

Science and Technology

Grade 5

Government of Nepal

Ministry of Education, Science and Technology

Curriculum Development Centre

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Preface

School education is the foundation for preparing the citizen who are loyal to the nation and nationality, committed to the norms and values of federal democratic republic, self-reliant and respecting the social and cultural diversity. It is also remarkable for developing a good moral character with the practical know-how of the use of ICT along with the application of scientific concept and positive thinking. It is also expected to prepare the citizens who are moral and ethical, disciplined, social and human value sensitive with the consciousness about the environmental conversation and sustainable development. Moreover, it should be helpful for developing the skills for solving the real life problems. This textbook 'Science and Technology, Grade 5' is fully aligned with the intent carried out by the National Curriculum Framework for School Education, 2076 and is developed fully in accordance with the new Basic Level Science and Technology Curriculum, 2078.

This textbook is initially written by Mrs. Rabina Maharjan, Mr. Yogyaraj Prasai, Mrs Achala Thapa, Mr. Yubaraj Adhikari and Mr. Khil Narayan Shrestha. It has been translated by Mr. Keshar Bahadur Khulal. The contribution made by Director General Baikuntha Prasad Arylal, Pro. Dr. Krishna Bhakta Maharjan, Mrs Pramila Bakahati Mrs.Mina Shrestha, Uma Nath Lamsal, Dr. Kamal Prasad Acharya, Mr. Shailesh Kumar Pradhan, Mr. Heramba Raj Kandel. The language of the book has been edited by Mrs. Kunti Adhikari. Art editing of this book was done by Mr. Shreehari Shrestha by making it four colour. The Curriculum Development Centre extends sincere gratitude to all of them.

The textbook is a primary resource for classroom teaching. Considerable efforts have been made to make the book helpful in achieving the expected competencies of the curriculum. Curriculum Development Centre always welcomes constructive feedback for further betterment of its publications.

2080 BS

**Curriculum Development Centre
Sanothimi, Bhaktapur**

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1

Scientific Learning

When we see things around us, we want to touch, look and ask questions about them. Curiosity arises in the mind. While searching for an answer to our curiosity, new information can be obtained.



Fig. 1.1

To find the answer to our curiosity, we must observe, measure, classify, estimate, and test. All these are procedural skills of science. Scientific learning starts with the observation of various objects in the environment. Knowing about the properties of objects using the sense organs is observation. While some learning is instant, the learning of some knowledge and skills requires repeated effort, experimentation, inquiry and experience.

Measurements should be taken to identify the actual quantity of observed objects. Different types of instruments are used to measure different quantities.

Various experiments and inquiries are done to learn about different properties of matter and the cause of different phenomena that occur in the environment. Thus, the process of reaching conclusions through observation, estimation, inquiry, comparison, tests, classifications, experimentation, etc. is the scientific learning process. The continuous effort of scientific learning leads to discoveries.

Observation, experiment and inquiry in scientific learning

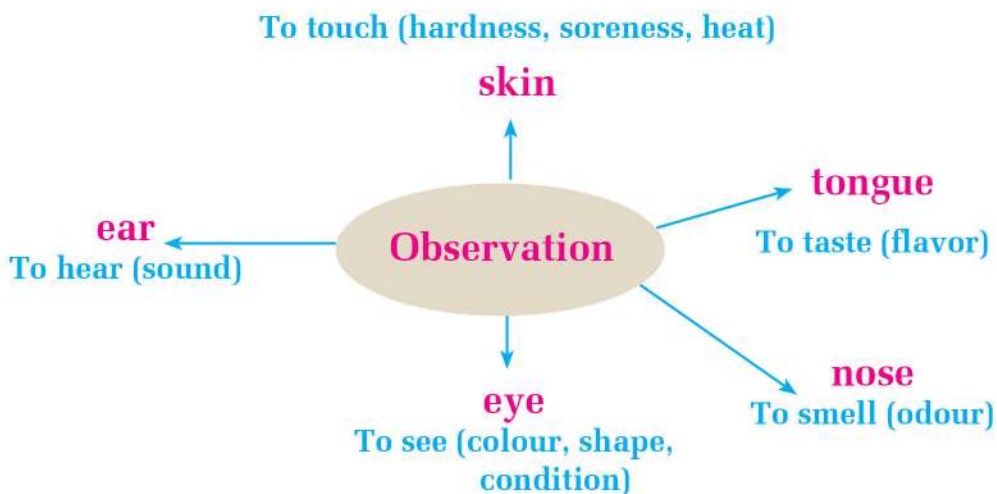
There are various kinds of objects around us. Due to the various properties of those objects, they look different from each other. We can learn about the properties of objects through observation, experiments, and tests.

Activity 1.1

Observe the various items available in your kitchen and fill up their properties in the table below:

S.N.	Material	Colour	Smell	Taste	Shape	State (Solid, Liquid, Gas)
1.	Water					
2.	Salt					
3.	Sugar					

To learn about the properties of an object, we use the sense organs (eyes, nose, ears, Tongue, and skin). Through the sense organs, we can see, smell odours, hear sounds, get the taste, and experience hot and cold. Thus, knowing the various properties of objects through the sense organs is observation. Observation is the basic process of scientific learning. From observation, we obtain information about the external condition of objects, such as the shape of object, color, taste, etc.



Observation should be done to identify the general properties of any object. Knowledge of the overall aspect of the object can be obtained through intensive observation. Such knowledge is called information. A variety of scientific instruments, such as hand lenses, microscopes, stethoscopes, etc. can be used for observation. The actual measurement of an object cannot be determined through observation. Instruments such as pan balance, thermometer, clock, scale, etc. are used to determine the actual measurement.

Question to think

Can all the properties of an object or event be identified only through observation?



Fig.1.2

Study the event and learn from it:

Students from grade five were taken to an observation tour of the vegetable farm nearby the school. Students were asked to take notes about the objects observed and their properties. Students became very happy seeing the real plants of the fruits and vegetables that they had been eating every day. They started watching the shape of the plants, leaves, flowers and fruits carefully. They also started taking notes about the characteristics of the observed objects. Their teacher Mina thought of buying a cucumber and pumpkin. She then asked Pasang and Samita to compare the weight of the cucumber and pumpkin by lifting them with their hands. Samita explained that the cucumber must have more weight because is long. Pasang opined that although the pumpkin is shorter, it could have more weight because of its round shape. When they kept the cucumber and the pumpkin on the pan balance, the weight of the pumpkin was found more than the weight of the cucumber. Pasang became happy because his guess turned out to be correct.

Based on the above events, let's discuss the following questions:

- Which properties of plants were identified from the observation?
- Which property of the plant could not be identified from the observation? What was done to identify that property?
- What other properties of objects cannot be identified from observation alone?

Activity 1.2

Take two test tubes. Put some water in one and some cooking oil in the other. Add some salt to both and shake them gently. In which test tube did the salt dissolve? Discuss the results of the experiment in class.

By observation, one can identify the properties such as color, roughness and shape of objects, but properties like an object's actual volume, solubility, weight, flammability or non-flammability, etc. cannot be identified only by observation. That requires experimentation. Experimentation is another important step in the scientific learning process. It is also known as learning by doing.

Experimentation helps to identify additional properties of objects. It also helps to describe quantitatively and communicate the properties of objects. For example, an experiment has to be done identify the length, mass and internal structure of an object.

Study the event and learn from it.

Ayusha had seen a lamp (diyo) being lit with ghee or oil in her home. This incident made her curious. She asked her mother if the lamp could be lit with milk. Mother told her that wouldn't work. She then asked why the lamp lights in ghee and oil but not in milk. To clarify her, her mother demonstrated it experimentally. The lamp did not burn when milk was used. To find out the reason for this, her mother suggested Ayusha to ask the teacher or search on the internet.



Fig. 1.3

Questions for discussion

- Which scientific learning process did Ayusha follow?
- Was she able to complete the learning only through the process she applied?

Experiments confirm whether our assumptions are correct or incorrect. The experiment may give results but not the reason. Further studies and inquiries are necessary to find out the reason for the results obtained. Through such inquiry and research, discoveries of science have become possible. Inventions may not be possible in a single attempt. Many

inquiries and repeated efforts are required. Inquiry helps us discover the answer to our curiosity. Likewise, the reasons for many incidents in nature can also be found through inquiry. The reasons for many such incidents have been discovered through the scientific learning process.

A conclusion can be drawn based on information obtained through observation, experiments and inquiry. Inventing new things by conducting various tests and long-term research in the laboratory also falls under the scientific learning process. The scientific learning process should be adopted not only by scientists but by all of us. The simple observations, studies, tests and inquiries we conduct to make our activities better and more creative are also part of the scientific learning process. For example, Shyam's neighbor is a hardworking farmer. To produce better crops than other neighbors' in his field, he inquires, studies and makes observations, and carries out tests and experiments. These activities are part of the scientific learning process. Similarly, Sita's mother cooks delicious food. To make the food tastier and healthy, she has visited various places for observation. She has read various newspapers and made inquiries on the internet. All these efforts are examples of the scientific learning process.

Questions to think

- (a) How might our ancestors have discovered vegetables, spices, herbs, etc?
- (b) How might our ancestors have found that timber from Saal and Sisau can be used for building houses, and Daar and Khamari could be used for making vessels?

Activity 1.3

Most of the objects we use are the result of scientific processes such as observations, tests, experiments, and inquiries made by our ancestors. In this context, prepare a speech on the topic, "We are the descendants of scientists."

Exercise

1. Select the most appropriate one from the given options:

- (a). What is required for observation?
- i. Knowledge
 - ii. Experience
 - iii. Sense organs
 - iv. Estimation
- (b) What is the property of an object that cannot be known by observation?
- i. Taste
 - ii. Roughness
 - iii. Warmth
 - iv. Combustibility
- (c) Which of the following works comes under the scientific learning process?
- i. Discovering new things by observation, experiment and inquiry
 - ii. Study and read science books and resources
 - iii. Perform assigned tasks properly
 - iv. Work as per the scientist's instructions
- (d) Which of the following is the importance of the scientific learning process?
- i. To learn or discover something new
 - ii. Be able to read scientific sources
 - iii. Be able to write answers to questions in science exam
 - iv. Be able to experiment as instructed by the teacher

2. If the statement given below is correct, put a tick mark (✓) and if it is wrong, put a cross mark (X):

- (a) To learn about the roughness of an object by feeling it is an example of observation.

- (b) The actual quantity of the object can be identified from observation.
- (c) A hypothesis must be tested to determine whether it is true or false.
- (d) Inquiry has to be done to find out the cause of the facts obtained from observation and tests.
- (e) Modern laboratory is required for scientific learning.

3. Fill in the blanks by choosing the appropriate word:

Information sense organs properties
 estimation conclusion

- (a) Observation is done with the help of
- (b) The result obtained at the end of an experiment is called
- (c) The knowledge collected from a test or experiment is called.....
- (d) of an object can be determined through observations, tests and experiments.

4. Answer the following questions:

- (a) What is observation? List the properties of objects that can be and cannot be known by observation.
- (b) List any four properties of an object that can only be known by testing and experimenting but not by observing.
- (c) To know the weight of an object, we must weigh it. Is this an observation, experimentation, or inquiry? Why?
- (d) You have been given some table salt and cooking oil. If you are to do a comparative study of various properties of these two substances, what different scientific processes will you apply, and how?
- (e) How does inquiry help in the learning process? Clarify with examples.

Scientific Apparatus

Activities such as observing, measuring, and testing should be done in science. These activities require various scientific instruments. Heat is needed to make food in daily life. Firewood, gas, electricity, etc. are used as a source of heat. Different types of utensils are used for cooking food. A tripod stand, stove, etc. are used to keep the dishes elevated while heating. Similarly, in the laboratory, a stand is used for heating utensils as well as raising them.

Activities 1.4

Comparative different materials and apparatus used as the source of heat, utensils and stands in the following pictures and complete the table.



Fig. 1.4



Fig. 1.5



Fig. 1.6



Fig. 1.7

S.N.	Materials	Figure 1.4	Figure 1.5	Figure 1.6	Figure 1.7
1.	Source of heat				
2.	Stand				
3.	Utensil				

Tools like the one shown in Figure 1.7 are used for scientific learning processes like observation, testing, and experimentation. In the laboratory, small amounts of chemicals are used as samples. Hence, the instruments used in the laboratory are relatively smaller in size and they have scales on them for measurement.

Question to think

Apparatus used for heating and storing chemicals in the laboratory are made of glass instead of metal. What could be the reason for this?

Some frequently used apparatus in the laboratory

SN	Name of the Scientific Apparatus	Use
1	Bunsen burner	To produce heat
2	Tripod Stand	To elevate heating apparatus such as beaker, round bottom flask, etc.
3	Conical flask	To keep chemicals, to mix chemicals
4	Round bottom flask	To mix and heat chemicals
5	Measuring cylinder	To measure the volume of liquid
6	Standard weights	To determine the weight of unknown mass
7	Physical balance	To measure mass
8	Spring balance	To determine the quantity of unknown mass in an object
9	Thermometer	To measure temperature
10	Test tube	To mix and heat chemicals
11	Funnel	To help pour liquids and support filter paper
12	Condenser	To cool
13	Porcelain basin	To heat chemicals and for evaporation
14	Beaker	To mix and heat chemicals
15	Digital balance	To measure weight
16	Wire gauge	To help conduct heat uniform

Schematic diagram

Let's observe and discuss



Fig. 1.8



Fig. 1.9

The diagrams shown above represent the actual and symbolic picture of the house. Which diagram is easier to draw a picture?

While observing, testing, and investigating, various types of materials and instruments are used. The design of the experiment is shown with the pictorial format of the apparatus used. Such pictures are generally drawn using lines or symbols. The drawings that are drawn using lines or symbols are called schematic drawings. The drawing made by the engineer for the construction of a house is also an example of a schematic diagram. Likewise, the diagram of the equipment used in the laboratory and their arrangement, the diagram of an electrical circuit, etc. are the schematic diagrams. While making a schematic drawing we must not close the top of the picture, must not shade or use colour, must use a single line, draw only two-dimensional pictures in correct proportion, and use a sharp pencil and ruler.

The actual picture and schematic drawing of the test tube are given in the figure. Identify the differences between these two pictures and write them in the table.

S.N.	Real Diagram	Schematic Diagram
1.		
2.		
3.		
4.		



Fig. 1.10

Based on this information, list the rules we must follow while drawing a schematic diagram. Prepare a chart and paste it on the demonstration board.

Experimental Activity

With the help of a teacher, boil some water in a laboratory using a Tripod Stand, Wire Gauze and Burner. With the help of a thermometer, observe the temperature change. In your practical copy, sketch a schematic diagram clearly showing the position of all the apparatus used in the experiment.

Activity 1.5

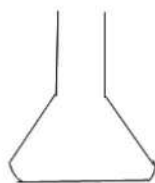
Schematic diagrams of some of the equipment commonly used in the laboratory are given below. Observe each of these materials and equipment. Discuss with the teacher and find out what each of them are used for. Now, make a schematic diagram of these and other similar materials.



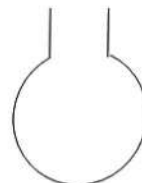
Beaker



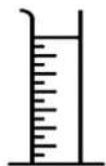
Funnel



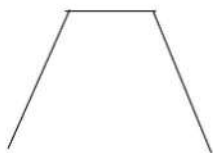
Conical flask



Round bottom flask



Measuring cylinder



Tripod stand



Weight



Stand



thermometer



Wash bottle



Test tube



Spring balance



Physical balance

Fig.1.11

- (b) Measuring cylinder is used to find the hotness or coldness of an object.
- (c) Schematic diagram is quick and easy to draw.
- (d) Schematic diagram is made attractive by filling in color and shading.
- (e) Dimensions of an object can be compared based on the schematic diagram.

3. Fill in the blanks in the following sentences with suitable words:

tripod stand transparent schematic
 physical balance spring balance

- (a) A drawing made using lines or symbols is called diagram.
- (b) is used for raising a flask while heating.
- (c) Observation is easy in glass test tubes, beakers and flasks because they are
- (d) is for measuring the mass of an object.

4. Match the name and picture of the instruments:



funnel



beaker



conical flask

measuring cylinder



test tube

5. Answer the following questions:

- (a) What are the points to be considered while making a schematic diagram? Mention any four points.
- (b) Mention any three importance of the schematic diagram.
- (c) Prepare a table comparing the apparatus in kitchens and laboratories used for a similar function.
- (d) Draw a schematic diagram using lines and symbols showing the location of your home and the nearby main road, main square and other public places.
- (e) Draw the schematic diagram of the following apparatus:
Tripod stand, beaker, test tube, conical flask.

Measurement

Observe the picture and discuss.



Fig. 1.12

- What are the above tools used for?
- What other tools have you seen being used for measurement in daily life?

In our daily life, we exchange various things. While exchanging goods, we take measurements to know the actual quantity. To find the length of an object metre scale, ruler, and measuring tape are used. To find out the weight of an object standard weights and balance are used. To find the time interval between two events, a clock is used. Similarly, the space occupied by milk, curd, oil, water, etc. can be measured with maana, paathi, measuring cylinder, etc.

Measurement of length

What tools have you used to measure and find out how length, width or height of an object?

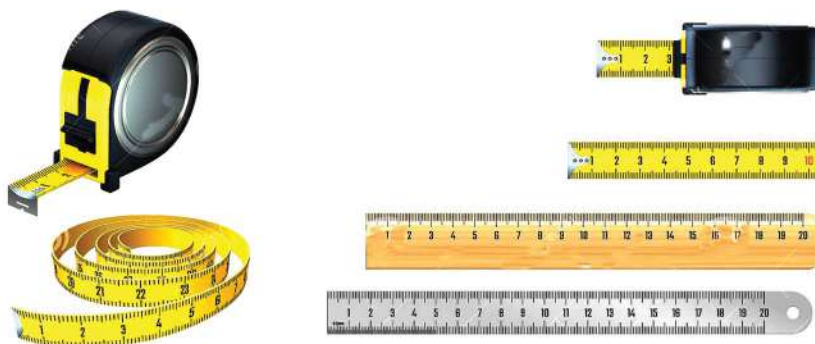


Fig. 1.13

By comparing any two objects and observing them, we can tell which one is longer or shorter, taller or shorter. To find out how long, tall or short, it is necessary to measure. To measure, we need an object of a known length.

Metre scale, ruler, measuring tape, etc. are objects of known length. Finding the correct quantity by measuring the length is one of the steps in the scientific learning process.

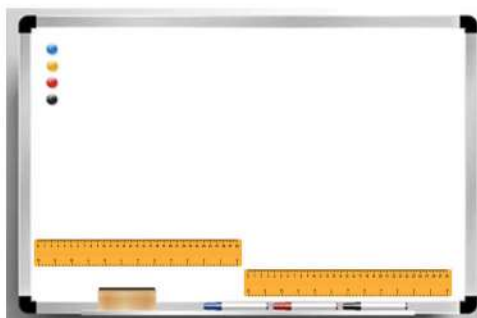


Fig. 1.14

A metre scale and writing board are shown in the picture. The length of the metre scale is the known (standard) quantity. The length of the board is an unknown quantity. When the length of the board is compared with the length of the metre scale, the board looks twice as long as the metre scale. Therefore, the length of the board is 2 metres.

Activity 1.6

Measure the length of the available items in your home or school. Use a suitable instrument (ruler, metre scale, measuring tape, etc.) to measure the length. Fill in the obtained information in the given table. Discuss the findings with friends in class.

S.N	Object	Measuring instrument	length
1.	Book	Rulercm
2.			
3.			
4.			

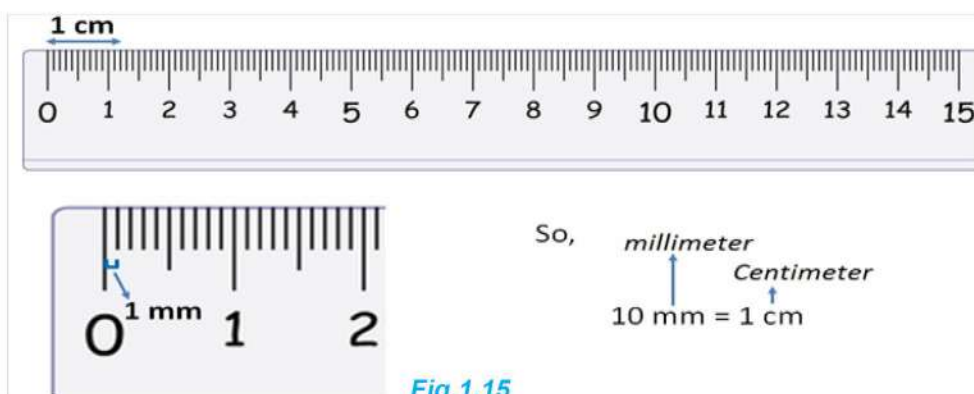


Fig. 1.15

Length is measured in millimetres (mm), centimetres (cm), metres (m), kilometres (km), etc. These are called units of length. The unit should be selected according to the length of the object.

$$10 \text{ mm} = 1 \text{ cm}$$

$$100 \text{ cm} = 1 \text{ m}$$

$$1000 \text{ m} = 1 \text{ km}$$

Study the event and learn from it:

Rhythm's father called the shopkeeper to place a new carpet in a room in his house. The shopkeeper advised him to take the

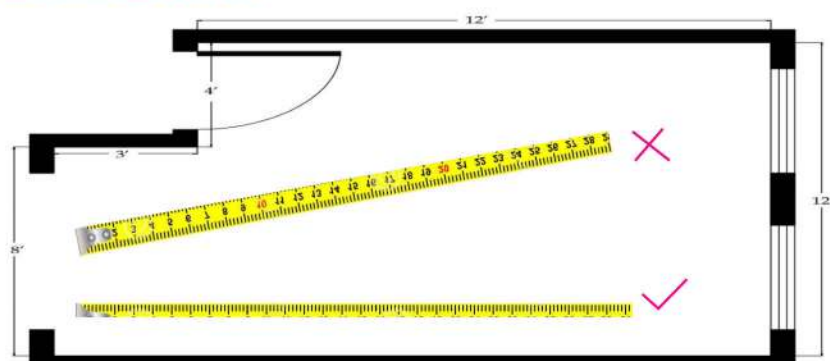


Fig. 1.16

measurements of the room and come to choose the carpet. The father asked Rhythm to measure the length and width of the room. He gave him the measuring tape that his mother would use for measuring clothes. After Rhythm finished taking the measurements, the father verified the measurements by taking the measurements himself. Father's measurements were a little less than Rhythm's. Rhythm had not kept the measuring tape straight while measuring. His father taught him to hold the measuring tape straight and parallel to the wall while measuring its length.

Discuss in class the things consider while measuring length, as Dad reminded Rhythm in the above event.

Length is also measured in other units such as inches, feet, yards, miles, etc. Do you know?

$$1 \text{ metre} = 39.4 \text{ inches} = 1.09 \text{ yard}$$

$$1 \text{ yard} = 0.91 \text{ m}$$

$$1 \text{ centimetre} = 0.39 \text{ inches}$$

$$1 \text{ inch} = 2.54 \text{ cm}$$

$$1 \text{ foot} = 30.48 \text{ cm}$$

$$1 \text{ metre} = 100 \text{ cm}$$

Measurement of mass

Activity 1.7

Take some glasses of equal size. Fill a glass each with soil, water, sand, gravel, rice, flour, ash, chaff, wood dust, cotton, etc. Lift each glass in turn and fill their weight. Are all the glasses equally heavy? Discuss with friends in class.

Every object is made up of small particles. These particles are tightly packed in some substances whereas loosely packed in others. For example, air particles are not as tightly packed as in solid objects. Objects that have tightly packed particles contain more amount of matter and are thus heavy. Hence, the total amount of matter in an object is called the mass of the object.

The actual mass of matter contained in an object cannot be determined by observation. However, the difference in the mass of two the objects can be estimated.

To find the actual mass, we must measure.

The mass of an object is measured by comparing it with an object whose mass is already known. Objects whose mass is known are called standard weights. Physical balance is used to compare the unknown mass with the mass of the standard weights.



Fig..1.17

Masses of which different objects have you measured with the help of a physical balance and standard weights? Which one of the following diagrams shows the correct position of a physical balance while measuring the exact mass of a substance?



Fig.1.18

Activity 1.8

Take a physical balance and a standard weight of one kg mass. With the help of these, measure one kg each of soil, water, sand, husk, wood dust, ash, gravel, legumes, etc. Make separate packets by keeping the measured quantity of each substance in separate plastic bags. Is the total space occupied by all one kg substances equal? Observe and present the findings in class.

Because the particles in each object have different compactness, they do not occupy equal space even if their masses are equal, for example, a kg of cotton occupies more space than a kg of rice.

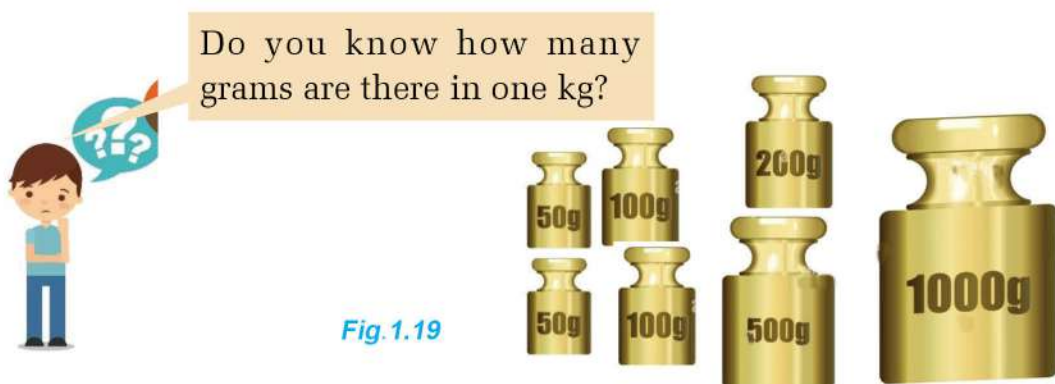


Fig.1.19

Activity 1.9

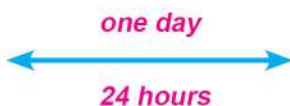
Measure the mass of a book, exercise copy, pen, brick, etc. using physical balance and standard weights and fill in the table given below.

SN	Object	Mass
1.	Book	
2.	Brickkgg

Measurement of time



this morning **Fig. 1.20**



tomorrow morning **Fig. 1.21**

Natural and artificial events keep occurring in daily life. The rising and setting of the sun, beginning and ending of a class in school, starting and ending of rainfall, starting and ending of an examination, etc. are a few examples of events. The period between any two such events is time. A clock is used to measure time. In the above pictures, the rising of the sun this morning is an event. Likewise, the rising of the sun tomorrow morning is another event. The period between these two events is one day.



Fig. 1.22

Remember

60 seconds = 1 minute, 60 minutes = 1 hour, 24 hours = 1 day

Activity 1.10

With the help of your teacher, open the clock app on your mobile phone and practice the apps such as the world clock, alarm, stopwatch, and timer, etc. Discuss with the teacher the things you did not know.

Activity 1.11

Draw a straight line of fixed length in the playing field using a measuring tape. Then each student in the class takes turn to run that distance. With the help of a stopwatch, measure the time taken by each student to cover that distance and record it in the table given below. In what conditions does the use of a stopwatch become more effective? Discuss in class.

