

Science and Environment

Grade - 6

Government of Nepal
Ministry of Education
Curriculum Development Center

Publisher: Government of Nepal
Ministry of Education
Curriculum Development Centre
Sanothimi, Bhaktapur

© Publisher

First Edition : 2016

Revised Edition : 2018

Price Rs : 69/-

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Preface

The curriculum and curricular materials have been developed and revised on a regular basis with the aim of making education purposeful, practical, relevant and job-oriented. It is necessary to instill the feeling of nationalism, national integrity and democratic spirit in students and equip them with morality, discipline and self-reliance so as to develop in them social and personal skills as well as the basic competencies of language, science, occupation, information and communication technology, environment and health, and life skills. It is also necessary to enable them to appreciate, preserve and promote arts and aesthetics, social norms and values and ideals. Moreover, in order to develop an equitable society, it is necessary to inculcate students with respect for ethnicity, gender, disabilities, languages, religions, cultures and regional diversity. Likewise, education should also help them to be well-informed of human rights and social norms and values so as to make them capable of playing the role of responsible citizens. This textbook has been developed in this form based on the Basic Education Curriculum, 2069 (Grade 6), incorporating the feedback obtained from various schools, workshops and seminars and interaction programmes attained by the teachers, students and parents.

This textbook was translated and edited by Kedar Gobinda Amatya, Ram Prasad Subedi Dambardhoj Angdembe. In bringing out this text book in this form, the contribution of the Executive Director of CDC Mr. Khagaraj Baral, Deputy Director Dinesh Khanal, Prof Dr. Hridayaratna Bajracharya, Prof Dr Chidananda Pandit, Umanath Lamsal“Umesh”, Parvati Bhattarai, Uttara Shreshtha, Bijay Kanta Mishra is highly commendable.

Language of this book was edited by Nim Prakash Sing Rathor and Lalmani Joshi. The layout design of the book was done by Jayaram Kuikel. The illustration of the book was done by Sunil Ranjit and Gautam Manandhar. CDC extends sincere thanks to all those who have contributed in the development and revision of this text book.

Textbook is considered as an important tool of learning. Experienced teachers and curious students can use various learning resources and tools to achieve the competencies targeted by the curriculum. An attempt is made to make this textbook activity oriented and interested as far as possible. The teachers, students and other stakeholders are expected to make constructive comments and suggestions to make this book a more useful learning material.

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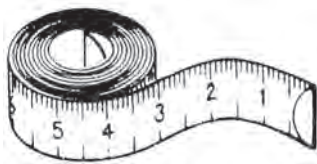
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Measurement plays an important role in our everyday life. A good measurement is essential for every action we perform. For example, a tailor measures our body and body parts for the better fitting of clothes. Similarly liquid commodities such as oil, milk, etc are measured with the standard measuring vessels to get their exact volume for their marketing purposes or so. Land is sold or purchased by its area measurement. The body temperature of a patient is measured with the help of a thermometer. In the same way we need to know the proper measurements of different aspects of the objects such as the length, area, volume, or the weight of a solid etc, to run our daily life smoothly.

The physical quantity refers to the measurements of the mass, length, area and volume of an object.

We need different instruments to measure various physical quantities. Diagrams of some measuring devices are given below.



Measuring tape



Physical balance



Watch



Spring balance

Local measurement system

Long time back, before the existence of the bureau of measurement in our country, people used to measure the length with the help of the individual's arm length, which naturally differs from individual to individual. The smaller demunitive length is measured in "Bitta", etc. These measurements simply give the approximate idea of measurement of length. The grains and volume of the liquid is measured in terms of mana, pathi, muri, etc in some areas. Though the bureau of Nepal government's standardized measurements of manna, pathi, or dharnee is reliable, this system is not followed all over the country. In Terai region, another system as maund, ser (tola), chhatak, etc was in common use. It is quite difficult to relate different systems

of measurements with one another. At some region in our country the local people consider 5 pau = 1 ser, where as at some other place they consider 4 pau = 1 ser. This is a quite confusing state to deal with. With time there were some improvement in the measuring system. The length was measured in terms of inch, foot, yard, mile, etc. The weight of a substance in terms of standard dharni, ser, chhatak, pau etc. But again there lies the difficulty of converting this from the higher unit to the lower one and vice-versa, for it needs a certain mathematical table. Thus the need of the international standard measuring system was realized, which is simpler than the existing one.

Activity 1:

Divide the students in different groups and ask them to measure and note the length of the table in the class, using their arm's length (haath) and "angul" (distance equivalent to the breadth of a finger). Now let the students discuss why their measurements differ from each other's result.

Standard measurement:

A standard measurement should indicate the same measurement number all over the place. For example, if any substance weighed a kilogram in Nepalgunj is taken to Kathmandu, it should remain the same there. It is only possible when the mass used in both places is equal. In another example for international reliability a measurement of 500 metres of cloth measured at Japan, should have exactly the same length in Kathmandu or elsewhere. For this the physical quantities used for measurement all over the world should remain equal. In every measurement of physical quantities, their basic measurements such as the measurements of length, mass and time are considered. Any other measurements will be a combination of any two of them or sometimes a combination of all three of them.

Measurement systems and their Units:

There are mainly three systems of measurements:

- (i) The units of measurements which are accepted internationally are called the standard units (or S.I. units). In international system, the three basic units are taken as metre (m) (as the unit of length), Kilogram (kg) (as the unit of mass) and second (s) (as the unit of time). It is also known as M.K.S system. This system is used in science laboratories all over the world. Being in use all over the world, it is also known as international system of unit (S.I. system).

- (ii) In C.G.S. system, it uses centimetre (cm) (as the unit of length), gram (g) (as the unit of mass) and second (s) (as the unit of time)
- (iii) In F.P.S. system, it uses foot (f) (as the unit of length), pound (p) (as the unit of mass) and second (s) (as the unit of time). The F.P.S. system is used in Britain and in some American industries. This system is also known as British system.

Definition of basic units:

One metre is defined as the definite distance between two lines engraved on a platinum iridium bar kept at 0°C at the international bureau of weights and measurements at Savres, near Paris, France. The duplicate copies are called the international prototype metre. Duplicate bars were made and placed in various capitals around the world including in the bureau of weights and measurements in Kathmandu Nepal. The metre scale used all over the country are made as per the duplicate bar.

Length :

What will be the approximate distance between your house and your school? What is your height? How long is your school bench? What is the breadth of your copy? These different questions indicate the length of the object between two fixed points. So the distance between two fixed points in an object is called the length of that object.

Measurement of length:



30 cm scale



Measuring tape



1 metre scale

For the measurement of length, we use different equipments, as centimetre scale, metre scale, long measuring tape, etc.

To measure a long distance, a long measuring tape is used, where as for smaller measurements, a metre or centimetre scale is used. For measuring the distance, we take one point as the "zero mark" On the scale and the other point is the last point of the object whose distance has to be (found) measured.

Unit of length

The standard unit of length is metre. There are other units which are smaller or bigger than metre. Their relationships are as follow:

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

$$100 \text{ centimetres (cm)} = 1 \text{ metre(m)}$$

$$10 \text{ millimetres (mm)} = 1 \text{ centimetre (cm)}$$

Activity 2

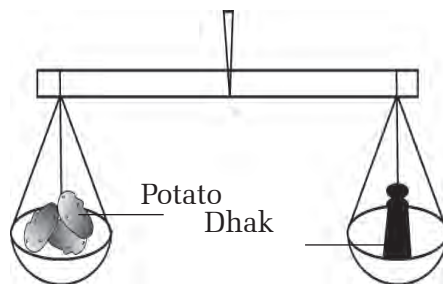
Take a metre scale. Count the marks given in between two numbers on it. What do the marks indicate ? Find it by measuring it with the scale of your geometry box .

Mass:

Different objects around us have their own masses. When we say a wooden block, a brick, copy, a glass of water, etc. They have their own individual mass.

Activity 3

Take a bucket full of water and a glass of water. Lift them in turn. Which one do you feel heavier. Certainly, your answer will be the bucket full of water. It is because it contains a larger quantity of water than the glass. The quantity of water in the substance determines its mass. Consider a single chalk and a piece of the chalk. A single chalk contains a larger amount of tiny chalk particles than the piece of the chalk. So the mass of a chalk is more than that of the piece of chalk. The quantity of these particles determine the mass of the given piece of chalk.



Potato is weighed in a physical balance.

Measurement of mass (or weight)

We cannot predict correctly the mass of the object by just lifting it by our hand. It is better obtained from a physical balance. A common physical balance contains two identical pans. In one pan the object

whose mass is to be found is kept where as in the other pan, a standard weight is kept. When the two weights on the pans are equal, the beam of the balance becomes horizontal, and the pointer of the balance indicates the zero mark engraved in the horizontal scale in the physical balance.

Activity 4:

Take a physical balance and some objects as a small book, a small piece of stone, etc, to measure their mass. Put the object (for example a book) on the left arm pan and adjust the standard mass on the right arm pan, till the beam is horizontal and the pointer of the balance shows the zero mark on the horizontal scale of the balance. This gives the mass of the object.

The Unit of Mass:

The unit of mass is kilogram. There are smaller and bigger units of mass than kilogram. Bigger units are used to measure more amount of mass of matter and small units are used to measure less amounts of matter.

Their relations are

$$1000 \text{ milligram(mg)} = 1 \text{ gram(g)}$$

$$1000 \text{ gram(g)} = 1 \text{ kilogram (kg)}$$

$$100 \text{ killogram (Kg)} = 1 \text{ quintal (q)}$$

$$10 \text{ quintal (q)} = 1 \text{ metric ton}$$

Time:

To get the general idea of time, let us consider that, it took one hour to reach the school from your home. Here we have two events. (i) Our first event is the moment we left the home for school and (ii) the next event is the moment we reached the school. The interval between these two events is considered as the time elapsed for that purpose.

The interval between two events is considered as the time for it (the specific event).

The SI unit of time is second. The bigger units of time are minute, hour, day etc.

60 seconds (s) = 1 minute (min)

60 minutes (min) = 1 hour (hr)

24 hours (hr) = 1 day

7 days = 1 week

365 days = 1 year (yr)

Example

Find the time in second in one day.

Solution:- 1 day = 24 hr
= 24 x 60 min
= 24 x 60 x 60 sec
= 86400 sec.

Thus, 1 day = 86400 seconds.

1 second = $\frac{1}{86400}$ day

i.e when one day is divided into 86400 parts, then one part of it is one second.

In general time is measured with the help of a watch. Different types of watches are shown in the following diagrams.



Wrist watch



Table clock



Wall clock

Activity 5:

Guess how much time it took for you to reach your school from your home. Also record the time elapsed with the help of a watch. Find the difference between these two results.

Experimental activity:

Using the previous activities, take the measurement of different objects using certain local measurement units Draw your conclusion from your experiment.

When we want to measure something, the first essential thing is to establish a standard unit and measure it with reference to that unit. The measurement of physical quantities involves two components. The first component is a number which expresses how many times it is, compared to the standard unit, the second component is the unit used in the measurement. Thus in any measurement the unit is just as essential as the number preceding it. For example 500m, or 50m etc in length, similarly, 500kg, 50gm, etc in mass or 2 days, 2 hours, 5 min, etc in time. The number representing a certain measurement, if its unit is missing, carries no sense. For example, when we say the length of the table is 20, which is expressed without its unit, then it does not give the correct idea of the measurement.

Summary:

1. Mass, length, area, volume, etc are termed as the physical quantities.
2. The random units of measurements used in different localities may not be uniform, as they follow their own traditional systems and not the international system.
3. The units of measurements, which are accepted internationally are known as International standard system.
4. Some commonly used units are as follows:-
 - (a) F.P.S = Foot, pound, second system.
 - (b) C.G.S = Centimetre, gram, second system
 - (c) M.K.S = Metre, kilogram, second system.
5. The distance between two points in an object is called its length.
6. The standard measurement of length is expressed in "metre".
7. The total quantity of matter in a substance gives its mass.
8. Mass is measured with the help of a physical balance. Mass is expressed in kilogram.
9. The period elapsed between two events is called time.
10. Time is expressed in second. A watch measures time.

Exercise:

1. Fill up the gaps.

- (a) A substance which contains more amount of matter has more
- (b) The period between two events is called
- (c) The mass of an object is measured in

2. Tick the correct answer.

- (a) The international unit for the measurement of length is
(i) foot (ii) yard (iii) inch (iv) kilo-metre.
- (b) One day has.....
(i) 86400 seconds (ii) 84600 seconds
(iii) 48600 seconds (iv) 68400 seconds
- (c) The international unit for mass is,
(i) pound (ii) kilo-gram (iii) dharni (iv) ton*.

[Ton- also termed as short ton- commonly used in U.S, Canada and South Africa. 1 ton=2000 pound (=907.2 kg.)*

Long ton- commonly used in U.K

1 ton= 2240pound (= 1016.06 kg)

The unit "ton" is still in common use in U.S as well as in U.K but it has different conceptual values in their countries. - a confusing unit]

- (d) Which system of measurement unit is not be reliable?
(i) The traditional local system of measurement.
(ii) F.P.S system (iii) C.G.S system
(iv) M.K.S system

(3) Give answers:

- (i) What do you mean by the term "standard unit"?
- (ii) Define mass of an object.
- (iii) What is the standard unit of time.
- (iv) Give two possible errors, when the measurements are done in a traditional local system.
- (v) Write the full form of: (a) M.K.S (b) C.G.S (c) F.P.S
- (vi) Why is the need of international standard units are realized. Explain with suitable examples.

Human beings perform different activities such as walking, running, playing, ploughing, reading, writing etc. For any activity we perform, it needs energy. In other words we use appropriate force for these activities. A strong person can perform a lot of activities. A weak person can perform fewer activities. A machine can perform a lot of work. An appropriate machine exerts force to perform different work. Different animals like, mule, horse, donkey, etc exert necessary force to carry away the load.

A force always tends to (1) pull, or (2) push an object on which it is acting. Thus the agency that tends to change the state (state of rest, or state of uniform motion) of an object is called the force. The S.I unit of force is newton (N) (1 newton=1 kg.m/sec²)

Effects of force:**(a) A force can bring motion on a body which is at rest.**

When a body changes its positions, it is termed as its motion. In the fig. shown below, some persons are pushing a loaded cart. Similarly in the next fig, a cyclist is exerting his muscular energy to run the bi-cycle. A football player kicks the ball with a certain force to make it move in a certain direction.



Pushing cart



Cycling

(b) A force can bring a moving object to rest.

By the application of the brakes, a moving bi-cycle can be slowed down or even brought to rest. Here the brake exerts the necessary force against the wheel to make that change in the motion. Thus the "external agent" called the force is responsible for all those changes in the state of motion of the object.

(c) A force can produce an acceleration in a body.

