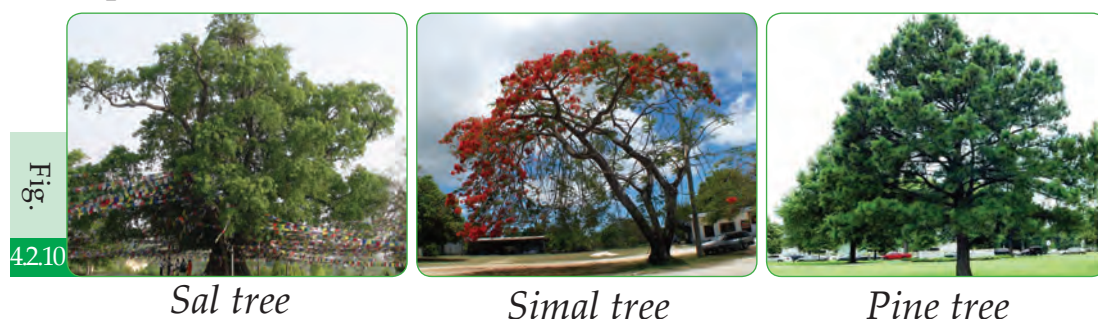
Hibiscus plants Cotton plants Coffee plants

Shrubs have hard and woody stems. They have many small branches and hence appear bushy. They have long and strong roots. They live for many years.

(iii) Trees

The big plants having hard and woody trunks are called trees. They are the largest and strongest plants. Pine, peepal, banyan,

simal, sal, sissoo, okhar, deodar, mango and jamun are some examples of trees.



Trees have many branches and sub-branches. Their roots are very long and strong. They live for so many years.

Activity 10

Observe different types of plants in your locality. Complete the given table after your observation.

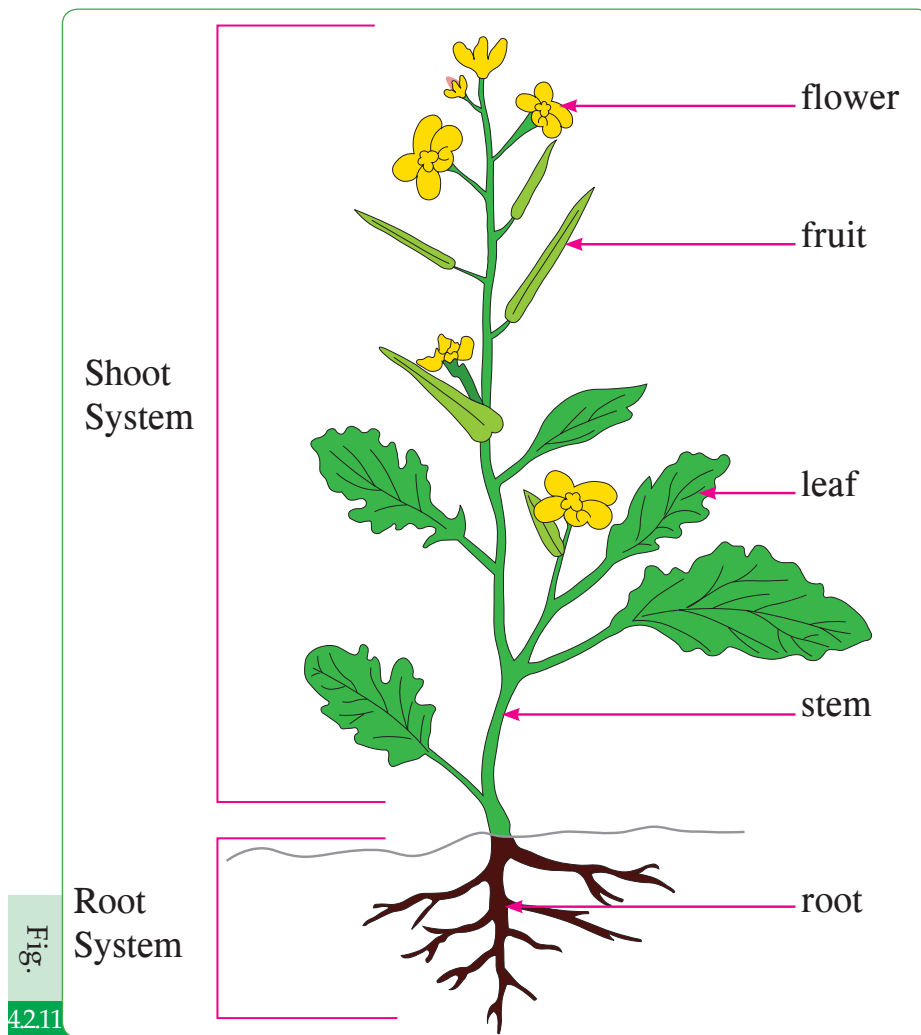
Herbs	Shrubs	Trees
1.	1.	1.
2.	2.	2.
3.	3.	3.
4.	4.	4.
5.	5.	5.

2.4 Parts of Terrestrial Plants

Flowering plants have different parts like roots, stem, leaves, branches, flowers, fruits and seeds. The roots of flowering plants absorb water and minerals from the soil. Roots also fix the plant body firmly to the soil. The stem of flowering plants contain branches, twigs, leaves, flowers and fruits. Seeds are found inside the fruits.

The stem supports various plants and transports water and minerals from roots to leaves. Similarly, the stem transports

prepared food to the different parts of flowering plants. Leaves of plants prepare food by using sunlight, carbon dioxide gas and water. This process is called photosynthesis.



Different parts of flowering plant

Activity 11

- Collect pictures of herbs, shrubs and trees from old books.
- Paste these pictures on a chart paper.
- Display the chartpaper in the classroom.

2.5 Aquatic Plants or Hydrophytes

Activity 12

Visit a nearby pond, lake or river along with your seniors. Collect some hydrophytes and study their features.

Different plants like lotus, water lily, hydrilla, pistia, water hyacinth, etc. grow in water. **These plants are called aquatic plants or hydrophytes. The plants that grow in water are called hydrophytes or aquatic plants.**

Aquatic plants may be non-flowering plants or flowering plants. Aquatic plants grow in ponds, lakes, rivers, oceans, etc.



Lotus, water lily, hydrilla, pistia, water hyacinth, tapegrass, duckweed, eel grass and sea lettuce are some examples of aquatic plants or hydrophytes. Most hydrophytes are flowering plants and rest are non-flowering plants.

Hydrophytes are found in fresh water as well as marine water. Hydrophytes like hydrilla, water hyacinth, lotus, water lily and pistia are found in fresh water, i.e. ponds, lakes, rivers, etc. Hydrophytes like eelgrass, sea lettuce, etc. are found in marine water or sea water.

Fig.
42.13



Eelgrass



Sea lettuce

2.5.1 Classification of Hydrophytes

Hydrophytes are classified into three groups. They are as follows:

1. Submerged hydrophytes
2. Fixed hydrophytes
3. Freely-floating hydrophytes

1. Submerged hydrophytes

Some hydrophytes like hydrilla and tape grass remain covered with water. These plants are called submerged hydrophytes. These plants remain fixed to the soil at the bottom. They have flexible stems with air spaces. These plants have narrow and thin leaves.

Fig.
42.14



Hydrilla



Tape grass

2. Fixed hydrophytes

Hydrophytes like lotus, water lily, etc. are called fixed hydrophytes. These plants remain fixed to the soil at the bottom but their leaves and flowers float on the surface of water.

Do You Know

Fixed hydrophytes are those hydrophytes which remain fixed to the soil at the bottom but leaves and flowers float on the surface of water. Examples: lotus, water lily, etc.



Fig.

4215

Lotus



Water lily

Fixed hydrophytes have soft, spongy and hollow stems. Their leaves are flat and broad which help them to float on water. Their stems and leaves are covered with waxy substance to prevent them from decaying. Their stems are long, hollow and flexible which can bend easily without breaking.

3. Freely-floating hydrophytes

Some hydrophytes like pistia, duckweed, water hyacinth, etc float freely on the surface of water. These plants are called free-floating hydrophytes.

Do You Know

The hydrophytes which float freely on the surface of water are called freely floating hydrophytes. Examples: pistia, duckweed, water hyacinth, etc.

Fig.
42.16



Pistia



Duckweed



Water hyacinth

Freely-floating hydrophytes are light having spongy tissues filled with air. It helps them to float easily on the surface of water. They have small roots that remain hanging in water.

2.5.2 Characteristics of Hydrophytes

1. Most hydrophytes have spongy and air-filled tissues which help them to float in water.
2. Their stems and leaves are covered with waxy coat which prevents them from decaying in water.
3. Most hydrophytes are soft, flexible and weak.
4. Hydrophytes have small and less developed roots.
5. In fixed and floating hydrophytes, stomata are found on the upper surface of leaves.

2.5.3 Parts of Aquatic Plants

Aquatic plants have different parts like root, stem, leaves, flowers and fruits. Aquatic plants may be non-flowering or flowering. Non-flowering hydrophytes like spirogyra, diatoms, etc. do not have root, stem and leaves. But flowering hydrophytes like lotus, water lily, etc. have root, stem, leaves, flowers and fruits.

Key concepts

1. The plants that grow on land are called terrestrial plants.
2. Herbs are very small plants with soft and weak stems.
3. Shrubs are medium-sized plants having bushy and woody stems.
4. The big plants having hard and woody trunks are called trees.
5. Flowering plants have different parts like roots, stem, leaves, branches, flowers, fruits and seeds.
6. The plants that grow in water are called hydrophytes or aquatic plants.
7. The hydrophytes which float freely on the surface of water are called freely floating hydrophytes. Examples: pistia, duckweed, water hyacinth, etc.
8. Aquatic plants also have different parts like root, stem, leaves, flowers and fruits.
9. Most hydrophytes have spongy and air-filled tissues which help them to float in water.

Project Work

- Collect roots, leaves, and flowers of some plants.
- Press them inside thick books and leave for two weeks.
- Paste them on a chart paper and name them.
- Submit your work to the science teacher.

Exercise

1. Tick (✓) the best answer from the given alternatives.

- a. Which one of the given plants is not a terrestrial plant?
☐ mango ☐ sal ☐ lotus
- b. Which of the following plant has thick and fleshy leaves?
☐ aloe ☐ sugarcane ☐ orange
- c. Which of the given plant is a xerophyte?
☐ fern ☐ cactus ☐ sal
- d. Which one of the given plants is a shrub?
☐ sal ☐ tomato ☐ rose
- e. The plants that grow in water are called
☐ hydrophytes ☐ xerophytes ☐ terrestrial plants
- f. Which one of the given plants remains covered with water?
☐ hydrilla ☐ lotus ☐ pistia
- g. Which one of the given plants is a fixed hydrophyte?
☐ tape grass ☐ water lily ☐ duckweed
- h. Which one of the given hydrophytes floats freely on water?
☐ pistia ☐ lotus ☐ hydrilla

2. Put a tick (✓) for the correct statements and a cross (×) for the incorrect ones.

- a. The plants that grow on land are called terrestrial plants. ☐
- b. Coconut, bamboo and rubber shed their leaves in winter. ☐
- c. Plants like pine, deodar and spruce have cones. ☐

- d. Trees have hard, strong and woody stems. ☐
- e. The plants that grow near water are called aquatic plants. ☐
- f. The stem of an aquatic plant is very hard and strong. ☐
- g. Aquatic plants are covered with waxy substance. ☐
- h. Hydrilla and tape grass are submerged hydrophytes. ☐

3. Fill in the blanks using appropriate words.

- a. The plants that grow on land are called
- b. Plants like mushroom and fern grow in places.
- c. Very small plants with soft and weak stem are called
- d. Shrubs are larger than and than trees.
- e. The plants that grow in are called aquatic plants.
- f. Hydrophytes are divided into three groups. They are, and
- g. Hydrophytes are covered with which prevent them from decaying.
- h. The stem of a hydrophyte is and

4. Answer the following questions.

- a. What are terrestrial plants? Give any five examples.
- b. What types of plants are evergreen? Name any three plants that grow in hot and moist climate.
- c. Name any two plants that grow in desert or dry places.
- d. What are xerophytes? Give any three examples.
- e. Write any two characteristics of xerophytes.

- f. What are conifers? Give any three examples.
- g. Define herbs with any three examples.
- h. Define shrubs with any three examples.
- i. What are trees? Give any three examples.
- j. What are hydrophytes? Write any four examples.
- k. Name three groups of hydrophytes.
- l. What are submerged hydrophytes? Give any two examples.
- m. Write any two characteristics of submerged hydrophytes.
- n. What are fixed hydrophytes? Give any two examples.
- o. Write any two characteristics of fixed hydrophytes.
- p. Define freely floating hydrophytes with any two examples.
- q. Write any two characteristics of freely floating hydrophytes.
- r. Write any four characteristics of hydrophytes or aquatic plants.

5. Write any two characteristics of the given plants.



6. Give reasons.

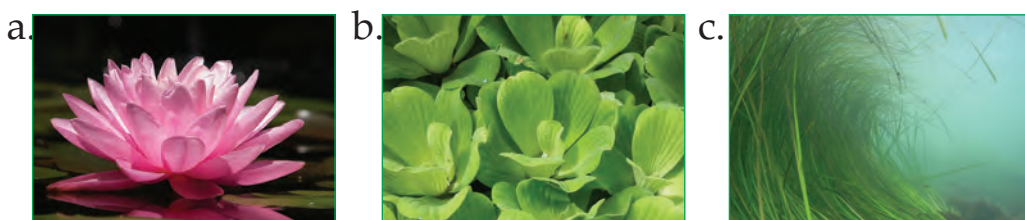
- a. Cactus and aloe are called xerophytes.
- b. Mustard and onion are called herbs.
- c. Mango and pine are called trees.
- d. Deodar and spruce are called conifers.

7. Write any two differences between:

- a. Herbs and Shrubs
- b. Shrubs and Trees
- c. Hydrophytes and Xerophytes

8. Draw a neat and labelled figure showing different parts of a terrestrial plant.

5. Identify the given hydrophytes and write any two characteristics of each.



6. Match the following:

- | | | |
|--------------------------------|--------------------------|------------------------|
| a. Fixed hydrophytes | <input type="checkbox"/> | Eelgrass, sea lettuce |
| b. Submerged hydrophytes | <input type="checkbox"/> | Pistia, water hyacinth |
| c. Freely floating hydrophytes | <input type="checkbox"/> | Lotus, waterlily |
| d. Marine hydrophytes | <input type="checkbox"/> | Hydrilla, tape grass |

7. Write any two differences between submerged hydrophytes and freely floating hydrophytes.

8. Draw a neat and labelled figure of a lotus and colour the figure.

9. Draw a neat and labelled figure showing different parts of a mustard plant.

Estimated teaching hours : 15

Before You Begin

Living beings take food. They breathe. They excrete. They reproduce. They transport various substances from one part of body to another. These activities are called life processes. Those activities which are performed by living beings to survive are called life processes. For example, growth, nutrition, respiration, excretion, internal transport, sensitivity, reproduction, etc.

Different types of plants are found around us. Can you name some plants that you have seen around your home? Rose, sugarcane, mango, apple, guava, cauliflower, cabbage, fern, mushroom, liverworts, pine, cycas, mustard, maize, paddy, barley and tomato are some examples of plants that are found in our surroundings. Among them some plants bears flowers and fruits while others don't. Can you name some plants that produce flowers? **The plants that produce flowers and seeds are called flowering plants.** Mango, apple, rose, lotus, marigold, mustard, tomato, papaya and orange are some examples of flowering plants. These plants produce fruits. Seeds are produced inside fruits at maturity. When these seeds get suitable condition, they germinate and develop into new plants.

We see a variety of insects in our surroundings. Some of them are mosquito, cockroach, honeybee, grasshopper, butterfly, etc. Most of the insects complete their life cycle in four different stages. They are (i) egg (ii) larva (iii) pupa and (iv) adult. Life cycle is the series of forms into which an organism changes as it develops. Among many insects, the butterfly is the most beautiful insect which gets attracted to the flowers.

Learning Outcomes

After completing the study of this unit, students will be able to:

- introduce life processes with examples.
- explain various stages of plant development.
- state various stages of animal development.
- observe various stages of life cycle of butterfly and explain each of them.

Glossary

autotrophs	: the organisms that can prepare their own food by photosynthesis
cotyledon	: seed leaf

excretion	: the removal of waste materials from the body of living
germination	: the process by which a seed becomes a seedling or new plant
heterotrophs	: the organisms that depend on green plants for food
larva	: an insect at the stage when it has just come out of an egg
life cycle	: a series of forms into which an organism changes as it develops
life processes	: those activities which are essential for living beings to survive
metamorphosis	: the process in which a living being changes into a completely different form
nutrition	: the process by which living beings receive food
ovary	: the female organ of a flower beings
pollen grains	: fine powdery structures produced by stamens of a flower
proboscis	: the long thin mouth, like a tube of insects
pupa	: an insect in the stage of development between a larva and an adult
reproduction	: the process by which living beings produce their own kinds
respiration	: the process in which the digested food combines with oxygen to release energy
seed	: a small hard part that is found inside the fruit and germinates into a new plant
seedling	: a baby plant produced after germination
sensitivity	: the capacity of an organism or sense organ to respond quickly
shoot	: the part of a plant that grows above the soil
voracious	: eating or wanting a large amount of food

Activity 1

Study the given figures and discuss the answer of the following questions.



a.



b.



c.



d.



e.



f.

Fig.

5.1.1

Questions:

- What do you see in the each of the given figures?
- Which activities are being performed by animals and plants in above figures?
- Why do living beings perform these activities?
- A fish dies when taken out of water, why?

1.1 Life Processes

Various activities like breathing, nutrition, digestion, excretion, transportation, etc. are essential for survival of living beings. Living beings take food. They breathe. They transport materials from one part of the body to another. Similarly, they reproduce

their own kinds. These activities are known as life processes. Growth, nutrition, respiration, excretion, internal transport, reproduction, etc. are the life processes that occur in living organisms. **Life processes are those activities which are performed by living organisms for survival.** In this lesson, we will study some common life processes like nutrition, respiration, internal transport, excretion and reproduction in brief.

a. Nutrition

All plants and animals take food to survive. Food provides energy to grow and perform various metabolic activities. Food consists of different nutrients like carbohydrate, protein, fat, minerals, etc. **The chemical substances that an organism needs to survive are called nutrients.**

The nutrients supply materials for growth, development and protection against diseases. **The process by which plants and animals obtain food and utilize nutrients present in the food is called nutrition.**



Goat is eating grass.

Venus fly trap is trapping an insect.

Tiger is eating flesh.

Fish is eating food.

Modes of nutrition

Living beings show two types of nutrition. They are: (i) autotrophic nutrition and (ii) heterotrophic nutrition.

1. Autotrophic nutrition

Green plants can prepare their own food by photosynthesis. They use carbon dioxide and water in the presence of sunlight during photosynthesis.

All the green plants are called autotrophs as they can prepare their own food. The mode of nutrition of green plants is called autotrophic nutrition.

Do You Know

- Chlorophyll traps solar energy and helps in photosynthesis
- The process of making food by green plants by using carbon dioxide and water in the presence of sunlight is called photosynthesis.

2. Heterotrophic nutrition

Non-green plants like mushroom, yeast, mucor, etc. and all the animals cannot prepare their own food. The organisms that cannot prepare their own food are called heterotrophs. The mode of nutrition of heterotrophs is called heterotrophic nutrition. Mushroom, yeast, mucor, human, goat, cow, sheep, frog, snake, rat, tiger and elephant are some examples of heterotrophs. Some heterotrophs are given below:



Mushroom



Frog



Snake



Elephant

b. Respiration

The process in which the digested food combines with oxygen to release energy is called respiration. This energy is utilized by living organisms to carry out life processes. Breathing is a part of respiration. In this process, oxygen is inhaled and carbon dioxide is exhaled. Plants breathe through stomata and animals breathe through various organs like skin, trachea, gills and lungs.

Fig.

5.14

*Stomata**Gills**Lungs*

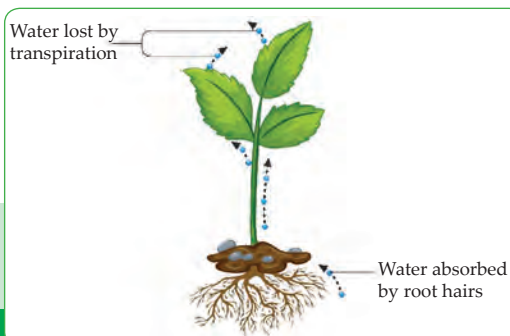
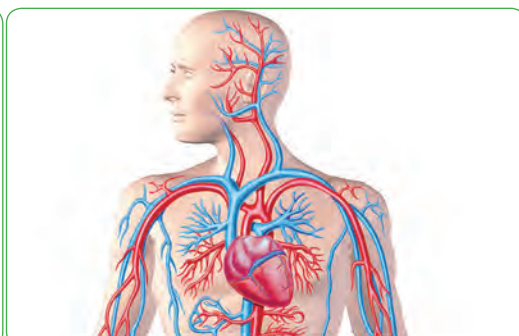
Living beings respire throughout their life to get energy required to perform various life processes. Plants and animals take oxygen from atmosphere. Then oxygen and digested food reach each and every cell through internal transport system. The oxygen reacts with digested food in mitochondria of a cell. This process is called respiration. In this process, oxygen reacts with digested food to release energy, water and carbon dioxide gas.

c. Internal transport

Living beings transport water, oxygen and digested food from one part of the body to another. Similarly, they transport various waste materials for their removal from the body. **The process by which living beings carry various substances from one part of the body to another is called internal transport.**

Fig.

5.15

*Transport in plants**Transport in human*

Plants have xylem and phloem tissues to transport various substances from one part of body to another. In unicellular organisms, cytoplasm helps in internal transport. In developed animals, blood transports various substances from one part of

the body to another. Blood transports oxygen, digested food, carbon dioxide, water and waste products.

d. Excretion

Plants and animals excrete to get rid of waste products which are harmful for their bodies. The removal of waste materials is very essential because these waste products are toxic or poisonous when they accumulate in the body. **Excretion is the removal of waste materials from the body of living beings.**

Green plants produce various waste materials like oxygen and water vapour during photosynthesis. These waste products are removed through small pores present in their leaves. These pores are called stomata.

Animals produce waste materials like carbon dioxide, urea, uric acid and faeces (stool). They excrete urea, uric acid and excessive water through urethra in the form of urine. They remove solid waste, i.e. faeces through anus. Animals excrete carbon dioxide and water vapour through the nose.



Fig.

5.16

Excretion



Fig.

5.17

Stomata of plants

e. Reproduction

Living beings cannot survive forever. They have a limited life span and die after a certain time. So living organisms reproduce their

Do You Know

- The process by which living beings produce their own kinds is called reproduction.
- Animals and plants reproduce by various methods.

own kinds to continue their race on the earth. This process is called reproduction.



Mother and baby Cow and calf Bird and nest Dog and puppy

Some animals like cow, buffalo, sheep, dog and cat reproduce by giving directly birth to their young ones. Animals like birds, snakes, frogs, fishes, butterflies and mosquitoes reproduce by laying eggs. Some plants like rose, sugarcane and potato reproduce by their stem. Flowering plants like mango, orange, pumpkin, maize, etc. reproduce by means of seeds. When seeds fall on soil, they germinate into new plants in suitable condition.



Germination of seeds

Budding in potatoes

Key concepts

1. Those activities which are performed by living beings to survive are called life processes.
2. The process by which plants and animals obtain food and utilize nutrients present in the food is called nutrition.