SN	Student name	Distance covered (m)	Time
1.			
2.			

Measurement of volume

The matter has both mass and volume. A matter in small quantity has a small volume and a big quantity has a large volume. The space occupied by a substance is called the volume of that substance. The amount of space occupied by a substance depends on its length, breadth, and height.

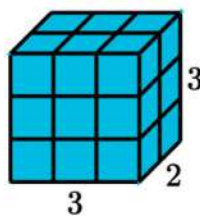


Fig. 1.23

How many cuboid blocks are shown in the above picture? Find out a way to find the answer easily and quickly and present it to the class.

Activity 1.12

As shown in the above figure, pile up objects with uniform length, width and height, for example, bricks, matchboxes, etc. Now count the total number of items.

The total number of items = Number of items on the length side \times Number of items on the width side \times Number of items on the height side of the pile

Likewise, space occupied by an object = measurement of length \times measurement of width \times measurement of height

or, Volume of an object (V) = $l \times b \times h$

The above formula is used for finding the volume of a regular object with length, width and height. Dusters, writing boards, books, desks, benches, etc. are regular objects.

Similarly, find the volume of regular objects around you by measuring the length, width and height of rectangular objects and compare them.

SN	Hexagonal object	Length (l)	Breadth (b)	Height (h)	Volume(v)= $l \times b \times h$
1.	Room				
2.	Book				
3.	Box				
4.					

Do you know?

- (a) Objects having only surface but no height or thickness have no volume, e.g. rectangle, square, triangle, circle, etc. are surfaces. They have area but not volume.
- (b) Gas does not have a fixed volume due to its ability to expand and contract.

Activity 1.13

Collect empty bottles, boxes and packets of liquids like mineral water, milk, cooking oil, liquid ointments, etc. Study the volume written on them. What are the units used to measure the volume of liquids? Make a list and discuss it in class.

Liquids do not have a fixed shape. They take the shape of the container they are kept in. The amount of water that can be held in a vessel with an internal volume of 1000 cm³ is called one litre.

$$1 \text{ litre} = 1000 \text{ cm}^3 = 1000 \text{ ml}$$

$$\text{or, } 1 \text{ cm}^3 = 1 \text{ ml}$$

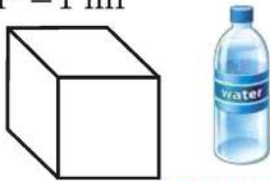


Fig.1.24

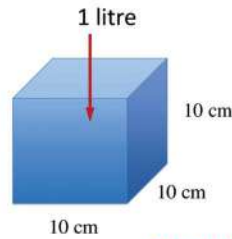


Fig.1.25

Based on this, scaled cylinders are used to measure the volume of liquids. Such vessels are called measuring cylinders. Measuring cylinders of different volumes are shown in the figure below.



Fig.1.26

Activity 1.14

Take a measuring cylinder. Fill it with some water and note the volume. Tie a stone with a thread as shown in the picture and dip it into it. Now, what is the volume of water with stone? Observe and take notes. By how much did the water level increase? What was the volume of the stone? Discuss among friends and present the finding to the class.

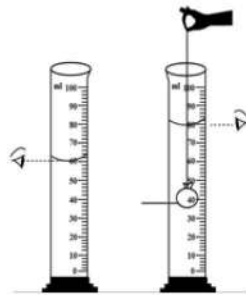


Fig. 1.27

Find the volume of other solids in the same way as in Activity 1.14. Compare their volumes, discuss them in class, and write a conclusion.

SN	Object	Volume of water (ml)	Volume of water and object (ml)	Volume of the object (cm ³)
1.	eraser			
2.	stone, pieces of brick			

Question to think

You are given an irregular shaped stone and asked to find its volume. The stone is too big to dip inside the measuring cylinder. Now, how will you measure the volume of that stone?

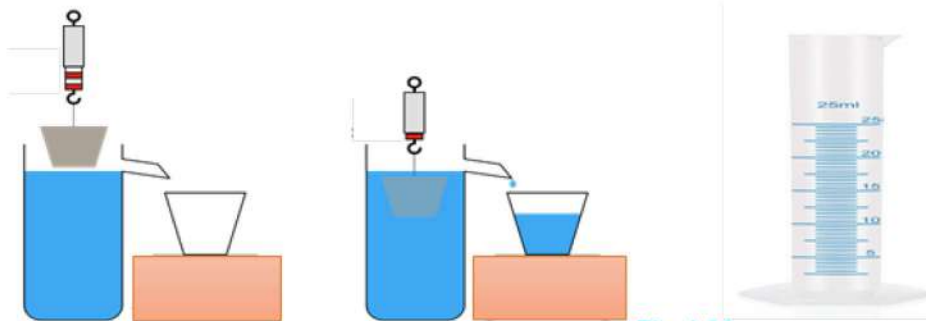


Fig. 1.28

To find the volume of large objects that cannot go inside a measuring cylinder,

fill a kettle with water. Put that kettle in a big bowl. Now, immerse the stone in the kettle. Collect the water spilled from the kettle into the bowl and measure its volume with a measuring cylinder.

The volume of the spilled water is the volume of the stone.

Points to note when determining the volume of a liquid using a measuring cylinder

- (a) The measuring cylinder should be placed on a flat surface.
- (b) Eyes must be kept parallel to the surface of the liquid in the cylinder while observing.

Exercise

1. Choose the most appropriate option from the given options:

(a) Which of the following quantities is equal to 5200 cm?

- A. 52 m
- B. 52 mm
- C. 520 m
- D. 0.52 km

(b) What is the total amount of matter in an object called?

- A. volume
- B. mass
- C. weight
- D. area

(c) How many centimetres are equal to 10 inches?

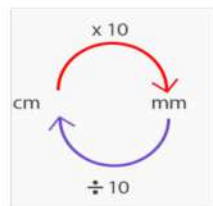
- A. 10
- B. 25.4
- C. 100
- D. 1000

(d) It is 2:50 PM on Hari's watch. What will be the time on his watch 3 hours and 10 minutes later?

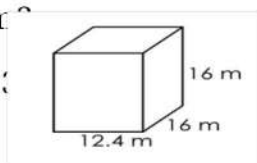
- A. 6:00 PM
- B. 7:00 PM
- C. 6:00 AM
- D. 5:50 PM

(e) Which is the meaning of the given figure?

- A. divide by ten to convert centimetres to millimetres
- B. multiply by 10 to convert centimetres to millimetres

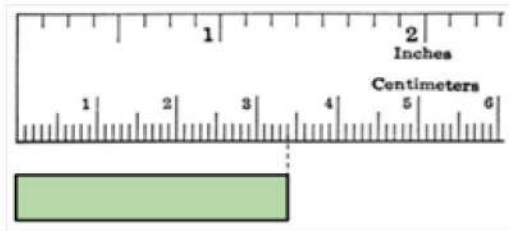


- C. multiply by 10 to convert millimetres to centimetres
 D. divide by 100 to convert centimetre to millimetres
- (f) Which unit is used to measure the length of a pencil?
 A. metre B. kilometre
 C. millimetre D. centimetre and millimetre
- (g) Which of the following is the largest unit?
 A. yard B. inch
 C. foot D. centimetre
- (h) Sadiksha measured the volume of a cube of wood. If the length of the wood is 4, and the volume is 64, which of the following are the units of these two quantities?
 A. m, cm³ B. cm, cm³
 C. ml, ml³ D. cm, m³
- (i) What is the volume of the given box?
 A. 3174.4 m³ B. 3174.4 cm³
 C. 3174 ml C. 3174 cm³
- (j) Your school starts at 9:45 AM and ends at 4:00 PM.
 What is the time between these two events?
 A. 5 hours 20 minutes B. 5 hours 25 minutes
 C. 5 hours 35 minutes D. 6 hours 15 minutes
- (k) Ayusha weighed a cauliflower in a vegetable shop and found it to be 1800g. Find its mass in kilograms.
 A. 0.8 B. 1.8
 C. 18 D. 180



(l) What is the length of the object given in the picture?

- A. 3.4mm
- B. 3.4cm
- C. 3.4 inch
- D. 3.4 m



2. **If the statement given below is correct, put a tick mark (✓) and if it is wrong, put a cross mark (x):**

- (a) Objects of equal volume have equal masses.
- (b) Traditional instruments for measuring the volume of solid and liquid objects are Maana and Paathi.
- (c) There are 24 hours in a day.
- (d) Volume of an irregular object can be measured with the help of a measuring cylinder.
- (e) One foot is equal to 12 inches.

3. **Fill in the blanks in the sentences below with suitable words:**

unit kilometre square metres volume
cubic metres measurement

- (a) One thousand metres is equal to one
- (b) One is equal to 1000 liters.
- (c) Objects having no height or thickness has a surface but no
- (d) The definite quantity used to measure physical quantities is called
- (e) is the process of comparing an unknown quantity with an existing quantity.

4. Match the units and physical quantities:

Unit	Physical quantity
kilograms	volume
metre	weight
second	area
square metres	mass
litre	length
	time

5. Answers the following questions:

- What is mass? Name the mass measuring instrument and its various units.
- If the length of the school playground is 50 feet, calculate its length in metres.
- List various instruments used in daily life to measure the volume of solid and liquid substances.
- What are the differences between the timer and the stopwatch features of the mobile clock app? Explain with examples.
- Describe with suitable diagrams the process of measuring the volume of irregular shaped objects.
- Suruchi has an irregular shaped piece of wood. It floats in water. She is inquiring how to determine the volume of that piece of wood. Describe, with a suitable diagram, the process of measuring the volume of that wood with the help of a measuring cylinder.

2

Information and Communication Technology

In the twenty-first century, there has been a lot of development in the field of science and technology. You can immediately find out the events that happened in any part of the world. The tools used to obtain the information are the means of communication. A computer with the internet is used as a means of modern communication. Its uses have brought a big change in every sector of society like education, health, agriculture, business, banking, etc.



Fig. 2.1

With the help of the computer, we can prepare various documents, make pictures, calculate, and edit them. Documents prepared in this way can be easily sent to other people through email. Using the internet, we can do banking transactions, pay bills for electricity, water, telephone, etc.

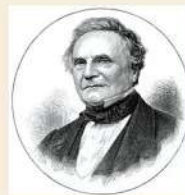


Fig. 2.2

from home. We also get information about various materials through internet and can buy them online. Various informative materials needed for learning can also be found on the internet. Therefore, computer knowledge and skills are important for everyone.

Do you know?

Charles Babbage was a British scientist. He was a mathematician, philosopher, inventor and mechanical engineer. He developed the concept of the modern digital programmable computer. That is why he is known as the Father of the computer.



Sources of information

Let's study a case:

After having dinner, Sampriti was preparing a project work report on his laptop. He had to email his friends the report that had to be presented at school tomorrow. Sister Roshni was searching the way to Pathivara Devi Temple on google maps from her father's mobile phone. She is preparing for a speech contest on the use of information and communication technology in tourism development. Mother is reading newspaper whereas father is watching television. Grandfather and grandmother are listening to folk songs on the radio. Just then, mother received a call on her mobile phone from her elder sister. She had called to invite them to her son's wedding.

Mother : Hello, Namaskar! How are you all?

Aunt : We are all fine here. How about there?

Mother : All fine here too.

Aunt : Son's marriage has been finalized. That's why I called.

Mother : (Joyfully) With whom and when?

Aunt : Everything has been mentioned in the invitation card, but how should I send it?

Mother : There's the internet to send a photo.

Aunt : Oh yes! I will send it immediately, and we will talk again later.

Mother : Okay.

Grandmother: How easy things have become these days! It used to take too long just to know this much information in the past.

Grandfather : Yes, there was neither telephone nor a newspaper at that time. We used to gather at the army uncle's house just to listen the radio. Now our grandchildren find that amusing.

Activity 2.2

A few sources of information are given in the table below. Are all these sources of information available on mobile phones with internet facilities? Discuss in class. Find out what different applications are available on mobile phones as sources of information and record them in the table.

S.N.	Sources of information	Facility available on mobile phone
1.	Letter	Example: Message
2.	Watch	
3.	Magnetic needle	
4.	Calendar	
5.	Phone diary	
6.	Book	
7.	Radio	
8.	Telephone	
9.	Television	
10.	Dictionary	

Based on the above activity, write an essay on the topic, "One mobile phone, many functions," and show it to your teacher. Also, read aloud your essay in turn.

Project work

With the help of a teacher or parent, install learning platform such as Sikai Chautari or other useful apps from the play store in a mobile phone. Watch the reference materials, different books and audio-video materials available on the learning platform. Make a presentation in the class about the resource material that you like the most among the various learning resources available on that platform.

Communication and its types

The transmission of information from one place to another is called communication. The devices used for the flow of information are called communication devices. Newspapers, radio, television, book, computer, telephone, etc. are means of communication. Along with the development of science and technology, the invention of modern means of communication has occurred at a rapid pace. Since information from anywhere gets transmitted all over the world instantly, the whole world seems like a village.

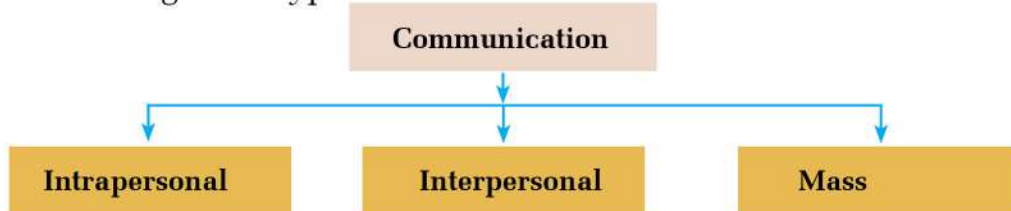
Let's study the case:

Pemba's house is in the Himalayan region of Sindhupalchowk. He keeps yaks and sheep. One day, while grazing sheep during the rainy season, he saw a huge avalanche falling down from the mountain and blocking a nearby river. When the river was blocked, a large lake was formed. After seeing this, Pemba thought that this lake could burst any time and cause a big flood. It might destroy the lives and property in the settlements on the riversides. Pemba communicated this information he had obtained from direct observation among the nearby shepherds. One of the shepherds went to the village further down and informed the Ward Chairperson about it. The Ward Chairperson immediately telephoned the nearby FM radio and requested that notice be broadcasted on the radio informing the residents of the riverside settlements to be alert and stay in a safe place. After the information was shared from the radio, all the people in the vulnerable settlement moved to a safer place before the flood occurred. Hence, the flood at night did not cause any major loss of life and property.

- (a) How did Pemba get the information about the above incident?
- (b) How did the information received by Pemba flow to other people or groups?
- (e) How did the information about the flood spread to the general community at once?

Just as in the above incident, information from a source passes to an

individual, among two people or a group of people, and among the general public. Based on this, communication can be classified into the following three types:



(a) Intrapersonal communication

A person internally thinks, contemplates, compares, reasons, separates right and wrong, etc. and finally reaches into a conclusion. This is called internal communication. Sometimes we question ourselves. Thus, internal or personal communication is the flow of information that occurs internally within a person. We often learn or acquire knowledge through personal communication. In the above incident, the information obtained by Pemba from his observation was communicated to his brain. He then thought over it, reasoned and came to the conclusion in his mind that the others must be informed as well. This is an example of internal or personal communication.

(B) Interpersonal communication

Interpersonal communication is the flow of information from one person to another person or group. In this type of communication, information flow is two-way. Face-to-face and phone conversations, classroom discussions, etc. are examples of this type of communication. In the above incident, Pemba informing other shepherds and one of them talking to the Ward Chairperson on the phone are the examples of this type of communication.

(c) Mass communication

Radio, television, online magazines, etc. transmit information to many people in different places at the same time. This type of communication is called mass communication. In mass communication, flow of information is one way. In the above case, broadcast on the FM radio to communicate information in all the settlements simultaneously is an example of mass communication.

Question to think

Does internal or personal communication take place in interpersonal and mass communication as well? Discuss in class.

Information can be communicated in non-verbal, verbal, written and audio-visual forms.

Activity 2.3

Non-verbal communication in daily life Collect different examples of non-verbal communication (communication that is done through symbols) in daily life. Fill in the symbols and their meanings in the table given below and present them to the class.

S.N.	Symbolic communication	Meaning
1.	To join two hands	Namaskar (hello)
2.	The traffic light turns red	Stop
3.	To nod the head up and down	I understand
4.	To shake the head left and right	Don't know
5.		
6.		
8.		

Create a new table by collecting more examples of communication done in written, oral and audiovisual communication forms.

Do you know?

Smiling, laughing, crying, clapping, etc. are also symbolic communication.

Exercise

1. Put a tick mark (✓) on the correct option for the following questions.

- (a) Which of the following types of communication takes place during a conversation between friends?
- i. mass communication
 - ii. internal communication
 - iii. personal communication
 - iv. interpersonal communication
- (b) Which of the following is a means of mass communication used in daily life?
- i. letter
 - ii. telephone
 - iii. radio
 - iv. email
- (c) Which one of the following is a one-way communication?
- i. interpersonal communication
 - ii. mass communication
 - iii. discussion program
 - iv. telephone conversation
- (d) What type of communication is the use of a red or yellow card by a referee in football?
- i. audible
 - ii. audiovisual
 - iii. symbolic
 - iv. written
- (e) Binu is reading a book. Bibek is making tea in the kitchen and talking to his friend on the phone. Father and mother are listening the news on the radio. Which of the following is interpersonal communication in this incident?
- i. Binu reading a book
 - ii. the news on the radio

iii. Bibek talking to friends on the telephone

iv. Father and Mother listening the news on the radio

2. If the statement given below is correct, put a tick mark (✓) and if it is wrong, put a cross mark (X):

Transmission of information from one place to another is called communication.

- a) Telephone is a means of mass communication.
- b) Information obtained from observation is a source of information.
- c) Clapping is symbolic communication.
- d) Communication through newspapers is interpersonal communication.

3. Fill in the blanks with suitable words:

Communication, symbolic, mind, personal, mass, dual

- a) Deciding where to cross the road by looking at the zebra cross is communication.
- b) Tool used to convey the information is called tool.
- c) Interpersonal communication is a transmission of information.
- d) Information received from the senses is communicated to the
- e) Television is a means ofcommunication.

Computer as a means of communication

A computer is a versatile electronic device. It is also a modern means of communication. To produce the desired result from the data or instructions received, there are various parts in the computer. Computer helps to solve complex problems in a short time in an error-free manner. It also stores the entered data.



Fig. 2.3

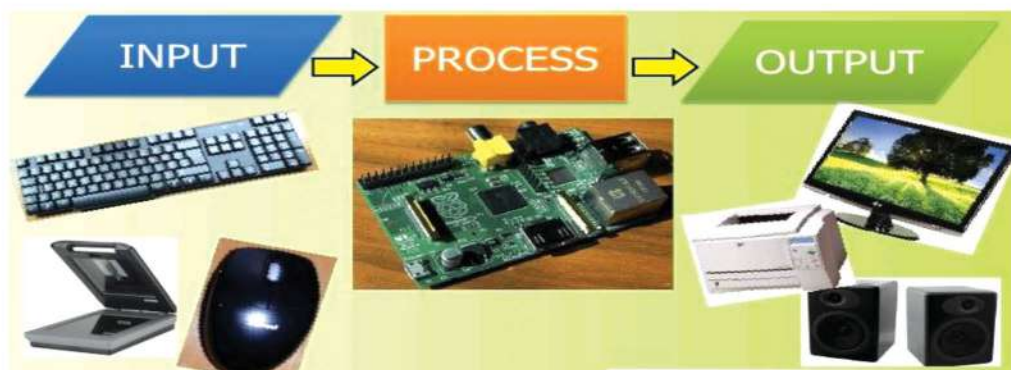
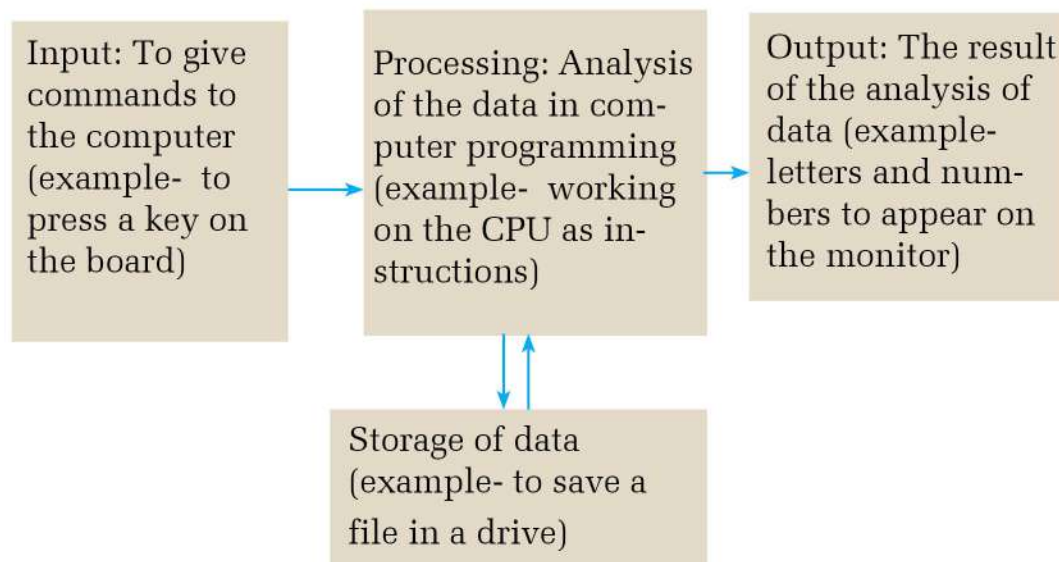


Fig. 2.4



The computer has different parts that can be seen by our eyes (outside and inside). This physical form of the computer is called hardware.

Similarly, we have to keep programs and applications on the computer to perform various tasks. Such programs and applications are called computer software, such as word processor typing software, presentation software, spreadsheets, etc. are examples of computer software.



Hardware

Fig. 2.5



Software

Fig. 2.6

The computer receives data and instructions from the keyboard and mouse. Thus, the device that provides data and instructions to the computer is an input device. Such raw data or commands are converted into meaningful results in the CPU. This activity is called processing. The meaningful results converted in this way can be viewed on a computer monitor, printed on a printer and heard from a sound box. In this way, the devices used to display, read, and print the results obtained after processing are output devices. Likewise, those meaningful results can be saved in the computer storage. The hard disk of the computer, solid-state drive (SSD), etc. are part of the storage. Documents prepared by us, photos, audio, video, etc. can be stored safely in them.

Activity 2.4

Note down the names of the different parts of the computer in the school's computer lab. Ask the teacher about the names and functions of the parts that you do not know. Now, based on the work of each part, classify them as input, processing, output or storage device and fill in the table.

S.N.	Input device	Processing device	Output device	Storage device
1.				
2.				

Like a computer, our body also receives information from various sources through the senses. It takes food and oxygen to get energy. In this way, the organs that supply information, food, oxygen, etc. into the body are like input devices of a computer. Oxygen and the nutrients present in the food reach the cells through various body parts and react there to produce energy. The internal organs involved in this process, including the brain are like the CPU of a computer. Energy generated in the body, growth and development, etc. are the outputs.

In this way, there is some similarity in the working style of human body and computers. The human brain can be compared to the CPU, the eye to the camera, the ear to the receiver, and the mouth to the speaker.

As in activity 2.4, create a table by classifying the organs of our body into four parts based on their work - input, processing, output and storage devices.

Although similarities have been found in the actions of some parts of a computer and a human being, a computer is an electronic device made by humans. The dissimilarities between humans and computers can be listed as follows:

S.N.	Human	Computer
1.	People may have different opinions on any information.	For the same command, all computer results are the same.
2.	Humans can express emotions like sadness, happiness, and pain.	Computers cannot express emotions like sadness, happiness, or pain.
3.	Human has creativity. It can write poems, stories, essays, etc.	It does not have creativity. It cannot write poems, stories, essays, etc. on its own.

4.	Human needs more time than a computer to analyze data.	
	With fixed programming, a computer can analyze data in seconds.	
5.	Human can make the decision himself/herself.	The computer cannot make decisions on its own.

Do you know?

Different games and songs can be played on the computer but have you heard about the computer composing songs, poems, etc. on its own?

The robots too laugh, cry, converse, etc. like humans. This is possible because various programs have been installed on it. These types of devices are called artificial intelligence (AI) devices.

Organize a debate competition on the topic, "Robot: A blessing or a curse?". Present your arguments in favour of or against the topic.

Exercise

1. Put a correct mark (✓) in the correct option for the following questions:

- (a) What is the physical form of a computer called?
- i. software
 - ii. hardware
 - iii. input device
 - iv. output device
- (b) Which of the following type of device is a pen drive?
- i. processing device
 - ii. storage device
 - iii. input device
 - iv. output device
- (c) Which of the following is an input device?
- i.
 - ii.
 - iii.
 - iv.



- (D) Which of the following can be done by humans but not by computers?
- i. analyzing data
 - ii. dissemination of information
 - iii. storing data
 - iv. making a practical decision
- (e) You have created and saved various pictures on the computer. Those pictures are stored in which of the following part of the computer?
- i. monitor
 - ii. CPU
 - iii. drive
 - iv. software

2. If the statement given below is correct, put a tick mark (✓) and if it is wrong, put a cross mark (X):

- (a) The computer stores the entered data.
- (b) Monitor is the output device of the computer.
- (c) Humans can analyze data faster than computers.
- (d) Drive, SSD, etc. are the computer processing device of a computer.
- (e) If the computer gets angry, it makes more errors.

3. Fill in the blanks by choosing the appropriate word.

results input storage processing output

- (a) Human brain does the work of like the hard drive of the computer.
- (b) Printer of computer is a device.
- (c) form all computers is the same as per the command.
- (d) The function of giving data or instruction to the computer is done from the device.

Typing software

Nowadays, documents and accounts used in offices, schools, hospitals, bakeries, and commercial areas are typed and stored on computers. Electronic copies of stored documents can be sent to other people or organizations with the help of the Internet. They can also be printed as hard copy for storage. Various typing software have been developed to learn typing different kinds of document on the computer in a fast and easy way. Typeshala, Typing Master, Typing Tutor, etc. are such software.