As the force can change the rest state of a body into motion, it also can change the speed of a moving body. The rate of change in velocity of a moving body is called its acceleration. The force applied in the direction of motion causes positive acceleration and in opposite direction negative acceleration.

(d) A force can change shape and size of object.

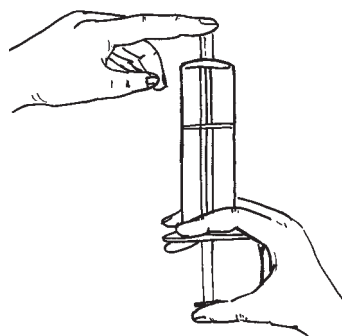
A force can also change the shape and size of the object. For example by pressing a soft rubber ball we can change its shape. Similarly by stretching a rubber band we can increase its length.

Activity 1

Put a paper box in your hand. The shape of the box will be changed when you apply an appropriate force against it. Similarly, put a lump of soft clay on the floor, and if you press against it by your foot, its shape will change.

(e) Force can bring changes in volume of an object.

The change in volume is prominent in a gaseous mass than in a liquid or a solid substance. We can see the changes in volume when we fill air in a foot-ball, bi-cycle, or a cartyre. The pressure exerted by air inside increases the volume of the ball, etc.



pressed the piston against the finger that covered the outlet of syringe.

Activity 2

Take a new simple syringe. Now close the outlet of the piston (nozzle) with the

finger and press the piston gently so that the trapped air inside it is squeezed. As the pressure inside builds up, it will be difficult to move the piston further by exerting the usual pressure. Now think, what is there inside the syringe which made it difficult to move it by further distance. Since air is transparent we cannot see the exact change which is taking place inside the syringe. During the shift of the piston, the air inside is compressed into a small volume. This experiment shows that by exerting force the volume of air can be changed.

Unit of force:

The S.I unit of force is "newton" which is abbreviated as "N". Depending on the nature of work, we need different magnitude of force. For example, the forces which are needed for pedaling a bi-cycle, lifting a small water bucket, running a car, etc.

Motion of an object

On the basis of change in its location, a body can be in following two states:

(1) Rest

If a body does not change its position in reference to its surrounding objects, we call the body is at rest. For example the tables, benches, chairs, etc inside a classroom are at rest. Similarly a house, a tree, an electric pole etc are at rest.

(2) Motion.

If a body changes its position with time relative to its surrounding objects, we call that the object is in motion. For example, a moving bi-cycle, running water, flying bird, etc are in motion. A walking person constantly changes his position with time relative to his/her surrounding. In the same way, a student reaches the school by walking from home.

Activity 3

Point out the difference between the state of rest or in motion of an object. Discuss among your friends. Submit your conclusion answers to your teacher within five minutes of the discussion.

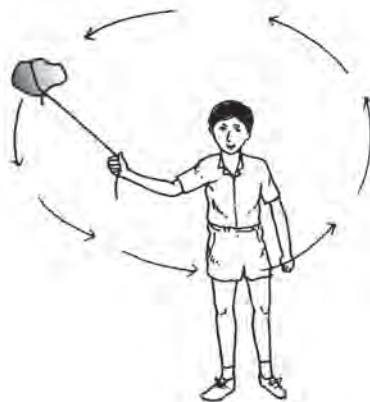
Types of motion:

(a) Translatory motion:

The motion in which every point of the moving object has simultaneously the same speed and direction of the motion is known as the translatory motion. The physical meaning of translation is the motion of a body in which all the points follow a parallel path.

Activity 4

Make a long straight vertical mark on the board of the classroom. Take a rectangular piece of small wooden block. Now drop this block gently from the top mark of the line. It will fall down vertically. Here the direction of motion of the all particles has same direction of motion. So, also all the particles have the same speed.

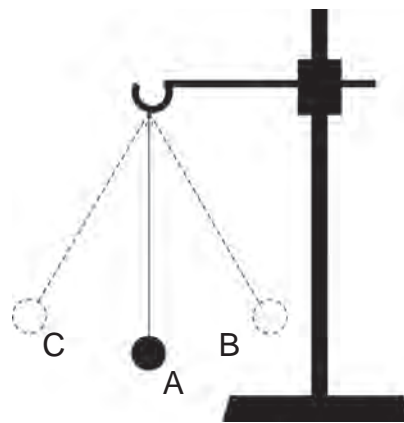


Circular motion

B. Circular motion:

Activity 5

Tie a small piece of wood or stone, at one end of a thread. Hold the other end firmly. If our hand exerts the rotational force on it, the wooden piece will move in a circle. If the thread is released at any point during its revolution, it will fly away. This type of motion is called the circular motion.



Oscillating the pendulum

C. Oscillatory motion.

Activity 6

Take a piece of string of about 50cm. Tie one end of the string on a pendulum bob. Suspend the bob on a rigid support. Now set the pendulum bob to swing carefully through a certain angle. The bob will swing at different positions as, $A \rightarrow B$, $B \rightarrow A$, $A \rightarrow C$, and back. The motion continues for some time. This type of motion is called the oscillatory motion.

d. Random motion:

The gentle breeze generally carries dust particles, along with it. This breeze when strikes against a large rigid surface, will change its direction. We can see this change looking at the random motion of the dust particles. Insects also show random motion in air.

Activity 7

Take some small pieces of paper or light pieces of leaflets of a plant. Now let them fall freely in the open air from a certain height (about 2 metres or so). Do they fall down in a straight path? The light paper pieces will move in different random directions with different speeds during their fall. The motion of a body in which its speed and direction changes continuously is said to be random motion.

Experimental work

Perform activity number 6 and show it experimentally.

Summary:

- (1) The external agent which tends to push or pull an object is known as the force.
- (2) A force can bring a moving object to rest and similarly it can make to move an object which is at rest.
- (3) A force can produce an acceleration in a body.
- (4) A force can change the volume of a body.
- (5) A force can change the shape of a body.
- (6) The unit of force is newton (N).
- (7) When a body changes its position, the motion is produced in the body.
- (8) A body can have different types of motion.
 - (i) Translatory motion
 - (ii) Circular motion
 - (iii) Oscillatory motion
 - (iv) Random motion
- (9) A body has translatory motion, if all the particles of the body move with the same velocity and their paths are parallel.

Exercise

1. Fill in the gap.

- (a) The motion of a freely falling light paper is called
- (b) The state when a body is changing its position is called
- (c) A stone thrown up in the air, falls back again towards the ground after some time, this act is due to the
- (d) To change the shape of an object it needs a

2. Tick the correct answer:-

- (a) The rate of change of velocity in a body is called
 - (i) Motion
 - (ii) acceleration
 - (iii) force
 - (iv) speed.
- (b) Which force does only the pulling action on the body?
 - (i) muscle force
 - (ii) frictional force
 - (iii) gravitational force
 - (iv) magnetic force
- (c) The function of a force is,
- (i) to resist the motion of an object
- (ii) to change the mass of an object
- (iii) to maintain the state of rest of object
- (iv) to change the weight of an object
- (d) A rotating wheel (or a merry-go-round) has
- (i) circular motion
- (ii) random motion
- (iii) translatory motion
- (iv) oscillatory motion

3. Answer the following questions:-

- (a) Give the definition of a force.
- (b) Write any three different effects of force on a body.
- (c) How do you show that a force can change the volume of an object?
- (d) How do you increase the speed of a moving bi-cycle?
- (e) What do you mean by oscillatory motion?
- (f) If the thread of the kite is broken in the sky, what type of motion will the kite get?
- (g) What do you mean by a circular motion? Give your answer with a suitable example.

Simple Machine

Different types of tools are used in our home, school, factory, office, etc. Tools like scissors, net cracker, pulley, axe, sickle, pliers, screw driver, wheelbarrow, crow bar, etc help us to do different types of works in a convenient and easy way. These tools which help to do the work easily and more conveniently are known as the simple machines. A knife and a "chuleshi" help for cutting potato, onion, etc in a convenient way. Similarly scissors help to cut the cloth smoothly.



Metal cutter



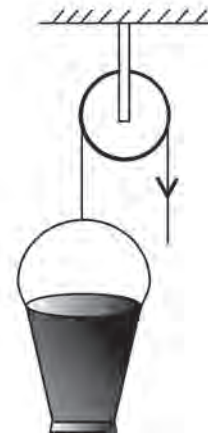
Use of crow bar



Axe



Wheel barrow



Use of Pulley

Function of a simple machine:

Draw a table as shown below. Name ten such tools and give their functions. A few samples are given below.

Tool	Function
1. Knife	To cut different objects, as potatoes, tomatoes, onions, etc.
2. Scissors	To cut the cloth.
3. Axe	To cut wood, logs, etc.

A simple machine has only one type of tool in its mechanism. But in the complex machine, there will be the combinations of many tools (in its mechanism). The different tools are arranged in such a

way that they jointly work to achieve the desired job to be done. In the domestic sewing machine there are many different component parts. Here each part of the component is itself a simple machine. The function of a simple machine depends on the external manual power. But the complex machine can also be driven by other energy, which is different from the manual power. For example a watch can also be run electrically.

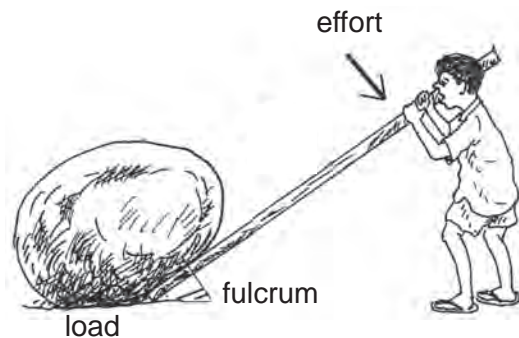
Usefulness of a simple machine:

A simple machine helps to perform the daily work in a convenient and simple way. Some advantages of a simple machine are given below.

- (a) With the use of a simple machine, work can be performed easily and conveniently.
- (b) It takes less time to complete the job if a simple machine is used.
- (c) The direction of the force to be applied can be changed with the use of the simple machine.

(A) A simple machine makes work easy to do the job:

To do a certain job we have to apply an appropriate force. Without the use of the force, the job will not be done. If a big block of wood, or a log, or a stone (assumed to have 100kg mass approximately) is to be displaced, to perform this job by a single person is quite difficult. We perform the job easily with the help



of a crow-bar. It works on the principle of lever. A lever is a rigid bar which is capable of rotating about a fixed point called its fulcrum. The perpendicular distance between the fulcrum and the direction in which the effort is applied is called the power arm, (or, effort arm). Similarly the perpendicular distance between the fulcrum and the direction of the load (or weight to over come) is called the load arm (or weight arm).

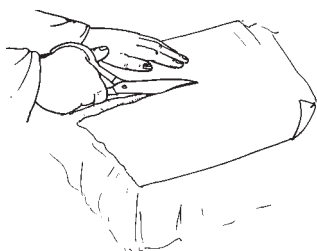
The effort is applied at a more convenient point and in a more convenient direction. Here the point E where the effort is applied is called the effort point. The point 'W' represents the point where the load is kept. The fixed point F of this system is called the fulcrum. In the crow-bar, the

point where it touches the rigid surface acts as the fulcrum F. At the end of the long arm (effort arm), the effort is applied. The load lies over its short arm. Now an appropriate effort at E will move the load 'W' (i.e the stone). In this way by the application of a reasonably less effort a big load can be moved or lifted. According to the principle of lever the effort should be much longer compared to the load arm. A reasonably long effort arm makes the job easy even when the load (weight to be shifted) is much larger than the effort (applied force).

(B) A simple machine helps to do work in less time.

A simple machine helps to complete the job in a lesser time. Let us consider a pair of scissors. It cuts the cloth smoothly in a regular manner according to the need of certain measurement. It is difficult to do the job without it. Similarly, a shovel is used in lifting and moving loose materials, as earth, gravel, sand, snow, etc. Without a shovel the job becomes much troublesome.

Now discuss among your friends and mention other simple machines which are used to make the job simpler.



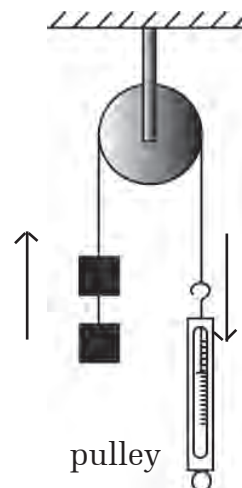
cutting cloth with the help of scissors



lifting soil with the help of shovel

(C) A simple machine helps to change the direction of the external applied force:

A simple machine helps to change the direction of the applied force in a convenient direction. In a simple pulley, we apply the force in the downward direction and consequently the load will move up. Here we can even use our body weight as the external pulling force "E" against the load "W" to be lifted. In the absence of the pulley we have to apply the force in the upward direction. This gives a big



stress in different parts of our body. Similarly in the previous example of stone shifting, if we try the job without the use of any machine, we have to use our manual force in the upward direction. Applying a large manual force in an inconvenient upward direction is quite troublesome. But a simple machine helps to solve this problem and the external force can be used in a convenient direction.

Experimental work:

Show experimentally, how a simple machine can change the direction of the applied force.

Summary

- (1) In our daily life, a simple machine helps to complete the job in a simpler and easier way.
- (2) The advantages of a simple machine are as follows:-
 - (a) It helps to complete the job in an easier way.
 - (b) It helps to complete the job in less time.
 - (c) It can change the direction of the force to be applied.
- (3) Knife, chuleshi, pulley, scissors, etc are some simple machines.

Exercise

1. Fill in the gaps.

- (a) To cut the cloth, the use of the scissors makes the job than the manual attempt.
- (b) Pliers are
- (c) The use of a "chuleshi" makes the cutting work
- (d) In our daily life a makes the job simpler and easy.
- (e) A simple machine can change the of the applied force.

2. Tick the correct answer.

- (A) A simple machine is
- (i) a tool which makes the job easy
 - (ii) a tool which helps to complete the job in a lesser time.
 - (iii) a tool which helps to complete the job in an easy manner and in a lesser time.
 - (iv) all the above statements.
- (B) Which one of the following is not a simple machine ?
- (i) ladder
 - (ii) wheel barrow
 - (iii) pulley
 - (iv) electric pole.
- (C) Under what condition will the magnitude of load be bigger than effort?
- (i) When the load arm is longer than the effort arm.
 - (ii) When the effort arm is longer than the load arm
 - (iii) When the load arm and the effort arm are equally long.
 - (iv) When the load and the effort points are very close to the fulcrum.

3. Answer the following:

- (a) What type of machine is called a simple machine?
- (b) Give the names of five simple machines.
- (c) Write three advantages of a simple machine.
- (d) Write a simple use of each of the followings.
 - i. Scissors
 - ii. Axe
 - iii. Chuleshi
 - iv. Sewing needle
 - v. Hammer
- (e) Justify the statement "the use of a simple machine keeps the danger away".
- (f) Which three simple machines are used in your home? Clarify which machine is used for what type of job.
- (g) It is better to use a crow-bar to displace a heavy load than trying manually without it. Justify the statement with two suitable reasons.

