

Science and Technology



Grade 6

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unit 1

Scientific Learning

1.1 Introduction to Scientific learning

What is science? How and why is it studied? Is the science learning different from other learning? Discuss and present the conclusion in the class.

Science focuses on systematic study of any object, subject and event. Scientific skills are required to study of science. Observing, classifying, measuring, predicting, communicating, experimenting and concluding etc are scientific skills. The systematic study of subject matters that are seen, heard and felt is called the scientific study. Observing, inquiring, estimating, experimenting, analyzing and concluding are under scientific learning. Sir Isaac Newton invented the gravity after seeing the apple falling from the tree. James Watt invented steam engine by observing the kettle's lid pushed by water vapor. These inventions were become possible due to scientific study. We can do new research when we study for a long time steadily. We can also discover new facts if we study steadily and patiently through scientific way.

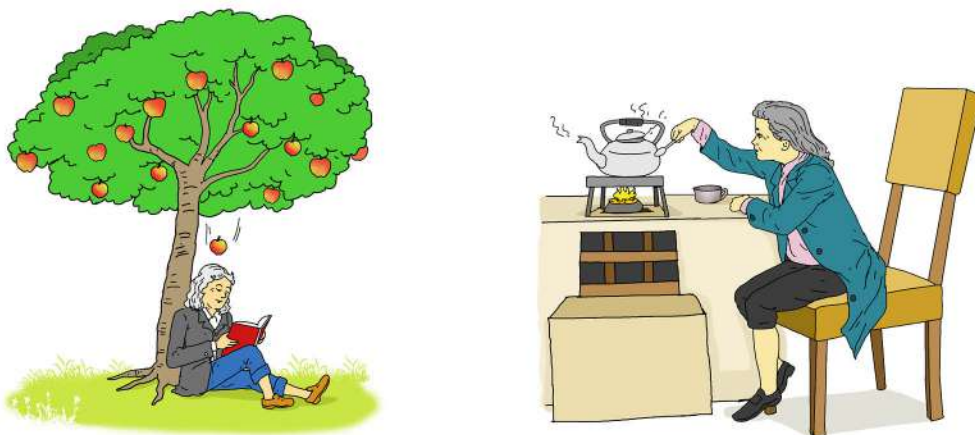


Fig 1.1

Activity 1.10

Draw an one inch line on your exercise book. Measure its length in centimetre.
How many centimetres are there in one inch?

As in the activity 1.8 and activity 1.9, the local unit and SI unit of different physical quantities can be compared. It is found to be expressed the local units into SI unit after the comparison between them. All the local units cannot be transferred into S.I units confidently. For example: it cannot be said confidently that how many centimeter there are in a *hat* because the length of *hat* can be different in each individual.

Project work

How can the units like ropani, hector, aana and kattha used to measure area be transferred into S.I unit? Fill in the blanks by asking your parents or searching in the internet.

1 ropani =m²

1 hector =m²

1 aana =m²

1 kattha =m²

Make the following conceptual grid to differentiate between local unit and SI unit on the basis of above activity and discussion.

Table 1.4

Base line of differences	Local unit	SI unit
Reliability		
Accuracy		
Uniformity		
Appropriate for scientific learning		

Multiple and submultiple units

Suppose you have to measure the distance between the earth and sun, length of a field and length of a pen. Can you measure these all in metre, why?

Although the physical quantity in each case of the above is same(length), a vast difference is seen in magnitude. It is appropriate to measure the length of field in metre but needs bigger unit than metre to measure the distance between the earth and the sun. And it needs a unit smaller than metre to measure the length of a pen. Thus, it needs a bigger unit to measure the large amount of physical quantity and needs small unit for less amount of same quantity.



Fig 1.7

Therefore, large amount of a physical quantity is expressed in larger unit whereas the smaller quantity is expressed in smaller unit. Although the tools and units of measurement are small and big they can be mutually transferred to each other.

Activity 1.10

List different measuring tools. Make the following table based on the purpose of their use and fill it.

Table 1.5

S.N.	Name of tool	use
1	15 m long scale	
2	1 m long iron scale used to measure cloth	
3	2 metre long tape (inch tape)	
4	50 or 100 metre long plastic or cloth tape	
5	150cm long plastic tape	

The design of measuring tools are different based on its purpose. A short ruler used to measure a short length. A long tape is used to measure a long length. A long tape is rolled to make it easy to carry. Lines are drawn with the help of a small and rigid scale kept in the geometry box. It is easy to measure cloth using a rigid scale of iron.

Unit of length

How far is your school from home? What is your height? How long is the bench? These questions relate the length of objects. The distance between any two points is called length. For example; height of a man means the distance between a point at the upper part of his head to a point on his feet. The SI unit of length is metre. There are units bigger and smaller than metre. Their relation is as follow.

$$10 \text{ mm (millimetre)} = 1 \text{ cm (centimeter)}$$

$$10 \text{ cm} = 1 \text{ dm (decametre)}$$

$$10 \text{ dm} = 1 \text{ m (metre)}$$

$$1000 \text{ m} = 1 \text{ km (kilometre)}$$

Example

1. How many centimetres are there in 2 m and 50 cm?

$$\text{Here, } 2 \text{ m } 50 \text{ cm} = 2 \times 100 + 50 = 250 \text{ cm.}$$

2. Convert 506 cm into m.

$$\text{Here, } 506 \text{ cm} = 506 / 100 = 5.06 \text{ m}$$

Unit of mass

Activity 1.10

Take a glass and a bucket. Fill both of them with water. Lift the glass and bucket one after another. Which one is heavier and why? Discuss among your friends.

The quantity of matter contained in an object is called its mass. The mass of a glass of water is lesser than a bucket of water. The object with greater mass becomes heavier and the object with lesser mass becomes lighter. Therefore, it is easier to lift the water in the glass than that in the bucket.



Figure 1.8

All the objects have their mass. Soil, stone, paper, water, air etc all are matter. A physical balance is used to measure mass. The S.I unit of mass is kilogram. There are smaller and bigger units than kilogram. Their relation is as follow.

100 milligram (mg) = 1 gram (g)

100 g = 1 kilogram(kg)

100 kg = 1 quintal

1000 kg = 1 tone



Fig 1.9

Activity 1.10

Take a beam balance and *dhak* of different masses. Put an object on the pan of one side of balance and balance it by using the masses on other pan. The total mass of the *dhak* used to balance the object is its mass.

Examples:

1. How many grams are there in 5 kg 200 g?

Now 5 kg 200 gm = 5x 1000 + 200 = 5200g

2. How many kg are there in 1550 g?

Here 1500 gm = $\frac{1500}{1000}$ kg= 1.55kg

Unit of time



Fig 1.10

How long do you take to arrive school from your home?

We have to measure time to get accurate time. Coming out from the home is one event and arriving at school is another event. The interval between these two events is the time taken to reach the school. The interval between any two events is called time.

Different types of watches like simple watch, automatic watch, digital watch, table clock, wall clock etc are used to measure time. The SI unit of time is second, Minute; hour, day, week, month, year, decade and century are the bigger unit of time.

60 seconds = 1 minute

60 minutes = 1 hour

24 hours = 1 day

7 days = 1 week

12 months = 1 year

365 days = 1 year (There are 366 days in a leap year)

Example

Let us calculate the number of seconds in a day.

1 day = 24 hours = 24x60 minutes = (24x60x60) seconds = 86400 S

Therefore, 1 day = 86400 S

Unit of temperature

Ice is cold and boiled water is hot. Coldness of ice and hotness of water represent their temperature. The SI unit of temperature is kelvin (K). It is also measured in $^{\circ}\text{C}$ and $^{\circ}\text{F}$ in the daily life.



Fig 1.11

Have you seen the process of measuring temperature of a person suffering from fever? What is used to measure it?

A thermometer is used to measure temperature. There are different types of thermometer. A simple thermometer is used to measure the temperature in the laboratory. Similarly, a clinical thermometer is used to measure the temperature of human body. At the sea level, the temperature of pure melting ice is 0°C and that of boiling water is 100°C . Temperature of other body is measured by comparing with these temperatures.

Activity 1.10

Take a digital thermometer and measure the temperature of your body.

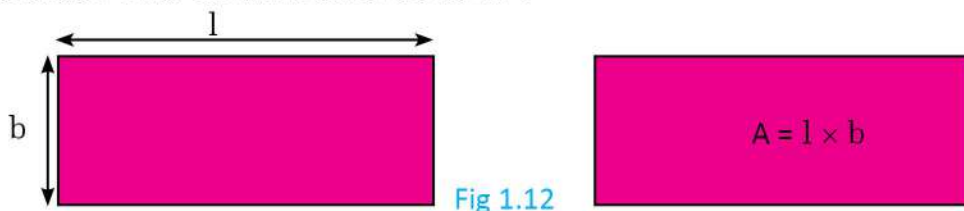
Unit of area

Activity 1.10

Keep a coin on a paper and sketch its circumference using a pencil. Now raise the coin up and have a look on the area covered by it.

The space occupied by the coin in the paper is called its area. Similarly, the space occupied by our foot on the ground is called

its area. The space covered by the surface of an object is called its area. The SI unit of area is m^2 .



Some of the solid objects around us have a fixed geometric shape. They are called regular objects. Books and copies are rectangular objects. We can use different formulae to calculate the area occupied by the plain surface of regular objects.

Area of a rectangular object = length(l) x breadth(b)

Area of land is calculated by dividing it in to different triangles and the area of each is calculated. Finally, the areas of all the triangles are added to get the area of that land.

Example

1. **If the length of a rectangular room is 5m and its breadth is 3m, calculate the area of that room.**

Here,

$$\text{Length (l)} = 5\text{m}$$

$$\text{Breadth (b)} = 3\text{m}$$

$$\text{Area (A)} = ?$$

According to the formula,

$$A = l \times b$$

$$= 5 \times 3$$

$$= 15 \text{ m}^2$$

Therefore, the area of room is 15 m^2 .

2. How many cm^2 is equal to 1 m^2 ?

$$1 \text{ m}^2 = 1\text{m} \times 1\text{m} = 100\text{cm} \times 100\text{cm} = 10000 \text{ cm}^2$$

3. How many m^2 is equal to 1 km^2 ?

$$1 \text{ km}^2 = 1\text{km} \times 1\text{km} = 1000\text{m} \times 1000\text{m} = 1000000 \text{ m}^2$$

Activity 1.10

Calculate the area of outer page of your science and technology book. Measure the length and breadth of your classroom and also calculate its area.

Unit of volume

We need the liquids like milk, kerosene oil, petrol etc in our daily life. How are these liquids measured? Have you gone shop to buy oil or kerosene oil?

Which vessel does the shopkeeper use to measure it? In the past, these liquids are measured by using mana and pathi but now a days vessels calibrated in litre or millilitre are used. Why so?



Fig 1.13

When some liquid is poured into a measuring vessel, it occupies space. The total space occupied by a body is called its volume. All the matters have volume. Solid and liquid have a fixed volume

but the gas does not have a fixed volume. In SI system, volume is measured in m^3 . Volume of liquid is measured in litre (l).

$$1 \text{ m}^3 = 1000 \text{ l}$$

$$1 \text{ l} = 1000 \text{ millilitre (ml)}$$

$$1 \text{ l} = 1000 \text{ cm}^3$$

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

cm^3 is also written as cc (centimeter cube).

How many cm^3 is equal to 1m^3 ?

$$1\text{m}^3 = 1\text{m} \times 1\text{m} \times 1\text{m} = 100\text{cm} \times 100\text{cm} \times 100\text{cm} = 1000000\text{cm}^3$$

In science laboratory, volume of liquid is measured by using measuring cylinder. The measuring cylinders of capacities 10ml, 25 ml, 50ml, 100ml, 250ml, 500ml and 1000ml are available. There might have measuring cylinders in your school as well. Sketch such tools showing units their clearly.

Exercise

1. Fill appropriate words in the blanks

area volume length time
measurement square meter conclusion

- We need to take of a body to get its accurate quantity.
- The interval between any two events is called
- The distance between any two points is called
- The SI unit of area is
- of liquid is measured by using measuring cylinder.
- A is drawn after the analysis of data.

2. Select the correct answer.

- How many seconds are there in an hour?
i) 3600 S ii) 4800 S iii) 2400 S iv) 6000 S
- What is the SI unit of mass?
i) pound ii) dharni iii) kilogram iv) tone
- What is the SI unit of electric current ?
i) volt ii) ohm iii) watt iv) ampere

3. Match the following.

Length	Kilogram
Mass	Second
Time	Metre
Area	Cubic metre
Volume	Square metre

Scientific learning process

Activity 1.1

Collect some fruits like mango, banana, apple, lemon, grapes, pomegranate, gooseberry, coconut, walnut, papaya etc. Observe these fruits by seeing, catching, smelling and touching. Divide them in different groups on the basis of their size, color, taste and hardness.

Table 1.1

Having similar shape	
Having similar colour	
Having similar taste	
Having similar hardness	

Conclude on the basis of the table above.

For example: 1. fruits are of different taste

.....
.....

Activity 1.2

Collects the objects like piece of wood, stone, plastic, eraser, rubber, ice, iron nail, paper, ball pen, leaves, cloth, spoon, and grain of rice and pulses from your surroundings. Guess the floating and sinking objects and fill the table below.

S.N	Name of object	Whether it sinks or not	
		your guess	Result after the test
1	Piece of wood		
2	Stone		
3			
4			

On what basis did you guess about the floating and sinking of the object? Tell your friends. After having your guess, take some

4. Convert the following

- a. 2 hours into second
- b. 15 kg into gram
- c. 2m^2 in to cm^2
- d. 4m^3 into cm^3

5. Answer the following questions

- a. What is a measurement?
- b. What is the SI unit?
- c. Why is the SI system developed?
- d. What is volume?
- e. What types of problems would have to be faced if the SI system was not introduced?
- f. What is the improvement seen in the measurement system after the development of standard units?
- g. Father of a student bought a vest and trousers for his son from nearby market. The vest was found to be long and waist of the trousers became a bit tight when the student tried to wear. State the cause of this problem and write the solution.
- h. Show the phases of scientific learning process in a flow chart. Mention the main characteristics of each phase in the chart.

water in a bucket. Drop them one after another into the water in the bucket. Fill the result in the above table.

1. Compare your guess with test result.
2. Why did some of these objects not sink in the water?
3. Can you tell the name of other floating and sinking objects?
4. What could be the conclusion of this activity?

The process of concluding and communicating the report by observing, guessing, testing, discussing and explaining the surrounding objects or events is called scientific learning process.

Steps of scientific learning process

Following phases can be followed in the scientific learning process.

1. Study of surrounding objects or events

The scientific learning process begins from the study of surrounding objects or events which are seen, heard or felt. Collecting the surrounding objects as given in the activity 1.2 is the example of this phase. Study of events like falling fruits from a tree, snowfall and feeling cold in winter etc are the first phase of the scientific learning process.

2. Questioning about objects or events

Asking questions is the second phase of the scientific learning process. Having query / interrogating about the sinking or floating objects in the activity 1.2 is an example of second phase of scientific learning process. The inquiry of Newton about the falling apple and curiosity of James Watt for searching the cause of lifting the lid of kettle by water vapour are also belong to questioning phase.

Question to think

1. *Was the falling of apple in front of Newton the first event in the world?*
2. *Why did only Newton succeed to find the reality of this event?*

3. Guessing the probable answer of question

In this phase, the possible cause and answer of a question or event is searched which makes easy to find the fact. The guess regarding the floating and sinking objects made before the testing process in the activity 1.2 is an example of this phase.

Guess it

1. *What would be the change in volume when a piece of ice is melted?*
2. *What would happen when a green plant is covered for some days not allowing light to fall on it?*
3. *What would happen when an egg is dipped in vinegar or lemon juice for long time?*

4. Testing

In this phase, the guess made by a person is tested adopting an appropriate method. Since the actual fact is found out from the testing, it is considered as the most important phase of the scientific learning process. Dropping the collected objects into the water one after another in the activity 1.2 is an example of testing phase.

5. Accumulating the data from testing

The result of the test is noted down. In the activity 1.2, the names of floating and sinking objects are listed in the table.

6. Concluding after the data analysis

Conclusions are made by analyzing the data obtained from the test. The conclusions of activity 1.2 are

- i. *These objects; an iron nail, stone, brick, spoon and rubber cork which are denser than water sink.*
- ii. *These objects; a page of paper, leaves, pieces of plastic and ice which are density than that of water float on it.*

7. Presenting a report

This is the last phase of scientific learning process. In this phase, the conclusion obtained after the data analysis is presented orally or in written form.

Let us practice the scientific learning process

Activity 1.3

Collect the objects like compass, geometry box, pen, pencil, metal zipper, button, an iron nail and an aluminum sheet available in your surroundings.

Guess the magnetic and non-magnetic substance and fill in the table.

Separate the magnetic substances with the help of a magnet and fill in the table.

Compare your guessing with the result.

Make a conclusion from the test.

Relate the completed task with the phases of scientific learning process and explain it.

Activity 1.4

Collect the seed of plants like maize, wheat, barley, gram and pea etc. available in your home.

Guess the monocot and dicot seeds from the sample and note it down.

Now remove the outer covering of each seed and find out whether they are monocot or dicot.

Note down the result of your test.

Did you find the differences between the result of guessing and testing?

Relate the completed task with the phases of scientific learning process, make a report and present in the class.

1.2 Measurement and unit

Activity 1.5

How long is the table?

Measure the table in your class using *bitta* of your hand. Suppose it is 4 *bitta*. Here the length of table is compared with your *bitta*. You come to know that the length of the table is four times the length of *bitta* of your hand. What are you measuring in your daily life? Discuss.

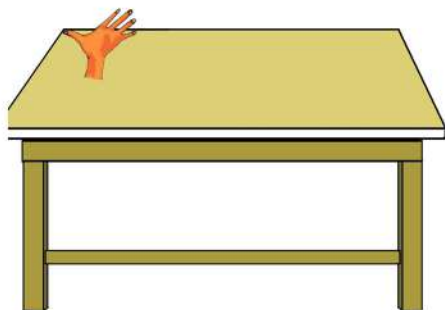


Fig 1.2

Activity 1.6

How much water is there in the glass?

Take a glass of water and a measuring cylinder. Pour the water in the glass into the measuring cylinder. How much milliliter (ml) in water is there in the glass?



Fig 1.3

Initially the volume of water in the glass is unknown. A measuring cylinder is a device which is used to measure the volume of liquid. By observing the level of water in the cylinder, its volume can be known. Measuring cylinder gives the standard measurement of volume of liquid. In this activity, the volume of water in the glass is compared with the volume of water in the measuring cylinder when the same water is poured into the cylinder. Volume is a physical quantity. The quantity which can be expressed in mathematical form after the measurement is called a physical quantity.

Thus, the process of comparing an unknown quantity (for

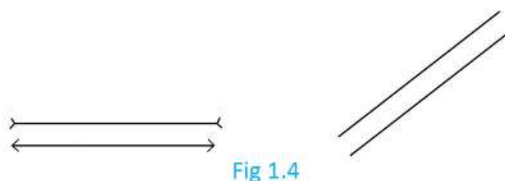
example the volume of water in the glass) with the standard known quantity (volume shown by measuring cylinder is called measurement. The standard quantity used to measure the physical quantity is called unit. Different physical quantities are measured in different units. For example, meter, kilogram, second and degree Celsius are the units of length, mass, time and temperature respectively. The amount of physical quantity expressed by using unit along with number. For example: the length of a particular object is written as 4m. Here, length is the physical quantity. m represents the unit and 4 indicates that the object is four times the unit length.

Question to think

What are the differences between the units used in the activity 1.5 and activity 1.6?

Why is it necessary to have measurement?

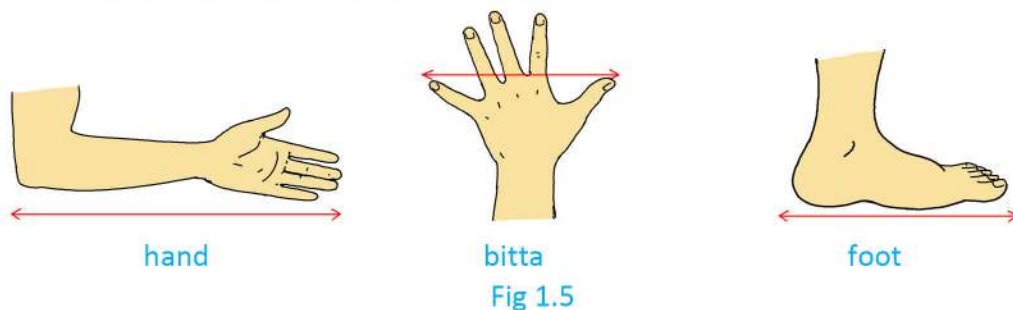
Which one of the lines in the figure is longer? Tell without taking measurement. Now take the measurement with the help of a ruler. Was your guess correct? Probably it is not.



Thus, the guess made by just seeing the physical quantity may not be always accurate. The main phase of scientific learning process is testing. Usually, measurement is taken during the testing phase. If the measurement is incorrect, the conclusion of the test will be wrong. Thus, measurement plays an important role in scientific study.

We do different works daily. We buy rice, pulses, sugar, oil, ghee etc from the shop. We need to measure them. We need to fix the quantity of sugar, tea, milk and water while making tea. Similarly, the quantity of salt is to be measured correctly in the curry. The cloth does not fit in our body if it is sewed without measurement. Therefore, measurement is important in our life. Measurement is essential to know the accurate quantity of substances.

Local and standard units of measurement



Own type of measuring system is adopted in different places. In various places, hand, bitta, foot and angul etc are found to be taken as units for the measurement of length.

Similarly, manapathi and muri are used to measure grains and ghee in our country. On the basis of production and working capacity, the tradition of measuring area of fields using the units *muri*, *hal* or *ropani* is still practice in Nepal. These units used in measurement are not standard units.



Fig 1.6

The units used in the local level are known as local units. Some local units are still in use in various places.

Activity 1.7

Which units are used in your community/locality to measure the length, mass, time, area and volume?

Physical quantity	Length	Mass	Time	Area	Volume

Activity 1.8

Measure the length of a desk or a table of your classroom using bitta and note down the result. Now measure it using the *bitta* of your friends turn in turn. Is the result same? If not, why is it so? Discuss.

Since the local units are not standard, there is no uniformity of measurement in different places. It creates problems in national and international trades. It is realized to have reliable and internationally accepted units to solve such problems. In 1960, the conference of scientists held in France declared the standard units. These internationally recognized units of measurement are called S.I units. Some examples of SI units as follows:

Table 1.3: S.I units

S.N.	Physical quantity	Unit	Symbol
1	Length	Metre	m
2	Mass	Kilogram	kg
3	Time	Second	s
4	Temperature	Kelvin	K
5	Electric current	Ampere	A
6	Area	Square metre	m ²
7	Volume	Cubic metre	m ³
8	Force	Newton	N
9	Energy	Joule	J
10	Power	Watt	W
11	Speed/velocity	Metre per second	m/s

The measuring system developed in the conference of scientists in 1960 is the SI. System. The units of measurement under SI system are called S.I units.

Activity 1.9

Take a vessel calibrated in litre and another vessel of capacity one pathi. Measure one pathi of water and put in a vessel. Pour this water in the vessel calibrated in litre. How many litres are there in one pathi? Find it out. Do the measurements from all the *mana* and *pathi* carry same result?

2.1 Technology

In our daily life we perform various activities like cooking, farming, etc. Now make a list of such works performed in your home and neighborhood. What technologies and tools are used in such works? Is it possible to perform all these activities without technology and equipment? Let's discuss, what technologies are being used while making and using such tools?

Local technology



fig:2.1

What sort of activities are happening in the picture above? Discuss the name of instruments used in performing such activities. We perform different activities in our daily life using different small and large instruments, such as: cutting grass with a sickle, chopping vegetables with a *chulesi*, grinding spices with mortar and pestle, chopping firewood with an axe, ploughing a field with a plough, making bread with the help of a rolling-board pin, etc. The above mentioned tools like sickle,

chulesi, mortar and pestle, axe, plough, rolling-board pin etc. are the tools related to local technologies. The traditional knowledge and skills used in manufacturing and use of such equipment is called local technology. The development of local technology is due to the traditional knowledge and skills of the people. Such technologies make our daily work faster, more convenient and easier. Therefore, the tools which make our daily activities fast, easy and comfortable are called local tools and the technology used to make such tools is called local technology.

Activity 2.1

Some tools of local technologies are given below. Discuss with your parents, friends, relatives and neighbours about the usage of such technologies. Fill up the table and discuss in classroom.

Khal, janto, Odan, traditional chulo, wooden kol for grinding mustard or chiuri, *kol* for grinding lemons, iron heated with coal, *madani, theki, pots, pani ghatta, diyo, tuki* etc.

S.N.	Name of instrument	Use of instrument
1.	Doko, Namlo	To carry grass, firewood, luggage etc. Sometimes to carry sick people to hospitals in absence of vehicles.
2.		
3.		

Nepal is rich in traditional skills and technology. Due to its geographical and ethnic diversity, there is diversity in locally developed technologies. Local technology has been used in agriculture and animal husbandry, food and beverage manufacturing, yarn and textile production, energy production, water management, architecture, Infrastructure construction, etc.

Modern technology

What sort of activities are happening in the picture below?

What tools have been used for those purpose? Discuss.



Fig. 2.2

Along with scientific development, modern technologies are being developed on the basis of traditional technology. Room heaters, air conditioners, etc. are used to warm rooms and offices. Refrigerators are used to maintain freshness of vegetables and fruits. Smart phones and computers are used for information sharing and communication. Scooters, cars, jeeps, buses, trains, ships, etc. are used for transportation. All of these tools are manufactured and used with scientific knowledge and skills. Such technologies are called modern technology. With the development of modern technology, work can be performed quickly and can produce large number of good quality goods at a time. Production of quantities in mass is possible using such technology. Some devices with such technology operate on mechanical power, while others operate on electrical power.

Activity 2.2

For what purpose modern technologies have been using in and around your home? Have a look. Complete the table below with your friends.

Name of instrument	Use of instrument
Electric iron	Used to iron the cloths
Tractor	Used for ploughing fields, transporting goods etc.

Uses of local and modern technologies in agriculture



Fig. 2.3

What differences can you observe in the activities given in the picture? Discuss.

Kuto, spades, plough, etc. used to plough the fields are local technologies while tractors, threshing machines, lawn mowers are modern technologies.

Activity 2.3

Observe farming around your home and neighborhood. Also, take reference of TV, video, or other audio-visual materials and discuss the following questions:

1. What can be used instead of plough for ploughing nowadays?
2. What tools are used in agriculture?
3. Categorize them into local and modern technological devices with reasons.

Use of local and modern technology in grinding and threshing



Fig. 2.4

What sort of activities are demonstrated in above pictures? Categorize them into local and modern technologies.

Dhiki, Janto, Okhal, Pani Ghatta, Lemon/Mustard crushing kol etc. are the traditional technologies used in grinding and crushing while paddy threshing mill, flour grinding mill, mustard grinding mill etc. are modern technologies.

Activity 2.4

Find answers to the following questions by asking your parents, relatives, neighbours, friends, etc. Discuss in class upon:

- i. How did the local and modern technology used to grind herbs, turmeric powder, chilli, cardamom, cumin, garlic etc.?
- ii. How do people purify water using local technology before development of filters?
- iii. How were pickle, *gundruk*, *mohi*, *churpi*, *masyaura*, *chiura* etc. made using local technology? Are there any modern technologies developed to prepare these food items?
- iv. How are *kuto*, *kodalo*, *hansiya* etc. made using local technology?

Project work

Explore the various local and modern technologies that are popular in your town. Discuss the collected data with your friends by presenting them in the table below.

Work	Local technology	Modern technology
Making bread	Use of Belna Chowki	Use of bread maker
To thresh paddy	Use of khal, dhiki etc.	Use of rice mills
To make wheat, barley, maize, millet, buck-wheat flour	Use of mill and water mill	Use of modern grinding mills

To cook food		
To grind spices at home		
To extract oil or ghee from mustard/ chiuri seeds		
Digging or ploughing the field		
To Warm the house or room		
To iron the cloth		
To extract milk, curd and butter		
To keep water cool in summer		
To cross river		
To carry sick people to hospitals		
To send the message from one place to another		
To make roads		
To make alcohol		
To make plough, spade, sickle etc.		

The local skills and technologies have been using for a long time. Today's modern technology has evolved from development and modernization of local technologies. The computer has been using excessively in the modern technology. A variety of automated devices have been developed using computers. Modern technology makes work faster, efficient, accurate, easier and less expensive than local technology. In cities, use of modern technology is wider although, local technologies are still being used in daily activities in many places of Nepal.

- iii. Which type of technology do sickle, chulesi, plough, mortar and pestle belong?
- (a) Modern technology
 - (b) Local technology
 - (c) Both modern and local
 - (d) Digital technology
- iv. Choose the right option. from the following statements regarding the reason for calling Kuto as local technology,
- i. It works in traditional way.
 - ii. it is made by heating iron
 - iii. It has a simple structure
 - iv. it is easy to handle
- (a) (i) and (iv) are correct
 - (b) (i) and (ii) are correct
 - (c) (i),(ii) and (iv) are correct
 - (d) All are correct

3. Differentiate between:

- i. Local technology and modern technology
- ii. Coal iron and electric iron

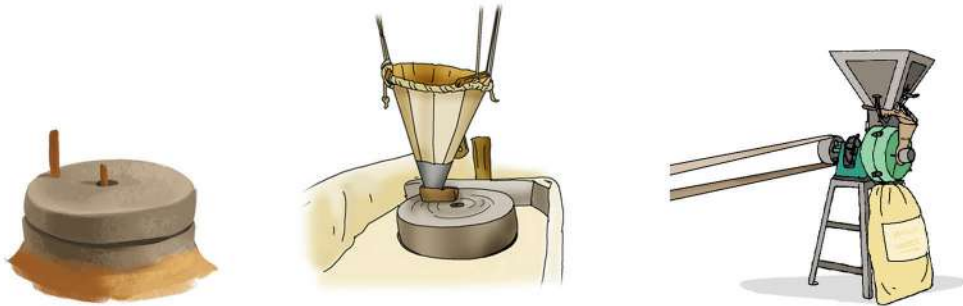
4. Answer to the following questions:

- i. What is technology? Why is it used?
- ii. Write the names of any four devices of local and modern technologies.

- iii. Compare the use of local and modern technologies in agriculture.
- iv. Write the name, usage and type of technology by recognizing the pictures below.



- v. Plough and tractor are used for same purpose but tractor was developed for ploughing although plough was already been there. Why? Give arguments.
- vi. Look at the picture and answer the questions below.



- a. Identify the pictures.
- b. What technology are these devices made up of?
- c. What similarities do these devices have in terms of usage?
- d. Describe the development stages of these devices.
- e. What type of devices were being used before the development of such devices? Give your arguments.
- f. "Even in modern times, local technologies are considered important." justify.

2.2 Use of mobile phone and computer in our daily life

Let's discuss about the uses of mobile phones and computers:

The use of mobile phones and computers is not a new topic in today's age. These tools have become essential to us. The usage of mobile phones and computers is increasing in education, health, security, entertainment, business, etc. Due to these devices, the world is now considered as a global village. Without such devices, our daily life seems incomplete.



Fig 2.5 Use of mobile phone and computer

Use of smart phone in our daily life

Activity 2.5

Who are the users of smartphone in your home? What do they use it for?
With appropriate discussion with them, make a list like the following:

S.N.	Members of family	Usage of smartphone
1	Father	To communicate, calculate, take photos, read and listen to the news, to share photos, etc.
2	Mother	
3		

1. Do you use a smartphone?
2. What do you use a smartphone for?
3. What is the difference between you and your family member based up on the purpose of using smartphone?

Until a few years ago, mobile phones were used only as a means of exchanging information. At that time, mobile phones did

not have any other facilities except external keypad, speakers and flashlight. With the development of technology and the demand of the time, smartphones with many features including camera, internet, etc are developed. Many types of programs have been added to smartphones. Its use has been increased. The use of smartphones in information, education, health, security, entertainment, business, etc. has become mandatory. We use smartphones to communicate, make calculations, take photos, take videos, view and send emails. It is also used for operating social networking platforms like: Facebook, Messenger, Viber, Imo, WhatsApp etc. Not only this, online shopping, mobile banking etc. are also being widely used through smartphones.



Fig: 2.6

Use of computer in daily life

Activity 2.6

Do you have a computer at home? What do you use your computer for? Who are the users of computer at home? What do they use the computer for? With appropriate discussion with them, make a list like the following:

S.N.	Members of family	Use of computers
1.	Father	Creating office documents, keeping household accounts, viewing and sending emails, reading and listening to news, sharing photos and documents, searching for various topics from search engines, etc.
2.	Mother	

1. Have you used a computer at school?
2. For what activities do you use computer?
3. What are the uses of computers in your school?
4. For what purposes are computers used in home, office, hospital, business, etc.?

Computers can perform tasks reliably at faster speed. Because of this, computers are widely used in home, schools, offices, banks, hospitals, security agencies, entertainment and information exchange departments. Nowadays, there is no area where computers are not used. The use of computer in the field of education is transforming the traditional education system into a modern education system. The teaching-learning style has changed. Online learning practices are becoming efficient with the use of computers.