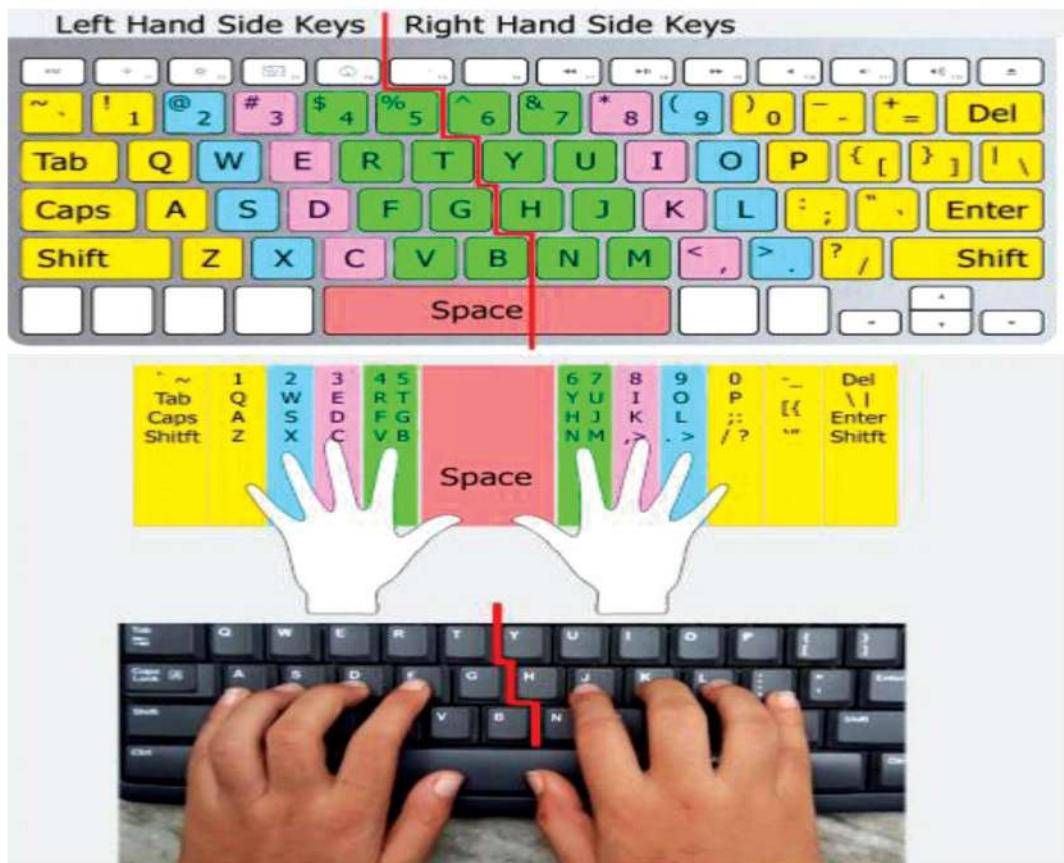


Fig. 2.7

A computer has many keys with letters, numbers and various commands. To type quickly and easily, all fingers of both hands should be used. The picture above shows which keys to type with which finger.

Let's do and learn:


Open Microsoft Store on your computer. Type 'easy typing' in the search box as shown below. You will see different apps, like  the one shown below, to practice typing in English. To download any of these apps, click on 'Get'. After downloading and installing the app on your computer, open it. Practice typing according to the instructions given there.



Fig. 2.8

Question to think

Is the sequence of letters and numbers the same on all keyboards?

What must be the reason for allocating more keys for some fingers and less for others?

Do you know?

Keyboards have a raised part like a small line on the keys for letters F and J. This helps to keep the fingers on the keyboard correctly. Similarly, letters that are frequently used (such as vowel letters) are placed in a place that can be easily reached on the keyboard.

Activity 2.6

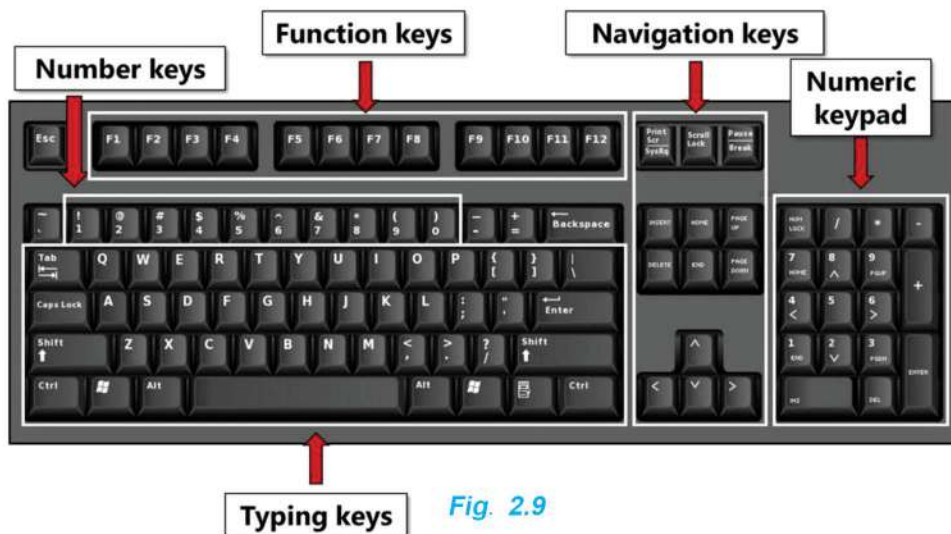
With the help of a teacher, open the word processor on a computer. By placing your fingers on the keyboard correctly, type the letters of the home row, top row and bottom row respectively. Type each letter twice and then leave a space. In this way, type the text given below on the monitor. Use the stop watch to see and record the time required for everyone to type this text. Find out whose typing speed is faster.

aa ss dd ff gg hh jj kk ll qq ww ee rr tt yy uu ii oo pp zz xx cc vv bb
nnmm

aa ss dd f f gg hh jj kk ll qq ww ee rr tt yy uu ii oo pp zz
xx cc vv bb nn mm

Introduction to the keyboard

The keyboard is the main input device of the computer. It has different keys. Based on the function, these keys can be divided into different groups as shown in the figure below. The main functions of the keys divided into different groups are as follows:



(a) Number and letter keys: to type numbers, letters and symbols

(b) Function keys: to do special work in a computer program, for example,

F1: to show help screen in most program

F2 :to rename a file or folder

F3: to search for something in an open application

F4 : Alt + F4: to turn off the computer

F5: to refresh the computer

F12: to save file as, etc.

(c) Navigation keys: to access different parts of the file or application

Home: to access the first page (in read mode)

End: to go to the last page (in read mode)

Page up: to go to the next page

Page down: to go to the last page

Arrow keys: to move the cursor in the direction of the arrow



Fig.2.10

(d) Special keys:

Delete key: to delete a letter or number to the right

Backspace key: to delete a letter or number to the left

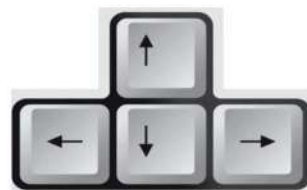


Fig.2.11

Caps Lock key: to write capital letters

Shift key: Shift + letter = capital letter

For example, Shift + a=A

Shift + Number = symbol, for example, Shift + 5 = %

Ctrl + C: Copy the selected part

Ctrl + X: to cut the selected part

Ctrl + V: to cut and paste the copied part

Ctrl + A: to select the whole document

Ctrl + S: to save the document

Ctrl + Z: to go back one step (undo)

Space bar: to move the cursor and subsequent text forward one step

Enter: to move the cursor and subsequent text to the next line

Do you know?

Since keys like Ctrl and shift have to be typed together with other numbers and letters, they are placed on both the left-hand side keys and right-hand side keys of the keyboard.

Word Processor

A word processor is a computer program. With its help, one can type (input), edit, format, take out a print of a text, etc. Microsoft word, Google Docs, Libreoffice writer, Notepad, Wordpad, etc. are examples of word processors.

Steps to open the word processor

1. Click on the Start button located in the lower left-hand corner of your desktop or laptop.
2. Right above the start button, you can see the list of all programs.
3. Look for Microsoft Office there. If you click on the Microsoft Office Group icon, the subgroup will open.
4. One of the icons in the subgroup is Microsoft Office Word. Double-click the Microsoft word icon with the left mouse button.

Or

1. Click the right mouse button on an empty part of the desktop or laptop monitor.

2. The first interface will be visible. It will look like the one shown in the given figure. If you put the cursor on New, another interface that looks like the one shown in the figure will appear. When you left-click on the Microsoft word document on it, a new Microsoft word document appears on the computer screen.

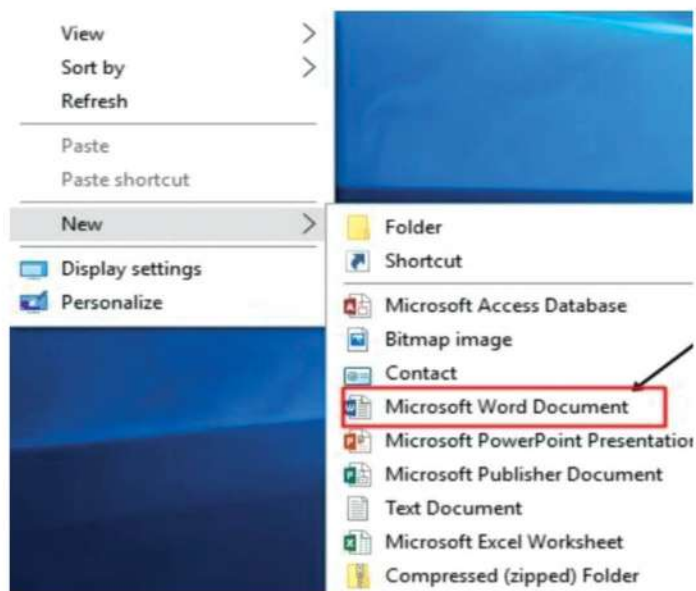






Fig..2.12

3. When you right-click on the file and then click on Open, a word file opens.

Activity 2.6

Open Microsoft word document on the computer. Type a sentence in English. Highlight (select) that sentence. To select it, keep the cursor at the start of the sentence, hold the shift key and keep pressing the arrow pointing right (). Alternatively, keep pressing the right side of the mouse and drag the cursor over the required text. Now click on different command buttons in the home tab of the word file in turn. What difference did you get? What happened when you click on those commands once again? Click on the downward pointing arrow () on the right side of any command and observe the changes in the shape, structure, colour, style, etc. of the words in the sentence. Based on this, discuss the functions of different commands of the font group  in the home tab of the Microsoft word document and then fill in the given table.

S.N.	Command	Function
1.	B	
2.	<i>I</i>	
3.	<u>U</u>	
4.	abc	
5.	A [^]	
6.	A [∨]	
7.	Aa ∨	
8.	<u>A</u>	
9.	ah 	
10.	A	

Do you know?

On the computer, when the mouse cursor is placed on the command button, a box will appear with the name of the command, function, and the shortcut key.

Activity 2.7

On computer at your school, open the word processor and prepare the following notice. Name it 'Notice' and save it in a drive on the computer.

Shree Sinam Secondary School

Sirijangha - 1, Taplejung

Estd : 2007 BS

Date :

NOTICE

Inter-Class Drama Competition

Our school is organising an **Inter-class Drama Competition** to be held on Friday, 31st March, in school auditorium. The competition is open to classes IV-X. Interested students can register their details to their class teacher by 20th March. For further information, please contact to ECA co-ordinator.

.....
Head Teacher

Paint software

Various programs have been developed to create or design pictures on the computer. Mac paint, Tux paint, Ms paint, etc. are some examples.

Microsoft paint

This is the system software in the computer. You can easily draw pictures, fill in colors and edit other pictures using this software. The way to use MS paint is described here:

A. Opening MS paint on a computer

1. Click the windows icon () in the lower left part of the computer. There you can see the list of programs on the computer.
2. There is MS paint in the list of programs. To open it, double click on the left button of the mouse or right click on the mouse and click on Open. It can also be dragged to the desktop of the computer. When you open MS paint, you can see the interface as shown in the picture.

In the upper left part, there are three ribbon tabs: File, Home and View. You have to go to the home tab to draw the picture. The home tab contains clipboard, image, tools, shapes and of color commands. By using these commands, pictures can be created in the canvas area. The area of the canvas can be increased or decreased.

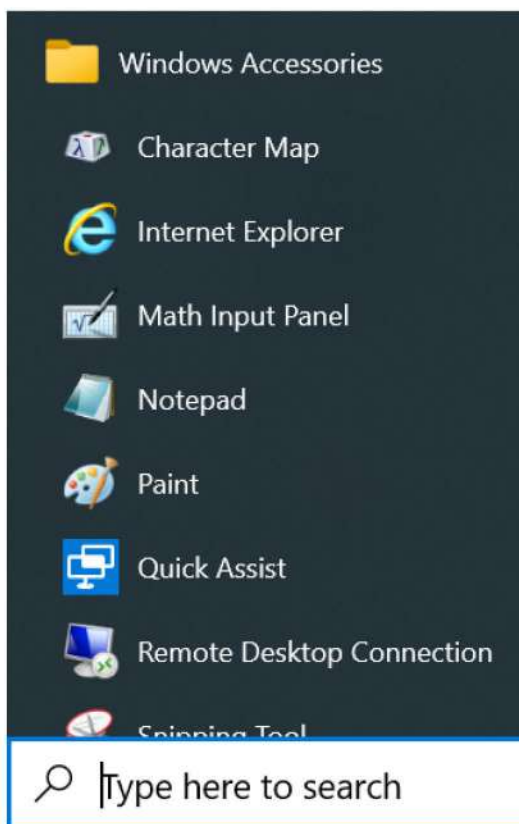


Fig. 2.13

B. Drawing and filling colour




1. Click the pencil tool (🖋️).
2. Click on the color you want in Colors. Color 2 is the color of the background, while color 1 is the color to fill in the picture.
3. Press the left button of the mouse to sketch the outline of a picture on the canvas with a pencil.
4. Fill up the shape with suitable color with the help of the appropriate brush. By clicking on the arrow below the brushes command (🖌️), you will get to choose different types of brushes (such as oil brush, watercolor, airbrush, etc.).

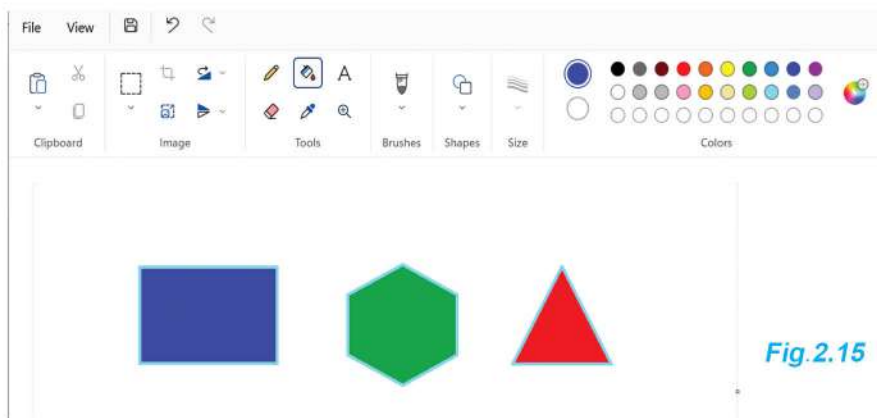


Fig. 2.14


5. You can also fill different colors using fill up color tool (🔨) in the shape made with pencil. For this, the shape should be enclosed to fill the color.
6. The eraser tool is used to erase the mismatched parts of the picture. The pencil, eraser, and brush size can be changed by clicking on the thin or thick lines in the size command. (≡). Eraser has the background color.

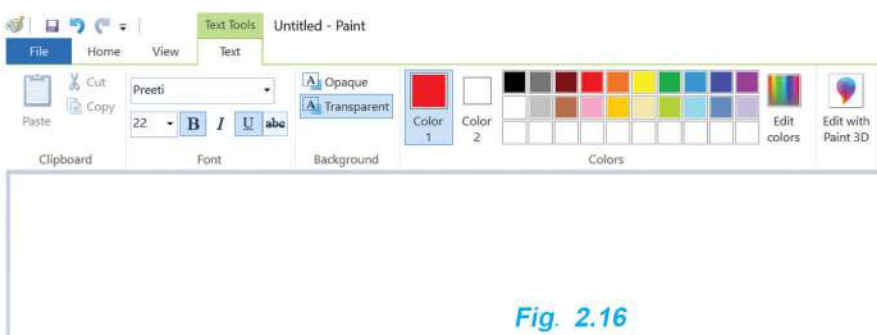
C. Creating a shape and filling colour

1. Select the desired shape from 'Shapes'. Slowly draw that shape on the canvas by pressing the left button of the mouse.
2. Click on the desired colour from 'Colors'. Fill different colors in the shape using the fill up color tool ().
3. The color of the outline of the shape created in this way can be changed from the outline () and the color inside the shape can also be changed from the shape fill ().



D. Adding text and filling colour

1. Click on the Text tool (). Then click where you want to write text on the canvas. A dialog box appears for typing.
2. Select the font and font size of the text to be written.
3. You can write the words or numbers in the dialog box using the color you want.



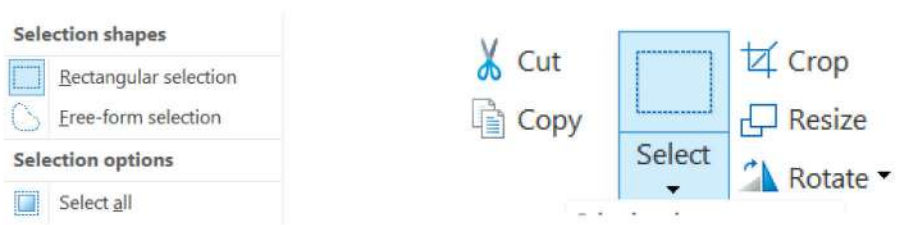


Fig. 2.17

To select a part of the image created in this way, click on the 'Select' command. By choosing the option in Select and then pressing the left mouse button slowly, the desired part can be selected. Then you can cut, copy, crop, resize or rotate the selected part.

E. Save the diagram

1. Click on the 'File' tab to save the created image.
2. Click on 'Save' from the various options there.
3. Write the name of the picture in the place where 'Untitled' is written. Also, click on the part of the computer where you want to save the file and click on the 'Save' button.
4. The saved picture can be viewed or edited again whenever you want.

Activity 2.5

Try to make the pictures in MS paint as shown below. Show the pictures you have made to the teacher. Print the best three (color print is better) and decorate your class.



Fig. 2.18



Fig. 2.19

Exercise

1. Tick the correct option:

(a) Which of the following is the icon for MS paint?

i.



ii.



iii.



iv.



(b) What is the name of the tool given in the picture?



i. magnifier

ii. pencil

C. brush

D. fill up color

(c) Which of the given tools is used to delete the created picture?

i.



ii.



iii.



iv.



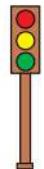
(d) Which of the given shapes is used to make a picture of a traffic light like the one shown in the picture?

i. square and oval

ii. rectangle and circle

iii. spherical and triangular

iv. cylindrical and spherical



(e) What is the row between the upper and lower row on a computer keyboard called?

i. home row

ii. function row

iii. number row

iv. special row

- (f) Which key is used to delete the letter or number to the right of the text?
- i. backspace
 - ii. delete
 - iii. end
 - iv. enter
- (g) Which of the following command is used to save a document in a file?
- i. Ctrl + A
 - ii. Ctrl + S
 - iii. Ctrl + V
 - iv. Ctrl + X
- (h) Which tab should be clicked to create a table in the word processor?
- i. home
 - ii. design
 - iii. insert
 - iv. draw

2. If the statement given below is correct, put a tick mark (✓) and if it is wrong, put a cross mark (X):

- (a) To fill color with the help of 'Fill up color', the shape must be enclosed.
- (b) MS paint is present in Windows Accessories of the computer program.
- (c) With the help of MS paint, you can paste the pictures on the computer and fill in the color you want.
- (d) Save the picture in MS paint cannot be opened, viewed and edited.
- (e) In MS paint, the eraser color is different from the background color.
- (f) Any text can be edited on a computer with the help of a word processor.
- (g) Spacebar is used to move the cursor and subsequent text one step forward.

Prepare the list of different communication tools being mentioned in the case above.

We have been regularly receiving information about people, things, places and events in our daily lives. Such facts and data are called information. We are getting information about the incidents in our environment and community by directly observing them. Sources of information obtained from direct observation are called primary sources. When we obtain information from sources through direct observation, those sources are called primary sources of information. We use various media such as newspapers, radio, television, internet, online magazine, mobile, computer, etc. to get information about events. Such media help in conveying information from one place to another. All these media are sources of information.

Activity 2.1

In the given table, note down the names and work of the various devices used for obtaining information. Discuss it in class and draw conclusion.

S.N.	Name of the source of information	Work
1.	Television	to acquire information by hearing and seeing
2.		
3.		
4.		
5.		
6.		
7.		

Mobile phones are considered easy and convenient sources of information. Other sources of information such as newspapers, radio, etc. can also be accessed from mobile phones and computers with internet facilities.

- (h) F3 is used to rename a file or folder.
- (i) Only the middle finger should be used to type on the keyboard.
- (o) Google sheet is an example of a word processor.

3. Fill in the blanks by choosing the appropriate word from the list.

select text file size save

- (a) tab must be clicked to save the created image.
- (b) tool is used to write words in MS paint.
- (c) To change the size of the pencil, eraser or brush, command is used.
- (d) To cut, copy, crop, resize or rotate the desired part of the image, we should first the part

4. Match the pairs:

(A)

Tool symbol



Tool

brush tool

pencil tool

text tool

shape fill tool

colour fill tool

select tool

(B)

Group (a) (shortcut key)

Ctrl + Z

Ctrl + P

Ctrl + X

Ctrl + S

Ctrl + C

Ctrl + A

Group (b) (function)

Copy the selected part

To cut the selected part

To paste the cut and copied part

To select all the document

To save the document

To go one step back (undo)

To print document

5. Answer the following questions:

- What is the difference between information and communication? Explain with examples.
- What are the sources of information? Classify with examples.
- Mention the types of communication and describe each in brief.
- Name the various parts of a computer. Distinguish between input, output, processing device and storage device.
- Write three similarities and three differences between humans and computers.

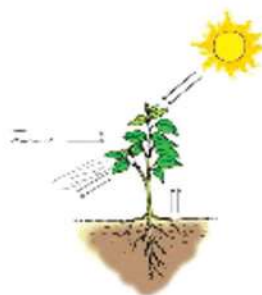
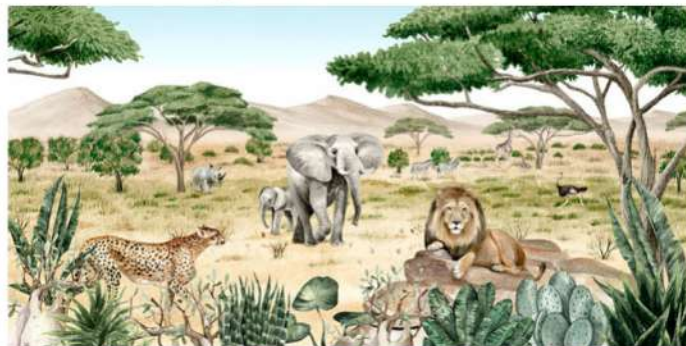
Project work

- Open Paint Software on the computer. Make a picture of your choice using different shapes and colors and display the picture in the classroom.
- Open any word processor on the computer and write a short essay about your school. Bold the title by making the font size larger and place it in the center. Select the main points in the essay and highlight them.

3

Organism and Environment

Observe the picture and discuss:



Questions

Fig. 3.1

- Which animals did you see in the pictures?
- Which energy do plants need to make food?
- What are the creatures doing in the picture?
- What kind of plants are found in the Himalayan region?
- Which is the chief natural source of energy in the given pictures?

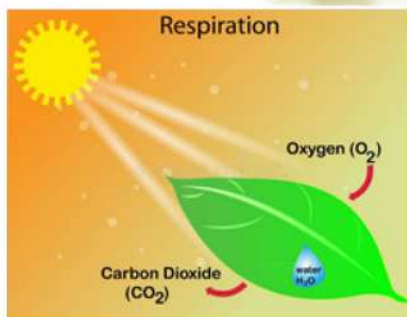
The environment is made up of living and non-living things. Animals and plants are living things. Soil, water, air, etc. are non-living things. Living things depend on other living and non-living things for survival. Animals and plants need energy such as heat and light. Living things get heat and light from the environment. In this way, living and non-living things are interrelated with each other. The environment is the overall form of living things like plants, and animals and non-living things like air, water, soil, heat, light, etc. in a place.

Heat and light for living beings

Let's look at the pictures and discuss:



Fig.3.2



What different activities are shown in the pictures above? Which energy is required for these activities?

The sun is the main source of light and heat. Plants make food in the presence of sunlight. Heat is required for the growth of a plant, flowering, fruiting, seed maturation, and removal of excess water from leaves. Similarly, animals need heat energy to keep their body warm, for reproduction, etc. The light and heat from the sun help in drying wet clothes, cooking, drying grains, and producing vitamin D in the body. Sunlight helps to remove darkness and make the place bright. The heat of the sun warms the surface of the earth and makes it suitable for life. Similarly, electricity can be generated from sunlight. Due to the heat received from the sun, the water in various sources evaporates and helps to maintain the water cycle.

Project Work 3.1

Effect of sunlight on growth and development of plant

Purpose: To observe the effect of sunlight on plant

Required materials: pot, soil, fertilizer, water, jug, seeds

Working procedure

In two pots of the same size, take an equal amount of soil mixed with finely crushed manure. Take some seeds of any one type of pulse (bean, gram, etc.). Sprinkle an equal amount of seeds in both pots. Place the pots in a place where there is no sunlight and water them both equally every day. Observe daily whether the seeds have germinated or not. After the seeds have germinated, keep one pot outside in a sunny spot and the other in a dark room where the sunlight never reaches and water them regularly. Every week observe the color of the leaves of the plants and measure the height of the plants. Fill in the results obtained from this in the table below. Discuss the results with your friends in the class and write the conclusion.

Changes in the plant after germination		Plants in a dark room away from sunlight	Plants in a bright room with sunlight
Color of the plants	First week		
	Second week		
	Third week		
		
Height of the plants (cm)	First week		
	Second week		
	Third week		
		

Conclusion

The plants exposed to sunlight were found to be in colour and in height. But the plants not exposed to the sunlight were in colour and in height.

Seeds germinate in favorable conditions of heat, light, water and soil. Green plants contain chlorophyll. Chlorophyll absorbs solar light and use it to make food. The same food promotes the growth of plants. In the absence of sunlight, the plant turns yellow.

Question to think

The plants growing in a shady place do not bear fruit well, why?

Let's look at the pictures and discuss the importance of heat and light.



Fig.3.3

Animals need heat and light energy for the growth and development of the body, to keep the body warm, to hatch the baby from the eggs, etc. In the same way, light helps in seeing things, finding food and shelter, avoiding traps, etc.

Question to think

- Why are frogs, snakes, mice, etc. seen less in the winter season?
- Why do animals move away from their habitat during adverse weather and return to their original habitat during favourable condition?

Project work 3.2

What kind of plants, fruits, and vegetables are found in the environment where you live? Fill in the table below by observing or asking your elders. Based on this, discuss the effects of heat and light on plants and present their conclusions to the class.

The name of the place you live

S.N.	Trees	Fruits		Vegetables	
		Winter	Summer	Winter	Summer
1.					
2.					
3.					

The shape, size and types of plants found in any place depend on the amount of rainfall in the place, duration of the sunlight, etc. Hence, different plants are found in different geographical regions. Nepal has geographical regions like mountains, hills and plains. Due to the different altitudes and climates, the plants in the mountains, hills and plains are also different. Pine, walnut, fir, rhododendron, etc. are found in the hilly region of Nepal. The leaves of plants like spruce and juniper (Dhupi) found in the Himalayan region are thin and needle-shaped. Since it snows in the high Himalayas of Nepal, the grasslands are visible only in the summer.

Activity 3.1

Let's read the conversation and discuss:



The environment inside the tunnel Fig.3.4 *The environment outside the tunnel*

Location : Footpath in a hilly region

Characters : Four friends of class five (Shravan, Devaki, Phurwa and Kamala)

Shravan : The winter vacation ended so quickly, right?