All living beings including plants and animals need heat energy for their survival. You must have noticed that with the beginning of winter season, the leaves start to fall down from the trees. Most of the trees look bare and appear to be dry. Every year, we also get the news from different sources as radio, T.V, news papers, etc. that some persons died because of hypothermia. For our domestic cooking purposes, to run the factories, industries and transportation vehicles, a proper heat source is needed. Excess of heat energy than necessary is also harmful to us. We feel uneasy when the atmospheric temperature shoots up than a certain limit. Thus excess of heat energy is not beneficial to the living beings. It cause more harm than benefit.

Heat is a form of energy. It can be transformed to another form (type) of energy and vice-versa.

1. Sun as the source of heat energy.

More or less, any hot body acts as a source of heat energy. Sun is the prime source of heat energy in the earth. We feel chilly during the winter time, when we do not get sufficient amount of heat energy from the sun. It is the same reason that night time is cooler than the day time. In the absence of sun no life will survive on our planet, earth. The sun rays give warmth to the earth, air, water etc. In nature we get water cycle because of the sun. Water is constantly evaporated in nature and hence we get water cycle. At present the solar energy is also used to heat water and for other heating purposes. The solar cells collect solar heat energy and in return give current electricity which is used for lighting and other useful purposes.



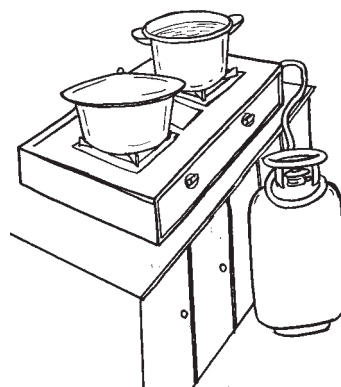
Taking heat of Sun

2. Bio-fuel

The fuel energy which is obtained from living organisms such as bio-gas, dry cakes of cow and buffalo dung, straw, hay, wood, etc. is known as the biomass-fuel. In the villages these fuels are generally used for cooking and warming the rooms during winter season. The people even sit around the burning bio mass fire to avoid coldness. Some villagers generate the bio-gas by collecting dung in a specially made pit and get bio-gas from the decomposed biomass.

3. Fossil fuel

The fuels like, coal, kerosene, petrol, diesel, natural gas ,etc., which are obtained from the earth's crust are called the fossil fuels. Domestic cooking is also done by burning coal and kerosene oil. The natural gas or the L.P.G. (liquefied petroleum gas) is mainly used for cooking, room heating etc. Fuels like petrol, diesel oil are generally



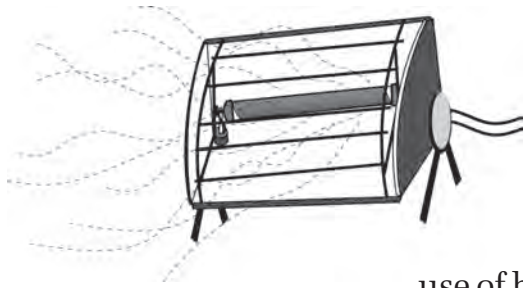
Cooking rice in gas stove.

used for running means of transport like motor cycles, cars, aeroplanes, etc. When these fuels are burnt, the necessary heat energy is produced for running the engine. So fossil fuel is one of the main source of heat energy.

4. Electricity

Electricity is also one of the source for heat energy. In the city and in some villages, people use current electricity for room heating during winter and cooking as well. But as the electricity bill is expensive, people hesitate to use it. Since our nation has high potential to generate hydro-electricity, if we can exploit existing natural hydro resources, the electricity bill will come down to a level at which common people also can use it.

In fact there are other sources as well for the heat energy. But in our nation only the above mentioned few sources are available.



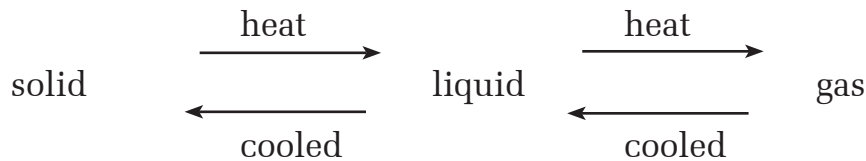
use of heaters

Effects of heat:

Heat energy can give different effect on the body. It can change the volume and produce physical changes on the bodies.

1. Physical change

Matter can have three different forms, as a solid, a liquid and a gas. For example, the solid form is ice, liquid form is water and the gaseous form is vapour. How does ice change into water and then to steam? The solid ice when heated changes into water. Water when heated turns into steam or vapour. Thus heat is the prime agent which converts the matter into different forms.



Activity 1

Put few pieces of ice in a plate and put it in the sun for some time. We see that the ice is turning into water. If we put the plate in the sun for some more time, we find that the quantity of water is gradually decreasing in the plate. This is due to the evaporation of water.

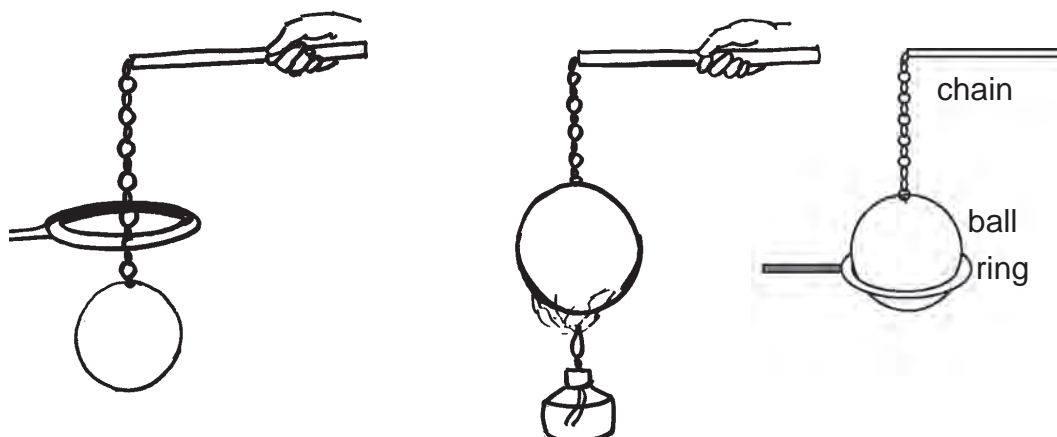
2. Change in volume

Matter in all its three forms, changes its volume when heat is applied on it.

Activity 2.

The change in volume of a solid can be seen from the experiment given below.

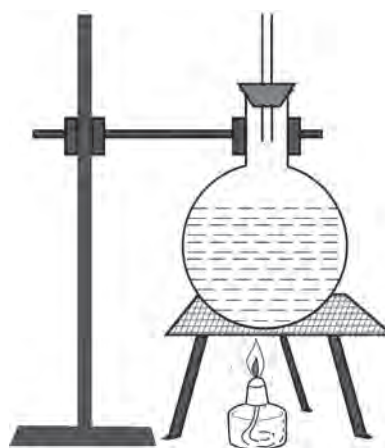
Take a Gravesands ball and ring. Keep the ball over the ring at cold state. Observe it. Now heat the ball and replace the ball on the ring. What happens now ? Why is the ball stop on the ring ? Discuss in class. It is due to the expansion of the ball by the heat Like solids, liquids also expand when heated.



Use of Gravesande's ring and ball

Activity 3

Take a round bottomed glass flask (R.B. flask). Fit the mouth of the flask with a one holed cork. A long glass tube is fitted on it. Fill the flask with coloured water. The cork should fit air tight with the mouth of the flask and the glass tube should touch the liquid surface. When the flask is heated gently in the flame, we see the rise of water level in the glass tube. Note the rise in water level in the glass tube at certain



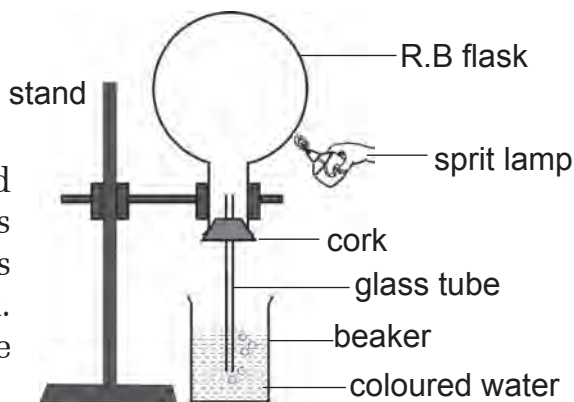
Water is heated in R.B flask.

intervals of time as 2 minutes. The experiment shows that liquid expands when it is heated.

Activity 4

Gas expands on heating

Take an empty round bottomed flask. A one holded cork is fitted in its mouth. A long glass tube passes through the cork. The cork and the glass tube should fit air tight.



R.B is heated with spirit lamp

The glass tube is inserted into a

beaker with water as shown in the fig. Heat the flask gently by a spirit lamp or any other source of heat. We see the air bubbles coming out in the water glass. The experiment shows that gas expands when heated. It is due to expansion of air.

Absorption of heat

Most objects absorb the incident heat energy. The absorbed heat by the object increases its temperature. Thus the addition of heat energy on the object increases its temperature, It is the effect of heat on the object. In the same way loss of heat drops the temperature. When we stand in the sun, our body absorbs the incoming heat energy. We find that our cloth, head, body etc are warmed. Different objects absorb the heat energy in different amounts. Some are quick to absorb where as some are slow.

Activity 5

Take four moderate paper or cloth bags of colours as, black, red, blue, and white. Insert the bulbs of four separate thermometers into each of these bags. Close the mouth of the bags. Keep all the bags over a plank and then put the plank carefully in the sun. Note the mercury meniscus in each thermometer at the intervals of every five minutes. Inter the result in the tabular form as,

Time in minutes	Temperature in black bag	Temperature in red bag	Temperature in blue bag	Temperature in white bag
5 min				
10 min				
15 min				
20 min				

Observation:

Which thermometer (in reference to the colour of the bag) showed higher rise in temperature. Write them in descending order as black white.

We see that the mercury meniscus of thermometer in the black bag shoot up the highest where as that in the white bag shoot the least.

Conclusion: Black body absorbs heat energy to the highest extent while white absorbs the least. Different colours absorb the heat energy in different extends when exposed to it.

Uses of heat energy

As discussed in the preceeding sections, we find that heat energy is essential for the survival of all living beings. Human beings use heat energy to achieve various aspects.

(a) It keeps our body warm.

In the winter season, the cool air takes away heat energy from our body and we feel chilly. To keep our body warm we do different activities. To get the necessary heat energy, we burn fire, or use electric heaters, gas heaters or stand on the sun. Thus heat energy help us to keep our body warm.

(b) Use for cooking our food

Under cooked or uncooked food may be harmful for our health. Except the fruits, the food we take has to be cooked properly. A well cooked food is tasty and helpful for the health.



Cooking food with fire wood

(c) Use for drying wet cloths :

We need to use neat and clean cloth to be healthy for which we have to wash them routinely to clean them. The wet cloths are better dried in the sun. The solar heat energy evaporates water from the wet cloth. In the cloudy day the drying process takes longer time.

(d) Use for industrial production:

Heat energy is very essential to achieve the different aspects in our life. Without the necessary amount of heat energy plants cannot give grains, vegetables, and fruits. We also like to have biscuits, chocolates, noodles, etc to eat. We need heat energy to make them. Similarly to bake bricks in the kiln, to produce iron rods, cement, plastic and plastic goods, electric cables, toys and domestic utensils, heat is extremely essential. The needful heat energy, we generally get from coal, wood, natural gas, electricity , etc.

(e) To sterilize water

Water we get from different sources as river, pond, lake, etc is generally contaminated. Even though it looks clear, it might contain different types of invisible bacteria. When water is heated to its boiling point, the different bacteria in it dies and the water becomes drinkable.

(f) To preserve grain, meat, fish and other food stuff.

We need necessary heat energy to remove moisture from the food grains, meat, fish etc so that they can be stored for a longer period of time. The moisture content in these food spoils them when stored.

Project work:

1. Find out how many families live in your locality . Also find the different energy sources as fire wood, straw, fire cakes, bio-gas etc used by them for cooking . Make a simple report on it.
2. How many houses are there in your villages or locality? Find how many of them use bio mass fuel, fossil fuel or electricity for cooking and room heating, etc. Try to make a brief report.

Experimental work:

Show with the help of the activity 4, that gas expands when heated.

Summary

1. Sun, biomass-fuels, current electricity, fossil fuels, are the prime sources of heat energy.
2. Solar heat warms the environment, helps to heat water and produce current electricity.
3. Fire wood, hay, straw, and bio mass-gas, etc belong to bio mass-fuel.
4. Coal, petrol, diesel, kerosene, are the fossil fuels, as they are extracted from the mine.
5. Heat energy can change the volume and shape of the object.
6. Black and deep dark coloured objects absorb heat quicker than the light coloured or shiny objects.
7. Heat is used for different purposes as purification of water, to run factories, to cook food, to dry wet clothes and food grains, to keep our body warm, etc.

Exercise

1. Fill up the blank:

- (a) Sun is the prime source of
- (b) can be heated from the solar heater.
- (c) Fire wood, hay, straw, etc are known as fuel.
- (d) Coal, petrol, etc are called fuel.
- (e) Heat can change the and of the body.
- (f) When water is heated it turns into
- (g) Gas or air when heated its volume.

2. Tick the correct option:

- (a) Which one is the fossil fuel?
 - i. fire wood ii. coal iii. bio-gas iv. fire cakes
- (b) Among the coloured cloths, which cloth absorbs more heat energy in a given time?
 - i. Black ii. White
 - iii. Green iv. Red
- (c) What change do you get when heat energy is applied ?
 - i. Vapour turns into water.
 - ii. Water turns into ice.
 - iii. Steam turns into ice.
 - iv. Ice turns into water.
- (d) Which one is the bio-mass fuel?
 - i. Natural gas ii. Coal
 - iii. Straw iv. Kerosene
- (e) Which one is not the source of heat energy?
 - i. Moon ii. Sun
 - iii. Coal iv. Current electricity

- (f) From where do you get the bio gas?
- i. Mine
 - ii. Atmospheric air
 - iii. Decomposed animal dung
 - iv. Fire wood

3. Answer the following questions:

- (a) Why is the sun considered as the prime source of heat energy?
- (b) What do you mean by the bio mass-fuel?
- (c) What is the name of that electric appliance which produces heat energy?
- (d) What changes do you see when water is heated?
- (e) In general, people use black cloths in winter and white cloths in the summer seasons, why?
- (f) What do you suggest to get pure drinkable water?
- (g) Why do wet cloths take longer time to dry in the shade than in the sun.
- (h) Most foods are generally cooked properly before they are consumed. Give two reasons for this.