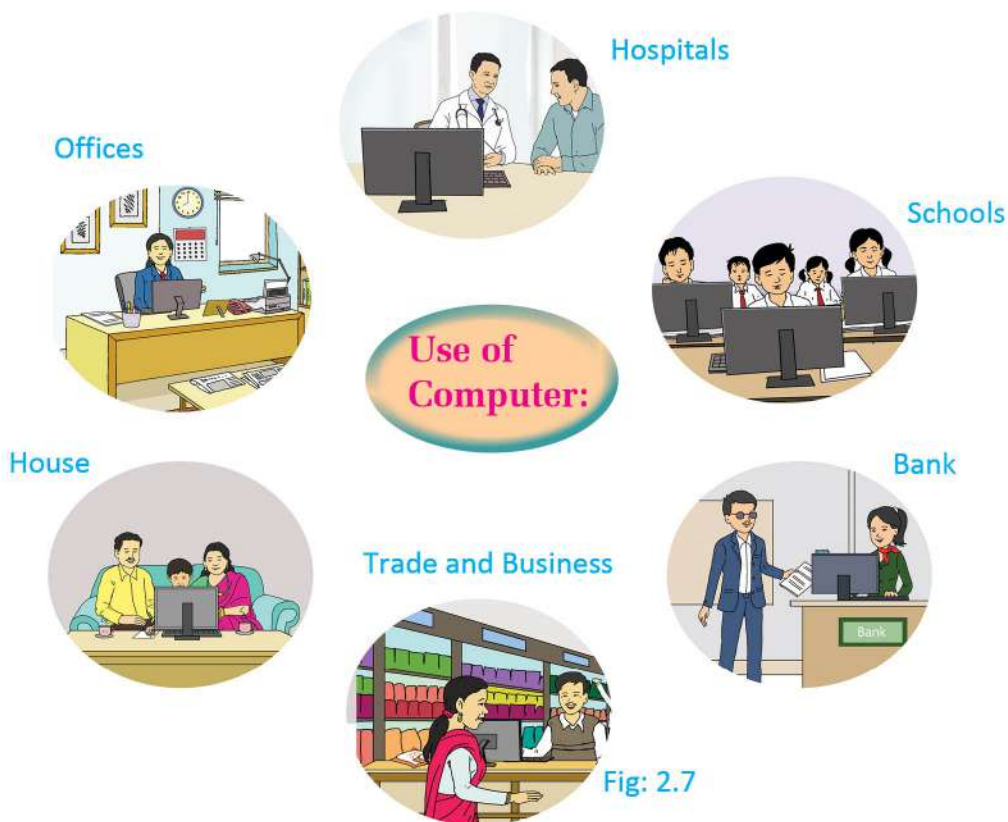


Fig: 2.7

Things to remember while using smart phone and computer

Smartphones and computers are very useful devices. However, if they are not used properly, we may be at a disadvantage. Frequent use of smartphones and computers can cause irritability, insomnia, headaches, dry eyes, red eyes, burns, pain, etc. For this reason, it is better to take a break while using smartphones and computers. It is advised not to use the smartphone at bed time, while eating and charging. It is not good practice to work on a computer with a small screen, dim light and small font size. It affects our eyes. Prolonged exposure to the screen can have a negative effect on a child's physical and mental development.

Question to think

1. If a student watches cartoons on his mobile phone for a long time on a daily basis, what problems might be in the future?
2. Roshni's father has to work on computer most of the time. What do you suggest him to avoid the negative effects caused by prolonged use of computer?

Computer

The word computer is derived from the Latin word 'Computare', which means a calculating device. In a broad sense, a computer is defined as an electronic device that processes data and provides useful results with the help of available programs based on data received from the user and instructions.



Fig: 2.8

Components of a computer

Hardware and software are the basic components of a computer. Physically touchable and visible devices like keyboard, mouse, monitor etc. are hardware. Since the hardware itself cannot do anything, it needs programs that instruct the hardware to work. The collection of programs that instruct hardware to work is called software. Windows operating system, Microsoft Word, Media players, etc. are the examples of softwares.

Working principle of a computer

The computer operates on the principle of IPO i.e. input, processing, and output.

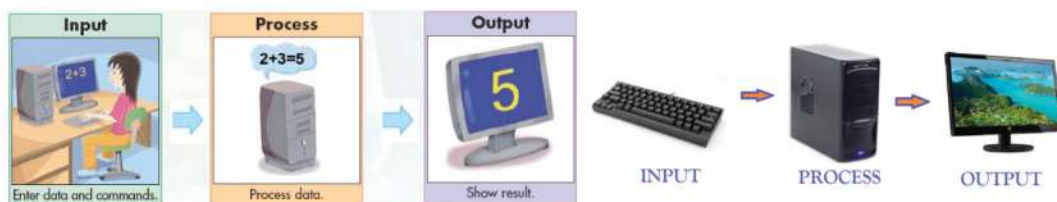


Fig: 2.9

(A) Input

The process by which the user transmits data or instructions to the computer is called input. Input is given from various devices, such as: keyboard, mouse, microphone, scanner etc. which are the examples of input devices.

(B) Processing

The data given to the computer is processed in Central Processing Unit, CPU.

(C) Output

The results obtained after processing are obtained by the user through the output devices, such as: Monitor, Speaker, Printer etc. which are the examples of output devices.

Activity 2.7

1. Open the Microsoft Word program in your computer. Press the different letters buttons on the keyboard. Instantly the letters appear on the computer screen.
2. Observe and identify the input devices, output devices, processing devices, and storage devices of computer.



Fig: 2.10:

Discuss what other devices can be connected to a computer in addition to the ones listed above. Among them, identify the devices that provide data and instruction to computer taken from user. Also identify the devices on which the result is obtained.

Storage device

The work done or the content brought to the computer from other sources is stored in the computer. Useful content stored in such a way can be reused in the future. To keep the useful contents safely is called storage.



Fig: 2.11

A hard disk is a device used to store such contents in a computer. Similarly, other storage devices used to store such contents are Pen Drive, Optical Disks (CD, DVD) , Blu-Ray Disks, etc. The various types of computer programs that we use like YouTube, Facebook, email, etc., are stored in various Cloud storage platforms.

Activity 2.8

Open the Microsoft Word program on the computer. Type your name, age, class, and the name of your school in a word document. Give a name to the document you typed and save it. Then close and reopen the word file.

1. Describe the hardware and software components on the computer you are working on.
2. If the typing you made is not saved, what happens?

Types of computer

Activity 2.9

Observe desktop computers, laptops, tablets, iPads, smartphones either directly or using audio-visual devices. Distinguish the similarities and differences among them. Discuss whether the working mechanism of these devices is similar to that of computer in terms of input, processing and output.

Computers used few years back used to be mostly desktop computers. Advances in computer technology have made it possible for people to carry a small computer that can easily be carried from one place to another. These portable devices are called by different name such as laptops, tablets, iPads, smartphones, etc. All of these devices operate on the principles of computer operating system. So, all these devices are often generalized as computers. There may be differences in their design and the programs used to operate them.

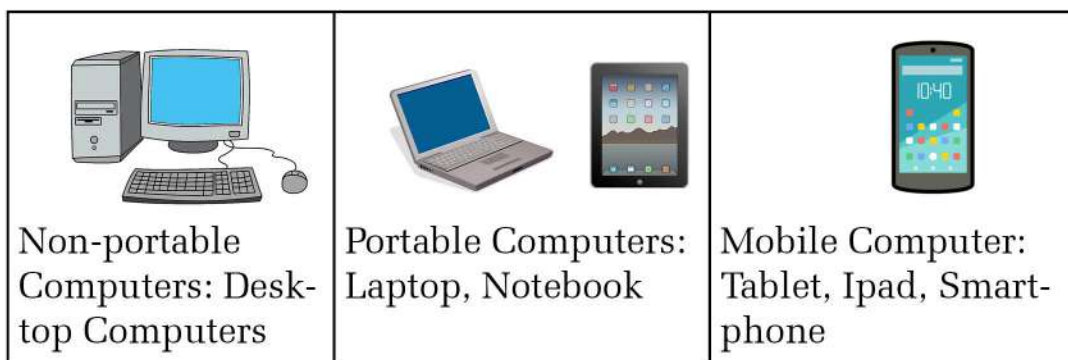


Fig: 2.12

Use of word processor

Word Processor- WP is a software that allows us to create, edit and print documents in advance. This software can be used to store your documents electronically on a computer's hard disk and display them on a screen. Various computer companies in the world have developed word processor software for their businesses. Some of the most popular word processors in the world are Microsoft Word, Libre Writer, Google Docs, etc.

Basic functions in use of Microsoft Word

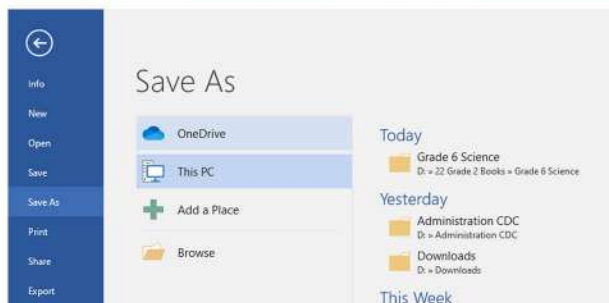
How to open?

1. Operate the computer, click the Start button () in the lower left corner of the desktop, or press the Windows button () on the keyboard.
2. Type the word 'Word' from the keyboard. On the right side of the computer screen you will see the icon of the software. Click the icon once with the left mouse button.
3. When Word opens at the beginning, a list of templates that you have previously opened will be given to a group of templates. Double-click on the blank document and double-click it. Then a blank page appears. Use the keyboard to type what you want to write on the page.



How to save?

4. Store your files on your computer's hard disk for later use. For this, click the File button on the top left of the screen. Now click on 'Save As' of the file. Then another window appears as shown in the picture. Click on 'Computer' button of that window and then click on 'Browse'.



5. Then you will see a new window as shown in the figure. On the left side of this box you will see a list for the storage of the file. For easy access, select Desktop.

Release the mouse button after selecting the desired location. As soon as you release the mouse button, a box appears next to it. Select the appropriate font from the box. You can also choose the size and color of the font in this box. You can also make the letter bold, italicized and underlined too.

The above work can also be done by using the Microsoft Word Ribbon. You will see the ribbon in the title of the blank page as shown in the picture below. There you will see the menu buttons like File, Home, Insert etc. The selected button appears clearer than others.



Activity 2.10

Create a file by opening Microsoft Word on your computer. Create a paragraph containing 10 lines entitled 'My School' on that file. Now arrange the documents according to the format shown below.

Title: (font Arial Black size 14, Bold)

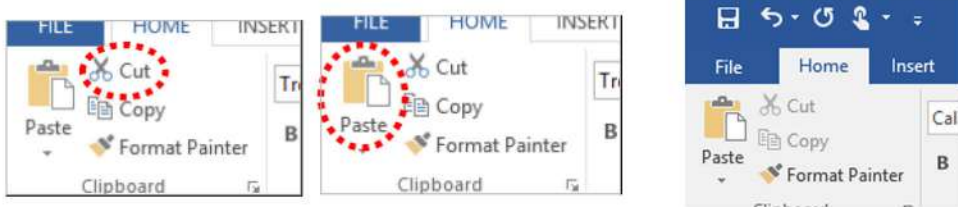
Date: (italic)

Paragraph: Font: Times New Roman (size 14), regular -----

Cut, Copy and Paste in Word document

Sometimes you need to change the location of the words you type in your document. The quickest and easiest way to do this is to use the cut and paste buttons. For this select what contents need to be removed. As shown below, click on the Cut icon inside Microsoft Ribbon's home button or press Ctrl and X keys once on the keyboard. Then click on the location of the Word document.

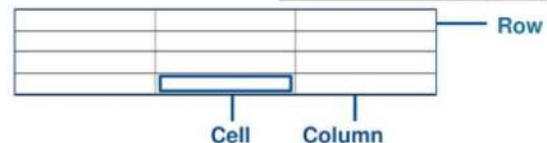
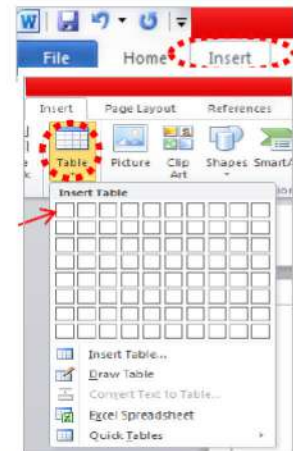
Now, click on the Paste icon inside Microsoft Ribbon's home button or press Ctrl and V keys once on the keyboard.



When working on a word document, you may have to put the same content in two or more locations in some places. For this, it can be copied and pasted. While doing this, the selected word stays in both the previous place and the new place. For this, highlight the topic that needs to be put in another location too. Click on the copy icon inside the home button of the Microsoft Ribbon as shown above or press the Ctrl and C keys at once from the keyboard. Then click and paste in the location of the Word document.

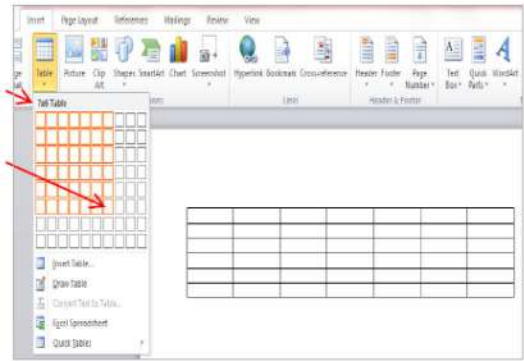
Tabulation Work in Microsoft Word

1. Create a new word file.
2. Click the Insert tab at the top of the blank page ribbon.
3. Then click on the icon next to the table and a grid popup with an empty table will appear. Place the mouse pointer in the upper left room. Move the pointer to the right and down to select as many rooms as you need on the table. A table with equal sized room will be inserted on your page.



The group of vertical rooms on the table are columns and the group of horizontal rooms on the table are called rows. The

space where rows and column get crossed are called a room or a cell. Now fill in the required information i.e. data by typing from the keyboard in the cells of the table. You can use the keyboard arrow keys to move from one cell to another, or you can click the mouse on the desired cell.

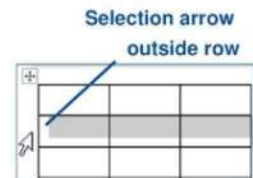


i. How to Select table, row, column, and cell

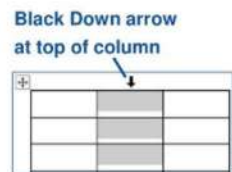
1. Click on one of the cells inside the table to select the whole table. When you do this, you will see a four-faced arrow mark in the left corner of the table. When the mouse pointer is placed on the arrow, the pointer becomes four-faced. The whole table can be selected by clicking on that place. Clicking on the arrow and dragging the mouse around moves the whole table.



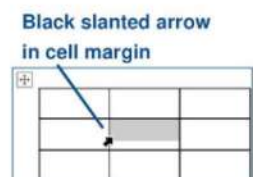
2. When you move a mouse pointer right in front of a row to select a row, the pointer turns upside down and changes shape. When you click on that place, a whole row is selected.



3. To select a column, move the mouse pointer just above the column you want to select. The pointer turns upside down and changes shape. Clicking on that place selects a whole column.



4. To select a cell the mouse pointer right in front of the cell. which is moved to be selected.



ii. Use of table tools

1. Make another table in the Word Document that you have opened. Click on the table you have inserted, and then click on the Design tab on the ribbon on that page. You will see a variety of table structures there. Click on the required size.
2. The size of the table cell on your page can be made larger or smaller. To do this, click on the table you have inserted and click on the Layout tab on the ribbon of that page. The space around the table cell can be increased or decreased by clicking on the cell margin icon. Using the Aligning Data icon, the characters in the table cell can be written in the lower part, upper part, left corner, right corner or center. To split one cell into two cells, select one of the cells and click on the Split Cell icon. Then, in the next window, select two columns and one row. If you want to merge two cells into one, first select the two cells by dragging the mouse. Now click on the Merge Cell icon. You will find two cells merged into one cell.



When working on a table, sometimes additional rows or columns need to be added between rows or columns. To add a row in the middle, choose where to add the row first. Now click on the Insert Above or Insert Below icon. Similarly, select a column to add a column in the middle of the table. Now click on insert left or Insert Right.

Activity 2.11

Open Microsoft Word on your computer, create a table and make row, columns and cell look alike as shown in figure below. Practice merge, insert and split of cell, rows and columns.

Activity 2.12

Open Microsoft Word on the computer. write a paragraph on science and technology in a Word document. Fill in the details of five of your classmates by inserting the table as shown below on the document page. Save the document on my desktop with 'MyClass' as filename or any other file name.

Logo	Shree School					Class
					
	Student's Record- 2078					
Section						
S.No	Name of the student	Father's name	Mother's name	Address name		Contact no

Project work

Make a table from the computer's word processor and fill in the names, gender, age and occupation of all the members in your household.

Use of multimedia

The use of TV, computer, smart-phone etc. is becoming common in our daily life. Sometimes when you watch an advertisement on TV, you may have seen the words and pictures artistically presented with audio and video. When viewing such advertisements, the viewers clearly understand what they are trying to show. Similarly, using computers, projectors, speakers, screens, etc., you can watch videos containing such texts in Science and Technology classes. Multimedia is a combination of words, pictures, sounds, animations and videos seen and heard in daily life. It is used to convey contents effectively.



Fig: 2.14



Fig: 2.14

The development of technology has led to the widespread use of multimedia. It is being used extensively in the fields of education, entertainment, trade, etc. Multimedia is used for effective teaching and learning in the field of education. In the elementary class, letters, numbers, stories, poems, songs, etc. are displayed as multimedia. The materials presented in this way are more effective for learning. In multimedia, softwares are needed to give artistic moves to letters and pictures and to combine audio and video. For the purpose of the class, the content including multimedia can be prepared using Microsoft PowerPoint. Google Slides can also be used for multimedia presentation online.

Examples of some multimedia software and their use:

Table 2.8

Multimedia Software	Uses
Adobe Illustrator, Adobe Photoshop	Creating graphics
3D Studio Max	Creating 3D animations
Microsoft PowerPoint	Creating Presentations
Macromedia Director	Authoring multimedia
Sound Forge	Sound editing
Adobe Premier	Video editing

Creating PowerPoint presentation

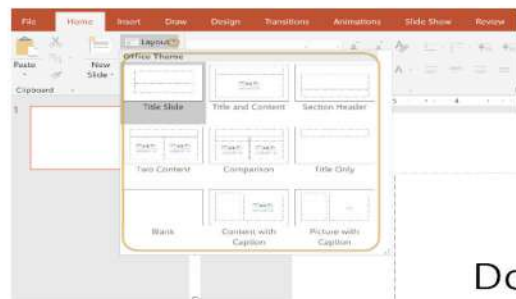
Microsoft PowerPoint is a software for creating multimedia presentations. Store content, related images, audio, video, etc. on your computer before preparing a presentation.

1. Turn on the computer and open Microsoft PowerPoint. It can also be opened by pressing the Start button and typing PowerPoint.

2. Selecting Blank Presentation opens a file with the name of the presentation 1. Save the file with your name.



3. When clicking on the Home tab on the Microsoft PowerPoint ribbon, you will see a layout icon. Clicking on the icon allows you to choose the layout of different slides. For exam-



ple, the title slide can be used to write the title. Type a title of your theme by clicking on the title box of the slide.

Dc

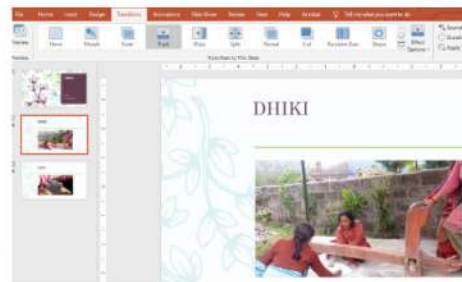
Type the content you want in the text box under the title.



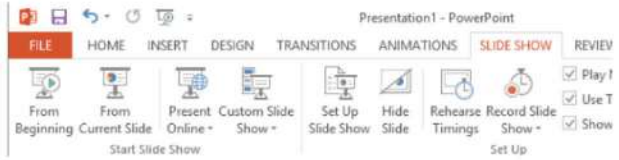
4. Now give your favorite theme on slide. To do this, click on the Design tab in the Microsoft PowerPoint ribbon. You will see a variety of themes there. Click on a theme.
5. Click on the 'Insert' tab on the PowerPoint ribbon to add more slides, images, audio, videos and videos to your presentation. For this, you have to browse or bring where your picture, audio, video file from the wheel they are kept on the computer.



6. While presenting power point slide, how the sides come one after another can be selected by choosing transition in the power point ribbon. For example, if the transition of second slide is selected as 'Push], then the second slide after the first is displayed in the screen as if pushed from the bottom to the top. In this way, the presentation can be made attractive by using transitions.
7. Before performing your presentation, save the file and click on the Slideshow tab in the PowerPoint ribbon. Then click on the From Beginning icon that appears. After a slide show, click the mouse. Present the new slide continuously.



If you want to make a presentation in full screen on a computer or projector, press the 'F5' button on the keyboard. When the slide show is finished, press the escape button ESC from the keyboard. Then you will return to your former screen.



Activity 2.13

Create a PowerPoint presentation based on themes related to local technology and modern technology. Demonstrate your presentation in the classroom with the help of your teacher.

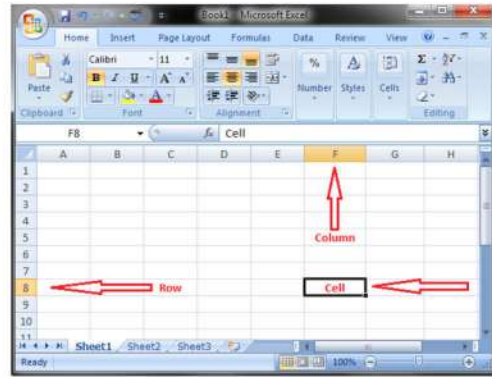
Use of Spreadsheet

In the school, the educational details of the students are prepared and stored in the computer. For this, spreadsheet is used in the computer. A spreadsheet is a computer file made up of many rows and columns. It can be used to easily combine a lot of information or data. Similarly, addition, subtraction, multiplication, percentage, etc. can be done mathematically easily. Spreadsheets are also called worksheets or sheets. Worksheet is a page and a group of many pages is called a workbook. Spreadsheets are used in various fields to calculate and manage information. It is used to keep account details in the banking sector, to record student results in the education sector, to keep patient details in the hospital, to keep telephone user details in the communication sector. There are various types of spreadsheet programs available today for this purpose. There are such programs as Google Sheets, Apple Office Suite, and Microsoft Excel etc.

Activity 2.14

Create an open file in Microsoft Excel on your computer. Take a look at the various features of the Excel spreadsheet. Identify rows, columns, cells, etc. in it.

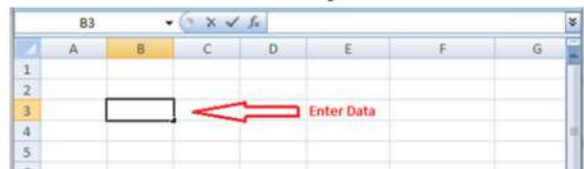
After opening Microsoft Excel, you will see a spreadsheet named Book-1 Microsoft Excel (as shown in the picture). It can be saved by any name. When inserting a table in Word, it can be separated into rows, columns and cells. The rows in the spreadsheet are denoted by 1,2,3,4,... and the columns in the spreadsheet are denoted by A,B,C,D,..... The row 8 and column F is shown in the picture.



The place where the column and row are cut in the spreadsheet is called cell. The cells are filled with data. Each cell has an address. The address of the cell pointed in figure is F8, where F indicates column and 8 indicates row.

Filling data in spreadsheet

1. Select the cell where you want to enter data by clicking the mouse once. The cell you want to enter the data in the picture is B3.
2. Now type words and numbers from the keyboard. The selected row can be filled by double click.



3. Press 'Tab' key from the keyboard to move to another column after filling data in one cell. Press the 'Enter' key from the keyboard to move to the lower cell of the same column.
4. Use the arrow keys to point from the keyboard to select left, right, and upstairs cells as needed on the spreadsheet. Or you can use the mouse to click on a cell.

5. In most cases, the words we fill in the spreadsheet do not fit in a cell, and when we press the 'Enter' button, some of the typed part is covered by the side cell. For example, the content of cell A2 is covered by cell B3 in below figure. In this case, when you move the mouse pointer between the columns A and B, you will see an arrow on both sides. In this case, when clicking the mouse twice, the width of the entire column changes accordingly. In the same way, the width of the row can also be changed.

Data auto fill

In some cases, the data that needs to be filled in a column or a row of the spreadsheet is constantly repeated. In this case, the data can be typed in one cell and re-entered in another without typing again. For example, in the picture below, the word 'YES' is filled in one cell and the other cell is filled automatically. For this you will see a small square in the lower right corner of the cell filled with the initial data. When you move the mouse pointer over the square, the plus sign appears. When the icon appears, drag the row to the right or the column to the bottom with the click of a mouse. Hover the mouse over the data to be filled and drop where you have to end filling.

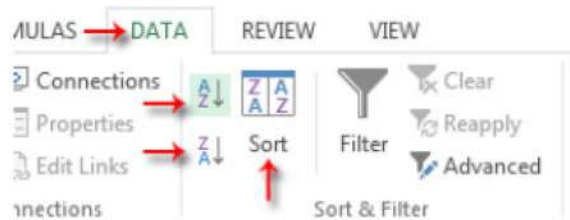
Sometimes when filling a number in a row or column, you have to fill in the increments according to the number. For example,

in the picture above, in column A, 1 and 2 are filled and rest of the numbers up to 10 are filled in the other cell without typing from the keyboard. To do this, fill in the blanks in the first cell as you did above, then move the mouse pointer over the small square in the lower right corner of the cell to see the plus sign. When the icon appears, press the control button on the keyboard a small plus sign appears. Now, with the click of a mouse, drag and drop to the bottom of the column. Hover the mouse over the data to be filled before dropping.

Sorting data in a Spreadsheet

When working in a spreadsheet, in some cases the data has to be kept in order for easy study. The data filled in the column can be arranged in alphabetical order and in case of numbers, it can be kept in increasing or decreasing order. For this,

1. First select the data to be sorted in the column or columns. Just like selecting columns in Word, in a spreadsheet, you can select the whole column by moving the mouse pointer to the top of the column, or you can select the data by dragging the mouse from the beginning to the end of the selected part.
2. The Excel Ribbon menu appears in the Data tab on the bar. When you click on it, you can see the short-cut options as A to Z



Sort options in Data tab of Excel.

and Z to A as shown in the picture below. Clicking on the A to Z icon will cause the data to arrange in increasing alphabetical order and down while clicking on the Z to A icon will go decreasing order.

Activity 2.15

Fill in the names of all the students in your class and the marks they obtained in a spreadsheet as shown. Now align the student's name alphabetically. Based on the scores obtained again, adjust from smaller to greater.

Project work

Enter the names, genders, and ages of all members of your household using a spreadsheet. Now combine everyone's names in alphabetical order and age in increasing order.

Exercise

1. Fill the blanks.

hardware computare row column software cell

- i. The word computer originates from the Latin word
- ii. The parts of a computer that we can touch and see are called
- iii. The collection of programs is called
- iv. A spreadsheet is a program made up of many and.....

2. Distinguish whether the following are right or wrong.

- i. Keyboard is an input device. ()
- ii. Monitor is an input device. ()
- iii. The computer works on IPO principle. ()
- iv. PowerPoint is also called worksheet. ()

3. Choose the correct option from the following:

- i. Which organ is mostly affected by prolonged use of smartphone?
(a) Eyes (b) brain
(c) backbone (d) abdomen
- ii. Which theory is correct according to the principle of working by computer?
(a) Input, output and processing
(b) Input, processing and output

- (c) Output, input and processing
- (d) Output, processing and input
- iii. What is known as B5 in Microsoft Excel?
 - (a) Row and column
 - (b) Column and row
 - (c) The second column and the fifth row cell
 - (d) The fifth column and the second row cell
- iv. What is meant by spreadsheet?
 - (a) Workbook
 - (b) Worksheet
 - (c) Workdate
 - (d) Workpit

4. Look at the picture and answer the following question:

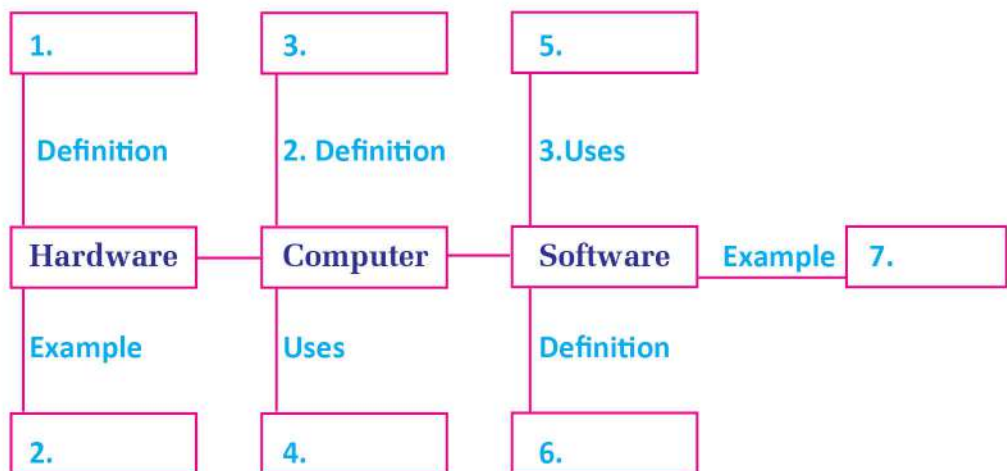
- i. Name the equipment provided.
- ii. State the common names of the devices provided.
- iii. What should be done to avoid the effects of overuse of these devices?

5. Write the answer to the following question:

- i. Discuss the precautions to be taken while using smart-phones and computers.
- ii. Mention the field in which computers are used.

- iii. Are laptops, desktops, tablets, iPads, smartphones all computers, why?
- iv. Describe the working principle of computer.
- v. Explain the input devices, processing devices, output devices and storage devices in the computer with examples.
- vi. A friend of yours is typing the names of all the classmates on the computer in the alphabetical order by searching the letters. How will you teach your friend to perform that task in short and easy way? Mention those ways in points.
- vii. If your teacher asked you to make a presentation about the school, what computer program would you use to do that? Write the method of preparation in points.
- viii. Which computer program do you use if you have to fill the marks obtained by your classmates? How do you work on that file?

(I) Complete the chart by writing the match in the empty box:



6. Differentiate between:

- i. Input device and output device
- ii. Hardware and software

Word meaning:

Automatic	:	self-running
Submarine	:	A ship that sails both underwater and on the surface of the water.
Local Technology	:	Simple tools made from general knowledge and skills
Drag	:	Pulling work
Merge	:	The act of merging or uniting
Insert	:	to add writing to a text, form, etc.:
Cell Margin	:	The outer edge of the box
Column	:	A group of vertical cells at a table
Row	:	A group of horizontal cells at a table

Unit 3 **Organisms and their Structure**

There are different types of plants and animals found in our surrounding. They have different shape, size and body structures. They are classified into different groups based on their structure, habitats, foods etc. to make the study of animals and plants found on earth easier. Organisms have different characteristics and body structure to grow and obtain food from environment.

3.1 Adaptation of organisms

Various types of organism are found in different environment. They have different body structure to survive in a particular environment. Organism can survive easily due to those body structures.

Fish lives in water. Rat lives in hole. Birds fly in air. Organisms have specific organs for these purposes. Organisms can adapt in the environment due to these organs.



Fig 3.1



Lotus



Hydrilla



Water hyacinth



Pistia

Fig no. 3.17

Project works

Observe different types of plants found around your home and school. Write their structures and adaptational features of those plants in the given table and present it in your class.

S.N	Name of plant	Organ/structure	Function
1	Beans/ black eye beans	tendrils	surrounding the other plant to climb up
2			
3			
4			

Exercise

1. Fill in the blanks with suitable words.

gills adaptation flexible strong water air

- Ability of organisms to adjust in environment is called
- Aquatic animals respire through or skin.
- Terrestrial plants have hard and stem.
- Plants grown on hot and dry place has..... storage capacity.
- The stem of aquatic plants is

2. Choose the correct answer from given alternatives.

- a. Which of the following animal is found on desert ?
(i) Cow (ii) Yak (iii) Sheep (iv) Camel
- b. Which of the following animal's body is covered with thick fur ?
(i) Cow (ii) Yak (iii) Camel (iv) Rhinoceros
- c. Which animal changes its body temperature according to environment ?
(i) Human being (ii) Bird (iii) Fish (iv) Cow
- d. What type of leaves are found in plants which grow on dry places?
(i) Big (ii) Broad (iii) Long (vi) Thorny

3. Write differences

- (a) Water hyacinth and maize
(b) Aquatic plant and terrestrial plants

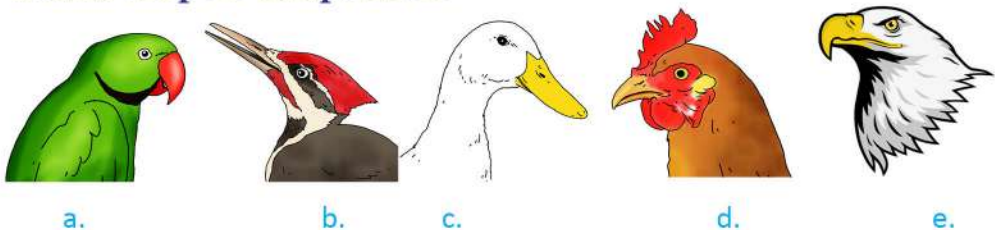
4. Write one function of each of the following organ of animals.