Devaki : Yes! These days are so cold!

Science and Technology, Grade 5

- Phurwa : Cold wind has been blowing time and again since morning.
- Kamala : As it is the first day of school after winter break, I got up early this morning. I looked at the yard outside, it was completely covered with frost!
- Shravan : Look there! What is that plastic covering?
- Devaki : Oh! A lot of tomatoes are fruiting inside.
- Phurwa : Yes. But plants could not grow well due to too much cold in the hills.
- Kamala : Wow! It seems that a plastic tunnel can help grow vegetables even in the off-season, isn't it?
- Shravan : I agree. All the tomato plants in our backyard have died. I wonder how the tomatoes could grow so well inside the tunnel!
- Kamala : Listen, the sun's heat can easily come inside the tunnel but cannot go out, because of that, it is hotter inside the tunnel than outside. So, the plants can grow well.

Questions for discussion

- Why did the plants outside the tunnel die?
- What could be the reason for the good fruiting of tomatoes in the tunnel?
- How can off-seasonal vegetable cultivation be done?

Question to think

Why only transparent plastic is used in the tunnel?

Let's know

Days are long in summer but shorter in winter. In summer, the plants get sunlight for a long time, and this helps the plants to grow faster and flowers to bloom.

Since the days are shorter in the winter than in the summer, the plants do not get much sunlight in winter. Thus, plants grow less in winter because they get less heat and light needed to grow. Not all flowers bloom in the daytime. Jasmine, Parijat (Night Jasmine), Queen of the night, etc. bloom at night. A cold environment is favourable for plants like pine, chestnut, walnut, etc.



Parijat



Jasmine



Queen of the night

Fig.3.5

Project work

Objective: To compare the temperature outside and inside a transparent plastic or glass box

Materials required: A transparent plastic or glass box, a thermometer

Procedure

Take a small transparent plastic box. Measure the temperature outside and inside the box with the help of a thermometer and record it. After that, keep the box in the sun for some time and then measure the temperature inside and outside. Complete the table below. Write a conclusion based on the information.

S.N.	Condition of the box	The temperature outside the box	The temperature inside the box
1.	While not placed in the sun		
2	After placing it in the sun		

Findings: The temperature inside the box is than that of the outside.

Discuss the findings and present them to the class.

Exercise

1. Select the most appropriate option among the given options:

- (a) Which of the following is the main source of heat?
i. fire ii. gas iii. electric lamp iv. sun
- (b) Which of the following is the main reason for plants not growing properly in winter?
i. lack of light required by plants
ii. lack of heat required by plants
iii. lack of water required by plants
iv. lack of air required by plants
- (c) Which of the following is the main function of the tunnel made for vegetable cultivation?
i. increasing the temperature inside the tunnel
ii. preventing light from entering the tunnel
iii. allowing air to circulate inside the tunnel
iv. protecting plants from insects and diseases
- (d) Which of the following elements are required for plants to make food along with the substances absorbed from the roots?
i. light, chlorophyll and oxygen
ii. heat, chlorophyll and carbon dioxide
iii. light, chlorophyll and carbon dioxide
iv. carbon dioxide, chlorophyll and oxygen

2. If the statement given below is correct, put a tick mark (✓) and if it is wrong, put a cross mark (x):

- (a) Chicken need light to hatch their chicks from eggs.
- (b) Plants grow faster in areas exposed to sunlight for longer periods.

- (c) The leaves of plants found in the Himalayas are needle-shaped.
- (d) Heat, light, soil, and air are inorganic elements of the environment.
- (e) Tunnel protects the plants inside it by not letting the sunlight enter through the plastic.

3. Fill in the blanks in the sentences below with the appropriate word.

Chlorophyll environment favourable cold
 yellow suitable green

- (a) Energy is obtained from the
- (b) weather is necessary for farming.
- (c) In adverse weather, animals move toplaces from their habitat.
- (d) Plants turnin the absence of sunlight.
- (e) is present only in green plants.

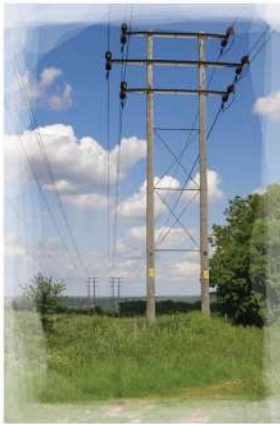
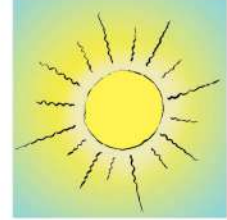
4. Write the answers to the following questions:

- (a) List any three sources of heat and light.
- (b) Write the reasons why plants do not grow well in places without sunlight.
- (c) Why are plastic tunnels used for vegetable cultivation during winter?
- (d) For what functions do living things require heat?

Sources of energy in environment

Activity 3.2

Observe the picture and discuss:



Activity 3.3

Fig.3.6

List the energy that you are using in your daily life. Where do you obtain that energy from? What are their sources and uses? Fill in the table below.

S.N.	Sources of energy	Where it comes from	Types of energy	Uses
1.	Firewood	Forest	Heat	To cook food, warm our body
2.				
3.				
4.				
5.				

Questions for discussion:

- Which of the above energy sources have you used for cooking? Apart from these, what other sources of energy can be used for cooking?
- Where have you used electricity to do different things in your daily life?
- What are the sources of energy used in the means of transportation such as motorcycles, cars, minibuses, buses, trucks, airplanes, etc?
- Which fuels are used to run factories?

Energy is needed to perform various tasks in daily life. Energy is needed to move an object from one place to another. The energy obtained from the sun is called solar energy. Solar energy is essential for all living things. Solar energy comes to earth in the form of heat and light. Plants make food from sunlight. Animals depend on plants. Wood, firewood, and charcoal are made from plants. Cattle dung is used for making dungcakes (guitha) and biogas.

Due to the heat of the sun, the water on the earth's surface evaporates. Clouds are a form of water vapour. Clouds cool and fall to the ground as rain. Hydroelectricity is generated by collecting water from streams, rivers, etc. in dams. Electricity is used in homes, schools, offices, factories, industries, etc. We should not use energy unnecessarily.

Let's read the conversion:

Location: Village footpath

Characters: Pawan and Geeta from class five, Harke Dai

Pawan : Hello Harke Dai! Where are you going early this morning?

Harke Dai : I am going to the jungle.

Gita : Why?

Harke Dai : Because I have run out of fodder and firewood, I am going to bring some from the jungle.

- Pawan : But, isn't the collection of fodder and firewood from the forest forbidden?
- Harke Dai : Ah....Pawan, that's why I decided to go to get some firewood quietly early in the morning.
- Geeta : How can you do that, Harke Dai? Collecting too much firewood from the forest leads to the destruction of the forest.
- Pawan : Yes, the habitats of the creatures living there are also lost and the animals become extinct. Isn't it?
- Harke Dai : Umh...! What else happens if there are no trees?
- Gita : When there are no trees and plants, even the soil on the ground gets easily washed away, Harke Dai.
- Pawan : Yes, and when there are no vegetation and due to bare hills, more landslides occur during the rainy season.
- Harke Dai : Without firewood, how do I cook food? I can't afford kerosene or gas.
- Pawan : We are not saying firewood must not be used at all. Dry and fallen trees can be collected with permission and used.
- Geeta : And, Harke Dai, new plants must be planted after cutting trees.
- Pawan : You can also use biogas, electricity, etc. for cooking food and boiling water.
- Harke Dai : Oh, is it? How do you cook with electricity?
- Pawan : Electric heaters, induction stoves, etc. can be used. They cook food easily. They also help keep the environment clean because they do not produce dust and smoke.

- Harke Dai : I think using kerosene is more convenient than these.
- Gita : Not really, Harke Dai. The dust and smoke from the burning of coal, kerosene, diesel, petrol, etc. pollute the air and cause harm to human health!
- Pawan : Not only that. The excessive use of fossil fuels will result in them being used up, and it takes millions of years to regenerate.
- Harke Dai : Oho! Now I understood. You are very young but still so practical! Thank you for all this information.

Activity 3.4

Based on the conversation you read above, discuss with the friends in your locality the importance of energy and the effects due to lack of energy conservation. Based on this conversation, write an essay on the conservation and use of energy.

Question to think

The use of electric vehicles reduces pollution. How?

Activity 3.5

Observe the pictures and discuss:

How can the use of the items shown in the figure reduce the negative impact on the environment? Write in the table below and present it to the class.



Fig.3.7



Fig.3.8

The name of the items	Reduction of environmental impact
Improved stove	Less firewood is used, food cooks faster, smoke goes out, makes the kitchen and house smoke-free
Pressure cooker	
Solar panel	
Hydroelectricity	
Electric vehicles	
Biogas	
Gas stove	

There are non-renewable sources of energy such as coal, kerosene, etc., and renewable sources of energy such as the sun, forests, and hydroelectricity. The unnecessary use of resources like mineral oil must be reduced at homes, schools, offices, factories, etc. However, the use of renewable sources of energy such as biogas, wind power, hydropower, solar power, etc. should be increased.

Project work

1. On the occasion of World Environment Day, June 5, organize an art exhibition displaying the ways to reduce the impact of the excessive use of energy on the environment.
2. Organize public awareness program in your school area with placards containing measures to reduce the impact of unnecessary and excessive use of energy on the environment. Also, collect the sample of the placard and prepare a booklet on energy conservation.
3. Carry out inquiry on the effects of excessive use of energy resources in your locality and prepare a report and present it to the class.

Exercise

1. Select the most appropriate answer from the given options.

- (A) Which of the following is a renewable source of energy?
- i. kerosene
 - ii. diesel
 - iii. water
 - iv. coal
- (B) Which of the following sources of energy causes the air more polluted?
- i. diesel
 - ii. hydropower
 - iii. sun
 - iv. biogas
- (C) Which of the following source of energy does not pollute the air?
- i. diesel
 - ii. hydropower
 - iii. firewood
 - iv. coal
- (D) Which of the following methods is suitable for preventing the unnecessary use of energy?
- i. using pots in conventional stoves
 - ii. using less electricity than required
 - iii. use of a pressure cooker in an improved stove
 - iv. use of high-wattage lamps for illumination

2. If the statement given below is correct, put a tick mark (✓) and if it is wrong, put a cross mark (x):

- (a) Use of electric vehicles causes pollution.
- (b) Excessive and unnecessary use of energy effects the environment.
- (c) Coal is abundant in nature.
- (d) Keeping lights on when there is no one in the room is an example of unnecessary use of energy.

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

Excessive electricity sun pollution less coal

- (a) is a source of energy that will finish when we go on using it.
- (b) use of energy causes natural sources of energy to become depleted.
- (c) Use of solar energy does not cause in the environment.
- (d) is the main source of energy.

4. Write the answers to the following questions:

- (a) Prepare a list of items used as sources of energy in daily life.
- (b) Write any two measures you have applied or seen in your home or community to save energy.
- (c) "Use of biogas is better than the use of firewood as a source of heat." Write any two justifications for this statement.
- (d) Which one is better to use, a diesel vehicle or an electric vehicle? Give reason.
- (e) Correct selection of the source of energy helps to keep the environment clean. Clarify this with a suitable example.
- (f) Write the ways to conserve energy.

4

Classification of Living Beings

Let's look at the picture and discuss:



Fig.4.1

- Which of the animals shown in the picture have you seen?
- Do all animals have the same body structure?
- Where do these animals live?
- Which animals have a backbone?
- Which are the flowering and non-flowering plants in the picture?
- Are the parts of all the plants same?

Various kinds of animals and plants are found around us. Animals and plants have different shapes. Some animals are small and some are big. Similarly, some plants are small and some are large.

Animals are mainly divided into two groups with and without a backbone. Earthworms, crabs, centipedes, spiders, flies, ants, snails, starfish, etc. are animals without a backbone. Fish, frogs, lizards, snakes, chickens, pigeons, dogs, cats, cows, humans, etc. are animals with a backbone.

Some plants bear flowers and some do not. Thus, plants are mainly divided into two groups: flowering and non-flowering.

Vertebrates

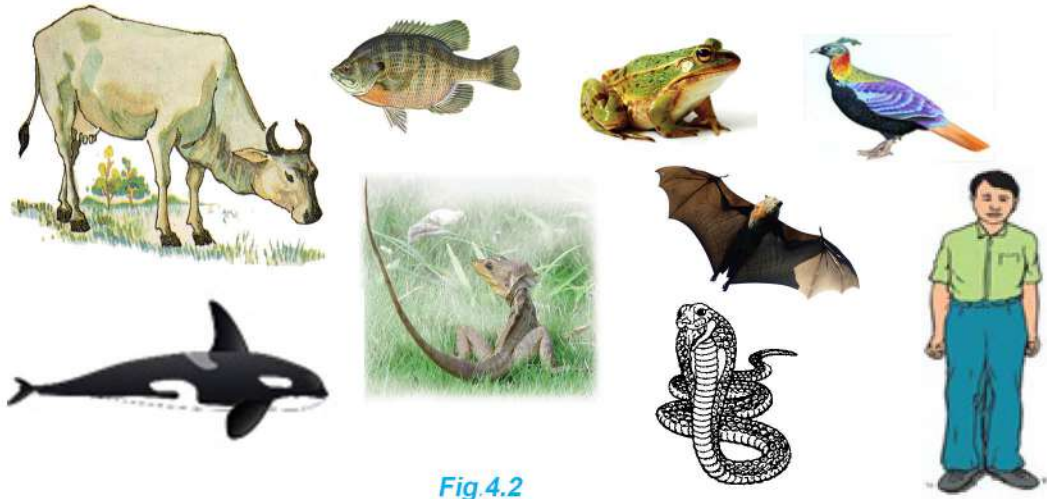


Fig.4.2

- Which of the animals shown in the figure can live only in water?
- Which animals can live both in water and on land?
- Which animal's body is covered with scales and crawls on land?
- Which animal's body is covered with feathers and can fly in the air?
- Which animals give birth to babies which look like themselves and breastfeed them?

A fish is an animal with a backbone that lives in water. The bones of their body are like thorns. Animals that live on both water and land are frogs and toads, while snakes, crocodiles, turtles, etc. are crawling animals. The body of lophophorus (Danphe) and pigeons is covered with feathers. Birds can fly in the air with the help of wings. Cows, goats, and humans live on land and give birth to babies like themselves. All these animals have a backbone in their bodies. Animals with a backbone are called vertebrates. All vertebrate animals do not have the same body structure. Their breathing organs are also different. The process of producing babies is also different. Some make babies by laying eggs while some give birth to babies.

जानी राखौँ :

कत्लै कत्लाले ढाकेको
पखेटा पनि भएको
उड्ने हैन पौडने
के होला त्यो ?

जमिनमा नि बस्छ ।
पानीमा नि बस्छ ।
छालाले पनि सास फेर्छ ।
के होला त्यो ?

काँडा जस्तो कत्ला छ ।
पुच्छर पनि छ ।
घस्री घस्री हिड्छ ।
के होला त्यो ?

प्वाँखै प्वाँखले ढाकेको
पखेटा नि भएको
अन्डा पारी कोरल्ने
के होला त्यो ?

बच्चालाई स्याहाछ ।
दुध पनि चुसाउँछ ।
शरीरभरि रौँ भएको
के होला त्यो ?

Identify the vertebrates that have characteristics like those mentioned in the poem above.

As animals living in water, living both in water and on land, crawling and having rough bodies, having the body covered with feathers and flying, and giving birth to babies and suckling milk, animals with backbones are divided into the following five categories:

1. Pisces



Fig.4.3



Fish breathing through gills

Sea horse

Rohu fish, sea horses, etc. are examples of animals found in this group. The group includes all types of fish. Fish can only live in water. Small and large, all fish belong to the Pisces group.

Activity 4.2

Place a small fish in the water kept in a transparent plastic or glass container. Observe and identify the parts body parts of fish that covers the body, organs on the right and left side of the head, organs that help move the body. Return the fish safely to its habitat after observations. If live fish is not available, then study the fish using a museum specimen or a picture on the internet.

Common characteristics of the Pisces Group

- Most of the fish's body is covered with scales.
- Their bodies are streamlined.
- They swim in water with the help of fins.
- Their heads have gills for breathing.
- They lay eggs in water.

Question to think

- Do whales and dolphins belong to the fish group or not? Why?
- Why do fish have gills for breathing?

2. Amphibians

Let's play a game

All students gather in a circle in an open place. Listen carefully to the instructions of the teacher or the team leader and act accordingly. For example, when you hear the word “water”, shout 'twartwar' like a frog and act like swimming. When you hear the word ‘mud’, move quietly in a circle hopping like a frog. (Students who do not act according to the instructions will move out of the circle. The student who remains in the circle until the end wins.)



frog



webbed feet



toad

Fig.4.4

Frogs and toads are examples of animals belonging to the amphibian group. Animals belonging to this group can live in both water and on land. Animals belonging to this group are called amphibia.

Activity 4.3

Observe the movements of a frog. Do they show the same type of movement in the water and on the land? Which organs help the frog to jump on the ground and which organs help to swim in the water? Discuss with friends.

Common characteristics of the amphibian group

- The skin of animals belonging to the group of amphibians is moist.
- The body has a head, abdomen and two pairs of legs.
- Amphibians use legs for walking, jumping and crawling.
- They lay eggs in water. A tadpole emerges from the egg. They grow in water.
- Amphibians have different breathing organs depending on the

situation. Tadpoles breathe through their gills. Adults breathe through their skin when they are in water and through their lungs when they are on land.

Question to think

Why are not all frogs seen in very cold and very hot seasons?

3. Reptiles



garden lizard



snake

Fig.4.5

Let's talk:

Let's read a conversation between two students of grade five about reptiles.

- Characters : Grade five students (Tara and Chandar)
- Tara : Hey, Chandar, what is that long white object?
- Chander : Which one? Where is it?
- Tara : Over there by that bush.
- Chandar : Oh... That one! That's snakeskin.
- Tara : But the snake does not have legs, how can it walk?
- Chander : Yes, snakes have hard sheet-like scales on the underside of their bodies, and they crawl with their help.

Snakes, lizards, crocodiles, turtles, etc. are examples of animals that belong to the group called reptiles. Animals belonging to this group are mostly found on land. Some reptiles can live in water too.

Common characteristics of reptile group

- (a) The body of the animal belonging to the group of reptiles is covered with dry horny scales.
- (b) The body has a head, neck, abdomen and tail.
- (c) Reptiles have two pairs of legs but snakes have no legs.
- (d) They breathe through the lungs.
- (e) Reptiles lay eggs on land.

4. Aves

Activity 4.4 Search words

Let's find the Nepalinames of 5/5 birds vertically and horizontally from the table below:

मा	टी	को	रे	ची	ल
भ	द्रा	इ	त्र	का	ज्ञ
तो	का	ली	ज	का	ग
प	ठ	डाँ	ले	कु	रु
च	फो	फे	वा	ल	ड
रा	र	हु	टि	दया	उँ

Chicken, pigeons, sparrows, crows, cuckoos, ducks, hawks, ostriches, etc. are examples of animals belonging to the bird group. This group includes different types of birds. Most birds live on land and can fly in the air. Some birds can also live in water. Animals belonging to the bird group are called aves.

Common characteristics of the bird group

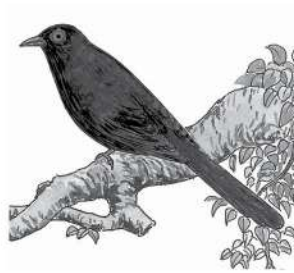


Fig 4.6

- (a) Bird's body is covered with feathers.
- (b) Their body is boat-shaped (streamlined).
- (c) A bird's body consists of a head, neck, beak and tail.
- (d) Birds do not have teeth but have beaks.
- (e) Bird bones are spongy.
- (f) Birds have one pair of legs and one pair of wings. The feet of birds are used for walking, running, and catching prey. Wings are used for flying.
- (g) Birds breathe through their lungs.
- (h) They have air sacs in their bodies.
- (i) Birds lay eggs and hatch babies.

5. Mammals



whale



dog



bat



tiger

Fig.4.7

Activity 4.5

Let's play the animal name-finding game.

Students gather in a circle in an open space. Listen carefully to the instructions of the teacher or the team leader and follow the instructions. To start the game, the first friend says the name of an animal from the letter given by the teacher or the team leader, and the second, third friend tells the name of the animal starting with the letter that follows. The one who cannot name an animal according to the rule will step out of the circle. The one who remains in the circle until the end will be the winner.

Humans, dogs, cows, tigers, elephants, rats, cats, deer, rhinoceros, dolphins, whales and bats are examples of animals belonging to the group of mammals. This group includes various types of animals that give birth and suckle milk. Most mammals live on land. Some mammals can fly in the air and some can live in water.

Common characteristics of the mammal group

- (a) The body of mammals is covered with fur or hair.
- (b) They have a head, neck, body, and two pairs of legs. Most mammals have a tail too.
- (c) Mammals breathe through the lungs.
- (d) Mammals are viviparous, which means they give birth to babies and breastfeed them.

Question to think

Porcupine's body is covered with sharp spines and a pangolin's body is covered with scales. Are these both mammals? Why?

Project work 4.1

Which animals with backbones have you seen in your house and on road, in fields, rivers, ponds, and near the forest? Make a tablelike the one shown below on chart paper. Stick two pictures of animals that belong to each group. Name every animal. Present the chart to the class.

S.N.	Living in water	Living both in water and on land	Crawling	Having feathers on the body	Giving birth to babies
1.					
2.					

Project work 4.2

Which animals with backbones have you seen around the place where you live? Observe some animals and fill in their characteristics in the following table. Find out which group those animals belong to. Fill in the details you have collected on the table in a chart paper and present the table to the class.

S.N.	Animal's name	The body is covered in	Organ for movement	Organ for breathing	Method of reproduction	Group
1.						
2.						
3.						
4.						
5.						

Exercise

1. If the statement given below is correct, put a tick mark (✓) and if it is wrong, put a cross mark (x):

- (a) Fish breathe through gills.
- (b) Animals that live in both water and land are called reptiles.
- (c) Gecko (Wall lizard) breathes through lungs.
- (d) The body of the bird is covered with hair.
- (e) Mammals give birth.

2. Fill in the blanks by choosing the appropriate words in the sentences given below:

breastfeeds fins gills vertebrates crawl swim

- (a) Animals with backbones are called
- (b) Fish swims in water with the help of
- (c) The webbed feet of a frog helps it to
- (d) Snakeon the ground.
- (e) A monkey itsbaby.

3. Match the body covering parts and the animals:

- | | |
|--------------------|----------------|
| A. Soft moist skin | a. Crab |
| B. Scales | b. Frog |
| C. Hair | c. Tortoise |
| D. Dry hard scales | d. Lophophorus |
| E. Feathers | e. Starfish |
| | f. Cat |

- (d) Draw a picture of a fish and a bird showing their main characteristics. Name the parts.
- (e) Most reptiles have two pairs of legs but snakes have no legs. Why is a snake placed in the reptile group?
- (f) Identify the group of animals with the following characteristics:
- i. Laying eggs on land, breathing with lungs, covered with dry hard scales
 - ii. Body covered with hair, give birth to babies, breast-feed
 - iii. Body with scales and fins, breathing with gills
 - iv. Two pairs of legs, soft moist skin, and lungs and skin for respiration
 - v. Boat-shaped body, light bones, breathing with lungs

Word meaning

Adult : fully developed organism

backbone : A large vertical bone extending from the neck to the anus or tail

Parts of a plant and their functions

Let's look at the picture and discuss:

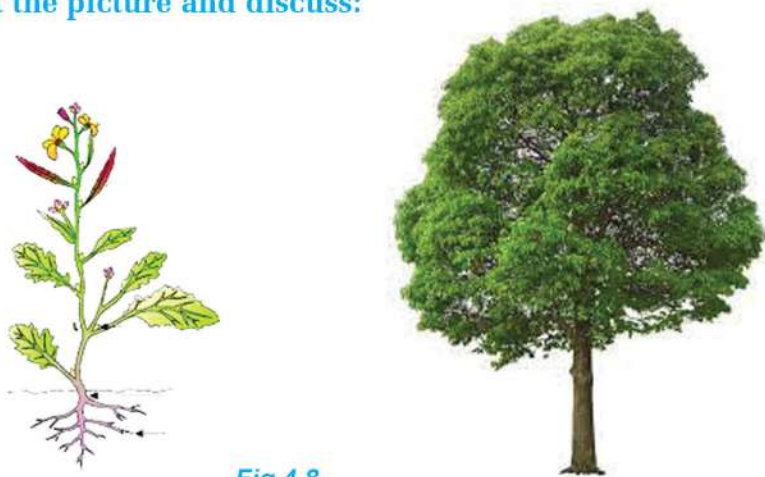


Fig.4.8

- (a) Which part of the plant shown in the figure is under the soil?
(b) Which part of the plant is above the soil?

Activity 4.6

Prepare a list of the vegetables you eat and you find around you. Copy the table below in your exercise book. Put a tick mark (✓) in the appropriate box and present it in the class.

S.N.	Name	Root	Stem	Leaf	Flower	Fruit	Seed
1.	Potato						
2.							
3.							
4.							
5.							
6.							

Different parts of plant

Some part of the plant is under the soil and the rest is above the soil. The part of the plant under the soil is called the root system, while the part above the soil is called the shoot system.

Root system

Activity 4.7

Uproot some plants around your house. Wash the soil on the roots thoroughly. Observe the structure of the roots of each plant and compare them with the roots of plants shown in pictures 'A' and 'B'.

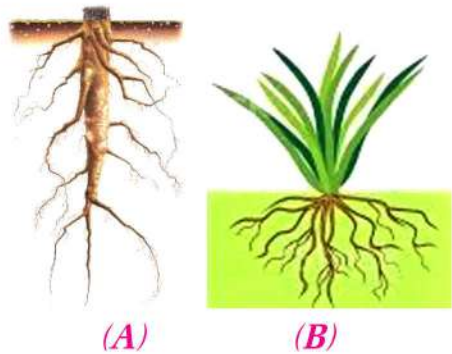


Fig. 4.9

The part of a plant that usually stays under the soil is the root. The roots are white or gray. Roots are mainly of two types:

1. Tap root system

Roots that have the same structure as the roots of a mustard plant have the tap root system. The thick root that goes below the surface of the soil is the taproot. The deeper the root goes, the thinner it becomes. The central part, the main root is called the primary root, while many small roots coming out from the main root are called secondary roots. Other fine roots also emerge from the auxiliary roots. Dicot plants have a tap root.

2. Fibrous root system

Roots that have the same structure as the roots of onion plant have fibrous root systems. In fibrous root system, roots of the same thickness come out from the same place in the lower part of the stem and smaller roots grow out from them. A monocot plant has a fibrous root.

Functions of roots

1. Roots bind soil particles. Therefore, the roots keep the plant fixed in the soil.
2. The roots absorb nutrients from the soil for the plant.
3. The roots of some plants store food.