Light is a form of energy. Light energy is essential for all the living beings. With the help of light we see different objects. Human beings cannot see objects without light. Plants too need light energy. In the presence of light, plants make their food. These foods are then used to fulfill the need of the living beings for their survival.

Sources of light

Any luminous object can be taken as the source of light.

Sun:

Sun is the prime natural source of light. Because of the sun day are brighter than night. Normally there is no other light source which can produce better light than the sun. Thus sun is the prime source of light energy.



Sun light

Current electricity:

Current electricity is the next important source of light energy. In the night. We use current electricity to get light. We consider the electric devices to be simple and easy to handle. In most parts of our country electricity is used for light. Big towns and developed countries also use electricity for light.



Reading under the light of electricity

Lamp:

Candle lamp, kerosene lamp, lantern etc. can also be taken as the secondary light source. Candles are made from wax. Kerosene is used in the kerosene lamp and the lantern. These two have been the main sources of light where there is no current electricity.

Luminous and non-luminous objects:

Luminous object:

Any object which produces light energy by itself is called the luminous object. For example sun, electric lamp, burning fire, star, firefly, etc are the luminous objects. Light comes out from these objects, by different phenomenal processes in them. In general heat is also produced along with light energy from the luminous objects.

Non-Luminous object:

Objects which cannot produce light of their own are known as the non-luminous objects. The objects around us are mostly non-luminous. Tables, benches, books, mirrors, chalk, stone, soil, etc are non-luminous objects. Moon is also a non-luminous object. Moon cannot produce light from its (own) surface. Moon appears bright when sun light is reflected from its surface and falls on the earth. Similarly, a mirror also appears bright and shiny when the incident sun light is reflected from it. But both the moon and the mirror are not the luminous objects.

Among the non-luminous objects, they are categorized as,

- (1) Transparent object
- (2) Translucent object
- (3) Opaque object.

1. Transparent object:

Objects in which light can easily transmit through them are known as transparent objects. Air, clear water, smooth glass plate, thin colourless plastics sheets, etc are transparent objects. Light can easily transmit through them. For example, for hundreds of kilometre, earth is surrounded by atmospheric air. Sun rays reach the earth's surface transmitting through these dense layer in very short time. The incident light rays are transmitted without significant deviation or absorption on them.

2. Translucent object:

Translucent objects permit the passage of light rays but the transmitted light rays are scattered or diffused. Because of diffusion, the objects on the other side cannot be seen clearly. For example, frosted glass

allows light to pass through it but an object cannot be seen clearly through it. Oil papers, tissue papers, thin tracing papers, etc behave as the translucent objects. Hence in a translucent medium such as a ground glass, light can pass through it only with an appreciable loss. So that objects cannot be seen distinctly through it.

3. Opaque object:

Any object that does not allow light to pass through it is called an opaque object. Wood, stone, iron, etc are opaque objects. The opaque object forms its shadow as it stops the light incident on it.

Activity 1

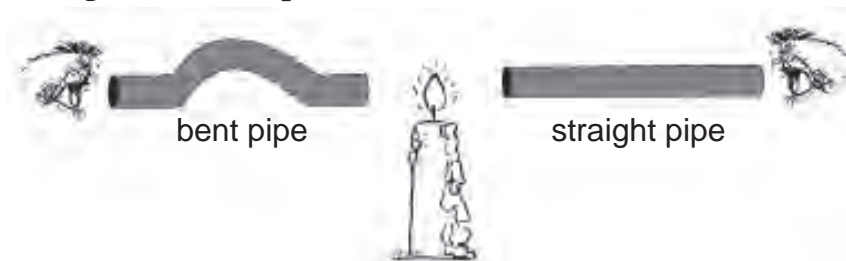
Collect different objects as the small pieces of glass, ground glass, wood, stone, tracing paper, oil paper, etc. Put them systematically on in the sun light. Note which object makes a dark shadow, and which transmits sun light. Also note which objects give you a blurred vision when viewed through it. Tabulate your observations in the tabular form, as,

Object	Light is completely stopped	transmitted light is diffused and the object cannot be seen clearly	very little loss of transmitted light and the object can be seen clearly	Inference
Stone Ground glass				opaque Translucent

Rectilinear propagation of light:

Activity 2:

Put a burning candle lamp on the table.

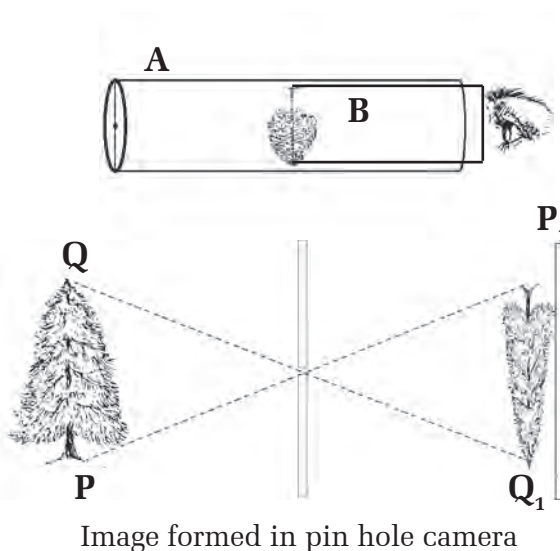


Look the flame with the help of a straight, flexible pipe. Can you see the flame? Now bend the pipe, as shown in the fig. Check whether you can see the flame. Light cannot pass from one end to the other end when the pipe is bent some where in between. This shows that light travels in straight lines. You might have noticed, the suspended dust particles floating in straight line along the beam of sun light coming into your room through the small hole of the window. These observations show that light travels in straight line in a given medium. The fact that light travels in straight line is known as the rectilinear propagation of light.

Activity 3:

A pin hole camera:

Take two paper pipes (or black polythene pipe pieces which one is easily available) of about 3-4 inches in diameter. Pipe A has little larger diameter than pipe B, so that, pipe B can easily pass through A when inserted. Now stick a circular tracing paper at one end of pipe B, and a black paper on pipe A. Make a small pin hole at the centre of the black paper. Pipe B is then inserted into pipe A such that we can look through the free end of pipe B. Face the end A towards the object and look through the end B. We see the inverted image of the object on the tracing paper. Here the tracing paper acts as the screen. As shown in the fig. light rays from the top of the object P(tree) passes straight through the pin hole to form its image at P₁ on the screen. Similarly light rays from the point Q, form its image at the point Q₁. In the same manner, the light rays coming from the intermediate points between PQ pass straight through the pin hole (H) and form the image in line with P₁Q₁. Finally we see the inverted image of the object on the screen. This phenomena shows that light travels in on straight lines.



Experimental work:

Using activity 3, make a pin hole camera. Demonstrate it in your classroom.

In the camera you will find that

1. The image is inverted.
2. The image is sharp if the hole is small.
3. A small hole would give a clear but a dim image.
4. A bigger hole gives a brighter image but the effect is blurring.
5. The shape of the hole is not important provided it is small.
6. A larger tube (or box) gives a larger image but it is less bright.

Summary:

1. Any object which can emit light is considered as the light source. Sun, electric lamp, candle, etc are the sources of light.
2. An object which can emit light from its own is called the luminous object. For example sun, electric lamp, candle, etc belong to luminous source.
3. Object which cannot emit light by itself is known as non-luminous object. Non-luminous object can be seen with the help the external light which fall on it.
4. If the external light falling on them is cut off, we will be unable to see them.
5. Objects from which the incident light cannot transmit through them are called opaque objects.
6. In a translucent object the transmitted light is scattered with an appreciable loss. So the object can be seen distinctly through it. For example, tissue paper, greased paper, etc translucent.
7. Light travels in straight lines.
8. A pin hole camera shows that light travels in straight lines.

Exercise:

1. Fill up the gap:

- (i) Objects which give off light are known as
- (ii) The prime natural source of light is
- (iii) Object which can emit light out from its own is known as the
- (iv) Light travels in

2. Tick the correct statement.

- (a) Which one is not the light source?
i. Sun ii. Star iii. Mirror iv. Fire fly
- (b) Which one is the luminous object?
i. glass ii. mirror iii. moon iv. star
- (c) Which one is the transparent object?
i. ground glass ii. thin sheet of paper
iii. a small mirror iv. clear water
- (d) How does the propagation of light take place?
i. in straight lines ii. in curved paths
iii. in zig-zag paths
iv. in random path like that of lightning.

3. Answer the following questions:

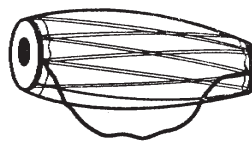
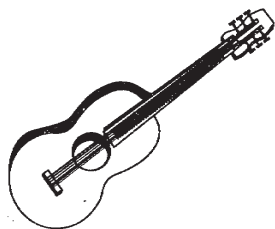
- (1) Define source of light.
- (2) List three different light sources.
- (3) Differentiate, between the light source and the luminous object.
- (4) What is a transparent object?
- (5) List three different transparent objects.
- (6) How is the image formed in a pin hole camera?
- (7) In what manner does light propagate in its path?
- (8) How do you realize that light travels in straight lines?

Since early morning till late evening before we go to bed, we have different kinds of sound from the various sources. We hear sound while we talk, listen music and different types of noises made from different sources as the transporting vehicles, birds and animals etc.

Sound is a form of energy

Source of sound:

For the production of sound wave we need a vibrating object. Sound waves can travel through solid, liquid, and the gaseous medium. A ringing bell produces sound waves. The body of the bell when it vibrates above a certain limit of vibration, we get sound wave. To get a continuous wave we need a constant source of the vibrating object.

Activity 1:

Put your fingers near your vocal cord while you talk or sing. Do you feel some vibrations within your throat? So long as the vocal cord is in vibration, you get sound wave.

Activity 2:

Put a steel tumbler or a steel bowl on the table using a pencil. Strike it gently near its rim. The body of the vessel vibrates, in return and sound is produced. Now touch the rim by your finger. The vibrations stop and there will be no more sound. Why it so? Similarly when school bell, ring in vibration and sound is produced. A vibrating object can be taken as the sound source. How is sound produced from the following musical instruments?

(a) Guitar

(b) Madal

(c) Damphu

(d) Bell

What types of musical instruments are there in your locality?

After discussion with your friends list five different such musical instruments.

Pitch of sound:

The nature and quality of sound wave depends on the mode of frequency the source produces. Some vibrating sources produce sharp note (sound) where as the other might give a dull note. In general the sound waves produced from the metallic vibrations are sharper than those produced from the non-metallic or flexible objects.

The sharp or dull sound is due to the high or low pitch of the sound wave. In the stringed musical instruments, high pitch is produced when the string is taut. Similarly the pitch in the female voice is high compared to the male voice.

Activity 3:

Observe the sound produced by the following objects. From Which object sharp sound is produced? Write with conclusion.

- (i) steel and plastic tumbler
- (ii) the thick and the thin strings of guitar.
- (iii) guitar strings when it is taut and slack.
- (iv) the two opposite ends of a madal.
- (v) the voice of a girl and boy.

Loudness of sound:

Loudness is related to the energy in the sound wave. It is a physical perception of the sound intensity. The radiant energy transmitted normally per second per unit area by a wave is known as intensity. The loudness of a sound wave is a measure of the power stimulating the ear. It also depends on the sensitivity of ear and on the intensity of the particular sound.

Activity 4:

Put a steel tumbler on a table. Strike the tumbler's rim gently with a pencil. Perceive the loudness of the emitted sound. Then again strike

it harder by a rigid (metal) rod. The loudness in the second case is higher than the first. The energy carried by the sound wave in the second case is greater than that in the first. Hence this second wave will be available to a greater distance than the first.

Activity 5:

Take the school bell and its wooden hammer in the open field of the school compound. Now ask your friends to stand at distances differing by 5-5 meter from each other in a line from the sound source. Strike the bell gently. It will produce a sound wave of certain intensity. The students standing at different points will raise their hands when they hear the sound of the bell. The process is repeated when the bell is struck with different forces. In each case the students will raise their hands when they receive the sound. This simple experiments shows that when the bell is struck hard, it carries sound waves of higher energy, that is, of high intensity sound. This sound is audible to a greater distance than the previous sound waves produced by softer striking. High intensities waves contain greater energy.

Wave:

Sound wave needs a materials medium for its propagation. It can travel through, a solid, a liquid or a gaseous medium. In our daily life we get sound which is propagated through the air medium. Waves can travel in two different modes as (a) longitudinal (b) transverse. But sound is a longitudinal wave. If you drop a pebble gently in a calm water pond, the water waves gradually travel forwards from the centre in the form of ripple. They travel towards the bank of the pool. The point where the pebble is dropped acts as the source for the wave. Here the water waves travel in the form of longitudinal mode. you can do this experiment in a large plastic bucket in your home.

Activity 6:

Take a large plastic bucket. Fill it with water to a depth of about 10cm. When the water surface is calm, quickly insert your finger at its centre. you will find that the water particles move up and down in a regular manner and the water waves gradually spread outwards. Here the water at a certain point or region do not move along with the waves. They simply move in the up and down pattern. This

phenomena can be seen clearly, if you put some light particles as, small pieces of paper or cork on the water surface. These particles simply move up and down pattern. They remain at the same position but the waves travel outwards. This type of wave motion is known as the longitudinal wave motion.

Propagation of sound

We get sound waves which is propagated through the air medium. Like the water waves, discussed above, sound also travels in the form of wave. The speed of sound wave in air at normal temperature is about 332 metres per second. In the liquid medium like water, its speed is around 1450-1500 meters per second. In a solid medium its speed still increases.

Medium:

For the propagation of sound wave it needs material medium, as a solid, a liquid or a gas. Earth is surrounded by a thick layer of atmospheric air. Air is a mixture of different kinds of gases. It mainly contain nitrogen and oxygen. It also contains a small proportion of carbon di-oxide and traces of other gases. The sound wave which we get generally travels through the gaseous medium. Sound waves cannot travel through vacuum. On the moon's surface, as there is no air, sound waves cannot travel as they do on the earth's surface.

Liquid Medium:

Sound can travel through the liquid medium. If we ring a bell inside the water the sound is heard outside. the aquatic animals like the whale, dolphin, etc communicate through sound in water.

Solid Medium:

Sound can transmit through solid medium also. It can be understood well by the following activity.

Activity 7

In your school ask one of your friend to put his ear pressed against the class desk at one edge of it. Now scratch the desk very gently at its other end. He will get the scratching sound very clearly. Repeat the procedure for the second time. But this time he is in his normal

position and his ear is not in contact with the desk. It will be found that the scratching sound will be distinct and clear in the first case than in the second case. In the second case the sound received will either be very faint or not audible. Thus we find that the speed of sound in the solid medium is greater than It is in the gaseous medium. The speed of sound wave in iron is about 5000 metre per second.