- a. Wings b. Gills c. Sharp claws
d. Pointed mouth e. Phalanges with sharp claws

5. Draw figures of following animals and plants.

- a. Fish, b. Cat, c. Bird, d. Bean, e. Pine

6. Beaks of different birds are given below. Write, how these beaks help in adaptation.



7. Answer the following questions.

- Write any four adaptation characteristics of terrestrial animals.
- Write any four adaptation characteristics of aquatic animals.
- How do thick and long fur and hair of sheep and yak help to survive in Himalayan region?
- Fish can survive in water but rat can not, why ? Write down based on their body structure.
- How does broad phalanges with claws of a tiger and a bear help to adapt in environment ? Write.
- Pemba likes lotus flower blooming in a pond. She thought of planting a lotus on a pot in her house. Can she grow there ? Present your opinion with reasons.
- To compare the adaptation of stem, roots and leaves of water hyacinth and cactus, prepare a table like given below and complete it.

Plant	Leave	Stem	Root
water hyacinth			
cactus			

3.2 Classification of animals on the basis of food

All animals need energy to survive. Organisms eat food for that purpose. They obtain energy by digesting food they have eaten. They perform their life processes from that energy.

Activity 3.7

List down the name of animals found around your house or school. Now observe. What do these animals eat? And fill the given table.

S.N.	Name of animal	Food
1.	Insects	Plant's leaves
2		

Animals eat various types of food. Cow and buffalos eat grass, plants and grains. Tiger eats flesh of other animals. Cat eats rats. It also eats milk and rice. Eagle and vulture tear and eat flesh of other animals. Crow eats both fruits, grain of plants and fles h of animals. Animals have different types of sources of food and process of taking food. According to that their body and organ structures are also different. Based on the process of taking food, animals are classified into three types.

a. Herbivores



Buffalo



Cow



Deer



Rabbit.

Fig no. 3.18

Animals which feed on plants, grains and fruits are called herbivores. Cow, buffalo, deer, rhinoceros elephant etc. are herbivorous animals. They have teeth in their mouth to chew. That help them to chew grains pulses. They have a long alimentary canal in their digestive system.

b. Carnivores

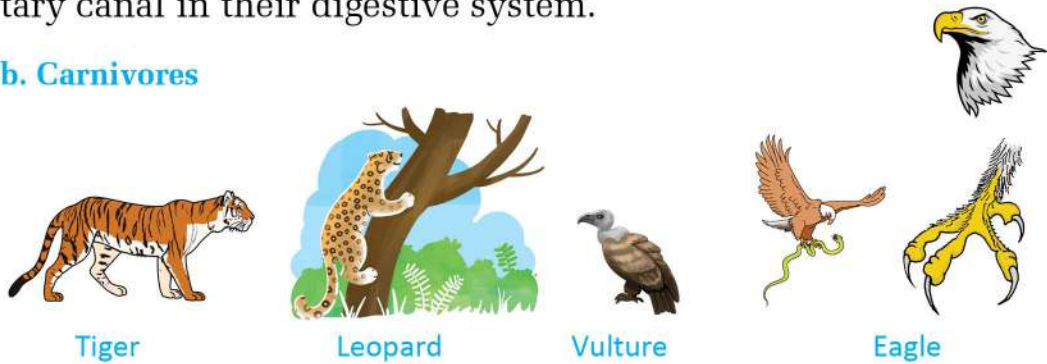


Fig no. 3.19

Those animals which feed on flesh of other animals for their survival are called carnivores. Tiger, leopard, vulture, eagle etc. are carnivorous animals. Tiger, leopard has long and sharp teeth in their mouth. They have sharp and strong claws in their feet. These organs make easier to catch other animals. Eagle catches other birds and small animals with the help of claws present in its feet; and tear and eat flesh with the help of pointed beak. Vultures also tear and eat flesh from dead bodies of animals with the help of their long beak. Tiger and leopard eat flesh of other animals by killing them with the help of their strong claws and sharp teeth. strong claws help to catch animals and sharp and long teeth are used to bite them to kill them. They have shorter alimentary canal than herbivores.

C. Omnivores

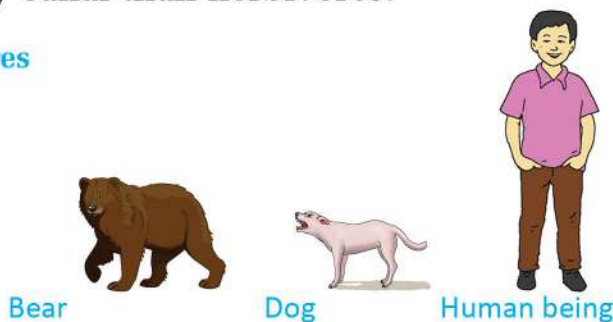


fig no . 3.20

Omnivores are those animals which feed on both plants and animals. They have teeth in their mouth which are useful to chew grains, pulses and meat. Bear, human being, dog etc. are omnivorous animals.

Activity 3.8

Observe the animals found in your surrounding and categorise them into herbivores, carnivores and omnivores groups.

Herbivore	Carnivores	Omnivores
1.	1	1
2.	2	2

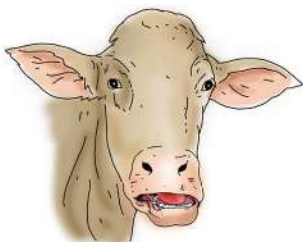
Summary

Exercise

1. Categorize the following animals into herbivores, carnivores and omnivores group

- (a) Cow (b) Dog (c) Tiger (d) Crow
(e) Vulture (f) Elephant (g) Cat

2. Observe the teeth of following animals and categorize them into herbivores, carnivores and omnivores.



a.



b.



c.

3. Write answers to following question.

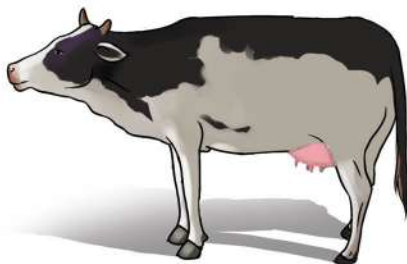
- Write any three features of herbivores.
- Write three features of body structure of carnivorous animals.
- Write any four differences between herbivores and carnivores.
- Define omnivores.
- List out the herbivorous and carnivorous animals found in your surrounding.
- Dog not only eat flesh but also eat rice. Can it be said an omnivore? present your opinion.
- What type of animal is human being based on the process of taking food?

3.3 Vertebrates :

Lets look at pictures and discuss



Human being



Cow



Pigeon



Fish



Frog



Snake

Fig no. 3.21

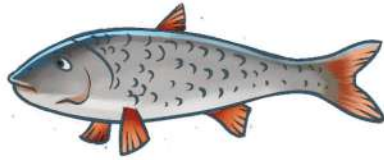
Questions to think

- Do all organisms have vertebral column ?
- What function does bone do in animal's body ?
- Do all the vertebrates live on land ?

Animals having vertebral column in their body are called vertebrates. Human being, monkey, cow, buffalo, hen, birds, fish, frog, snake etc are vertebrates. Vertebral column present in their body bears their body weight. Some of these animals live in water, some live on land and some live on both water and land. vertebrates are classified into two groups based on wheather they can change their body temperature according to environment or not.

A. Cold blooded animals

Why do animals like snake, lizard, frog not seen during winter season ? Discuss.



Fish



Frog

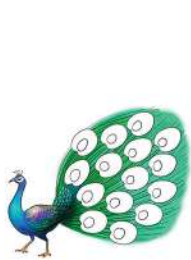


Lizard

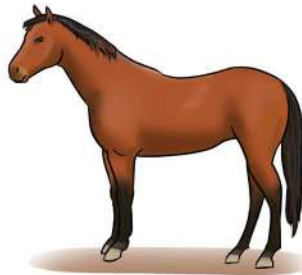
Fig no 3.22

Animals which can change their body temperature according to environment are called cold blooded animals or poikilothermic animals. Fish, frog, Lizard tortoise, crocodile, snake, wall lizard, are cold blooded animals. Some cold blooded animals go for hibernation during the winter season to protect themselves from severe cold.

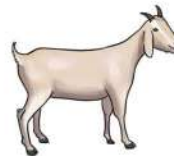
B. Warm Blooded animals



Peacock



Horse



Goat



Whale

Fig no. 3.23

Animals which can not change their body temperature according to environment and remain constant are called warm blooded animals or homoeothermic animals. Human being, cow, buffalo, tiger, rhinoceros and different types of birds belong to this group. The body temperature of the animals always remains constant. For example; a healthy human being has the body temperature of 98.6 of.

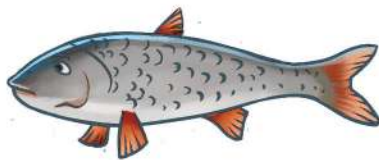
Question to think

We wear thin clothes during summer season and thick clothes during winter season. What type of role does these clothes play to keep our body temperature constant ?

Vertebrates are classified into five classes based on their body structure and characteristics.

1. Pisces- different types of fishes
2. Amphibia - frog, salamander etc.
3. Reptillia- Lizard, crocodile, snake, tortoise etc.
4. Aves- Hen, pigeon, lophophorus (Different types of birds)
5. Mammalia- Human being, bat, whale, cow etc.

Pisces



Fish



Sea horse

Fig no. 3.24

All types of fishes belongs to this class. Their body is streamlined. Characteristics of animals who belongs to this class are as follow:

- i) Their body is flat, slender and covered with scales.
- ii) They live in water
- iii) They swim in water with the help of fins.
- iv) They have gills on both side of head to breathe.
- v) They have two chambered heart.
- vi) There is external fertilization and lay eggs in water.

Example : Asla, Rohu, sea horse etc.

Activity 3.1

Collect an earthworm from soil near your house and school and observe it carefully. How is the structure of it ?

Keep the earthworm by making its half body on sunlight and half on shady moist soil and observe which side it move.

In which place does it resides, Also observe the butterfly, fish etc and compare their habitat and their body structure. Study the different characteristics of different organism found in your surrounding.

S.N	Name of organism	Place where they live	Characteristics
1.	Earth worm	moist soil	soft body
2.	Butterfly		
3.	Fish		

Organisms fulfill all their needs from the environment. They have developed suitable body structure, physiology and features for these purposes. Specific characteristics developed to adapt in a particular environment are known as adaptational feature. These organisms can grow easily in a particular environment due to these characters.

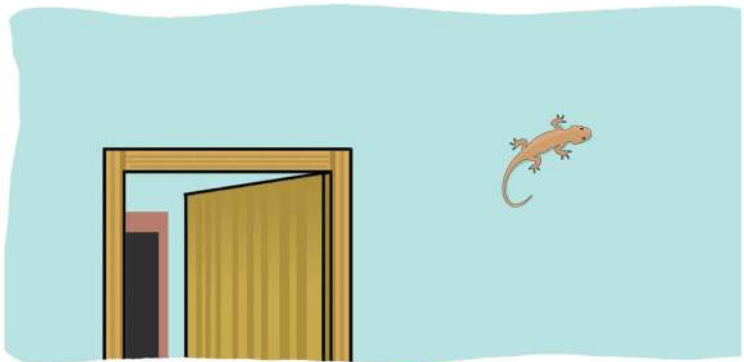


Fig 3.2

Question to think

Have you seen wall lizard crawling on the wall ? How does it crawl there?

Amphibian

Animals of this class live on both land and water. Because of that they are called amphibian. Their life starts from water. Characteristics of animals who belong to this class are given below:



Fig no. 3.25

- i) Their skin is slimy and slippery.
- ii) Their heart contains three chambers.
- iii) They have four limbs.
- iv) They respire through gills during Tad-pole stage and respire through skin inside water and they respire through lungs when they are on land.
- v) There is external fertilization in them and lay egg in water.



Fig no. 3.26

Reptilian

Most of the animals belong to this class crawl on the ground. Most of them live on land; some live in water. Characteristics of this class are as follows:



Crocodile



Tortoise



Wall Lizard

Fig no. 3.27

- i) Their skin is dry and covered with hard scales.
- ii) Most of the animals of this class have three chambered heart.
- ii) They respire through lungs.
- iv) They lay eggs on land.
- v) They show locomotion by crawling.

Example : Snake, crocodile, tortoise, garden, lizard, wall lizard etc.

Aves

All types of birds belong to this class. The characteristics of animals belonging to this class are as follows:

- i) Their body is covered with fur and feather.
- ii) They have a pair of wings, a pair of legs and a beak.

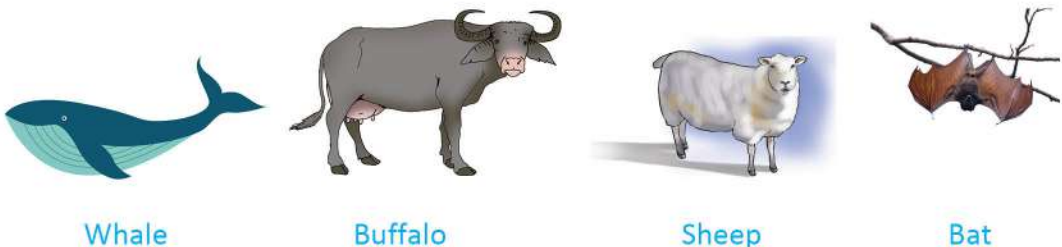


- iii) They respire through lungs.
- iv) Heart contain four chambers.
- v) Bones are light and hollow.
- vi) Forelimbs of birds are modified into wings.

Examples: Pigeon, duck, hen, lophopuorus, peacock, crow etc.

Mammalia

Most advanced animals belong to this class. Most of the mammals live on land. Some live on water and some fly in air too, For example; whale and dolphin live in water and bat flies in air. The characteristics of animals belonging to this class are as follows:



Whale

Buffalo

Sheep

Bat

Fig no 3.29

- i) Their body is covered with hair
- ii) They give birth to body and suckle milk to their body.

- iii) They respire through lungs.
- iv) Heart contains four chambers.
- v) Most of the organisms have a pair of external ears.

Examples: Human being, bat, whale, wow, buffalo etc.

Activity 3.9

Find out the animals what covers their body which you have seen and fill up the given table.

S.N	Name of animal	scale	Feather	Hair
1.				
2.				
3.				
4.				

Project work

What kind of animals are found around your residence? Visit a pond, lake, river or forest near your village or residence and collect the name of animals you have seen there. Write the name of animals in which group they belong to making a table just like the given below:

S.N	Fish	Amphibian	Reptilian	Aves	Mammalia
1.					
2.					
3.					

Summary

1. Animals having a backbone in their body are called vertebrates.
2. Animals whose body temperature changes continuously according to environment are called cold blooded animals or poikilothermic animals.
3. Animals whose body temperature does not change according to the environment and remain constant are called homeothermic warm blooded animals.
4. Vertebrates are classified into five classes. they are Fish, Amphibian, Reptilia, Aves and Mammalia.
5. Animals that belong to fish have flat, slender streamlined, body covered with scales.
6. Amphibians live both on land and water.
7. Crawling animals belong to reptilia.
8. All kind of birds belong to Aves. Their body is covered with fur and feathers and they have a pair of wings, a pair of legs and a beak.
9. The animals which give birth to their baby and suckle milk belongs to Mammalia.

Exercise

1. Fill in the blanks with suitable word.

Homeothermic

Vertebral column

Light

Poikilothermic

three

Gills

- Vertebrates body has
- Fish respire through
- General reptiles have chambered heart.
- Bones of aves are and hollow.
- The animals whose body temperature does not change and remain constant are called

2. Choose the correct answer from given answers.

- Which one is vertebrate ?
(i) Butterfly (ii) Snail (iii) Leech (iv) Fish
- Which animal gives birth to the baby.
(i) Pigeon (ii) Bat (iii) Parrot (iv) Peacock
- Which organ is used to respire by most of the aquatic animals
(i) Skin (ii) Trachea (iii) Gills (iv) Lungs
- How many chambers are present in heart of aves ?
(i) Two (ii) Three (iii) Four (iv) Five

3. Match the following

Light bones

Human

Three chambered heart

Fish

Four chambered heart

tortoise

respire through gills

Bird

Lives on both land and water

sea horse

frog

Adaptive characteristics of terrestrial animals

The animals found on land have different body structure. Let's study the adaptational features of these organisms.

Activity 3.2



Fig No 3.3

Observe the adaptation features of some organism like yak, cow, buffalo, goat, sheep, horse, donkey, dog, cat etc. and fill in the given table.

S.N.	Name of animals	Adaptation features
1.	sheep, yak	thick fur on body
2.		

The fast running and hunting animals have broad phalange and strong claws. The structure of phalange of dog, cat, tiger, bear etc. provides adaptation to them to catch their pray and to run. fast running animals have long and strong legs.



Fig No 3.4

The animals found on Himalaya and cold regions are covered with thick fur or hair. It protects the animals from cold by keeping its body warm. Body of yak, polar bear etc are covered with thick fur.



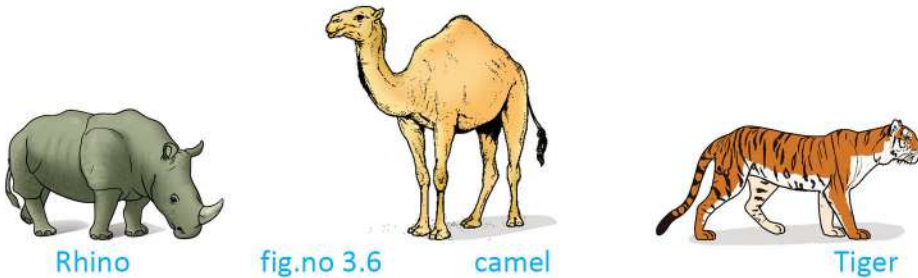
Polar bear



fig.no 3.5

Yak

The animals found on hot climate have thin fur in their body to adapt in that climate. The strong muscle of animals found on land help them to walk and run. The animals found on desert have thick and dry skin to prevent the loss of water from their body. Camel has hump in its back that stores fatty substance which is utilized to obtain energy even though they do not get food for long time. Camel can drink a large amount of water at a time. Its body structure is also helpful to prevent loss of water.



Rhino

fig.no 3.6

camel

Tiger

Some animals climb trees. The chest of these animals are very strong. Phalanges of monkey are long and clamping type which helps to catch the branches of trees. The leg of wall lizard has many hooks and is covered with thick covering. Such hooks help to create suction pressure. There fore wall lizard can walk on a wall and willing. It can also leave its tail to protect it from enemy.



fig.no 3.7

Activity 3.3

Observe the different types of birds found in your surrounding and write the structure of organs and their characteristics. Write the name of organs and their functions in the given table.

S.N	Name of bird	Name of organ	Function
1.	Hen	beak	pick the grains
2.	Dove/Pigion	wings	
3.	Eagle	sharp eye sight	
4.	Crow	sharp beak	
5.	Duck	flat and broad beak	

Wings and hollow bones of birds help them to fly. They have different types of beak to perform different functions. Beak of some birds are adapted to pick grains, insect and to eat fruits. Woodpecker has a long and strong beak. Duck has a flat beak to pick the food from muddy soil.

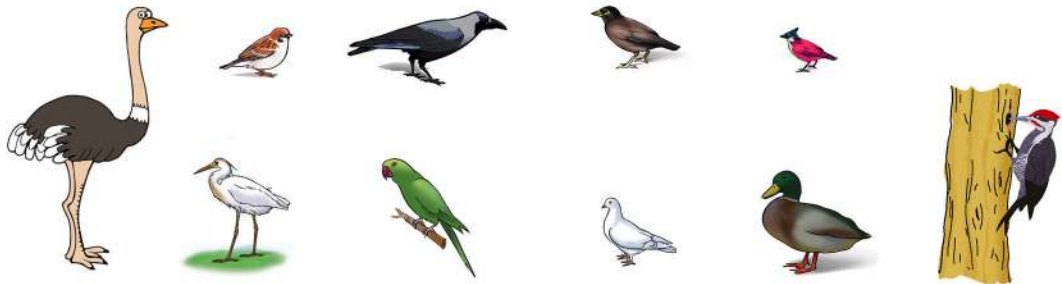


Fig no. 3.8

Activity 3.4

Search the pictures, videos of animals which live in hole like : rat, squirrel, porcupine from the internet or other sources. Observe their adaptational characteristics and prepare a chart of it and then present it in the class. Also observe the adaptational features of other animals found in your surrounding and fill in the given table.

S.N	Name of animal	Organ or structure	Function
1	cat	claw	catch rat
2			
3			
4			
5			



Rat



Snake



Rabbit

Fig 3.9

Some animals live in holes. Some animals make their hole themselves and some lives in holes made by others. Rat and rabbit make their hole themselves. They have pointed and strong mouth and sharp claws in their legs. Snake lives in hole made by others.

Adaptational characteristics of aquatic animals

Activity 3.5

Observe fish and fill up the given table.

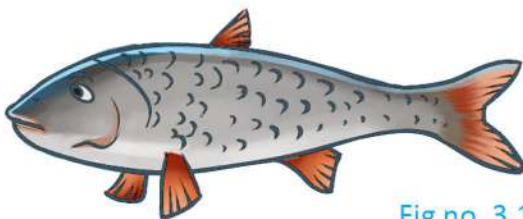


Fig no. 3.10

S.N	Adaptation features of fish	Function
1.	Streamlined body	makes easier to swim

2	Slippery scales on body	
3	Fins present in body	
4	Gills	

Aquatic animals have streamlined body. That helps them to swim in water easily. Outer covering of their body is slimy and slippery. Fins help them to swim easily. Some of the aquatic animals respire through gills. Their body temperature changes according to their surrounding. Their body is covered with scales. Most of these animals do not have lungs but crocodile and dolphin have lungs.



Fig No. 3.11

Adaptation characteristics of terrestrial plants

Activity 3.6

Collect different types of plants found around your house or school and observe stem root, and leaves. Note the adaptation characteristics shown by those parts of plants.

Just like animals, some plants are found in water and some are found on land. The shape and size of plants differ based on the place where they are found.

Roots of plants found on land are more developed than the roots of aquatic plants. Their stems are hard and strong. Different features can be seen on the plants which grow on different parts of land.



Coconut



Mango



Rubber

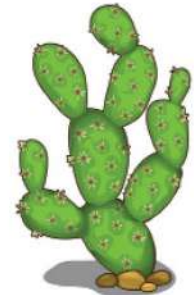
Fig No. 3.12

The plants found on hot places are tall and have hard stem. their leaves are gathered at the top of plants. Mango, coconut, rubber etc. are these type of plants.

Plants found on dry places have thick bark. Their leaves are thick and small. Stems are thick and green. Roots reaches deep into the land. They have more water storage capacity. Leaves of some plants are modified into thorns, Catcus, aelovera are the exam- ples of the those types of plants.



Alovera



Cactus

fig No. 3.13

Small sized plants are grown in those places where very less amount of sunlight falls. Generally non-flowering plants are grown in such places. Fern, moss etc are the examples of those types of plants.



Fern



Mushroom



Moss

Fig No. 3.14

Plants grown in himalayan region and snow falling places have thin and needle shaped leaves. These are cone shaped plants. Pine, dhupi, etc. are examples of these plants.



Pine

Dhupi

Fig 3.15

Some plants have vines. These plants climb up on other plants or support with the help of those vines and tendrils. Beans, cucumber, sponge gourd etc. are example of these plants.



Bean

Cucumber

sponge gourd.

fig No. 3.16

Adaptational characteristics of aquatic plants

Plants like algae grown in water do not possess roots. Aquatic plant's roots are not so developed. Some plants float in water and some are submerged in water. Floating plants have thin fur for floating and balancing roots. Their stem are soft and flexible. Even they float with water, stem do not break down Water hyacinth (jalkumbhi) plants float in water due to the presence of hollow stem below the leaves. Lotus plant has broad leaves and floats in water but roots are inside the soil. Submerged plants have small leaves. In this way, root, stem and leaves are different according to plants.

unit 4 Biodiversity and Environment

There are different types of animals, birds, plants and microorganisms along with human being on the surface of earth. There are many diversities on food, habitat and body structure of these organisms. The diversity between organisms is called bio diversity. There are not only living things but also non living things in our surrounding. So, all different types of living things and non living things in our surrounding is environment.

Environment

Let's see the picture and discuss:



Figure no 4.1

1. What are the organisms you have seen in picture ?
2. What are the natural resources you have seen in picture except organisms ?
3. What type of inter relationship is found between organisms and natural resources ?

All the animals, plants, microorganisms and non-living things found on earth are interrelated with each other. The environment of particular place is created due to interrelation

between biotic and abiotic factor present over there. The complete structure of air, water, land, sunlight, plants, animals and other organisms found in our surrounding is environment. Living things survive in environment and affect each other. All the living organisms along with human being obtain water, food, energy, nutrients necessary to perform their life cycle from environment. Human being should take care of environmental factor while fulfilling their needs from environment to conserve it. This is called environmental conservation.

Activity 4.1

Observe the living things and non living things present around your school or residence. Prepare a list of them and discuss in class.

Air, water, soil, energy, plants, animals organisms etc are environmental factor of that particular place.

Air

Earth is surrounded by air. This layer of air is called atmosphere. Air contains nitrogen, oxygen, carbon dioxide and other gasses. Oxygen present in air is life gas. All the plants and animals need oxygen to respire. Living things take oxygen and release carbon-dioxide during respiration. Green plants take atmospheric carbon-dioxide and release oxygen during photosynthesis. In this way, level of carbon dioxide and oxygen is balanced in environment.

Water

Seventy one percent of earth surface is covered with water and 29 percent of earth is covered with land. River, rivulets, lake, pond, well etc are the sources

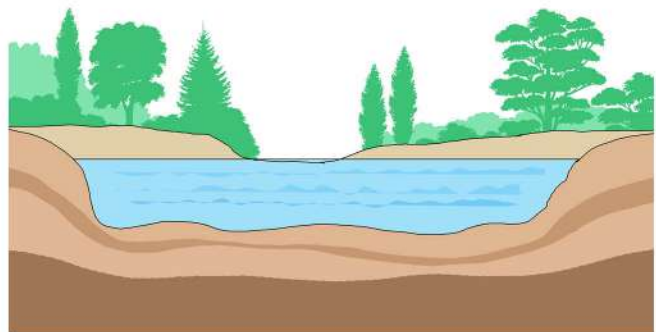


fig no 4.2

of water is compulsory for the survival of living organisms.

Land

Land represents surface of the earth. Soil and rocks are found on land. Land is of different forms like: plane, high, slopy, low lands etc. Land gives base for germination and grow plants. Plants absorb necessary nutrients from land. Human beings plant their crops, fruits, vegetables, medicinal herbs etc in soil. Soil is also the habitat of animals.

Energy

Sun is the main source of energy on earth. We get heat and light from the sun. Heat obtained from the sun keeps the earth warm. Plants prepare their food in the presence of sunlight. Plants cannot prepare food without sunlight. Animals survive by eating those plants. Timber and firewoods are obtained from trees. Heat and light is obtained by burning firewood. Surface water present on earth evaporates in the form of vapour and reaches to the sky due to sunlight. When water vapour cools down then forms cloud and falls on earth surface in the form of rain and snow. Because of these, water flows in rivers and rivulets.

Plants

Small grasses to large trees found in our surrounding are plants. Plants are the main source of food for organisms. Along with this timber obtained from plant is used to construct house. Oxygen used for respiration is also obtained from plants. Forest provides habitat for wild animals and different birds. Plants roots capture soil and prevent soil erosions:

In this way, plants purify air, conserve soil and provides habitat and food for animals, therefore, plants has very important role in environmental balance.

Animals

Unicellular organisms to very big animals are found in

environment. They take oxygen and release carbon dioxide in environment. They depend on plants and other animals for their food. When they die, microorganisms decay them and mix in soil in the form of nitrogen, salt etc. Those are again used by plants to prepare food. In this way, Organisms play important role in environment.

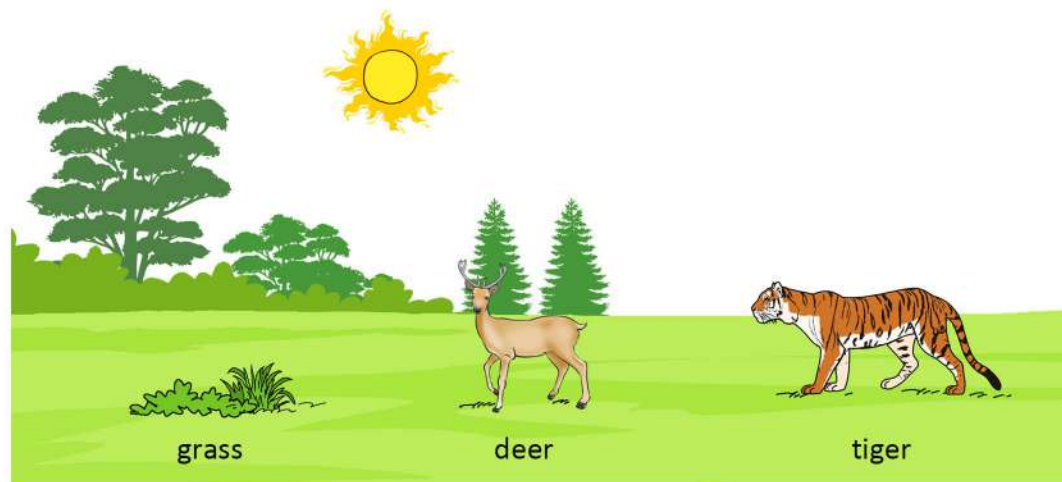


Fig no 4.3

Human beings use different animals for different purpose. Cow and buffalo are used for milk, goat for meat; donkey and horse are used for carry load. If anyone of these animal is destroyed, it affects other and disturbs the environment. Therefore, the animals play important role in environment.

Activity 4.2

What are the environmental factors (air, water, soil, plant and animal) found in pond, lake, garden, field or forest near your habitat ? make a list.

All the living organisms belong to biotic factor. Habitats, food, life cycle of all living organisms are related with environment.

4.2 Environment friendly behavior

Let us read the following case study and discuss:

Rasmita is a student of grade 6. Clothes bag is used to carry

things from market in her house. While doing so plastic bags do not come to house. Wasted tin can, plastic pots etc are used to plant flowers in her house. Biodegradable wastes are collected in a pit to make fertilizer. Non biodegradable wastes are collected separately and sent to the waste collector. They use wastewater obtained from cleaning activity for irrigating plants. Because of that waste water cannot be stagnant in surrounding. Insecticides are not spread in their kitchen garden. Solar panel are joined to heat water and glow bulb. They harvest and store rain water and it is used for different domestic purposes. House and environment around is clean and green.

Questions to think:

- (a) What is done to keep clean environment around Rasmita's house ?
- (b) What kind of behavior should be acquired to control air and water pollution ?
- (c) What can be done to conserve plants ?
- (d) Is there any effects in environment due to your behaviour.
- (e) If all the people of community perform environment friendly behaviours, What will be its benefit?

Human beings fulfill their food, clothes, habitat along with other necessity from environment. Human being increases the use of natural resources to fulfill their necessities. Natural resources are used in agriculture, factories, industries, ayurvedic medicine, taming animals, firewood and medicinal herb collection. The overuse of natural resources by human being to fulfill their needs causes the environmental imbalance. Therefore, degradation of natural resources should be protected. Use of natural resources by human being without degrading and destroying its quality is called environment friendly behaviour. Fresh air, water, land and food are very essential things for human beings. Environment friendly

behavior helps to keep air, water, soil and other natural resource in their natural form. Controlling pollution, control of misuse of resources and conservation of environment are the examples of environment friendly behavior.

Along with this, following activities belong to environment friendly behavior.

A. Proper disposal of garbages

Garbages should be disposed in the indicated place. Garbages coming out of the houses should be separated into decomposable and non-decomposable container and should be sent to the collector. Improper disposal of garbages spreads bad smell and also may cause diseases. Garbages thrown in soil decreases the fertility of soil and it may also destroy the existence of organisms in soil.

B. Classification of solid wastes and their management

Classify the solid waste into bio-degradable and non- biodegradable. Biodegradable wastes can be used to prepare compost fertilizer. Non-bio gradable wastes can be sent to reuse or recycle. Reuse means using same things again and again. For example: Old papers, new papers, pamphlet, books etc can be used to keep different things. Using milk plastics for planting flower by filling soil in it and using cut cold drinks bottles for planting plants by filling soil in it etc. are example of reuse. Method of using already used substance and a raw materials to produce new substances is known as recycle. Making new goods by melting old pieces of metals is the example of recycle.

C. Conservation of trees and plants

Trees and plants play an important role in purification of air and to keep environment clean and fresh. Planting plant, growing them, caring them, preventing firing etc are the behaviours of conserving trees and plants.

D. Minimizing use of environmental pollutant

Use of plastic, chemical fertilizer, insecticides should be minimized as much as possible. This helps in conservation of environment. Overuse of chemical fertilizer and use of chemical insecticide should be minimized. Instead of these, compost fertilizer and bio insecticides should be used.

Project work

Divide the students into groups having three students in each. Make a field visit of your community. Make a list of environment friendly behavior observed in that locality and also the activities which affect the environment. Prepare and present the report on environment friendly behavior mentioning your role in it.

Exercise:

1. Fill in the gaps with suitable word.

Sun Reuse

Atmosphere

environment

carbon dioxide

- Complete form of living things and non living thing found in a particular place is called
- Organisms takes oxygen and release during respiration.

- (c) The main source of energy on earth is
- (d) Use of same substance again and again is called

2. Write in short

- (a) Air (b) Water (c) Soil (d) Sunlight

3. Write the differences:

- (a) Biotic and Abiotic factor (b) Reuse and Re-cycle

4. Answer the following question.

- (a) What are the environmental factors ? Write in short.
- (b) What is environment friendly behavior ? Clarify.
- (c) What are the things you can reuse? Write down and-present in your class.
- (d) What are the substances in your village collected for recycling. Write down.
- (e) Describe, How the oxygen and carbon dioxide are balanced in atmosphere.
- (f) What can you do to control pollution from your side ? Explain.
- (g) Plastic is considered as a main cause of environmental pollution. How can it be managed to minimize its effects. Express your view.