Project work 8.3

Let's make a herbarium of roots

1. Take roots of monocotyledonous and dicotyledonous plants found around you.
2. Wash the soil on the roots thoroughly.
3. Place it between old books or newspapers and press it with a heavy object for 2/3 days.
4. After 2/3 days, take it out and place it again in another newspaper.
5. Keep repeating this process until the roots are completely dry.
6. Stick the dried roots of monocotyledonous and dicotyledonous plants on A4 size paper or cardboard paper with tape or gum.
7. By the right side of each plant, write its name, type of root, and the place it was collected from.

Shoot system

The parts of the plant above the soil include the stem, branches, leaves, buds, flowers and fruits. The part of the plant other than the root is called the shoot system.

Let's study the pictures and discuss:



mango



wheat



soyabean



money plant

Fig. 4.10

Questions for discussion

- Which of the plants shown in the figure have hard stems and which have soft stems?
- Which of the plants shown in the picture have hollow stems?
- Which plants grow by taking the support of the other plants or objects?

Activity 4.8

Observe any five plants around your home or school. With the help of parents or teachers, break the stems of small plants gently so that the plants are not damaged. Try to find out whether the stems of those plants are hollow or solid. Copy the facts obtained from the observation in the table given below and put a tick mark (✓) in the appropriate box.

S.N.	Name of the plant	Hollow stem	Solid stem	Plant group
1.	Mustard		✓	Dicotyledonous
2.				
3.				
4.				
5.				

The stem is part of the plant that is attached to the root above the ground. The part of the stem near the root is thick and gradually becomes thinner towards the top. The stems of monocotyledonous plants are usually hollow, while the stems of dicotyledonous plants are solid.



The stem of monocot plant



The stem of dicot plant

Fig.4.11

Branches emerge from the stem of the plant. Branches have leaves, buds, flowers, and fruits. Some plants have no branches. The part where a branch or leaf emerges from the stem is called a node and the part between two nodes is called an internode. In monocotyledonous plants, the nodes are distinctly visible, while in dicotyledonous plants they are not so distinct.

Functions of stem

1. The stem helps to hold the parts of the plant like branches, leaves, buds, flowers, and fruits.
2. Water and nutrients absorbed by the roots reach the leaves of the plant through the stem.
3. The food made in the leaves of the plant reaches different parts of the plant through the stem.

leaf

Activity 4.9

Let's look at the pictures and discuss:

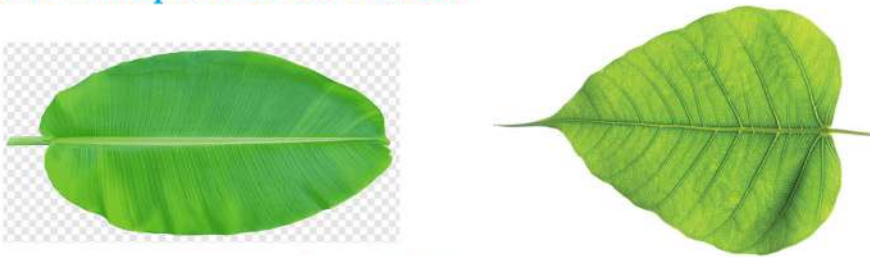


Fig. 4.12 Different leaves

- (a) Are all leaves of the same shape and form?
- (b) What are the general parts of a leaf?
- (c) What does the structure of leaf veins look like?
- (d) What might be the reason for the color of the leaves being green?
- (e) What is the main function of a leaf?
- (f) Which gas do plants take in during respiration?
- (g) Which gas does a plant need to make food?
- (h) How does a plant dispose of excess water?

Activity 4.10

Collect leaves from each different types of plants around your house. In a group, observe the veins of the leaves in class. Compare the leaves of different plants with Figure 4.11 and prepare a list of the leaves of the plants you observed. Copy and complete the table by putting a tick mark (✓) in the appropriate box.

S.N.	Name of the plant	Veins like that of radish leaves	Veins like that of bamboo leaves	Plant group
1.	Maize		✓	Monocotyledonous
2.				
3.				
4.				
5.				

Parts of a leaf

Different plants have different types of leaves. A leaf generally has three parts. They are leaf base, petiole and lamina.

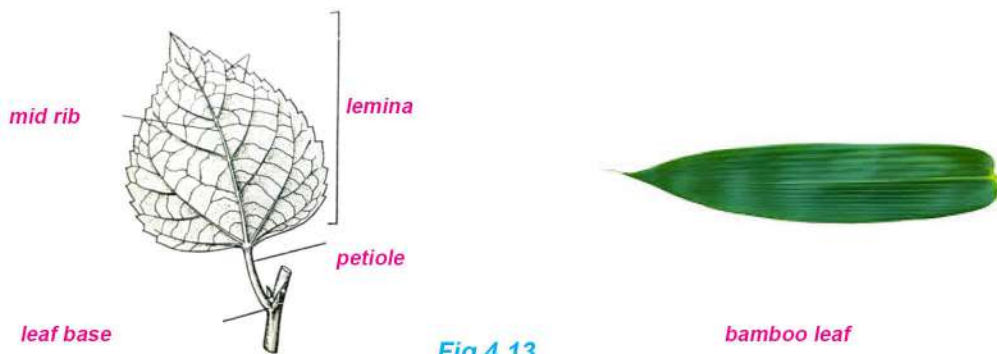


Fig 4.13

Usually, the leaf is attached to the branch or twig. That part is known as the base of the leaf.

The broad part of the leaf is called lamina. The part between the base and the lamina is called petiole. The thick vein running from the petiole to the tip of the lamina is called the midrib. In the leaves of peepal, radish, pumpkin, etc., many small veins emerge from the main vein and spread like a net. In the leaves of maize, banana, bamboo, etc., the veins are parallel to each other. The leaves of plants with chlorophyll are green. Like humans and other animals, plants also take in oxygen gas for respiration and throw out carbon dioxide. To make food, plants take in carbon dioxide gas and throw out oxygen gas.

Functions of leaf

Let's look at the picture and discuss:

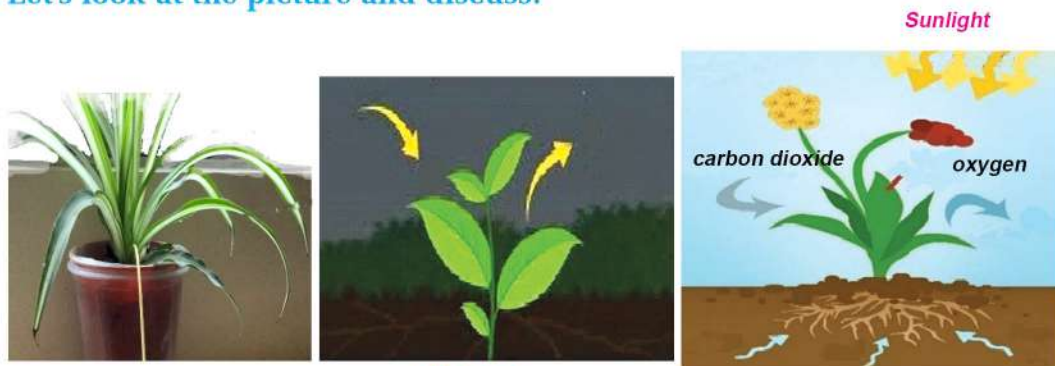


Fig.4.14

Discuss the different functions of the leaf shown in the above picture.

The function of leaves can be mentioned as follows:

1. Green leaves make food for plants.
2. The leaves of plants take in oxygen for respiration and release carbon dioxide.
3. When plants make food, they take in carbon dioxide gas and release oxygen gas.
4. Leaves expel excess water from the plant. This action is called transpiration.

Project work 4.4

Let's make a leaf herbarium:

Collect leaves from monocotyledonous and dicotyledonous plants found around your home. Prepare a leaf herbarium using the herbarium-making steps outlined in Project work 4.3. Display and discuss the herbarium in class.

Fower

Activity 4.11

Let's observe and discuss:



Fig. 4.15

- What differences are there between the structure of flowers shown above?
- Which of the above flowers have you seen?
- What parts do you see in the flower?
- What do you think the flower does for the plant?

Different plants have different types of flowers. A flower generally has four parts: calyx, corolla, androecium and gynoecium.

1. Calyx

The outermost part of the flower is called the calyx. Calyx is made up of small leaf-like sepals. They are green in colour. When the flower is in the bud stage, the sepals protect it by covering it.

2. Corolla

The second part of the flower, which is inside the calyx, is called the corolla. Different types of flowers have corolla made up of petals of different shapes, numbers and colour. Since the corolla is colourful and has fragrant, it attracts humans, birds, butterflies, snakes, etc.

3. Androecium

The third part of the flower, which is found inside the corolla is called androecium. Androecium is the male part of the flower. It is made up of stamens. Androecium has an elongated part with a pouch-like structure on it. The pouches contain a yellow dust-like substance called pollen grains. Pollen helps in pollination.

4. Gynoecium

The part located in the center of the flower inside the androecium is called gynoecium. It is the female part of the flower. The gynoecium is made up of carpels.



Fig.4.16



Fig.4.17



Fig.4.18



Fig.4.19



Fig.4.20

Every gynoecium has a bulging part at the bottom, a tube-like part in the middle and a round part at the top. Fruits and seeds are formed in the swollen part of the fruit. The four parts of the flower are attached to the thalamus. Usually, the gynoecium is attached to the pedicel that lies below it.

Activity 4.12

Go near the flowers of plants in bloom around your home or school. Carefully observe the different parts of the flowers. Complete the table below by putting the tick mark (✓) at the appropriate place.

S.N.	Name of the flower	Calyx	Corolla	Androecium	Gynoecium
1.	Mustard flower	✓	✓	✓	✓
2.					
3.					

Fruit and seed

Activity 4.13

Let's observe the pictures, identify, and discuss:

- Which of the fruits shown in the picture have you seen?
- Which of the fruits shown in the figure has only one seed?



Fig.4.21

- Which of these are monocots and which are dicot fruits?
- What is the function of the fruit in the plant?

A plant produces fruits after flowering. Fruits come in a variety of shapes. There are one or more seeds inside a fruit. Most of the new plants grow from seeds. Based on the cotyledons of seeds, there are two types of plants; monocotyledonous and dicotyledonous.

Monocotyledons and dicotyledons plants

Look at the picture and discuss:



Fig.4.22



Fig. 4.23

Questions for discussion

- Which of the trees shown in the pictures have you seen?
- Are the parts of all the plants same?
- Are all these plants flowering plants?

Activity 4.14

Among the plants shown in Figure 4.12, identify flowering and non-flowering plants.

Nonflowering plants	Flowering plants
Fern	Mustard

Let's read and understand:

Moss, mushrooms and fern are the non-flowering plants, while onions, maize and bananas are the flowering plants. There is also a variety among the flowering plants. They have different types of fruits, flowers, leaves, stems and roots. The seeds inside the fruit are also of different shapes. Plants look different because of their different roots, stems, leaves, flowers, fruits, and seeds. Flowering plants produce fruit from flowers. There are seeds inside the fruit. Based on the type of seed cotyledon, leaf veins, stem structure, and type of roots, the plants are divided into two types - monocotyledonous and dicotyledonous.

Seed



Fig.4.24

Activity 4.15

Objective: Identify monocotyledonous and dicotyledonous by observing the seeds



Fig. 4.25

Materials needed:

Seeds of gram, pea, maize, soya beans, paddy, wheat, mustard, millet, buckwheat, barley, etc., small beaker or any pot, water

Method

Place the available seeds in a container and soak them in water for about 24 hours. Carefully observe the seeds soaked in water. Based on the observation, identify whether the seed cover and the cotyledon have separated or not. Copy the following table and put a tick mark (✓) in the appropriate box.

S.N.	Name of the seed	Seed cover		Cotyledon		Plant group
		Came out	Did not come out	Separated	Did not separate	
1.	Mustard	✓		✓		Dicot
2.						
3.						
4.						
5.						

Conclusion: Monocot seeds have only one cotyledon while dicot seeds have two cotyledons.

Let's read and understand

Some plant seeds have only one cotyledon, for example, rice, wheat, maize, barley, coconut, banana, pineapple, etc. These plants are called monocotyledons.

Some seeds have two cotyledons, such as gram, peas, beans, mustard, etc. These plants are called dicotyledons.

Exercise

- If the statement given below is correct, put a tick mark (✓) and if it is wrong, put a cross mark (x):**
 - The color of the root is white or gray.
 - The part of a leaf between the base and lamina is called petiole.
 - Barley is a monocotyledon plant.
 - The stalk of wheat is solid.
 - The outermost part of the flower is called petal.
- Choose the words given below and fill in the appropriate spaces:**

Hollow dicotyledonous fibrous roots solid stem
reticulate veins parallel veins monocotyledonous
tap root

Part of plant	Monocot plant	Dicot plant
Root		
Stem		
Leaf		
Seed		

- Match the parts of the flowers and their names:**
 - Colorful and attractive part
 - Place where the four parts of the flower are attached
 - Male organ
 - Green part of flower
 - Female organ
 - gynoecium
 - calyx
 - petiole
 - thalamus
 - androecium
 - corolla

4. Write the name of the parts of a leaf by looking at the given picture and the description:



Board part of the leaf

The part of the leaf attached to the stem

The part of the leaf between the base and lamina

A thick vein from the base to the tip of the leaf

5. Choose the correct option for the questions given below:

(a) Which of the following parts make the colourful organ of a flower?

A. sepal

B. petal

C. stamen

D. carpel

(b) Pollen is found in which part of the flower?

A. Calyx

B. Corolla

C. Androecium

D. Gynoecium

(c) How many parts are the flowers usually made up of?

A. 2

B. 4

C. 5

D. 6

(d) Which plants have parallel leaf veins?

A. bean and gram

B. soybeans and maize

C. barley and paddy

D. paddy and gram

6. Look at the given table and answer the questions.

Plant	Root type	Stem type	Leaf vein	Cotyledon
P	Tap	Compact	Parallel	One
Q	Fibrous	Hollow	Parallel	One
R	Tap	Compact	Reticulated	Two
S	Fibrous	Hollow	Reticulated	Two

Which plant is dicotyledonous?

A. P

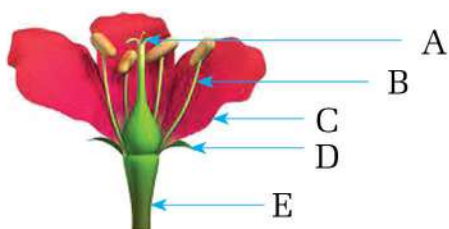
B. Q

C. R

D. S

5. Answer the following questions:

- (a) Sketch fibrous root and tap root and write any two differences between them.
- (b) Why is gram plant called a dicotyledonous plant? Write any two reasons.
- (c) Differentiate between maize and soyabean plants based on roots, leaves, stems and seeds.
- (d) Some parts of sugarcane are shown in the picture. Look at the picture and answer the questions below:
 - (i) Which part of sugarcane is shown in the picture?
 - (ii) Based on the picture, how can monocotyledonous and dicotyledonous plants be distinguished?
 - (iii) Draw a picture of the veins of a sugarcane leaf and mention the nature of the veins.
- (e) Why is leaf called a plant's kitchen?
- (f) Which of the characteristics of the flowers attract insects?
- (g) Can the petals perform photosynthesis? Explain the reason.
- (h) Study the given picture of a flower and write the answers to the following questions.



- (i) Identify the parts 'A' and 'E'.
- (ii) In which process does the yellow powder found in part 'B' participate?
- (iii) What is the benefit of 'C' part of the flower being colourful?
- (iv) What happens if 'B' part of the flower is injured?
- (v) In which condition does 'D' part protect the flower?

5

Life Process

Let's look at the picture and discuss:



Fig. 5.1

- What different things are the animals in the pictures doing?
- Do all animals eat the same kind of food?
- Why do living beings breathe?
- How do plants and animals reproduce?
- How do living beings excrete wastesubstances from their bodies?

Living things need food to survive. Organisms get oxygen through respiration. They obtain energy by breaking down food with the help of oxygen. Likewise, they excrete unnecessary substances from their bodies.

Animals, including humans, excrete waste products such as carbon dioxide, sweat, urine and feces. Similarly, plants excrete carbon dioxide and water vapor as gases. Apart from this, plants also throw out resin, latex, etc. from the leaves, bark and so on. Organisms produce offspring like themselves through reproduction. In this way, the activities like nutrition, respiration, excretion, transportation and reproduction that animals and plants perform continuously for survival are called life processes.

Nutrition in plants and animals

Activity 5.1

Let's look at the pictures and discuss:

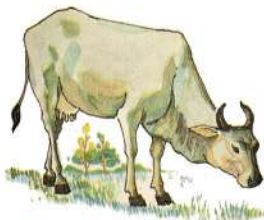


Fig. 5.2

- (a) How do you think the green plants make food?
- (b) Does the mushroom make its own food?
- (c) How do cows and lions obtain their food?

Read the conversation:

Let's read the conversation between teacher Kamala, a fifth-grade student Rama and a fourth-grade student Raghav.)

Raghav : Hey Rama! Why are the leaves of all these plants green?

Rama : The leaves of plants contain chlorophyll. So they are green. Plants can make food with the help of chlorophyll. That is why the leaves of the plant are also called the plant's kitchen.

Rama : Look, Kamalamissis heading this way. Let's wait for her.

Raghav : Okay.

Rama and Raghav : NamaskarMiss.

Kamala : Namaskar ! What are you talking about?

Rama, Raghav : We were discussing how plants make food.

- Rama : Is it only the chlorophyll in the leaves that makes food?
- Kamala : Oh! How inquisitive you are! Let's talk about it on our way to school.
- Rama : Raghav! Do green plants need water and carbon dioxide gas too to make food?
- Raghav : Yes. Is it that if there is no rain, plants cannot make food?
- Kamala : Not really Raghav! Plants' roots can absorb water that is stored in the ground and send it to the leaves through the stem.
- Rama : Miss, how does carbon dioxide gas reach the leaves?
- Kamala : The leaves of the plant have very small pores called stomata. The carbon dioxide gas reaches the leaves through the stomata.
- Rama : Oh ! This way, the green plants make food from carbon dioxide gas and water in the presence of sunlight.
- Kamala : Yes, the process of making food by green plants is called photosynthesis. And, the green plants that can make their food are called autotrophs.
- Raghav : That means, plants like a mushroom cannot make their food! So, how do they survive?
- Rama : Yes. Mushrooms do not have chlorophyll. Plants without chlorophyll cannot make food, isn't it, Miss?
- Kamal : Right. They obtain food from decaying matter.
- Raghav : Even animals like rabbits, goats, humans and tigers cannot make their food! Isn't it?
- Kamala : Yes, Raghav! These organisms directly or indirectly depend on green plants for food.
- Rama : Yes! Herbivores like goats, rabbits, and deer also use plants as food.

- Raghav : Oh, yes! Carnivorous animals like leopards, tigers, lions, and jackals eat goats, rabbits, deer, etc.
- Rama : Similarly, omnivores like humans, crows and cats are also directly or indirectly dependent on green plants.
- Kamala : Plants that do not have green pigment(chlorophyll)and animals that cannot make food in their own body are called heterotrophs.
- Rama : Oh..!. Now I have understood about autotrophs and heterotrophs.
- Raghav : We have reached the school. Thank you sister and teacher for addressing my curiosity.

Let's look at the pictures and discuss:

What does the arrow indicate in the picture?

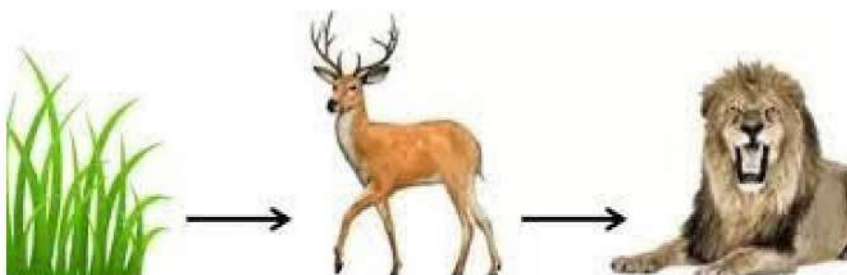


Fig. 5.3

Living things get energy from food. With that energy, various life processes such as nutrition, excretion, respiration, transportation, and reproduction are carried out in the body. It is because of these functions in the body that life is possible. Organisms get energy by eating green plants or animals as a source of food. Herbivores and carnivores get energy by eating autotrophs. In this way, there is a direct or indirect relationship between green plants and animals in the nutritional process of animals.

Respiration in plants and animals

Let's look at the picture and discuss:

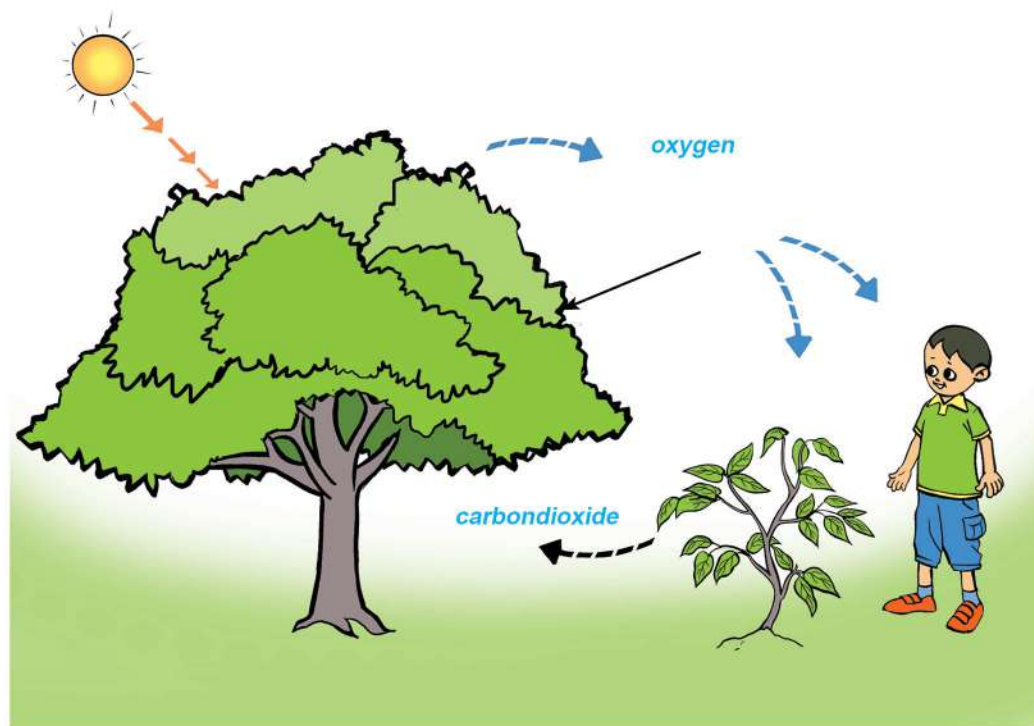


Fig 5.4

- For which process do green plants take in carbon dioxide gas?
- In which process do animals and plants take in oxygen and throw out carbon dioxide?

All living things need oxygen for breathing. All plants and animals use the oxygen present in the air. Fish and aquatic plants use the oxygen dissolved in water. The breathing process supplies oxygen to all parts of an organism's body. Oxygen breaks down the food and produces carbon dioxide, water and energy. The energy produces in the body continuously helps all life processes such as nutrition, excretion, breathing, transportation, reproduction, etc.

Breathing organs of animals

Different animals have different breathing organs. Fish and tadpoles breathe from gills, humans and other evolved organisms breathe from the lungs, insects breathe from the spiracles, and frogs breathe from the skin when they are in the water. The process of taking in oxygen and throwing away carbon dioxide is called breathing. The process of breaking down food elements into carbon dioxide, water and energy in the body of living organisms is called respiration.



Fig.5.5 breathing organs of animals

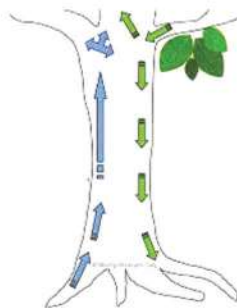
Animals do not need carbon dioxide but plants need it for photosynthesis. So, the carbon dioxide released by all organisms in the process of respiration is reused by green plants for photosynthesis. After photosynthesis, oxygen gas is again released into the air. In this way, the balance of oxygen and carbon dioxide gas is maintained in the environment and the life process of animals and plants continues.

Internal transport in plants and animals

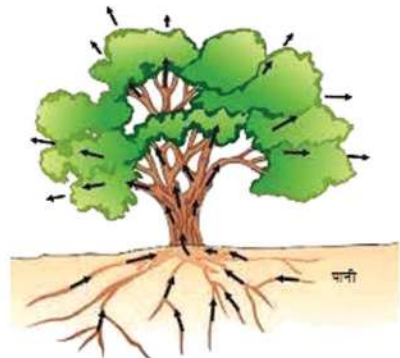
Let's look at the picture and discuss:



Patient having a saline infusion



Plant absorbing nutrients
Fig.5.6



Plant getting rid of excess water

For living organisms to survive, food, water, oxygen and other useful substances have to be transported from one place in the body to another. Nutrients need to be carried to different parts of the body. Likewise, the waste products produced at the different parts of the body have to be transported to the appropriate organs for excretion. In plants, roots absorb water and food from the soil through the stem to the leaves. Similarly, the food produced by the process of photosynthesis in the green leaves again reaches different parts of the plant such as branches, leaves, flowers, fruits and roots through the fine tubes in the stem. In developed animals, the work of transportation is done by blood. In this way, the process of transporting food, water, oxygen, nutrients and harmful waste products inside the body is called internal transportation.

Practical Activity 5.5

Purpose : To demonstrate the transportation of water and minerals through the plant stem

Materials needed: A water glass or beaker, red or blue ink, a white flower with a stem.

Procedure :

Take a glass or a beaker. Fill it half with water. Add a few drops of red ink into the water and stir it. Keep adding ink until the color of the water changes to dark red. Dip the stem of the white flower into the colored water. Place the apparatus in a visible place and leave it for some time. After some time, observe the change in the color of the stem and flower and fill in the given table.

Observation

Time	Change in the colour of the flower
One hour later	
Two hours later	
Three hours later	
Four hours late	



चित्र 5.7

Conclusion:

Substances that are dissolved in water also reach the flower through the stem along with the water.

Excretion in plants and animals



Fig 5.8 Excretion from leaf



Activity 5.6

Early in the morning, observe the plants in the flower pot or kitchen garden or flower garden. Do you notice water drops on the leaves of the plant like the one shown in the above figure? How did the water drops appear on the leaves? Discuss in class.

Activity 5.7

Have you ever noticed animals and plants excreting like that in the pictures below? Make a list and present it to the class.

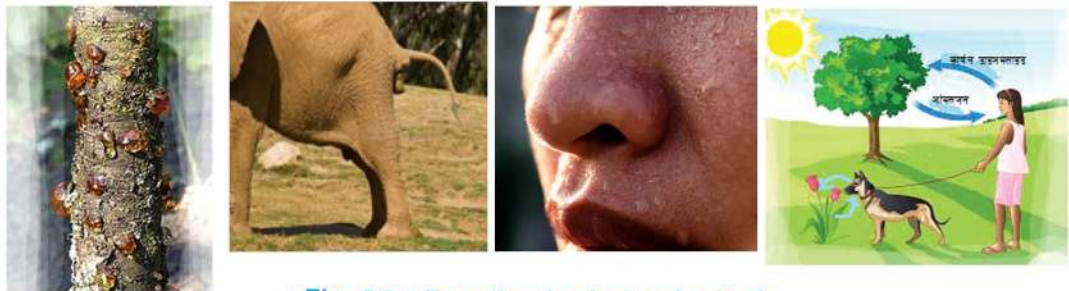


Fig. 5.9 : Excretion in plant and animals

Let's read and understand :

While various life processes take place, unwanted harmful substances are also produced in the body of living organisms. Animals throw out waste products from the body in the form of feces, urine, carbon dioxide, etc. In the case of plants, releasing carbon dioxide gas during respiration, releasing oxygen gas during photosynthesis, loss of excess water from the leaves, and resin and latex discharge from the stem

are some examples of excretion in plants. Excretion is the process by which the body throws out these unnecessary waste products.