3. The organisms that cannot prepare their own food are called heterotrophs and their mode of nutrition is called heterotrophic nutrition.
4. The process in which the digested food combines with oxygen to release energy is called respiration.
5. The process by which living beings reproduce their own kinds is called reproduction.

Exercise

1. Tick (✓) the best answer from the given alternatives.

- a. The process of making food by green plants is called

.....

☐ photosynthesis ☐ respiration ☐ reproduction

- b. Which of the following is a heterotroph?

☐ maize ☐ grass ☐ tiger

- c. Fishes breathe through

☐ skin ☐ gills ☐ stomata

- d. Which of the following are the excretory organs of plants?

☐ skin ☐ stomata ☐ kidneys

- e. Which of the following is the breathing organ of birds?

☐ gill ☐ skin ☐ lungs

2. Put a tick (✓) for the correct statements and a cross (×) for the incorrect ones.

- a. Reproduction and excretion are the life processes. ☐

- b. The animals that feed on flesh are called herbivores. ☐

- c. Plants breathe through stomata.
- d. Green plants are autotrophs.
- e. Human beings breathe through skin.

☐
☐
☐

3. Fill in the blanks using appropriate words.

- a. The plants that cannot prepare their own food are called
- b. Omnivores feed on both and
- c. In unicellular organism, helps in internal transport.
- d. Green plants release gas during photosynthesis.
- e. Birds and snakes reproduce by laying

4. Match the following.

- | | | |
|--------------|--------------------------|-------|
| a. Autotroph | <input type="checkbox"/> | Lion |
| b. Herbivore | <input type="checkbox"/> | Bear |
| c. Carnivore | <input type="checkbox"/> | Grass |
| d. Omnivore | <input type="checkbox"/> | Cow |

5. Answer the following questions.

- a. Define life processes with any two examples.
- b. What are nutrients? What is meant by nutrition?
- c. What are autotrophs? Define autotrophic nutrition.
- d. What are heterotrophs? Define heterotrophic nutrition.
- e. Define herbivores, carnivores and omnivores with any two examples of each.

- f. What is respiration? Name the respiratory organs of human, fish and green plants.
- g. What is meant by internal transport?
- h. What is excretion? Name any three excretory organs.
- i. What is reproduction? Why do living beings reproduce?

6. Give reason.

- a. Green plants are called autotrophs.
- b. Cow and tiger are called heterotrophs.
- c. Lion and vulture are called carnivores.

7. Differentiate between:

- a. Autotrophs and Heterotrophs
- b. Herbivores and Carnivores
- c. Respiration and Excretion

8. Identify the life processes shown below:

a.



b.



Project Work

- Collect any five pictures of various life processes from old books or internet.
- Take a chart paper and paste these pictures on it.
- Demonstrate the chart paper in the classroom.

Activity 1

Study the given figures and discuss the answer of the following questions.

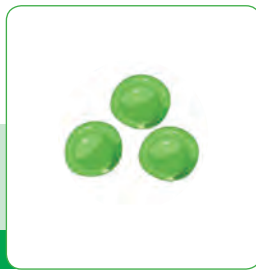


Questions:

- What do you see in each of the given figures?
- Which part of plant produces seeds?
- Do all plants contain flowers and seeds?
- Which part of the plant germinates to form a new plant?
- What is required to germinate a seed?
- What are the different stages of plant development?

2.1 Stages of Plant Development

There are different stages in the cycle of flowering plants. They are (i) seed (ii) seedling (iii) flower and (iv) fruit.

*Seed**Seedling**Flower**Fruit*

2.1.1 Seed

A seed is a hard part that develops inside a fruit. Most flowering plants reproduce by means of seeds. Seeds of different plants have different shapes, sizes and colours.

Seeds are protected with a hard cover called seed coat.

Seeds are found inside the fruits. Some fruits contain only one seed inside them, e.g. mango, peach, plum, avocado, etc. whereas some fruits contain many seeds, e.g. watermelon, papaya, pumpkin, tomato, cucumber, etc.

Do You Know

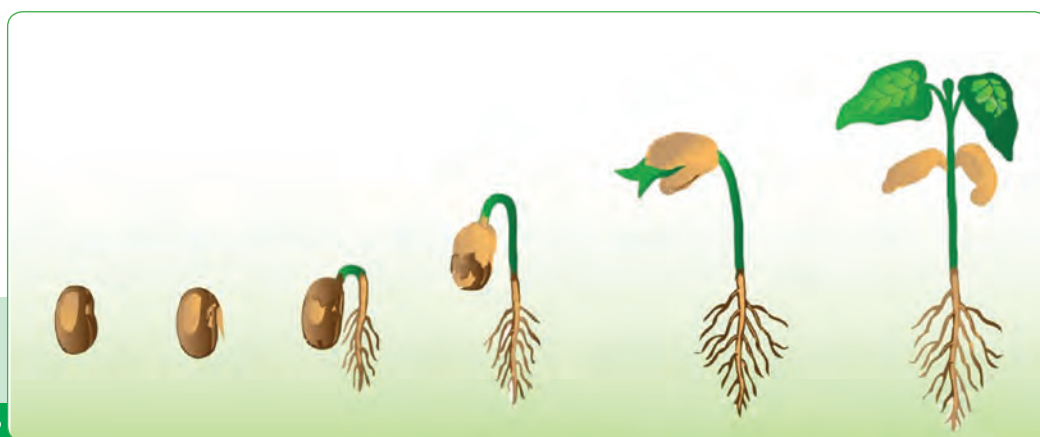
- Seed coat is a hard covering that protects a seed.
- A seed germinates into a seedling on favourable condition.

*Mango seeds**Bean seeds**Papaya seeds**Avocado seed*

A seed germinates into a new plant in favourable condition. Enough water, air and warmth are the conditions required for germination of a seed. The process by which a seed becomes a seedling or a baby plant is called germination.

Fig.

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Germination of a seed

While germinating, a seed absorbs water and then its seed coat breaks open. Then, the root grows towards the soil and the shoot grows upwards. Then, the shoot produces a stem and leaves. This stage of a plant is called a seedling or young plant.

2.1.2 Seedling

When a seed germinates, it forms a seedling. A baby plant produced after germination of a seed is called a seedling. A seedling gets food from the cotyledon of a seed.

Fig.

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Seedling of bean

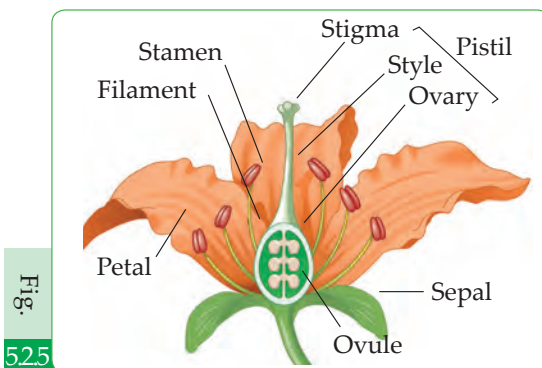


Seedling of maize

A seedling absorbs water and minerals with the help of roots. The seedling grows gradually and develops leaves. Then the plant can prepare its own food by photosynthesis. The seedling keeps on growing and forms branches, sub-branches and buds. These buds gradually develop into flowers.

2.1.3 Flower

A flower is the reproductive organ of developed plants. It is colourful and attractive. A complete flower consists of four different whorls or rings. They are (i) sepal (ii) petal (iii) stamen and (iv) pistil.



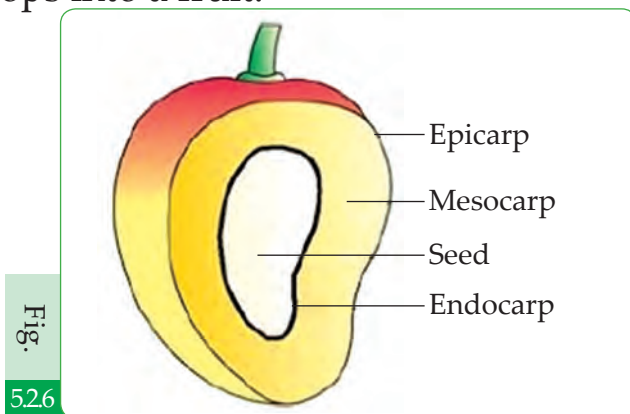
Different parts of a flower

Sepals are green parts whereas petals are colourful and attractive parts of a flower. Stamen is the male organ that produces pollen grains and pistil is the female organ of a flower that produces ovules or female cells.

At maturity anthers of stamens release pollen grains. Then pollen grains are transferred from anther to the stigma of a pistil. This process is called pollination. After pollination, fusion of a male cell and a female cell takes place and forms a zygote. This process is called fertilization. After fertilization the zygote develops into a seed and the ovary develops into a fruit.

2.1.4 Fruit

The mature ovary of a flower is called a fruit. It consists of two parts. They are pericarp and seed. The pericarp of a fruit consists of three parts. They are epicarp, mesocarp and endocarp. The epicarp is the outermost part, the mesocarp is middle fleshy part and the endocarp is the hard part of a fruit which encloses a seed.



Different parts of a seed

At maturity, fruits fall on the ground and the seeds get dispersed. Each seed germinates into a new plant in a favourable condition.

Activity 2

- Visit a nearby garden and observe various stages and parts of flowering plants like seedling, flowers, fruits, seeds, etc.
- Draw a neat and labelled figure of each and submit it to your science teacher.

All flowering plants do not reproduce by means of seeds. Some flowering plants like sweet potato, dahlia, potato, sugarcane, rose, bryophyllum, etc. do not produce good seeds. These plants reproduce by means of root, stem or leaf.

Some flowering plants like sweet potato, dahlia, etc. reproduce by means of roots.

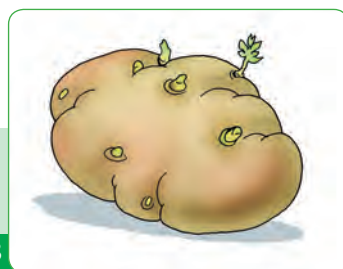


Roots of sweet potato



Root of dahlia

Some flowering plants like potato, onion, banana, sugarcane, rose, etc. reproduce by means of stem.



Potato with buds



Reproduction of ginger by stem

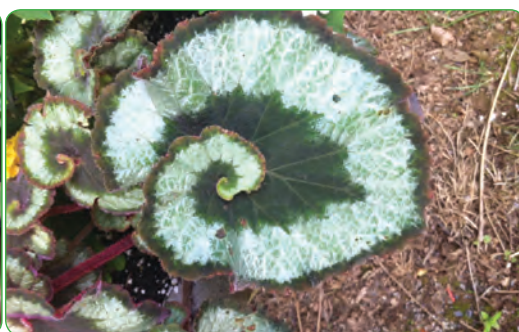


Reproduction of rose by stem

Some flowering plants like Bryophyllum, Begonia, etc. reproduce by leaf.



Leaf of Bryophyllum with plantlets



Leaf of Begonia with plantlets

Activity 3

- Take some potatoes and keep them in a moist place for 3-4 days. After 3-4 days, you can see the buds developed on potatoes.
- Plant those potatoes in soil and water them regularly.
- Measure the length of the plantlets and count the number of leaves produced after 7 days.
- What can you conclude from this activity?

Activity 4

How are new plants produced from given plants? Discuss in the classroom and write.

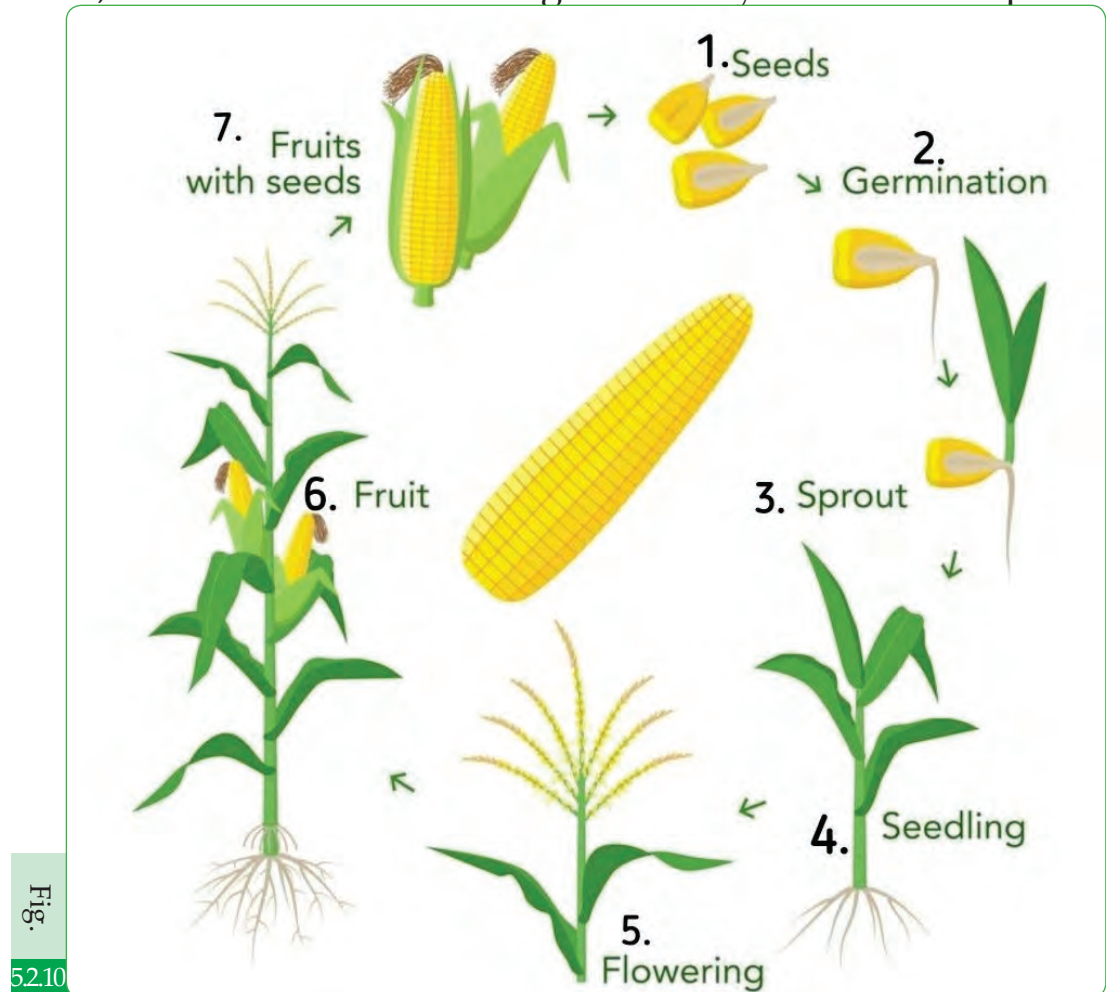
S.N.	Plants	Methods of Reproduction
1.	Mango	
2.	Sweet potato	
3.	Rose	
4.	Bamboo	
5.	Apple	
6.	Onion	

2.1.4 Life Cycle of Plants

Plants pass through different stages during their life span. **The series of different stages during the life span of an organism is**

called **life cycle**. We cultivate seeds into the soil to grow new plants. The seeds germinate and form baby plants. These plants grow and turn into young plants. These plants produce flowers and flowers produce fruits and fruits produce seeds. So, seed, baby plant, young plant flowers and fruits are different stages of life cycle of flowering plant.

Now, observe the different stages of life cycle of a maize plant.



Various stages of life cycle of maize plant

Project Work 1

- Take some tubers of potato with buds.
- Cultivate the tubers in soil. Water it regularly.
- Observe the plantlets and their growth every week.
- Observe the potato plants till they complete the life cycle.
- Draw neat figure of different stages in a chart paper and submit it to your science teacher.



Various stages of life cycle of potato plant

2.1.5 Plants having Short and Long Life Span

Different types of plants have different life span. Some plants grow only for one season. Plants like wheat, maize, spinach, chilly, tomato, etc. complete their life cycle with a few months or one season. These plants die after completing the life cycle.

Some plants like cabbage, onion, mustard, cauliflower, etc. complete their life cycle in two seasons. But many plants take a few years to complete their life cycle. Plants like apple, mango, sal, sissoo, simal, etc. live for many years. It shows that different plants have different life span. The plants having long life span take a few years to complete their life cycle.

Activity 5

Observe different types of plants present in your locality. Ask the seniors about their life span and duration to complete their life cycle. Fill in the given table after observation.

S.N.	Plants	Duration to complete their life cycle
1.	Wheat	6 months
2.		
3.		
4.		
5.		
6.		

Project Work

To prepare herbarium:

- Collect different parts of plants and their stages.
- Press these parts keeping inside thick books and let them to dry.
- Take a chart paper and paste the dried parts and stages of plants onto the chart paper.
- Label each part and demonstrate the chart paper in the classroom.

Key Concepts

1. There are different stages in the cycle of flowering plants. They are (i) seed (ii) seedling (iii) flower and (iv) fruit.
2. A seed is a hard part that develops inside a fruit.
3. The process by which a seed becomes a seedling or a baby plant is called germination.

4. A baby plant produced after germination of a seed is called a seedling.
5. A flower is the reproductive organ of developed plants.
6. The mature ovary of a flower is called a fruit.
7. All flowering plants do not reproduce by means of seeds.
8. The series of different stages during the life span of an organism is called life cycle.

Exercise

1. Tick (✓) the best answer from the given alternatives.

a. Which of the following is a flowering plant?

☐

rose

☐

mushroom

☐

fern

b. The hard part of a plant that develops inside the fruit is called

☐

flower

☐

root

☐

seed

c. Which of the following fruits contains only one seed?

☐

apple

☐

mango

☐

watermelon

d. A complete flower consists of

☐

two whorls

☐

three whorls

☐

four whorls

e. Which of the given plant completes its life cycle in one season?

☐

mango

☐

cabbage

☐

wheat

2. Put a tick (✓) for the correct statements and a cross (×) for the incorrect ones.

- a. Seed, flower and fruit are three stages of plant development. ☐
- b. Fruits are found inside the seeds. ☐
- c. Germination is the process in which a seed becomes a seedling. ☐
- d. Potato and rose reproduce by means of leaves. ☐
- e. Different plants have different life span. ☐

3. Fill in the blanks using appropriate words.

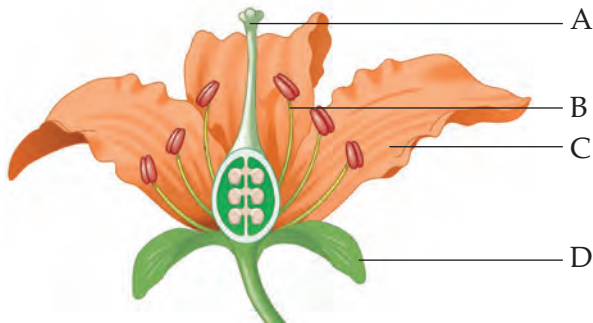
- a. Most reproduce by means of seeds.
- b. The most attractive part of a plant is a
- c. A complete flower consists of whorls.
- d. Bryophyllum and begonia reproduce by means of
- e. The series of different stages during the life span of an organism is called

4. Answer the following questions.

- a. Define flowering plants with any five examples.
- b. What are the four stages of plant development?
- c. What are seeds? Where are they formed?
- d. What is germination? What are the conditions required for germination of a seed?
- e. What is a flower? Name the four whorls of a flower.
- f. What is a fruit? Name the two parts of a fruit.

- g. What is fertilization? How is a zygote formed?
- h. Name any two plants each that reproduce by root, stem and leaf.

5. Name the parts A, B, C and D shown in the given figure. Also, write the main function of each.



- 6. Draw a neat and labelled figure showing different parts of a fruit.
- 7. Name the different stages of life cycle of bean plant. Also, draw a neat figure of each.
- 8. Draw a neat and labelled figure showing different stages in the life cycle of mustard plant.
- 9. Name any three plants each having short life span and long life span.

3.1 Introduction

Activity 1

Observe the various stages of development in the life cycle of a frog. Arrange them in proper order of their development giving numbers.



No animals can survive forever. The babies of animals grow, become young and mature after a certain time. The mature animals reproduce their own kinds. After certain time, these animals become old and finally die. But some animals die before being old due to diseases, accidents or other reasons.

3.2 Animals and Their Babies

Some common animals and their babies are shown below.



a.

Buffalo and calf



b.

Horse and colt



c.

Lion and cub



d.

Dog and puppies



e.

Cat and kittens



f.

Hen and chicks



g.

Duck and ducklings



h.

Goat and kids



i.

Tiger and cubs



j.

Pig and piglets



k.

Elephant and calves



l.

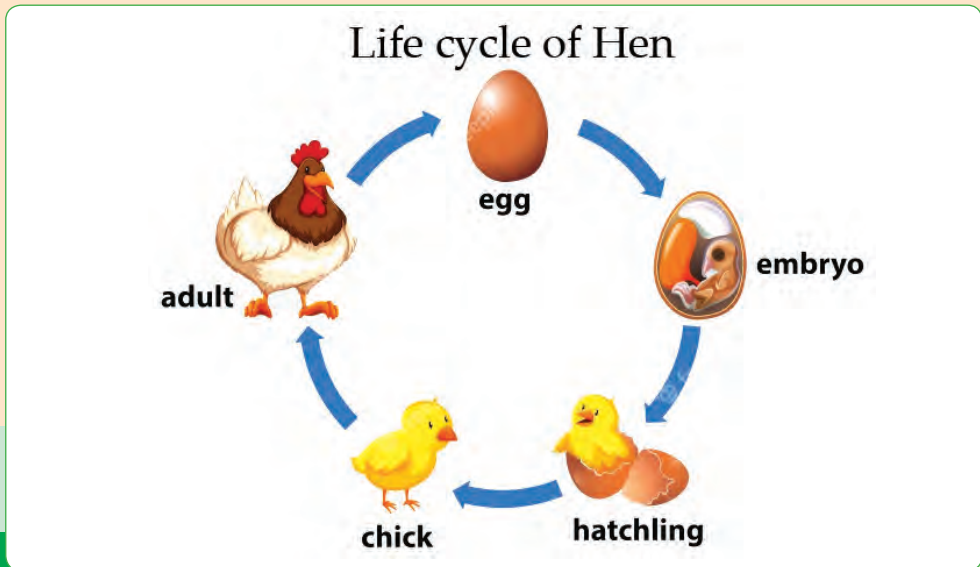
Deer and fawn

Fig.

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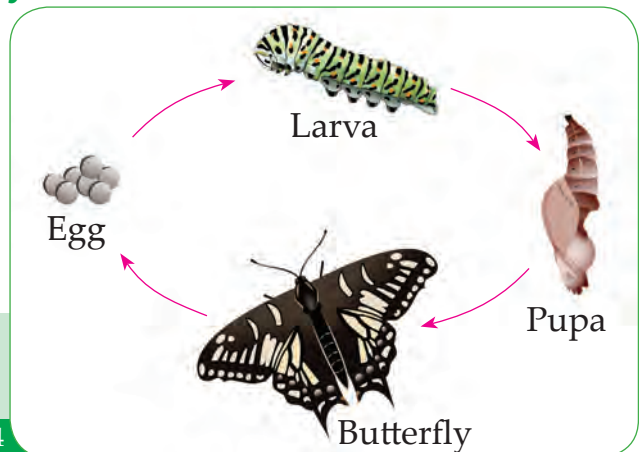
Project Work 1

- Visit a nearby poultry farm.
- Observe the various stages in the life cycle of a local hen.
- Draw neat figure of the life cycle in a chart paper and present in the classroom.