4.3 Ecosystem

There are stones, soils, rocks, rivers, rivulets, pond, lake, ocean etc. on the surface of earth. All these parts are surrounded by air. Composition of these things make the physical part of the earth. All these factors affect the life cycle of plants and animals on earth surface. Plants and

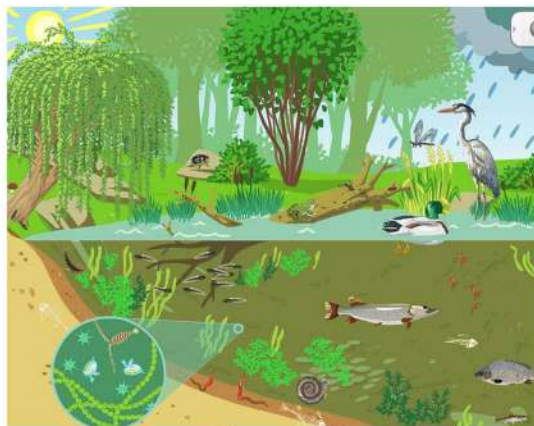


Fig no 4.4

animals obtain air, water, food, minerals etc necessary for their survival from this physical environment. In this way, inter relationship between living and non living things is maintained. The autonomous system formed by the inter-relationship of non-living things like air, water, soil and living things like plants and animals present in environment is ecosystem. Factors of ecosystem are mainly grouped into two parts.

A. Abiotic factors

Factors like air, water, soil, heat, light etc. are called abiotic factors. Atmosphere present around the earth contains nitrogen, oxygen, carbon dioxide, water vapour etc. Water is the most essential factor of animals and plants. Plants prepare food by absorbing water from soil. In the same way, soil is the habitat of all organism. Plants absorb water and minerals from soil. Habitat of all animals is also in soil. Soil is composed of rocks, minerals, dead and decaying parts of plants and animals. Sun provides heat and light to the organisms. Therefore, there is deep inter relationship between biotic factor and abiotic factor in an environment.

B. Biotic factor

Animals, plants and micro organisms are called biotic factors.

These are classified into three groups based on their food habit: producer, consumer and decomposer.

Producer

Different types of green plants are found on the surface of the earth. They prepare their own food. Therefore all green plants are called producer. Paddy, wheat, maize, millete, mustard, buck wheat (Phapar) are examples of producers. In the same way, mango, banana, orange, apple, pear etc are also plants, So, they are also producers. These green plants prepare their own food by utilizing air and water present in the environment in the presence of sunlight. Therefore, these are called autotrophs.

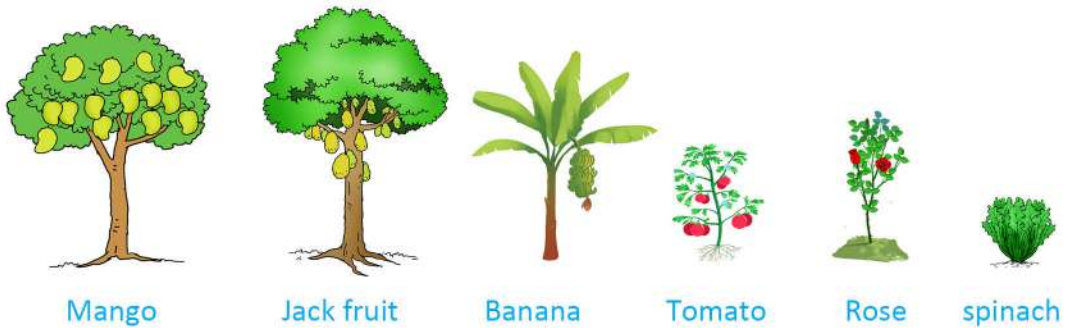


Fig no 4.5

Consumer

We are consumer, as we survive by eating plants and grains, fruits etc obtained from them. In the same way, cow buffalo, goat, sheep etc. are also consumers. Organisms which depends on other organisms for their food are called consumers. All the animals are consumers. Consumers are also herbivores, carnivores and omnivores. Consumers can be classified into three groups. They are as follows:

Primary consumer

Those animals which directly feed on producers for their survival are called primary consumer. These are herbivores. Cow, buffalo, sheep, goat, deer etc eat plants for their survival and growth. All these herbivorous animals are primary

consumers.



Cow

Buffalo

Sheep

Goat

Deer

Figure no 4.6

Secondary consumer

Insects which feed on plants are primary consumers whereas frog which feeds on insect is secondary consumer. Animals like: fox, hyena etc are secondary consumers which feed on primary consumers. Some of them are carnivores and some are omnivores.



Fox

Dog

Frog

Fig no 4.7

Tertiary consumers

Animals which depend on secondary consumers for their food like leopard, tiger, python, eagle etc are called tertiary consumers. These are carnivores. Vulture eats flesh of dead bodies. Eagle eats other birds and small animals for their survival. Tiger survive by eating deer's, jungle pigs etc. They get energy from these foods. From this energy, growth and development of body takes place.



Tiger

Leopard

Eagle

Snake

Figure no 4.8

Decomposer

The organisms which help to decompose the dead bodies of plants and animals and mix into soil are called decomposers. Microorganisms like: bacteria, fungi etc. falls under this. Decomposer decomposes the things by using its enzymes. Some of these are used as their food. Most of these are mixed in soil. Plant uses the minerals from the soil to prepare its food. In this way, there is a relation established among producer, consumer and decomposers.

Activity 4.3

Visit the pond, lake, field or garden near your residence, what types of producers, consumers and decomposers are found there ? Observe and note them and discuss in class.

4.4 Interrelationship among plants, animals and micro organisms:

Green plants are autotrophs. They prepare their own food therefore plants are called producers. Animals obtain foods from plants. Animals are consumers. Herbivores like : Cow, goat, sheep, rabbit, deer's etc are primary consumers. Animals like dog, cat, frog etc. obtain food from primary consumers. These are called secondary consumers. Animals like tiger, leopard, lion, eagle, vulture, python etc obtain foods from primary and secondary consumers. These animals are called tertiary consumers. These are carnivores. Microorganisms like bacteria decomposes dead bodies of plants and animals. These are called decomposers. Organic matters mixed in the soil after the decomposition of dead bodies of organisms are used by plants for their growth and development. Carbon dioxide and oxygen is continuously exchanged between plants and animals. Microorganisms also take oxygen and release carbon dioxide during respiration. In this way, there is deep interrelationship in environment among producers, consumers and decomposers.

Activity 4.4

Visit a field, garden or forest near your house or school. Study and list the producers, consumers and decomposers found there. Show the inter relationship among them on a chart paper.

Type of Ecosystem

Ecosystems are of different types according to places. Therefore, ecosystem is classified into two types; aquatic ecosystem and terrestrial ecosystem.

A. Aquatic ecosystem

Ecosystem of water is called aquatic ecosystem. Aquatic ecosystems are also of different types based on the status of source of water.

B. Terrestrial ecosystem

Ecosystem present on land is called terrestrial ecosystem. Surface of land is also not same in all places. Surface of land differ due to various status of land. According to the status of land like desert, field, forest, etc. biotic factors and abiotic factors found there are also different. Interrelationship between biotic factors and abiotic factors is maintained in every place. Grass land ecosystem and forest ecosystem can be taken as example.

Forest ecosystem

The ecosystem formed by the interrelationship between biotic factors and abiotic factors of forest is called forest ecosystem. Biotic factors and abiotic factors of forest ecosystem are as follows:

Abiotic factors

Air, water, soil, rocks, minerals, light, heat, moisture etc. are abiotic factors. Sloppiness, moisture and structure of land affects the ecosystem.

Biotic factors

Plants and animals found on forest are biotic factors. Grass, herbs, shrubs and big trees all plants are producers. They prepare their food by absorbing carbon dioxide from atmosphere and release oxygen. In one side, these plants provide food for animals and in another side maintains balance in environment. Different herbivores which feed on plants are also found in forest. These are called consumers. Insects to deer, rabbit, elephant, rhinoceros etc. are primary consumers. Animals like fox, hyena feed on primary consumers are secondary consumers. Animals like leopard, tiger etc. which feed on primary and secondary consumers are called tertiary consumers. In this way there is a balance among producers, primary consumers, secondary consumers and tertiary consumers in the forest. There are some organisms which decompose the dead bodies after the death. They are called decomposers. Bacteria, fungi etc are decomposers. Plants reabsorb these decomposed substances which are mixed in soil and prepare food. In this way, ecosystem is balanced in the forest.



Fig no 4.9

Ecosystem plays a important role to balance the organisms on earth. This produces the base of living for different plants and animals. Oxygen and medicinal herbs needed for human is also obtained from this. This also has high importance in environmental balance.

Exercise

1. Fill in the blanks with suitable words.

Producer Sun Secondary Consumer

Decomposer Tertiary

- (a) Organisms which depend on other are called
- (b) Organisms which decay and decompose the dead bodies of organisms are called
- (c) Main source of light is
- (d) Frog which survive by eating insects are consumers.

2. Match the following

Algae Primary consumer

Tiger Secondary consumer

Frog Tertiary consumer

Cow producer

Decomposer

3. Give answer of following questions.

- (a) What is abiotic factor ? Write with example.
- (b) What type of organisms called producers ? Clarify with example.
- (c) How does bacteria help in balancing ecosystem, write.
- (d) Explain the biotic and abiotic factors of forest ecosystem.

(e) All the deers of a forest is killed by hunter. What effects will be seen in forest ecosystem, explain.

4. Write difference:

- (a) Aquatic and terrestrial ecosystem
- (b) Producer and consumer
- (c) Biotic and abiotic factors

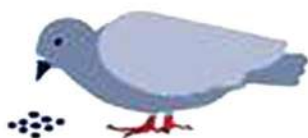
unit 5

Life Process

Every organisms perform different processes inside their body to live themselves. Respiration, nutrition, excretion are process which are essential for both plants and animals. Different process which occurs in living being's body are called life processes. Simple and premitive organisms have simple type of these processes. Advanced organisms have complex type of processes.

5.1 Modes of Nutrition

Let us discuss by observing pictures



Pigeon



Mushroom



Fern

Figure no 5.1

Questions

- What are the differences observed in above pictures based on the mode of obtaining food ?
- What are the plants you have seen which contain chlorophyll?
- What other plants have you seen except plants having chlorophyll ?
- Can all plants prepare their own food, why ?

Organism need energy to run their life. Organisms need food for energy. Food is the source of energy for organisms. Green plants

can prepare their own food. Some animals obtain food from plants whereas some animals get their food by killing other animals. In this way, all animals obtain their food from different sources.

Organisms are divided into two groups based on the process of obtaining food.

a. Autotrophs

b. Heterotrophs

Autotrophs



Paddy



Maize



Papaya

Figure no 5.2

Green plants and some bacteria like cyanobacteria belongs to autotrophs. They prepare food in cell containing chlorophyll by utilizing non-living things water and mineral absorbed from soil and carbondioxide absorbed from atmosphere and distribute it to all parts.

The autotrophs perform their own life processes and grow through energy. The green plants are the important sources of food for all livingbeing as they prepared food by using the sun light.

Activity 5.1

Observe the plants found around your school and own house. Make a list of these plants that can prepare their own food (autotrophs) and present in the classroom.

Heterotrophs

Those organism which cannot prepare their own food and depends

on other organisms for their food are called heterotrophs. They depend on plants and other organisms. Some obtain food from dead organisms whereas some suck directly from living organisms. Some eat other animals by killing them. In this way, heterotrophs are also divided into different groups.

1. Saprophyte
2. Parasite
3. Holozoic

Saprophyte

Have you seen mushroom growing on bark of fallen tree? Mushroom and mucor obtain their own food by absorbing from dead bodies. These organisms are called saprophytes. Therefore, mushroom producers cultivate mushrooms on straw of paddy. Have you seen fungus growing on old curd, decayed fruits? Plants without chlorophyll like mushroom, mucor etc. can not prepare their own food. In this way organisms like mushroom, mucor and some bacteria obtaining food from dead body of organism are saprophytes.



Mushroom

Mucor

Fig no 5.3

Activity 5.2

List out the saprophytes which are not mentioned in above text by using internet or by discussing with someone who has more knowledge than you. Also discuss about nutrition process obtained by them.

Parasites



Bedbug



Leech

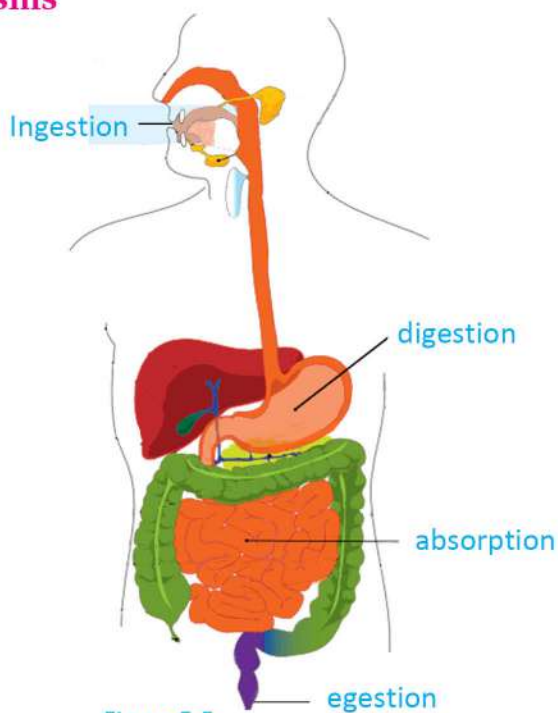


Louse

- (a) How do the organisms shown in figure obtain their food ?
- (b) What are other parasites except the organisms mentioned above ?

Some organisms live on other body and complete their life. organisms like louse, flea, bed bug, leech etc. survive by sucking blood from other organisms body. Plasmodium, pinworm, ascaris etc. are found inside the body of other organisms and obtain food from them. These are called endo parasites louse, bed bug, flea, leech etc. suck blood from the body of other organisms from outside, these are called ectoparasites.

Holozoic organisms



Holozoic organisms ingest the food (Ingestion), digest it (digestion), absorb the nutrients (absorption), assimilate it (assimilation) and excrete the undigested waste materials (egestion). There are different processes of obtaining food in organisms. Most of the organisms are holozoic. For example, human being, dog, cow, amoeba etc.

Activity 5.3

List out the saprophytes, parasites and holozoic organisms either from internet or from inquiry. Write the mode of nutrition they perform and present in class.

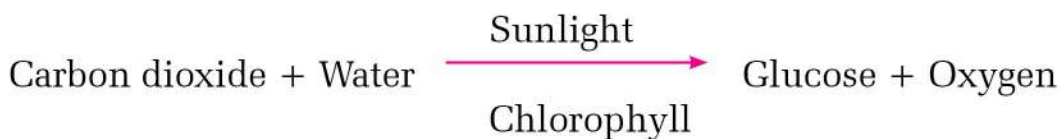
Question to think

How and from where do plants obtain food ?

5.2. Photosynthesis

Green plants can prepare their own food. Green plants prepare their food in chlorophyll leaves by using carbon dioxide present in air and water absorbed from soil in the presence of sunlight. This process of preparing food by green plants is called photosynthesis.

This process occurs in leaves. Energy needed for this process is obtained by chlorophyll present in the green leaves from sunlight. Glucose and oxygen are formed in this process.



Plants absorb water from soil with the help of root and carbon dioxide present in air with the help of stomata present on leaves. Plants convert glucose into starch and store in cells. Oxygen formed during this process is released thrown in air by plants.

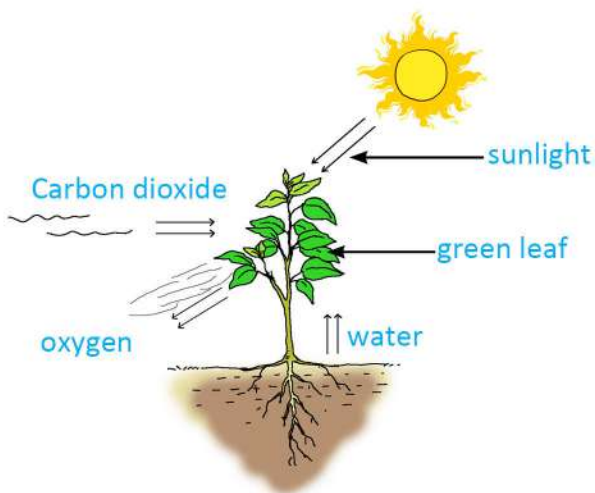


Fig no 5.7

Factors essential for photosynthesis

1. Chlorophyll

Green plants contain chlorophyll. Photosynthesis occurs only in chlorophyll containing plants. Chlorophyll contained in leaves of plants absorbs sunlight for photosynthesis.

2. Carbon dioxide

Carbon dioxide is the raw material essential for photosynthesis. Plants absorb carbon dioxide from air with the help of stomata present in leaves.

3. Water

Water is another important raw material. Plants absorb water from soil with the help of roots and pass it to leaves through the xylem system.

4. Light

Chlorophyll present in leaves absorbs sunlight and uses it to prepare food. Green plants convert light energy into chemical energy while preparing food.

Testing starch present in leaves of green plants

Activity 5.4

Essential materials: Green leaves, forceps, vessel to keep hot water, 90% ethanol, iodine, water, spirit, lamp, dropper, beakers etc.

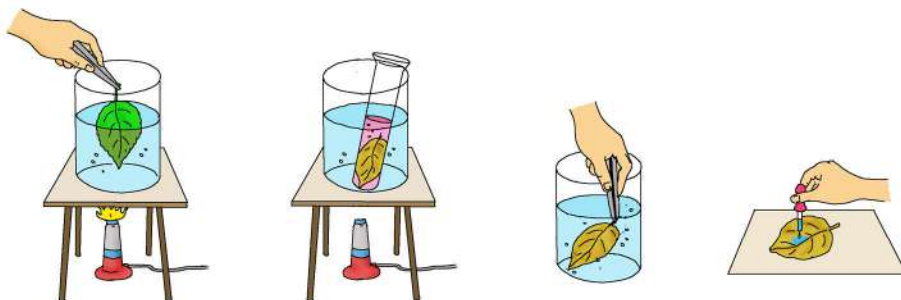


Fig no 5.8 test of starch

Procedure:

Pluck leaves of a plant and dip it into boiled water for five minutes. Leaf becomes soft by this process. Then dip it into warm alcohol (90% ethanol) for some time. Then take out that leaf and clean it with water properly. Take iodine solution in a tray and dip the leaf into it. Now it will turn into dark blue. Iodine turns color of leaf due to presence of starch.

Human digestive system

We obtain energy by digesting food that we have eaten. We perform various function in our life from that energy. Now, we study about how is food digested in human body and what are the organs that take part in digestion.

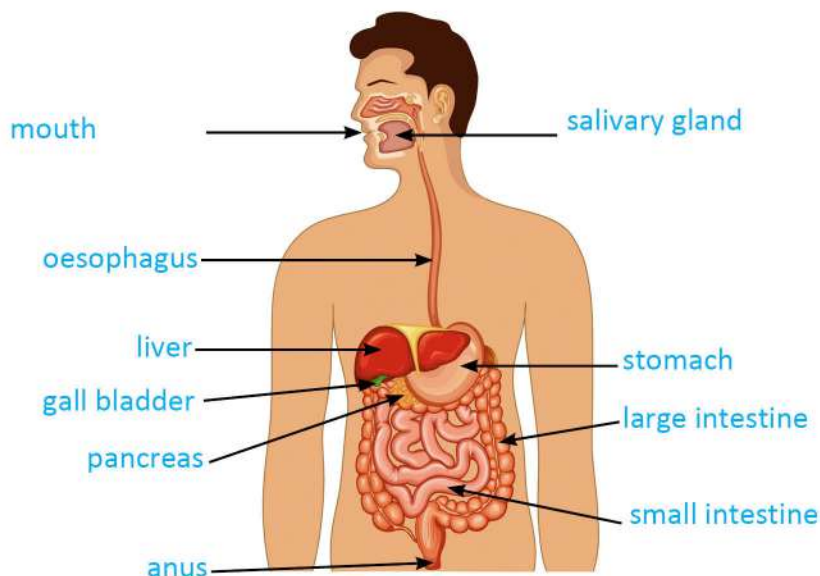


Fig no 5.9

Food we have taken can not be directly changed into energy. Group of organs which help in digestion are called digestive system. Digestive system is mainly divided into two parts ie. alimentary canal and digestive glands.

A. Alimentary canal

Alimentary canal starts at mouth and ends at anus. This canal is some where broader and somewhere narrower. Organs present in alimentary canal are as follows

- (a) Mouth
- (b) Food pipe
- (c) Stomach
- (d) Small intestine
- (e) Large intestine
- (f) Anus

B. Digestive glands

Different chemicals are needed to digest food. Those chemicals are called enzymes. Organs which produce enzymes are called digestive glands. Enzymes secreted by digestive glands digest food into simpler form and makes it absorbable.

Digestion process

Saliva is secreted from salivary gland while chewing food in mouth. Amylase contained in saliva converts starch into glucose. Then, food reaches to stomach through food pipe. Glands present on the wall of stomach are stimulated when the food reaches to it. Hydrochloric acid secreted from gastric gland make the food acidic there. It kills some germs present in food and prevent the decaying of food. Pepsin helps to digest protein>After this, food will enter into small intestine. Gall juice coming from gall bladder is mixed with semi digested food in first part of small intestine ie duodenum. It helps to digest fat. Pancreatic juice coming from pancreas is also mixed in duodenum. Enzymes like trypsin digests protein, amylase digests starch & Lipase digests fat. Then food reaches to small intestine from duodenum. Intestinal juice secreted by small intestine also helps to digest food. Essential nutrients for the body are absorbed by villi present in the wall of small intestine and mixed in blood. Then remaining substance reaches to large intestine. Water is absorbed in large intestine. At last remaining substance will be thrown out through anus.

Various digestive glands and enzymes secreted by them are as follows :

S.N.	Place	Digestive gland	Digestive juice
1.	Mouth	Salivary gland	Saliva
2.	Stomach	Gastric gland	Gastric juice
3.	Chest	Liver	Bile juice
4.	Below stomach	Pancreases	Pancreatic juice
5.	Small intestine	Intestinal gland	Intestinal juice

In this way, food is digested into glucose, fructose, amino acid, fatty acid etc in digestion process. These substances are reaches to every cells of body through blood from small intestine. Glucose chemically reacted with oxygen and converts into energy in cell. Carbohydrate present in food provides energy; fat and oil gives energy and heat; protein helps in growth and repairing of cell and tissues.

Activity 5.5

Fill in the table with the functions performed by nutrients in our body.

S.N	Nutrients	function
1	Carbohydrate	
2.	Fat	
3	Protein	
4	Minerals	
5	Vitamin	

Activity 5.6

1. List out the organs that take part in human digestive system by observing human digestive system video.
2. Prepare a chart showing different parts of human digestive system.
3. Prepare a model of human digestive system by using black loam soil. If black loam soil is not available, flour can be used.

Exercise

1. Fill in the blanks with suitable words.

Digestive gland Energy Photosynthesis

Digestive system Chlorophyll

- (a) The process preparing food by plants is called
- (b) Leaves of plants are green due to presence of
- (c) Group of organs help in digestion of food is called
- (d) Carbohydrate present in food gives us

2. Select correct answer from given answers

- (a) Which gas is evolved during photosynthesis?
 - (i) Carbon dioxide
 - (ii) Oxygen
 - (iii) Nitrogen
 - (iv) Hydrogen
- (b) Which chemical is present in digestive juice?
 - (i) Hormone
 - (ii) Enzyme
 - (iii) Vitamin
 - (iv) Carbohydrate
- (b) What is the process of making food by plant ?
 - (i) Respiration
 - (ii) Digestion
 - (iii) Photosynthesis
 - (iv) Excretion

(d) Which gas is needed to prepare food for plant ?

(i) Carbondioxide

(ii) Oxygen

(iii) Nitrogen

(iv) Argon gas

3. Answer the following questions.

(a) Write the definition of life process

(b) What are the essential factors for photosynthesis?

(c) How the starch test are done? State the points.

(d) Does plant perform photosynthesis during night time?
Present your view with reason.

(e) What is digestive system? Define.

(f) Describe the role of digestive juice.

(g) Draw a figure of human digestive system with label.

4. Write the name and function of given organs and parts.



a



b



c

unit 6

Force and Motion

We perform various types of works like walking, running, playing, digging, carrying load etc in our life. We need force to perform every work.

6.1 Motion and its types

Activity 6.1

Place a book on a table. Push it slowly and observe the phenomenon.

Did the book change its position?

Whether the table changed its position or not?

Do the desk, bench, chair etc in a room change their position themselves?

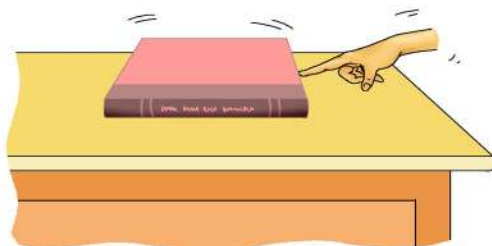


Fig. 6.1

Here the book on the table keeps on changing its position while pulling it. The state of book at that instant is the state of motion. Flowing water, a flying bird, a moving vehicle, a walking man, a moving bicycle etc are in the state of motion. When a man is walking, his position is also changed. We remain in the state of motion while going to school on foot. The state of a body in which it keeps on changing its position with respect to its surrounding objects is called the state of motion.

A table, a chair, a bench and a desk in a room are in the state of not changing their position i.e. in the state of rest. A house, a bridge, an electric pole etc. are the examples of the objects at rest. The state of a body in which it is not changing its position with respect to its surrounding objects is called the state of rest.

Activity 6.2

What are the differences between a moving object and a resting object? Discuss among your friends and make a list of each of moving objects and resting objects in your classroom.

Question to think

Are the people in the moving vehicles in the state of rest or motion? Why?

Activity 6.3

Keep a plastic sac in the field. Tell a student to sit on it. Let other two students to pull the sac slowly. Does the student sitting on the sac remain in the state of motion or rest? Discuss it and write the conclusion.

Types of motion

All the objects do not have same type of motion. Motion of object is categorized into two types as linear motion and curvilinear motion.

a. Linear motion

Activity 6.4

Tie a stone with a piece of thread and drop it from a certain height. How does the stone fall down? Observe it.



Fig. 6.3



Fig. 6.2

Motion of a body moving along a straight line is called linear motion. A vehicle moving in a straight line, motion of a rolling ball in a plain field and motion of a bullet fired from a gun are some examples of the linear motion.

b. Curvilinear motion

Activity 6.5

Observe the motion of an ant and other insects moving in a field. Similarly observe the motion of different animals, flying butterfly and insects too. How is their motion? Discuss it.



Fig 6.4

The motion of a body in which it changes the direction, instead of moving in a straight line is called curvilinear motion. In other words, motion of a body moving along a curved path is called curvilinear motion. Motion of a vehicle moving in a curved/round path and motion of needles of a watch are the examples of curvilinear motion. Sometimes the blowing air flies away the dust particles, leaves, pieces of paper etc. These flying things do not have a particular direction. They are flying by changing their direction. Such motion is known as curvilinear motion.

Activity 6.6

Drop a piece of paper and a stone simultaneously from certain height and observe them. How does the stone fall? How does the paper fall? Do they have same type of motion? Write a conclusion after the observation.

6.2 Force

We perform various types of work every day. We need force to do any type of work. What is the actual meaning of force?

Activity 6.7

Keep a bag, containing books on a table. Now push this bag slowly. It displaces from one place to another place. Again pull the bag slowly. It again changes its position i.e it keeps on changing its position. The bag remains in the state of rest unless it is not pulled or pushed but it comes in the state of motion when it is pulled or pushed. Pulling or pushing is force.



Fig. 6.5

On pulling or pushing, there is change in state of rest or motion of a body. Thus the external agent that changes or tends to change the state of rest or motion of a body is called force. Force is used to perform every work; like to walk, to run, to carry loads, to play football, to run bicycle and to open a door. No work can be done without force. A force is to be used to bring resting body into motion and moving body into the state of rest.

Activity 6.8

1. Put a bag, containing some books on a table. Now take a spring balance and attach its hook to the belt of the bag and then pull it slowly towards you. Note down the reading shown by the indicator of the spring balance.
2. Hold a spring balance. Tie a stone with piece of string and hang it on the hook of that spring balance and then note down the reading shown by it. In this way we can measure the force.

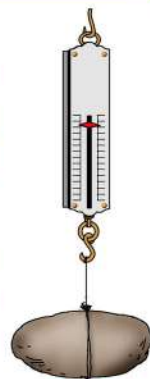


Fig. 6.6

The SI unit of force is Newton. The SI unit of weight is also Newton. The pulling force of the earth on an object towards its surface is called the weight of that object. The weight of an object of mass one kilogram on the surface of the earth is about 9.8 Newton.

Effects of force

Activity 6.9

1. Take a ball and keep it on the playground and then roll it by kicking forcefully. Tell your friend to stop the ball rolling so. What type of effect of force did you find here?
2. Go to the playground taking a small ball. Now roll the ball towards your friend and tell him to stop by using a stick or a bat. Where does the ball move? (or In which direction does the ball move ?)
3. Initially a swing shakes slowly but keeps on shaking with greater speed as we go on increasing the force. Why so? Observe it by playing the swing.
4. What change occurs in the size of the balloon filled with air when it is pressed slowly? Observe it.
5. What happens when the brakes of a moving bicycle or vehicle are applied? Observe it and fill above conclusions in the table below.

Table no 6.1

S.N.	Use of force	Effect of force
1	While kicking a ball	Resting object comes in motion
2	While stopping a ball	Moving object comes in rest
3	While striking a ball on the wall	.....
4	While applying extra force to the playing swing	.....
5	While pressing a balloon filled with air	.....
6	While applying the brakes of moving bicycle or vehicle	.....

There are various effects of force on an object. Out of them, some effects are as follow:

a. A force produces motion in a resting object.

When a force is applied to an object at rest, it may produce motion. On kicking a ball kept on a ground, it comes in the state of motion. A bicycle moves, on pressing its pedals. A wheel and barrow comes in motion when it is pushed.



Fig. 6.7

b. A force brings a moving object in the state of rest.

A force is to be applied to stop a moving ball. When brakes of a moving bicycle and vehicle are applied they come to the state of rest. While playing football, the goal keeper has to apply force to stop the ball. In this way a force brings a moving body in the state of rest.



Fig. 6.8

c. A force changes the velocity of a moving object.

When a force is applied to an object at rest it comes in motion. On increasing the force acting on it, its velocity goes on increasing. While playing a swing, it swings faster along with the increasing force. Speed of bicycle increases with increase in speed of rotation of its pedals.



Fig. 6.9

d. A force changes the direction of a moving object.

The direction of a moving ball changes, when it suddenly collides with an obstacle. The direction of a cricket ball changes, when a cricket player hits the ball with a bat.



Fig. 6.10

e. A force changes the shape of an object.

When a balloon filled with air is pressed slowly, its shape changes. The dough can be changed into different shapes by applying force on it. The shape of a paper bag or a plastic bag changes by pressing it using two hands. In this way, a force changes the shape of an object.



Fig. 6.11

f. A force changes the size of an object.

The size of a balloon gets changed, when it is blown. On crumpling a piece of paper and compressing clothes into a bag, their size changes.



Fig. 6.12

In this way, force changes the state of motion and direction and also change the shape and size of the object.

Transformation of force

Activity 6.10

Observe the activities like splitting a log by using axe and excavating field by using spade. What are the places or parts of applying effort and doing work in these tools? Discuss it.



Fig.6.13

We need to apply force while doing any work. Force is applied on the handle of a sickle or a khukuri or an axe while cutting a piece of wood. But the cutting action is done by their sharp edge. Here, the wood is cut by sharp edge due to the transformation of force applied on their handles. Similarly the force is transferred in the same way while excavating field by using a spade or a kuto. We need to apply brakes to stop a moving bicycle, a motor cycle and a vehicle. While pressing the brake with a leg or a hand, that force gets transferred up to the rotating wheels and the frictional force produced in the wheels brings them in the state of rest. In case of a motor cycle, a vehicle and an aeroplane also the force applied to their brakes gets transferred to their rotating wheels to stop them. In this way force transfers from one place to another place through the brakes.

Activity 6.11

Take a piece of a hollow cylindrical pipe. Now take a long stick that can easily pass through the pipe and insert it into the pipe. Tell your two friends to hold its two ends separately and to make it parallel to the ground. Now tie a brick or a piece of stone tightly at one end of a string. Pull another end of the string keeping it over the pipe as shown in the figure and raise the stone slowly up. How is the stone raised up by applying force at one end? Observe it. Have you seen the process of drawing water from a deep well by using a pulley? In this way a heavy object can be lifted up by transferring a force.



Fig.6.14

Activity 6.12

Take two syringes. Remove the needles of both the syringes. Now fill half of each syringe with water. Connect the nozzles (the places where the needles were attached) of both the syringes tightly using a pipe or a rubber tube. Now observe the movement of piston of another syringe in backward direction when the piston of a syringe is pushed in. How did that piston move in backward direction? Tell the conclusion to your teacher after having discussion.

When force is applied to the piston of one of the syringes, that force gets transferred to the another syringe via water in the pipe. In this way the process of passing a force from one place to another place is called transformation of force.