Question to think:

What is the cause of sweating in the body in extreme heat?

Activity 5.3

Objective: To demonstrate plant leaves releasing water

Materials needed : A growing potted plant, transparent plastic bag, sellotape

Method : Take a potted plant. Cover the plant well with a transparent thin plastic bag. Tie the mouth of the plastic bag around the stem so that it becomes airtight. Now place the plant in a sunny place and leave it there for two to three hours. Observe the plant after that and fill the table below with the results obtained and their reasons.



Fig. 5.10

Observation table

S.N.	Change	Reason
1.		
2.		

Conclusion

Plants absorb water from the soil through their roots. The water flows to through the stem. Excess water is thrown out into the air in the form of from the small pores called stomata in the leaves. In this way, the process of removing the excess water in the form of vapour through the small pores (stomata) in the leaves is known as transpiration.

Activity 5.8

List the excretory organs and the corresponding waste material of plants and animals in the table below:

Excretory organ of the plant	Waste material	Excretory organ of the animal	Waste material
Leaf	Excess water	Lungs	Carbon dioxide
Stem		Skin	

Question to think

Why do we feel cooler when we sit in a place where there are plants than in a place without plants?

Reproduction in plants and animals

Look at the picture and discuss:

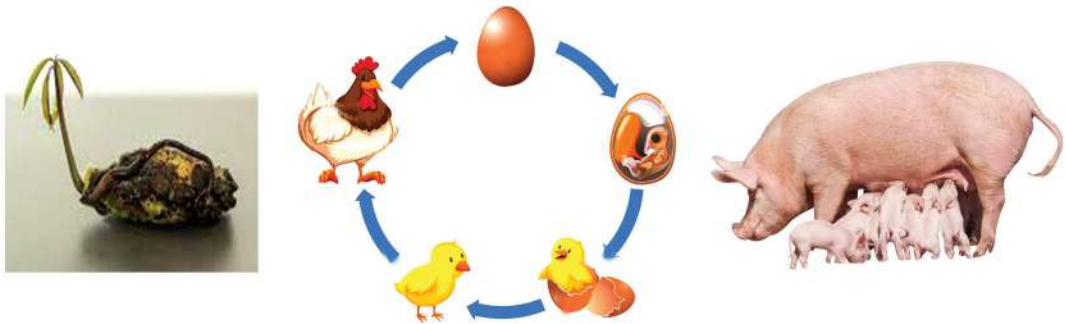


Fig. 5.11 Reproduction in plant and animals

Questions

- Which animals have you seen hatching a baby from an egg and animals giving birth directly, as shown in the picture?
- Have you seen a germinating mango seed?
- Like mango, which other plants grow from seed?
- How does a new plant develop from a mustard seed?
- How do new plants grow from potato, onion, ginger and garlic?

Read and learn:

The mustard plant produces mustard seeds. From that seed, a mustard plant grows again. Oranges grow on orange trees. Similarly, birds, crocodiles, snakes, frogs, fish and insects lay eggs and babies hatch from the eggs. Humans, dogs, cats, mice, and other animals give birth to offspring like themselves. In this way, the act of living organisms producing offspring similar to themselves to maintain their species is called reproduction.

Activity 5.9

How do the following life processes occur in plants and animals? Write the differences in the table given below:

S.N.	Life process	In the plant	In the animal
1.	Nutrition	Green plants make their food	Animals depend on green plants and other animals for food
2.	Respiration		
3.	Excretion		
4.	Transportation		
5.	Reproduction		

Exercise

Exercise

1. If the statement given below is correct, put a tick mark (✓) and if it is wrong, put a cross mark (x):

- (a) In the absence of oxygen, living organisms cannot obtain energy from food.
- (b) During respiration, plants take in carbon dioxide and release oxygen.
- (c) The process by which living organisms produce offspring like themselves is called reproduction.
- (d) Fish takes oxygen dissolved in water.
- (e) Plants discharge resin and latex from the leaves.

2. Fill in the blanks with the appropriate words:

Blood, carbon dioxide, transpiration, oxygen, eggs

- (a) Living organisms take in and release in the process of respiration.
- (b) Animals like fish and frogs reproduce by laying in water
- (c) The process of loss of excess water from plant leaves is called
- (d) Plants take in and release in photosynthesis
- (e) Generally transportation in an animal's body is done by

3. Choose the correct option:

- (a) What do insects breathe through?
 - i. spiracles
 - ii. lungs
 - iii. skin
 - iv. gills

- (b) What is the process of disposing of unwanted substances by living beings called?
- i. respiration
 - ii. photosynthesis
 - iii. reproduction
 - iv. excretion
- (c) Which of the following is an organism that reproduces by giving birth to offspring directly?
- i. bird
 - ii. crocodile
 - iii. snake
 - iv. cat
- (d) Generally, from which part of the plant does the process of transpiration take place?
- i. roots
 - ii. stem
 - iii. leaves
 - iv. flower
- (e) Why do living organisms need oxygen?
- i. to assist in the excretion process
 - ii. to assist in the transportation process
 - iii. to produce offspring
 - iv. to produce energy from food

4. Answer the following questions:

- (a) What is a life process?
- (b) What are the life processes in living organisms?
- (c) What does the plant excrete?
- (d) Can all the plants prepare food by themselves? Give reason.
- (e) Write any two differences between autotrophs and heterotrophs.
- (f) Breathing and respiration are different things. Give your opinion.
- (g) We take medicine when we have headache, stomachache, or something else in our body. Which life process transports medicine from our stomach to the aching part? Explain it.

6

Matter



vinegar



water



stone



nitrogen



oxygen



chocolate



wood



oil



pencil



book



milk



mercuryteeth



comb



cup

Fig. 6.1



juice



cloud

There are many kinds of things around us. Some are found in pure form and some in impure form. When other things are mixed with one type of item, the item becomes impure. Such impure things are called mixtures. Among the various types of objects found around us, objects that have mass and occupy space are called matter. Matter exists in a solid, liquid and gaseous state. Solids, liquids and gases have different physical properties. Heat is needed to change matter from one state to another.

Introduction to matter

Activity 6.1

Place a glass in a water trough and fill the glass to the brim with water. Tie a thread to a small stone and dip it in the water. Did the water spill? Why? Discuss in class.

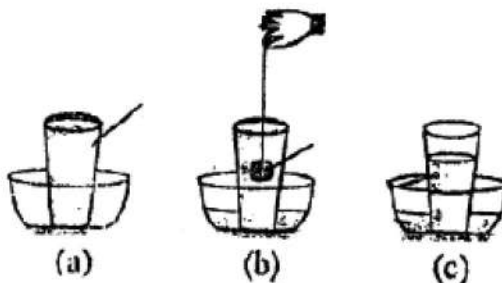


Fig. 6.2

Activity 6.2

Fill a glass to the brim with water. Now add more water. Discuss why the added water spilled.



Fig. 6.3

Activity 6.3

Take a balloon. Fill the balloon with air by blowing with your mouth. Did the balloon change shape? Why does it do so? Discuss in class.

From Activities 6.1, 6.2 and 6.3, we learned that stone, water and air occupy space. What other objects around us take up space? Do all the objects around us take up space? Discuss in class.

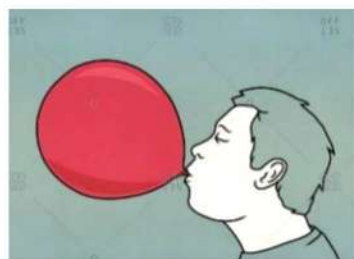


Fig. 6.4

Objects that occupy space also have mass. Thus, any object that has mass and occupies space is called matter. Stone, table, air, water, plants, animals, etc. are examples of matter. Light, heat, sound, shadow, etc. do not occupy space and they do not have mass, so they are not matter.

Activity 6.4

Identify the substances around you and find out their properties with the help of the table below:

Name of the substance	What is its shape?	Can the volume be measured?	Can it be compressed?	Can it flow?
Writing board				

Activity 6.5

Take a beaker, a bottle, a glass and a measuring cylinder. Take water in a beaker. Pour it into the bottle, cup, glass, and measuring cylinder one at a time. Discuss how the shape and volume of the water changed each time.

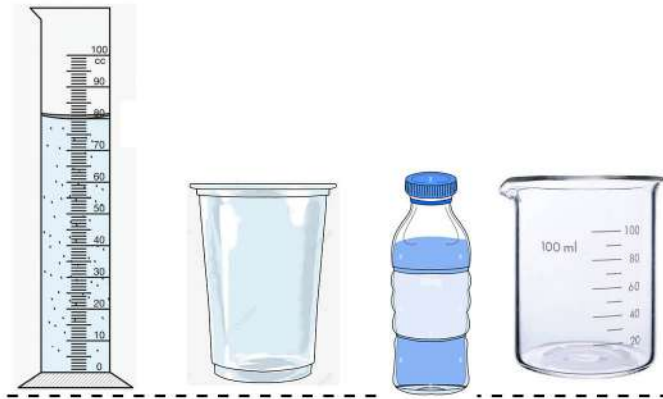


Fig. 6.5

From this experiment, it can be concluded that liquids have fixed but do not have fixed

Activity 6.6.

Take a solid object. Fill a plastic bottle with water. Fill a balloon with air. Now squeeze the solid object, the bottle filled with water and the balloon filled with air one at a time. Which objects could be compressed and their shapes changed by squeezing? Discuss in class.

From this experiment, it can be concluded that and can be compressed but not the

Activity 6.7

Take a book, a glass of water and an incense stick. Now drop the book from the table. Pour the water from the glass into a slant surface. Light the incense. Observe all these activities. Which substance flowed and which substance did not flow? Discuss and draw conclusions.

From these experiments, it can be concluded that do not flow, flows andspreads out.

Activity 6.8

Take equal amounts of ghee, water, glycerin and honey and spread them on the same surface one at a time. Discuss the results of the observation in class. Draw appropriate conclusions.

From this experiment, it can be concluded that different substances have properties.

Activity 6.9

Take a glass of water. Add some alcohol or vinegar to it. Similarly, take water in another vessel and mix a little oil. Discuss the results of the observation in class.

From this experiment, it can be concluded that ability of liquids is different.

Physical properties of solids

1. Solid has a definite shape and volume.
2. They cannot be compressed.
3. They are hard so they do not flow.

Question to think

Sponge or foam is a solid, but it can be compressed, why?

Physical properties of liquids

1. Liquids do not have a fixed shape but have a fixed volume.
2. They cannot be compressed.
3. They flow easily as they are not rigid but the flowing abilities of different liquids can be different.
4. They have different mixing properties.

Question to think

When sand is poured from a height, it flows and takes the same shape as the container it is placed in. Is sand a solid or liquid, why?

Physical properties of gases

1. Gas does not have a definite shape and volume.
2. It can be compressed.
3. It is not hard so it flows easily.

Question to think

When a smelly object or a bottle of perfume is spilled, the whole room will be smelly, why?

Activity 6.10

Based on the above activities related to solids, liquids and gases, list the differences in their physical properties in the table given below:

S.N.	Basis of difference	Solid	Liquid	Gas
1.	Shape			
2.	Volume			
3.	Flowing property			
4.	Mixing property			
5.	Hardness			

Effects of heat on matter

Observe the pictures given below and discuss the following questions:

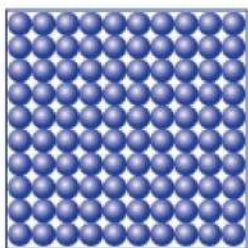


Figure (a)

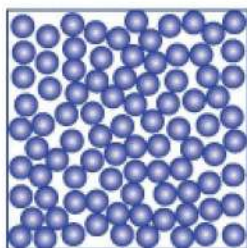


Figure (b)

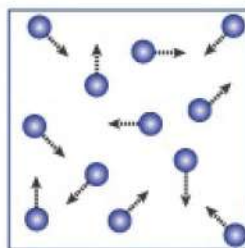


Figure (c)

Fig. 6.6 State of the particles in matter

Questions

- What is the state of particles in figures a, b, and c?
- Among the pictures (a), (b), and (c), which represents a solid, liquid and gas?
- What should be done to convert from the state in figure (a) to the state in figure (b)?
- What should be done to convert from the state in figure (c) to the state in figure (b)?

Matter exists in three states: solid, liquid and gas. Every matter is made up of small particles. The particles of solid matter stick to each other, i.e., the distance between the particles is very small. The force of attraction between these particles is high. Particles of liquids are farther from each other than in solids. Hence, the force of attraction between them is also less than that of a solid. Similarly, the particles of gases are even farther away from each other than solids and liquids. Therefore, the attraction between them is very weak.

Project work

Make a model of the solid, liquid and gaseous state of matter using beans or any small, fine object found at the local level as particles so that the state of matter is clear. Exhibit it to the class.

Activity 6.11

Heat a little bit of water, camphor, wax and ghee separately and then let them cool down. What kind of changes did that work bring? Observe. Discuss the results of the observation in class.

From this experiment, it can be concluded thatcan change the state of matter.

The three states of matter can be changed from one to another. Ice can be changed into water, water into steam, steam into water and water into ice. For this, heat energy is required. They can be changed from one state to another by heating or cooling. When heated, the particles of a solid object begin to vibrate and the attraction between them becomes weakens. Particles then separate from each other and make the solid turn into a liquid state. In this way, when the heat energy is continuously given, the particles reach further and become a gas.

Question to think

Why do we see fog in the winter and get hailstones sometimes when it rains?

Activity 6.12

Take Gravesand's Ring and Ball as shown in the picture. Try to get the ball inside the ring. Observe whether the ball passes through the ring or not. Now, heat the ball for a while using a heat and try to pass it through the ring again. Observe whether the ball enters the ring or not.

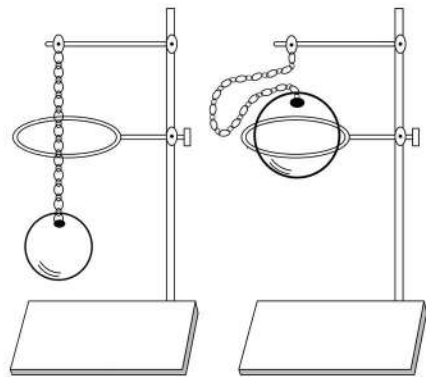


Fig. 6.7

From this experiment, it can be concluded that heat the volume of solid substances.

Activity 6.13

Fill up a round bottom flask with water. Add a few drops of ink into the water to make it colourful. Drill a hole in the cork and insert a capillary tube through it. Plug the flask with the cork such that the capillary tube sinks into the coloured water of the flask. Mark the position of the coloured water in the capillary tube. Now, heat the flask using a suitable heat source. And observe what changes occur in the water level in the capillary tube.

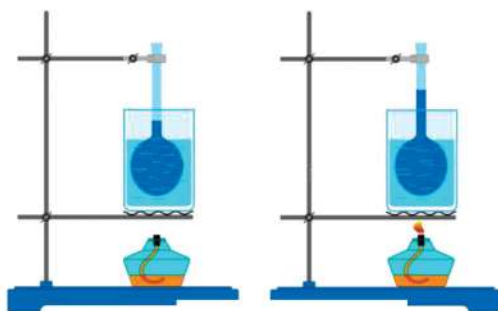


Fig. 6.8

From this experiment, it can be concluded that heat the volume of liquid substances.

Activity 6.14

Take a plastic bottle, a balloon, and a water trough. Fix the mouth of the balloon to the mouth of the bottle so that it does not come out. Now, stand the bottle with the water trough and pour hot water into the trough. Observe how the shape of the balloon changes.



Fig. 6.9

From this experiment, it can be concluded that heat the volume of gaseous substances.

Let's study the event and discuss:

Raveena wished to add some ghee to her food, but she could not open the lid of the jar in which the ghee was kept. Her mother advised her to dip the jar in hot water for a while. Raveena did as she was told by her mother. When she tried to open the lid after a while, it opened easily. Based on this incident, discuss the following questions:

- Why did the jar's lid open easily after it was dipped in hot water?
- Would the lid open if the jar was dipped in cold water instead of hot water, why?

Project work

Find the effects of heat on solids, liquids and gas in our daily life and present it to the class.

Advantages of heat in daily life

The heat helps to perform various tasks in daily life. Human life is impossible without the heat of the sun or other sources. From the time we wake up in the morning until we go to sleep at night, heat is helping people to do various things such as cooking food, drying clothes, drying vegetables and other agricultural products, etc. Apart from this, heat is also being used in industries and factories to produce various goods.

The benefits of effects of heat in daily life can be listed as follows:

1. As heat changes the state of matter, different objects can be melted and given a new shape.
2. As heat reduces the amount of water in the material, food materials are dried for long-term storage.
3. Heat increases the volume of the material and helps to open the tight lids.
4. Heat helps kill harmful germs in milk, water and other food items.
5. Heat helps dry wet clothes.

Project work

Recall other phenomena where heat helps in everyday life, and discuss them in class.

Disadvantages of effects of heat in daily life

In daily life, heat has not only advantages but also disadvantages. When the temperature is too high or too low, humans and other animals have to face various problems. Water pipes bursting in winter, and food getting spoilt quickly in summer are some of the disadvantages caused by heat.

The disadvantages of heat effects in daily life can be listed as follows:

1. Water pipes can burst due to cold in winter.
2. Cold glass may shatter if a hot substance is placed in it.
3. Placing a hot substance in a plastic bottle causes the bottle to shrink.
4. Heat can cause chemical reactions in food and spoil it.
5. Due to heat, electricity and telephone wires can expand and sag due to which various accidents might occur.

Project work

Explore other harmful effects of heat in daily life, and discuss them in class.

Question to think

Why are the bottles containing mineral water or other drinks not fully filled?

Exercise

1. If the statement given below is correct, put a tick mark (✓) and if it is wrong, put a cross mark (x):

- | | |
|---------------------------------------|--------------------------|
| (a) Matter occupies space. | <input type="checkbox"/> |
| (b) A liquid has a definite shape. | <input type="checkbox"/> |
| (c) Gas is a compressible substance. | <input type="checkbox"/> |
| (d) Heat changes the state of matter. | <input type="checkbox"/> |
| (e) Heat is not required to melt ice. | <input type="checkbox"/> |

2. Fill in the blanks in the sentences below by choosing the appropriate word.

gas solid liquid three volume mass

- (a) Matter exists in states.
- (b) Heat changes the of matter.
- (c) Solid and substances cannot be compressed.
- (d) The state of matter having definite shape and volume is the
- (e) Camphor changes to when heated.

3. Choose the correct option for the question given below.

- (a) Which effect of heat allows us to make new plastic products from used plastics?
 - i. the property that heat can change the volume of a substance
 - ii. the property by which heat can change the state of matter
 - iii. the property that heat can change the temperature of a substance
 - iv. the property that heat can change the density of a substance
- (b) In how many states can matter generally exist?
 - i. three ii. four
 - iii. five iv. six
- (c) What would you do if you had to open a tightly sealed glass bottle?
 - i. open it by oiling it
 - ii. open by heating it
 - iii. cutting it open with a sharp object
 - iv. open it by applying excessive force

- (d) Which of the following is a negative effect of heat?
- increase in the volume of a substance due to heat
 - change of state of matter due to heat
 - decomposition of food substances due to heat
 - change in the shape of matter due to heat
- (e) Which of the following substances can flow?
- | | |
|-----------------------|------------------------------|
| A. solids and liquids | B. liquids and gases |
| C. gases and solids | D. solids, liquids and gases |

4. Write the answers to the following questions.

- (a) What is matter?
- (b) Write three differences between solid and liquid.
- (c) Why is air called a gaseous substance?
- (d) Write the reason why heat and light are not considered matter.
- (e) Can the state of the matter be changed? How? Give examples.
- (e) Water turns into steam when it boils. Represent this process in a diagram so that the particles of matter are clear.
- (f) Have you seen used plastic bags being collected? Why are they collected?

Project work

Classify the objects in your kitchen into solid, liquid and gas based on their properties and present your findings to the class.

Mixture

Activity 6.15

Look at the picture of the objects given below and find what they are made up of. Discuss your findings in class.



Fig. 6.10

Some objects around us are made of a single kind of substance where as some are made of two or more substances. Two or more substances that are physically combined are called mixtures, such as tea, milk, soil, air, etc. The items in the mixture are called the components of the mixture, for example, rice pudding is a mixture in which sugar, milk, spices, rice, etc. are mixed. These are the components of rice pudding. Discuss what the other ingredients of the mixture are given above.

Types of mixture

Activity 6.16

Observe the different mixtures in your home or school. Identify the ingredients in that mixture. Write them clearly on chart paper and display it in the classroom.

Based on the state of the components of the mixture, the mixture can be divided into the following forms.

(a) Mixture of solid and solid: Quati (mixture of beans), soil, rice and sand are the example of solid and solid mixture.



Fig. 6.11

(b) Mixture of solid and liquid: A solution of sugar and water, and a solution of sand and water are examples of a mixture of solids and liquids.

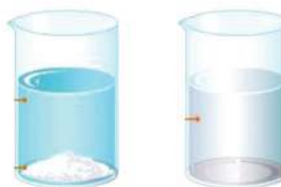


Fig. 6.12

(c) Mixture of liquid and liquid: Alcohol and water solution, milk and water solution, and vinegar and water solution are considered as a mixture of liquid and liquid.



Fig. 6.13

(d) Mixture of liquid and gas : Fog, drinks like soda water, coke, etc. are examples of a mixture of liquid and gas.



Fig. 6.14

(e) Mixture of gas and gas: Air is an example of a mixture of gas and gas.



Fig. 6.15

Activity 6.17

Put water in a glass and mix salt, sugar, alum, vinegar, sand, soil, sawdust, and chalk dust into the water separately. Mark (✓) in the appropriate box in the given table based on your observation.

Mixture	Components are visible to the naked eye.	Components are not visible to the naked eye.
A mixture of salt and water		
A mixture of sugar and water		
A mixture of vinegar and water		
A mixture of alum and water		
A mixture of sand and water		
A mixture of soil and water		
A mixture of straw and water		
A mixture of chalk dust and water		

The components of some mixtures can be seen with the naked eye, while the components of some mixtures cannot be seen with the naked eye. If the components in a mixture are mixed evenly so that the components cannot be seen with the naked eye, then such a mixture is called a homogeneous mixture. A mixture of salt and water, a mixture of sugar and water, a mixture of vinegar and water, a mixture of alum and water, etc. are homogeneous mixtures. If the components in the mixture are not evenly mixed and they can be seen with the naked eye, then such a mixture is called heterogeneous mixture. A mixture of sand and water, a mixture of soil and water, a mixture of sawdust and water, a mixture of chalk dust and water, etc. are heterogeneous mixtures.

Methods of separating mixture

Read the following discussion and discuss:

(Here's a conversation between a grandmother and granddaughter about how to separate a mixture:)

Rima : What are you doing, grandma?

Grandmother : Oh! My dear granddaughter is here! See, the rice has stones and husks mixed with it. So, I am trying to separate them.

Rima : So you are separating the rice from the mixture!

Grandmother : Yes. Everything is a mixture these days. What to do? I bought some mustard seeds recently, and even that had soil and stones mixed with it!

Rima : Oh! And how did you separate them? Soil cannot be picked up with hands like stones.

Grandmother : Yes. I first washed the mustard seed mixture in clean water. The soil dissolved in water. The heavy stones settled at the bottom of the container. I pulled out the floating mustard seeds and dried them in the sun.

Rima : What a clever trick you came up with, Grandma!

Grandmother : Look how muddy the tap water is. I have kept a muslin at the nozzle but it still needs to be filtered. Otherwise, it is not potable.

Rima : Wow! How wise our grandma is!

Grandmother : Experience made me wiser, dear. I learned by doing work like this since childhood.

Rima : Yes, one indeed learns by reading or through experience. How hard you work even at this age, grandma!

Grandmother : What options do I have? See, the work of separating the husk from the paddy and cleaning the vegetables

is yet to be done. The flour is old and has grown worms. That needs to be sieved. Even the bitten rice is to be winnowed for snacks.

Rima : Oh! What a lot of work you have, grandma! Seems like I am distracting you with this talk. Instead, why don't I help you? Can I, grandma?

Grandmother : Yes, sure. Let's work together while we talk.

Questions

- (a) Why should the components of a mixture be separated?
- (b) How did grandmother separate the stones from the rice?
- (c) How did grandmother separate the soil from the mustard seeds?
- (d) How might grandmother clean the vegetables?
- (e) What is used for sieving the flour?

We may not need all the components in the mixture. Therefore, the unnecessary components can be separated by adopting different methods. The method of separating the unnecessary components from the mixture is called the method of separating the mixture. Depending on the properties of the ingredients mixed in the mixture, different mixtures can be separated using different methods, such as: picking by hand, sedimentation and decantation, sieving, winnowing, sieving, etc.

(a) Hand picking

If the unwanted components in the mixture are large enough to be seen with the eyes and picked by hand, then they can be separated by picking them by hand. For example, stones in rice, stones in pulses, weeds in vegetables, etc.



Fig. 6.16

Project work

Take a picture of you helping your mother or father in the kitchen.

separate the unwanted thing from rice, lentils, and other things by picking them with your hands. Send the picture to your teacher by email.

(b) Sedimentation and decantation

If the unwanted component in the mixture is heavier than the necessary component, then the mixture can be separated by mixing it with water, stirring it, letting it sediment and then decanting it. For example, sand and water, soil and sesame, ajwain(jwano), etc.



Fig. 6.17

Experimental activity

Prepare a mixture of sand and water and then separate it by the process of sedimentation and decantation.

(c) Winnowing

If the unwanted ingredients in the mixture are lighter than the essential ingredients, then the mixture can be separated by winnowing. For example, rice and husk, paddy and husk, etc.



Fig. 6.18

Experimental activity

Take rice, husk, dry leaves, and pieces of paper and mix them. Now put those things on a plate or a tray. Now standing on a slightly elevated place in a well-ventilated area or sitting in front of a fan, slowly pour the mixture down. Conclude after observing what happened.



Fig. 6.19

(d) Sieving

If the unnecessary component in the mixture is large and the necessary component is fine, then the mixture can be separated by the method of sieving. For example, flour, etc.

Project work

Before baking roti at home, take a video or a picture of you helping your mother or father with sieving the flour and send it to the teacher by email.

(e) Filtration

If the unwanted substance in the mixture is insoluble in water and the essential substance is soluble in water, such a mixture can be separated by the filtering methods, such as turbid water.