Summary:

1. Sound wave is generated from a vibrating body.
2. The sharpness of sound is known as its pitch.
3. The baby voice has higher pitch than that of the adult voice.
4. Loud sound has high intensity.
5. Faint sound has low intensity.
6. High intensity sound wave can be heard from a far away distance.
7. Sound travels in the form of a wave.
8. For the propagation of sound wave, it needs a material medium.
9. Sound waves cannot travel through vacuum.

Experimental works:

1. With the help of the activity 5, relate the high intensity wave with its propagation distance.
2. With the help of activity 6, generate a water wave and show how does the wave travel.

Exercise

1. Fill in the gap:

- (a) Object produce sound by their
- (b) When you play on flute is produced.
- (c) Sound wave produced from a metallic body has
- (d) Sound wave which contains high energy has high
- (e) Sound travels in the form of a
- (f) For the propagation of sound wave, it needs
- (g) The speed of sound in air is about

2. Tick the correct option.

- (A) To produce sound from a body it needs,
 - (i) vibrating body
 - (ii) medium
 - (iii) solid object
 - (iv) gaseous object.
- (B) What is the essential factor for the propagation of sound ?
 - (i) vacuum
 - (ii) material medium
 - (iii) conducting wire
 - (iv) None of them.
- (C) What do you mean by the term pitch of sound wave?
 - (i) loudness of sound
 - (ii) sound wave having large intensity
 - (iii) sharpness of sound
 - (iv) High intensity sound.

3. Answer the following questions:

- (a) When a ringing bell is touched by hand, the sound is stop, why?
- (b) Mention any four sources of sound.
- (c) What is the difference between the male and female voice?
- (d) How can you produce high pitch sound from a guitar? Suggest two such means.
- (e) How is loud sound is produced ? Why does the sound travel a greater distance?
- (f) Give a neat sketch of a water wave.
- (g) Why does sound become fainter and fainter as it proceeds forward? Describe.

Magnet

A magnet attracts iron pieces towards it. A magnet can be used to pick up and collect small iron pieces from the floor. It is also used to pull out tiny iron pieces from ear or eye when it happened to enter into them accidentally. Magnet is one of the important component in the constructions of radio, transistor, speaker, telephone and other electric equipments. Similarly it is one of the important component in the construction of electric generators and electric motors. Thus a magnet plays an important role in the development of modern electric equipments.

There are two magnetic poles at each end of bar magnet. At one end there is magnetic north pole and at the other end a south pole. The energy of a magnet is termed as the magnetic energy.

Magnetic property:

1. Attractive property:

A permanent magnet has the property of attracting the magnetic materials towards it. The objects which are attracted by a magnet are termed as the magnetic materials. Iron, cobalt, nickel, and some alloys are attracted by a magnet.

When a bar magnet is dipped into iron fillings, they stick only near the ends or poles of a bar magnet. It shows that the magnetic effect is concentrated at the poles of a magnet. These poles always occur in pairs which are of equal strength.

2. Directive property:

The two ends of a freely suspended bar magnet always point roughly towards the geographical north and the south poles. The north seeking (north pole) always points roughly towards the geographical north pole and the other end towards south. This property of a magnet is

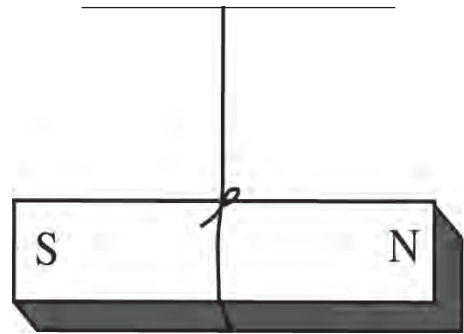


Magnet attracts iron fillings.

known as the directive property of the magnet. Similarly two ends of a compass needle always points towards the geographical north and south pole. A compass needle is pivoted at its centre so that it can rotate freely. It is then kept inside in small case (a small box). The top surface of the case is covered with a transparent glass piece. Similar to a compass needle, a bar magnet if made to float on water surface with the help of a cork (or some light solid plastic), comes to rest such that its one end points towards the geographical north and the other south.

Activity 1:

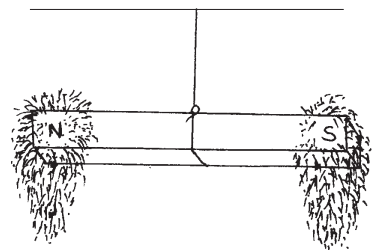
Suspend a bar magnet by an unspooled thread, such that the bar is horizontal, when suspended freely. There should be no other magnetic material close to it, in this experiment. The two ends of the bar magnet point north and south poles when it comes to rest. To conform this test swing it by a careful and gentle push on its end. After completing a certain number of swings, it again comes to rest pointing north and south. This property is known as the directive property of a magnet.



3. Magnetic strength is concentrated at the ends of a magnet

Activity 2

A magnet has more magnetic force at its ends. It has the least or about nil magnetic force at its middle line. It can be understood by following activity. The activity shows that like poles repel and unlike poles attract each other.



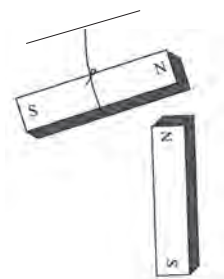
Take some iron filings on a sheet of paper. Put the bar magnet over it and then suspended it by an unspooled thread. It will be found that the filings stick only near the ends of the bar magnet and no filings at the middle of the bar.

4. Like poles (N-N) or (S-S) repel and unlike poles (N-S) attract each other:

The north pole of one magnet and the north pole of another magnet, similarly (S-S poles) are like poles. When two similar poles of the magnet are brought close to each other, they get repelled with each other. But the unlike poles (S-N) attract each other. It can be shown using a compass and a permanent magnet. It will be found that N-pole of the compass is pushed away when the N-pole of the bar magnet is brought close to it.

Activity 3:

Hang a bar magnet freely to move. Bring the north pole of another magnet close to the north pole of the hanging magnet. It is found that the north pole of the suspended magnet is pushed away. Again bring the south pole of the suspended magnet near the north pole of the suspended magnet. It is found that the poles are attracted towards each other. The activity shows that like poles repel and unlike poles attract each other. The activities shows that like poles repel and unlike poles attract each other.



Like poles repelled

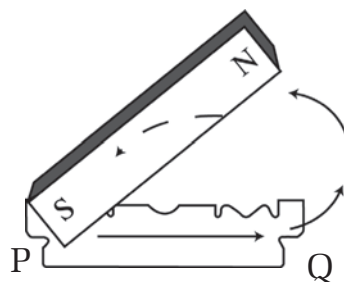
5. Magnetic poles always exist in pairs:

The poles of a magnet always exist in pairs as north and south. The poles cannot be isolated. We cannot get a magnet having a single north or a south pole. A new pole will be developed at the region where we divide and sub-divide a magnet. Thus in a magnet the poles always exist in pairs which are of equal strength.

Activity 4:

Take a razor blade. Break it into two parts along the sharp edge. Keep one piece over a table. Now touch the S-pole of the external magnet at one end of the blade and slide it along PQ as in the diagram.

Repeat the process for about 20-25 times. Note the resultant polarity on the razor blade with the



help of a compass. Break the razor blade again into two pieces at its middle. It will be found that there is one new magnetic pole developed at each piece. Check the nature of the new magnetic polarity using a compass. If we divide and sub-divide the razor piece again and again, at each time we get a pair of magnetic poles, however small it may be. This activity shows that magnetic poles always exist in pairs.

Magnetic and non-magnetic substance:

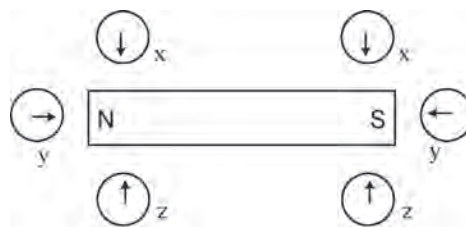
A magnetic substance is attracted by a magnet. Iron, cobalt, nickel, and some alloys belong to the magnetic substance. These metals can be magnetized by different methods as single touch method, electric method etc. The non-magnetic substances are not attracted by a magnet. The metals, as gold, silver, brass, etc come in the family of non-magnetic substances. These metals cannot be magnetized by any methods.

Magnetic poles

The region of a magnet from which the magnetic forces appear to originate is known as the magnetic pole. It lies a little inside the body of the bar magnet from its end. For example if the real length of a bar magnet is 10 cm , then the distance between the poles will be 8.5 cm. The distance between the poles of a magnet is called the magnetic length. The magnetic force of a magnet appears to concentrated at the ends of the magnet.

Activity 6:

A rough and approximate method to get the position of the poles is discussed below. Put a bar magnet on a sheet of white paper and draw its outline. Draw a dotted pencil mark along the length of the outline which runs centrally in the outline. Put a compass at different positions



as 'X', 'Y', 'Z' as shown in the figure near one end of the magnet. Put the pencil marks at the two free ends of the compass needle. Join those points which meet at N and S respectively. These points represent roughly the position of the magnetic poles. Measure the magnetic

length N-S and the real length of the magnet. Theoretically, the ratio between the magnetic length to the real length of the magnet comes about 0.85.

Magnetic field:

A magnet can attract magnetic bodies up to a limited area only around it. Thus there is a fixed place around a magnet to which the magnet can affect on magnetic bodies which is called magnetic field of the magnet. Some magnets have wide magnetic field and some have narrow magnetic field, By using a magnetic compass we can plot the magnetic field of magnet . Now do the following activity to detect the magnetic field of the given magnet.

Activity 6:

To get the general idea of the magnetic field of a magnet, we take a sheet of white paper and a bar magnet. Remove all the magnetic substances from the experiment table. Put the paper on the table. A bar magnet is placed on the paper. Draw its outline. Put a compass near one end of bar magnet. The compass needle will be affected by the magnetic force of the bar magnet. Slowly move the compass away from the magnet till the compass needle shows no effect on it. The procedure is repeated at different positions till we get a closed area surrounding the magnet. This area in which the compass needle detects the magnetic force is the magnetic field of the given magnet.

Experimental work:

Using activity 3, shows that like poles (N-N) or (S-S) repulse and unlike poles (N-S) attract each other.

Summary:

1. Property of a magnet is called the magnetism.
2. A magnet is a very useful object.
3. A magnet attracts magnetic substances.
4. The magnetic strength appears to concentrate near the ends of a bar magnet.
5. A freely suspended magnet points north south directions at rest.

6. Like poles (N-N) or (S-S), repel and the unlike poles (N-S) attract each other.
7. Magnetic poles always exist in pairs.
8. The magnetic substances are affected by a magnet.
9. The region where the magnetic force appears to concentrate is known as the magnetic pole.
10. The space surrounding a magnet where it produces a magnetic force is called its magnetic field.

Exercise

1. Fill in the gap:

- (a) The specific property of a magnet is also termed as its
- (b) A magnet can small pieces of iron.
- (c) The north pole of a magnet the north pole another magnet.
- (d) The magnetic force of a magnet concentrate at its
- (e) A bar magnet, even if it is divided and sub-divided, a single north or south pole will not be from it.
- (f) A substance which is not affected by a magnet is termed as

2. Tick the correct option:

- (a) What types of substance does a magnet attract?
i. Brass ii. iron piece iii. Pencil iv. eraser
- (b) In what direction does a freely suspended magnet point?
i. North-South ii. East-West
iii. along the inclined line pointing north-east
iv. along the inclined line pointing south-west
- (c) Which one is not a magnetic substance?

i. brass ii. iron iii. nickel iv. cobalt

3. Answer the following:-

- (a) What is the Magnetism of a magnetic source.
- (b) State any four equipments in which a magnet is an essential component.
- (c) Why may a bar magnet placed on a table not point along N-S direction ?
- (d) Give two examples of (a) magnetic and (b) non-magnetic substance each.
- (e) What is magnetic field? Which type of a magnet will have a bigger magnetic field area?
- (f) What is the difference between the real length and the magnetic length of a magnet?

Current electricity is one of the important energy for the mankind. In our daily life we need it for different aspects. To avoid darkness at night we use electric lamps. To operate radio, T.V, telephone, computer or other electric appliances, we need current electricity. Similarly electric heater, electric iron, electric motor, etc depend on current electricity. Electricity is essential to run the factories, and various industries.

Source of electricity

Equipments which generate current electricity are said to be the electric sources. Electricity can be obtained by different means. Some of them are discussed below.

1. Cell
2. Photo cell
3. Dynamo and generators

1. Cell:

By some specific chemical reaction current electricity is produced in the cells. For example, we have dry cells or simple cells. We get current electricity by the chemical reaction inside them. Dry cells are generally used to operate the touch light, small transistors, etc. Dry cells are handy to carry as there is no chemical in the liquid form inside them.

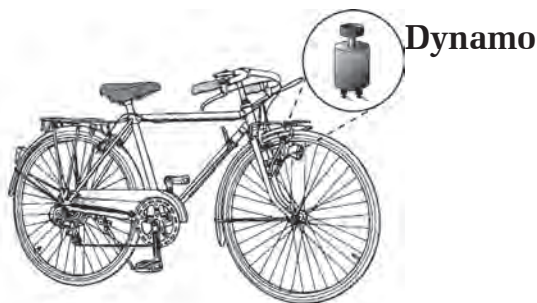
2. Photo cell:

Photo cells convert solar energy into useful current electricity. Photo cells absorb the incident solar energy and convert them into current electricity. The electricity is used for lighting the bulbs, to operate T.V and computers.

3. Dynamo and generators:

Electric generators can produce a large amount of current electricity. Turbine, a component in the generator is rotated at high speed by some external means. The turbine is rotated by the impact of a current of water, or air, vapour, etc. upon the blades of a wheel. The wheel then rotates the shaft of the generator, which produces current electricity. In Nepal, water from a certain

high level is let fall on the turbine fans. The stored energy in the high speed running water is used to rotate the turbine and then the shaft, It spins the generator which finally produces electricity. Since the river sources originate from the high mountains, at high levels, its huge stored hydroenergy rotates the turbine wheel and shaft, by which we get electricity. In another example a small dynamo fitted in a bi-cycle near its wheel rim can produce electricity of small magnitude. When the dynamo head is made to press against the rotating wheel, the small shaft inside it rotates and electricity is produced.

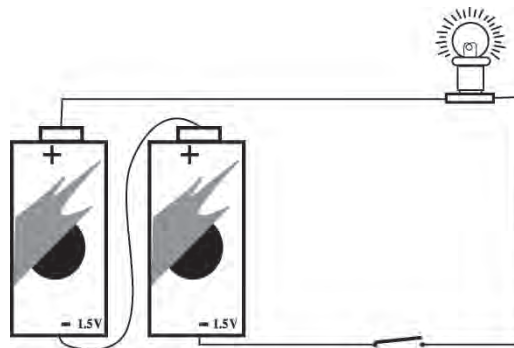


Dynamo used in bicycle.