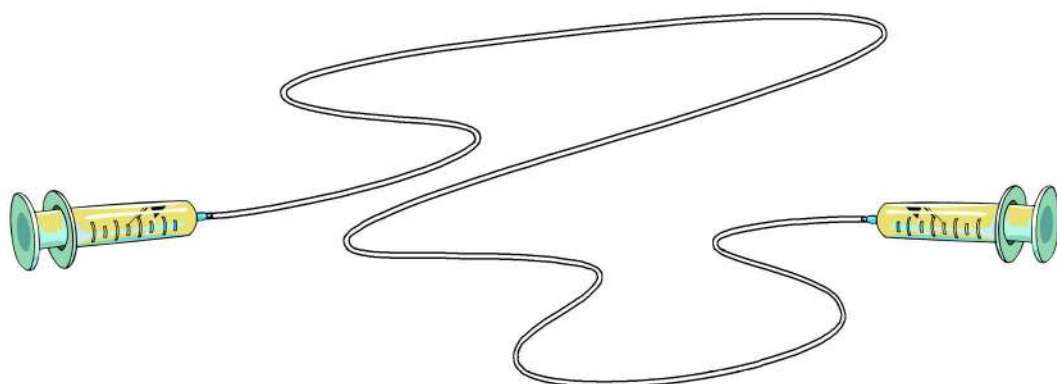


Fig.6.15

In most of our daily works, we transfer force in the same way. All the tools like a kuto, a spade, a chande, a sickle, a Khukuri, an axe, wedge etc transfer the force in the same way. In this way we use different tools to transfer the force.

6.3 Simple machine

We do different types of works in our daily life. We use various types of tools to carry out such works. Such tools make our work easier and faster. Those tools which we use to work in such ways are known as simple machines.

Activity 6.13

Have you seen different types tools used to cut vegetables, to cut clothes, to dig field, to plough field and to cut wood? Make a table as shown below and write the purpose of using different tools

S.N.	Name of tools	Function
1	Scissors	To cut clothes and papers
2	Spade , Plough	To dig field, to plough field
3	Knife, chulesi	.....
.....
.....



Fig 6.16

Hasiya and khurpa are used to cut grass and fire woods in the village. An axe is used to split fire wood or to cut trees. Spade and kuto are used to dig field. Similarly tools like chulesi, fire tongue, knife, *sarauta*, shovel, *charkha* etc are used for various purposes. A pulley is used to pull water from the well. Heavy loads are loaded on the truck by using a slanted plank. A knot can be unscrewed or tighten by using a screw driver. The devices having simple structure which are used to perform any work easily, speedily and conveniently are called simple machines.

A simple machine indicates only such type of tool in which there is no use of fuels like diesel, coal etc. However, a complex machine is made by the combination of so many small simple machines. Every parts of a complex machine are simple machines. Similarly, various simple machines combinely work together in a complex machine.

Application of simple machine

Simple machines are used to perform various works in the daily life. It helps a lot to do a work. The main applications of simple machines are as follow.

- A heavy load can be lifted by using less effort.
- More work can be done in less time.
- An effort can be used conveniently.

Question to think

What do you do to roll a heavy stone?

Force is to be used to perform any type of work. But sometimes we have to do work against the larger force. For example we have to roll a stone of mass about 1000 kg. We can not roll it alone. It can be rolled easily by using a type of simple machine. If a long iron rod or a strong wooden stick is inserted below the stone by using a small stone as a fulcrum and applying a small downward effort at another end of the rod, the stone rolls. In this way, a small effort can be used to perform a work against the larger force. The stone shifts up by pressing the rod down. The rod used here helps to make work easier and to change the direction of the applied force.



Fig 6.17

Scissors are used to cut papers and clothes. A Shovel is used to carry/throw soil and sand. A pulley is used to pull water from a deep well.

Activity 6.14

Identify the simple machines in the picture and fill their application in the table below.



S.N.	Name of the simple machine	Application
1.		
2.		
3.		

Activity 6.15

Take some goods in a bucket. Lift it up by tying a rope on its handle. Now roll the rope over a pulley and pull it down to lift the bucket. What differences have you found? Mention it.

Exercises

1. Fill the appropriate / suitable word in the blank:

Force	Motion	Linear	Newton	Easy	Simple machine
-------	--------	--------	--------	------	----------------

- The state in which a body changes its position with respect to its surrounding objects is the state of
- The factor that changes the state of rest or motion of a body is called
- The SI unit of force is
- is to be used to bring a body at rest into the state of motion.
- The motion of the bullet fired from a gun is

- f. A simple machine makes our work and faster.

2. Write the differences between:

- a. Linear motion and rectilinear motion.
b. Rest and motion.

3. Answer the following questions

- a. How are rest and motion are relative terms ? Write with an example of each.
- b. Define force.
- c. List out the effects of force.
- d. What is transformation of force? Write with examples.
- e. Among the motion of the objects that you have seen, classify them as linear and rectilinear motion.
- f. “A force can change the state of a body”? Justify the statement with an example
- g. Write the examples of the tools that can transfer the force.
- h. How can the force be measured by using a spring balance? Explain with the suitable figure.
- i. How does the transformation of force take place while using broom in your home? Explain it.
- j. What is a simple machine?
- k. Write the main application of the simple machines in points.
- l. What are the reasons behind using a pulley to pull water from a deep well? How does it help to perform the work well? Explain it.

4. Draw the clean diagrams of the following simple machines.

- a. Spade b. Scissors c. Pulley d. Khukuri

Unit 7 Energy in Daily Life

We perform various activities like writing, reading, playing, running etc in our daily life. Can we perform all these works without taking food? Of course we can not. In the same way, can we run vehicles, aeroplane, tractor etc without using diesel, petrol or other fuels ? Certainly, it cannot be. Can we run computer, radio, mobile, television, telephone etc without electricity? Certainly, we cannot do so.

We acquire energy from food. Motor vehicles and aeroplane acquire energy from diesel, petrol or other fuels. Electrical appliances acquire energy from electricity. Energy provides the capacity of doing work. Thus, the capacity of doing work is called energy. It is measured in Joule(J).

7.1 Forms of energy

Various types of works are being conducting around our surroundings. Different forms of energy are needed to perform these works. Mechanical energy, heat energy, sound energy, magnetic energy, light energy, electrical energy, chemical energy, atomic energy etc. are the different forms of energy.

Mechanical energy

Some of the objects are in motion and some of them are in rest. The energy possessed by a body due to its motion or position is called mechanical energy. Mechanical energy can be categorized into two types as potential energy and kinetic energy.

a. Potential energy

Activity 7.1

Take a catapult and a round stone. Release the stone in the open area by pulling the catapult. Now consider the following questions and draw conclusion.

1. Which type of energy is used to throw the stone up to that longer distance?
2. Where is the energy from?
3. Is the energy of same type be used, when a football player kicks the ball by his foot?
4. Is the same type of energy be used while compressing, extending/pulling, bending, or coiling a spring?
5. Do the water collected in a reservoir at certain height, a raised stone and a brick contain this type of energy?



Fig 7.1

There is energy in the muscles of our hand. That energy gets stored in the rubber while stretching the catapult. The energy so stored in the rubber throws the stone up to the longer distance. This energy stored in the stretched rubber is called potential energy. In the same way, the energy in the muscles of football player gets converted into potential energy while raising his foot. This potential energy rolls the football up to a certain distance while kicking. The energy stored in a body due to its position or change in position is called potential energy.

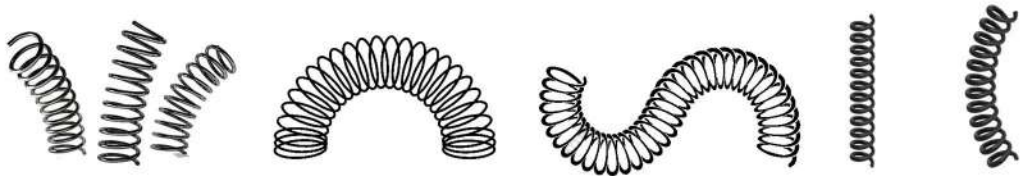


Fig 7.2

Potential energy gets stored in the different objects in the way it is stored in the stretched rubber. Potential energy gets stored in the water collected in a reservoir at certain height, a raised stone and a brick due to their position or change in position. Change in position of a spring takes place while compressing, extending/pulling, or bending or coiling a spring and potential energy gets stored in it. Water collected in a reservoir and in the mechanical watch, when its spring is compressed also contain potential energy.

Activity 7.2

What do you find in the condition of kinetic energy being stored in your home, school or surroundings? Make their list and discuss with your friends.

b. Kinetic energy

It is easier to catch a ball thrown slowly whereas it is quite difficult to catch that thrown with greater speed. Similarly, it is easier to catch a tennis ball whereas it is difficult to catch a cricket ball thrown with the same speed. From this, we can conclude that every mass in motion contains energy. Such energy is called kinetic energy. The energy possessed by a body due to its motion is called kinetic energy. The form of energy in the rolling ball, flying birds, flowing water, blowing air and moving vehicles are the examples of kinetic energy.

Activity 7.3

What do you find in the condition of energy being stored in your home, school or surroundings? Make their list and discuss with your friends.

Factors affecting the kinetic energy

Activity 7.4

Take a cricket ball and a tennis ball and go to the playground with your friends. Let a person throw the cricket ball slowly and tell another one to catch it. Repeat it turn to turn. Again, let them throw the cricket ball with greater speed and tell another one to catch it. Let the person throw the tennis ball too and tell another one to catch it again. Have a discussion on following questions related to these activities and come to a conclusion.



Fig 7.3

1. What different did you find while catching the cricket ball thrown slowly and with greater speed?
2. What different did you find while catching the cricket ball and tennis ball thrown with the same speed?

question to think

1. Out of two bicycle riders riding on a bicycle with slow speed and another with greater speed striking against a wall, which one gets injured more?
2. Which one effects more when a bicycle and a motor cycle with same speed strike against a wall?
3. Why is a heavy hammer used for making iron tools but a light hammer for making gold ornaments?

Kinetic energy depends up on mass and velocity of an object. An object with greater mass contains more kinetic energy whereas the object with lesser mass contains less kinetic energy. For example, a cricket ball contains more kinetic energy than a tennis ball thrown with the same speed and a motor bike contains more kinetic energy than a bicycle moving with the same speed. Similarly, a cricket ball thrown with greater speed contains more kinetic energy than that thrown slowly. The damages occurred due to the collision of vehicles with greater speed becomes more than that occurred due to the collision of vehicles with slow speed.

Question to think

1. Which one is damaged more when a vehicle with greater speed and another with less speed collide with an obstacle?
2. It is easier to break a stone using heavy hammer than using lighter one. Why?

Transformation of energy

Activity 7.5

What would be the form of energy possessed by the water in a tank kept on the top floor of a house? What type of energy does the water from same tank contain when a tap of bathroom is opened? What type of energy does a spoon placed on a table contain? What would be the type of energy when that spoon falls from the table? Make a list of such type of examples, present them in your class, and differentiate between potential energy and kinetic energy.

There is potential energy in the water collected in a reservoir or a dam or a lake or a pond. If the water flows, potential energy changes into kinetic energy. In this way energy changes from one form to another but it does not destroy. Thus, energy can neither be created nor be destroyed. It is known as the law of conservation of energy.

We need energy in our daily life in the various forms. Sometimes we need potential energy and sometimes kinetic energy as well. Similarly, sometimes light energy is required and sometimes electrical energy, magnetic energy and sound energy too. That is why the available energy is converted into the required form with the help of the appliances that we have. This is known as the transformation of energy.

For example, a solar panel converts solar energy into electrical energy. An electric bulb converts electrical energy into light energy. An electrical heater converts electrical energy into heat energy. A torch light converts electrical energy into light energy. Transformation of energy can be shown in the flow chart.

Water collected in a dam → flowing water from the dam → rotating turbine the water → lighting bulb
(potential energy) (kinetic energy) (electrical energy) (light energy)

Activity 7.6

Make a list of energy transferring appliances found in your home or school and present it in the class. Discuss the energy converted by each of the appliances.

Exercises

1. Fill the appropriate word in the blank:

Kinetic energy	Mechanical energy	Energy	Forest	Potential energy
----------------	-------------------	--------	--------	------------------

- The capacity of doing work is called
- The energy possessed by a body due to its motion or position is called.....
- The water stored in a reservoir containsenergy
- A moving vehicle contains energy

2. Choose correct answer of the following questions.

- Which one of the following conditions contain kinetic energy?
 - stretched spring
 - stationary water
 - a leg lifted to kick football
 - a flying bird
- Which one of the following conditions contain potential energy?
 - flying aeroplane
 - flowing water
 - a compressed spring
 - a moving vehicle

- c. Which is the SI unit of energy?
i) Watt ii) Joule
iii) Newton iv) Celsius
- d. Which one of the following alternatives related to energy is correct?
a) Energy cannot be destroyed.
b) Energy cannot be produced.
c) Energy cannot be converted.
d) Energy cannot be developed.
- i) only i is correct
 ii) both i and ii are correct
 iii) i, ii, and iii is correct
 iv) all are correct

3 Answer the following questions.

- a. What is energy? Write its SI unit.
- b. Define mechanical energy and mention its types.
- c. Define kinetic energy and potential energy with two examples of each.
- d. Write the factors on which kinetic energy of a body depends.
- e. Write any two differences between kinetic energy and potential energy.
- f. What is energy transformation? What difficulties would have to be faced if there is no transformation of energy?
- g. "Our food is also a form of transformation of solar energy." Justify this statement.
- h. We can work without taking food for a short time but cannot work for a long time. Explain these two events in the context of energy.

7.2 Heat

We feel hot during the summer season whereas feel cold during the winter season. On touching a piece of ice, we feel cold and feel warm on touching hot water. What would be the main cause of feeling hot and cold? Consider it.

The main cause of having the feeling of hotness or coldness is the effect of heat. Heat is a form of energy. It gives us the feeling of hotness. The SI unit of heat is Joule. It flows from a body at higher temperature to a body at lower temperature. When we touch a body hotter than our skin, heat transfers from that body to our skin and we feel hot. Similarly, on touching a body cooler than our skin, heat transfers from our skin to that object and we feel cold. In this lesson, we will discuss about heat absorbing capacity of various objects.



Fig. 7.4

Heat absorption

Activity 7.7

1. How do you feel when you sit in front of a burning heater or in the sunlight for some time?
2. Why does a vessel exposed in the sunlight get heated up?

What we come to know from the activity 7.7 is, on sitting in the sunlight or in front of burning heater or on wearing the cloth dried in the sunlight, we feel warm. We feel hot when we touch the vessels exposed in the sunlight. Cause of these events is the absorption of heat by our body. Heat flows from a hot body

to a cold body. Since these objects are hotter than our body, therefore heat is transferred to our body. The process in which a body gains heat from its surrounding hotter objects is called absorption of heat. The heat absorbing capacity of all the objects is not same. It depends up on various factors.

Activity 7.8

Take some hot water in glass A and some cold water in the glass B. Measure their temperature using a thermometer and note down the readings. Pour the water of these two glasses into the third glass C and measure the temperature of mixture. Draw a conclusion after having a discussion on the following questions.

1. Whether the mixture is hotter or cooler than the hot water?
2. Whether the mixture is hotter or cooler than the cold water?
3. Water of which glass would have released and gained the heat?
4. When does the process of heat loss and gain last?

Factors affecting the absorption of heat

Mainly the ability of heat absorption depends up on surface area of the object and its color.

1. Surface area of the object

Activity 7.9

Take equal amount of water in a plate and glass. Expose them in the sunlight for some time and observe it.

1. After some time measure the temperature of water in each vessel and find out the hotter one.
2. Find out the reason of being the water hotter in a vessel and cooler in other one.



Fig. 7.5

Conclusion: Due to the more surface area covered by the water in the plate, it has higher temperature than that in the glass.

Question to think

Answer the following questions based on the activity 7.9

1. Why do we spread wet or washed clothes to dry them?
2. Why do we spread grains while drying them?
3. Why is the surface area of a solar heater made larger?
4. Why is the base of a cooking utensil made wider?
5. Why do we spread our fingers while warming over a heater or fire instead of making a fist?

Conclusion: The heat absorbing ability of an object increases with the increase in its surface area and decrease with decrease in its surface area.

2. Color of the object

Activity 7.10

Take a piece of black cloth and a piece of white cloth having equal area. Wrap a thermometer with the black piece of cloth and another thermometer with the white piece of cloth and then expose them in the sunlight for equal interval of time. After some time, which one of the thermometer shows higher temperature? Observe it.

Conclusion: The thermometer wrapped with the black piece of cloth shows higher temperature.

Question to think

Consider the following question based on the activity 7.10

Why is the surface of a solar heater coated with the black color? Why does the hair get heated faster than other parts of body while exposing in the sunlight?

An object with black color has high heat absorbing capacity whereas object with white color has low heat absorbing capacity.

That is why, usually white clothes are worn in the hot season and black or dark clothes are suitable to wear in the cold season. In the same way, a solar heater is coated with black color so that it can absorb more amount of light energy from the sun. Usually the outer bottom of a cooking utensil is made black so that food gets cooked faster and energy saving takes place.

Activity 7.11

Collect some examples in daily life, which are based on the fact that black objects absorb more heat and white objects absorb less heat and list them. Present that list in the class and have a discussion on it.

Exercises

1. Fill the suitable words in the blanks given below

Less	Energy	Joule	Negligible	More
------	--------	-------	------------	------

- The SI unit of heat is
 - Heat is a form of
 - Absorption of heat in the larger area is
 - The heat absorbed by the white objects is
- ### 2. Identify whether the following statements are 'True' or 'False'.
- While touching an object hotter than skin, heat transfers from the hot object to skin.
 - While touching an object cooler than skin, heat transfers from the cold object to skin.
 - Heat absorbing capacity decreases with increase in area.
 - Heat absorbing capacity of a black colour object is less.

3. Choose the correct alternatives of the following questions.

- a. Which one of the following is the correct way of transferring heat?
- i) From a hot body to a cold body.
 - ii) From a cold body to a hot body.
 - iii) From a body at lower temperature to a body at higher temperature.
 - iv) From a body at higher temperature to a body at lower temperature.
- b. Which one of the following colors has higher heat absorbing capacity?
- i) Red
 - ii) White
 - iii) Black
 - iv) Green
- c. What is the cause of feeling very hot on wearing black clothes during the strong sunny day?
- i) Due to rapid transfer of heat
 - ii) Due to more absorption of heat
 - iii) Due to less absorption of heat
 - iv) Due to more reflection of heat
- d. Why do we spread wet or washed clothes over sunlight?
- i) To drop water from the clothes
 - ii) To increase the absorption of heat
 - iii) To see whether they are cleaned
 - iv) To show others

4. Give reason

- a. Bedding are spread over the sunlight during the winter season.
- b. It is more comfortable to wear white clothes than black one during the summer season.

5. Answer the following questions.

- a. Mention the importance of heat in our daily life.
- b. What is absorption of heat? On which factors does it depend?
- c. What is the relation between heat absorbing capacity and the color of objects? Also, give an example that you have seen or known.
- d. Explain an example related to daily life, which is based on the fact that heat absorbing capacity of an object increases with increase in surface area.
- e. Which type of clothes would provide the feeling of coolness during the summer season and that would provide warmth during the winter season?

7.3 Light

We can see houses, vehicles, trees, animals etc while going to school. We also see flowers of different colors. What would be the reason behind possible of seeing these objects? Let us discuss.

All the objects around us are seen during the daytime due to the presence of light rays from the sun. In the same way, all the objects around us are seen during the night time due to the presence light from lamps. When the light from a brighter body falling on an object reflects back to our eyes, then that object is seen. Therefore we need light to see surrounding objects. Light is a form of energy which helps us to see our surrounding objects.

Transmission of light

Have you seen shifting of light from one place to another place? How does light arrive from the sun to the Earth? Discuss.

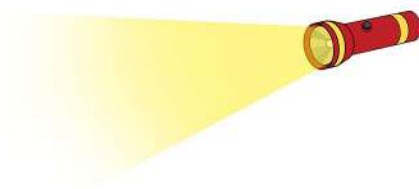


Fig 7.6

Light shifts from one place to another place. The light shifting from the sun arrives up to the earth. Light shifts about three lakh kilometer in one second. In this way, the process of shifting light from one place to another place is called transmission of light.

Rectilinear propagation of light

Observe the rays of sunlight entering through the small holes of window to your room during the morning time. Dust particles can be seen in the sunlight. Does the light



come to the earth in a straight line? Have you turned lighting torch light facing towards the sky in the night time? It is clear from these two examples that light travels in a straight line.

Activity 7.12

Take about half meter long hollow plastic pipe. Place a burning candle on a table. Now observe the candle through one end of the pipe as shown in the figure. Can the candle be seen?

Now bend the pipe. Observe the candle again. Can the candle be seen now? The candle can not be seen in this condition. It is clear from this activity that light cannot transmit through a bent pipe. This means light always travels in a straight line.

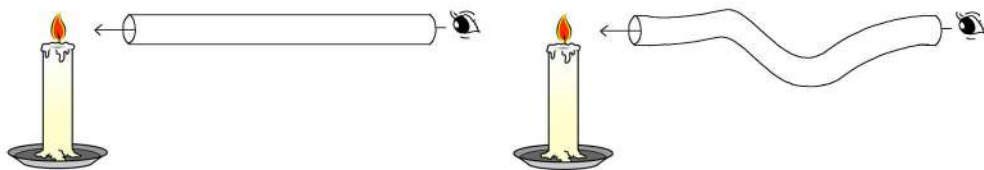


Fig 7.7

Activity 7.13

Take three pieces of cardboard paper with same size. Make a small hole at the centre of each. Hold them on a table as shown in the figure.

The holes of cardboard papers should lie at the same height. Put a burning candle on the table so that it lies on the same straight line of a hole of one side. Observe the candle from the opposite side. Is the candle be seen?

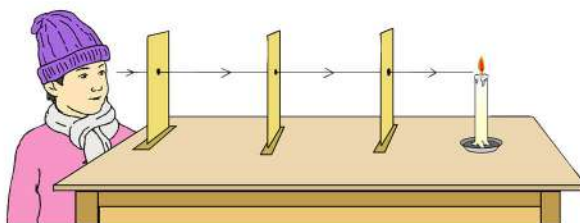


Fig 7.8

Shift one of the cardboard papers towards left or right and observe the candle. Can a candle be seen?

1. In which condition is the candle seen and not seen?
2. What is the cause behind it? Discuss.

Does this rule be applicable to the light from the sources of light seen in our daily life?

Sometimes we have illusion that the light from its sources appear to be bent. For example; the light from an electric bulb and torch light etc. Light does not transmit in a bent or curved path. Light travels in a straight line in the direction emitting from the source.

Ray of light

When we walk using torch light at night time, we see the light travelling up to longer distance. Similarly, you might have seen the light from the moving vehicles travelling up to longer distance during the night time. Light travelling so is called a light beam of light. The small unit of a light beam is called a ray of light. It is indicated by a straight line. Since light travels in a straight line therefore it is indicated by a straight line. The sign of arrow is used to show the direction of light.



Fig 7.9

Pinhole camera

Make a smaller and another bigger cylinders using thick and black paper. They should be made in such a way that the smaller one can easily be inserted inside the bigger one. Close one side of small cylinder using tracing paper. Close one side of big cylinder using black paper. Make a small hole at the midpoint of the black paper. Insert the end with tracing paper of smaller cylinder in to the bigger cylinder. In this way a pinhole camera is prepared.

Now observe through open end of smaller cylinder facing the hole in the black paper of bigger cylinder towards the trees,

men, houses etc. The inverted images of these objects are seen in the tracing paper. Here the white paper behaves like a screen.

If the smaller cylinder is pulled out, the height of an image increases and the height of an image decreases when it is pushed in. Since light travels in a straight line, formation of images is possible.

To form the image Where may this light come from?

Working principle of pinhole camera

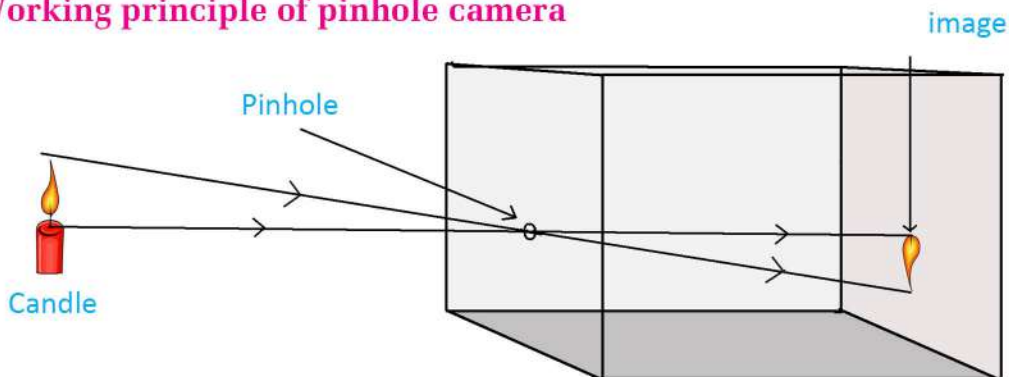


Fig 7.10

Pinhole camera

A ray from the tip of an object moves down and another rays from its bottom moves of while passing through the pin hole of the camera and both of them fall on the screen. The rays from the other parts of the object also falls on the screen being in the straight line. In this way an inverted image of an object gets formed on the screen.

Project work

Prepare a pinhole camera using a cartoon box or a thick paper. Demonstrate it in the classroom.

Shadow

When we stand on a ground during the sunny day, our shadow gets formed on the ground in the direction opposite to direction of sunlight. If sunlight is blocked by houses, animals and trees etc , their images are seen opposite to them.

Why and how does an image form? Think about it.

Activity 7.14

Place a small ball on a table in front of the wall of your room. Now allow to fall light from a torch light. Shadow of the ball will be seen on the wall. Since the ball blocks the light from the torch, a shadow is seen in the region of not reaching light.

In fact, objects are transparent, translucent and opaque. Since light can pass easily through a transparent object, its shadow does not get formed. Since light does not pass through an opaque object, its shadow gets formed. Thus when an opaque object is kept in front of the source of light, its shadow gets formed behind it.

Types of shadow

There are two types of shadow. They are umbra and penumbra. If light is blocked totally, umbra is formed whereas penumbra is formed due to partial blockage of light.

Size of a shadow depends up on the distance between object and the source of light. It also depends up on the distance between light blocking object and the screen or wall on which shadow gets formed. If the object or screen is shifted towards the source of light, the size of the shadow decreases. The size of shadow also decreases by taking the source away from the object.

Activity 7.15

Make your school lab or a room dark by closing all its windows and doors. Put a candle or a lamp on a table. Now make the images to represent dog's head, a flying bird etc. using your palm and fingers as shown in the figure.

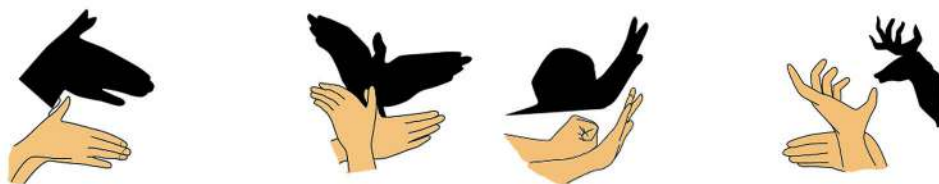
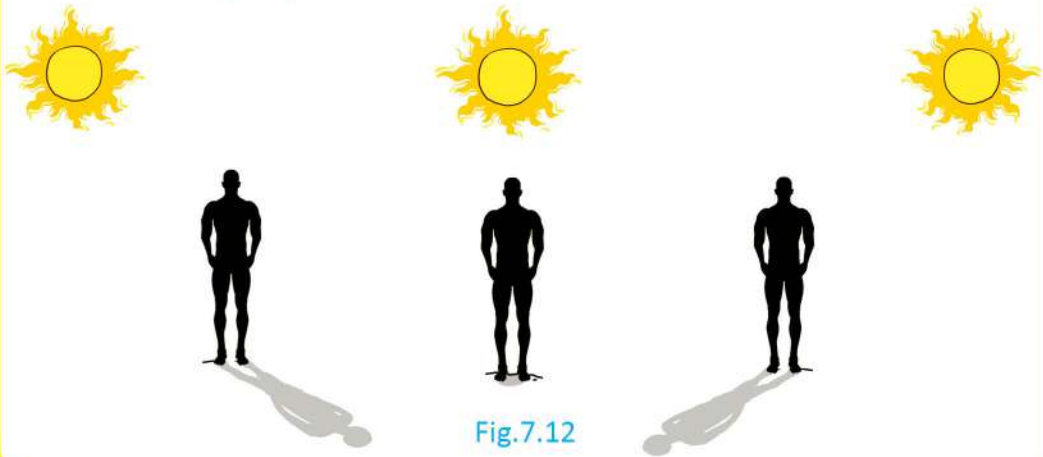


Fig 7.11

Activity 7.16

Observe the size and direction of your shadow formed while standing on the assembly ground during the school hour. Mark your position and length of the shadow. Repeat this activity in tiffin time and after the school hour as well.

What differences have you found in the direction and the length of your shadow? Discuss it next day in your class.



Question to think

1. Does a shadow get formed while standing in the dark place?
2. Will the shadow form if light travels in bent or curved path? Why?

Sundial

Activity 7.17

Take a wooden stick about 20 cm long. Make it erect on a cardboard paper kept on the yard so that its shadow falls on the paper. At the tip of the image so formed, make dot marks on the paper using a pen in the interval of each hour. Also measure the length of the shadow and fill it in the table below.

Time	8 AM	9 AM	10 AM	11 AM	12 Noon	1 PM	2 PM	3 PM	4 PM	5 PM
Length	....	....	....	....	....	....	....	....	....	....

- How are the length, direction and the position of the shadow changed?
- Can the time be estimated by observing the position and the size of the shadow? Discuss with your teacher in the class room.

Do you know how time was estimated before the invention of watch? What type of devices did our ancestors use to measure time?

The name of simple device used to know the information about the time before the invention of various types of watches is sundial. Time was measured by the study of length and direction of the shadow formed by it.

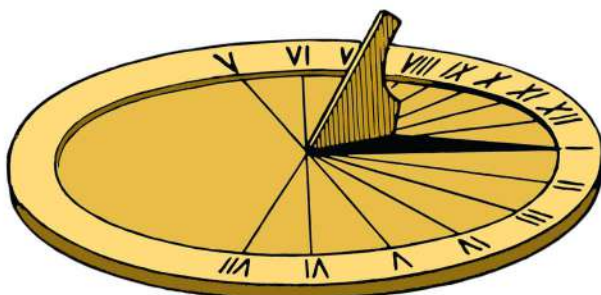


Fig.7.13

sundial

Activity 7.18

Make a sundial with help of a stick. Put it in the sunlight. Find out the time with the help of length and direction of the shadow of sundial.



Fig 7.14

- Shadow of which time of a day becomes long and short?
- Explain the cause of changing the size and direction of shadow during morning time, noon and evening time on the basis of this activity.
- What type of changes occur in the shadows of the objects placed in dark when a burning lamp is moved around them? What happens when the distance between the objects and the lamp is changed? Study it.

Exercises

1. Fill an appropriate word in the gap.

Ray	Straight	Shadow	Screen	Bending
-----	----------	--------	--------	---------

- Light only travels in a.....line.
- The small unit of a light beam is called.....
- Since light does not pass through an opaque object, itsis seen behind it.
- The tracing paper in a pinhole camera behaves like.....

2. Select a correct answer from the given alternatives.

- How does light propagate?
 - in a bending path
 - in a straight path
 - in a slanting path
 - in both bending and straight paths
- Which one of the followings is not necessary to form a shadow?
 - light
 - screen
 - a transparent object
 - an opaque object
- What is the small unit of a light called?
 - ray
 - light beam
 - shadow
 - image
- What type of image of an object is seen in the pinhole camera?
 - erect
 - inverted
 - vertical
 - horizontal
- Under what condition, can the size of a shadow be increased?
 - by shifting the source closer to the object
 - by shifting the object closer to the sources

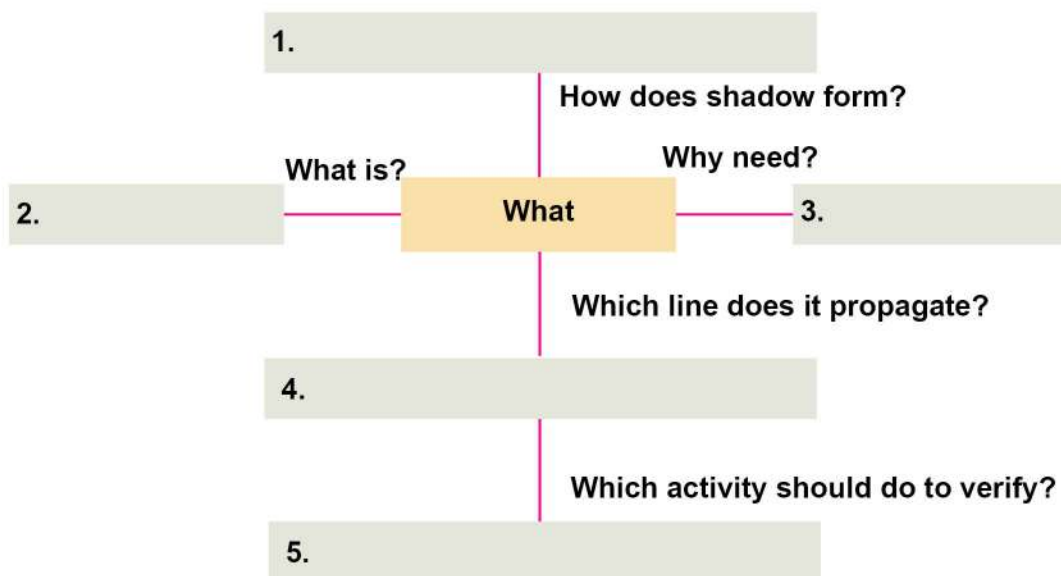
- iii) by shifting the screen closer to the objects.
- iv) both i and ii

3. Differentiate between

- a. a ray of light and a beam of light
- b. Umbra and penumbra

4. Answer to the following questions

- a. What is shadow? How many types of shadow are there? Why does the size of a shadow differ during the morning and evening time?
- b. Light propagate in a straight line. Explain this fact with a suitable diagram.
- c. If light travels in a straight line, why is the image of an object seen inverted in the pinhole camera?
- d. Light spreads out in all direction when a bulb is lighted. How is it possible according to the fact that light travels in a straight line? Put your opinion.
- e. Complete the following chart by filling the suitable facts in the boxes.