3.3 Life Cycle of Butterfly

Butterflies are the most beautiful flying insects having large scaly wings. The body of a butterfly can be divided into three distinct parts. They are head, thorax (chest) and abdomen (tail end).



Life cycle of Butterfly

The head of a butterfly consists of a pair of antennae, a pair of compound eyes and sucking type of mouth parts. Most of the

butterflies suck the nectar of flowers with the help of tube-like sucking organ called proboscis.

Two pairs of large, colourful wings and three pairs of jointed legs are attached to the thorax. The thorax contains the muscles that make the legs and wings move. The body of a butterfly is covered with tiny sensory hairs.

Habit and habitat

Butterflies feed on nectar of flowers using a tube-like proboscis. The proboscis is a long and flexible tube. It uncoils to sip food and coils up again into a spiral when not in use.



Butterflies are found all over the world and in all types of environments; hot and cold, dry and moist, at sea level and high in the mountains. However, butterflies are commonly found in tropical regions.

Activity 2

- Catch a butterfly from your surroundings and observe its body parts carefully.
- Draw a neat and labelled figure in your practical file and submit it to your science teacher.

Life cycle

Butterflies complete their life cycle in four different stages. They are (i) egg (ii) larva (iii) pupa, and (iv) adult. Like

Do You Know

- Metamorphosis is the occurrence of different stages in the life cycle of insects.
- A butterfly shows complete metamorphosis in the life cycle.

butterflies, mosquitoes, honey bees, houseflies, moths, etc. undergo complete metamorphosis in their life cycle.

Sexes are separate in butterflies, i.e. male and female are different. Mating may take place on ground or in air. The male butterfly transfers sperm packets into the female while mating.

A brief description of various stages of the life cycle of a butterfly is given below:

1. Egg

Egg is the first stage of the life cycle of a butterfly. After mating,

a female butterfly lays one egg to hundreds of eggs on the lower surface of the leaf. These eggs are attached to the leaf with a sticky secretion secreted by the female

along with eggs. The eggs may be round, spherical, oval, etc. The colour of the eggs may be white, green or yellow depending on the type of butterfly. They lay their eggs on leaves so that the tiny caterpillars start feeding soon after hatching.



Eggs of a butterfly

2. Larva

Larva is the second stage in the life cycle of a butterfly. It is also

called caterpillar. Each larva hatches from a tiny egg. Soon after hatching most larvae eat the shell of their egg as their first meal. Then they feed on the leaves of the plant on which they are present.



Larva of a butterfly

The body of a larva remains covered with numerous hair-like structures called setae. The body of the caterpillar can be divided into three distinct parts. They are head, thorax and abdomen. The head of the larva consists of powerful jaws designed for biting and chewing leaves. **The larva of a butterfly is a voracious eater. It feeds on a lot of leaves.**

The larva changes its skin 4-5 times as it grows. **The process of changing skin by the larva is called moulting.** At maturity, the larva stops eating and attaches itself to a leaf, twig, etc. and changes into a pupa. The larval stage lasts from two weeks to one month.

3. Pupa

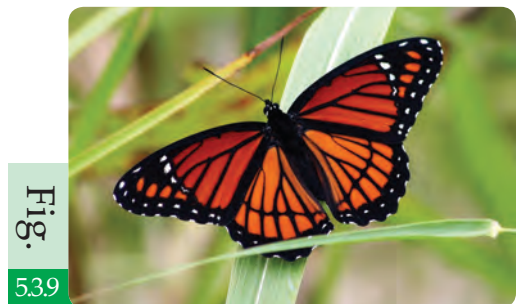
Pupa is the third stage of the life cycle of a butterfly. It is covered with a hard case called puparium or cocoon. The pupa neither eats nor moves but active changes take place inside the body. The pupal stage lasts for a few days to several months depending on the climatic condition. The pupa of a butterfly remains suspended from a silk pad and abdominal hooks. The pupa becomes transparent about one day before the adult butterfly emerges.



Pupa of a butterfly

4. Adult

At maturity, a fully developed adult butterfly emerges out from the puparium by tearing it. **The newly emerged adult butterfly is called imago.** When the imago emerges, its wings are wrinkled



Adult of a butterfly

and moist. The imago then rests and dries its wings before flying.

In this way, the life cycle of a butterfly is completed within one month. **The cyclic process from the egg to the development of an adult butterfly is called the life cycle of a butterfly.**

Project Work 2

- In spring season, observe the eggs, larvae and pupae of butterflies in your surroundings.
- Observe the structure of caterpillars and study their feeding habit.
- Collect eggs, larvae, pupae and adult butterflies. Keep them in plastic container. Study their structure carefully.
- Take a chart paper and draw a neat and labelled figure of life cycle of a butterfly.
- Submit your work to the science teacher.

Key concepts

1. Life cycle is the series of forms into which an organism changes as it develops.
2. Butterflies are the most beautiful flying insects having large scaly wings.
3. Butterflies are found all over the world and in all types of environments.
4. Butterflies complete their life cycle in four different stages. They are (i) egg (ii) larva (iii) pupa, and (iv) adult.
5. Egg is the first stage of the life cycle of a butterfly.
6. Larva is the second stage in the life cycle of a butterfly.
7. The larva of a butterfly is a voracious eater. It feeds on a lot of leaves.

8. The process of changing skin by the larva is called moulting.
9. Pupa is the third stage of the life cycle of a butterfly. It is covered with a hard case called puparium or cocoon.
10. The newly emerged adult butterfly is called imago.

Exercise

1. Tick (✓) the best answer from the given alternatives.

- a. The baby of a tiger is called

<input type="checkbox"/> cub	<input type="checkbox"/> kid
<input type="checkbox"/> baby	<input type="checkbox"/> kitten
- b. The body of a butterfly can be divided into

<input type="checkbox"/> two parts	<input type="checkbox"/> three parts
<input type="checkbox"/> four parts	<input type="checkbox"/> five parts
- c. The second stage in the life cycle of a butterfly is

<input type="checkbox"/> egg	<input type="checkbox"/> larva
<input type="checkbox"/> adult	<input type="checkbox"/> pupa
- d. The cover of the pupa is called

<input type="checkbox"/> shell	<input type="checkbox"/> caterpillar
<input type="checkbox"/> pupal case	<input type="checkbox"/> puparium
- e. The life cycle of a butterfly completes in

<input type="checkbox"/> one month	<input type="checkbox"/> two months
<input type="checkbox"/> one week	<input type="checkbox"/> two weeks

2. Put a tick (✓) for the correct statements and a cross (×) for the incorrect ones.

- a. The baby of a dog is called colt. ☐
- b. The life cycle of a butterfly shows complete metamorphosis. ☐
- c. The larva of a butterfly is a voracious feeder. ☐
- d. The pupa of a butterfly is very active. ☐
- e. Caterpillar is the second stage of the life cycle. ☐

3. Fill in the blanks using appropriate words.

- a. The baby of a pig is called
- b. The life cycle of a butterfly completes in stages.
- c. The larva of a butterfly is a feeder.
- d. The hard case of pupa is called
- e. The third stage of the life cycle of a butterfly is called

4. Match the following.

- | | |
|----------------|---|
| a. Caterpillar | <input data-bbox="632 1132 694 1190" type="checkbox"/> Fourth stage of the life cycle |
| b. Egg | <input data-bbox="632 1197 694 1254" type="checkbox"/> Third stage of the life cycle |
| c. Pupa | <input data-bbox="632 1262 694 1319" type="checkbox"/> Complete metamorphosis |
| d. Adult | <input data-bbox="632 1326 694 1384" type="checkbox"/> First stage of the life cycle |
| | <input data-bbox="632 1391 694 1448" type="checkbox"/> Second stage of the life cycle |

5. Answer the following questions.

- a. What is the baby of a lion called?
- b. What is the baby of a horse called?

- c. What is a butterfly? Where is it found?
- d. Name the four stages of the life cycle of a butterfly.
- e. What is metamorphosis? Name any three insects that show complete metamorphosis in their life cycle.
- f. Where do butterflies lay eggs? Why?
- g. What is larva? What does it feed on?
- h. Which stage in the life cycle of a butterfly is known as voracious feeder? Why
- i. What is cocoon? Write down its function.
- j. Write any two features of an adult butterfly.

6. Describe the structure of a butterfly with a neat and labelled figure.

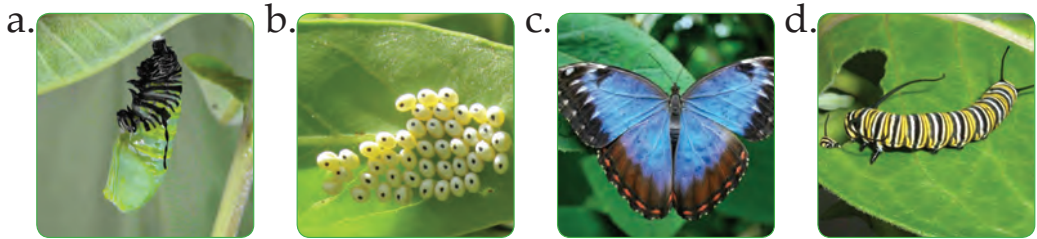
7. Differentiate between:

- a. Larva and Pupa
- b. Pupa and Adult

8. Give suitable reason.

- a. Larva or caterpillar of a butterfly is called a voracious eater.
- b. The metamorphosis in the life cycle of a butterfly is called complete metamorphosis.

9. Arrange the given figures of the life cycle of a butterfly in a proper order.



10. Draw a neat and labelled figure showing the life cycle of a butterfly.

11. Match the following :

A

Cub

Colt

Calf

Kitten

Puppy

Duckling

Fawn

B

Cow

Cat

Duck

Horse

Deer

Lion

Dog

12. Draw a neat and labelled figure showing life cycle of hen.

13. Write down the different stages of life cycle of pigeon and draw a neat figure of each.

UNIT 06

Matter

Estimated teaching hours : 30

Before You Begin

We see different types of substances around us. Air, water, soil, stone, brick, wood and plastics are some of the common substances which are found around us. These substances are called matter. The substance which has mass and occupies space is called matter. All the substances that are found in our surroundings are matter. Matter exists in three states, viz. solid, liquid and gas.

Water is the most useful chemical substance found in nature. About 71 percent of the earth is covered with water. Water exists in three different states. They are solid, liquid and gas. In air, water remains in the form of vapour and cloud. In high mountains, water remains in the form of ice or snow. In ponds, lakes, rivers, oceans, etc., water is found in liquid state. Underground water is another source of water. It is obtained from well, tube well, etc. Water is used for bathing, washing, drinking, cooking, irrigating, swimming, etc. It is also used in industries.

Air is a mixture of different gases. The gases present in air include nitrogen, oxygen, carbon dioxide, water vapour and inert gases like neon, argon, etc. The layer of air that surrounds the earth's surface is called atmosphere. Air is very essential for survival of living beings. We can feel air but cannot see. Air has weight and occupies space. It is a colourless, odourless and tasteless matter. Due to gravity, i.e. pulling force of the earth, air flows from one place to another. Air occupies space. So, all empty vessels remain filled with air.

The earth is the common habitat for all living beings. The surface of the earth is made of rocks, soil and water. Rocks are the solid and hard substances found on the earth's surface. More than three-fourth parts of the earth remain covered with water and the rest with soil. If we dig a layer of soil to a certain depth, bed rocks can be seen from the ancient time. Rocks are being used by human beings for various purposes. Rocks are widely used in construction of buildings, houses, roads, pavements, bridges, dams, walls, canals, etc. Similarly, different types of minerals are also obtained from the rocks.

Learning Outcomes

After completing the study of this unit, students will be able to:

- introduce matter with examples.
- state properties of water.
- identify three states of water and describe the role of heat to change the states of water.
- introduce evaporation, condensation, freezing and melting.
- demonstrate activity based on water cycle.
- describe undesirable change in water as water pollution.
- identify major causes of water pollution and suggest ways to control water pollution.
- introduce water mill and hydroelectricity.
- state the measures to conserve water resources.
- define air as the mixture of different gases, water vapour and dust particles.
- state physical properties of air.
- state uses of air with examples.
- describe undesirable changes in air as air pollution.
- explain causes, effects and preventive measures of air pollution in locality.
- state physical properties of rocks.
- identify rocks and classify them as hard rocks and soft rocks.
- tell the main uses of rocks.

Glossary

air	: the mixture of various gases like nitrogen, oxygen, carbon dioxide, water vapour, etc.
combustion	: the process of burning some thing
condensation	: the process in which vapour changes into liquid
conversion	: the act or process of changing something from one form to another
dispersal	: the process of spreading something over a wide area
droop	: to bend, hang or move downwards
evaporation	: the process in which a liquid changes into its vapour
expand	: to increase in size or volume
igneous	: formed by solidification of magma, formed when hot, liquid rock cools and becomes hard
magma	: molten rock material within the earth from which igneous rock results by cooling
matter	: anything which has mass and occupies space
minerals	: a substance that is naturally formed under the ground
rocks	: the hard and solid structures on the surface of the earth
rust	: a reddish brown substance that forms on iron when it comes in contact with moist air
sedimentary	: formed by or from deposits of sediment
steam	: the hot gas that water changes into when it boils
sublimation	: the process in which a solid directly changes into gas

1.1 Introduction to Matter

A variety of things are found around us. Air, water, soil, stone, and wood are some of the substances found in our surroundings. These substances have weight and occupy space. **The substance that has weight and occupies space is called matter.** Some of the common matter found around us are shown below :



Stone



Water



Air



Brick



Wood



Petrol

Fig.
6.1.1

1.1.1 States of Matter

Matter present around us exists in three states. They are:
(i) solid (ii) liquid and (iii) gas.

a. Solid

Substances like stone, wood, brick and paper have definite shape and volume. **The substances having a fixed shape**

and volume are called solids. Solids are hard and rigid.



b. Liquid

Substances like water, kerosene, milk, petrol, oil and diesel occupy space but do not have a fixed shape. These substances are called liquids. The substances having a fixed volume but no fixed shape are called liquids.



The shape of a liquid changes according to the shape of the vessel in which it is kept. However, the volume of a liquid does not change no matter what type of container we keep it in. Similarly, liquids can be poured from one container to another.

Activity 1

- Take a glass and add 50 ml water in it. Observe the shape of water in the glass.
- Now, pour the water in some other containers like beaker, jug, bottle and bowl. Observe the shape of the water in each of the given containers.
- Measure the volume of the water in each of the containers. Does the volume change in each container? Write down the conclusion of this activity.

This activity proves that liquids have no fixed shape but have a fixed volume.

c. Gas

Air is the mixture of different gases. Nitrogen, oxygen, carbon dioxide, water vapour, etc. are found in air. These gases neither have a fixed shape nor a fixed volume. **The substances which neither have a fixed volume nor a fixed shape are called gases.** Examples: air, smoke, water, vapour, etc.

Fig.
6.14



Balloon



Gas cylinder



Tube

Gases can be compressed inside the cylinder, balloon, football, basketball, tubes of vehicles, etc.

Activity 2

- Take a big balloon and inflate it with more and more air to make it very big.
- Observe the volume and shape of the inflated balloon. Can you see the air inside the balloon?
- Now, prick the balloon with a needle. What is the shape and size of the balloon? What can you conclude from this activity?

Fig.
6.15



1.1.2 Floating and Sinking Objects

Some substances like ice, dry wood, plastic and leaves float in water. These substances are lighter than water. **The substances that are lighter than water float on water.**

Substances like stone, brick, glass, iron and marble sink in water. These substances are heavier than water. **The substances that are heavier than water sink in water.** Can you name some substances that sink in water?

Fig.
6.1.6



Ice floating on water



Wood floating on water



Iron nail sinking in water

1.2 Introduction to Water

Activity 3

Study the given figure and identify three states of water in it.

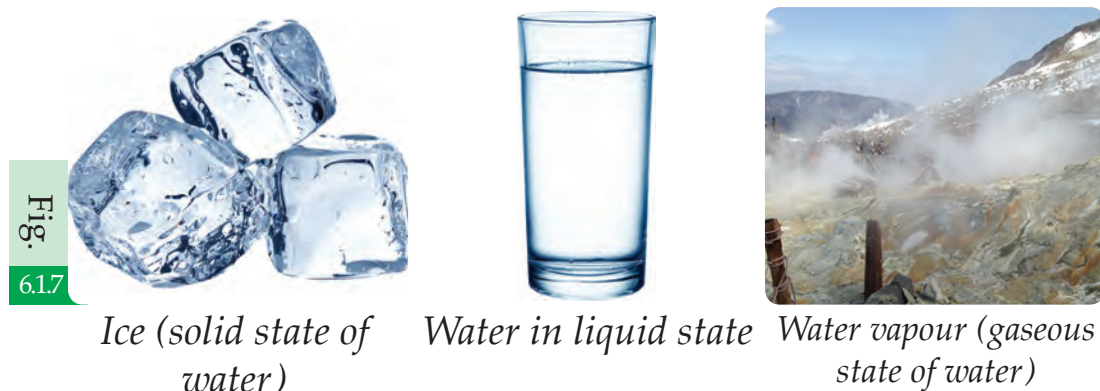


Water is the most important substance essential for survival of living beings. **Plants and animals cannot survive without water.** About two-thirds of the earth's surface remain covered with water. **Water exists in solid, liquid and gaseous states in nature.** However, we use the liquid state of water the most.

Water is also found in the bodies of living organisms.

1.2.1 States of Water

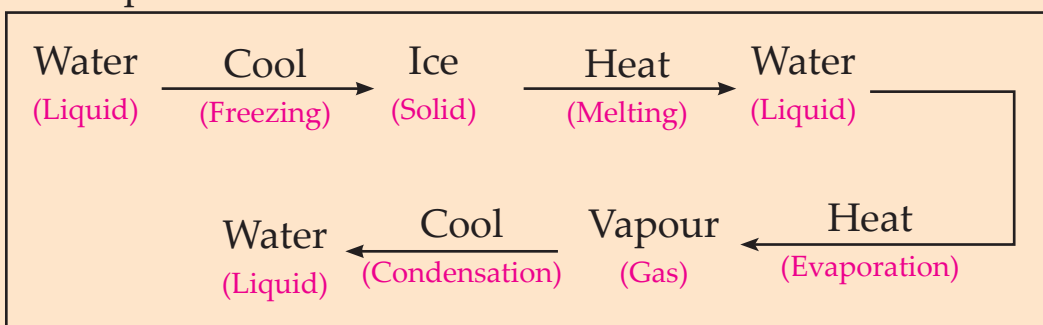
Water exists in all the three states. They are solid, liquid and gas. In solid state, water is found in the form of ice or snow in the Himalayas. When water is cooled, it changes into solid state, i.e. ice. In liquid state, water is found in oceans, rivers, lakes, ponds, streams, etc. Similarly, water is found in liquid state under the earth's surface. When water is heated, it changes into vapour or gaseous state.



Activity 4

- Take some water in a beaker. Observe the state of water present in the beaker. The water in the beaker is in liquid state.
- Now, keep the beaker in the refrigerator for 3-4 hours. Observe the beaker after 4 hours. What do you observe? The water changes into ice. It is the solid state of water. What is this process called?
- Now, keep the beaker over the flame of Bunsen burner and heat the beaker. What do you observe? The ice melts and again changes into water (liquid state). What is this process called?

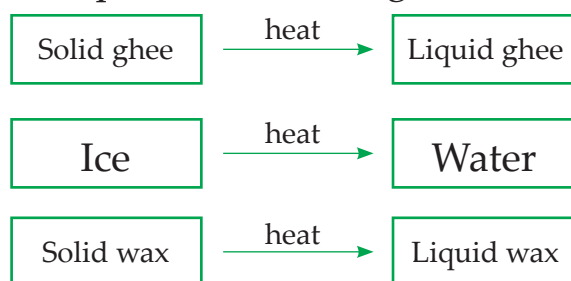
- Heat the beaker for some time till it changes into vapour. The vapour is the gaseous state of water. What is this process called ?
- Place a plate with cold water above the water vapour. Does the vapour change back into water drops? What is this process called?



From above facts, we can conclude that matter exists in three different forms and one physical state of any matter can be changed into its another state by heating or cooling it.

Melting

At the room temperature, wax exists in solid state. When the wax is heated, it changes into its liquid state. In winter or in cold, ghee exists in solid state. When the solid ghee is heated, it changes into its liquid state. This process is called melting. So, **the process in which a solid changes into its liquid state is called melting**. When a solid is heated, it melts. So, heat energy is required for melting of a substance.



Do You Know?

- The process in which a solid changes into its liquid state is called melting.
- Heat energy is required for melting of a substance.

Activity 5

- Take a candle and a matchbox.
- Observe the physical state of the wax in the candle. Now, light the candle with the help of the matchbox.
- Now, observe carefully the part of the candle just below the flame of the burning candle. You can see the solid wax melting and changing into its liquid state. This process is called melting.



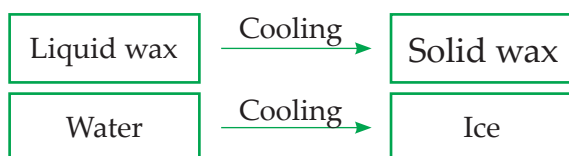
Fig.

6.18

Burning candle

Freezing

When water, i.e. liquid is cooled, it changes into ice, i.e. solid. Similarly, when liquid ghee or wax is cooled, it changes into solid. When a liquid is cooled, it loses its heat energy and changes into its solid state. This process is called freezing or solidification. Conversion of water into ice, liquid, ghee into solid ghee, liquid wax into solid wax, etc. are some examples of freezing.



Do You Know

- The conversion of a liquid into its solid state is called freezing.
- A liquid changes into its solid state on cooling.

Activity 6

- Take a candle and light it.
- In the burning candle, you can see the liquid wax just below the flame.
- Observe the drops of wax falling down from the surface of the candle. After sometimes, those drops of wax change into solid state. This process is called freezing.



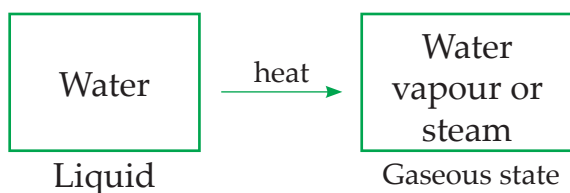
Fig.

6.19

Burning candle

Evaporation

If you see the container of a boiling water, you can observe water vapour rising up from the container. When water is heated, it changes into its vapour, i.e. gaseous state. This process is called evaporation. Formation of water vapour on heating water is an example of evaporation. Heat energy is required for evaporation.



Do You Know

- The conversion of a liquid into its gaseous state or vapour is called evaporation.

Condensation

When water vapour is cooled, it again changes into its liquid state, i.e. water. This process is called condensation. The vapour loses heat energy on cooling and finally changes into its liquid state. Conversion of water vapour into liquid is an example of condensation.



Do You Know

- The process in which the gaseous state of a substance changes into its liquid state on cooling is called condensation.

1.2.2 Properties of Water

1. Pure water is colourless, odourless and tasteless.
2. Water exists in three different forms. They are solid (ice), liquid (water) and gas (vapour).
3. Water does not have its own fixed shape. It takes the shape of the vessel in which it is kept.
4. Water always flows downwards.
5. Water is a solvent. Many substances like sugar, salt, etc. dissolve in water.

Activity 7

Take some pure drinking water in a glass. Observe its colour, smell and taste. Is it colourless, tasteless and odourless?