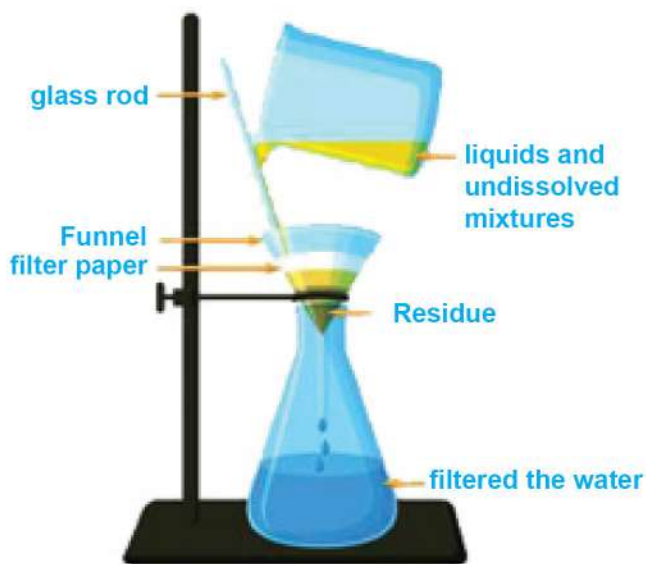


Fig. 6.20

Experimental activity

Collect samples of water from a nearby stream or the tap in school or from the tap at home, and rainwater, if possible. Now go to the science lab and take the funnel, filter paper, beaker, glass rod, stand and clamp, and connect them as shown in the figure. Now filter the collected water samples. Use a separate filter paper for each sample. After filtering all the water samples, observe the filter paper used in each and conclude.

Exercise

1. If the statement given below is correct, put a tick mark (✓) and if it is wrong, put a cross mark (x):

- (a) A new substance made up of two or more physical substances is called a mixture.
- (b) Salt water is a homogenous mixture.
- (c) Coca-Cola is a mixture of liquid and liquid.
- (d) Turbid water can be separated by filtration.
- (e) If stones are mixed with beaten rice, they can be removed by hand.

2. Fill in the blanks in the sentences given below by choosing the appropriate word:

homogeneous component heterogeneous
winnowing filtration

- (a) The substance mixed in a mixture is known as of the mixture.
- (b) If the components of a mixture can be seen with the naked eye, the mixture is called mixture
- (c) Sand and water can be separated by the method of
- (d) To separate the mixture of heavy and light substances method is used.
- (e) Sugar water solution is an example ofmixture.

3. Choose the correct option for the questions given below:

- (a) In which of the following mixtures are all the components solids?
 - i. air
 - ii. turbid water
 - iii. dalmoth
 - iv. rice pudding
- (b) Which of the following mixtures can be seen with the naked eye?
 - i. sugar and water
 - ii. vinegar and water

- iii. soil and water iv. salt and water
- (c) Which method is better to follow before collecting water if you get dirty water in the tap?
- i. sieving ii. filtration
- iii. hand picking iv. winnowing
- (d) Which of the following options would you take to make a homogenous mixture?
- i. husk and sand ii. sand and water
- iii. water and vinegar iv. vinegar and husk
- (e) What kind of mixture is air?
- i. mixture of solid and liquid ii. mixture of liquid and gas
- iii. mixture of gas and solid iv. mixture of gas and gas

4. Write the answers to the following questions:

- (a) What is a mixture?
- (b) Write the difference between a homogeneous mixture and a heterogeneous mixture.
- (c) Why is air called a gas and a mixture of gas?
- (d) As soon as Biju opened the Coca-Cola bottle, fizz came out. Why did this happen?
- (e) Ramila mixed sand in the drinking water by mistake. She was afraid that her mother would scold her. What advice would you give her after reading the method of separating the mixtures?

Project work

Make a list of mixtures you have in your house. Prepare a description of the method of separation of mixtures used in your home in daily life and present it to the class.

7

Energy



Fig.7.1

Humans and other living organisms need different types of energy for survival. For example, light helps us see the objects around us and helps green plants carry out photosynthesis. Similarly, sound energy and electrical energy are also the energies that help us to perform various tasks in our daily life.

7.1 Light

Eyes help us to see things around us easily. But can we see things if we only had eyes? If so, why can't we see in the dark even though we have eyes? It is not only our eyes that help us to see objects around us but also light energy. Our eyes can see the objects around us due to the

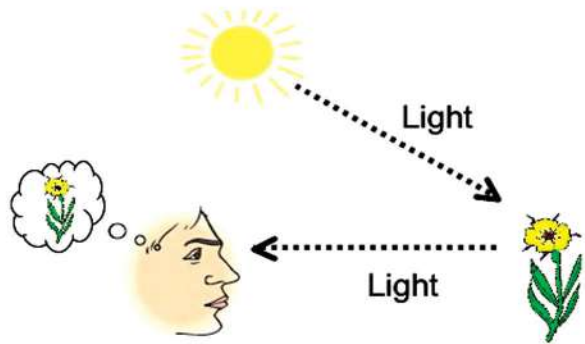


Fig.7.2

light coming from the sun, the light coming from the electric lamp, the light coming from the candle or any burning object. Thus, the energy that helps us to see any object is called light energy.

Sources of light

Read and discuss the given event

On Saturday, Rajan was going to his maternal uncle's home with his mother. On the way, he saw trees, cars, people in the market, dogs, cats, etc. It was night by the time Rajan reached his uncle's house. The electricity went out in his uncle's house. Rajan looked for his uncle but did not see him. He went to his bedroom thinking he would be there. As it was dark, Rajan could not see anything and he fell down.

- Why could not Rajan easily see various objects on the way to his maternal uncle's home?
- Why did Rajan fell down while going to his uncle's bedroom?
- Among the objects given below, which object could have Rajan taken with him so that he would be safe when he went to his uncle's bedroom?



Fig.7.3

We can easily see the surrounding objects in the daytime because of sunlight but cannot see at night or in a dark room due to lack of light. Dark objects can be seen with the help of electric lamps, flashlights, burning splints, candles, and torches. Thus, we need light energy to see any object.

Activity 7.1

What are the sources of light? Fill in the table below:

S.N.	Sources of light
1.	
2.	
3.	
4.	

Objects that give light are called light sources. Light sources can be divided into two types, natural and man-made. Natural sources of light include the sun and stars, while man-made sources of light include electric lamps, flashlights, candles, torches, kerosene lamps, etc.

Luminous and non-luminous objects

Activity 7.2

Group the following objects as the things that give light and those that do not give light and fill in the table.

Burning splint, mirror, candle, torchlight, stick, umbrella, kerosene lamp, table, cupboard, stone, tube light, table lamp, sun, moon, star, earth, glass, book, diamond studded ring, gold bangle

Objects that give light	Objects that do not give light

Objects that have their own light are called luminous objects, for example, sun, stars, and electric lights. Objects without light are called non-luminous objects, for example, sticks, glasses, books, etc.



Fig.7.4

Question to think

Even though the light comes from the moon, it is called a non-luminous object, why?

Transparent, translucent and opaque objects

Activity 7.3

Collect various objects around you, such as water glass, steel cup, book, greased white paper, transparent plastic bag, colored plastic bag, mirror, metal objects, white nylon cloth, black cloth, wood, zinc plate, glass filled with water, glass filled with juice, glass filled with sunflower oil or glass bottle, etc. Hold each one in front of your eyes and see if you can see objects around you clearly or not. After observation, mark the appropriate box in the table below.

S.N.	Names of objects	Clearly visible	Less obvious	Nothing visible
1.				
2.				

Objects that allow light to penetrate easily are called transparent objects, such as glass, water, air, etc. Transparent objects do not cast shadows. A material that allows only a small amount of light to pass through is called a semi-transparent material, for example, greased paper, white plastic, white thin cloth, etc.

A semi-transparent object creates a soft shadow. Objects that do not penetrate light at all are called opaque objects, such as stone, clay, black thick cloth, etc. Opaque objects create dark shadows.

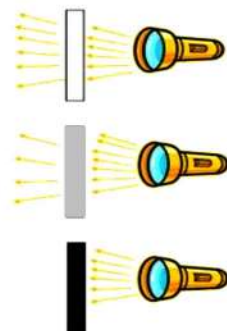


Fig.7.5

Activity 7.4

Based on Activity 7.3, separate transparent, semi-transparent, and opaque objects. Fill in the table below.

S.N.	Transparent	Translucent	Opaque
1.			
2.			

Colour of light

Let's read the poem and discuss

Rainbow

पानी परिसकेपछि घाम लाग्छ जब
सप्तरङ्गी इन्द्रेनी देखापर्छ तब ।

कति राम्रो इन्द्रेनी हेर्न जाउँ न साथी
अर्धचन्द्र घेरा भई आउँछ आकाश माथि ।
रातो, सुन्तला, पहेँलो, हरियो अनि निलो
बैजनी र प्याजी छन् छैन त्यसमा कालो ।

सात रङले सजिएको कति राम्री इन्द्रेनी
रङ नै रङले भरिएको कस्तो तिम्रो जीवनी ।
थोपा थोपा पानीबाट जान्छ प्रकाश जब
सात रङमा छुट्टिन्छ इन्द्रेनी भई तब ।

अचम्मको गुण रैछ सेतो प्रकाश किरण
किन यस्तो हुन्छ होला थाहा भए भनन ।



Fig.7.6

Questions

- When does the rainbow appear?
- What are the colours in the rainbow? Write in order.
- How is sunlight separated into seven colours?
- Is a rainbow visible in the sky at any time, and why?
- Where else can we see white light separating into colours?

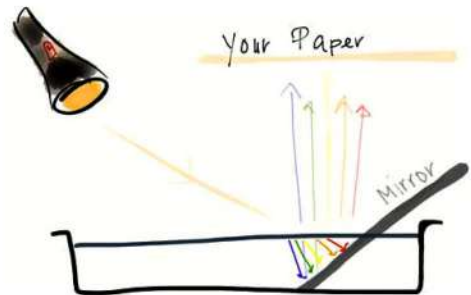
The white rays of the sun that we see are made up of seven different colours. When it passes through a transparent medium other than air, the white ray separates into seven coloured rays. The process of separation of white light into seven colours is called dispersion of light.

Activity 7.4

Put some water in a pan or trough as shown in the picture. Then place a mirror in it by tilting it so that only half of it is immersed in water. Shine a beam of sunlight or a flashlight onto the immersed part of the mirror. Look at the place where the reflected light beam falls. Discuss what was observed after observation.



Fig.7.7



Question to think:

In the sunlight, rainbow-like images appear in soap bubbles. Why does this happen?

Exercise

1. If the statement given below is correct, put a tick mark (☑) and if it is wrong, put a cross mark (☒):

- a) Objects are visible due to light.
- b) The flame of a fire is a nonluminous object.
- c) Air is an opaque substance.
- d) Light can easily penetrate through the stone.
- e) Rainbows can be seen when the sun shines after the rain.

2. Fill in the blanks by choosing the appropriate word.

Nonluminous, man-made, seven, natural, transparent, five

- a) Sun is the source of light.
- b) Wood is a object.
- c) An object that lets the light pass through it easily is called object.
- d) Rainbow hascolours.
- e) Torchlight is asource of light.

3. Choose the correct option for the question given below:

- (a) Which of the given objects is luminous?
 - A. planet
 - B. Sun
 - C. satellite
 - D. Moon
- (b) How many colours are there in a rainbow?
 - A. five
 - B. six
 - C. seven
 - D. eight

- (c) If you wish to plant a plant that needs a lot of sunlight in your room, which of the following window would be suitable?
- A. window with wooden pane B. window with glass pane
C. window with plastic pane D. window with zinc pane
- (d) Your mother complains that she has to face glaring sunrays while riding a scooter on the way to her office and they hurt her eyes. Which of the following advice would you give her?
- A. wear spectacle with transparent lenses
B. wear spectacle with translucent lenses
C. wear spectacle with powerful lenses
D. wear spectacle with opaque lenses
- (e) Why is there light on a cloudy day even if the sun is not visible?
- A. because clouds are transparent
B. because clouds are opaque
C. because clouds are translucent
D. because clouds reflect light

4. Write the answers to the following questions:

- (a) Write the definition of a luminous object with two examples.
- (b) Distinguish between transparent and opaque objects.
- (c) Write two ways to make the transparent glass placed in the window translucent.
- (d) What does rainbow appear only after rain?

- (e) Why is it difficult to drive on the road when there is a thick fog?
- (f) Your little sister wants to see a rainbow on a day when it is not raining. Explain what you would do to satisfy your little sister's curiosity.

Project work

Plant a few corn or barley seeds in a transparent plastic cup and a clay cup. Cover the plastic cup with another transparent plastic cup. Cover the clay cup with another clay cup. Water them every day by opening the upper cup and record the changes you notice. Do this for 10 days. Present the results to your class.

7.2 Sound

Activity 7.5

Observe the pictures and discuss the following questions



Fig.7.8

- What are the instruments shown in the figure related to?
- How is the sound produced by these instruments?
- How does it feel if these instruments are touched while they are producing sound?
- Why does madal sound softer when played gently and louder when played hard?
- What is the difference between the sound of a thick string and a thin string of a guitar?

When a madal is played, the flute is blown and guitar strings are plucked, the sound is produced. When the hand strikes the hide on the madal, it vibrates. In the same way, while blowing the flute and plucking the strings of the guitar, they vibrate and produce sound. The energy generated by the vibration of molecules in any object is called sound. Therefore, to generate sound energy, first, we have to apply energy by hitting, beating, blowing or shaking the sound-generating object.

Activity 7.6

Take a ruler. Place it on the table in such a way that more than half of it is outside the table. Hold firmly the end on the table with one hand and pluck the other end with the thumb of the other hand. What happened and why? Discuss in class.

Activity 7.7

At home, gently beat the plate with a spoon. What type of sound did it produce? How is such sound generated? Think about the possible answer, write down your ideas and share them in class.

Activity 7.8

Feel your throat while speaking. What did you feel? Discuss in class why this happened.

Project work : Making a model of a guitar

Materials Required:

Rectangular cardboard box, cardboard tube, scissors or paper cutter, 2 rubber bands, sellotape

Procedure

1. Cut a circular hole in the center of the wider face of a rectangular cardboard box.
2. Take the duct tube and cut one end as shown in the figure so that the rubber band can be anchored.
3. Insert the duct tube into the box and stick it with a piece of sellotape.
4. Now apply the rubber band as shown in the picture.
5. The guitar is ready. Play it in the classroom.



Fig.7.9

Sources of sound

Among the objects given below, tick the ones that produce sound.



Fig. 7.10

Objects that can produce sound are called sound sources. All things around us that make sound are sources of sound, such as people, birds, animals, television, radio, musical instruments, bells, alarm clocks, etc.

Activity 7.9

Make a list of sources of sound that you have seen and present it to the class.

Propagation of sound

Figure 7.11

How do people hear the sound of a barking dog? Discuss in class.



Fig.7.11

Activity 7.11

Take two paper cups. Make a hole in its back with a needle or a pointed object and connect them with an approximately 2 metre long thread. Now two friends take one cup each and go away until the thread is straight. Then, one person should hold the cup to the ear and the other person should whisper into the cup gently. Discuss the following questions:

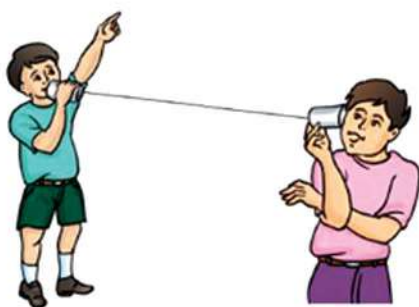


Fig.7.12

- Can you hear your friend whisper?
- Why do you think the whisper made from a distance is audible?
- What might be the effect of making the thread longer and shorter?
- What might be the effect of using a woolen string or a rope instead of the thread?

Activity 7.12

Take a bucket half full of water. Take two spoons inside the water and bang them against each other. Bring your ear close to the water and listen to the sound. Could you hear it? Discuss in class.

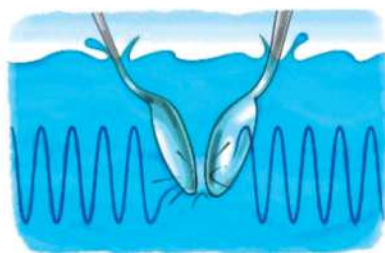


Fig.7.13

A medium is needed for the transmission of sound. Sound cannot be transmitted without a medium. The sound we speak reaches the ears of others through air and the sound is heard. Apart from air, the sound is also transmitted through solid and liquid media. In a vacuum, where there is no medium, sound cannot be transmitted. That is why communication through speech is not possible in a vacuum. When the sound produced by a sound source makes the particles in the medium vibrate, the sound is transmitted through that medium. In activity 7.11, the sound was transmitted through the string, which is a solid medium.

Question to think

- (a) How could the distant voice be heard through the telephone?
- (b) Do you think it is possible to talk in the space as on the earth, why?

Activity 7.13

Take steel glass, earthenware, wooden item, plastic buckets, ceramic bowls and a glass tumbler and arrange them in a row. Strike each one gently with a spoon. Listen to each sound carefully. Now, hit them again but harder. Discuss the findings of the experiment in class.

Activity 7.14

Take a whistle. Blow it gently at first, and then harder. What was the sound like when blowing the whistle gently and while blowing it hard? Discuss.

Sound can be loud, soft, shrill or hoarse. It depends on the force used to generate the sound, the type of object producing the sound, etc. In particular, a shrill sound is generated from metal objects, while wooden and plastic objects produce a hoarse sound. When you speak slowly, a soft sound is produced, while when you shout, a loud sound is produced.

Question to think

Why is the voice of girls shrill while the voice of boys of age is hoarse?

Activity 7.15

Study the picture and discuss:



Fig.7.14

- What kind of environment is shown in the picture?
- How would you feel if you had to live in such a place?
- Why is such an environment created?
- What can be done to solve this?

When there is a loud sound, we often close our ears because such a sound is not pleasant to the ears. Loud sound distracts us. So, if there is noise in the class, we find it difficult to understand the things being taught. It is difficult to communicate in a place where there is a loud sound. If we stay in a noisy place for a long time, the hearing ability of our ears becomes weaker. In addition, loud noise creates mental problems. Loud sound irritates and has a negative impact on blood flow.

Read the poem and discussion

जताततै हल्लै हल्ला

लौ न कसो गरुँ ?

कान खायो, टाउको दुख्यो

म कसरी पढुँ ?

सानो स्वरले बजाउँदा

सुनिन्न र गीत ?

रमाइलो गर्ने तिम्रो

कस्तो हो यो रित ?

हर्न मात्रै बजाएर

पुग्ने हो र घर ?

धैर्य गरी आनन्दले

गाडी हाँक्ने गर ।

कारखाना बनाई दिऔँ

बस्तीभन्दा टाढा ।

शान्त वातावरणसित

बनाऔँ नाता गाढा ।

Questions for discussion

- What happens to us when we stay in a noisy place?
- What is the message of the poem?
- What should be done to develop a peaceful environment?

Excessive noise is harmful to health. So, to avoid unnecessary sound we have to follow sound etiquette, which is listed below:

- a. **Playing radio, television and musical instruments at a low volume.**
- b. **Keeping factories and machines that make loud noise far away from human settlement.**
- c. **Making cinema halls and dance halls soundproof.**
- d. **Not blowing the horn in front of schools and hospitals.**
- e. **Not blowing horns unnecessarily and obeying traffic signs.**

Exercise

1. **If the statement given below is correct, put a tick mark (✓) and if it is wrong, put a cross mark (x):**

- a. Sound is a form of energy.
- b. Sound originates itself from the source of the sound.
- c. A medium is required for the transmission of sound.
- d. The thin strings of the guitar produce a shrill sound.
- e. Noisy factories should be built away from human habitation.

2. **Fill in the blanks in the sentences below with suitable words.**

sharper, good etiquette, vibrate, mental illness, sound, hoarse

- a. Radio is a source of
- b. To produce sound, the object must
- c. must be followed even inside the classroom.
- d. Beating a metal object produces Sound than beating wooden object.
- e. Staying in a noisy place for a long time may cause..... .

3. Choose the correct option for the following questions:

- (a) Which of the following is the source of the sound?
- i. apples
 - ii. flashlight
 - iii. radio
 - iv. book
- (b) Which of the following media is not suitable for the transmission of sound?
- i. air
 - ii. water
 - iii. wood
 - iv. vacuum
- (c) Which of the following actions causes vibration in an object?
- i. beating it
 - ii. keeping in the sun
 - iii. keeping it undisturbed
 - iv. keeping it beside another object
- (d) Which of the following types of sound is harmful to health?
- i. shrill
 - ii. hoarse
 - iii. soft
 - iv. loud
- (e) In the absence of the teacher in the class, someone is drumming the desk and singing a song. Some people are making loud noises. Because of this, students who are trying to read are not able to do so. Which of the following would be the best way to solve this problem?
- i. let it be as it is
 - ii. expulsion of the rowdy student from the class
 - iii. to inform the principal about it
 - iv. follow good behavior to avoid unnecessary noise in the class

4. Write the answers to the following questions:

- a. What is sound?
- b. How does sound originate from the source of the sound?
- c. Why does the drum make a soft sound when it is struck slowly and a loud sound when it is struck hard?
- d. What are the sources of noise around your house? Prepare a list.
- e. There has been a traffic jam on the road outside the hospital for a long time. Everyone is in a hurry, so everyone is honking loudly. Write down the solutions to the problem that occurs in such a situation.

Project work

- a. Inquire about the causes of loud and noisy sounds around your school and make a list. Also, find out what could be done to control it. Present your finding to the class.
- b. There is a factory near your school that uses very loud machines. This has caused problems in teaching and learning activities in schools. People are organizing a peaceful protest rally to solve this problem. Design necessary placards or pamphlets for this.

7.3 Electricity

Electric circuit

Read the poem and discuss the questions that follow:

Torchlight

अँध्यारामा ज्योति दिन्छु
टर्चलाइट हो नाम
स्विच ट्याक्क पारेपछि
बले मेरो काम ।

बाहिरवाट हेर्दाखेरि
बत्ती मात्रै देख्छौं
भिन्न खोली हेर्नो भने
व्याट्री पनि पाउँछौं ।

स्विच अन गर्ना साथै
बत्ती बल्छ जब
सुचालकको बाटो हुँदै
विद्युत् बग्छ तब ।

व्याट्रीले विद्युत् दिन्छ
सुचालकले बाटो
बाले निम्ने बेलामा
स्विचको हो पालो ।

सबै मिली टर्चभिन्न
एउटा पथ बन्छ
विद्युतीय भाषामा यसलाई
परिपथ भन्छ ।

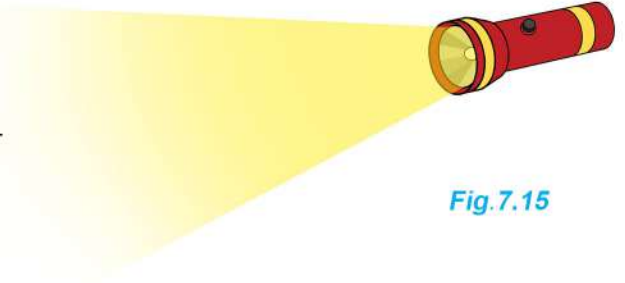


Fig.7.15

Questions

- (a) What is needed to light a torchlight?
- (b) Where is the battery in the torchlight?
- (e) What are the functions of the battery, switch and conductor?
- (e) What is an electric circuit?

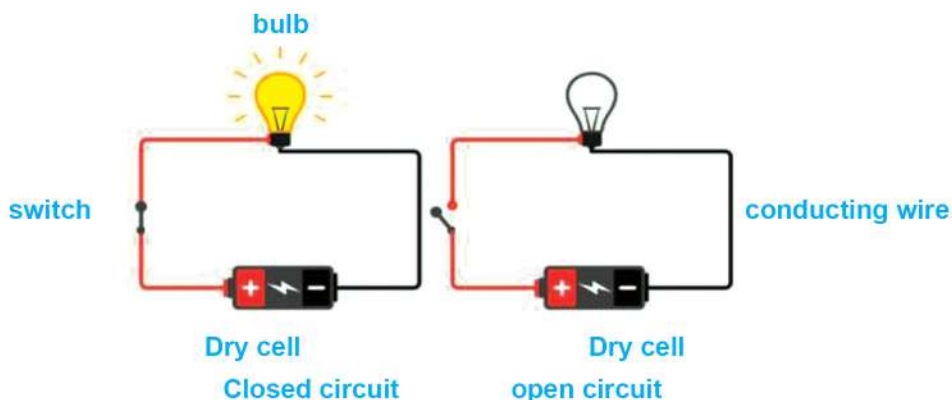


Fig.7.16

You must have seen an electric lamp at home or school or other electrical instruments running instantly when the switch is turned on. Any electrical device needs electricity to run. Electricity flows through conducting wires. The function of the switch is to allow or stop the flow of electricity as needed. In this way, the device that consumes electricity, the source of electricity, the conducting wires, and the switch form a path which is called an electric circuit. An electric circuit that is switched on has current flowing on it, and it is known as a closed circuit. When the switch is switched off current does not flow, and the circuit is known as an open circuit.

Activity 7.16

Take a small torchlight bulb or a LED, conductive wires, a safety pin or hook, and a dry cell. Connect one end of the conducting wire to the positive terminal of the cell and the other end to one of the terminals of the light bulb or the LED. Take another conducting wire and connect one end to the negative terminal of the dry cell and the other end to the

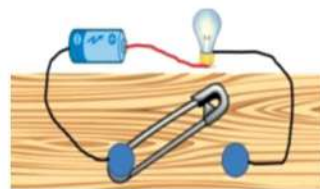


Fig.7.17

other terminal of the light bulb. Attach a safety pin to one end of a conductive wire as shown in the figure to use it as a switch. Now to use the safety pin as a switch, try connecting and disconnecting it with a conductive wire, and observe what happens. What did you observe? Why did this happen? Discuss the findings in class. Inquire what else can be used in place of the safety pin.

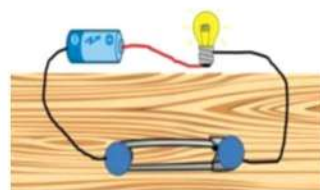


Fig.7.18

Safety measures to be followed while using electricity

Let's study the given pictures and discuss the do's and don'ts:

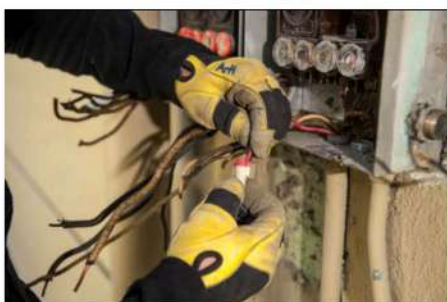


Fig.7.19

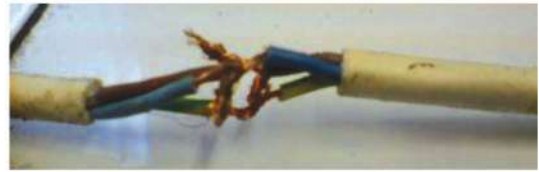


Fig.7.20

Electricity is very important in our daily life. But if not used carefully, electricity can cause life-threatening accidents. So, while using electricity we have to follow these safety measures:

- a. Do not insert fingers into the plugs and sockets.
- b. Bare wire should be covered with tape or some conductor.
- c. Rubber gloves should be worn while doing electrical work.
- d. If anything related to electricity breaks down, call the concerned person to repair it.
- e. Do not operate electronic equipment without the permission or supervision of a senior.
- f. In case of a power cut, lightning, and fire, the main switch should be turned off.