Electric circuit:

Activity 1

Take two dry cells, two pieces of connecting wires of about 30cm each, a small (3V) electric bulb and a key. Connect the cell circuit as shown in the diagram.



When the switch is in "ON"

position, the bulb glow. The bulb goes off when the key disconnects the circuit. This is known as the "open" circuit condition. Current flows when the circuit is closed and it stops when it is open. Here the bulb is called as the electric load. Similarly, any other electric equipments which are connected in the closed circuit are the electric loads. To get the current flow the circuit should be closed. The current flows along the path through the connecting wires. The current strength which we get from the supply of electricity board, is far bigger than

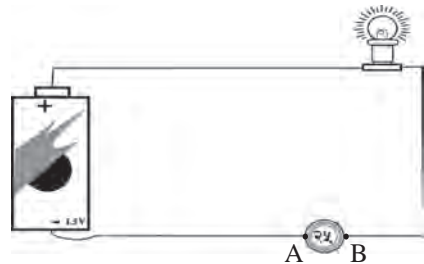
that obtained from the cells. In such a case the cable wires which are used for different domestic purposes should be well insulated and of good quality. By any cause if the wire insulation weakens. It may turn to be a danger zone. If we happen to touch the bare wire, we might get electric shock, which might often turn to be fatal or sometimes cause house fire.

Conductor:

The connecting wires which conduct electricity through them are called the good conductors of electricity. Metals are generally good conductors. Metals like copper, silver, gold, brass, etc are good conductors. For our domestic use a good cable has copper wires in it.

Activity 2:

Collect different materials as, wooden pieces, rubber, hard plastic, pebbles, metallic coin, pin, eraser, pencil lead, etc. complete an electric circuit as shown in the fig.



Try to the circuit using these materials to be the connecting key in turn. When the coin is used as the key in the circuit, the bulb will glow. It shows that the coin is a good conductor of electricity. Now put other materials in turn, as the key and check whether the bulb will glow and or not. Enter the result in the following table.

Material	The bulb glows	The bulb does not glow	It is a good conductor	It is a semi conductor	It is an insulator
Coin	✓		✓		
.....					
.....					
Pencil lead	glows freely when the supply voltage is good enough			✓	

Insulator:

The experimental observations show that, rubber, pebble, eraser, plastic, etc are insulators of electricity, because current electricity cannot conduct through them. We find that the cable wires are covered with insulators like rubber, plastic, etc which are insulators of electricity. A properly insulated cable can be touched without any electric shock or danger even if electricity is flowing continuously within them.

Semi-conductors:

Semi-conductors are neither very good conductor nor very bad insulator. Silicon and germanium are the two best known semi-conductors. Their conductivity changes on the physical conditions, as their temperature and on the added impurities on them. Pencil lead also works as a semi conductor.

Experimental work:

Make an electric circuit as done in the activity 2. Collect different pieces of materials. Use these materials in turn as the connecting key of the circuit. Then record their conducting property.

Project work:

1. Collect some fruits as, lemon, orange, or apple. Insert two conducting materials like razor blades, thick copper wires, or copper plates etc at two regions on it. Then put a compass just beneath the connecting wire. See what will happen to the compass needle, will it deflect?
2. Put some cow dung in a small plastic bucket. Add some water till it form thin paste. Dip two different metal plates like a copper plate and a zinc plate. Connect the plates with a copper wire. Now use a small compass kept beneath the wire to check whether there is current in the circuit or not. The deflection in the compass needle shows that there is current electricity in the connecting wire.

Summary:

1. Current electricity is one of the essential energy to run our daily life smoothly.
2. Some primary sources of electricity are simple cells, photo cells, and electric generators.
3. The closed path of the electric circuit contains wires, switches, etc in it.
4. The materials which electricity can easily conduct through are termed as good conductors of electricity.
5. The materials which electricity cannot easily conduct through are termed as bad conductor of electricity.
6. Semi-conductors show the property which lie between a conductor and an insulator. At very low temperature they behave as an insulator but at moderately high temperature they show some conducting nature.

Exercise

1. Fill up the gap:

- (a) A dry cell converts the into electric energy.
- (b) Equipments which can generate current electricity are said to be the
- (c) Electricity which is generated with the help of high speed running water is termed as
- (d) Substances in which electricity can conduct are known as of electricity.
- (e) may feebly conduct electricity through them at room temperature.
- (f) To use electricity we need to make a

2. Tick the correct option:

- (a) The electric equipment which converts solar energy into electrical energy is,
 - (i) simple cell
 - (ii) photo cell
 - (iii) a dynamo
 - (iv) a generator

- (b) Which electric equipment cannot produce electricity for longer time?
 (i) a simple cell (ii) a dry cell
 (iii) photo cell
- (c) Which electric equipment do you need to get electricity from a high speed running water
- (i) simple cell (ii) dry cell
 (iii) dynamo (iv) generator
- (d) Which one is the good conductor of electricity?
 (i) pebble (ii) pencil lead
 (iii) copper (iv) rubber
- (e) Which one is the insulator of electricity?
 (i) brass (ii) iron
 (iii) silver (iv) hard plastic
- (f) Material which conducts electricity freely at room temperature are,
- (i) good conductors (ii) Semi-conductors
 (iii) bad conductors (iv) insulators

3. Answer the following questions.

- (i) What is a photo cell?
- (ii) What is hydro-electricity? Describe in short about the electricity production by it..
- (iii) Draw a circuit diagram which contains, a cell, connecting wire, switch (key) and a small electric bulb. Write the names of different components used in the diagram.
- (iv) What is an electric circuit? Write the importance of the circuit.
- (v) Why is the copper wire well covered by the insulating plastic material?
- (vi) What are insulators of electricity ? Write any two example of it.

There are different kinds of objects around us. Water, air, stone, table, are some examples of these objects. Every object differs with respect to its colour, odour, size and other properties. But some attributes are common. Can you tell some common properties of above mentioned objects? Water, air, stone, table and book have their own mass. Similarly they all have their own volume. The object which has its own mass and volume is called matter. Each matter is composed from small particles known as molecule. Light, sound, shadow, etc has no mass and volume. So, these are not considered as a matter.

Physical properties of matter

A matter has a definite mass, volume, colour, odour, and taste. These are the properties of a matter. Here, we are going to discuss about the mass and volume of matter.

A. Matter has definite mass

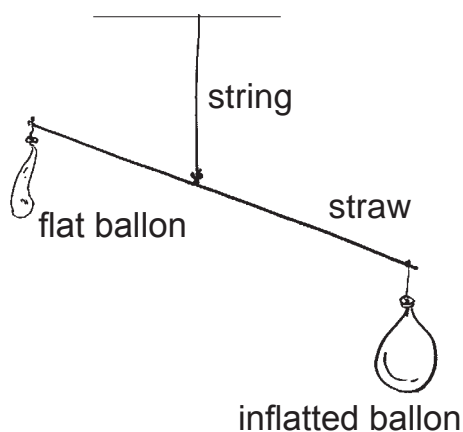
Activity 1.

Expand your hand and ask your friend to keep a brick on one hand and a piece of wood on the other hand having equal size. Which one do you feel heavier? Brick is heavier than the piece of wood because brick contains more mass than the wood however both are equal in size. Thus each matter has a definite mass. Similarly take two equal size of glasses. Fill one glass with full of water and other one fill with half of water. Hold the glasses and feel which one is heavier and why?



Activity 2.

Take two identical size of balloons. In flat one of them blowing air in it. Now hang them at two ends of a straw. The straw is tied with a string at middle and hanged. Observe which balloon goes down. Balloon filled with air goes down as it is heavier than the empty balloon. It proves that air (matter) has also mass. All of these above activities show that air, brick, wood and water have their own mass. Total quantity of matter contained in an object is called mass of that object.



Matter has certain mass

B. Matter has volume.

Take a glass fill with water in it. Take one piece of stone. Put it into the glass. Now observe you will find that the water overflows outside from the bottle. The space occupied by the stone inside the glass is called the volume of that stone. Thus the occupied space of any matter is called volume.



Space occupied by the stone

States of matter

There are 3 states of matter. They are; solid, liquid and gas. In room temperature wax exists in solid, water exists in liquid and oxygen exist in gaseous state.

Solid:

Every solid matter has its certain shape and volume. Usually these are hard in touch. For example: stone, marble, glass, brick, etc.

Liquid:

Liquid matter has certain volume but no definite shape. It takes as the shape of the container in which it is kept. They flow down. For example: Water, petrol, kerosene, alcohol, etc are some examples of liquid.

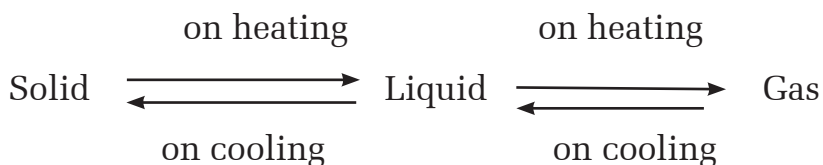
Gas:

Gaseous matter does not have a fixed volume and shape. Volume and shape of gaseous matter depends upon the container in which it is kept. For example: air, oxygen, nitrogen, carbon dioxide, hydrogen, methane etc.

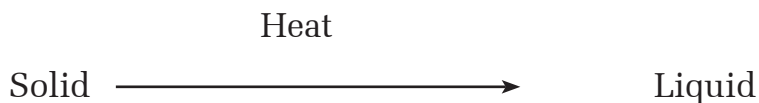
Change of states of matter.

In room temperature, matter exist in three states. By heating or cooling states of matter can be changed.

By heating, solid substances can be changed in to liquid and liquid can be changed in to gas. When solid substance is heated it's molecules become mobile. With the increment in temperature the space between the molecules increases due to solid substances changed into liquid. In similar manner, when liquid substance is heated, it's molecule becomes separated and thus change into gas. Also, when gaseous matter are cooled its molecules come closer to each other and hence it changes into liquid. Similarly, when a liquid substances is cooled their molecules are attached with each other and hence it change into solid substances.



On heating, solid changes into liquid. Gold or silver can be melted on heating and jewellery of different designs and shape can be made. On heating, ice melts into water. The process of conversion of solid into liquid on heating, is known as melting. And, the temperature at which a substances melt is known their melting point. For example ice melts at 0°C and becomes water, so melting point of ice is 0°C. Different substances have different melting points.



Similarly, on heating substance in liquid state changes to gaseous state. For example when water is heated, it changed into vapour. The process of conversion of liquid into gas, on heating, is known as evaporation. In normal pressure (sea level) water boils at 100°C.



Some substances like camphor, iodine, ammonium chloride and phenol (naphthalene) are directly change into gas by heating. This process of changing solid into gas by heating and changing gas into solid by cooling is known as sublimation. Due to sublimation, smell of above mentioned substances spread.



On cooling, gaseous substances change into liquid forms. For example water vapor changes into water on cooling. The process of conversion of gaseous substances into liquid by cooling is known as condensation.

Similarly, on cooling liquid changes into solid. For example, on cooling, water changes into ice. The process of conversion of liquid substance into solid, on cooling, is known as freezing.



Element, compound and mixture

There are many substances around us. Some of them are pure while some are impure. Pure substances are made up of same kind of molecules. For example- copper, water, etc. Elements and compounds are also pure substances. Impure substances are made up of different kinds of molecules. Mixture is an impure substance. Compounds and mixture can be broken down into its components. Water is an example

of compound. Through chemical process, it can be broken down into hydrogen and oxygen. Similarly, muddy water is an example of mixture. With help of filtration mud and water can be separated. Elements cannot be further changed into other substance. For example iron is an element, it cannot be changed or broken down into other substances through chemical process.

Element

Various materials used in our daily life are made up of different substances. For example utensils used in kitchen are usually made up of iron or aluminum. Jewellery is made up of gold and silver. Substances like iron, aluminum, gold, silver, etc are made up of same kind of molecules. They cannot be broken down into new elements. These substances are known as elements. Total number of elements known at present is 118. Among them, 92 elements are natural and remaining are synthesized in laboratory. Hydrogen, oxygen, iron, copper, gold, silver, etc are natural element. While Californium, Einsteinium, etc are artificial elements. In normal temperature, elements exist in all three forms i.e solid, liquid and gas. Gold, silver, iron, etc, exist in solid state. Mercury, bromine, etc exist in liquid state. Hydrogen, oxygen, nitrogen, etc exist in gaseous state.

Compound

We usually use sugar, water, salt, etc in our food items. These substances are made up of more than one element. The ratio of combination of these elements is fixed and such substances are called compound. Some other examples of compound are carbon dioxide, soap, etc.

Hydrogen + Oxygen \longrightarrow Water

Sodium + Chlorine \longrightarrow Sodium chloride (salt)

Carbon + Oxygen \longrightarrow Carbon dioxide

Mixture

Various materials around us are made up two or more substances. Example: air, muddy water, etc. Air is made up of nitrogen, oxygen, carbon dioxide and dirt. Muddy water is made up of water, soil and

various other substances. Tea, we drink, contains water, milk, sugar and tea leaves. Two or more than two substances when brought together do not undergo chemical change and they lie together. Their properties are also not lost. Such combination of substances is called mixture. There are two kinds of mixture. They are among homogeneous mixture and heterogeneous mixture.

Example:

Water + Sand \longrightarrow Muddy water (Heterogeneous mixture)

Water + Sugar \longrightarrow Sweet water (Homogeneous mixture)

Water + Salt \longrightarrow Salty water (Homogeneous mixture)

Experimental activity:

1. Stone, water and air have certain mass and volume. Prove this statement experimentally .
2. Matter has three states. Prove it experimentally.
3. Show the the process of changing solid into gas state directly by an experiment.

Summary

1. The substances found in our surrounding are matter.
2. Matter has volume and mass.
3. Quantity of matter contained in an object is called the mass of that object.
4. The space occupied by a matter is called volume of that matter.
5. Matter exists in three states: solid, liquid, and gas.
6. Solid substances have fixed shape and volume.
7. Liquid substances have fixed volume but they do not have fixed shape and size.
8. Gases have no fixed shape and volume but they have fixed mass and weight.

9. With the change in temperature, state of matter also changes.
10. An element is a distinct kind of matter which can not be broken down into simpler substances.
11. Compound is formed by the combination of two or more elements in fixed proportion. They are formed due to chemical reaction.
12. Mixture is formed on mixing two or more substances in any proportion.

Exercise

1. Fill in the blanks:

- (a) Matter has and.....
- (b) Matter occupies
- (c) Liquids have fixed volume but they do not have fixed
- (d) With change in temperature changes.