Activity 8

- Take a glass, beaker, plate, bowl and a bottle.
- Pour some water in each of these containers. Observe the shape of water. Does water get the shape of the container?
- What can you conclude from this activity?



Activity 9

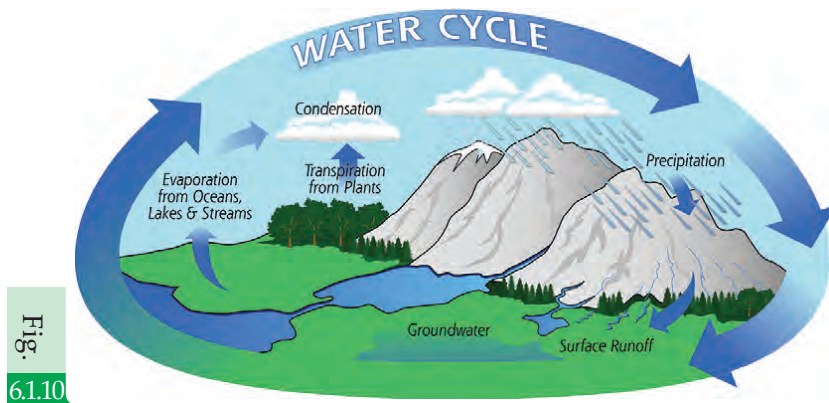
- Collect some salt, sugar, ink, colour, cooking oil, sand, piece of cork, rubber, piece of brick, etc.
- Put these substances one by one in water kept in a beaker and stir. Observe whether these substances dissolve in water or not.
- Fill the given table after your observation.

S.N.	Substances	Dissolves in water	Does not dissolve in water
1.	Sugar		
2.	Piece of brick		

1.3 Water Cycle

The water present on the surface of the earth gets heated due to the heat of the sun and forms vapour. This vapour moves up in the sky and forms clouds. When clouds are cooled, water again falls down in the form of rain. This process is called the water cycle. So, **the water cycle is the cyclic movement of water**

from earth's surface to the atmosphere and back to the earth's surface again.



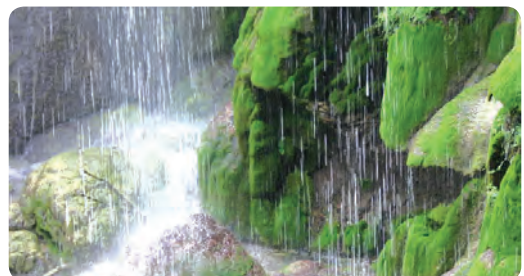
Water cycle

Let us describe the water cycle that occurs in nature. Water is found in liquid state in oceans, rivers, ponds, lakes, etc. Due to the heat from the sun, water on seas, rivers, ponds and lakes gets heated and forms water vapour. The vapour goes up in the atmosphere and cools down to form water droplets. This process is called condensation.

Numerous droplets of water join together and form clouds. When clouds are cooled, water falls down in the form of rain. **Black and dark clouds carry more water than white clouds. So, heavy rainfall occurs when the sky is covered with dark clouds.** In the water cycle, water from the earth's surface goes up in the sky and again falls down on the earth's surface in the form of rain. The water cycle is a continuous process that occurs in nature.



Clouds in the sky



Rainfall

1.4 Sources of Water

The place from which we get water are called sources of water. Water is found on the surface as well as inside the earth's surface.

a. Surface water

Surface water is the water present on the surface of the earth. It consists of water present in river, pond, lake, ocean, etc.



Koshi River



Phewa Lake



Atlantic Ocean

Rivers originate from the Himalayas and finally all the rivers get mixed in the ocean. In the rainy season, the level of water increases in rivers during heavy rainfall. **Melting of ice in the Himalayas due to heat of the sun is the main causes of formation of rivers.** Rivers always flow from higher level to the lower level. Lakes and ponds are formed by collection of rainwater or collection of water from rivers and streams. Ponds are smaller while lakes are larger in size.

Water remains in the form of ice in the Himalayas and high mountains. The ice melts due to heat of the sun and flows downwards in the form of rivers. Most of the rivers of Nepal originate from the Himalayas. Saptakoshi, Saptagandaki and Karnali are some famous rivers of Nepal.

Do You Know

- The process in which water changes into ice is called freezing.
- The process in which ice changes into water is called melting.

Fig.
6.1.13



Gandaki River



Karnali River

b. Underground water

Water present under the surface of the earth is called **underground water**. It comes out through spouts and springs. We can get underground water through well, tube well, hand pump, etc.

Fig.
6.1.14



Spouts



Spring



Tube well

Project Work

- Observe various sources of water in your locality.
- Take a chart paper and draw a neat figure of each.
- Colour these pictures and display in the classroom.

1.5 Importance of Water

1. Water is essential for the survival of plants and animals.
2. Water is used by green plants to prepare food.

3. Water is used for drinking.
4. Water is used for bathing, swimming and washing clothes.



Drinking water



Swimming



Transportation

5. Water is used for boating and shipping.
6. Water is used to generate hydroelectricity.
7. Water is used for cooking food and cleaning things.
8. Water is used for irrigating crops.



Hydroelectricity power plant

1.6 Water Mill or Pani Ghatta

Water mill or Pani Ghatta is a very common technology in rural areas of the hilly region of Nepal. From ancient time, local people have been using water mills to grind grains like wheat, maize, barley, millet, rice, etc. water mill is operated with the help of force of water. So, this technology is known as water mill or Pani Ghatta.

The technology of Pani Ghatta is based on the theory that running water generates motion in a body at rest. The major components of a water mill are Jaanto, wooden or iron fan, wooden canal or plastic pipe and Daali (grain container). Have

you seen a water mill in your locality?

To construct a water mill, a wooden fan or iron fan is fixed to the ground and a Jaanto is fixed to the axle of the fan. A Daali is fixed just above the centre of the Jaanto and the Daali is connected to the Jaanto with the help of a wooden piece called Ghodi in such a

Fig.
6.1.17



Water mill

way that when the Jaanto rotates, the Ghodi shakes the Daali.

The fan is rotated with the help of water current sent through the canal. The fan rotates the Jaanto connected to the upper end of the fan. The grains are poured into the Jaanto through the hole in the centre. The rotating Jaanto grinds the grains and we get flour. In this way, Pani Ghatta produces flour by grinding the grains.

Activity 11

- Visit a nearby water mill or Pani Ghatta in your locality. Observe the structure and working mechanism of the Pani Ghatta.
- Draw a neat and labelled figure after your observation.

1.7 Turbine

A turbine is an engine that has a part with blades that are caused to spin by pressure from water, air, etc. Turbine is the improved form of a water mill.

A turbine is used to generate hydroelectricity. A turbine has a fan which is rotated when water strikes the fan with a high speed. Rotating turbine generates electricity and the electricity is supplied and distributed to houses and industries with the help of electric wires.

Fig.
6.1.18



Turbine

Activity 12

- Observe the nearby pani ghatta in your locality.
- Study the structure and working mechanism of pani ghatta.
- Prepare a short report and submit to your science teacher.

1.8 Water Pollution

We get water from various sources like river, lake, pool, stream, fountain, well, etc. We all need clean and pure water to use. But the sources of water are being polluted day by day due to human activities. **The contamination of water due to mixing of harmful and unwanted substances is called water pollution.**

Fig.
6.1.19



Water pollution

Causes of water pollution

- i. Disposal of unwanted sewage in the sources of water
- ii. Defecating and urinating in the sources of water or near the sources of water
- iii. Discharging untreated wastes from industries, hospitals, etc. into rivers
- iv. Bathing of humans and cattle in the sources of water
- v. Throwing waste materials and dead animals into water
- vi. Washing clothes and vehicles in the sources of water
- vii. Excessive use of detergents, insecticides, pesticides, chemical fertilizers, etc.

Effects of water pollution

- i. Drinking of polluted/contaminated water may cause various water borne diseases like diarrhoea, typhoid, cholera, dysentery, etc.
- ii. Polluted water may cause death of aquatic animals.
- iii. Polluted water used for irrigation causes abnormal growth of plants.

Methods to reduce water pollution

- i. Disposal of unwanted sewage in the sources of water should be avoided.
- ii. Defecating and urinating in the sources of water or near the sources of water should be avoided.
- iii. Discharging untreated wastes from industries, hospitals, etc. into rivers should be avoided.
- iv. Bathing of humans and cattle in the sources of water should be avoided.

- v. Throwing waste materials and dead animals into water should be avoided.
- vi. Washing clothes and vehicles in the sources of water should be avoided.
- vii. Excessive use of detergents, insecticides, pesticides, chemical fertilizers, etc. should be avoided.

Exercise

1. Tick (✓) the best answer from the given alternatives.

- a. Matter exists in states.
☐ two ☐ three ☐ four
- b. Water is essential for survival of
☐ plants ☐ animals ☐ living beings
- c. Water remains in the form of ice in the
☐ Himalayas ☐ hills ☐ plains
- d. Water exists in states in nature.
☐ one ☐ two ☐ three
- e. Water is used for
☐ drinking ☐ washing ☐ drinking and washing
- f. Turbine is used to produce
☐ heat ☐ light ☐ hydroelectricity

2. Put a tick (✓) for the correct statements and a cross (×) for the incorrect ones.

- a. About two-thirds of the earth's surface are covered with water. ☐
- b. The process in which ice changes into water is called melting. ☐

- c. Ice is the liquid state of water. ☐
- d. Water is used for boating and shipping. ☐
- e. Mixing of sewage in water is the main cause of water pollution. ☐

3. Fill in the blanks using appropriate words.

- a. Rivers originate from the
- b. We can get underground water through and
- c. In the Himalayas, occurs instead of rainfall.
- d. Turbine is used to generate
- e. The contamination of water with unwanted wastes is called

4. Answer the following questions.

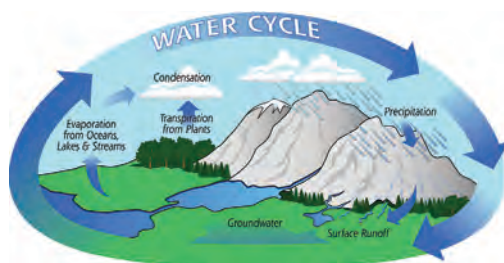
- a. What is matter? What are three states of matter?
- b. Define solid, liquid and gas with any two examples of each.
- c. What is surface water? Name any three sources of surface water.
- d. What is meant by underground water? How can we get underground water?
- e. What are the three states of water?
- f. What is water cycle?
- g. Define condensation and evaporation.
- h. What is a turbine? Write its use.
- i. What is Paani ghatta?

5. Differentiate between:

- a. Solid and Liquid
- b. Liquid and Gas
- c. Melting and Freezing
- d. Evaporation and Condensation

6. Draw a neat figure showing the water cycle.

7. Name the process shown in the given figure. How does this process take place in nature? Describe in brief.



8. Write down the utilities of water in any five points.

9. State any three properties of water.

10. Describe an activity to show that water is a solvent.

11. What is paani ghatta? How is it constructed?

12. What is hydroelectricity? Write down its advantages.

13. What is water pollution? Write its causes and effects.

14. How can you control water pollution in your locality? Write any five points.

2.1 Introduction to Air

Air is the mixture of different gases. Different gases present in the air include nitrogen, oxygen, carbon dioxide, etc. Water vapour and dust particles are also found in the air. Air cannot be seen but its presence can be felt. Have you ever seen the leaves of tree shaking due to the movement of air?

Fig.

621



Leaves shaking by air Air filled in balloons

Wind mill

The surface of the earth remains surrounded by a layer of air. This layer of air is called atmosphere. **Air has weight and it occupies space.** It moves from one place to another. Air moves gently as well as with a high speed.

2.2 Physical Properties of Air

1. Air is colourless, odourless and tasteless matter.
2. Air has weight.

Activity 1

To demonstrate that air has weight

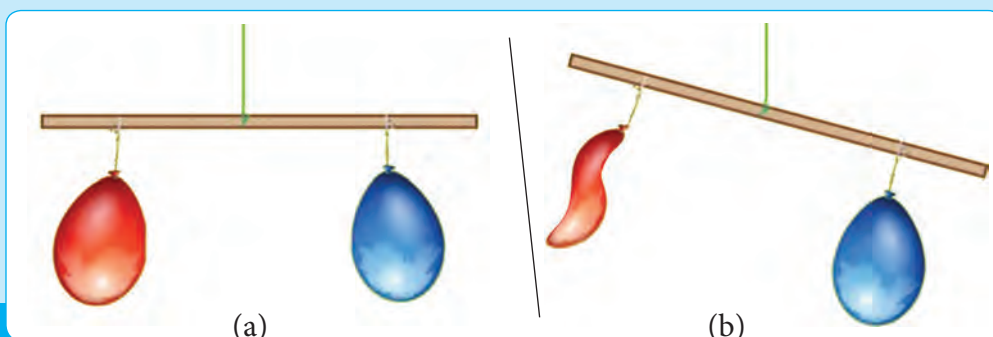
Requirements : Two large balloons of equal size, a straight wooden stick, pin, thread

Procedure

- Take two large balloons and inflate them with equal amount of air.
- Tie each of them with a thread of equal length.
- Take a straight wooden stick and find its mid-point.
- Tie a thread at the mid-point of the stick.
- Tie both balloons as shown in the figure (a). Both balloons show the same weight.
- Now, take a pin and prick one of the balloons. What do you observe?

Fig.

622



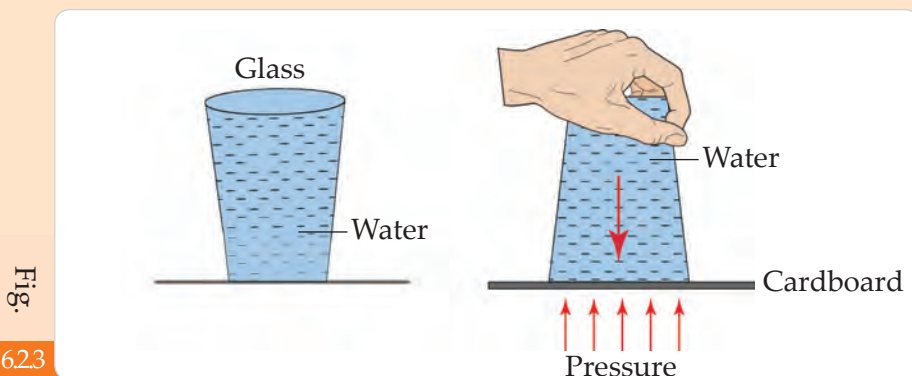
Observation : When one of the balloons is pricked, air rushes out of the balloon and the balloon moves upwards and another balloon moves downwards due to imbalance in weight. The inflated balloon becomes heavier due to the presence of air inside it and moves downwards.

Conclusion : From this experiment, it can be concluded that air has weight.

3. Air exerts pressure.

Activity 2

- Take an empty glass and fill it completely with water in such a way that there is no space for air.



- Take a thick cardboard and cover the glass gently and press the cardboard. Now, invert the glass pressing the cardboard with your hand.
- Now, remove the hand from the cardboard gently and observe it carefully.

The cardboard does not fall down for a while because the atmospheric pressure holds the water in the glass by pressing the cardboard upward. This activity shows the presence of atmospheric pressure.

4. Air occupies space.

Activity 3

- Take a balloon and blow it. Does the shape of balloon increase while blowing?
- What can you conclude from this activity?



2.3 Uses of Air in Daily Life

Air is a very important matter for living beings. Plants and animals cannot survive in the absence of air. The uses of air are given below:

1. All living beings need air (oxygen) to breathe.
2. Green plants use air (carbon dioxide) to prepare food by photosynthesis.
3. Air is utilized to run wind mills.
4. Air is essential to burn substances.
5. Air is used to inflate balloons, balls and tyres of vehicles.
6. Air helps to dry wet clothes.
7. Air is essential for paragliding and flying kites.
8. Air is essential for flying aeroplanes and helicopters.



Fig.

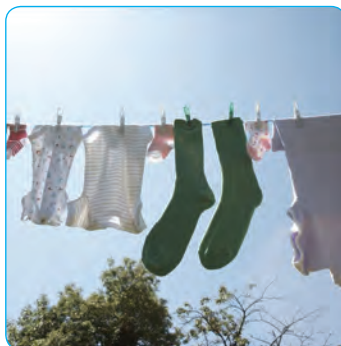
625

Paragliding



Fig.

626



Some uses of air

2.4 Air Pollution

We all need fresh and clean air to breathe. But the air that we breathe is being polluted day by day due to human activities. Mostly in urban areas, air contains various unwanted substances like dust, harmful chemicals, industrial gases, bad smells, smoke, etc. Such type of air is called polluted air. **The contamination of air with harmful and unwanted substances is called air pollution.**



Air pollution

Causes of air pollution

- i. Smoke released by burning of substances like plastic, firewood, coal, petrol, diesel, etc.
- ii. Smoke released by brick kilns, industries, etc.
- iii. Exhaust gases emitted by vehicles like truck, bus, car, van, etc.
- iv. Smoke produced due to wild fire or forest fire.
- v. Dust particles released during the movement of vehicles on the road, construction of roads and buildings, etc.
- vi. Mixing of bad smell into air due to decaying of dead animals, garbage, etc.

Effects of air pollution

- i. Breathing in polluted air causes various diseases like pneumonia, asthma, tuberculosis, lung cancer, etc.

- ii. It causes skin diseases.
- iii. It causes cough and suffocation.
- iv. Polluted air increases the temperature of the environment.

Methods to reduce air pollution

1. Biogas or electric heater should be used for cooking food instead of firewood and dung cakes.
2. Industries and factories should be established away from human settlement.
3. Wild fire or forest fire should be controlled.
4. Household wastes should be managed properly.
5. Plastics, papers and other wastes should be recycled instead of burning.
6. Vehicles should be maintained regularly.
7. Tall chimneys should be installed in the industries and brick factories.
8. Solar energy, wind energy and hydroelectricity should be used instead of coal, petrol, kerosene and diesel.

Exercise

1. Tick (✓) the best answer from the given alternatives.

a. The mixture of different gases is called

☐

air

☐

water

☐

wind

b. The thick layer of air that surrounds the earth's surface is called

☐

hydrosphere

☐

atmosphere

☐

wind

c. Air is the state of matter.

☐

solid

☐

liquid

☐

gaseous

d. Green plants use gas to prepare food.

☐

oxygen

☐

carbon dioxide

☐

nitrogen

e. Which of the following are the properties of air?

☐

Air has weight

☐

Air exerts pressure

☐

Air occupies space

☐

All of them

2. Put a tick (✓) for the correct statements and a cross (×) for the incorrect ones.

a. Air is the mixture of different gases.

☐

b. Air does not move from one place to another.

☐

c. All living beings need oxygen to breathe.

☐

d. Wind mills run with the help of air.

☐

e. Smoke and dust cause air pollution.

☐

3. Fill in the blanks using appropriate words.

a. The thick layer of air that surrounds the earth's surface is called

b. The air that moves with a high speed is called

c. Air is used to balloons.

d. Air is the of various gases.

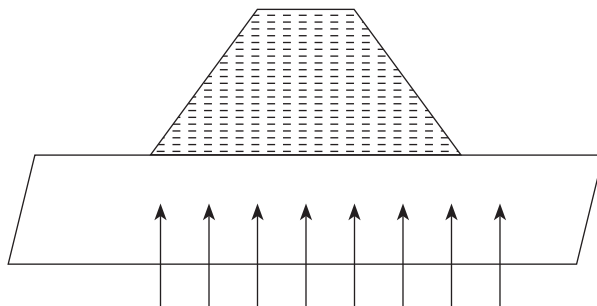
e. The contamination air with unwanted substances is called

4. Answer the following questions.

- What is air? Write any two properties of air.
- Name any three gases present in the air.
- Define atmosphere.
- Write any three properties of air.
- Write down the importance of air in any four points.
- What is air pollution? Write its causes.

5. Describe an activity to show that air has weight.

7. What fact can be proved from the given figure? Write.



8. What is air pollution? Write its causes, effects and control measures.

9. Study the given figure and write a paragraph on it.



10. What happens if there were no air on the earth? Write.

3.1 Introduction to Rocks

Activity 1

What do you see in the given figures? Discuss.



Rocks are hard solid substances that form the surface of the earth. The earth's crust is made of rocks. They are found everywhere in our surroundings. They form cliffs, hills and mountains. Rocks form the bed of the sea. Rocks are also found below the layer of soil, on the banks of rivers, streams, etc.



Rocks are made of fine grains of minerals. Different types of metals and non-metals are found in rocks. Over a period of time, rocks undergo weathering which results in the formation of soil.

3.2 Physical Properties of Rocks

1. Generally, rocks are hard but some soft rocks are also found in nature.

Fig.

6.3.3



Hard rock



Soft rock

2. They have different colours. The colour of a particular rock is due to the type of minerals present in it. Rocks may be white, red, yellow, brown, green, gray, etc.

Fig.

6.3.4



Rocks of different colour

3. Surface of the rock may be rough or smooth.

Do You Know

Rocks are hard and solid substances having metallic and non-metallic minerals.

Fig.

6.3.5



Rough rock and smooth rock

4. Rocks contain different types of metallic and non-metallic minerals.
5. Rocks exist in solid state.
6. Most rocks have high density, i.e. they are heavy.

Project Work

- Observe different types of rocks in your locality.
- Study their shape, size, colour texture, surface, etc.
- Prepare a short report and submit to your science teacher.

3.3 Types of Rocks

There are three types of rocks on the basis of method of formation and origin of rocks. They are as follows:

1. Igneous rocks
2. Sedimentary rocks
3. Metamorphic rocks

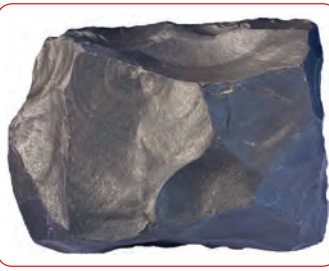
1. Igneous Rocks

The rocks formed by solidification of magma are called **igneous rocks**. Examples: basalt, pumice, granite, dunite, etc. During volcanic eruption, hot molten magma comes out through the cracks on the surface of the earth. The magma which comes out on the surface of the earth is called lava.

The lava cools down slowly and becomes solid resulting in the formation of rocks. Sometimes, the magma cannot come out on the surface and cools down just below the surface of the earth, which also forms igneous rocks.



Obsidian rock



Basalt rock



Pumice rock



Graphite rock



Dunite rock



Gabbro rock

Some igneous rocks

Fig.
63.6

2. Sedimentary Rocks

The rocks formed by the sedimented substances under high temperature and pressure are called sedimentary rocks. Limestone, sandstone, coal, shale, conglomerates, etc. are examples of sedimentary rocks. These rocks contain many layers and are soft in nature. Since sedimentary rocks may contain fossils and hence, help to know about evolution of organisms.



Limestone



Sandstone



Shale

Fig.
63.7

3. Metamorphic Rocks

The rocks which are formed by the modification of igneous and sedimentary rocks due to high temperature and pressure under

the earth's surface are called **metamorphic rocks**. These rocks are formed over a long period of time due to metamorphosis of both igneous and sedimentary rocks. Marble, slate, gneiss, schist, quartzite etc. are examples of metamorphic rocks.



Marble



Slate



Gneiss

Fig.
6.3.8



Schist



Quartzite

Activity 2

- Study the features of the rocks that are found in your locality.
- Classify these rocks into igneous, sedimentary and metamorphic rocks.
- Also, write down their characteristics and uses.

3.4 Formation of Soil

During rainy season, big rocks from the hilly region are carried away by rivers, streams, etc. These rocks break into small pieces due to collision. When this process continues for a long time, large rocks change into fine particles. As a result, soil is formed.