7.4 sound

What is sound? How is it produced? How can it reach up to our ears? Let us discuss on it.

Sound is a form of energy. It is produced in the form of wave due to the vibration of the objects. The wave is so produced up to our ears. We hear different types of sound in our daily life. Some of them are needed to us whereas the rest are unnecessary. We like some type of sound and we don't like the sound of other types.

Wave

Activity 7.19

Stretch a long rope with the help of a friend. Observe that rope by jerking its one end slowly.

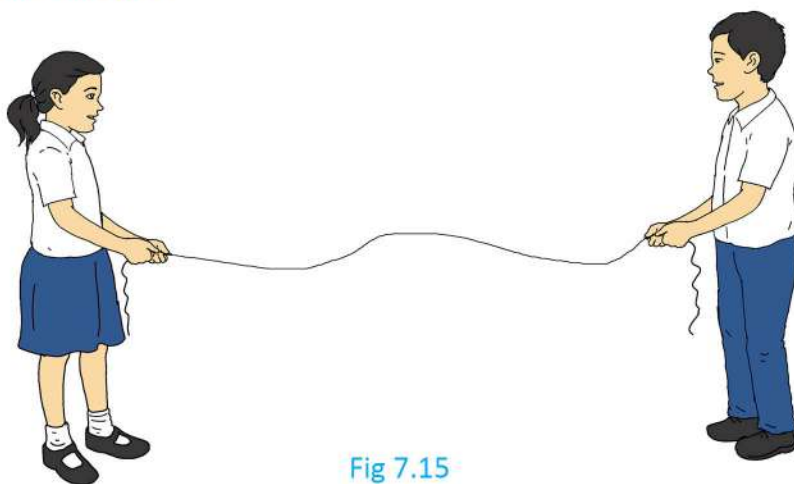


Fig 7.15

What do you see when one end of the rope is jerked slowly?

After dropping a stone into the still water of a pond, ripples appear to move towards its edge along with up and down motion. We called them waves. These waves seem to be distributed in all directions. Although waves spread out in all directions, the water in the pond continues to remain in its own position. In the same way, on jerking a stretched rope, waves are produced.

That wave seems to be transmitted in order being up and down from one end to another end of the rope. The process of transferring energy in a medium when an object gets vibrated is called wave.

Sources of sound

Activity 7.20

Take a steel plate and a spoon. Strike the spoon against the plate slowly and observe it.

1. Does the plate vibrate when the spoon strikes?
2. Does a sound produce after the production of vibration in the plate?
3. Do the vibrations continue on touching the plate?
4. Can such type of activity also be done in madal, guitar, bell etc?



Fig 7.16

From the above activity, we get the information that waves are produced in the air due to the vibration of plate. That wave reaches up to our ears in the form of sound. Thus, the main thing required for the production of sound is vibrating body. Sound transmits from one place to another place through all three media solid, liquid and gas. The object which produces sound is called a source of sound. Madal, guitar, bell, flute etc are the sources of sound.



Basuri



Bell



Madal



Guitar

Fig 7.17

Origin of sound waves

We come to know from the above activity 7.20 that sound is produced when the vibration produced in the plate pushes the air around it forming to and fro motion. This wave passes through the air from one particle to another and reaches up to our ears. Then we hear the sound. Thus, to produce sound, it is necessary to have vibration in a body and a material medium around it. Waves are not produced and we cannot hear the sound if there is no material medium around a body although it is vibrating.

Propagation of sound

Activity 7.21

Bring a long spring. Hold its two ends with the help of a friend and stretch it. Jerk its one end slowly and observe.

1. Is there production of waves while jerking its one end?
2. Do the waves move from one end to another end?
3. How does the distance between any two circular patrons of the spring appear during the propagation of waves?

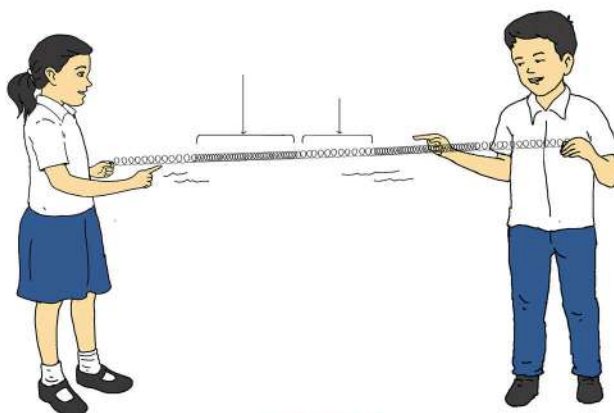


Fig 7.18

In the activity above, the circular patrons of the spring move in to and fro motion producing vibrations when one end of the spring is jerked. That vibration travels from one end to another end of the spring and the energy returns again back to the previous end after the reflection. While vibrating so some part of the circular patrons seems to be compressed and some parts seems to be separated. During this phenomenon, the direction of

transmission of vibrations and the vibration of circular patrons is same. This type of wave is called longitudinal wave.

As in the above activities, sound wave also passes from one places to another place via. the molecules of solid, liquid and gas. Since the sound wave is also a longitudinal wave, therefore the direction of vibration of particles of medium and the direction of propagation of sound is same. Sound waves also propagate to all the directions around its source.

Process of propagation of sound wave

It needs solid, liquid or gas medium (material medium) for the propagation of sound. Sound cannot propagate through vacuum. The molecules of a solid, liquid or gas are arranged in a patron. When an object vibrates, one molecule of medium pushes its neighboring molecules and so on. While pushing one another, the molecules of medium vibrate in to and fro motion. Compression (C) and rarefaction (R) of molecules takes place during their to and fro motion. In this way, transmission of sound takes place being compression and separation of the molecules of a medium.

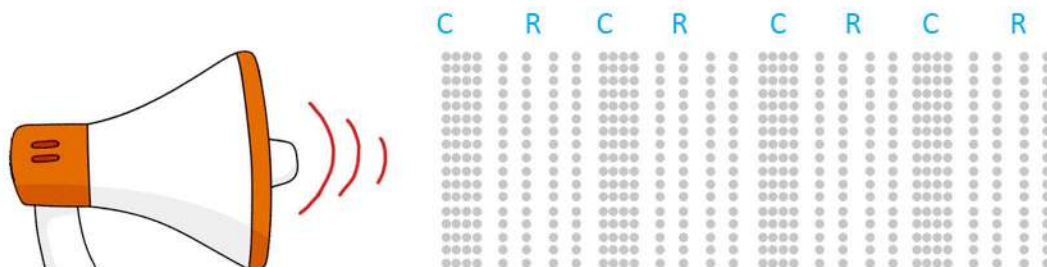


Fig 7.19

Propagation of sound wave in different medium

It needs material medium ie solid, liquid of gas medium for the propagation of sound but speed of sound in different medium is different.

Propagation of sound wave in solid medium

The molecules of solid are closer to each other. If a solid object is vibrated, the vibration pushes its molecules. The vibrating molecules push all the neighboring molecules. Thus, the wave immediately propagates from one to another molecule. Hence, the propagation of sound is fastest in solid.

Activity 7.22

Attach your ear to a wall. Tell a person to scratch the wall slowly at another end. Can the sound be heard? Now discuss about it.

From the activity above we come to know that sound propagate through a solid.

Whether the people inside a house can hear the outside sound? Discuss it.



Fig 7.20

Propagation of sound wave in liquid medium

Molecules of liquid are loosely packed than that in solid. When a molecule is pushed, it takes a bit time to collide with another molecule. Therefore, the propagation of sound in liquid is slower than that in solid.

Activity 7.23

Bring a bucket of water, a steel plate and a spoon. Strike the plate slowly with the spoon keeping them inside the water and hear the sound. Discuss Whether the sound is heard outside or not?



Fig 7.21

1. Can the aquatic animals hear the sound from outside the water? Have a discussion based on above activity?

Propagation of sound wave in gas medium

The molecules of gas are loosely packed than that in liquid. Since the molecules are loosely packed than that in solid and liquid, therefore a molecule takes more time to collide with other molecules than in solid and liquid when it is pushed. Thus, the propagation of sound is less in gas in comparison to solid and liquid.

Does sound propagate in vacuum or in absence of air?

It needs solid, liquid or gas medium for the propagation of sound. Since there is vacuum in the vast space between the sun and the earth, therefore the sound of big explosions occurred in the sun cannot reach to the earth. Similarly, it is impossible to communicate in moon without having special types of electronic devices because there is no air on the surface of moon.

Do you know?

The speed of sound is about 5200m/s in steel, about 1500m/s in water and about 332m/s in air.

Exercises

1. Fill in the blanks with the appropriate words.

Solid	Vacuum	Source of sound	Sound	Liquid
-------	--------	-----------------	-------	--------

- When a body vibrates,is produced.
- Transmission of sound is fastest in.....medium.
- Sound does not propagate through.....
- Sound producing object is called a.....

2. Select the correct alternatives from the following.

- In which medium of the following speed of sound is fastest?
 - solid
 - liquid
 - gas
 - both solid and gas.
- What is the velocity of sound in air?
 - about 332m/s
 - About 5200m/s
 - About 1500m/s
 - About 1000 m/s
- What is the sound producing object called?
 - a form of sound
 - medium of sound
 - condition of sound
 - source of sound
- Which order is correct for the speed of propagation of sound?
 - liquid > solid > gas
 - gas > solid > liquid
 - liquid > gas > solid
 - solid > liquid > gas

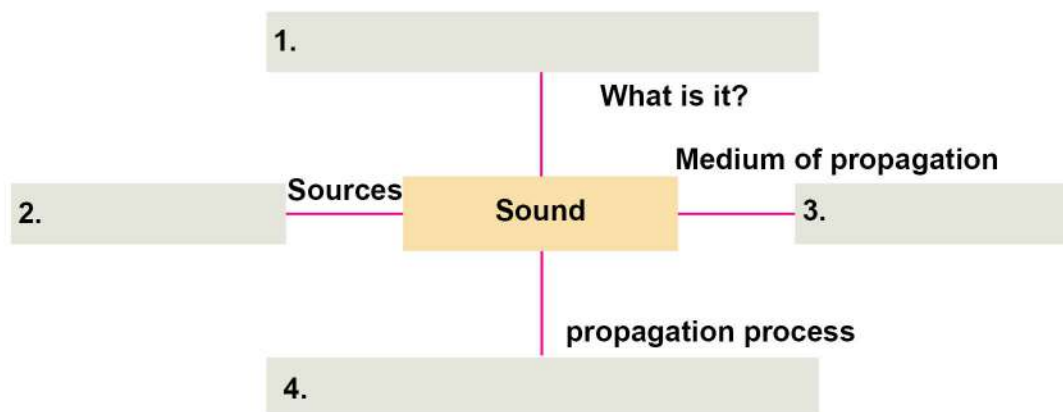
1. Give reason:

- An electronic device is to be used to communicate with a friend in the moon.

- b. The speed of sound is highest in solid.
- c. Speed of sound is least in liquid.

2. Answer the following questions.

- a. What is a wave? How is it produced?
- b. What type of similarities and differences are found when sound is propagated through solid, liquid and gas?
- c. Sound is heard later than the lightening in the sky. Why ?
- d. Once you attach your ear at one end of the longest wall of your classroom to hear and your friend scratches on another end of the same wall using a nail. Then you try to hear the sound without attaching your ear on the wall, In which condition of these two activities do you hear the sound and why? Explain in the context of propagation of sound.
- e. Fill the empty box.



unit 8 **Electricity and Magnetism**

What type of object is called a magnet ? How can it be identified whether a substance is magnet or not? Let us discuss in the class.

The object, which attracts iron dust, nail or pin is called a magnet. A magnet has a type energy of attraction, which is called magnetic energy. It attracts some objects due to its magnetic energy. Those objects, which are attracted by a magnet, are called magnetic substances. Magnets are used in the radio, telephone, electric motor, transistor, microphone, fan, speaker, generator etc.



Fig. 8.1

Let us study an event.

Many years ago, a shepherd named Magnes went to graze cattle by wearing shoes containing iron nails. While walking on the way, his shoes got attached on the ground. He could not detach them even after applying more force. On searching the cause, it was found that shoes attached on the ground due to the presence of magnet. In this way, a magnet, which could attract iron (magnetic substance), was found out.

Magnetic field

Activity 8.1

Bring a magnet, some iron dust and a piece of white paper. Spread the iron dust on the white paper after placing the magnet below the paper so that it lies at its middle portion. Now observe that the iron dusts up to what distance is attracted by the magnet.

1. In which part of the magnet, is the iron dust collected more?
2. Was the magnet capable of attracting all the iron dust?

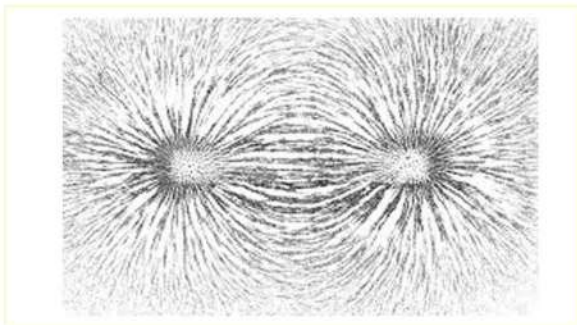


Fig 8.2

All the magnets have own capacity of attracting the magnetic substances. There is no influence of magnetic power beyond the particular region. The region around a magnet up to which a magnet can attract iron dust or a magnetic substance is called magnetic field. Thus the region around a magnet in which its effect can be experienced is called the magnetic field. The magnetic field of a powerful magnet is extending up to the longer distance whereas that of a weak magnet is closer to it.

Magnetic poles

On observing the conclusion of the activity 8.1, it can be known that the power of the same magnet differs in different places. If the magnet in above activity is brought closer to the iron dust, iron dust seems to



Fig 8.3

be collected more at the ends but that seems to be less at the middle portion. Therefore, the power of a magnet is more at both the ends than that at the middle portion. These ends are

called poles of a magnet. There are two poles: north pole and south pole in a magnet.

Activity 8.2

Repeat the activity 8.1 and above task again and draw a picture showing strength of a magnet is more at the poles than that at the middle portion.

Methods of making magnet

There are many methods of making magnets. Only the magnetic materials are used to make magnets. A non-magnetic substance cannot be changed into a magnet. Out of various magnetic substances, iron and nickel are used to make magnets. The magnet so prepared is called an artificial magnet. Some rules of making magnets from the magnetic materials are as follow;

- a. Stroking method
- b. Electrical method

Stroking method

A magnet can be prepared by rubbing a magnetic substance with a magnet. There are various ways of making magnets in this process too. Out of them a process of making magnet by rubbing a magnetic substance with a magnet in a single direction is given below.

Activity 8.3

Place a magnetic material (an iron rod or a nail) on the table. With the north pole of a permanent magnet, rub the magnetic material from one end to another end. When it reaches to another end, raise the magnet and rub it again from the previous point. The magnetic materials becomes magnet after sometime. The point from where the pole of the magnet is raised up, an opposite pole is produced at that point.

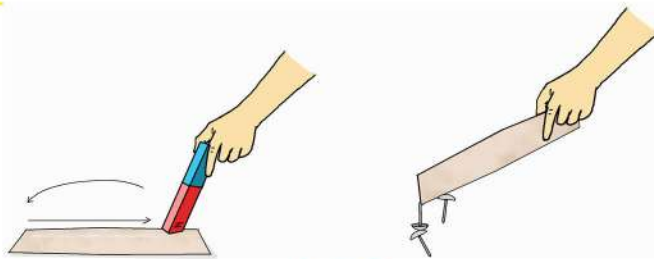


Fig 8,5

Can a nail, pin, blade etc be magnetized by applying this method?

From the activity 8.3 We know that magnet can be made by rubbing a magnetic substance with a permanent magnet in a single direction continuously.

Activity 8.4

Bring an iron nail and a piece of insulated copper wire about one-meter long. Coil the copper wire over the nail making about 80 to 100 turns by winding in one direction. After that connect the two ends of the wire to the two terminals of a cell. Bring that nail closer to the magnetic substances like iron dust, pin, blade etc.

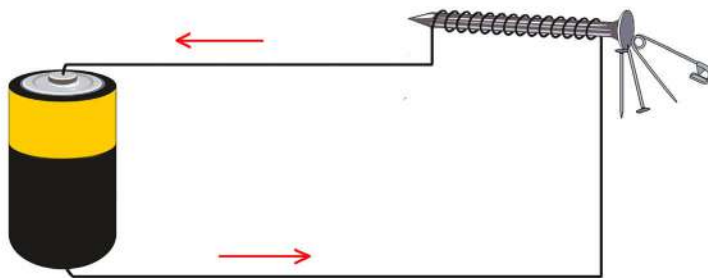


Fig 8.5

1. Does the nail attract iron dust, pin, blade etc?
2. What change occurs in the power of the electromagnet by increasing or decreasing the number of turns of the copper wire?
3. What change occurs in the power of the electromagnet by increasing or decreasing the number of cells keeping the number of turns of the wire constant?
4. What change occurs in the electromagnet when one end of the coil is detached from the cell?

The fact known from the activity 8.4 is that a magnet can be prepared with the help of electricity. The magnet made by using electricity is called an electromagnet. Such type of magnet is temporary. When it is needed it can be magnetized by passing electricity through it and an electromagnet can be demagnetized by stopping the flow of current. A magnet is not form by this process by connectig direct line of electricity at our home or school.

Change in magnetic strength of an electromagnet

The strength of an electromagnet can be changed according to our necessity. If the number of turns of wire is increased its strength increases and strength decreases by decreasing the number of turns. Similarly, its strength increases on increasing the number of cells and decreases with decreasing the number of cells.

Use of electromagnet

Activity 8.5

Make a list of various types of electrical devices with electromagnets used in your home by asking your parents or searching or seeing them.

Electromagnets are used in electric fan, motor and electric bell etc.

Electricity

Where is the necessity of electricity? What type of electrical devices have you seen? Discuss in the classroom. Electricity is needed in our daily life to do various works. Electricity is needed to cook food, to iron clothes, to wash clothes and to glow bulb. Telephone, television, radio, computer, heater, iron, electric motor and air conditions etc. are also run by electricity. Now a days most of the industries are run by electricity. Thus, electricity is most essential source of energy for modern age.

Sources of electricity

Electricity can be produced in various ways. Among them, cell, photo cell, generator etc. are the main devices of producing electricity. Electricity producing devices are called the sources of electricity.

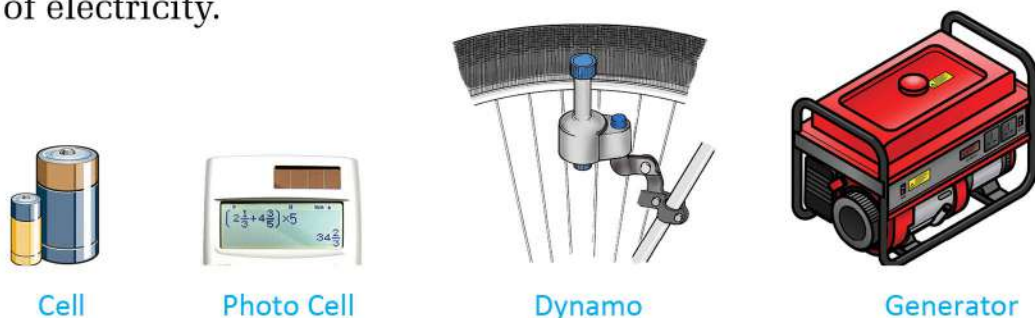


Fig.8.6

Cell

Have you seen the cell used in torch light, radio etc.? How does it work? Discuss it. A cell converts chemical energy in to electrical energy. The electrical energy so converted is transferred into light, heat, sound energy etc. with the help of electric devices.

Simple cell

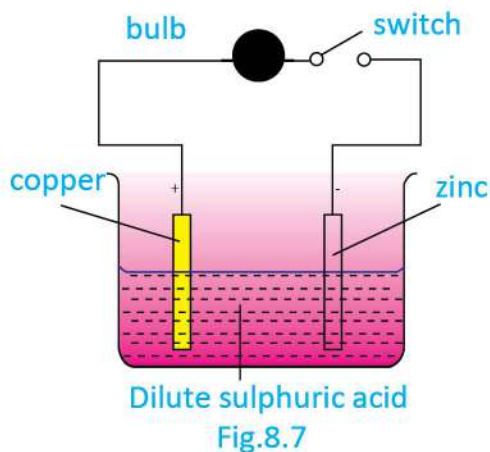
Have you seen a simple cell? How is its structure? How does it produce electricity? Let us discuss on these issues.

Caution: Since sulphuric acid is used in a simple cell, one should not work

Activity 8.6

without the supervision and help of a teacher.

Bring a beaker or a glass, a copper plate, a zinc plate, two pieces of copper wire, some amount of sulphuric acid and a bulb of a torch light. With the help of your subject teacher, take about half beaker of dilute sulphuric acid. Now dip the copper and zinc plate in the sulphuric acid. Connect the bulb, zinc plate and copper plate by means of the pieces copper wire as shown in the figure. Now observe it.



1. Can the bulb glow in the structure so formed?
2. Can electricity be produced for long time by this cell?
3. Can this cell be carried easily from one place to another place?

A simple cell produces electricity by converting chemical energy into electrical energy. Since sulphuric acid is used in this cell, it is inconvenient to carry from one place to another place. Electricity in large scale cannot be produced from this cell. Also, it cannot be used for long time. Therefore, it is less useful in our daily life.

Activity 8.7

Insert a small zinc plate and a small copper plate into a lemon fruit maintaining a certain distance between them. Now connect two pieces of copper wire and a galvanometer with the copper and zinc plate as shown in the figure.



1. Does a bulb glow with the help of the structure so formed?
2. Can electricity be produced from an apple, potato, vovate etc?

Electric circuit

Activity 8.8

Connect a dry cell, copper wire, switch and a bulb as shown in the figure. Does the bulb glow when the switch of this arrangement is pressed? Observe it. Now, let the switch remain opened and observe the bulb again.

1. The bulb glows when the switch is pressed but it does not glow when the switch remain opened, why?
2. What is the use of dry cell, copper wire, switch and bulb of this structure?

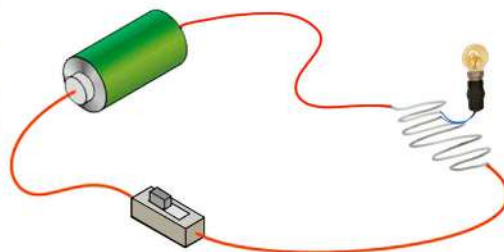


Fig. 8.9

Electricity is a form of energy. This energy can be transferred into light, heat, sound and magnetic energy. Electrical energy is used to light bulb, to run heater, fan, radio, television, and computer. The path through which electricity passes is called an electric circuit. There should be a source of electricity (cell), conducting wires and load (bulb) in an electric circuit. The continuous path made by connecting source of electricity, conducting wire and load such that electricity can pass through it is called an electric circuit. Electricity producing devices like dry cell, photocell, generator, dynamo etc are called the sources of electricity. The devices run by electricity are known as loads. An electric bulb, heater, radio, television etc are loads.





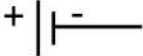
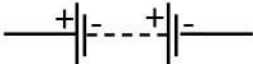



Closed and open circuit

Recall the activity 8.8 again. The bulb glows when the switch is on. This type of electric circuit is called a closed circuit. In the

above activity, the bulb does not glow in the condition of switch off or disconnection of wire at a place. Such circuit is called closed circuit. The circuit in which load is functioning is called closed circuit and if the load is not functioning it is called open circuit.

Symbols used in electric circuit

It is inconvenient and time consuming to draw the actual shape and size of devices while sketching an electric circuit as shown in the activity 8.8. Therefore, an electric circuit is sketched by representing different devices with symbolic signs. The names and their symbols of some important devices are given in the table below.

Electric device	Symbol
Wire	
Disjointed wires	
Jointed wires	
Switch	
Electric cell	
Battery	
Resistor or load	
Lamp or bulb	
Fuse	

Activity 8.9

Redraw the electric circuit given in the activity 8.8 using the symbols of dry cell, conducting wire, switch and bulb shown in the above table

1. Which electric circuit in the activity 8.8 or that in 8.9 is easier and faster to draw?
2. Can such symbols be used for other devices as well?
3. Tell any two differences between the figures in the activity 8.8 and 8.9.

Effects of current electricity

Different works can be done by converting the electric energy into various forms of energy. This is known as the effects of current electricity. There are various effects of current electricity like lighting effect, heating effect, magnetic effect and chemical effect etc. We will discuss here about heating effect.

Heating effect of current electricity

Activity 8.10

Caution: Hot wires of Nichrome and Constantan should not touch by hand.

Take a dry cell, copper wire, switch and nichrome or constantan wire and put them on a table or wooden plank. Connect them as shown in figure and wait sometime after putting the switch on.

1. Does the nichrome or constantan wire get heated after sometime?
2. What is the reason behind getting heated up?
3. Under the supervision and help of your parents, connect the heating devices like heater, kettle, immersion heater and iron of your home to the electric line and put their switch on. Observe the heat producing process.

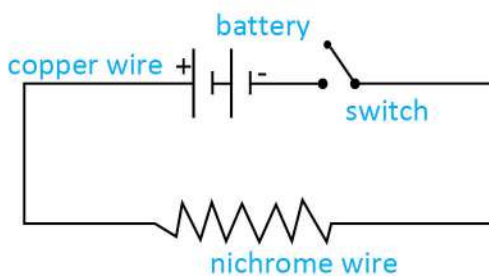
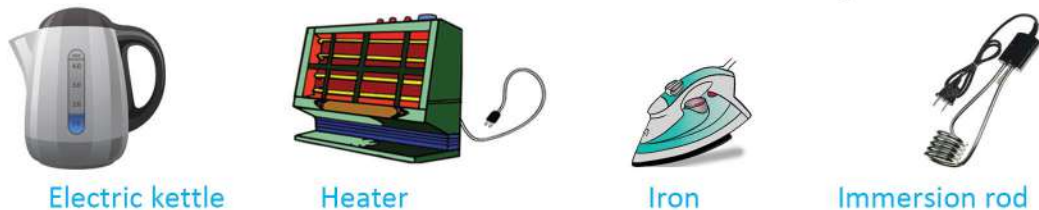


Fig. 8.10

When electricity is passed through the coil of some metal, it gets heated up producing heat. This process of producing heat is called heating effect of current electricity. This is utilized in room warming heater, electric kettle, immersion heater and electric iron. The coil used in these devices is called heating element.



Electric kettle

Heater

Iron

Immersion rod

Fig.8.11

Fuse

Sometimes, there may be excessive flow of current beyond the capacity of an electric circuit. When it happens, the electric devices used in the circuit may damage and catch fire. A preventive measure is applied in the electric circuit to avoid such accidents. A fuse is used for this purpose. Fuse is a short piece of wire which melts at lower temperature. It is connected in the electric circuit. If more current passes in the circuit, it melts making the circuit open and power supply stops. It is kept in a holder and socket arrangement and then used. If that wire melts after getting heated up, another fuse wire is used in it.



Fig.8.12

Activity 8.11

Connect two pieces of iron wire using a short piece of nylon thread. Heat a free end of iron wire using a burning candle. What happens then? Observe it.

1. From which part of the wire, does it break?
2. What is the difference between the working principle of a fuse and the nylon wire? Study it.

Miniature Circuit Breaker-MCB

If the fuse wire melts, it is to be replaced. This work is not easy and convenient for all. Thus, MCB is developed. MCB is the advanced form of fuse. It gets switched off itself, when more than required amount of current passes through the circuit and avoids the probable accidents. It works again when it is pushed up.

Summary

1. The object, that attracts the magnetic substances, is called a magnet.
2. The region around a magnet in which the force of attraction or repulsion can be experienced is called magnetic field.
3. The magnet prepared by using electricity is called an electromagnet.
4. A simple cell produces electricity by converting chemical energy into electrical energy.
5. The continuous path made by connecting source of electricity, conducting wire and load so that electricity passes continuously is called an electric circuit.
6. The circuit in which load is functioning is called closed circuit and if the load is not functioning it is called open circuit.
7. The process of converting electrical energy into heat energy is called heating effect of current.
8. The metal coil which converts electrical energy into heat energy after getting excessively heated while passing current through it is called heating element.
9. Fuse is a short piece of wire that melts at low temperature.
10. MCB gets switched off itself, when more than required amount of current passes through the circuit and avoids the probable accidents.

Exercises

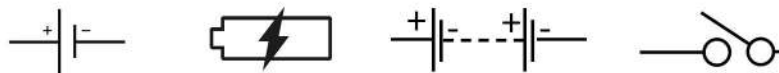
1. Fill the blanks with the appropriate words.

Magnetic field	Electromagnet	Magnetic substance	dilute Sulphuric acid
----------------	---------------	--------------------	-----------------------

- The substance attracted by a magnet is called.....
- is used in a simple cell.
- The region around a magnet in which a magnet attracts or repels is called.....

2. Select a correct alternative from the following.

- Which one of the following is not attracted by a magnet?
 - iron nail
 - iron pin
 - iron dust
 - dust particles
- Which one of the following is a device not producing electricity?
 - simple cell
 - dry cell
 - electric motor
 - generator
- Which one is the symbol of a cell?



- What is the function of a cell?
 - To convert electrical energy into chemical energy
 - To convert chemical energy into electrical energy
 - To convert chemical energy into light energy
 - To convert chemical energy into sound energy

- e. Why is a fuse used?
 - i) To increase current in an electric circuit
 - ii) To decrease current in an electric circuit
 - iii) To prevent more current than the capacity of circuit.
 - iv) To change the direction of the current in the circuit.

3. Identify true and falls

- a. The region of attraction or repulsion is called magnetic pole.
- b. Dilute Sulphuric acid is used while making a simple cell.
- c. Fuse wire melts at low temperature.
- d. MCB is the advanced form of fuse.

4. Write the differences between

- a. Closed circuit and open circuit
- b. Fuse and MCB

5 Give reason

- a. MCB is easier to use than fuse
- b. Fuse is called a protective wire.

6. Answer the following questions

- a. What is magnetic field?
- b. Define electromagnet. How do you convert an iron nail into electromagnet? Explain with figure.
- c. What is an electric circuit? What are the basic components of an electric circuit?
- d. What is heating element? Write any two examples.

- e. What is a simple cell? Explain the process of making a simple cell using a potato with a suitable diagram.
- f. Draw an electric circuit using following symbols.



- g. What do you do if the fuse in your home gets damaged when you are alone? Write your opinion.
- h. The fuse in Ronish's home is to be changed frequently. His neighbors suggest his father to use a bit thicker copper wire in the place of fuse wire so that it need not to be changed frequently and electricity can be consumed confidently without any disturbances. Mention your reaction in the context of that thought with the suitable reason.
- i. There is a problem in a house such that the MCB falls frequently down and stops the power supply. What happens when the house owner consumes electricity by holding the MCB using a short stick such that it does not fall down? Write your suggestions too.
- j. In present time, electricity has become an essential source of energy. Justify this statement with arguments.

Glossery

Conductor – a substance, which allows electricity to pass

Insulator - a substance, which does not allow electricity to pass

Constantan - an alloy of copper and nickel

Nichrome - an alloy of chromium and nickel

Heating element – a coil which gets heated up while passing current through it.

We found different types of objects in our surroundings. Most of these objects have their own weight and volume. We call soil, salt, water, wood, iron, air, etc. as matter. Some of these substances are pure and some are impure. Water, salt, iron, copper, etc. are pure substances while clay, milk, air, etc. are impure substances. Impure substances are called mixtures.

9.1 Mixture

In our daily life we have seen different types of objects like clay, rice, milk, curd, tea, air etc. Are they all made of the same material, or are they made up of different kinds of objects? Tea is made by mixing water, milk, tea leaves, sugar etc. The muddy water is mixed with soil, sand, garbage, etc. Nitrogen, oxygen, carbon dioxide and other gases combine to form air. Hence, mixture is a physical combination of two or more substances. The material from which the mixture is made, they are called components of a mixture. Tea is a mixture of water, milk, tea grains, sugar, etc., which are the components of tea.

Questions to Think

Why is soil called a mixture?

Types of mixture

We have seen a mixture of different types of ingredients. Waste rice may contain small stones, bricks and glass, rice seeds, husks, etc. These components can be easily identified, but the nitrogen, oxygen, carbon dioxide, and other gases in the air cannot be seen. The mixture can be divided into two types depending on the method of mixing

- i. Homogeneous mixture
- ii. Heterogeneous mixture

Activity 9.1

Bring two glasses. Put half a glass of water in each glass. Put a teaspoon of salt in one glass and a teaspoon of sand in the other glass and stir well with the help of a spoon or a small glass rod. Now take a closer look at both glasses. Can salt or sand be seen in a glass of water? Then keep both the glasses still for some time and see what changes. The salt dissolves in water while the sand separates from the water and settles on the bottom of the glass.