2. Choose the right answer.

- (a) In normal temperature which of the followings exist in gaseous state?
 - (i) Iron
 - (ii) Oxygen
 - (iii) Gold
 - (iv) Mercury
- (b) In normal temperature and pressure which of the following exist in liquid state?
 - (i) Silver
 - (ii) Iron
 - (iii) Bromine
 - (iv) Gold
- (c) At sea level, what is the melting point of ice?
 - (i) 0°C
 - (ii) 100°C
 - (iii) 200°C
 - (iv) 50°C

- (d) At sea level, what is the boiling point of water?
(i) 0°C (ii) 100°C
(iii) 400°C (iv) 200°C
- (e) What is air?
(i) Element (ii) Mixture
(iii) Compound (iv) None of above
- (f) What is the process of changing liquid into gas called?
(i) Evaporation (ii) Sublimation
(iii) Freezing (iv) Melting

3. Answer the following question:

- (a) What is matter? Write any two properties of matter?
(b) What are the states of matter? Give example of each.
(c) Why does ice change into water on heating?
(d) List any four elements used in our daily life?
(e) Why does liquid change into gas on heating?

4. Define briefly:

- | | | |
|-----------------|-----------------|--------------|
| (a) Element | (b) Mixture | (c) Compound |
| (d) evaporation | (e) Sublimation | (f) Melting |

5. Differentiate between:

- (a) Solid matter and liquid
(b) Element and compound
(c) Compound and mixture
(d) Evaporation and sublimation

There are different kinds of objects around us. Water, air, stone, table, are some examples of these objects. Every object differs with respect to its colour, odour, size and other properties. But some attributes are common. Can you tell some common properties of above mentioned objects? Water, air, stone, table and book have their own mass. Similarly they all have their own volume. The object which has its own mass and volume is called matter. Each matter is composed from small particles known as molecule. Light, sound, shadow, etc has no mass and volume. So, these are not considered as a matter.

Physical properties of matter

A matter has a definite mass, volume, colour, odour, and taste. These are the properties of a matter. Here, we are going to discuss about the mass and volume of matter.

A. Matter has definite mass

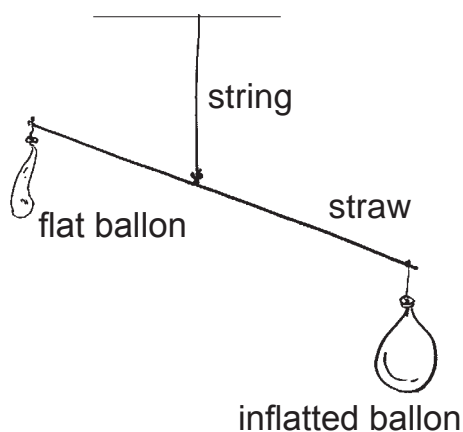
Activity 1.

Expand your hand and ask your friend to keep a brick on one hand and a piece of wood on the other hand having equal size. Which one do you feel heavier? Brick is heavier than the piece of wood because brick contains more mass than the wood however both are equal in size. Thus each matter has a definite mass. Similarly take two equal size of glasses. Fill one glass with full of water and other one fill with half of water. Hold the glasses and feel which one is heavier and why?



Activity 2.

Take two identical size of balloons. In flat one of them blowing air in it. Now hang them at two ends of a straw. The straw is tied with a string at middle and hanged. Observe which balloon goes down. Balloon filled with air goes down as it is heavier than the empty balloon. It proves that air (matter) has also mass. All of these above activities show that air, brick, wood and water have their own mass. Total quantity of matter contained in an object is called mass of that object.



Matter has certain mass

B. Matter has volume.

Take a glass fill with water in it. Take one piece of stone. Put it into the glass. Now observe you will find that the water overflows outside from the bottle. The space occupied by the stone inside the glass is called the volume of that stone. Thus the occupied space of any matter is called volume.



Space occupied by the stone

States of matter

There are 3 states of matter. They are; solid, liquid and gas. In room temperature wax exists in solid, water exists in liquid and oxygen exist in gaseous state.

Solid:

Every solid matter has its certain shape and volume. Usually these are hard in touch. For example: stone, marble, glass, brick, etc.

Liquid:

Liquid matter has certain volume but no definite shape. It takes as the shape of the container in which it is kept. They flow down. For example: Water, petrol, kerosene, alcohol, etc are some examples of liquid.

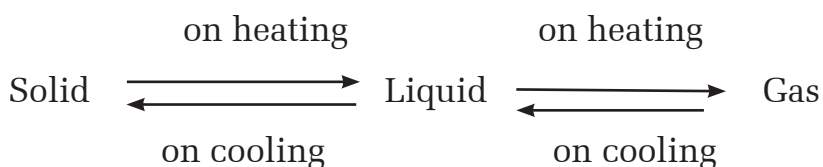
Gas:

Gaseous matter does not have a fixed volume and shape. Volume and shape of gaseous matter depends upon the container in which it is kept. For example: air, oxygen, nitrogen, carbon dioxide, hydrogen, methane etc.

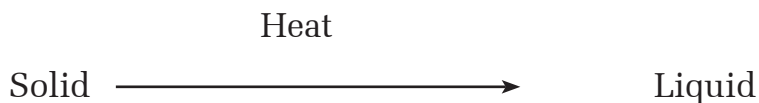
Change of states of matter.

In room temperature, matter exist in three states. By heating or cooling states of matter can be changed.

By heating, solid substances can be changed in to liquid and liquid can be changed in to gas. When solid substance is heated it's molecules become mobile. With the increment in temperature the space between the molecules increases due to solid substances changed into liquid. In similar manner, when liquid substance is heated, it's molecule becomes separated and thus change into gas. Also, when gaseous matter are cooled its molecules come closer to each other and hence it changes into liquid. Similarly, when a liquid substances is cooled their molecules are attached with each other and hence it change into solid substances.



On heating, solid changes into liquid. Gold or silver can be melted on heating and jewellery of different designs and shape can be made. On heating, ice melts into water. The process of conversion of solid into liquid on heating, is known as melting. And, the temperature at which a substances melt is known their melting point. For example ice melts at 0°C and becomes water, so melting point of ice is 0°C. Different substances have different melting points.



Similarly, on heating substance in liquid state changes to gaseous state. For example when water is heated, it changed into vapour. The process of conversion of liquid into gas, on heating, is known as evaporation. In normal pressure (sea level) water boils at 100°C.



Some substances like camphor, iodine, ammonium chloride and phenol (naphthalene) are directly change into gas by heating. This process of changing solid into gas by heating and changing gas into solid by cooling is known as sublimation. Due to sublimation, smell of above mentioned substances spread.



On cooling, gaseous substances change into liquid forms. For example water vapor changes into water on cooling. The process of conversion of gaseous substances into liquid by cooling is known as condensation.

Similarly, on cooling liquid changes into solid. For example, on cooling, water changes into ice. The process of conversion of liquid substance into solid, on cooling, is known as freezing.



Element, compound and mixture

There are many substances around us. Some of them are pure while some are impure. Pure substances are made up of same kind of molecules. For example- copper, water, etc. Elements and compounds are also pure substances. Impure substances are made up of different kinds of molecules. Mixture is an impure substance. Compounds and mixture can be broken down into its components. Water is an example

of compound. Through chemical process, it can be broken down into hydrogen and oxygen. Similarly, muddy water is an example of mixture. With help of filtration mud and water can be separated. Elements cannot be further changed into other substance. For example iron is an element, it cannot be changed or broken down into other substances through chemical process.

Element

Various materials used in our daily life are made up of different substances. For example utensils used in kitchen are usually made up of iron or aluminum. Jewellery is made up of gold and silver. Substances like iron, aluminum, gold, silver, etc are made up of same kind of molecules. They cannot be broken down into new elements. These substances are known as elements. Total number of elements known at present is 118. Among them, 92 elements are natural and remaining are synthesized in laboratory. Hydrogen, oxygen, iron, copper, gold, silver, etc are natural element. While Californium, Einsteinium, etc are artificial elements. In normal temperature, elements exist in all three forms i.e solid, liquid and gas. Gold, silver, iron, etc, exist in solid state. Mercury, bromine, etc exist in liquid state. Hydrogen, oxygen, nitrogen, etc exist in gaseous state.

Compound

We usually use sugar, water, salt, etc in our food items. These substances are made up of more than one element. The ratio of combination of these elements is fixed and such substances are called compound. Some other examples of compound are carbon dioxide, soap, etc.

Hydrogen + Oxygen \longrightarrow Water

Sodium + Chlorine \longrightarrow Sodium chloride (salt)

Carbon + Oxygen \longrightarrow Carbon dioxide

Mixture

Various materials around us are made up two or more substances. Example: air, muddy water, etc. Air is made up of nitrogen, oxygen, carbon dioxide and dirt. Muddy water is made up of water, soil and

various other substances. Tea, we drink, contains water, milk, sugar and tea leaves. Two or more than two substances when brought together do not undergo chemical change and they lie together. Their properties are also not lost. Such combination of substances is called mixture. There are two kinds of mixture. They are among homogeneous mixture and heterogeneous mixture.

Example:

Water + Sand \longrightarrow Muddy water (Heterogeneous mixture)

Water + Sugar \longrightarrow Sweet water (Homogeneous mixture)

Water + Salt \longrightarrow Salty water (Homogeneous mixture)

Experimental activity:

1. Stone, water and air have certain mass and volume. Prove this statement experimentally .
2. Matter has three states. Prove it experimentally.
3. Show the the process of changing solid into gas state directly by an experiment.

Summary

1. The substances found in our surrounding are matter.
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Exercise

1. Fill in the blanks:

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2. Choose the right answer.

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- (d) At sea level, what is the boiling point of water?
- | | |
|-------------|------------|
| (i) 0°C | (ii) 100°C |
| (iii) 400°C | (iv) 200°C |
- (e) What is air?
- | | |
|----------------|--------------------|
| (i) Element | (ii) Mixture |
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- | | |
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| (i) Evaporation | (ii) Sublimation |
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3. Answer the following question:

- (a) What is matter? Write any two properties of matter?
- (b) What are the states of matter? Give example of each.
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- (d) List any four elements used in our daily life?
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- | | | |
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| (a) Element | (b) Mixture | (c) Compound |
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5. Differentiate between:

- (a) Solid matter and liquid
- (b) Element and compound
- (c) Compound and mixture
- (d) Evaporation and sublimation

We use various kinds of substances in our daily life. For example- rice, tea, milk, etc. Tea, we drink, consist of milk, tea leaves, sugar, water, etc. Rice we eat may be mixed with stone, husk and unwanted seeds. Similarly, air consist of oxygen, carbon dioxide, nitrogen and other gases. In this way, the combination of two or more substances is known as mixture. The constituents of mixture are known as its components. Air is a mixture. It is made up of nitrogen, oxygen, carbondioxide, and other gases. Therefore, nitrogen, oxygen, carbondioxide and other gases are components of air. The properties of components of mixture are not lost and they are not mixed in any fixed proportion. Components of mixture can be easily separated with various physical methods.

Types of mixture:

We use different kinds of mixture in our daily life. For example- during summer we drink fruit juice, cold drinks, etc. These substances are made up of different components. In same way, in tea we mix tea leaves, water, milk and sugar. During rainy season river water becomes muddy and we can easily distinguish water, sand, soil, etc. Also, while eating rice sometimes we find stones, piece of bricks, etc. These are the examples of mixture. On the basis of components of mixture they can be divided into two types. They are

- a) Homogeneous mixture
- b) Heterogeneous mixture

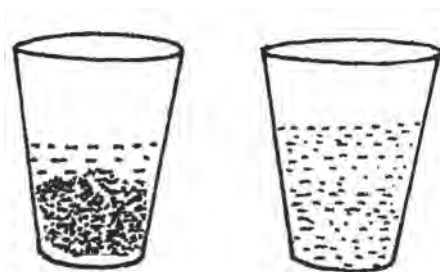
Activity 1.

Take two glasses of the same size and put half glass water in each of them as shown in figure. In one glass put a teaspoon full of salt or sugar. While in another glass put a teaspoon full of sand or soil. Stir the content in each of the glass. Now ask your friend to observe the particles in the glasses. After keeping the glasses still for about 2 minutes now ask again to the friend for the observation. What change is seen ? Salt or sugar dissolves in water . While sand and soil do

not dissolve in water and hence precipitate on the bottom of glass.

In this way, if the constituents of mixture are mixed homogeneously, it is called the homogeneous mixture. For example mixture of salt and water is a homogeneous mixture.

On the contrary, if the constituents of a mixture are not mixed homogeneously, then it is called heterogeneous mixture.



Sand and water

Sugar and water

For example mixture of sand and water is a heterogeneous mixture.

Methods of separating mixture.

We know, when two or more than two substances are mixed together and they do not undergo chemical change. They form mixture.

The process of separating various components of a mixture is known as separation of mixtures. This process is done when any component of a mixture is unwanted or in order to obtain useful component from the mixture. The components of mixture can be separated after studying their properties. There are different methods of separation. Among them we are going to study about sedimentation, filtration, winnowing, sieving and magnetic separation.

Sedimentation and decantation

This method is applied to separate a mixture of solid and liquid, or other heavier liquid matter. For example- separation of water and soil or sand from muddy water.

Activity 2

Take one glass or beaker. Pour water in it. Put soil or sand inside it and stir it with a glass rod. Soil or sand does not dissolve in water. Keep the mixture still and see what happens. The insoluble solid particles go down and settle at the bottom of the container. This is called sedimentation. Now tilt the beaker gently and pour the clear water into another beaker. This is known as decantation. In this way, water and soil or sand particles are separated.

Filtration

With help of filtration, mixture of insoluble solid particles can be separated from the liquid. While making tea we use clean clothes or wire net to separate tea leaves from tea. This process is known as filtration. We can also separate water and sand by this method.

Activity 3

Take a beaker. Pour water in it and put some sand or soil inside it. Take a thin piece of cloth or wire net. Put that thin piece of cloth or wire net on another beaker. Now pour the mixture of water and sand on it slowly. In this way, clear water is collected in beaker and sand or soil particles remain on the cloth.

Similarly, in laboratory we can use filter paper to separate the components of heterogeneous mixture. The filter paper is in a circular form of small sizes. Filter paper is folded into the shape of cone. With the help of filter paper water and soil can be separated from muddy water. In this way, the process of separating solid particles from liquid by passing the mixture through fine holes is known as filtration. The solid particle which cannot be passed through from the holes and thus remains on filter paper is known as residue. The clear liquid which can pass through the holes is known as filtrate. Here, water is filtrate and soil is residue.

Winnowing

With the help of winnowing, the mixture of heavier and lighter solid particles can be separated. We have seen the separating of rice from husked rice in our village. In this method, a farmer drops the



Filtration of tea



Filtration by using filter paper



winnowing rice

rice from the height with the help of winnowing tray. Rice grains are heavier than husk so, air flow the husk farther than the rice grains. In this way they are separated from each other. Thus, the method of separating the lighter solid particles and heavier solid particles with the help of air is called winnowing.