The rocks expand due to heat of the sun and contract due to cold at night. As this process continues, cracks are formed on rocks and finally these rocks break into fine particles. As a result, soil is formed.

Various activities of human beings and other animals also help in weathering of rocks. Similarly, some plants grow on the cracks of rocks and break the rocks into pieces. Likewise, some lichens (plants) produce acids which corrode the rocks and produce fine particles. As a result, soil is formed.

3.5 Importance of Rocks

1. Rocks are widely used in construction of houses, temples, buildings, bridges, walls, dams, road, monuments, columns, palaces, etc.
2. Rocks like marble, limestone, slate, etc. are used in decoration of walls, temples, floors, etc.
3. Rocks are used for extraction of minerals.
4. Rocks are used for extraction of metals.
5. Rocks like slate are used for roofing of houses and temples.
6. Rocks are used for making gemstones and decorative items.



Fig.
639



Uses of rocks

Exercise

1. Tick (✓) the correct statements and cross (×) the incorrect ones.

- a. Rocks are hard and solid substances found on the earth. ☐
- b. Igneous rocks contain fossils. ☐
- c. Granite is an example of sedimentary rocks. ☐
- d. Marble is a metamorphic rock. ☐
- e. Rocks are not useful for human beings. ☐

2. Fill in the blanks using appropriate words.

- a. The rocks that contain big granules appear
- b. rocks are formed by solidification of magma.
- c. Granite and dunite are the examples of rocks.
- d. Quartzite is an example of rock
- e. Igneous and sedimentary rocks form rocks after modification.

3. Answer the following questions.

- What are rocks? What are they made of?
- Where are rocks found?
- Name three types of rocks.
- What are igneous rocks? Give any three examples.
- What are sedimentary rocks? How are they formed?
- Give any three examples of sedimentary rocks.
- What are metamorphic rocks? Give any three examples.

4. Give reason.

- Fossils are found in sedimentary rocks.
- Igneous rocks are widely used in construction works.
- Marble is called a metamorphic rock.

5. Differentiate between:

- Sedimentary rocks and Igneous rocks
- Igneous rocks and Metamorphic rocks
- Limestone and Marble

6. Identify the rocks given below. Also, write any two features of each.

a.



b.



c.



7. Write down the major uses of rocks.

8. How is soil formed from rocks? Describe in brief.

UNIT 07

Energy

Estimated teaching hours : 25

Before You Begin

When we do not take food for a long time, we feel hungry and become weak due to lack of energy. **The ability of doing work is called energy.** We need energy to do work. There are different sources of energy. We need heat energy for cooking food. Heat energy can be obtained by burning firewood, coal, kerosene, LP gas, etc. Heat energy is also used to run vehicles which can be obtained by burning fuels like petrol, diesel, etc. Similarly, coal, petrol, diesel, etc. are used to produce heat and light energy in industries. Electrical energy is used to obtain light and heat, to operate radio, television, computer, mobile phone, iron, refrigerator, etc. Energy is very essential to perform various activities. Now-a-days Nepal is facing acute scarcity of energy. This condition is called energy crisis.

The form of energy which is produced due to the continuous flow of electrons or flow of charges is called electricity. It is of two types, viz. static electricity and current electricity. The electricity which is produced due to the continuous flow of electrons through a conductor is called current electricity. Cell and battery are the sources of electricity. We can convert electrical energy into heat energy, light energy, mechanical energy, sound energy, etc. Therefore, electricity is the most important form of energy.

The substance which attracts iron, nickel and cobalt is called magnet. A freely suspended magnet always points to north-south direction. The substances that are attracted towards magnet are called magnetic substances. Iron, nickel and cobalt are some examples of magnetic substances. The special property of a magnet due to which it attracts iron, cobalt and nickel, etc. and points to north-south direction when suspended freely is called magnetism.

Learning Outcomes

After completing the study of this unit, students will be able to:

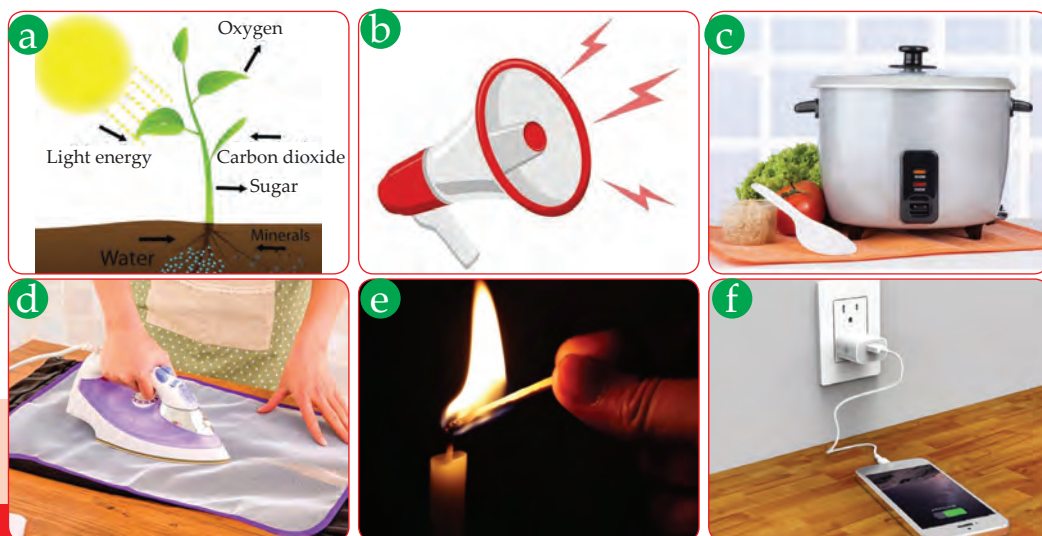
- define energy as the capacity to do work.
- identify the sources of energy.
- give examples of uses of energy in daily life.
- define electricity and identify its sources.
- introduce magnetic and non-magnetic substances with examples.
- compare power of different magnets.
- state the uses of magnets in daily life.

Glossary

acute	: severe or serious
cell	: the device which converts chemical energy into electrical energy
conductors	: the substances through which electricity can flow
crisis	: acute scarcity, shortage
dynamo	: a small device having magnet which is rotated to convert mechanical energy into electrical energy
electricity	: the form of energy which is produced due to flow of electrons
energy	: the capacity of doing work
generator	: a very big dynamo which produces electricity in a large scale
insulators	: the substances through which electricity cannot flow
judicious	: careful and sensible
magnet	: a substance which attracts iron, nickel, cobalt, etc. and rests in the north-south direction when suspended freely
magnetism	: the property of a magnet by virtue of which it attracts iron nickel, etc.
non-renewable	: which cannot be obtained or replaced again and again after use

1.1 Introduction to Energy

What do you see in the given figures? Discuss in the classroom.



Identify the form of energy present or used in the above things or activities.

Living beings cannot survive without energy. We need energy to do work. Food provides us energy to walk, run, jump and do other activities. Diesel provides energy to run vehicles and operate machines in industries. **The capacity to do work is called energy.**

We get energy from various things such as food, firewood, petrol, diesel, coal, kerosene, LP gas, running water, blowing wind, etc. The sun is the main source of energy. Energy is required for cooking food, running vehicles, operating machines in industries, lighting bulbs, operating computers, etc. All plants

and animals need energy to survive. In this lesson, we will study the sources and forms of energy, applications of energy and energy crisis in brief.

1.2 Sources of Energy

Project Work

Observe various sources of energy found in your locality. Write their names and uses in a chart paper. Display the chart paper in the classroom.

S.N.	Name of energy source	Uses
1		
2		
3		
4		
5		

We get light and heat energy from the sun. Therefore, the sun is the source of light and heat. Temple bell, radio, television, loudspeaker, etc. are the sources of sound energy. Burning coal, fire, electric heater, etc. are the sources of heat energy. Bread, petrol, coal, diesel, kerosene, etc. are the sources of chemical energy.

Cell, photocell, battery, etc. are the sources of electrical energy. So, **the substances from which we get energy are called sources of energy**. Examples: Heater, petrol, coal, rice, wind, water, battery, etc.



Sun



Dry cell



Bread



Coal

Some sources of energy

1.2.1 Types of Energy Sources

The sources of energy can be divided into two types. They are (i) renewable and (ii) non-renewable sources of energy.

(i) Renewable sources of energy

The sources of energy which are produced continuously in nature and can be used again and again are called renewable sources of energy. Solar energy, wind energy, energy from running water, biomass energy and biogas are some examples of renewable sources of energy. These sources of energy will never finish from nature and hence can be used again and again.



(ii) Non-renewable sources of energy

The sources of energy which cannot be used again and again after their use are called non-renewable sources of energy. Coal, petrol, diesel, petroleum gas, etc. are some examples of non-renewable sources of energy. These sources of energy have a limited stock in nature and take millions of years to form once again in nature. Therefore, non-renewable sources of energy cannot be used again and again.



Activity 1

Observe various sources of energy in your locality and name them. Also, classify them in terms of renewable and non-renewable sources of energy.

1.2.2 Natural and Artificial Sources of Energy

Some sources of energy are found in nature. Some sources of energy are made by human beings. The energy sources that are found in nature are called natural sources of energy. Examples: Sun, coal, petrol, wind energy, etc. The sources of energy that are made by human beings are called artificial sources of energy. Examples : Cell, battery, biogas, etc.

Activity 2

Observe the given energy sources and find out whether they are natural or artificial.



Natural Sources of Energy



Fig.
7.15



Take a chart paper. Draw the figures of natural sources of energy and submit to your science teacher.

1.3 Forms of Energy

Study the given figures. Identify the form of energy contained/ present in them.



There are different forms of energy. The major forms of energy are introduced below.

a. Light energy

The form of energy which makes things visible is called light energy. The sun, lighting bulb, CFL, burning candle, etc. emit light energy. Light energy is obtained from extremely hot objects. We cannot see things in the absence of light energy.



b. Heat energy

The form of energy which gives the sensation of warmth is called heat energy. We can get heat energy from extremely hot objects like the sun, burning coal, burning firewood, electric heater, etc. We use heat energy to cook our food, operate machines in industries, dry clothes, run vehicles, etc.



Fig.

7.18

Sun



Burning coal



Electric heater

c. Electrical energy

The form of energy which is obtained from cell, battery, photocell or generator is called electrical energy. It is the most important form of energy. It is used to obtain heat and light. It is used to operate computer, mobile phone, television, radio, refrigerator, etc. We can generate electricity by rotating turbine with the help of water. It is called hydroelectricity.

Electricity can also be obtained from the solar energy using solar panels.

Electrical energy can be changed into heat energy, light energy, sound energy, etc.

For example, electrical energy is changed into light energy using an electrical bulb. Electrical energy is changed into heat energy using an electrical heater.

Do You Know

The electricity generated by rotating turbine with the help of water is called hydroelectricity. It is a renewable source of energy.

Fig.
7.19



Solar panel



Battery



Generator

d. Sound energy

The form of energy which gives the sensation of hearing is called sound energy. It is produced due to vibration of objects. **The substances which produce sound are called sources of sound.** Temple bell, loudspeaker, television, musical instruments, etc. are some sources of sound.

Fig.
7.10



Temple bell



Loudspeaker



Piano

e. Magnetic energy

The form of energy obtained from a magnet is called magnetic energy. A magnet is a substance which attracts iron, cobalt, nickel, etc. A magnet is used in loudspeaker, television, radio, mobile phone, electric bell, etc. It is used to lift heavy iron objects in industries, to remove iron dust from the eyes, etc. A magnet is also used in a compass to detect the directions because a freely suspended magnet always points to North-South direction.

Fig.
7.1.11



Magnet attracting iron dust



Magnetic compass

f. Chemical Energy

When petrol is burnt in the engine of a car, the chemical energy stored in petrol is used to run the car. The energy stored in a matter is called chemical energy. Bread, coal, petrol, diesel, battery, wood, oil, etc. have chemical energy stored in them. Chemical energy is released when chemical change takes place. Some sources of chemical energy are given below:

Fig.
7.1.12



Bread



Kerosene



Cell

g. Nuclear energy

The energy obtained from the nucleus of an atom is called nuclear energy. This energy can produce a large amount of heat and light energy. Nuclear energy is used in atomic power plants to produce electricity. Similarly, nuclear energy is used for making atom bomb, hydrogen bomb, etc.



Bomb explosion

Activity 3

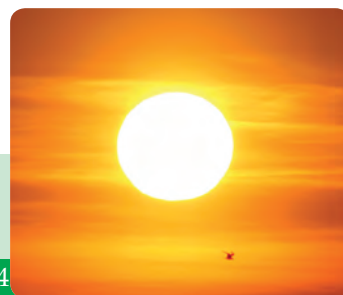
- Prepare a list of various sources of energy that are used at your home. Classify them into renewable and non-renewable sources of energy.

Activity 4

- Prepare a list of various forms of energy. Also, write down their applications in our daily life.

1.4 The Sun: The Main Source of Energy

Energy can be obtained from different sources like the sun, blowing wind, petrol, diesel, coal, running water, biomass, hydroelectricity, etc. Among them, the sun is considered as the main source of energy. All other sources of energy depend on the solar energy directly and indirectly. Green plants depend on solar energy to prepare food during photosynthesis. All animals depend on plants directly or indirectly for food. So, all living beings depend on solar-energy for food.



Sun

Water cycle cannot operate in the absence of heat of the sun. Without water cycle hydroelectricity cannot be generated. Therefore, the energy obtained from running water and hydroelectricity are also the outcome of solar energy.

Do You Know

The process of making food by green plants in the presence of sunlight is called photosynthesis. Green Plants prepare their food in leaves.

Similarly, petrol, diesel, coal, LP gas, etc. are also the outcome of solar energy. We use solar energy to operate solar cooker, solar water heater, solar calculator, traffic lights, vehicles, etc. The heat energy of the sun warms up the air and causes air

blow. Blowing wind is used to rotate wind mills, turbines, etc. Because of these reasons, the sun is considered as the main source of energy.

1.5 Applications of Energy

1. Energy is essential to do different types of work. For example, we need energy to run, to play, etc.
2. Solar energy is used by green plants to prepare their food during photosynthesis.
3. We use solar energy to operate solar water heater, solar cooker, solar car, solar calculator, etc.
4. Solar energy is used to produce electricity.



Fig.

7.1.15

Solar water heater

5. Wind energy is used to rotate turbines and wind mills to generate electricity.
6. Electrical energy is used to operate various equipment, to light bulb, to get heat, etc.
7. The energy from running water is used to generate hydroelectricity and to operate water mills (panighatta).
8. Magnetic energy is used in television, mobile phone, radio, loudspeaker, etc.
9. Heat energy from the sun is used to keep our body warm, dry clothes and crops.



Fig.

7.1.16

Windmill

10. Heat energy obtained by burning coal, petrol, diesel, kerosene, LP gas, etc. is used to cook food, boil water, operate machines in the industries and run vehicles.

Activity 5

- Name the various sources of energy that you use at your home.
- Write down the applications of these sources of energy and discuss in your classroom.

1.6 Energy Crisis

Now-a-days, we are facing the shortage of energy sources due to population growth. We are facing shortage of electricity, petrol, diesel, gas, etc.



Fig.

7.1.17

Energy crisis

Most of the sources of energy that we use now-a-days are petroleum products like petrol, diesel, coal, LP gas, etc. These sources have a limited stock in nature. We are using them at a rapid rate that their stock will be finished from nature in a very near future. It will result in great scarcity of energy sources. **The acute scarcity of energy sources is called energy crisis.**

Population growth, careless use of existing energy sources and lack of development of alternative sources of energy are the main causes of energy crisis.

It is our duty to contribute to push energy crisis further. Some methods of solving the problem of energy crisis are as follows:

1. We should use the existing sources of energy wisely and economically.

2. Alternative sources of energy such as solar energy, wind energy, biomass energy, etc. should be developed and used.
3. Solar water heaters and solar cookers should be used to heat water and cook our food.
4. Food should be cooked in pressure cookers to save energy.
5. Computer, television, bulbs, etc. should be switched off if their use is not necessary.
6. Lead bulbs should be used instead of electric bulbs to save electricity.

Key concepts

1. Energy is the capacity to do work. All animals and plants need energy to survive.
2. The sources of energy which are produced continuously in nature and can be used again and again are known as renewable sources of energy, eg. solar energy, wind energy, etc.
3. The sources of energy which get finished after use and cannot be used again and again are called non-renewable sources of energy, e.g. coal, petrol, diesel, etc.
4. Energy exists in different forms such as heat energy, light energy, sound energy, magnetic energy, etc.
5. The acute scarcity of energy sources is called energy crisis.

Exercise

1. Tick (✓) the best answer from the given alternatives.

a. The capacity of doing work is called

☐

heat

☐

light

☐

sound

☐

energy

b. Which of the following is a renewable source of energy?

☐

petrol

☐

coal

☐

diesel

☐

biomass

c. The form of energy that makes things visible is called energy.

☐

heat

☐

light

☐

sound

☐

electrical

2. Put a tick (✓) for the correct statement and a cross (×) for the incorrect one.

a. Energy is not required to do work.

☐

b. Coal and petrol are renewable sources of energy.

☐

c. Light is obtained from very hot objects.

☐

d. We should use existing energy sources wisely and economically.

☐

3. Fill in the blanks using appropriate words.

a. Hydroelectricity is sources of energy.

b. The energy gives the sensation of warmth is called

c. The energy that gives the sensation of hearing is

d. The acute scarcity of energy sources is called

e. The energy obtained from the nucleus of an atom is called energy.

4. Answer the following questions.

a. What is energy? Name two types of sources of energy.

b. Define renewable sources of energy with any two examples.

c. Define non-renewable sources of energy with any two examples.

d. Why are coal and petrol called non-renewable sources of energy?

e. Name any four forms of energy.

- f. Define light energy and heat energy.
- g. What is electrical energy? Name any two sources of electrical energy.
- h. What is magnetic energy? Write its two uses.
- i. What is energy crisis? Write any four ways of solving energy crisis.

5. Match the following.

- a. Burning coal
- b. Tube light
- c. Guitar
- d. Generator

- | | |
|--------------------------|-------------------|
| <input type="checkbox"/> | Electrical energy |
| <input type="checkbox"/> | Heat energy |
| <input type="checkbox"/> | Light energy |
| <input type="checkbox"/> | Sound energy |
| <input type="checkbox"/> | Chemical energy |

6. Write any four applications of energy in our day-to-day life.
7. The sun is considered as the main source of energy. Explain in brief.
8. Out of truck and motorcycle, which one will use more fuel to run, why?
9. We get tired after doing physical exercise, why?
10. Name the form of energy found in each of the given objects.

a.



b.



c.



11. Write any five methods of saving energy.

12. How do you save energy sources at your home? Write.

2.1 Introduction to Electricity

Activity 1

Identify the given equipment and write their names.



Also, write down the each of these equipment. Which form of energy is required to operate them? Discuss in the classroom.

The form of energy which is obtained from cell, battery, photocell or generator is called electrical energy. It is the most important form of

Do You Know

The electricity generated by rotating turbine with the help of water is called hydroelectricity. It is a renewable source of energy.

energy. It is used to obtain heat and light. It is used to operate computer, mobile phone, television, radio, refrigerator, etc. We can generate electricity by rotating turbine with the help of water. It is called hydroelectricity.

Electricity can also be obtained from the solar energy using solar panels. **Electrical energy can be changed into heat energy, light energy, sound energy, etc.** For example, electrical energy is changed into light energy using an electrical bulb. Electrical energy is changed into heat energy using an electrical heater.



Solar panel



Battery

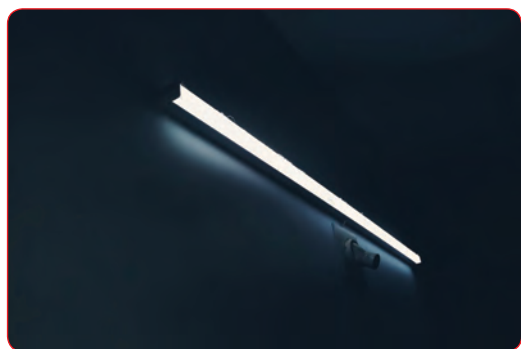


Generator

2.2 Uses of Electricity

Electricity is widely used in our daily life. Some of the main uses of electricity are stated below :

1. To get light using tubelights, bulbs, etc.



2. To operate computers, printers, etc.

Fig.

724



3. To operate machines like fridge, water pump, mixer, grinder, etc.

Fig.

725



4. To charge mobile phone, laptop, tablet, torchlight, etc.

Fig.

726



5. To run many equipment in industries and factories.

Fig.

727



6. To wash clothes using washing machine and press clothes using electric iron.

Fig.

728



7. To run electric heater and electric fan.

Fig.

729



8. To purify water using eurogards.

Fig.

7210



9. To heat water using immersion heater and electric cooker.

Fig.

7211



10. To cook food items.

Fig.

72.12



Activity 2

Observe the electrical equipment at your home and school. Name these equipment and write their uses.

S.N.	Name of electrical equipment	Uses
1.
2.
3.
4.
5.
6.
7.

Electricity is the main source of energy for human beings. It can easily be converted into another form of energy. We use various equipment to convert electrical energy into another form of energy. Some of them are given below :

1. Electric heater converts electrical energy into heat energy.
2. Bulb/Tubelight converts electrical energy into light energy.
3. Rice cooker converts electrical energy into heat energy.

4. Computer or TV converts electrical energy into sound energy, light energy and heat energy.
5. Loudspeaker converts electrical energy into sound energy.

2.3 Sources of Electricity

Observe the given figures and identify them. State the uses of each of them.



Those equipments from which electricity is obtained are called **sources of electricity**. Cell or battery, solar cell or photocell and dynamo or generator are the main sources of electricity. A brief description of sources of electricity is given below:

1. Cell

The device which converts chemical energy into electrical energy is called **cell**. It produces direct current. Cell is widely used in torchlight, camera, radio, tape-recorder, etc.



Dry cells

2. Dynamo and Generator

Dynamo is an equipment which converts mechanical(kinetic) energy into electrical energy. A strong magnet is used in dynamo. We use magnet in bicycle, motorcycle, car, truck, bus, etc. to generate electricity. However, dynamo cannot produce electricity in a large scale. So scientists have developed generator to generate electricity in a large scale.

Fig.

72.15



Dynamo



Generator

A very big dynamo which can produce electricity in a large scale is called a generator. It is used in hydropower stations. The turbines are rotated with the current of running water in hydropower stations to produce electricity in a large scale.

3. Hydroelectricity

The electricity that we use at our homes and offices is hydroelectricity. It is generated by rotating the turbine with the force of running water. When turbine is

Fig.

72.16



rotated with the help of water, electricity is produced. So the electricity generated with the help of water is called hydroelectricity. The electricity thus produced is transmitted through wires kept on electric poles. The electricity distributed to our homes is called main line. Various electric equipment are connected to main line to operate them.

We can generate electricity by rotating the turbine with the help of fast moving wind. A wind mill is used to generate electricity using wind energy.



Fig.

7217

Activity 2

- Take a bicycle with dynamo.
- Rotate the paddles and observe the brightness of the bulb.
- Now, decrease the speed of rotation what happens to the brightness of the bulb? Discuss.

We connect most of electric equipment to the main line to operate them. Television computer, mixture, grinder, electric fan, refrigerator, electric iron, mobile charger, etc are connected to the main line to operate them. Other equipment like clock, mobile phone, watch, remote, toy car, stop watch, etc. run with the help of battery. Similarly, solar energy is used to charge solar battery.