Exercise

1. If the statement given below is correct, put a tick mark (✓) and if it is wrong, put a cross mark (x):

- (a) Nothing happens if electrical equipment is touched with wet hands.
- (b) A conducting wire is a source of electricity.
- (c) The function of the switch is to turn the light on and off.
- (d) Current flows in an open circuit.
- (e) We should not put our finger in the electric socket.

2. Fill in the blanks of the sentences with suitable words:

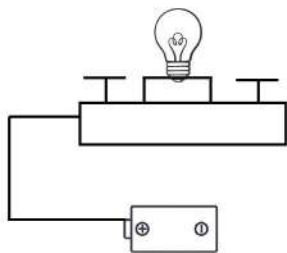
Insulator, electrical equipment, electrical circuit,
on, electricity, off

- a. Dry cell is a source of
- b. A path consisting of a source of electricity, conductors, switches, and electrical equipment is called
- c. If bare wire is seen, it should be covered with
- d. Switch isin the closed circuit.
- e. Small children should not play with

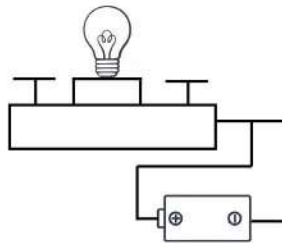
3. Choose the correct option for the questions below:

- a) A lamp placed in an electric circuit does not light. Which of the following could be the reason?
 - i. switch is off
 - ii. the circuit is complete
 - iii. new battery has been used
 - iv. switch is on
- (b) What is the function of a conducting wire in an electric circuit?
 - i. to turn the lamp on or off
 - ii. to pass electricity
 - iii. to reduce the amount of electricity
 - iv. to fix everything

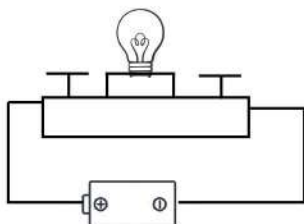
- (c) If an electric bulb does not light, what should be done?
- take out the bulb and inspect it
 - switch it on and off
 - take the help of a knowledgeable person
 - test with a tester
- (d) Without which of the following materials is an electrical circuit incomplete?
- battery
 - switch
 - conducting wire
 - safety pin
- (e) Which of the following events would you stop doing if you see them?
- father ironing the clothes
 - mother pulling out the plug of the television
 - little brother putting an electric wire in his mouth
 - Big brother changing a burnt light bulb
- (f) In which of the following figures does the bulb light up?



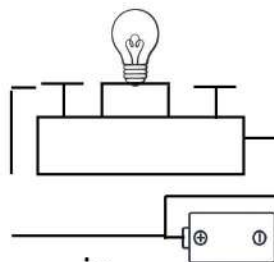
i.



ii.



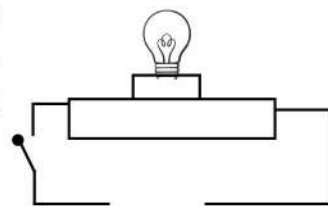
iii.



iv.

4. Write the answers to the following questions:

- a. Write the definition of an electric circuit.
- b. Write two differences between closed circuit and open circuit.
- c. Write two precautions to be taken while using electricity.
- d. Write a reason why a light bulb connected to a circuit that has a switch in the off position does not light.
- e. What is required to complete an electric circuit?
- f. What must be done to light the bulb in the circuit diagram given below? Copy and complete the circuit diagram.



Project work

With the help of your teacher or an elder sibling, open a common electrical device such as a torchlight, a remote control, a watch with a battery, etc., and study its structure. Discuss the obtained information in the classroom.

8

The Earth and Space

All that is visible from the earth we live is the sky. Sun, moon, planets, and stars are all in the sky. There are uncountable small and large bodies in the sky. All these bodies are called heavenly bodies. Objects that are close to the Earth appear large and objects that are far appear small. Some of these have their own light, while others are illuminated by the light of others. Some are movable and some are stationary. Based on these properties, heavenly bodies are classified into planets, stars, satellites, comets, asteroids, etc. The Earth we live on is also a heavenly body. So far, the Earth is the only celestial or heavenly body that is believed to have a suitable environment including air, water and temperature for living organisms. Many years ago the Earth was believed to be the center of all the celestial bodies and it was believed to be fixed. The research, studies and investigations of scientists revealed the fact that the Earth revolves around the sun. Just like the houses in motion when viewed from a moving car, the sun appears to rotate when viewed from the rotating Earth.



Fig. 8.1



Fig. 8.2

The celestial body that appears in different shapes and at different times at night is the moon. As the Earth revolves around the sun, the moon revolves around the Earth. Since the moon shines due to the light of the sun, we do not receive heat and light from it. The time of rising and setting of the moon is different every day.

Heavenly bodies

What types of heavenly bodies can be seen in the open sky? Why are celestial bodies seen at night but not during the day? Discuss.

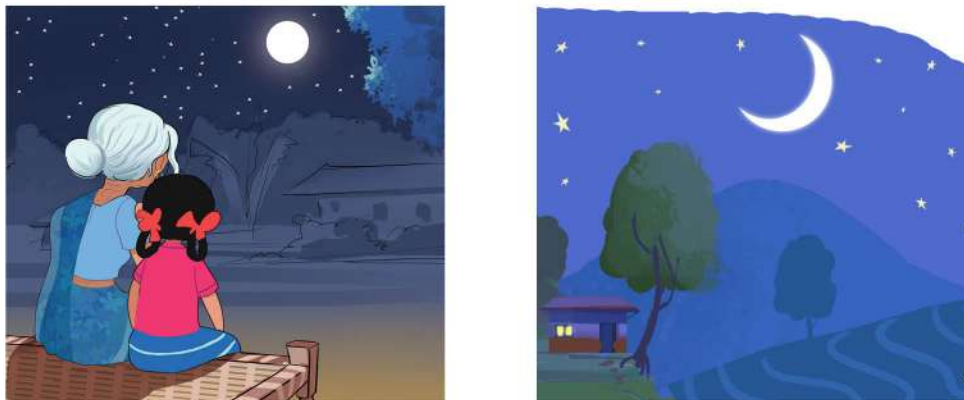


Fig. 8.3

Activity 8.1

Which heavenly bodies are visible at night and day when the sky is clear? Observe and fill in the given table.

Heavenly bodies visible during the day	Heavenly bodies visible at night

The bodies in the sky like the sun, moon, planets, baby planets, comets, meteors, meteorites, stars, etc. are heavenly bodies.

Activity 8.2

Observe the heavenly bodies that are visible when the sky is clear. Write their names if you know them. If you do not know their names, find out by consulting your parents, teachers, the internet, etc. Fill in the given table with the characteristics of those heavenly objects and discuss them in class.

Name of a heavenly body	Movable or stationary	With or without its light

Do you know?

Sunday is named after the sun. All seven days are named after celestial bodies.

Celestial bodies that are fixed in the sky and shine with their light are stars. They can be seen in countless numbers in the sky. They have very large mass and volume. Even the Sun is a medium size star. It is bigger and brighter than the others because it is closer to us.



Fig. 8.4

The sky is an area that extends to infinity. Many celestial bodies that do not have their light are orbiting the sun. The celestial bodies that circle the sun in a fixed path or orbit are called planets. Eight planets are orbiting the sun. Earth is one of them.

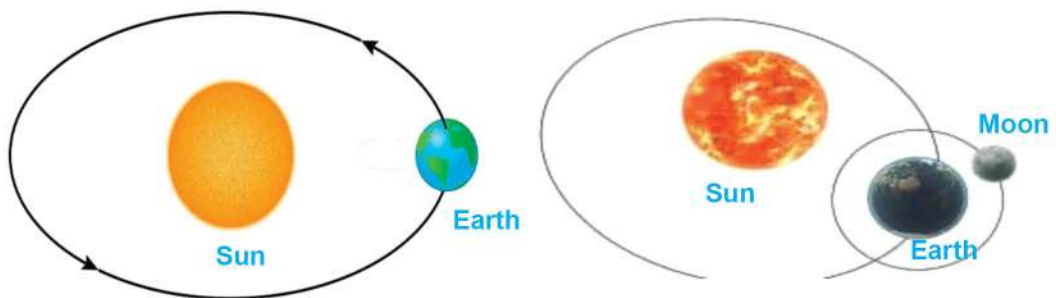


Fig. 8.5

Some planets have smaller objects orbiting them. Such celestial objects that orbit the planets are called satellites. Just like the planets, satellites also have fixed paths. Moon is the only satellite of the Earth.

With the sun at the center, the group of celestial bodies made up of the planets and satellites orbiting the sun is called the solar system.



Fig.8.6

The names of the eight planets in the solar system, in the order of increasing distance from the sun, along with the number of their satellites are as follows:

S.N.	Name of the planet	Number of satellites
1.	mercury	0
2.	venus	0
3.	earth	1
4.	mars	2
5.	jupiter	67
6.	saturn	62
7.	uranus	27
8.	neptune	14

The time taken by the Earth to revolve around the Sun once is called 1 year and it is equal to 365 days. Likewise, the time taken by the Moon to go around the Earth once is called a month. It is approximately 30 days.

Project work

1. Using thread, gum, cotton, etc. on chart paper, make a picture showing the Earth revolving around the Sun and the moon revolving around the Earth. Display the chart in the classroom and discuss it.
2. Take a chart paper. Draw a picture like the solar system above with the sun in the center and the other planets orbiting around it. Using wet paper or clay, make hemispheres of suitable sizes to represent the sun and planets. Apply a suitable colour on them as well. Now paste these hemispheres on the picture with the help of superglue and wire. Display the solar system model prepared in this way in the school laboratory or classroom.
3. With the help of a teacher or parent, open any browser on a computer in the school computer lab or on a mobile phone or computer at home. Search for animated videos of the solar system by typing it in the search box. Open the video and observe the planets orbiting the sun. Based on this, note down the main points learned and share the experience in the class.

Exercise

1. If the statement given below is correct, put a tick mark (✓) and if it is wrong, put a cross mark (x):

- (a) Sun is a moving celestial body.
- (b) There are countless stars in the sky.
- (c) Stars shine by their light.
- (d) Stars revolve around the sun.
- (e) Earth is a member of the solar family.

2. Fill in the blanks with the appropriate word:

Star Moon Sun satellite planet Earth

- (a) Planets revolve around the
- (b) Celestial bodies orbiting the planets are called
- (c) Sun is a medium size
- (d) The moon spends a month going around the
- (e) is the Earth's only satellite.

4. Match the planets and their number of satellites

Planet	Number of satellites
Mars	0
Saturn	1
Venus	2
Jupiter	62
Earth	14
	67

4. Choose the most appropriate option from the given ones:

- (a) What is the celestial body that orbits the planet called?
- i. star
 - ii. satellite
 - iii. dwarf planets
 - iv. sun
- (b) Which of the following is an example of a star?
- i. Venus
 - ii. Jupiter
 - iii. Moon
 - iv. sun
- (c) What is 24 hours?
- i. time taken by the Moon to complete one revolution in its orbit
 - ii. time taken by the Earth to complete one rotation on its axis
 - iii. time taken by the Moon to make one revolution on its axis
 - iv. time taken by the Earth to make one rotation in its orbit
- (d) Which of the following statements is correct?
- i. The moon makes one orbit around the earth in a year.
 - ii. The moon makes one revolution of the sun in a year.
 - iii. The Earth makes one orbit around the Sun in a year.
 - iv. Earth takes one year to rotate on its axis.

5. Write the answers to the questions given below:

- a) Give examples of celestial bodies.
- b) Write any two differences between stars and planets.
- c) Draw a neat picture of the Earth revolving around the Sun and the Moon revolving around the Earth. Name them.
- d) Out of the eight planets, what is the reason why only the Earth has living things?
- e) Are there planets and satellites of other stars like the solar system? Ask and write.

Motion of the earth

Earth is a moving celestial body. It revolves around the sun in a fixed orbit with the sun as its center. In the same way, the Earth also rotates on its axis.

Rotation of the earth

Activity 8.3

Take a globe. Find the east, west, north and south directions of the globe. Light a candle or electric bulb at one end of the classroom as the sun. Close the windows and doors of the room to prevent outside light from entering. Slightly rotate the globe in front of the lamp in an anticlockwise direction like a fan or a grinding stone. Observe the difference between the part of the globe facing the candle or bulb and the part on the opposite side. Based on this, discuss the reason why we have days and nights. Present the conclusion to the class.

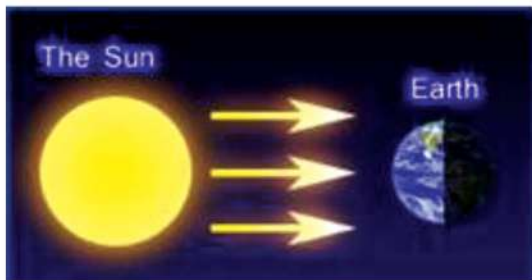


Fig.8.7

The Earth rotates continuously on its axis from west to east like a grinding stone. Such movement is called the rotation of the Earth. While rotating in this way, half of the Earth receives sunlight, and the other half does not. It is day in the sunlit part and night in the unlit part.

Do you know?

How long is a day? Now, guess how much time it takes for the Earth to spin once on its axis?

In the picture, a rod is placed in the middle of the globe so that it rotates around it continuously. This is the axis of the globe. Like the globe shown in the picture, the Earth's axis is also not vertical but inclined at an angle of 66.5° with the orbital plane.



Fig. 8.8

One day (24 hours) is the time it takes for the Earth to make one round on its axis. This movement of the Earth is called daily rotation. It is also called the daily motion of the Earth. For this reason, there is day and night on Earth. The time of day and night is different in different countries, for example, 3 PM in Nepal is 6:15 PM in Japan.

Activity 8.4

As in Activity 8.3, shine the light on a globe. Find the location of Nepal on the globe and mark it. Now, when the globe is rotated, find out under which conditions the following time occurs in Nepal.

- (a) dusk (b) midnight (c) sunrise in the morning (d) midday

Similarly, when evening falls in Nepal, in which part of the earth is it morning? Observe in turn.

Revolution of the Earth

Activity 8.5

Light the lamp in a dark room. Mark an elliptical orbit of the Earth around the lamp (as the sun) as shown in the given figure. Rotate the globe around the lamp (counter-clockwise) as the Earth. In this process, tilt the globe 66.5° with the orbital plane and rotate the globe around the lamp in the orbit. While rotating the globe, was the light falling on the globe uniformly? Observe and note your observations in the table given below.

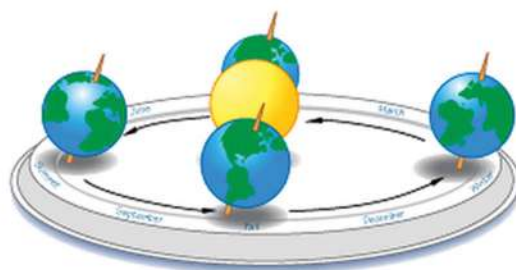


Fig. 8.9

Globe's position	Time of presence of light	
	Northward (more or less or equal)	Southward (more or less or equal)
1.		
2.		
3.		
4.		

What will be the effect of the sunlight falling more, less or equally on different places of the Earth? Discuss in class.

The movement of the Earth in a fixed orbit around the sun is called the revolution of the Earth or annual motion.

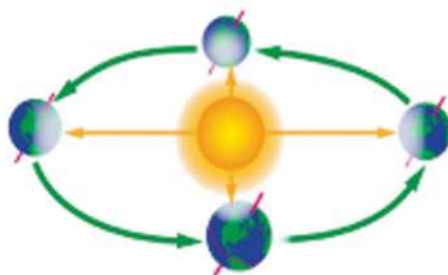


Fig.8.10

Do you know?

In the North Pole and South Pole of the Earth, there is a day for about 6 months and a night for the remaining 6 months. What may be the reason behind this?

As the Earth orbits the sun in a fixed orbit and rotates on its axis, the sunlight does not fall equally on all parts of the Earth forever. This is the reason why there is a variation in the length of day and night, change of seasons, etc.

Project work

As in Activity 8.5, moving the globe around the lamp, identify the countries where it is summer when it is winter in Nepal. Also, based on the activity, identify and make a list of the countries where it is hotter and where it is colder.

Exercise

1. If the statement given below is correct, put a tick mark (✓) and if it is wrong, put a cross mark (x):

- (a) Day and night occur because of the rotation of the Earth.
- (b) It takes 365 days for the earth to make one rotation on its axis.
- (c) Earth rotates clockwise on its axis.
- (d) Due to the rotation of the Earth, the time varies from place to place.
- (e) The seasons change when to the distance of the Earth from the sun changes.

2. Fill in the blanks with suitable words:

Faster 66.5° axis orbit equal slow 23.5

- (a) An imaginary line connecting the north and south poles through the center of the Earth is called
- (b) Earth is tilted at an angle in its orbital plane.
- (c) During the rotation of the Earth, if the light of the sun falls uniformly on all sides, the day and are
- (d) On the Earth, time in the east is than that on the west.

3. Select the best option from the given ones:

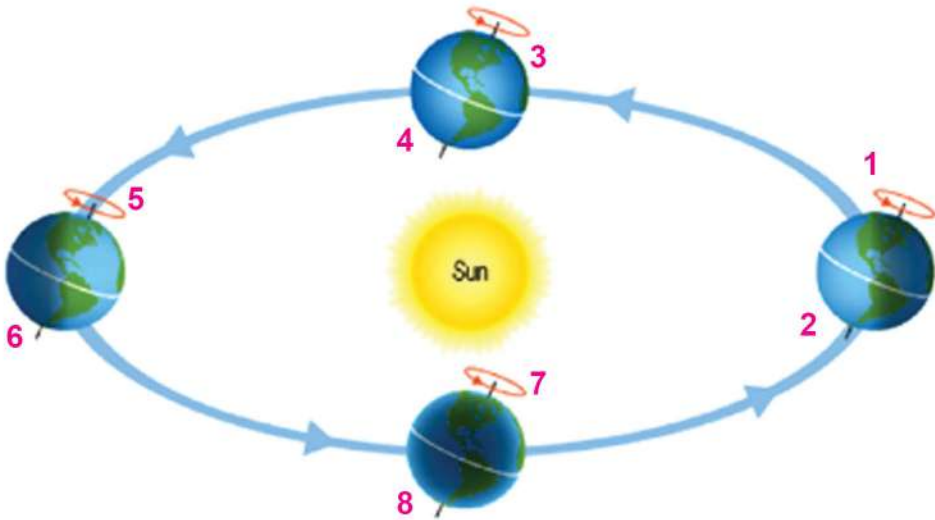
- (a) How long does it take the Earth to complete one revolution in its orbit?
 - i. one year
 - ii. one month
 - iii. one week
 - iv. one day
- (b) What is the reason for the change of seasons on Earth?
 - i. Changing of the distance between the Sun and the Earth

- ii. Earth rotating and revolving with a tilt of 66.5 degrees in its orbital plane
 - iii. Changing of the distance between the moon and the Earth
 - iv. Earth rotates in its orbit sometimes slowly and sometimes quickly
- (c) Which of the following causes day and night on the Earth?
- i. Sun rotating on its axis
 - ii. Earth rotating on its axis
 - iii. Earth revolving around the Sun
 - iv. Moon revolving around the Earth
- (d) Which of the following causes the sun to set?
- i. increase in the distance between the Sun and the Earth
 - ii. rotation of the Earth on its axis
 - iii. revolution of the Earth around the Sun
 - iv. excessive tilt of the Earth's axis

4. Answer the following questions:

- (a) Write any three differences between Earth's daily motion and annual motion.
- (b) Mention any two effects of the rotation of the Earth.
- (c) What would have been the effect if the Earth's axis were to be perpendicular to the orbital plane? Give your reason.
- (d) Different parts of the Earth have different climates at the same time. What is the reason behind this?
- (e) In the figure below, the various positions of the Earth on its orbit around the Sun are indicated by numbers 1 to 8. What will be the length of day and night (longer, shorter or

equal) at each of those positions in the northern and southern hemispheres? Fill in the table.



Northern Hemisphere	Southern Hemisphere
1. The shortest day	2.
3.	4.
5.	6.
7.	8.

Moon and its phases

Do you see the moon in the sky every evening?

The moon revolves around the Earth in an elliptical orbit. It takes about a month for this. This period is called the lunar month. The day of the lunar month is called Tithi.



Fig.8.11



Fig.8.12

Do you know?

In our eastern culture, rituals and festivals such as birth, death, marriage, etc. are determined based on the position of the moon.

Activity 8.5

When is the next full moon day? Look at the calendar. Note the time when the moon rises in the evening on a Full moon day. Observe the shape and brightness of the moon. Observe the time, size, and brightness of the moon rising on the day after the Full moon (Pratipada) and on the second day (Dwitiya) respectively. What difference did you find in the time, shape and brightness of the moon rising every day? Draw a picture every day and write it down on a piece of paper. Discuss in class the reasons for the changes you noticed.

Date	Tithi	Time of moonrise	Shape of the moon

The moon moves forward 12 degrees in its orbit every day. During this rotation, sometimes the moon comes between the sun and the earth and sometimes the earth comes between the sun and the moon. In the picture, the moon is between the sun and the earth. At this time the moon is in the sky but the dark (night) part of the moon is facing the earth. So, the moon cannot be seen, neither during the day nor at night. Such a situation is called the New moon(Aunsi). A part of the moon is visible in the sky in the morning a few days before the New moon day, and in the evening a few days after the New moon day.



Fig. 8.13

In the figure below, the Earth is between the Sun and the Moon. At this time, the bright part of the moon faces the Earth and the Full moon in the sky can be seen throughout the night. Such a situation is called the Full moon(Purnima). The moon rises 48 minutes later each day after the Full moon. The size and brightness of the moon also goes on decreasing. In this way, as the time of moonrise is delayed, the Sun and the Moon rise almost together on the New moon day.



Fig. 8.14

Do you know?

60 seconds = 1 minute

60 minutes = 1 hour

24 hours = 1 day

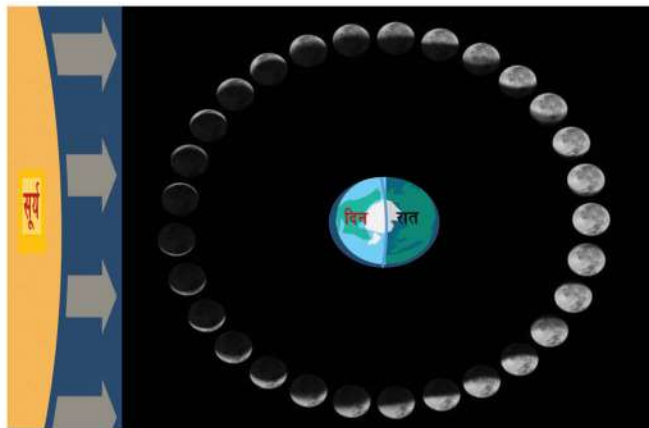


Fig.8.15

The period that follows the New moon until the Full moon is called the Bright Half(Sukla Paksa). During this period, the size of the bright part of the moon increases. Likewise, after the Full moon, the size of the bright part of the moon gradually decreases every day until the New moon day. This period is called the Dark Half (Krishna Paksha).

Do you know the names of the dates of a lunar month?

The word Shukla is written before the Tithis of Suklapakshya, and the word Krishna is written before the Tithis of Krishna Paksha, eg. Krishna Pratipada is the first day after the New moon(Purnima) and Shukla Pratipada is the first day after the New moon(Aunsi). The time between two consecutive Full moons is one lunar month.

Question to think

- Why doesn't the Sun have phases like that of the moon?
- In what condition would have the moon not changed its shape every day?

Activity 8.6

Take a white plastic ball. Paint half of it black. As shown in the picture below, make a hole in the ball and insert a small stick for holding the ball. Turn on the light in a dark room and rotate the ball around you by holding it by the handle as shown in the picture. In this activity, the light bulb represents the Sun, the ball represents

the Moon and you are the Earth. The black part of the ball should be facing away from the bulb.

Now observe how much of the white part of the ball you see when the ball reaches different places in the lunar orbit. Similarly, display the position of the moon on Full moon day, New moon day, and other dates sequentially.




Fig. 8.16

Based on this, make presentation to the class about the phases of the moon.

Project work

- (a) Type Earth motion, lunar motion, and phases of the moon on the search bar, download and watch the video on the internet. Based on the information from the video, prepare a report about the Sun, Earth and Moon and share it with your friends in the class.
- (b) Write the names of all the dates of the lunar month on the chart paper. On a particular Full moon day, record the time of the moonrise. Write down the time of moonrise on each day after that. Also, sketch the shape of the moon that you observe on that date. Present your work in the classroom for discussion.

S.N.	Name of the date (Tithi)	Time of moonrise	Shape of the moon
1.	Full moon (Purnima) PM	Picture 
2.			
3.			
4.			

Exercise

1. If the statement given below is correct, put a tick mark (✓) and if it is wrong, put a cross mark (x):

- (a) Moon rises in the east and sets in the west.
- (b) The moon stays in the sky throughout the day.
- (c) Every day the moon rises 2 hours later than the previous day.
- (d) The moon shines in the evening of the bright half (Shukla Paksha).
- (e) There is moonlight in the evening of the dark half (Krishna Paksha).

2. Fill in the blanks with the appropriate word:

Bright half (Shukla Pakshya) 60 New moon (Aunsi) Full moon (Purnima) 24 increases decreases

- (a) The period after the New moon to the Full moon is known as
- (b) One day is equal to hours.
- (c) The state of the Moon lying between Earth and Sun is called
- (d) The size and brightness of the moon during the dark half (Krishna Pakshya).

3. Choose the most appropriate option from the given options.

- (a) On which date does the moon rise in the evening and set in the morning?
 - i. Aunsi
 - ii. Ashtami
 - iii. Ekadashi
 - iv. Purnima
- (b) What is the reason for the existence of the phases of the moon?
 - i. tilting of the Earth's axis
 - ii. tilting of the Moon's axis
 - iii. Earth revolving around the Sun

- iv. Moon revolving around the Earth
- (c) The earth falls between the sun and the moon as the moon revolves around the earth. At what time of the day and how does the moon appear in this situation?
 - i. in full size throughout the night
 - ii. crescent moon at midnight
 - iii. in full size at dawn
 - iv. in full size only in the evening
- (d) At which of the following times does the shape of the moon appear as given in the figure?
 - i. rising at midnight 7 or 8 days after the Full moon
 - ii. rising in the evening 7 or 8 days after the Full moon
 - iii. rising at midnight 7 or 8 days after the New moon
 - iv. rising at dawn 7, 8 days after the New moon



4. Answer the following questions:

- (a) What does it mean by the phases of moon?
- (b) What is the position of the Moon, Earth and Sun during the New moon and Full moon? Draw a picture and show it.
- (c) What is the reason for the moon being invisible in the sky on the day of the New moon? Give a reason.
- (d) If the moon were a satellite shining with its light, how would have its shape visible to us differed and why?
- (e) Dolma's parents are farmers. They made a plan to get up early in the morning and start harvesting the paddy in the moonlight. Based on the study of the phases of the moon, advise them, with reasons, from which date it would be appropriate to start harvesting paddy.