Fig 9.1

Salt Water

Mixture of Sand and Water

From the above activities it is clear that salt and water mix uniformly. The ingredients mixed here cannot be seen and recognized with the naked eye. Sand and water do not mix uniformly. The ingredients mixed here can be seen and recognized with the naked eye. Thus if when all the objects or ingredients in the mixture are mixed uniformly and ingredients cannot be seen and recognized with the naked eye then such mixture is called homogeneous mixture. Examples of homogeneous mixtures are salt water solution, sugar water solution, soda water, different types of beverages, air etc. If the ingredients in a mixture are not uniformly mixed and the ingredients can be seen and recognized with the naked eye, such a mixture is called a heterogeneous mixture. Examples of heterogeneous mixtures are sandy water, muddy river water, rock or rice seeds or rice mixed with husk, etc.

Questions to think

1. Which of the mixture prepared on activity 9.1 is a homogeneous mixture and which is a heterogeneous mixture? Why?
2. What kind of mixture is made by dissolving sugar in milk?

Activity 9.2

Make mixtures of salt, sugar, alcohol, camphor, copper sulphate, clay, chalk dust, etc., one by one in water, as you did in the activity 9.1. Distinguish between the homogeneous mixture and the heterogeneous mixture.

Forms of mixture

Mixtures are made up of a variety of items. The forms of the mixture are as follows depending on the composition of the mixture:

- i. A mixture of camphor, soil, rice with waste etc. made of solid and solid
- ii. Mixtures of salt water, sugar water etc. made by mixing solid and liquid
- iii. Mixture of dust particles etc. in the air formed by mixing solid and gas
- iv. A mixture milk and water, kerosene and water etc. made by mixing liquid and liquid.
- v. A mixture of different types of beverages (soda water) etc. made by mixing liquid and gas
- vi. A mixture of gas and gas like air

Not all types of mixtures can be separated by the same method. The ingredients in the mixture are separated using different methods based on the properties of the substances mixed in the mixture. The mixture can also be separated by various methods like filtering, decantation, evaporation, distillation etc.

Method of separating mixture

Each mixture contains two or more ingredients. Not all of these ingredients are necessary or useful. Therefore, the items in the mixture have to be separated as per the requirement. Stones mixed with rice, husk, small pieces of brick, glass, rice seeds, etc. are unnecessary ingredients. Pure rice is obtained by separating those unnecessary ingredients from rice.

Evaporation

Activity 9.3

Make a glass of salt water in a pot. Slowly heat the salt water. After the salt water is heated, the water evaporates into the atmosphere, and in the end, white salt remains in the pot.

1. Why did all the water evaporate out of the pot and only salt was left?
2. What happens when you use this type of experiment in sugar water? Try it out.



Fig: 9.2

Evaporation is the process of heating a solution and separating a solid from a liquid. In this method the solution is heated slowly. After heating, the solvent (water) evaporates and the solute remains in the vessel. This method is used to extract salt from seawater.

Distillation

When water is heated, it boils at a certain temperature and becomes steam. When the same steam cools, it turns into water again. In this way water can be separated from the mixture. The evaporated liquid can be condensed and collected in another vessel. For example, the same method can be used to separate water from a mixture of salt water. Salt needs a lot of heat

to boil. When the mixture is heated, water evaporates before the salt. The steam is cooled and converted into water. Distillation is the process of converting the liquid in the mixture into steam and re-cooling it. In the laboratory, a special device is used to collect water by cooling the steam. This is called a condenser.



fig:9.3

Question to think

Is it possible to separate mixture of water and other liquids with less boiling point than water from distillation?

There are other liquids that boil at lower temperatures than water. The boiling temperature of alcohol is lower than the boiling temperature of water. When the mixture of alcohol and water is heated, the alcohol evaporates before the water and only water remains in the vessel. Distillation can be used to separate such mixtures. According to the boiling temperature of the liquid, it can be heated from the mixture and separated as steam.

Use of distillation as a local technology

People from some communities make alcohol at home. To make wine, a mixture of millet or other grains mixed with water and molasses is heated. Molasses is the mixture of cooked millet or other grains with *marcha*. When heated in this way, the mixture evaporates faster



fig:9.4

than water, which is brought into contact with cold water and collected as alcohol in a separate container. As the temperature rises, water vapour also mixes, so the wine does not contain pure alcohol. This is an example of separating the ingredients of a mixture by distillation method. Distillation is also used to extract essential oils from a variety of plants. People around the sea use distillary to extract pure drinking water from salt water.

Activity 9.4

How to separate salt and water from salt water solution?

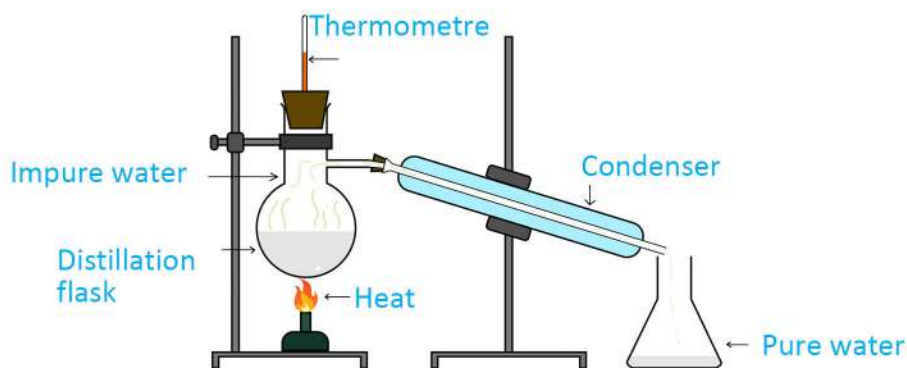


fig:9.5 Simple Distillation Method

Put half of the salt and water solution in a flask. Connect the flask to the condenser as shown in the picture and arrange for cold water to flow. Heat the flask slowly. After heating, water evaporates. The steam accumulates as pure water in a conical flask or measuring cylinder placed on the other side of the condenser.

1. Can this method be used to separate the mixture of alcohol and water?

Chromatography

Have you ever noticed that when writing with a fountain pen, the letters are is not recognized by moving the ink? The water in the mixture of colors can also transfer colors to paper, cloth, chalk, etc. When a mixture of colors is poured into a color-shifting medium, they are transmitted at different rates. The

color separation is due to the fact that some colored substances spread quickly on the paper and other substances spread slowly. Paper chromatography is used to distinguish and identify different coloured substances.

Activity 9.5

Take a filter paper. Make a circular hole in the center. Roll out another filter paper and insert it into the hole in the previous paper. Place a little red ink near the hole and let it dry. Now place the structure you made in a water beaker. Observe after 2 hours. You will see that the colors in the mixture have separated.

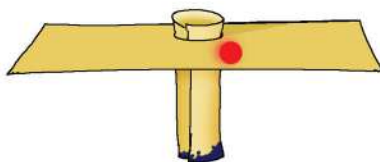


fig:9.6



Activity 9.6

Take half of water in a beaker. Drop a small amount of blue ink in a filter paper. Keep it above the water so that it does not sink. Observe after a while. You can see the blue ink spread on the filter paper. Along with that, different colors of ink can be placed in water and colours will be identified.

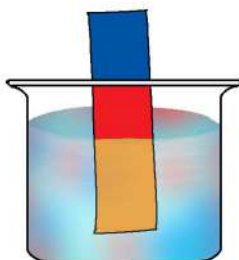
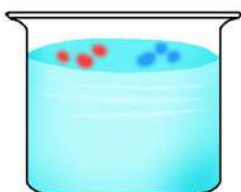


fig:9.7

Application of Chromatography

Chromatography is used in hospitals, laboratories, research centers, etc. The uses of this method are as follows:

1. In a laboratory or research center, different types of chemicals are identified by using the chromatography method.
2. It is used to present in the urine and blood in the hospital.
3. Using this method, different types of colors are identified by separating them from the mixture.

Project work

Bring a rose flower and leaves and grind them in a mortar to extract the liquid. Filter the liquid and separate the colors by paper chromatography.

Centrifuging

Activity 9.7

Bring a plastic bottle. Cover the bottle with sand, chalk dust and water. Tie the mouth of the bottle with a rope and rotate it for a few minutes in an open space. Now take a closer look at the bottle. Because the sand is heavy, it accumulates on the bottom of the bottle, but the chalk dust is lighter than the sand, so it separates and stays on top of the sand.



fig:9.8

The mixture contains a variety of substances. Some of these substances are heavy and some are lighter. When heavier and lighter unsoluble substances mixed in water is rotated with high speed, these substances get separated. This method is called centrifuging method. Using this method, butter is separated from milk and curd. Centrifuging method is also used when testing blood in modern laboratories.

Nowadays special types of centrifuging devices are used in the laboratory. These devices are connected to an electric motor for rotation. Such devices are called centrifuges. The mixture to be separated is placed in a test tube and placed inside the device. Inside the device are special chambers containing test tubes. Now the centrifuge is rotated with the help of electric motor. After turning, the heavy substances in the mixture are released at the bottom of the test tube and the lighter substances at the top.



fig:9.8

Activity 9.8

Collect about half a kilo of milkcream from your home, neighborhood or nearby dairy. Put the liquid in a deep bowl and stir for a while. In this way, it becomes butter. Now put water in the same container almost making that full. It is seen that the butter is floating in the vessel. Separate the butter from milk.

1. Discuss why the butter floated on the milk.
2. What happens if boiling water is put in the vessel instead of cold water?



fig: 9.10

Have you ever seen a yogurt maker in the village using a *theki* and a *madani*? If you have seen it, discuss it in class. The churning method is the simplest method of separating the ghee from the curd locally. In this method, yogurt is collected in a container and churned with the help of *Madani*. After a while, the butter appears.



fig: 9.11 Churning method

The butter is floated. Now the butter is separated with the help of hands. The liquid remaining after the separation of butter is called buttermilk (*mohi*). Thus using the centrifuging method, solid substances are separated from liquids.

Nowadays, in urban areas, butter is extracted by shaking milk or yogurt from motorized equipment called automatic electrical blender.

9.2 Solution, colloid and suspension

Take three beakers. Put salt water in one, milk in the second and muddy water in the third beaker. Fill in the table below by observing and testing all three mixtures and discuss the findings in class.

Table 9.1

Mixture	Can particles be seen with the naked eye or not?	Can particles be seen from hand lenses or not?	Light penetrating or not ?	Can filter paper be used to separate the mixture or not ?
Salt water				
Milk				
Muddy water				

Depending on the particle size, the mixture can be divided into three types viz., solution, colloid and suspension.

Solution

Have you drank the *Jeewanjal* ? What is it made of? Can you see the ingredients in it? Discuss with classmates.

Activity 9.9

Bring half the water in a glass jar. Add a teaspoon of sugar and stir well with a spoon. Now keep the glass still for a while and observe.

1. Did you see sugar in the mixture?
2. Mix pure substances like salt, sugar, alcohol, camphor, copper sulphate in different water to make a mixture. Observe which substances can be seen while mixing with water.



fig: 9.12

A solution is a mixture of two or more substances mixed homogeneously. Substances mixed in the solution cannot be easily seen and distinguished. For example, sugar cannot be seen in a solution of sugar and water. A solution is made by mixing solvent and solute. Solvent is the substance in which a solute dissolves to produce homogeneous mixture. Solute is the substance which dissolves in a solvent. For example, sugar is a soluble substance in a solution of sugar and water, while water is a solvent. When making a solution, more than one solute can be kept in the same solution. For example, sugar, water and lemon juice can be mixed to make a solution. It contains water as solvent and lemon juice and sugar as solute.

Solution = Solute + Solvent

Some examples of solution, solutes and solvents

S.N	Solution	Solute	Solvent
1	Sugar solution	Sugar	Water
2	Salt solution	Salt	Water
3	<i>Raksi</i>	Alcohol	Water
4	Copper Sulphate solution	Copper Sulphate	Water

Colloid

We have seen milk, gum, blood etc. These are a kind of mixture. This is called colloid. The particle size of the solute dissolved in the solution is very small (diameter less than 10^{-7} cm) and the particle size of the solute dissolved in the colloid is slightly larger (10^{-7} to 10^{-5} cm diameter). These particles cannot be filtered using filter paper. From the outside the colloid looks like a solution, but it is a kind of heterogeneous mixture, and the particles of dissolved in it cannot be seen with the naked eye.

Suspension

Take half a liter of water in a beaker. Put chalk powder / flour or lime in the water and dissolve it for a while. What kind of mixture is obtained, homogeneous or heterogeneous? Discuss. The particle size of the solute in the suspension is larger than that of the colloid (diameter greater than 10^{-5} cm). These particles can be filtered using filter paper.

Use of solution in our daily life

Activity 9.10

Make a list by looking at what solutions are being used in your home or by asking a parent. Write the use of each solution on chart paper and present it to the class.

We may have seen the putting of manure on field for plants growth. Do plants eat manure like we eat rice? Certainly not. Plants get their nutrients from the roots in the form of solutions. Humans and animals also take in many of the nutrients they need. In short, the usefulness of solution in our daily life can be explained in the following points:

1. Plants absorb the water and salts needed to make their food from the soil as a solution.
2. The food and medicine we eat is absorbed into the bloodstream as a solution after digestion.
3. Aquatic animals and plants breathe with the dissolved oxygen in the water.
4. A variety of medicines, beverages, juices, etc. are also available in the form of solutions.

Project work

Using wood, clay or paper, make a pattern of *theki* and *madani*. Discuss how this pattern works.

Summary

1. A mixture is a combination of two or more substances. Examples of mixtures are air, salt water solution, sand and iron dust.
2. The material from which the mixture is made is called the ingredient of the mixture.
3. Depending on the way the ingredients in the mixture are mixed together, the mixture can be divided into two types: homogeneous and heterogeneous.
4. If all the ingredients in a mixture are mixed uniformly, such a mixture is called a homogeneous mixture.
5. If the ingredients are not uniformly mixed, such a mixture is called an heterogeneously mixture.
6. The method of separating the ingredients in a mixture to obtain pure and essential ingredients is called separation of mixtures.
7. Evaporation is the process of heating a solution and separating a solid from a liquid.
8. The method of separating the mixture of liquid and solid by rotating them to separate the light and heavy substances in it is called centrifuging method.
9. The method of seperating liquid in the mixture first by evapouring and then cooling is called distillation.
10. A solution is a mixture of two or more substances mixed homogeneously.
11. The method of seperating dissolved colours in mixture based on the their rate of migration accross sheets of paper is called paper chromatography.

Exercise

1. Fill in the blanks.

Homogeneous distillation base vaporization mixture components

- i. A substance consisting of two or more physical objects is called
- ii. The object forming the mixture is called the of mixture.
- iii. Ingredients are mixed uniformly in the mixture.
- iv. Alcohol is made in the village usingmethod.
- v. In centrifuging method heavy objects accumulate in the of test tube.

2. Choose the correct answer from the options given below:

- i. In which mixture are the ingredients uniformly mixed?
(a) Sand water (b) Rice mixed with husk
(c) Salt water (d) Muddy water
- ii. Identify the heterogeneous mixture from the given examples:
(a) Sugar water (b) Soda water
(c) Salt water (d) Muddy water
- iii. What method is used to extract butter from curd?
(a) Distillation (b) Centrifuging
(c) Evaporation (d) Chromatography

iv. What method is used in the hospital to differentiate and identify chemicals mixed in urine and blood?

- (a) Distillation (b) Centrifuging
(c) Crystallization (d) Chromatography

3. Tick (✓) the correct statement and cross (X) the wrong statement.

- i. Air is a mixture of different gases. ()
ii. Salt water solution is called heterogeneous mixture. ()
iii. Colors cannot be separated by centrifuging method. ()
iv. Alcohol can be made by distillation method. ()
v. Centrifuging method is used to separate the blood cells. ()

4. Differentiate between:

- i. Homogeneous mixture and Heterogeneous mixture
ii. Solvent and Solute

5. Give reasons:

- i. The solution of sugar water is called uniform mixture.
ii. Mixtures of different types of colors are separated by chromatography method.
iii. Centrifuging method is used to separate light and heavy substances in a mixture of liquid and solid.
iv. Evaporation method is used to separate salt from salt water solution.

6. Write the answer to the following question:

- i. What is a mixture?
ii. What type of mixture is called uniform mixture? Give two examples.

- iii. Which of them, muddy water and salt water of the river is called heterogeneous mixture? Give your argument.
- iv. Write the properties of the mixture separated from the distillation method.
- v. Explain where and why centrifuging method is used.
- vi. Write down the method you use when separating the various chemicals in the blood.
- vii. Discuss the use of solutions in our daily life.
- viii. If you have been given salt water in one glass and pure water in the other. What do you do if you have to decide which of these is pure water? Explain it on the method of separating mixtures.

Glossary:

Mixture = a substance composed of two or more components

Centrifuges = electric motor devices used for centrifuging

Condenser = cooling tube

Filter paper = paper used for filtering purpose

Unit 10 Materials Used in Daily Life

Let's look at the pictures and discuss about the uses of these materials in our daily life:

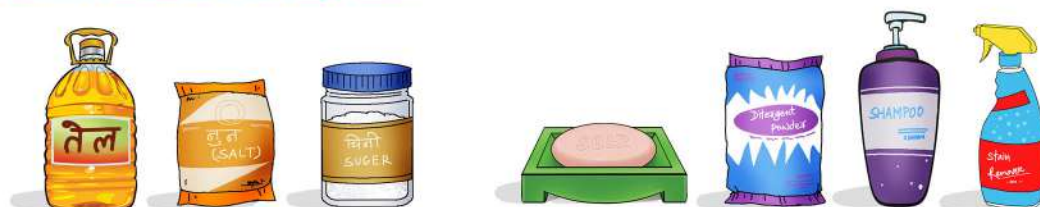


fig: 10.1

We use a variety of materials in our daily life. Different kinds of utensils are found in our homes, kitchens and bathrooms. We also make use of salt, oil, spices, sugar, rice, pulses, etc. while cooking. We also use soap, detergent, etc. Similarly, people use iron and aluminium to build houses. Marble and tiles are used for home decoration. We wear jewellery for decoration. All these things are matter.

10.1 Some useful chemicals

Activity 10.1

Divide students into two groups. Collect the names of various ingredients used or mixed in their own home from a group. Similarly, another group collects the names of items used for indoor and outdoor cleaning. Make a list of the two groups as described in the table below.

Food used or mixed in the kitchen during the preparation	Substances used for indoor and outdoor cleaning
Sugar, <i>Chukamilo</i> ,.....	Soap, handwash,....

Many kinds of chemicals are used in our daily life. Some of them are obtained from nature and some are prepared by human. *Chuk* is obtained from plants, baking soda is prepared from minerals, ghee is obtained from milk of cows and buffaloes. Toothpaste used for brushing teeth, soap used for cleaning, manure used in the field etc. are all chemical substances. Here, we will study the chemicals used in foods and the chemicals used for cleaning separately:

A. Chemicals used as food materials

Activity 10.2

You may have eaten or seen bread, cakes, biscuits, donuts, etc. Similarly, vegetables and pickles may remind the taste of salty, sour and bitter. Juice may remind you of sweetness. What chemicals are used in making such food and beverages? Make a list by asking your parents, relatives, teachers, etc.

1. Do you know any other foods that have hot taste except chilli?
2. Do you know anything other than lemon, *Imili*, and *Bhogate* which are sour?

Baking soda is used in rice flour to increase the size of bread. It is a chemical substance. Salt is also a chemical substance. The sour taste of lemon, orange, *amala* etc. is due to the chemical substance. Sugar in tea is also a chemical with a sweet taste.

Activity 10.3

Take the materials: Wheat flour, baking soda, water and two bowls. In one bowl, make the paste of the flour, water, and a small amount of baking soda together. In another bowl, take the mixture of same amount of flour and water without soda. Cover both bowls for 12 hours. Observe which flour has more volume.



fig:10.2

We may have eaten bread sometimes. It is spongy and soft. It is made loose by using baking soda. The use of baking soda helps to increase the size of food stuffs. Its chemical name is sodium bicarbonate. It is made from minerals.

Baking soda is used to make bread, cakes, biscuits, etc. It is also used to make soft drinks. It is also used as a medicine. It relieves stomach acidity. When using baking soda, we need to pay attention to its amount. Excessive use of baking soda can cause bloating, vomiting, and diarrhoea.

Edible salt is a mineral. It is obtained naturally from sea water and from underground reservoirs (rock salt). The chemical name of edible salt is sodium chloride. It dissolves in water. One of the major sources of sodium needed by our body is common salt.



fig. 10.3

Edible salt is used in food for its salty taste. It is also used to preserve fish, meat and pickles without spoiling them. Common salt is used in industries to make soap, paper, rubber, glass etc. Salt is also used in cleaning purpose and medicine.

Although sodium chloride is essential for our body. It is harmful when used in excessive amounts. High sodium levels can lead to high blood pressure and mental stress. This causes serious diseases like heart disease, kidney disease etc.

Do you know?

Salt with iodine is prepared by adding iodine to edible salt. Deficiency of Iodine causes goiter and mental problems in children. Children need adequate amounts of iodine in their body to be smart and to avoid goiter.

Sugar tastes sweet. Its chemical name is Sucrose. Sugar is prepared from sugarcane juice. Fruits like bananas, mangoes, grapes, pineapple contain some amount of sugar.



fig. 10.4

Sugar is used in food for its sweet taste. Packaged foods can be preserved with the use of sugar. As it dissolves easily in water, sugar is used to make various beverages.

Ghee is a type of fat obtained from cow's and buffalo's milk. Ghee is solid or liquid depending on the temperature of the atmosphere. It is solid in winter and liquid in summer. Ghee is used to make a variety of sweets and delicious food items. Ghee is also used to prevent dryness of the skin.



fig.: 10.5

Mustard oil, soyabean oil, sunflower oil, flax seed (aalas) oil, chiuri (butter tree) oil, olive (jaitun) oil, etc. are the main oils used widely. Ghee and oil give us energy and heat.

Do you know?

Oil is made not only from plant seeds but also from other parts of plant. For example, olive oil is produced from olive fruits.

B. Chemicals used as cleanser

Activity 10.4

Make a list of chemicals that are used to clean your home. Discuss in class about the use of these chemicals and the precautions to be taken while using these chemicals.

Soaps, shampoos, sanitizers, etc. are probably used in your home for washing clothes, bathing, and cleaning wounds. Along with modernization, many types of materials are used in household cleaning nowadays. Chemicals such as soap, detergent, phenol, stain remover are used to clean dirty dishes, window glass, car glass, toilets etc.



fig: 10.6

Phenol is a useful chemical. It is used as a disinfectant. It is also used to clean the house. It removes odours and repels flies. It dissolves easily in water. It is highly toxic. The eyes should be protected from exposure to phenol. Phenol also burns the skin. You should wear gloves while using it.

Activity 10.5

Children are often bathed with antiseptic soap. Even while washing baby's clothes, a little amount of antiseptic is mixed in the water. Ask your parents or teachers to find out the reasons behind use of antiseptics.

Soap used for cleanliness is a solid chemical substance. Different types of soap are used for bathing and washing clothes. When soap is dissolved in water, lather is formed.

A powder or liquid chemical used to wash clothes is called a detergent. It is more soluble than soap. Therefore, clothes cleaned with detergent look cleaner than those cleaned with soap. The sodium element present in soap and detergent cleans the dirt.

Activity 10.6

Bring a bucket of water, three small bowls, laundry soap, detergent and stain remover. Apply paint or grease stains on three small white handkerchiefs. Form three groups of students. The first group is supposed to clean the handkerchief with soap. The second group is supposed to clean another handkerchief with detergent. The last group is supposed to clean the handkerchief with a stain remover. Observe which chemical is better for cleaning.

Question to think:

What sort of chemicals are used to clean tables, glass, nail polish, mobile or computer screens, etc.?

Stain remover is a chemical used to remove stains. Sometimes our clothes, bed sheet, carpets, nail polish, etc. get stained which cannot be removed easily by washing. Stain remover can be used to easily remove such stains. It dissolves the dirt and cleans. Stain remover is available in both power and liquid form.

Exercise

1. Fill in the blanks.

Sodium Sodium chloride Sugarcane Baking soda Sugar

- i. The chemical name of edible salt is
- ii. is used to inflate food.
- iii. Sugar is usually prepared from the juice of
- iv. The element in the soap which cleans the dirt is

2. Choose the correct option from the following:

- i. What is the chemical name of baking soda?
 - (a) Sodium chloride
 - (b) Sodium carbonate
 - (c) Sodium bicarbonate
 - (d) Sodium sulphate
- ii. Which substance is chemically known as Sucrose ?
 - (a) Lactose
 - (b) Sugar
 - (c) Fructose
 - (d) Glucose
- iii. Which chemical is best to remove stains from clothing?
 - (a) Soap
 - (b) Phenol
 - (c) Detergent
 - (d) Stain remover
- iv. Why baking soda is used in bread, cakes, biscuits etc.?
 - (a) To make it sweet and tasty
 - (b) To make sponge by inflating
 - (c) To make it look good and plump
 - (d) To make it attractive

- v. Which of the given chemical group is compatible among its members?
- (a) Ghee, oil, soap and sugar
 - (b) Ghee, oil, salt and sugar
 - (c) Phenol, oil, soap and sugar
 - (d) Ghee, oil, salt and stain remover

3. Differentiate between:

- i. Baking soda and common salt
- ii. Soap and detergent

4. Answer the following questions:

- i. Name any four chemicals used as food and write their uses .
- ii. What type of chemicals are used in sanitation? Name any four of them.
- iii Why is baking soda used in making bread, cookies and bread?
- iv. Write the name and uses of any two chemicals used in your home kitchen.
- v. Physicians recommend washing hands with soap and water along with the use of sanitizer from time to time to avoid corona and other viruses. Why?
- vi. If your school toilet has a lot of stains and bad odour, write down how you would suggest the cleaner to clean the toilet.
- vii. Dot pen ink is stained on your friend's clothes. Even if her mother washes it with soap and water many times, the stain can not be removed. What can be done to

remove such stains? Give suggestions regarding this to your friend.

viii. Answer the following questions based on the given pictures.



- (a) What are these chemicals used for?
- (b) What effect does unnecessary use of these items have on human health?
 - (i) Name any four chemicals used as food and write any two of their uses.
 - (ii) What types of chemicals are used in sanitation? Name any four of them.

10.2 An introduction to metals and non-metals

We know that, touching a burning wood from opposite side of burning do not burn our hands, but touching a heated fire-tongs from opposite side burns our hand. Similarly, electrical wires are often made of copper or aluminum. Most cooking utensils are made of iron, copper, aluminum, steel, etc., while shoes, slippers, etc. are made of rubber or plastic. Silver, copper, iron, aluminum, steel, etc. are hard, while rubber, plastic, wood, etc. are soft. We categorize the materials we use on a daily basis as metal or non-metal based on their properties such as hard or soft, conductor or insulator of heat, electrical conductivity or non-conductivity, presence or absence of sonorous sound.



fig: 10.7 Different utensils made from metals

Metals

Activity 10.7

Collect pieces of zinc sheet, pieces of stone, copper utensils, charcoal, coal, sulfur, graphite, knives, fire tongs, hammers, iron nails, beam balance, standard weights, standard weight-shaped wooden specimen, soaps, small wooden pieces, etc. from home or surroundings and do the following activities:

1. Scratch each item one by one with an iron nail. Observe which objects are easily scratched and which are not.
2. Hit all the objects with a small rod. Observe the sound of the object.
3. Weigh iron piece and similar wooden piece on separate side of beam balance. Observe which one is heavy, even if they have same shape and size.

4. Observe whether the heat flows or not through iron nails and wooden tubs on fire.
5. Place the tip of the iron nails and the tip of the stone on a hard rock and keep hitting hard with the hammer. Observe which ones get thinner and which ones get broken when you hit them.
6. Observe whether all objects start shining or not when they are exposed to the Sun.

We use both metals and non-metals in our daily life. The substances which are generally hard, shining, malleable, ductile; conduct heat and electricity; and produce clink or sonorous sound while tickling are called metals. Some common metals are iron, copper, gold, silver, aluminum, etc.

Physical properties of metals

1. Metals have lustre.

Metals reflect light. This makes them look bright or shiny. Such shining property of metals on their surface is called metallic lustre. Some metals look very attractive because of their lustre in the presence of light. So people prepare jewellery using gold and silver.



fig: 10.8

2. Metals are usually hard, compact and solid.

Iron, copper, etc. are hard metals. Not all metals have the same hardness. Some metals are also soft too. For example, lithium, sodium, and potassium are soft metals. Soft metals can be cut easily but hard metals cannot be cut easily.

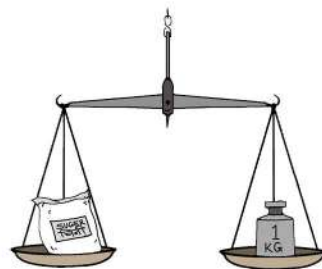


fig. 10.9

At normal temperature and pressure most metals are found in solid state but mercury is the liquid metal as an exception.

3. Metals produce a metallic clink or sonorous sound.

Vibration in metal produces a special kind of sound. When hard metals are hit or metals collide with each other, they vibrate and make a special "ting" sonorous sound. This property of the metal is called sonority.



fig. 10.10

4. Metals are malleable.

Most metals can be made thin by beating them with a hammer with heating. This property of making thinner when it is beaten in this way is called malleability. Due to this property of metals, the metal is converted into different shapes and types of sheets to make zinc sheets, utensils, etc.



fig. 10.11

5. Metals are ductile.



fig. 10.12

Gold, silver, copper, iron, aluminum, etc. can be heated and then stretched to form long and fine wire shapes. The property which allows the metals to be drawn into thin wire is called ductility. Being ductile in nature, metals can be converted into rods or wires of various shapes and types. Due to this property, it has become possible to make conducting wires (copper wire), iron rod etc. used in our house.

6. Metals are conductors of heat.

Metals are good conductors of heat. Since heat is easily transmitted from metal, metal utensils are made for cooking.

Metals are also used in various electrical appliances used for heating.

7. Metals are conductors of electricity.

Activity 10.8

Take a dry cell, a copper wire, a bulb, a coin and a rubber piece. Connect the dry cell, copper wire and bulb as shown in the picture and make an electric circuit. Once the coin is attached to the middle of the wire, observe whether the bulb glows or not. Then connect a rubber tube between the wires, and see if the bulb glows or not.

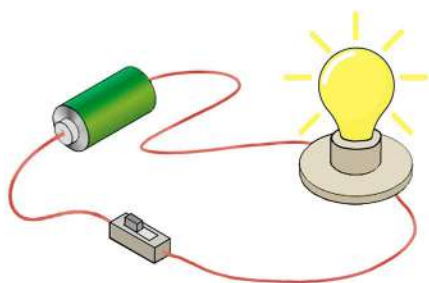


fig: 10.13

Also observe whether the bulb turns on or not when using zinc sheet piece, stone pieces, copper coin, iron fork, soap piece, wooden thorn etc.

Electricity flows from metals such as zinc sheets, copper sheets, coins, iron nails, etc. Therefore, metals are good conductors of electricity. Since electricity flows easily through metal, copper wire is used to make electrical circuits in our house. Various electrical devices are made using copper and aluminum wires.

Question to think:

What is the use of metals in our daily life? Discuss.

b Non-metals

There are many types of substances around us that do not have the properties as that of metals. Such substances are called non-metals. Hydrogen, oxygen, sulphur, nitrogen, carbon, charcoal, coal, graphite, etc. are non-metals. Non-metals are bad conductors of heat and electricity, they are usually soft and dull and does not give a special sound when hit.

Physical properties of non-metals

1. Non-metals are found in solid, liquid and gaseous state.
2. Non-metals are usually softer than metals (except diamonds).
3. Non-metals do not produce any metallic sonorous sound.
4. They do not have metallic luster.
5. Non-metals are non-malleable.
6. Non-metals are non-ductile.
7. Non-metals are bad conductors of heat and electricity (except graphite).

Question to think.

What is the use of non-metals for? Discuss.

Difference between metals and non-metals

Below are the differences between metals and non-metals based on their physical properties:

Metals	Non-Metals
Metals have metallic luster.	Non-metals do not have luster.
Metals are usually hard. As an exception, some metals are softer, such as sodium.	Non-metals are usually softer than metals.
Metals produce a special sonorous sound.	Non-metals do not produce such special sound.
Metals are malleable.	Non-metals are non - malleable.
Metals are ductile.	Non-metals are non-ductile.
Metals are good conductors of heat and conductors of electricity.	Non-metals are bad conductors of electricity and heat.

Environmental impacts of chemical substance

Activity 10.9

What kind of garbage do you observe around your house, neighborhood, ground, road, stream, farm, school etc.? Make a list after you observe.

1. Where do these garbage items come from: home, school, shop or factory?
2. What are the sources of such waste: such as cleansing, food, medicine, entertainment, or other sources? Make separate lists.
3. Explain whether these waste products are chemicals, metals, non-metals, minerals or others.

A. Environmental effect due to poor management of cleansing chemicals

Chemicals used in sanitation like soaps, shampoos, detergents, phenols, etc. are produced by human in industries. It is important to study the effects of these chemicals on human health and the environment before use. The chemicals we use may be harmful too. Excessive use of chemicals can pollute the soil, water, air, etc. and can have a negative impact on the body of humans and other organisms.

Chemicals used in soaps, for example, are bio degradable when mixed with soil, but detergent ingredients are not bio degradable in soil. Such elements remain in the soil. This degrades the texture of the soil. If a solution of harmful detergent falls on the plant, it will affect their growth and development. When such chemicals are present in water, aquatic organisms can die.