Activity 3

Observe the given figures. Identify the devices whether they are connected to the main line or battery to operate them. Complete the given table after observation.

















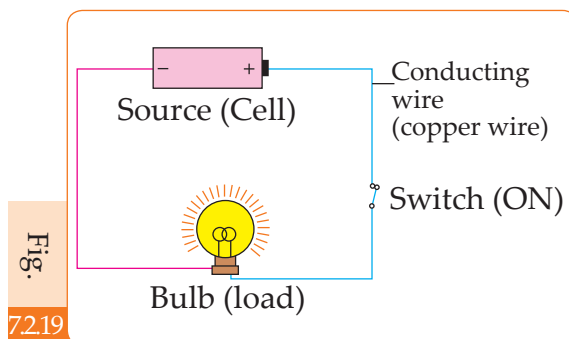


Fig. 72.18

Equipment that are connected to main line	Equipment that run with the help of battery
1.	1.
2.	2.
3.	3.
4.	4.

2.4 Electric Circuit

Electric current requires a continuous path to flow. It can be made by connecting a conducting wire with the source of electricity and a load. So, **the path made by connecting a source, conducting wire and load is called electric circuit.**



The components of an electric circuit are:

i. cell or battery, ii. conducting wire, iii. load (bulb) and iv. switch.

In an electric circuit, a cell or battery acts as a source of electricity. Conducting wire (copper wire) acts as the medium which offers flow of electric current through it. A

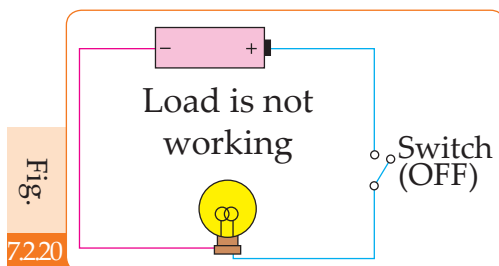
bulb is the device which converts electrical energy into heat and light energy. Similarly, a switch is used to open and close the circuit when required.

Do You Know

- Battery is the group of cells.
- In an electric circuit, cell or battery acts as a source of electricity.

2.4.1 Open Electric Circuit

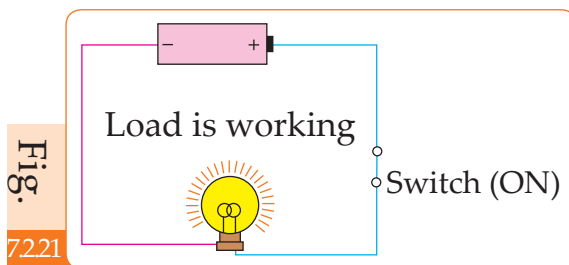
The electric circuit in which a load does not work is called **open circuit**. In an open circuit, electric current does not flow continuously. So the load (bulb) does not work. A circuit may be open (i) if the switch is turned 'OFF', (ii) wire has broken or (iii) load (bulb) is damaged.



Open circuit

2.4.2 Closed Electric Circuit

The electric circuit in which a load works continuously is called **closed electric circuit**. In this condition, current flows continuously through the circuit. The switch is turned 'ON' in a closed circuit.



Closed circuit

Activity 4

- Take a dry cell, a bulb, a bulb-holder, a switch and piece of copper wire.
 - Connect them and form an electric circuit.
 - Does the bulb glow when the switch is turned 'ON' ? Why?
 - Now, turn the switch 'OFF' and observe. Does the bulb glow? Why?
 - Now break the connecting wire and turn the switch 'ON'. Does the bulb glow? Why?
- What can you conclude from this activity?

2.5 Conductors, Semi-conductors and Insulators

a. Conductors

Conductors are those substances through which electricity can flow easily.

Silver, copper, gold, aluminium, iron, nickel, etc. are examples of conductors. Most metals are good conductors of electricity.

Do You Know

Graphite is a non-metal which can conduct electricity.

b. Semi conductors

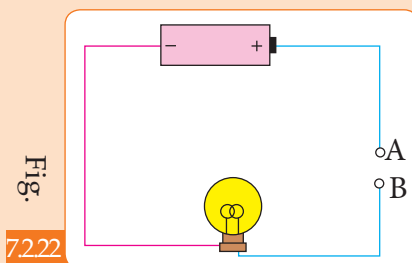
Semi-conductors are those substances which allow only a part of electricity to pass through them. Lead, silicon, etc. are semi-conductors of electricity.

c. Insulators

Insulators are those substances through which electricity cannot flow. Rubber, glass, paper, dry wood, plastic, stone, brick, etc. are examples of insulators.

Project Work

- Prepare an open electric circuit by connecting a dry cell, a bulb and connecting wire. Leave a gap AB in the circuit as shown in the figure.
- Bring small pieces of different metals and non-metals such as piece of iron, copper, aluminium, lead silicon, rubber, plastic, thread, dry wood, paper, glass, etc.



- Place each object turn by turn to fill the gap AB in the circuit. Observe carefully whether the bulb glows or not.

If the bulb glows while filling the gap, these objects are conductors. When the bulb glows brightly, they are good conductors, if the bulb glows dim, they are semi-conductors and if the bulb does not glow, they are insulators.

Key Concepts

1. Those equipment from which electricity is obtained are called sources of electricity.
2. Cell, battery, dynamo and generator are the main sources of energy.
3. The special type of cell which converts solar energy into electrical energy is called solar cell or photo cell.
4. Dynamo is an equipment which converts mechanical (kinetic) energy into electrical energy.
5. A very big dynamo which can produce electricity in a large scale is called generator.

6. The path made by connecting a source, conducting wire and load is called electric circuit.
7. The components of an electric circuit are i. cell or battery, ii. conducting wire, iii. load (bulb) and iv. switch.
8. The electric circuit in which a load does not work is called open circuit.
9. The electric circuit in which a load works continuously is called closed electric circuit.
10. Conductors are those substances through which electricity can flow easily.
11. Semi-conductors are those substances which allow only a part of electricity to pass through them.

Exercise

1. Fill in the blanks using appropriate words.

- a. The form of energy which is produced due to flow of electrons is called
- b. The device which converts mechanical energy into electrical energy is called
- c. A load works continuously in circuit.
- d. The electricity produced rotating turbine with force of water is called
- e. Metals are of electricity.

2. Tick (✓) the correct statements and cross (×) the incorrect ones.

- a. Solar cell converts light energy into electrical energy. ☐
- b. Battery is a source of electricity. ☐

- c. Current cannot pass through copper wire. ☐
- d. Wood and paper are insulators. ☐
- e. Dynamo produces electricity in a large scale. ☐

3. Tick (✓) the best answer from the given alternatives.

- a. Which of the given object produces a large amount of electricity?
☐ cell ☐ battery ☐ dynamo ☐ generator
- b. Which of the following converts electrical energy into light energy?
☐ cell ☐ bulb ☐ dynamo ☐ battery
- c. Which of the following is a good conductor of electricity.
☐ copper ☐ wood ☐ plastic ☐ paper
- d. A works continuously in a closed circuit.
☐ load ☐ cell ☐ switch ☐ battery
- e. Which of the following is a semi-conductor?
☐ copper ☐ silicon ☐ wood ☐ silver

4. Answer the following questions.

- a. What is electricity? How is it produced?
- b. Define sources of electricity with any three examples.
- c. What is cell? Name two types of cell.
- d. Why is cell used?
- e. Define dynamo and generator.
- f. Define electric circuit. Name the components of an electric circuit.

- g. Differentiate between open circuit and closed circuit.
- h. Define conductors, semi-conductors and insulators with any two examples of each.

5. Draw a neat and labeled figure of

- a. Open electric circuit
- b. Closed electric circuit

6. Describe an activity to demonstrate that metals are good conductors of electricity.

7. Give reason :

- a. Electricity is considered as the main source of energy.
- b. Hydroelectricity is the major source of energy in the context of Nepal.

8. Name the given electrical equipment and write their uses.

a.



b.



c.



d.



9. How is hydroelectricity generated? Describe with figure.

10. State the main uses of electricity in our daily life.

3.1 Introduction to Magnet

Activity 1

- Go to the science laboratory with your science teacher and observe different types of magnet.
- Take a magnet near the things made of iron. What do you observe?

When a bar magnet is brought near the iron nails, it attracts them. Similarly, iron attracts cobalt, nickel and steel. When a bar magnet is suspended freely, it always rests in the north-south direction. So, **the substance which attracts iron, cobalt, nickel, etc. and rests in the north-south direction when suspended freely is called magnet.**

Magnet exerts a force due to which it attracts iron, nickel, cobalt, etc. towards it. This special force is called magnetic force. Similarly, **the special property of a magnet by virtue of which it attracts iron, nickel, etc. is called magnetism.**

Fig.

7.3.1



Lodestone (Natural magnet)



Bar magnet



U-shaped magnet

Magnet is a very useful substance. It is used in loudspeakers, mobile phones, radio, television, electric bell, dynamo, generator, etc. Similarly, magnet is used for navigation. It is also used to remove iron dust from the eyes. In modern era, magnet is widely used to generate electricity.

3.2 Types of Magnet

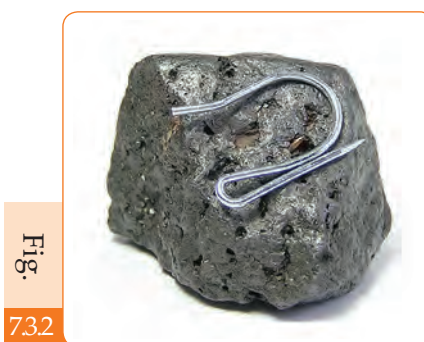
On the basis of source, there are two types of magnets. They are :

1. Natural magnet
2. Artificial magnet

1. Natural magnet

A magnet which is found in nature is called a natural magnet. Lodestone is an example of a natural magnet.

It was discovered by a shepherd boy Mangers while roaming on Mt. Ida of Asia Minor. He noticed that his iron strapped sandals got stuck to the black stone. The black stone had a special property to attract iron. The black stone was the ore of iron called magnetite or lodestone. It is found in irregular shapes and the attractive property is very less in natural magnets. Therefore, natural magnets are not much useful.



Lodestone (Natural magnet)

2. Artificial magnets

The magnets which are made by human beings by various methods are called artificial magnets. They are of different shape, size and strength. Some common artificial magnets are given below.



Bar magnet



U-shaped magnet



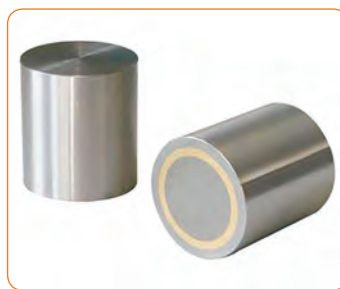
Horse shoe-shaped magnet



Magnetic compass



*Magnetic needle
(Dip needle)*



Cylindrical magnets

Fig.

733

Differences between Natural magnet and Artificial magnet

Natural magnet	Artificial magnet
1. It is found in nature.	1. It is made by human beings.
2. It is not found in all parts of the earth.	2. It can be made in all parts of the earth.
3. Its shape is irregular. Example : lodestone	3. Its shape is regular. Example : U-shaped magnet

3.3 Properties of Magnet

The major properties of magnet are given below:

1. Magnet attracts iron, nickel, cobalt, etc.

When a magnet is kept near the iron nails or iron fillings, it attracts them.

Activity 2

- Take some iron dust and spread them on a sheet of paper.
- Now, bring a bar magnet near the iron dust. Does the magnet attract the iron dust?

Fig.
734



When a magnet is brought near the iron dust, it attracts the dust. This property is called attractive property of a magnet.

2. Magnetic poles are inseparable.

Every magnet has two poles. They are the north pole and the south pole. In a bar magnet, one end of the

Fig.

735



magnet behaves as the north pole and another as the south pole. When a magnet is broken into two or more pieces, every piece develops two poles and behaves as a complete magnet. It shows that magnetic poles cannot be separated. There is no magnet having only one pole, i.e. either the North Pole or the South Pole. Therefore, we can say that magnetic poles are inseparable and they exist in pairs.

3. A freely suspended magnet always rests in the north - south direction.

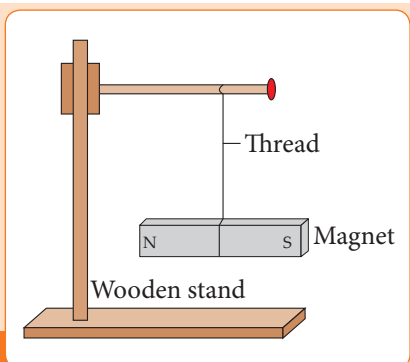
Activity 3

- Take a thread, a bar magnet and a wooden stand. Tie the magnet with the thread and suspend the magnet in the stand so that the magnet rotates freely.
- Leave the magnet undisturbed and wait until the magnet rests. The magnet rests by pointing to north-south direction.

- Now, take another bar magnet and repeat the above activity. This magnet also rests by pointing to north-south direction. This activity proves that a freely suspended magnet rests in the north - south direction.

Fig.

73.6



4. Unlike poles of magnets attract and like poles repel.

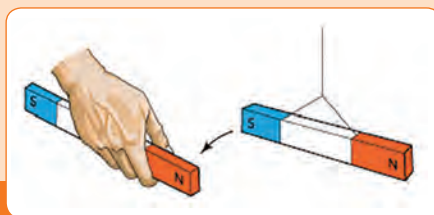
If the north pole of one bar magnet is brought near the south pole of another magnet, they attract each other. But if the north pole of one bar magnet is brought near the north pole of another magnet, they repel. Similarly, if the south pole of a bar magnet is brought near the south pole of another magnet, they also repel. It shows that unlike poles of magnets attract and like poles repel.

Activity 4

- Take two bar magnets. Keep one of them on a wooden table.
- Now, bring the north pole of another magnet near the south pole of the magnet kept on the table. Do they attract each other?
- Now, bring the south pole of a the magnet near the north pole of the magnet kept on the table. What do you observe? Do they attract each other?
- Now, repeat the above activity with bringing like poles of both magnets in close contact. What do you observe? Write down the conclusion of this activity.

Fig.

73.7



3.4 Magnetic and Non-magnetic substances

a. Magnetic substances

Those substances which are attracted towards magnet are called magnetic substances. Iron, cobalt, nickel and steel are the examples of magnetic substances.



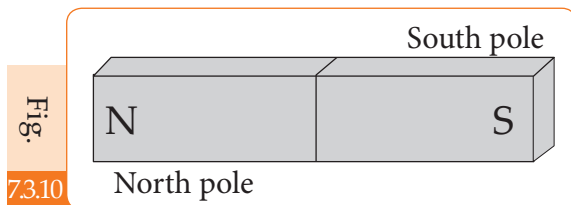
b. Non-magnetic substances

Those substances that are not attracted towards magnet are called non-magnetic substances. Plastic, stone, wood, brick, rubber, paper, glass, copper, aluminum, etc. are examples of non-magnetic substances.

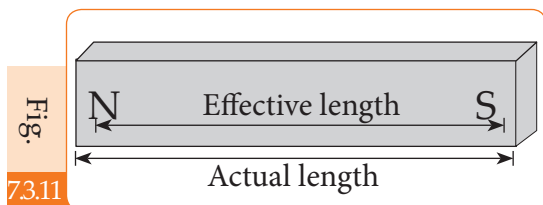


3.5 Magnetic poles

Each magnet has two poles. They are the north pole and the south pole. The poles of a magnet are inseparable. The regions in a magnet having maximum attractive power are called poles of the magnet.



Magnetic poles are located slightly near the ends of a magnet. But not at the terminal end.

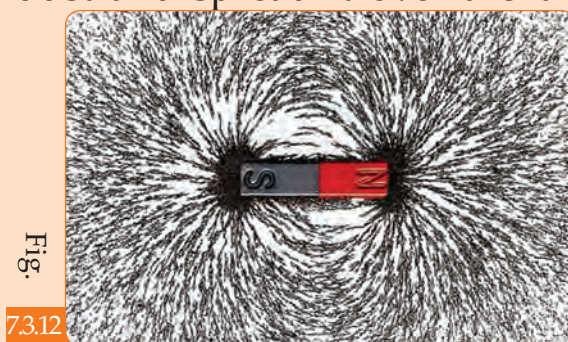


Do You Know

The magnetic force is maximum at the poles and minimum at the middle portion.

Activity 5

- Take a spoonful of iron dust and spread it over a chart paper uniformly.
- Take a bar magnet and roll the magnet over iron dust several times.
- Now, pick up the magnet and observe which portions of the magnet attract maximum iron dust.



Magnetic force is maximum at poles

We can observe that maximum iron dust is attracted at the poles.

This activity proves that magnetic force is maximum at the poles.

3.6 Uses of Magnets

1. Magnets are used in various equipment like electric bell, electric fan, speaker, microwave oven, etc.



2. They are used in radio, television, computer, dynamo, generator, electric motor, etc.



Radio



Loudspeaker

3. They are used in toys, doors of refrigerator, tape recorders, video recorders, etc.
4. They are used to lift heavy loads of iron and to remove eye splinters.
5. They are used to find directions.
6. They are also used in magnetic therapy.



Exercise

1. Tick (✓) the correct statements and cross (×) the incorrect ones.

- a. A freely suspended magnet always rests in the north-south direction. ☐
- b. A magnet does not attract cobalt. ☐
- c. We can separate the north pole and the south pole of a magnet. ☐

d. Magnetic force is maximum at the poles.

☐

e. Magnet is not used in radio and TV.

☐

2. Fill in the blanks using appropriate words.

a. Unlike poles of magnet each other.

b. Wood, paper and glass are substances.

c. A freely suspended magnet always rests in direction.

d. Lodestone is an example of magnet

e. The substances which are attracted towards magnet are calledsubstances.

3. Tick (✓) the best answer from the given alternatives.

a. Which of the following is a non-magnetic substance?

☐

Iron

☐

steel

☐

cobalt

☐

copper

b. A magnet has poles.

☐

one

☐

two

☐

three

☐

four

c. The magnetic force is maximum at of the magnet.

☐

north pole

☐

south pole

☐

poles

☐

middle

d. Which of the following is a natural magnet ?

☐

lodestone

☐

U-shaped magnet

☐

horse -shoe shaped magnet

☐

bar magnet

e. magnets are used in

☐ radio

☐ television

☐ fridge

☐ all of them

4. Answer the following questions.

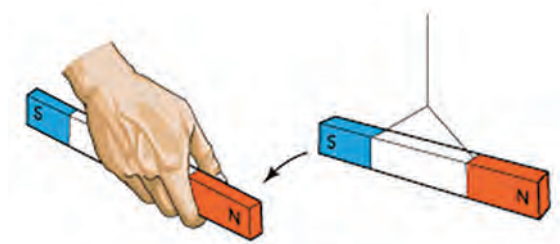
- Define magnet and magnetism.
- Write any two uses of magnet.
- Mention any four properties of magnet.
- Define magnetic and non-magnetic substances with any two examples of each.
- What is meant by the north pole and the south pole of a magnet.
- Where are magnetic poles located?
- What are the two poles of a magnet?

5. Explain an activity to show that magnetic poles are inseparable.

6. Write the main uses of magnets.

7. We cannot use a magnet to remove insect entered the eye, why?

8. Which property of the magnet can be explained by the given figures.



9. How do you use magnets at your home? Write.

UNIT 08

The Earth and Space

Estimated teaching hours : 20

Before You Begin

The earth is our home planet. Different types of animals and plants live on the earth. The surface of the earth is made of water and land. About three-fourths of the earth's surface are covered with water and only one-fourth with land. The earth is spherical in shape. There are high mountains, hills, valleys and plains. Similarly, there are oceans, rivers, lakes, ponds, streams, glaciers, etc. on the surface of the earth. Some parts of the land are covered with dense forests, grasslands, cropfields, etc. whereas some parts of the land have deserts. In this unit, we will study the internal structure of the earth and the factors that bring changes on the surface of the earth.

In rainy season, we see clouds in the sky. **Clouds are grey or white mass made of very small drops of water that float in the sky.** Clouds have various shapes, sizes, colours and appearance. Due to heat of the sun, water present on the surface of the earth changes into vapour. The vapour moves up in the sky. When the water vapour changes back into water droplets in the sky, clouds are formed. **Clouds are mainly of four types, viz. cirrus, cumulus, stratus and nimbus.**

In our country, lots of lives and properties are damaged every year due to floods and landslides. Earthquakes may kill thousands of people within a few minutes. Similarly, volcanic eruption, fire, tsunami, etc. occur every year and destroy human settlement, roads, animals, plants, etc. in different parts of the earth. These phenomena are called natural disasters. So, **the phenomena occurring in nature that damage lots of lives and property are called natural disasters.** Earthquake, landslide, flood, coldwaves (sheet lahar), volcanic eruption, cyclone, etc. are some examples of natural disasters.

Learning Outcomes

After completing the study of this unit, students will be able to:

- introduce the earth and explain its shape, size and composition.
- explain the structure of the surface of the earth.
- introduce atmosphere and various types of weather.
- explain various human activities in a particular type of weather.
- identify the weather changed in a certain time.
- collect information regarding weather forecasting.
- predict the forthcoming weather by observing clouds.
- prepare weather chart.
- introduce natural disasters.
- state effects on environment due to natural disasters.

Glossary

afforestation	: plantation of trees in bare and uncultivated land
atmosphere	: the layer of air around the earth's surface
butt	: the part of a cigarette that is left after smoking
cirrus	: a light cloud that looks like curls of white hair
climate	: the average atmospheric condition over a long period of time
cloud	: a grey or white mass of very small drops of water that floats in the sky
condensation	: conversion of water vapour into liquid state
cumulus	: a thick white cloud that looks like a cauliflower
deforestation	: the act of cutting down trees in an area
disaster	: something that happens suddenly and causes much suffering or loss of many people
embankment	: a wall of stone made to keep water back
explosion	: a sudden violent bursting and loud noise of something
forecast	: to predict what will happen in the future based on information that is available now
friction	: rubbing of one object or surface against another
glacier	: a large mass of ice, formed by snow in mountains
humidity	: the amount of water in the air
hydrosphere	: the part of the water on the surface of the earth
impact	: the effect that something has on something/somebody
latitude	: the distance of a place from north or south of the equator
lithosphere	: the part of land on the surface of the earth
meteorology	: the branch of science which deals with the study of weather
monsoon	: a period of very heavy rain in particular countries
natural	: existing in nature and not made or caused by people
nimbus	: large and grey cloud that causes rain or snow
outbreak	: a sudden start of something unpleasant
precaution	: something that is done in advance to prevent problems or to avoid danger
prone	: likely to suffer from something
residential	: an area of a town suitable for living
shallow	: not having much depth
solar	: connected to the sun, of the sun
spring	: place where water comes naturally to the surface from under the ground
stratus	: a grey cloud which looks like a flat blanket
weather	: the condition of the atmosphere at a particular place and time

1.1 Introduction to Earth

Activity 1

- Take a globe and study its shape. Observe the part of land and water in the globe.
- Find out the location of Nepal in the globe.
- Compare the part of land and water in the globe.
- Compare the shape of the globe and that of an orange.
- What can you conclude from this activity?

Fig.

8.1.1



Out of the eight planets of the solar system, the earth is the only planet where living beings exist. **The earth is the suitable house for all living beings as it has the suitable environment for existence of plants and animals.** It has suitable temperature, water and life supporting gases like oxygen and carbon dioxide. So living beings can survive on the earth.

More than two-thirds of the surface of the earth are covered with water and the remaining one-third surface of the earth is covered with land. The water bodies present on the surface of the earth include oceans, rivers, lakes, ponds, etc. The surface of the earth is not uniform. It has plains, valleys, hills and high mountains. Some places of the earth are covered with snow, some have dense forests and others have deserts.

Fig.

8.12

*Himalayas**Dense forest**Desert*

1.2 Components of the Earth

The outer surface of the earth has three main components which are as follows:

1. Hydrosphere 2. Lithosphere 3. Atmosphere

1. Hydrosphere

Hydrosphere is the mass of water present on the earth. It includes various water bodies like ocean, rivers, lakes, ponds, etc. These water bodies are the major sources of water. The hydrosphere spreads over the earth's surface, on the earth's surface and under the earth's surface.

In the Himalayas, most of the water is found in the form of snow or ice. The water on the surface of the earth gets heated due to the heat of the sun and forms vapour and clouds. The snow or ice, water vapour and clouds are the sources of water over the earth's surface. The sources of water like oceans, rivers, ponds, lakes, etc. are the sources of water on the earth's surface. Similarly, water is also found under the surface of the earth which is called underground water.

Fig.

8.13

*Ocean**Koshi River**Rara Lake*

The underground water bodies are the sources of water that comes out from well, spring, etc. We draw underground water on the surface of the earth with the help of tube well, pumpset, etc.

Activity 2

- What types of water bodies are found in your locality? Name them.
- Take a map of Nepal and find out the location of rivers and lakes of Nepal.
- Prepare a list of some major rivers and lakes of Nepal.



Fig.
8.14

Tube well

2. Lithosphere

Lithosphere is the part of land on the surface of the earth. It occupies about one-third part of the earth's surface. The surface of the earth is not smooth and uniform everywhere. It has plains, hills, valleys, plateaus, mountains, etc. Have you seen plains, hills, valleys and mountains? In which place is your home located?



Fig.
8.15

Plain



Valley



Mountains

The flat land of the lithosphere is called a plain. The Terai region of Nepal is an example of plain area. A rounded area of the land that is higher than the land around it but not as high as a mountain is called a hill. **The flat part of the lithosphere**

which is surrounded by hills or mountains is called a valley. Kathmandu valley, Dang valley, Pokhara valley, etc. are some valleys of Nepal. Mountains are the highly raised parts of the lithosphere. Tall mountains always remain covered with snow. For example, Himalayas.

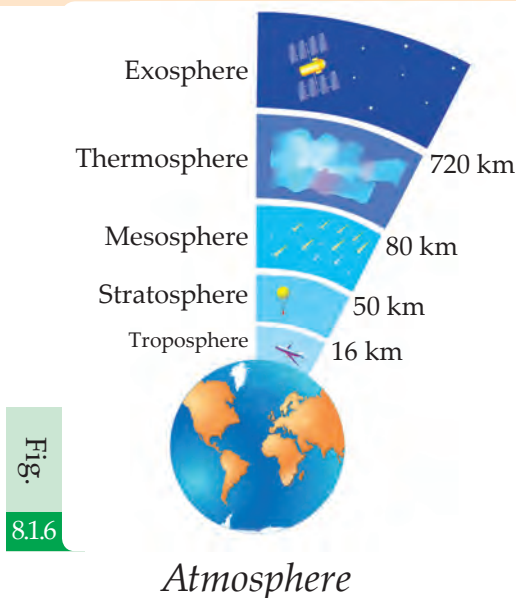
Activity 3

- Observe the surface of the earth in your locality. Is it a plain, hill, valley or a mountain? Why?
- Draw a neat figure of the part of the land and submit it to your science teacher.

3. Atmosphere

Atmosphere is the layer of air that surrounds the earth's surface. It consists of different gases, water vapour and dust particles. Atmosphere is essential for survival of living beings. The different gases present in atmosphere are oxygen, nitrogen, carbon dioxide, neon, etc. The atmosphere

extends upto 720 kilometres from the surface of the earth. However, about 99 percent of air is found upto 30 kilometres above from the earth's surface. The atmosphere near the earth's surface is thick. The amount of air decreases as we go higher in the atmosphere.



Activity 4

- Draw a neat figure showing various layers of atmosphere.
- Write down the importance of atmosphere for living beings.

1.3 Structures of the Earth's Surface

The structure of the earth's surface is not uniform. It has various landforms with different altitude. The land surface of the earth can be divided into plain, hill, valley, mountain and plateau.

a. Plain

The terai region of Nepal is an example of a plain area.

The flat surface of the earth with low height is called the plain. There is plenty of water and fertile soil in plains. Therefore, plains are suitable for farming. Generally, plains are warmer than hills and mountains.



Fig.

8.17

Plain (Terai)

b. Hill

Hill is the area of the land that is higher than the land around it. The height of a hill is less than that of a mountain. Nepal is a hilly country. Most of the land surface of Nepal is covered with hills of different heights. Hills are colder than plains and warmer than mountains. Hills are less fertile than plains. However, different types of birds, animals and vegetation are found in hills.



Fig.

8.18

Do You Know

Different types of fruits, vegetables, birds and medicinal plants are found in the hilly regions of Nepal.

c. Valley

The low-lying area of land surrounded by hills is called a valley. The soil of valley is fertile. So, it is suitable for crop production. Kathmandu valley, Dang valley and Pokhara valley are some valleys of Nepal. Human settlement is denser in valleys than that in hills.

Fig.
8.19



Dang valley



Kathmandu valley

d. Mountain

Mountain is the area of land which is higher than hill.

There are many mountains in Nepal. The highest mountain in the world, i.e. Mt. Everest is also located in Nepal. Mountains are not suitable for

Fig.
8.10

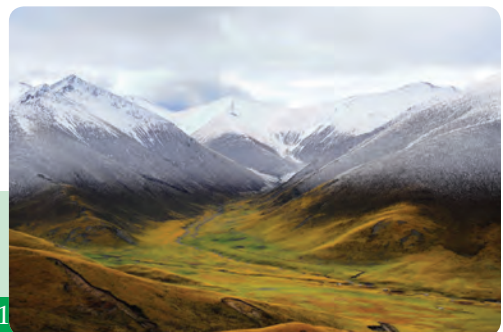


human settlement and crop production. Mountains are very cold as compared to hills and plains. Generally, mountains remain covered with ice.

5. Plateau

A plateau is the area of flat land that is higher than the land around it. The Tibetan plateau is the highest plateau in the world. It is also called the roof of the world. Human

Fig.
8.11



settlement, forests and wild animals are also found in plateaus. Generally, plateaus are used for agriculture and human settlement.

Activity 5

Name the landform where you live. List the plants and animals found there. Also, write any two features of that landform.

Key concepts

1. The earth is the suitable house for all living beings as it has the suitable environment for existence of plants and animals.
2. Hydrosphere, lithosphere and atmosphere are three components of the earth.
3. Hydrosphere is the mass of water present on the earth.
4. Lithosphere is the part of land on the surface of the earth.
5. Atmosphere is the layer of air that surrounds the earth's surface.
6. The surface of the earth consists of plains, hills, valleys, mountains and plateaus.
7. The flat part of the lithosphere which remains surrounded by hills or mountains is called a valley.

Exercise

1. Tick (✓) the best answer from the given alternatives.

- a. The number of planets in the solar system is

☐ 9

☐ 8

☐ 7

- b. More than part of the surface of the earth is covered with water.

☐ two-thirds

☐ one-third

☐ one-fourth

c. The part of the land on the surface of the earth is called

☐ hydrosphere ☐ lithosphere ☐ atmosphere

d. The flat part of land surrounded by hills or mountains is called a

☐ plain ☐ hill ☐ valley

e. Which of the following is also called the roof of the world?

☐ Mt. Everest ☐ Tibetan plateau

☐ Kathmandu valley

2. Put a tick (✓) for the correct statements and a cross (×) for the incorrect ones.

a. The earth is flat at the poles and bulging out at the equator. ☐

b. Hydrosphere is the mass of land present on the earth's surface. ☐

c. The flat land of lithosphere is called a plain. ☐

d. Living beings can survive without atmosphere. ☐

e. Mt. Everest is the highest peak in the world. ☐

3. Fill in the blanks with appropriate words.

a. More than part of the earth is covered with water.

b. The three components of the earth are, lithosphere and

- c. The part of land on the surface of the earth is called
- d. The atmosphere extends upto from the surface of the earth.
- e. The plateau is the highest plateau in the world.

4. Answer the following questions.

- a. What is the earth? What is its shape?
- b. What are the three components of the earth?
- c. What is hydrosphere? Write its any two features.
- d. What is lithosphere? Write its any two features.
- e. What is a plain?
- f. What are valleys and mountains?
- g. What is atmosphere? Write its any two features.
- h. Name any three gases found in atmosphere.
- i. What is a plateau? Name a plateau.

5. Identify the landforms shown in the given figures.

a.



b.



c.



- 6. Write any two differences between:**
- Hydrosphere and Atmosphere
 - Lithosphere and Atmosphere
 - Valley and Plateau
 - Hills and Mountains
 - Plains and Hills
- 7. Describe the importance of atmosphere for living beings in brief.**
- 8. What type of land is found in terai and hilly region?**
- 9. Name any three landforms that you have seen.**
- 10. Himalayan region is not suitable for growing crops, why?**

Project Work

- Take a chart paper and draw neat figure showing plain, hill, valley and mountain.
- Demonstrate the chart paper in the classroom.

2.1 Introduction to Weather

Activity 1

Observe the given figures and identify the type of weather.



Write down any two features of each weather. Also, write any two activities that we do in these weathers.

Some days may be sunny, cloudy, windy, rainy, etc. The weather of a place keeps on changing from day to day and hour to hour. The weather of a place never remains constant. The state of atmosphere at a given place and time is called weather. **The branch of science which deals with the study of weather is called meteorology.** The scientist who studies the weather is called meteorologist.

Fig.
821



Sunny weather



Cloudy weather



Rainy weather

2.2 Causes of Change in Weather

The heat of the sun is the main cause of the change in weather. The different weather of a place are sunny, windy, humid, cloudy, rainy, etc. We feel warm during sunny days as the sun rays heat the land and air. We feel cold at night as there is no heat of the sun. The heat of the sun also causes the wind to blow and clouds to form.

Fig.
822



Windy weather



Foggy weather

The heat of the sun causes difference in temperature of the day and night, morning and afternoon, and summer and winter. Sometimes, clouds block the sunlight, spread in the sky and make the day dark which may result in the rainfall. In winter, snowfall occurs in mountains.

Fig.
823



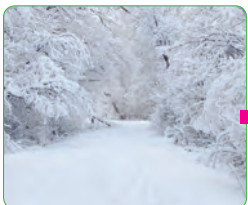
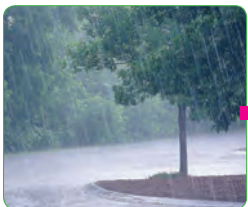
Snowy weather

The weather of a place changes from hour to hour and day to day. We can observe different types of weather like sunny, cloudy, windy, rainy, foggy, etc. It is very hot during summer and very cold during winter.

Activity 2

Observe the weather conditions for one week. Keep the record of different types of weather everyday.

Study the given figures. Identify weather and activities in the given weather. Match the following after your observation.



Project Work

Take a chart paper and draw neat diagrams of different types of weather. Write two features of each. Submit the chart paper to the science teacher.

2.3 Types of Weather

We can observe different types of weather. Sunshine, cloud formation, rainfall, snowfall, blowing of wind, dew and frost formation, fog formation, humidity, etc. are different types of weather. Some types of weathers are pleasant but others may cause a lot of discomfort to the people. What types of weather have you experienced so far?

a. Cloud formation and rainfall

The heat of the sun evaporates the water of oceans, rivers, ponds, etc. The water vapour rises up in the sky. As the water vapour reaches high up in the sky, it cools down and the water vapour condenses and forms clouds. When clouds come across cold air, the water droplets in clouds become bigger and heavier. As a result, rainfall occurs.

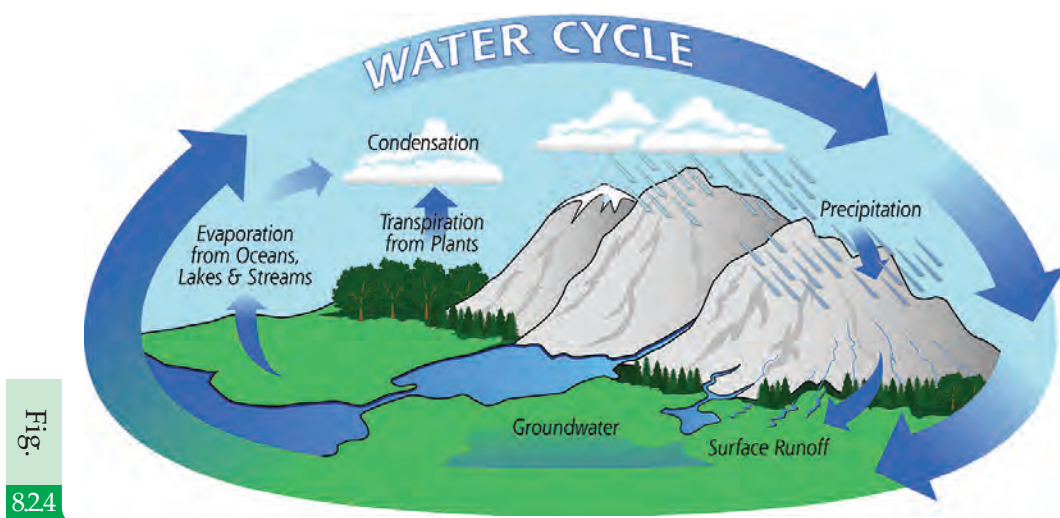


Fig.

824

Water cycle

b. Sunshine and blowing of wind

The sun shines brightly throughout the day when the sky is clear. Such a day is called a sunny day. We feel warm on sunny days. When the sun shines brightly, it heats the land and the air above the ground. The hot air rises up and the cold air rushes down as hot air is lighter than cold air. As a result, blowing of wind takes places.

c. Dew and frost

During winter nights, the water vapour present in the cold air condenses and forms tiny drops of water on window panes, leaves, grass, etc. These drops of water are called dew. The dew freezes and forms ice on very cold nights which is called frost. It can be seen on the ground, cars, roofs, etc. in very cold morning.



Fig.

825

Dew



Frost

d. Humidity

Humidity is the amount of water vapour present in air. Warm air carries more water vapour than cold air. So warm air is more humid than cold air. High humidity causes discomfort to us because the sweat does not evaporate and skin becomes sticky due to perspiration.

Activity 2

- Observe the leaves of plants and grass in a cold morning.
- Do you see droplets of water on them? What are those droplets of water called?

e. Fog

Fog is the air full of water vapour which condenses on tiny particles of dust and smoke in the form of tiny droplets of water. Fog is formed when clouds are formed very close to the ground. It generally occurs during winter. In foggy weather, we cannot see things clearly. Foggy weather slows down the traffic and may cause accidents. Therefore, the drivers should be careful and use yellow lights in vehicles so that they can see farther.

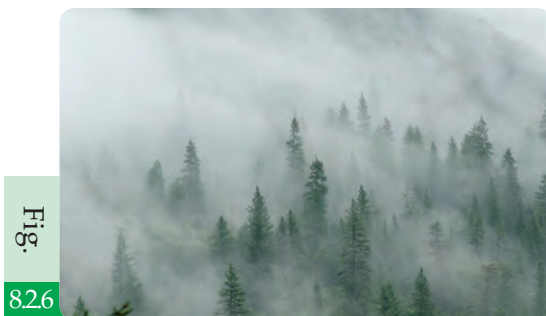


Fig.

826

Fog

f. Hailstones

Hailstones are the round balls of ice that fall towards the earth. When rain drops falling downwards pass through a very cold layer of air, they freeze and form small or big balls of ice. We should stay indoors when hailstones fall. Have you seen hailstones?



Fig.

827

Hailstones

Do You Know

- The heaviest hailstones ever recorded weighed 1 kg and landed in Gopalganj district, Bangladesh on April 14, 1968.
- The snow is not really white; it actually has no colour.

g. Snowfall

Snowfall generally occurs in mountains and high hills in winter. If the clouds are very cold or water vapour comes across very cold air it freezes into snow flakes. When these

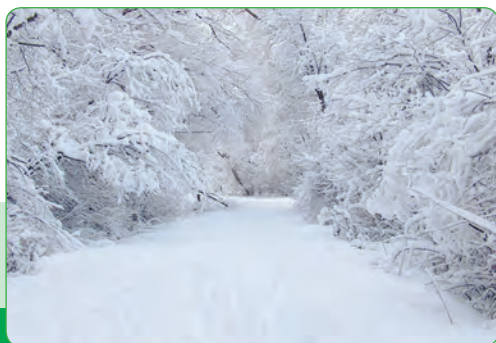


Fig.

828

Snowfall

flakes fall down, snowfall occurs. Heavy snowfall makes people stay indoors as it covers trees, crop fields roads and even roofs of the houses. Have you ever seen snowfall?

Activity 3

Different events occur in different weathers. Similarly, we do different activities in different types of weather. Identify the types of weather on the basis of activities given and complete the table.

Activities	Types of weather
1. Occurrence of flood and landslide	
2. Outdoor activities	
3. Eating ice-cream	
4. Using raincoat and umbrella	
5. Rice plantation	
6. Using heater	
7. Breaking trees	

2.4 Factors Bringing About Changes in Weather

The major factors that bring about changes in weather are as follows:

1. The sun
2. Water cycle
3. Monsoon
4. Humidity

1. The sun

The sun is the most important factor that brings about changes in weather. Blowing of wind and formation of clouds take place due to the heat of the sun. The variation

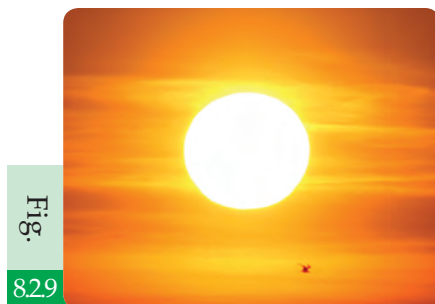


Fig.

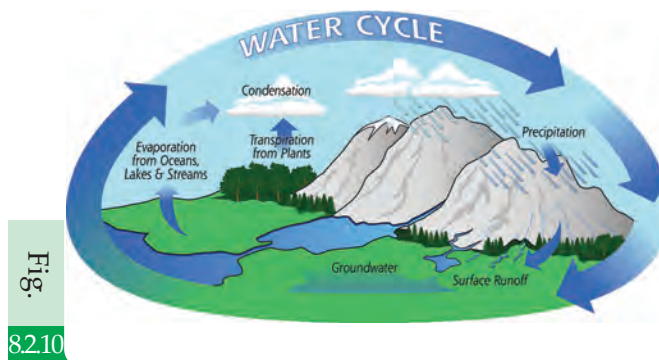
829

The sun

in the temperature on the earth occurs due to the presence or absence of the sun. We feel hot during the day due to the heat of the sun and we feel cold at night due to the absence of the sun. The temperature of morning, afternoon, evening and night also differ. The sun rays fall straight on the earth in the afternoon. So, we feel hot. But the sun rays are slanted in the morning and evening. So, we feel cold.

2. Water cycle

Water cycle is the repeated change of water into water vapour, the water vapour into clouds and then clouds into water.



Water cycle

Water cycle plays a significant role to bring about changes in weather. The water present in rivers, lakes, ponds, oceans, etc. gets converted into vapour due to the heat of the sun. Then the water vapour becomes warm and rises up in the sky.

When the water vapour reaches high up in the sky, it cools down and changes into clouds. The clouds further cool down in the sky. As a result, rainfall occurs on the earth. The water that falls on the earth gets accumulated in rivers, ponds, lakes, oceans, etc. The water again evaporates, changes into clouds and then rain and finally falls on the earth. This phenomenon is called water cycle. Cloud formation, snow fall, rainfall, etc. are the parts of water cycle which affect the weather of a particular place.

3. Monsoon

Monsoon is another major factor that brings about changes in weather. It is the period of very heavy rain in particular

countries. Monsoon is a seasonal wind that lasts for several months.

Monsoon is the cause of heavy rainfall in a particular region.

Monsoon is a wind in South-Asia that blows from South-West in summer bringing heavy rain.

In winter, it blows North-East. In Nepal, monsoon generally starts in June and causes heavy rainfall during the summer season. But the time and pattern of monsoon is changing due to global warming and climate change.

Do You Know

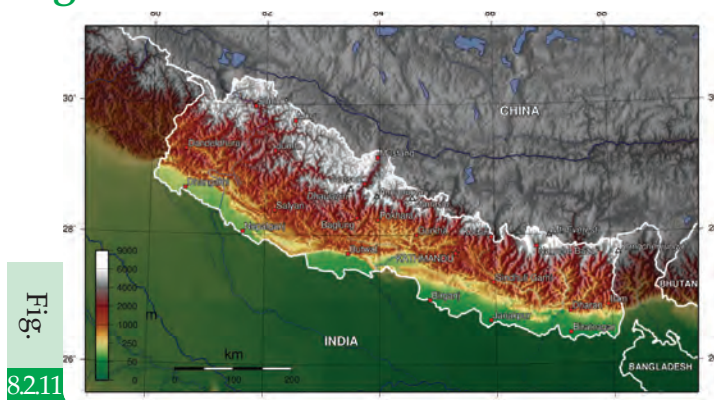
- The period of very heavy rain in particular countries is called monsoon.
- In Nepal, the monsoon causes heavy rainfall during the summer season.

4. Humidity

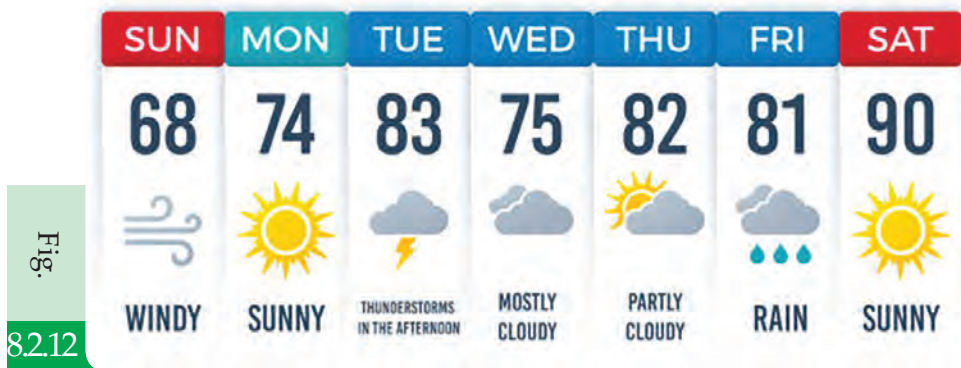
Humidity is another major factor that brings about changes in weather. The amount of water vapour present in the air is called humidity. Due to the heat of the sun, the water present on the earth's surface changes into vapour. Then the water vapour reaches the atmosphere and mixes with air. The air having more water vapour is called humid air and the air with less water vapour is called dry air. We feel warm in humid air than that in dry air. More humidity in air results in rain. Therefore, humidity also plays a great role to change the weather of a place.