B. Environmental effect due to poor management of metals

Various materials needed in daily life are made using metal. As we walk along the road, we sometimes find discarded blades, iron nails, tin cans, and so on. Such objects do not decompose easily in the soil. Haphazardly disposal of unused metallic

objects pollutes the environment. To control this, metallic waste should be collected in a systematic manner and reused or recycled.

Some metals are toxic. Lead, mercury, cobalt, etc. are harmful to human health. When such metals are mixed with water, they affect aquatic organisms. Proper management of metals that have a negative impact on our health can prevent their effects on us.

C. Environmental effect due to poor management of minerals

Burning of fossil fuels is a major cause of air pollution. At present, coal, diesel, petrol etc. are widely used as fuel. When such fuels burn, the amount of smoke and carbon dioxide in the air increases. Other sources of energy should be used as an alternative to such fuels to control air pollution.

Act of mineral processing also affects the environment. It causes water pollution, air pollution, soil pollution. When we manufacture cement from limestone, it affects the environment around the cement industry. The carbon dioxide emitted from the furnaces of such industries directly pollutes the air.

Exercise:

1. Fill in the blanks.

Mineral transfer metal iron

- i. Metals heat and electricity easily.
- ii. Iron, copper, gold, etc. are examples of
- iii. is mixed with carbon to form alloy of steel.

2. Choose the right option from the following:

- i. Which of the following is a property of non-metals?
 - (a) Malleability
 - (b) Ductility
 - (c) Good conductor of electricity
 - (d) Bad conductor of Heat
- ii. Which of the following is non-metallic?
 - (a) Lead
 - (b) Zinc
 - (c) Oxygen
 - (d) Gold
- iii. Which of the following can be categorized under the use of Iron?
 - (a) To make brass mixed with zinc
 - (b) To make rods, sheets, wires etc.
 - (c) To make idols, coins, medals etc.
 - (d) To fill the empty space of the tooth and to keep the crown in the tooth
- iv. Identify the group of metals.
 - (a) Wood, rubber, plastic, zinc

- (b) Iron, wood, copper, gold
 - (c) Silver, iron, copper, gold
 - (d) Plastic, zinc, copper, rubber
- v. Which option is incorrect?
- (a) Mercury is a liquid metal.
 - (b) Most non-metals are less hard than metal.
 - (c) Non-metals produce a special kind of sonorous sound.
 - (d) Lead and mercury are harmful to human health.

3. Differentiate between:

- i. Metals and non-metals
- ii. Malleability and ductility

4. Answers the following questions:

- i. What is metal? Mention any three properties of a metal.
- ii. How can a given object be determined to be non-metallic? Write based on any two qualities.
- iii. What are the two qualities of metal that make utensils from them?
- iv. What are non-metals? Give a couple of examples.
- v. Write any two properties and two utilities of metal and non-metal.
- vi. Write two uses of iron, copper and gold.
- vii. Briefly explain the impact of mismanagement of materials used in daily life on the environment.
- viii. What kind of garbage is found around your school?

Make suggestions to the school administration on how to reduce them.

- ix. It is often heard that glass has been mixed in petrol. It is also heard that environmentalists have raised many objections. Explain the reasons for such objections.
- x. Write an essay on "Our village is a beautiful place" including the sanitation condition around you, the causes of garbage, their effects and solutions.

Glossary

Surgery : A surgical procedure

Stain remover : paint or stain remover chemical

Toxic : Harmful substances when came in contact with the body

Transmission : transfer from one place to another

Conductor : which transmits easily

Exception : A situation that does not fall within the general rules

Disorganized : Used indiscriminately, unorganized, haphazardly.

11.1 Soil**Activity 11.1**

Collect some amount of soil from two different places around us . Compare those two samples. Use a hand lens for microscopic observation. Fill in the study data in the table below and discuss the findings with your friends.

Sample	What is in the soil?	What are the particle sizes?	What color is it ?	Is it wet or not?
Sample 1				
Sample 2				

Activity 11.2

Take some dry soil and put it in a beaker with half of water . Did you see air bubbles coming out of the water? What can you conclude from this activity?

Activity 11.3

Put a handful of clay in the beaker. Cover it with watch glass. Heat for few moments. Now cool for a while. Where did the water droplets inside of the watch glass come from? What can you conclude from this activity?

Most of the earth's surface is covered with a layer of soil. Soil is an important natural resource. Soil is made up by the deposition of rock , mineral and organic matter. In the soil, rock formations are in the form of dust, sand or stones. When organisms die and fall to the ground, organic matter are formed. Compost manure is an example of organic matter. Different types of germs, fungi, worms and insects contribute to the formation of organic matter.

Humus is a biological substance formed by the decay of plant parts. Water and air are also mixed in the rock. Soil organisms are able to survive because of the air and water mixed in it. Soils are of different types depending on the type of substances in soil. For example, the soil with a lot of humus is soft. Sandy soils contain a lot of sand.

Process of soil formation

Activity 11.4

Rub two stone pieces together. Observe what happened. Discuss the process of soil formation based on this activity.

Soil is formed by the process of rock decomposition. The process of breaking up rocks and minerals on the earth's surface is called weathering. The process of rock decomposition is mainly due to air, water and climate. Soil is formed by the following processes:

- (A) Rivers, streams, waterfalls, etc. bring large stones from the mountains. In this way, the stones that fall into the water collide with each other. This process lasts for a long time. It forms tiny rock particles. From this process, soil is formed.
- (B) Due to the heat of the day and the cold of the night, the rocks continue to heat up and cool down. As this process continues for many years, the rocks turn into small pieces. Soil is formed from them.
- (C) When water enters the hole in the rock, it also helps to break the rock and form soil.
- (D) Plants that grow in the place where the rock is cracked gradually weaken the rock and the rock begins to crumble. In this way the rock helps to become soil.
- (E) When the wind blows with force, the surface of the rock erodes and sand like particles come out and turn into soil.

Soil profile

Activity 11.5

Collect a soil sample from somewhere. Take a transparent glass jar with half water on it. Pour the collected soil into the water. Shake the pot for a while to mix the soil with water properly. Then keep the pot still for a while without moving it. Now observe the layers as shown in the adjoining picture.

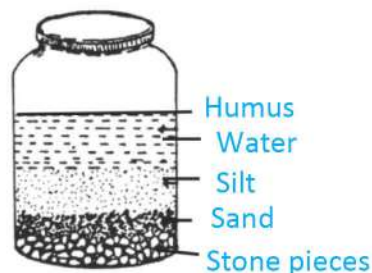


fig:11.1

Organic matters accumulate in the soil and mixes with the water and moves slowly downwards. As they move downwards, different layers of soil develop. A picture of a place where the layers of soil are visible from the ground surface to the interior is called the soil profile of that place. Therefore, a vertical section passing through different layers of soil is called soil profile.

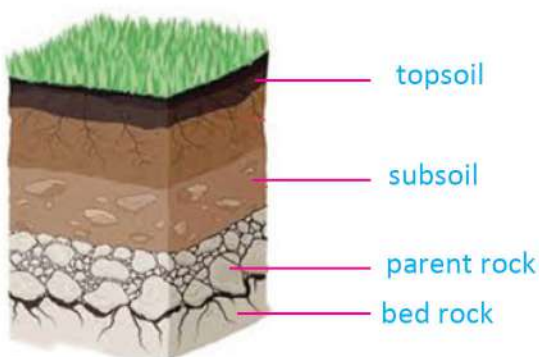


fig:11.2 Soil Profile

The soil profile differs in the texture, color, depth and chemical composition of each layer. The main layers of soil are as follows:

1. Top soil or A-horizon

This is the top layer of soil profile. It usually has dark colored soil. It is made up of manure, water, air and minerals. The manure in this layer loosens the soil and increases the water holding capacity. This layer is useful for the growth and development of plants.

2. Sub soil or B-horizon

At this level the amount of manure is less and the amount of minerals is more. The water absorbed from the first layer carries the minerals to this level. This layer is usually compressed and hardened.

3. Rock or C- horizon

This is a layer without manure. This layer is made up of small lumps of rock. This layer is mainly composed of the parent rock. Below the parent rock there is a layer of hard rock.

Erosion and deposition

Observe the condition of the soil around you that has been blown, spilled or dropped. What is the reason behind this? Discuss.

The depletion of land layers of the soil surface is called erosion. Examples of soil erosion are landslides, shifting of land in landslides, blowing of water or air resulting on pile up the soil from one place to another. The accumulation of soil from one place to another is called deposition. Soil erosion and deposition are two naturally occurring processes. Soil erosion usually occurs in sandy soils and in open ground without vegetation.

Conservation of soil

Have you ever seen a river or a riverbank with iron wire cage on gabion walls? Have you ever seen a tree planted on a river bank or in a bare land? Have you seen terrace farming on slope land? What is the purpose of doing all this?

In our country, floods during the rainy season and landslides in the hilly areas cause soil erosion every year. Even strong winds can cause erosion. The process of reducing or preventing such erosion is called soil conservation. The following measures can be taken to protect the soil:

1. Strong dams should be built on the land around the river to prevent soil erosion by water.
2. In order to prevent erosion by wind, trees should be planted to block strong winds.
3. The roots of the plants keep the soil firm. Therefore, trees should be planted on bare hills to prevent landslides.
4. Deforestation and cutting down the trees haphazardly, loosens the soil. Such activities should not be done as it increases the possibility of soil erosion.
5. In order to reduce the erosion caused by the farming activities done by the people on the sloping land, the cultivation should be done with terrace.

Activity 11.6

Observe audio-visual material on soil erosion and deposition. What causes soil erosion in different types of places? Fill the effects and prevention measures of soil erosion in the given table. Discuss in class the positive and negative aspects of deposition.

Causes of erosion	Possible location	Impact	Prevention measures
Landslide			

Soil pollution

Humans use a variety of chemicals in the soil to produce more. Also, in the course of daily activities, plastics and harmful metals, chemicals released from factories, etc. are mixed in the soil. Such activities degrade the quality of the soil. Hence, the degradation of soil quality due to the addition of unnecessary chemicals or other substances externally is called soil pollution.

Causes, effects and control measures of soil pollution

Observe the following conditions in relation to the surrounding soil.

Observing aspect	The situation seen in the observation circle	
What kind of garbage is mixed in the soil?	Decomposable	Non decomposable
Type of manure mixed in the soil	Dung manure / compost fertilizer	Chemical fertilizers
Other substances mixed with soil		

1. Based on the data obtained from the observation, what conclusions can be drawn regarding the causes of soil pollution?

The main cause of soil pollution is human activity. The causes, effects and controlling measures of soil pollution caused by human activities are as follows:

1. Humans use large quantities of chemical fertilizers and pesticides to increase soil yield. The chemical fertilizers and pesticides kill the beneficial micro-organisms found in the soil and make the soil dry. Consumption of crops produced in such a way also affects human health. Therefore, it is better to reduce the use of chemical fertilizers and pesticides and increase the use of organic fertilizers and biological pesticides.
2. Disposing of factory waste into the soil reduces its quality. It also affects soil organisms. Therefore, waste or chemicals coming out of the factory should be harmless before mixing with the soil.

3. Throwing polythene bags and other plastics into the ground kills the organisms present in soil. Plants do not grow well in such places. Therefore, the use of polythene bags and other plastic materials should be reduced.

Project work

Below are some of the human activities that pollute the soil. Observe, research, and discuss the effects and preventive measures on soil because of these and other similar activities.

Activities	Effect on soil	Preventive measures
Different type of chemical fertilizers on soil		
Pesticides on plants		
Throwing plastic and other items in the soil		
Disposal of industrial wastes		

11.2 The earth

Let's think for a moment. Where are we standing? Where are our houses, cowsheds, schools built upon? Where do we make playgrounds, roads, canals, ditches, etc.? Where do the plants, vegetables, fruits, etc. grow?

All of these things are found on the surface of the earth. Earth is our common home. Although it is said to be spherical in shape, it is not round like ball. Its equatorial part is flatten and the polar part is widen.



fig: 11.3

The earth is divided into three parts: the lithosphere, the hydrosphere, and the atmosphere. The part of land in earth

surface is called the lithosphere and the part of the water is called the hydrosphere. The earth's surface is surrounded by air, which is called the atmosphere.

Internal structure of the earth

Let's cut Pomelo(bhogate), orange or lemon seed in half and observe it carefully. Does its interior and exterior have the same shape? No. Similarly, studies of lava from volcanic eruptions prove that the earth's surface is hard and cold, but its interior is hot and molten.

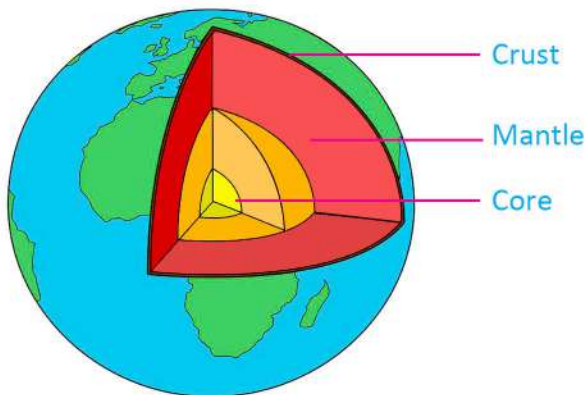


fig:11.4

The earth's surface is covered with mountains, plains, seas, and solid rocks, but the interior part consists of molten rock and metals. The interior part of the earth is divided into three layers according to the condition and composition of the rock:

1. Crust
2. Mantle
3. Core

Activity 11.7

Bring a boiled chicken egg. Cut it into two parts without removing the outer shell carefully. Now compare its structure with that of the earth.

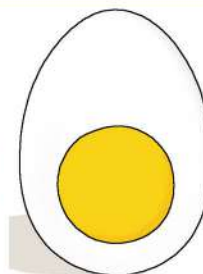


fig. 11.5

Crust

The outermost part of the earth is called the Crust, just like the

outer shell of the egg in Activity 11.5. It is found up to 50 km inside from Earth's surface. The earth's crust is made up of soil and rocks. This layer basically contains silicate minerals. The part of the ground water is also at this level. On the upper surface of the Crust, houses are built, farming is done, plants are planted, roads are built, etc. Rivers, seas, forests, mountains, etc. are on the surface of this layer. This part of the earth contains rocks, metals, coal and oil mines.

Mantle

The part below the earth's crust is called the mantle, just as the white part of an egg in Act 11.5. It has a thickness of about 2900 km and a temperature of 750 to 2500 °C. This part is made up of minerals like hard silicate, iron, and magnesium. Rocks at this level are 2 to 3 times harder than rocks.

Core

In Activity 11.5 the core of the earth can be compared to the yolk of an egg. The core is the innermost part. It is divided into two parts.

Outer core

The outer part of the core is called the outer core and the inner part is called the inner core. The thickness of the outer core is about 2100 km and the temperature is around 2500 to 3000 degree Celsius. The core contains heavy metals such as iron, cobalt, and nickel, as well as molten rock.

Inner core

The innermost part of the earth is called the inner core. The thickness of this part is about 1300 km and the temperature is around 3000 to 5000 degree Celsius. The rock in this part are up to six times heavier than the outer core. Due to the high pressure in the inner core, the molten materials also solidifies.

Activity 11.8

Bring some clay or wheat flour or old newspaper, four types of paint and water. Mix the clay, flour or newspaper with water to make a wet ball. With the help of a knife, cut the ball-like lump from the middle. Paint the inner part and display it in the classroom like the inner structure of the earth.

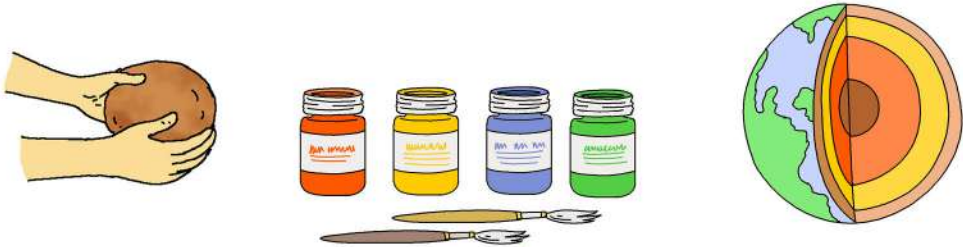


fig:11.5

By studying the the different layers of internal structure of earth, fill the below table with such data.

S.N	Layer	Thickness	Temperature	Condition	Found substance
1	Crust				
2	Mantle				
3	Outer core				
4	Inner core				

The earth in the solar system

Activity 11.9

Draw an elliptical structure on the table or on the ground. Place a cricket ball or a lemon in the middle of the circle. Now roll a marble or a small tomato in an elliptical circle.

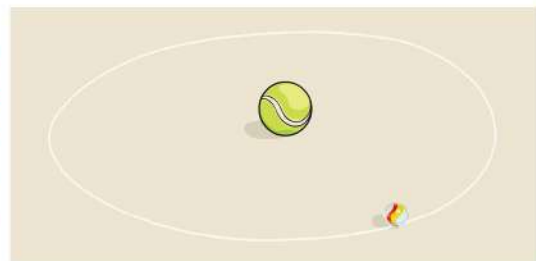


fig: 11.6

1. Is the distance between the marble and the ball always the same?
2. Observe in which cases the distance between the marble and ball is equal.

The imaginary line connecting the North and South Poles to the center of the earth is called the axis. Similarly, the path taken by the earth to rotate the sun is called orbit. The earth regularly rotates around its axis and revolves in orbit around the sun. It takes about 24 hours for the earth to rotate around its axis and about 365 days to revolve in orbit around the sun.

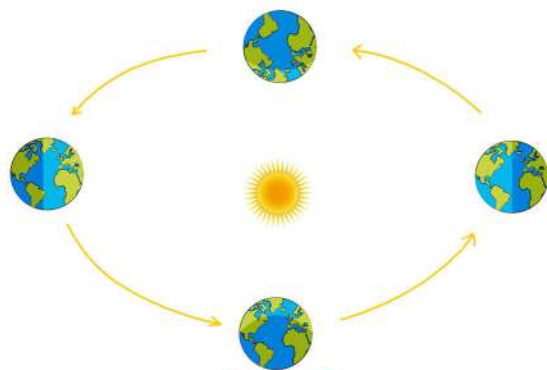


fig. 11.7

Activity 11.10

Bring a globe and a burning candle. Draw an elliptical circle around the lamp. In a dark room, place the globe close to the light and slowly rotate it in an oval circle around your axis and the light. Study the globe as the earth and the light as the sun:



fig:11.8

While rotating on its axis, in which part does day and night occur?

As the earth revolves around the sun, guess in which conditions summer and winter occur.

When the earth revolves around the sun, is day and night equal in all parts of the earth? If not, guess in which case the night is longer and in which case the day is longer.

On the Earth's orbital plane, the Earth's axis is tilted at an angle of 66.5° . So the earth rotates at an angle of 66.5° to the surface of the orbit. This type of rotation has the following effects on the Earth:

1. Day and night are not always equal in places other than the equator. Sometimes the day is long, the night is short and sometimes the day is short and the night is long.
2. The seasons are not the same everywhere in the world. The seasons keep changing.
3. The sun's rays do not always fall vertically in one place on the earth.

Seasons change

As mentioned above, the Earth revolves around the Sun in an elliptical orbit in 365 days. In this way, the earth is sometimes closer to the sun and sometimes farther away from the sun. As the earth revolves the sun at an angle of 66.5° to its orbital plane, the sun's rays fall directly on one place and slanted rays falls on the other parts. The part where straight rays of sun fall is heated more and the part where slanted rays of sun is heated less. Internationally, a year is divided into four seasons as follows:

Spring season:

Spring season occurs in the Northern Hemisphere from March 21 to June 22.

Summer season

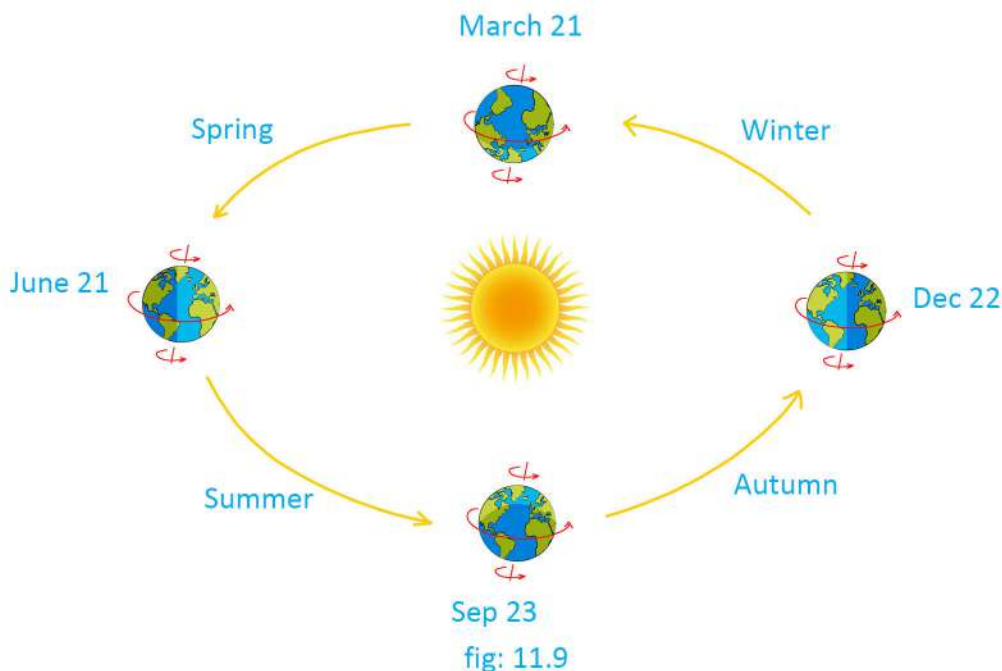
The summer season takes place in the Northern Hemisphere from June 22 to September 23.

Autumn season

The autumn season occurs in the Northern Hemisphere from September 23 to December 22.

Winter season

The Northern Hemisphere has a winter season from December 22 to March 21.



Spring season

In the Northern Hemisphere, winter is followed by spring. Since the start of this season, the days are getting longer and the nights are getting shorter. In Nepal, this season lasts from Falgun to Baisakh. Day and night are almost equal on the 7th of Chaitra (March 21). With the beginning of spring season, grass and plant leaves begin to sprout.

Summer season

In the Northern Hemisphere, the summer season comes after spring. It is very hot in this season. During this season the days are long and the nights are short. In Nepal, this season lasts from Jestha to Shrawan. Asar 7 (June 21) is the longest day and the shortest night in northern hemisphere.

Autumn season

In the Northern Hemisphere, summer is followed by the autumn season. In Nepal, this season lasts from Bhadra to Kartik. Since the start of this season, the nights are getting longer and the days are getting shorter. Day and night are almost equal on the 7th of Ashwin (September 23)

Winter season

In the Northern Hemisphere, winter season comes after autumn. During this time, the sun rays become slanted in the northern hemisphere and the days are shorter and the nights are longer. In Nepal, this season last from Mangsir to Magh. Poush 7 (December 22) is the shortest day and the longest night.

Seasons in the context of Nepal

In case of Nepal, a period of two months is considered as one season and only six seasons are in practice, which are as follows:

Spring	:	Chaitra and Baisakh
Summer	:	Jestha and Asshar
Rainy	:	Shrawan and Bhadra
Autumn	:	Ashwin and Kartik
Pre-Winter	:	Mangsir and Poush
Winter	:	Magh and Falgun

Project work

Draw a chart paper to show the characteristics of different seasons and the agricultural work done in that season, considering the scenario of Nepal.

11.3 Solar System

Activity 11.11

Take a look at the open sky at night. Present about your findings upon difference between various shiny objects in class on the very next day.

- (A) Do all the celestial bodies you see have the same brightness?
- (B) What is the difference between the brightness of the sun at day and that of star at night?

Countless number of bright objects appear in the open sky at night. Most of these bodies are stars. Other visible objects besides stars are planets, satellites, asteroids, meteorites, comets, etc. The sun seen during the day is also a star. It is the closest star to Earth. The solar system is a family of sun, planets, satellites, and other small celestial bodies. All the bodies in the solar system revolve around the sun in their orbits with the sun as the center.

Sun

The main center of the solar system is the sun. Other celestial bodies revolve around the sun under the influence of the sun's gravitational force. The sun is a medium-sized star. Compared to other stars, the sun is larger because it is closer to the earth. The sun is a gaseous body. The sun emits a tremendous amount of heat and light. It is assumed that the temperature in its surface is 5700°C and the temperature in its center is almost 15000000°C .

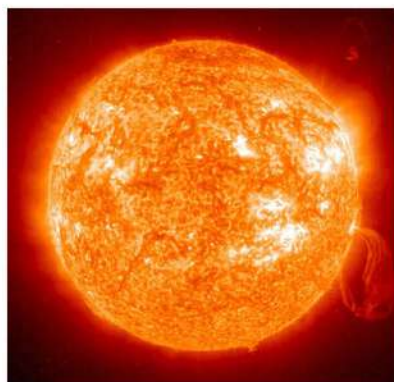


fig. 11.10 Sun

Planet

There are eight planets in the solar system, including the Earth. All the planets revolve on their axis as well as they revolve around the Sun. Although the planets do not have their own light, they reflect the light of the sun and appear bright. Therefore, the celestial body that revolves around the sun is called a planet. All the planets revolve around the sun at a certain distance due to the gravitational force of the sun. Mercury, Venus, Earth and Mars are the inner planets while Jupiter, Saturn, Uranus and Neptune are the outer planets. The eight in the order of near to far from the sun are:

Mercury

Mercury is the closest and smallest of the planets in the solar system. It rotates on its axis once every 59 days. It takes about 88 days to revolve around the sun. This planet is very close to the sun so it is very hot during the day and very cold at night. There is no atmosphere on this planet. This planet does not have a satellite.



fig.: 11.12 Mercury

Venus

The nearest planet to earth is venus. It is about the size of the earth. It is the brightest planet. It can be seen in the sky in the evening and early morning. It takes about 243 days to rotate on its axis. It takes 255 days to revolve around the sun. This planet does not have a satellite.



fig.: 11.13 Venus

Earth

The planet we live on is earth, where all living things have the necessary environment. Life on this planet is possible because of the water, the atmosphere and the proper temperature. Earth ranks third in terms of distance from the sun. It rotates on its axis once every 24 hours and revolves around the sun once every 365 days. The only natural satellite of this planet is on the moon.



fig.: 11.14 Earth

Mars

Mars is the rusty red planet in the sky. It is also called the red planet. The presence of water and oxygen in the atmosphere is thought to be the cause of life. It rotates on its axis for about 24 and a half hours. It takes about 687 days to revolve around the sun. The planet has two satellites, phobos and demos.



fig.:11.15 Mars

Jupiter

The largest planet in the solar system is Jupiter. The most satellites on the planet so far have been discovered. Jupiter rotates on its axis once every 10 hours. It takes about 12 years to revolve around the sun. A large red spot appears in the center of the planet. This planet has 67 satellites.



fig.: 11.16 Jupiter

Saturn

Saturn is a planet that looks like Jupiter. It has three elliptical rings on the outside. It takes about 10 hours and 20 minutes to travel around its axis and revolves around the sun once every 29.5 years. The planet has 62 satellites.



fig.: 11.17 Saturn

Uranus

The planet Uranus is made up of gas and liquids. This planet is about 14 times larger than earth. It is very cold as it is very far from the sun. It rotates on its axis for about 17 hours and 14 minutes. It rotates around the sun once in every 84 years. So far, 27 satellites have been discovered on the planet.



fig.: 11.18 Uranus

Neptune

Neptune is the farthest planet. It has a black spot about the size of the earth. Its axis rotation time is about 16 hours and revolution time is about 164 years. So far, 14 satellites have been discovered on the planet.



fig.: 11.19 Neptune

Activity 11.12

Find interesting information about the sun and planets from different sources and discuss it in the class.

S.N.	Members of the solar family	Interesting information
1	Sun	
2	Mercury	

Project work

1. Prepare a chart of the solar system by using different colours, ruler, pencils etc. and present it to the class by considering the estimated distance of the planets from the Sun and the color of the planets.
2. Prepare a model to show the solar system and their rotation of the eight planets and the moon using clay, flour or balls of different sizes and colour. Use colour, wires or other local materials. Present this model in class. When modeling in this way, consider the approximate distance of the planet from the sun and the color of the planet.

Satellite

You must have seen the moon at night. Does it have its own light? The celestial bodies that orbit the planet are called satellites. Because of the lack of light, these bodies, like the planets, reflect light from the sun. The moon is the only natural satellite of the earth. There are two types of satellites, natural and artificial. Self-generated satellites in the universe are natural satellites, while man-made satellites are artificial satellites. All planets except mercury and venus have satellites.



fig. 11.20 Moon

Activity 11.13

All the students gather at the ground. Make a small circle on the ground. Consider the circle as the sun and let one student to stand at that circle as sun. Eight friends are supposed to stand at different distances from the sun. Give each friend the name of the planet and make them move like planets in their axis and orbit. Describe the characteristics of the planets in your part.

Question to think

How could all the celestial bodies we see be fixed in the universe? Find out the scientific reasons and discuss it in class.

While viewing from earth, sun and moon are seen as of same size. But in actual size, the sun is many times larger than the moon. The sun is much farther from the earth than the moon, so the moon and the sun appear to be of the same size. The farther away the object is, the smaller it appears. When comparing the size of the sun and the earth, one has to look at their diameter. The diameter of the sun is about 1400000 km while the average diameter of the earth is about 12735 km. In this way, the sun is about 110 times bigger than the earth. We can compare the size of the earth and the sun by considering the earth as a pea nut and the sun as a basketball. Comparing the distance between the sun and the earth also shows that the sun is far away from the earth. The distance from the earth to the sun is about 1.5 billion km.

Meteors and Meteorites

Sometimes we see the falling of shining objects in the clear sky. It is called a meteor shower. When small celestial bodies in space rotate and enter the earth's gravitational field at high speeds, atmospheric friction generates heat in them and causes them to glow faster. The substances in it are converted into gas or vapour and dissolved in the middle, which is called meteors.



fig: 11.21 Meteors



11.22 Meteorites

Some meteorites are so large that they allow the remaining matter to reach the earth's surface. These are called meteorites.

Comet

The broom shaped gaseous icy bodies, which revolve around the sun in an elliptical orbit, are called comets. They do not have their own light. Due to solar heat, the ice on the outer surface of comets melts and evaporates, and solids come out as dust particles. The resulting gas and ice particles are blown in the opposite direction to the sun by the solar wind, and light rays appear as tails from the outside.



fig: 11.23 Comet

Summary

1. Soil is an important natural resource. Living things grow and develop in it.
2. Soil is made up of tiny rock particles, minerals and organic matter.
3. A vertical section passing through different layers of soil in a place is called soil profile.

4. The erosion or depletion of the surface of the soil is called erosion and the erosion of soil from one place to another is called deposition.
5. Soil pollution is the deterioration of the quality of soil by the addition of unnecessary chemicals or other substances.
6. Since the sun's light falls directly on the earth, some parts heat up more and some parts heat up less. The seasons on earth change because they are hot and cold.
7. A year is divided into four seasons: summer, autumn, winter and spring.
8. The interior of the earth is divided into three layers: Crust, mantle and core, depending on the condition and texture of the rock.
9. The solar system is a family of eight planets, including the sun, the earth, and its satellites and other tiny celestial bodies. It has a total of eight planets, including Earth.
10. A celestial body orbiting the sun without its own light is called a planet, while celestial bodies orbiting a planet are called satellites.
11. Meteors are small celestial bodies that fall to the surface of the earth and burn up in the atmosphere due to friction in the earth's atmosphere.
12. Sometimes 'extremely large meteors' reach the surface of the earth without burning are called meteorites.
13. The gaseous ice caps, which revolve around the Sun in an elliptical orbit, are called comets.

Exercise:

1. Fill in the blanks with the matching word:

spring Sun Deposition autumn mercury
3000 winter crust dissolution Venus

- i. The outermost part of the earth is called
- ii. In a year there are summer,, and seasons.
- iii. Physical erosion and chemical decomposition of rocks and minerals is called
- iv. The nearest star from Earth is
- v. The nearest planet from the Sun is
- vi. The brightest planet in the solar system is
- vii. The process of wind blowing the soil in one place and accumulating soil in another place is called

2. Choose the correct answer from the options given below:

- i. Why do the metals and rocks in the inner core remain solid?
(a) Excessive heat (b) Excessive pressure
(c) Excessive heat and pressure (d) being the heaviest
- ii. What is the second layer from the top of the soil profile called?
(a) Top soil (b) sub soil
(c) Bed rock (d) Humus
- iii. What are the broom shaped lumpy gaseous ice cubes orbiting the sun called?

v. Stars and planets

5. Give reasons:

- i. Objects solidify in the inner core of the earth.
- ii. Soil erosion and deposition are simultaneous processes.
- iii. The sun is the main source of heat and light.

6. Answer the following questions:

- i. What is soil?
- ii. Explain the process of soil formation.
- iii. Why should soil be protected?
- iv. What are the axis and orbit of the earth? Illustrate with figures.
- v. Illustrate the internal structure of the earth with figure.
- vi. Write the effects of the Earth's orbital rotation in points.
- vii. How, when and where do the seasons change? Describe with pictures.
- viii. Soil erosion and deposition are simultaneous processes. Illustrate this point with examples.
- ix. Illustrate the relationship between the production of various food stuffs and the soil with examples.
- x. How can we control soil pollution?
- xi. From time to time there is a demand to ban the use of polythene bags. What has this got to do with soil pollution and conservation? Explain.
- xii. Briefly introduce the various members of the solar system.