2.5 Weather forecasting

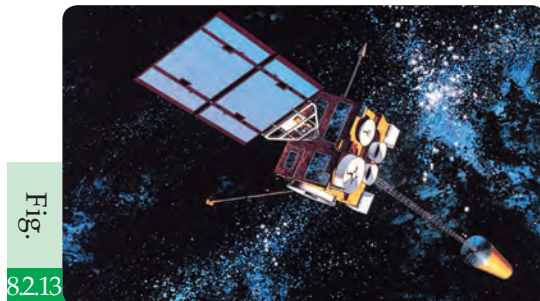
Before booking a flight ticket, we check the forecast of weather for that day. Similarly, farmers listen to the weather forecasting on the radio before



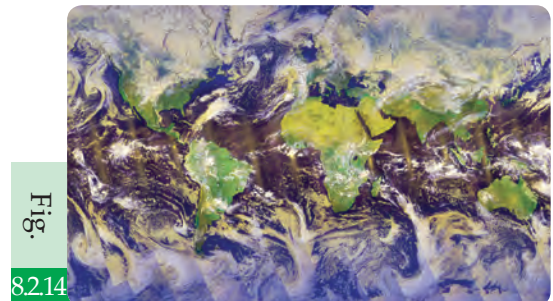
harvesting crops. It is done to be aware of forthcoming weather. The process of predicting the forthcoming weather of a particular region is called weather forecasting.



Weather forecasting is done by collecting data about current atmospheric condition. In this process, scientific understanding of atmospheric condition is used. It helps to forecast how the atmospheric condition will change in the near future. Now-a-days, weather forecasting is done by observing the situation and the speed of clouds in the sky and studying the pictures received from the artificial satellites. Such forecasting is reliable to a large extent.



Artificial satellite for weather forecasting



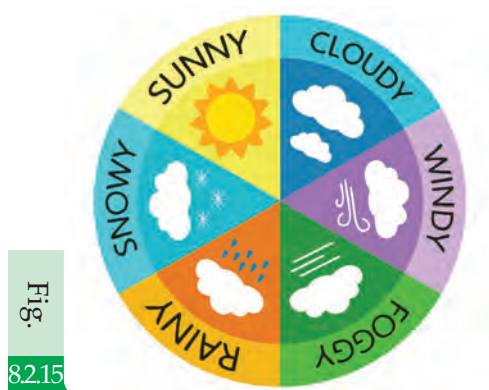
Satellite picture of weather forecasting

A scientist who helps in weather forecasting after studying the data received from artificial satellites is called a meteorologist. Meteorologists try to give a complete and accurate picture of weather conditions before hand. It helps people to be aware

of forthcoming weather and take necessary precautions. In Nepal, there are meteorological laboratories in different parts of the country to study weather and the factors responsible for changes in weather.

2.5.1 Some common ways of weather forecasting

1. Heavy rainfall may occur if the sky is suddenly covered with dark clouds.
2. If the day is partially cloudy from the morning, it may not rain throughout the day.
3. The possibility of rain increases with a sudden hot sunshine.



Weather chart

4. In the rainy season, if the day begins with very hot sunshine, it may rain in the afternoon.
5. In context of Nepal, if the clouds move towards the end of the rainy season, rain stops after some days.

Project work

- Listen to the radio or watch television at 9.00 PM for one week to know about weather of the following day.
- Observe the weather carefully on a particular day and keep its record.
- Now, discuss in your classroom whether the weather forecasting is reliable or not.

2.5.2 Importance of weather forecasting

1. Weather forecasting helps us to plan and perform outdoor activities.

2. Weather forecasting is utilized in agriculture to plant and harvest crops.
3. Weather forecasting is utilized to determine warnings for a particular day.
4. Weather forecasting and weather warnings are utilized to protect lives and property.

Key concepts

1. Weather can be defined as the condition of the atmosphere at a particular time and place.
2. The average atmospheric condition over a long period of time is called climate. Various factors affect weather and climate.
3. The branch of science which deals with the study of weather is called meteorology.
4. Water cycle is the repeated change of water into water vapour, the water vapour into clouds and then clouds into water.
5. Cloud formation, snow fall, rainfall, etc. are the parts of water cycle which affect the weather of a particular place.
6. Monsoon is a seasonal wind that lasts for several months.

Exercise

1. Tick (✓) the best answer from the given alternatives.

- a. Which of the following is the main factor that causes changes in weather?

☐

wind

☐

rainfall

☐

sun

- b. Frost and dew can be seen during

☐

winter

☐

summer

☐

autumn

- c. Snowfall generally occurs in

☐

terai

☐

hills

☐

mountains

d. We use umbrella and raincoat in weather.

☐

sunny

☐

rainy

☐

cold

e. Weather forecasting helps us

☐

to plant outdoor activities

☐

to plant and harvest crops

☐

to protect lives and property

☐

all of them

2. Put a tick (✓) for the correct statements and a cross (×) for the incorrect ones.

a. The weather of a place keeps on changing.

☐

b. Humidity and rainfall do not affect the weather of a place.

☐

c. The amount of water vapour present in air is called humidity.

☐

d. Monsoon is a seasonal wind.

☐

e. Heavy rainfall may occur if the sky is covered with dark clouds.

☐

3. Fill in the blanks using appropriate words.

a. The scientist who studies weather is called

b. The amount of water vapour present in air is called

c. More humidity in air results in

d. The process of predicting forthcoming weather is called

e. The scientist who studies weather is called

4. Answer the following questions.

a. What is weather?

b. What is meteorology?

- c. What are the causes of changes in weather?
- d. What are different types of weather?
- e. What is meant by dew and frost?
- f. What is humidity?
- g. What is fog? How is it formed?
- h. What are hailstones? How are they formed?
- i. Write any three features of rainy weather.
- j. Write any three features of sunny weather.
- k. What is monsoon?
- l. What is humidity?
- m. What is weather forecasting? Why is it done?
- n. Mention any three common ways of weather forecasting.
- o. Write any three importances of weather forecasting.

5. Study the given figures and identify the types of weather.



Also, write any two activities that we do during these weathers.

7. Give suitable reason:

- a. We feel hot during summer and cold in winter.
- b. We feel hot during day and cold at night.
- c. Weather forecasting is very important for human beings.

8. Write an essay on 'change in weather' about 100 words.

9. Describe the role of water cycle to bring out change in weather?

10. What is the importance of weather forecasting? Describe in brief.

3.1 Introduction to Clouds

When the sky is not clear, we can see different types of clouds. Clouds that we see in the sky have different shapes, sizes, colours and appearance. Clouds give us idea about the changing weather. Have you seen clouds in the sky? What are clouds made of? Have you ever wondered?

Fig.

8.3.1



Water exists in three different forms in nature. They are solid, liquid and gas. In solid state, water is found in the Himalayas and in liquid state, it is found in rivers, lakes, ponds, oceans, etc. Similarly, in gaseous state, water is found in the form of vapour in the atmosphere. When the water vapour changes back into water droplets, a cloud is formed. So, **a cloud can be defined as a grey or white mass of very small drops of water that floats in the sky.**

3.2 Formation of Clouds

The water present in rivers, lakes, ponds, oceans, etc. gets converted into vapour due to heat of the sun. The water vapour rises up in the atmosphere and gets mixed

Do You Know

The droplets of water in clouds are so small that millions of them combine to form a single drop of rain.

with dust particles. Then, the mixture of water vapour and dust particles undergoes condensation on cooling. As a result, a cloud is formed. A cloud is very light, so it floats in the atmosphere.

3.3 Types of Clouds

Clouds are of various types. However, there are four types of clouds on the basis of altitude in the sky where they are formed and their appearance.

(i) Nimbus (ii) Cumulus (iii) Cirrus (iv) Stratus

(i) Nimbus

Nimbus is formed below 2000 metres in the atmosphere. The lower half of nimbus contains more water vapour. The shape of this cloud is not fixed. **Nimbus is a large thick and grey cloud that causes rain or snow.** When nimbus becomes thick and covers the sky, a heavy rainfall occurs.



Nimbus cloud

(ii) Cumulus

Cumulus is formed between 2000 m to 6000 m in the atmosphere. This cloud is formed on sunny days from the pockets of rising air. **Cumulus is a thick cloud that looks like a cauliflower.** This type of cloud has a flat base. Its upper part appears bright due to the sunlight and its lower part appears dark black. Cumulus usually signals fair weather but casts shadows on the earth.



Cumulus cloud

Cumulus keeps on changing its outlines constantly and it is fun to watch as the cloud takes the shape of different animals and their faces.

(iii) Cirrus

Cirrus is formed above 6000 metres in the atmosphere. **Cirrus is a light cloud that looks like curls of white hair.** This cloud is thin and appears like small pieces of cotton wool spread in the atmosphere. Thick cirrus clouds can cause light rain or snow within a few days. Cirrus is made of tiny crystals of ice. So, this cloud is very cold.



Fig.
8.34

(iv) Stratus

Stratus is formed between 2000m to 12000m in the atmosphere. **Stratus is a grey cloud which looks like a flat blanket in the sky.** This cloud is much wider than its height and spreads in the sky in the form of thin white layers.

When the stratus remains close to the earth's surface, it looks like fog. Stratus cloud can be seen in the morning and evening. The weather remains calm when stratus covers the sky. When stratus becomes thick, it appears dark.



Fig.
8.35

Stratus cloud

Activity 1

- Observe the different types of clouds on cloudy days.
- Identify these clouds and classify them in terms of nimbus, cumulus, cirrus and stratus.
- Write any three features of each cloud.

Key concepts

1. A cloud is a grey or white mass made of very small droplets of water that floats in the sky.
2. Clouds are mainly of four types. They are cirrus, cumulus, stratus and nimbus.
3. Nimbus is a large thick and grey cloud that causes rain or snow.
4. Cumulus is a thick cloud that looks like a cauliflower.
5. Cirrus is a light cloud that looks like curls of white hair.
6. Stratus is a grey cloud which looks like a flat blanket in the sky.

Exercise

1. Tick (✓) the best answer from the given alternatives.

- a. A grey or white mass made of small drops of water is called

☐

rain

☐

cloud

☐

snow

☐

vapour

- b. The light cloud that looks like curls of white hair is

.....

☐

nimbus

☐

stratus

☐

cumulus

☐

cirrus

c. Which of the following clouds changes outlines constantly?

☐ stratus ☐ cirrus ☐ nimbus ☐ cumulus

d. Nimbus cloud is generally found

☐ below 2000m ☐ above 12000m

☐ above 6000m ☐ above 6000m

e. The weather remains calm when covers the sky.

☐ cirrus ☐ stratus ☐ nimbus ☐ cumulus

2. Put a tick (✓) for the correct statements and a cross (×) for the incorrect ones.

a. Stratus is generally found below 2000 meters in the sky. ☐

b. Cumulus does not cast shadows on the earth. ☐

c. Cirrus is found below 6000 metres in the atmosphere. ☐

d. Nimbus looks like a flat blanket in the sky. ☐

e. Cirrus is made of tiny crystals of ice. ☐

3. Fill in the blanks using appropriate words.

a. In the sky, is formed due to condensation of water vapour.

b. There are types of clouds.

c. The cloud which is formed below 2000 m in the atmosphere is

d. Cumulus is formed in days.

e. The cloud which can bring rain, snow or drizzle for a long time is

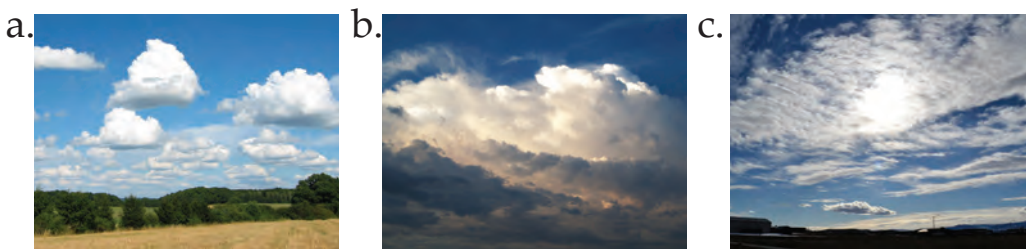
4. Match the following.

- | | | |
|------------|--------------------------|--------------------------|
| a. Nimbus | <input type="checkbox"/> | Between 2000 m to 12000m |
| b. Cumulus | <input type="checkbox"/> | Above 6000 m |
| c. Stratus | <input type="checkbox"/> | Below 2000 m |
| d. Cirrus | <input type="checkbox"/> | Above 12000 m |
| | <input type="checkbox"/> | Between 2000 m to 6000m |

5. Answer the following questions.

- What is a cloud?
- How many types of clouds are there? Name them.
- How are clouds formed?
- What is nimbus? Write its three features.
- What is cumulus? Write its main features.
- Which cloud signals fair weather but casts shadow?
- What is cirrus? Write its three features.
- What is cirrus made of?
- What is stratus? Write its two features.
- Which cloud is seen in the morning and evening?

6. Identify the types of the given clouds. Also, write any two features of each.



7. Differentiate between:

- | | |
|-----------------------|-----------------------|
| a. Nimbus and Cumulus | b. Cirrus and Stratus |
| c. Stratus and Nimbus | |

8. How are clouds formed? Describe in brief.

4.1 Introduction

Observe the given figures carefully. Identify the natural disaster shown in each of the given figures.



Discuss the causes and effects of these disasters.

In our country, lots of lives and properties are damaged every year due to floods and landslides. Earthquakes may kill thousands of people within a few minutes. Similarly, volcanic eruption, fire, tsunami, etc. occur every year in different parts of the earth. Which destroy human settlement, roads, animals, plants, etc. These phenomena are called natural disasters. So, the phenomena occurring in nature that damage lots of lives and property are called natural disasters. Earthquake, landslide,

flood, volcanic eruption, cyclone, etc. are some examples of natural disasters.

In this lesson, we will study some natural disasters like floods, landslides, fire, storm and earthquake with their causes, effects and preventive measures.

4.2 Floods

In Nepal, floods damage a lot of lives and property during the rainy season. **A flood is a natural disaster in which water overflows from streams and rivers.** Floods mainly occur during the rainy season.



Causes of floods

The main causes of floods are as follows:

1. Heavy rainfall
2. Melting of ice or glaciers
3. Outburst of glacier lakes
4. Deforestation



Effects of floods

The major effects of floods are given below:

1. Huge loss of lives and property
2. Destruction of agricultural land

Outburst of glaciers

3. Destruction of roads, houses, bridges, etc.
4. Outbreak of different diseases

Preventive and control measures of floods

1. Construction of dams
2. Embankments on the banks of rivers
3. Draining of glaciers
4. Construction of watersheds
5. Construction of houses away from the bank of rivers
6. Afforestation

Fig.
843



Dam

Activity 1

- Visit the places affected by floods in your locality.
- List the damages caused by floods.
- Suggest preventive and control measures of floods in that area.

4.3 Landslide

Landslides are the natural disasters in which landmasses fall from higher to lower altitude. In landslides, the soil and rocks become weak due to rain water and heat of the sun and fall down due to gravity. In Nepal, landslides mainly occur during the rainy season. It causes loss of lots of lives and property every year.

Fig.
844



Causes of landslides

1. Heavy rainfall
2. Deforestation
3. Unscientific agricultural practices in slopes
4. Earthquake
5. Explosion of bombs
6. Overgrazing

Fig.
845



Deforestation

Fig.
846



Bomb explosion

Effects of landslides

1. Loss of lives and property
2. Destruction of agricultural lands and crops
3. Destruction of roads, bridges, buildings, etc.
4. Water pollution
5. Floods due to the blockade of flow of rivers

Fig.
847



Flood

Preventive and control measures of landslides

1. Afforestation
2. Adoption of terrace farming in slopes or hilly regions
3. Construction of dams and embankments at the landslide prone zones
4. Controlling overgrazing
5. Controlling deforestation



Afforestation



Terrace farming

Activity 2

- Visit a landslide hit area in your locality.
- List the damages caused by the landslide.
- Suggest preventive and control measures of landslides in that area.

4.4 Fire

Fire is a destructive burning that destroys lives and property.

When the fire becomes uncontrolled it damages lots of lives and property in a very short time. In residential areas, fire damages lives and property whereas it damages plants and wild animals in the forest.



Fire generally occurs in dry and windy weather. In forests, fire can occur due to careless of human beings such as throwing of cigarette butts. Some times, wildfire may occur due to the friction between trees in the forest in dry weather.

Causes of fire

The main causes of fire are as follows:

1. Careless handling of petrol, diesel, kerosene, burning candle, gas stove, etc.
2. Electric short circuiting
3. Friction between trees in the forest in dry weather
4. Leaving burning firewood in the forest while going for a picnic
5. Throwing burning match stick and cigarette butts in the forest
6. Explosion of LP gas cylinders



Gas cylinder explosion

Effects of fire

1. Destruction of lots of lives and property
2. Destruction of forests and wild life
3. Air pollution

Preventive and control measures of fire

1. Proper handling of petrol, diesel, kerosene, gas stove, etc.
2. Keeping sources of fire out of the reach of children.
3. Checking electric circuits time to time



Fire brigade dousing fire

4. Dousing fire completely after cooking food.
5. Not throwing burning match sticks and cigarette butts in the forest
6. Calling a fire brigade as soon as possible in case of fire.

4.5 Storm

A storm is the air that moves with a high speed. Storm blows off dust particles, dry leaves, papers, plastics and other things at a high speed. A storm is very forceful and strong. A storm is very destructive in nature. It generally occurs on hot summer days.



Occurrence of a storm

The air on the surface of the earth gets heated due to strong heat of the sun during hot summer days. The hot air becomes light and rises up creating a gap. The cold air rushes down to fill the gap. As a result, a storm takes place.

Effects of a storm

1. A storm carries dust particles, paper, plastics, etc. and causes air pollution.

Fig.
8.414



2. The dust particles carried by a storm may enter our eyes. It may cause eye problems.

Effects of storm

3. A storm may blow away the roofs of houses made of tins and tiles. It may hit a person walking nearby the house and causes accidents.
4. A storm may uproot trees or break the branches of trees on the road side. It may cause road accidents.
5. A storm damages flowers, fruits and crops.
6. A storm may carry away the clothes kept on the roof top for drying.
7. In deserts, storm carries away a large amount of sand from one place to another forming sand dunes.

4.5 Clod Waves (Sheet Lahar)

The weather incidents which involve rapid cooling of temperature and air within 24 hours are cold waves. In Nepal, cold waves occur in 22 districts of terai region in months of Poush and Magh.



Cause of cold waves

In winter, the sky of terai region remains covered with fog continuously for a few days. It causes rapid cooling of air. The dew drops fall down continuously which lowers the temperature. As a result, cold waves occur.

Effects of Cold waves

- a. Cold waves can cause death and injury for animals, people and livestock.
- b. The may cause freezing of water pipe lines.

- c. Vehicles may not start if the motor oil gels or the antifreeze fails.
- d. Outdoor activities will be affected.
- e. Cold waves damage crops.

Preventive measures of cold waves

We cannot prevent the occurrence of cold waves as it is a natural phenomenon. But we should try to be safe from its effects as follows.

- a. We should stay inside house and wear thick woolen clothes.
- b. We should take hot drinks.
- c. We should sit near the fire or heater to keep our body warm.

4.6 Earthquake

Earthquake is one of the dangerous natural disasters that may claim lives of living beings and cause destruction of property. **The shaking of the earth surface resulting from the sudden release of**

energy in the earth's crust is called earthquake. It is also called quake or tremor or temblor. Earthquake occurs due to the vibration of the earth's surface that may be left and right or up and down. Nepal is the most sensitive zone for earthquake. There is the history of many devastating earthquakes in Nepal. The most devastating earthquakes that occurred in Nepal are earthquakes of 1990 BS (8.3 Richter scale), earthquake of 2045 BS (6.6 Richter scale) and earthquake of 2072 BS (7.6 Richter scale). These earthquakes claimed many lives and property.



Fig.
8.4.16

Causes of earthquake

The major causes of earthquakes are given below:

- a. The movement of tectonic plates situated beneath the earth's surface is the cause of earthquake.
- b. Earthquake occurs due to volcanic eruption.
- c. Contraction and relaxation of rocks beneath the earth crust results in earthquake.
- d. Explosions during the extraction of minerals under the earth crust is the cause of earthquake.

Effects of earthquake

- a. Earthquake destroys lives and properties.
- b. It causes natural disasters like soil erosion, landslide, volcanic eruption, flood, tsunami, etc.
- c. It changes natural structure of land.
- d. It degrades environment by polluting land, water and air.
- e. It may cause fire by short-circuiting and breaking gas pipelines.
- f. It destroys habitats of animals and plants.
- g. It destroys water resources.

Preventive measures of earthquake

Earthquake cannot be controlled, but harmful effects of earthquake can be minimized by the following ways:

- a. By constructing strong physical infrastructures like houses, buildings, bridges, etc.
- b. By protecting ourselves in safe and open places during earthquake.
- c. By staying away from weak walls, electric poles, tall trees, etc. during earthquake.

- d. By protecting our head under strong support like door frame, table, etc.
- e. By switching off electricity to prevent from catching fire during earthquake.
- f. By generating awareness programmes regarding in preventive safety measures of earthquake.

Activity 3

- Practice earthquake drill in the school under the guidance of your science teacher.
- Discuss the preparation before earthquake and the things we do during and immediately after an earthquake.

Activity 4

In winter season, it becomes very cold in terai region of Nepal. A few people die in the terai region every year due to extreme cold. Search in the internet about cold waves causes and effects. Discuss the measures to be safe from cold waves in winter.

Project Work

Make you Jhatpat Jhola (emergency bag)

- Prepare your own Jhatpat Jhola as instructed by your science teacher.
- Demonstrate your Jhatpat Jhola in the classroom.

Key concepts

1. The phenomena occurring in nature that damage lots of lives and property are called natural disasters.
2. A flood is a natural disaster in which water overflows from streams and rivers.
3. Landslides are the natural disasters in which landmasses fall from higher to lower altitude.
4. Fire is a destructive burning that destroys lives and property.

5. Disasters like flood, landslide, fire, etc. destroy lots of lives and property in Nepal every year.
6. A storm is the air that moves with a high speed.
7. The shaking of the earth surface resulting from the sudden release of energy in the earth's crust is called earthquake.

Exercise

1. Put a (✓) for the correct statements and a cross (×) for the incorrect ones.

- a. Floods, landslides and fire are natural disasters. ☐
- b. Natural disasters do not kill human beings. ☐
- c. Floods and landslides mainly occur in the rainy season. ☐
- d. We should throw cigarette butts in the forest. ☐
- e. Earthquake does not destroy lives and property. ☐

2. Fill in the blanks using appropriate words.

- a. The phenomena that occur in nature and damage lives and property are called
- b. The overflow of water from rivers and streams is called
- c. Landslides generally occur in the season.
- d. Short circuiting and carelessness of human beings are the main causes of
- e. The movement of tectonic plates is the main cause of
- f. Cold waves occur in the months of and in Nepal.

3. Answer the following questions.

- What are natural disasters? Give any three examples.
- What is a flood? Write any three causes of floods.
- Write any three effects and three preventive measures of floods.
- What is a landslide? Write any three causes of a landslide.
- Write any three effects and three preventive measures of a landslide.
- What is fire? Write any three causes of fire.
- Write any three effects and four control measures of fire.
- What is a storm? How does it occur?
- Write any four effects of a storm.
- When does cold waves occur in terai region of Nepal?
- What is earthquake? Write its main cause.
- What should we do during an earthquake.
- Write preventive measures against earthquake.

4. Name the natural disasters shown in each of the given figures.

a.		b.		c.	
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- How can you prevent the occurrence of flood and landslide in your locality? Write any three methods.
- What are cold waves? Write their causes and effects.
- Write any four causes and five effects of earthquake.
- Write down the preventives measures of earthquake.
- What should we do during and after an earthquake. Write.