Sieving

Different size of solid mixture can be separated from sieving method. You may have seen people separating the unwanted solid particles from the flour using sieve. This method is called sieving.



sieving flour

Activity 4

Take a sieve. Put some flour on it. Now, slowly move the sieve from side to side. You will observe that the flour will fall down on the plate beneath the sieve while the wheat bran remain on the sieve.

The way of separating the solid substances from the flour by using a sieve is known as sieving method. During the construction of the house the separating of sand and stones is done by using this method.

Magnetic separation

By using a magnet, we can separate different magnetic substances from any mixture. We use magnet in this process. In this method, we put the mixture on top of the paper or a card board and move the magnet around it. The magnetic substances get attracted to the magnet and magnetic substances can be separated from non-magnetic substance. By this method, we can separate magnetic substances from a *mixture*.

Activity 5

Take iron fillings and sand. Mix them together. Now, put the mixture on top of a paper. Take one magnet and move it around the mixture. What do you think will happen? Discuss it and write.



Mixture of sand and iron fillings

The iron fillings in the sand will get attracted to the magnet. By this way, we can separate magnetic substances from the mixture through the help of a magnet. This method is known as magnetic separation.

Experimental activity

1. With the help of activity one, separate homogenous and heterogeneous mixture.
2. By studying activity two, perform the experimental activities of separating method of the mixture of sand and water.
3. By studying activity three, perform the laboratory activity of separating the mixture of sand from water by using filter paper.
4. By studying activity five, perform the laboratory activity separating sand and iron fillings from the mixture.

Summary

1. The substance made by mixing two or more than two different things is known as mixture.
2. Mixture is classified into two types on the basis of things contained in the mixture.
3. If the components of mixture are mixed homogeneously, than it is called homogeneous mixture.
4. If the components of mixture are not mixed homogeneously, than it is called heterogeneous mixture.
5. The separation of mixture is done for obtaining useful and pure substance by removing unnecessary and harmful substance from the mixture.

6. The method of removing the components of mixture from each other is called the separation of mixture.
7. The collection of insoluble particles mixed in water on the bottom of container is called sedimentation.
8. The separation of insoluble particles from the liquid by using filtering materials is called filtration method.
9. The method of separation of heavier and lighter substances by the help of air is called winnowing.

Exercise

1. Fill in the blanks.

- (a) The substance made by two or more than two things is called
- (b) The mixture of salt and water is mixture.
- (c) Muddy water of a river is mixture.
- (d) The mixture of water and soil can be separated by method.

2. Select the best answer from the given alternatives:

- (a) Which of the following method is used to separate the mixture of sand and water?
 - (i) Filtration method (ii) Magnetic method
 - (ii) Winnowing method (iv) Sieving method
- (b) Which of the method is used to separate sand and iron fillings?
 - (i) Decantation method (ii) Magnetic method
 - (ii) Filtration method (iv) Sieving method
- (c) Which of the following mixture is homogenous mixture?
 - (i) Sugar and Sand (ii) Sugar and Water
 - (ii) Sugar and Iron fillings (iv) Sugar and Salt

(d) What is the separation process of unhusked rice from husked rice called?

- (i) Sedimentation
- (ii) Filtration
- (iii) Sieving
- (iv) Winnowing

3. Answer the following questions?

- (a) What is mixture? How many types of mixtures are there?
- (b) Write the name of methods of separation of insoluble particles from liquid?
- (c) Write any three reasons to separate the mixtures.

4. Give the definition of the following words:

- (a) Sedimentation
- (b) Filtration
- (c) Winnowing
- (d) Sieving
- (e) Filtrate
- (f) Residue

5. Which of the following substances can be mixed together to form homogeneous and heterogeneous mixture?

- (a) Water
- (b) Kerosene
- (c) Oil
- (d) Sand
- (e) Salt
- (f) Sugar

6. From which method can the following mixtures be separated?

Mixture	Method
Water + Sand
rice + Husk
Sand + Iron fillings
Wheat flour + Wheat bran

7. Write the differences

- (a) Homogeneous mixture and Heterogeneous mixture
- (b) Pure and Impure substance
- (c) Winnowing and Sieving
- (d) sedimentation and decantation

We use different things made up of various chemicals in our daily life. We use soap to wash our face and hand while use paste to brush our teeth. Paste and soap are some examples of the things made up of chemicals. We use salt, turmeric powder etc. while cooking our food. For the manufacture of bread and biscuit, edible soda and yeast are used. The main sources of these chemicals is the nature. In this chapter we study about some useful chemicals.

Activity 1

What chemicals do you use while you cook your food in the kitchen? Write their names and also their uses. Make a list.

Chemicals	How it is used?
Venegar	Making pickle
.....

(a) Baking soda

Edible baking soda is mainly used in the bakery industry. Its chemical name is sodium bicarbonate. It helps to swell out bread, cake and biscuits as well as make the food soft. It also helps to make soft baverage.

Activity 2

Take a little amount of baking soda. Mix it with flour and water. Now put it in a container and heat it up. What difference do you see in the mixture? Discuss and write.

(b) CHOOK (Thick lemon juice)

CHOOK is the liquid present in lemon, lime etc. It is sour in taste. Citric acid is present in it. It is the main sources of vitamin 'C'. it is prepared by heating up the juice present in the sour fruits. It is used to make different types of pickle. It also helps to preserve the pickle.

(c) Sugar

Chemical name of sugar is sucrose. It is prepared from the liquid of sugarcane and sweet potato. Different fruits like bananas, mangoes etc also contain some sugar. Sugar is in the form of a white crystal. It is sweet in taste. It is easily soluble in water. Sugar is also found in our body in the form of glucose. It also helps to preserve food.

(d) Ghee

It is made from the milk. The fatty substance found in the milk is called ghee. It remains in solid form in the room temperature. Its chemical name is triglyceride. Nowadays, the ghee is also manufactured from the vegetable oil with the help of different chemical processes. It is known as vegetable ghee. It gives energy to the body. Fat is necessary for our body. Different vitamins like A, D, E. and K cannot be absorbed without the help of oiliness. That is why, fat is necessary for our body but too much fat can increase the amount of animal fat in the body.

Activity 3

Take a little amount of CHOOK. Put a drop of it on your tongue. What does it taste like? Discuss it.

(e) Common salt

Edible salt is the most essential thing in our daily life. Its chemical name is sodium chloride. It also contains a little amount of magnesium chloride. Nowadays iodine is also found in edible salt. Iodine helps to make a child active and decreases the chance of occurring goitre. It is manufactured from the ocean water. It is salty in taste. It is used to make the food tasty. It also helps to preserve the fish, meat and pickle.

Activity 4

Take a little amount of edible salt. Put it on your tongue and tell your friends how it tastes like.

Experimental activities

Study the activity 2 and prepare a bread using the baking soda.

Summary

1. We use different types of chemicals in our daily life.
2. Chemicals have different properties and tastes.
3. Chemicals have different uses.
4. Baking soda is used in bakeries.
5. Ghee helps to give energy to our body.
6. CHOOK is used to make pickle.
7. Sugar is used to preserve different kinds of food.
8. Edible salt is used for the taste of a food.

Exercise

1. Fill in the blanks

- (a) Ghee gives to your body.
- (b) CHOOK is in taste.
- (c) Sugar helps to preserve different
- (d) The chemical name of edible salt is

2. Choose the correct answer.

- (a) What is the chemical name of baking soda?
 - (i) Sodium carbonate
 - (ii) Sodium bicarbonate
 - (iii) Sodium sulphate
 - (iv) Sodium chloride

- (b) Which acid is found in CHOOK?
- (i) Carbonic acid (ii) Acidic acid
(iii) Citric acid (iv) Hydrochloric acid
- (c) What does CHOOK taste like?
- (i) Sour (ii) Salty
(iii) Bitter (iv) Tasteless
- (d) What is the edible salt prepared from?
- (i) Ocean water (ii) River water
(iii) Pond water (iv) Well water

3. Answer the following.

- (a) Write the names of 5 different chemicals used in our daily life.
- (b) Write any two uses of baking soda.
- (c) What does CHOOK taste like? Why is it used to prepare food?
- (d) What does edible salt taste like? Write any 2 uses of it.

4. Differentiate between:

- (a) Edible salt and edible soda.

The earth is surrounded with air. The layers of air is known as atmosphere. Air is essential for every living being on the earth. We cannot live without air. Our surrounding is covered with air. We cannot see air. We cannot smell it. It occupies space. It also has weight. It is found everywhere on earth. Every empty object is full of air.

Composition of air

Air is the composition of different gasses. Air used to be known as an element. In 1775 AD, a scientist from France, named Lavoisier proved that the air is the combination of mixture of different gases. Nitrogen is found more than the other gases. It occupies almost 4/5 part of the air.

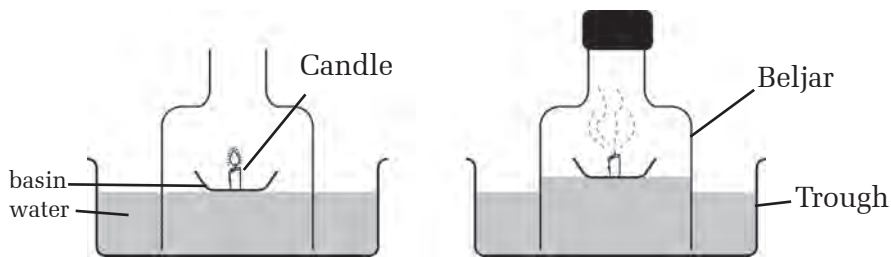
Air contains nitrogen, oxygen, carbondioxide and other gases and as well as water vapour. It also contains dust. The composition of air is almost same in most of the parts of atmosphere. But the water vapour and the dust in the atmosphere depends upon the place and the surrounding.

The formation of the air according to the volume is listed below:

Gas	Volume
Nitrogen	78%
Oxygen	21%
Carbondioxide	0.03%
Inert gas	0.95%
Water vapour	depends on the surroundings
Other gases	0.02%

Oxygen is found in air.**Activity 1**

Put a candle on the top of a small container. Then, put it in another container with full of water. Then cover it up with bell jar. Mark the

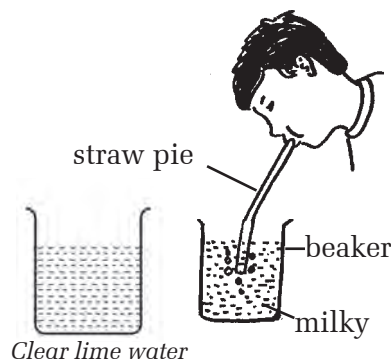


level of the water in the bell jar. Light the candle and cover the mouth of the bell jar. First, the candle lights up. After some times, the candle goes off, at that moment the gas inside the bell jar cools down. Then, the water slowly rises up. The oxygen present in the air is used by the candle. That is why, the volume of the air decreases, so the level of water increases. The level of the water is increased up to $\frac{1}{5}$ th of the marked point.

Air has carbon dioxide

Activity 2

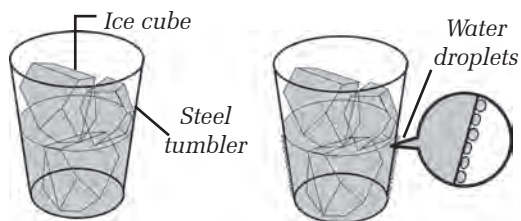
Take a glass tumbler. Put some lime water in it. Now put one end of the delivery tube inside the lime water and blow at the other end from your mouth. After sometimes the lime water turns into milky. So, the gas coming out of our body is carbon dioxide. It turns the lime water into milky. The gas we throw out of our body gets mixed with air. Thus, it proves that carbon dioxide is present in the air.



Activity 3

Water vapour is present in the air.

Pour some water in a steel tumbler. Put two or three ice



cubes in the water. What do you think will happen after sometime? You will see water droplets on the outer surface of the glass. These droplets are formed due to the condensation of the water vapour in the air. During winter, we can see water droplets on the surface of the glass of our window. This is also due to the condensation of the water vapour. During the morning time, we can see dew on the top of the leaves or grasses. This is also due to the condensation of water vapour.

Properties of air.

1. Air is the combination of different gases.
2. Air has weight.
3. Air occupies spaces.
4. Air is colorless, tasteless, and odourless.
5. The oxygen present in the air causes the rusting.
6. Due to the presence of oxygen, things can burn in air.
7. Air can move from one place to another.
8. Air can be compressed.

Air has weight

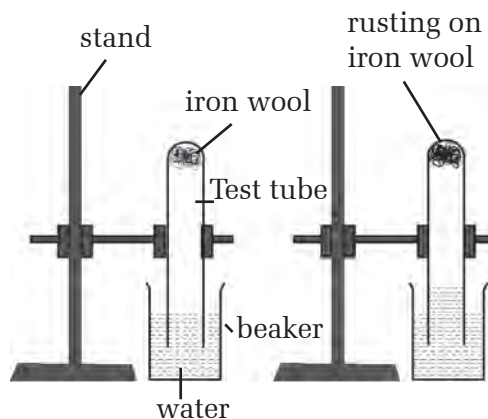
Activity 4

Take one balloon and measure its weight. Now blow the air in the balloon. Again measure its weight. This time the balloon's weight is a little greater than before. Thus, we can conclude that air has weight.

The oxygen present in air causes the rusting

Activity 5

Take a test tube and wet its inner surface with water. Put iron fillings or steel wool into the test tube. Some iron fillings will stick inside the test tube. Invert the test tube upside down into the beaker which is filled with water. Mark the level of water in the test tube. Two or three days



later you can see the rust in the iron fillings or steel wool and the increment of water level as well. Oxygen gas is used in the formation of rust. If a clean iron nail is kept in the moist place, after few days the iron nail is covered with a matter of red brown colour. This red brown coloured matter is called rust. This process is called rusting.

The uses and the introduction of the gases present in air.

Air is the combination of different gases. Nitrogen, oxygen, and carbon dioxide are the main gases present in the air. These gases have their own uses.

(a) Nitrogen:

Nitrogen occupies most of the space in the air. Its volume is approximately 78%. Usually, it does not show any combination with different substances. It cannot be directly used by plants and animals. But it has its own importance, they are:

1. It helps to make chlorophyll in the plants. Without the presence of chlorophyll, the plants turn yellow in colour.
2. It helps in the growth and the development of a plant.
3. Every animal directly or indirectly uses it in the manufacture of protein.
4. It is kept inside an electric bulb.

(b) Oxygen

The second most abundant gas in the atmosphere is oxygen. Its volume is approximately 21%. It is an active gas. It can easily react with other substances.

Importance of oxygen are:

1. It helps to burn substances.
2. It is essential for breathing.
3. The patients in the hospital are provided with oxygen.

(c) Carbon dioxide

Carbon dioxide is found approximately 0.03% in the air. It is very much essential for the plants. But animals cannot directly use it.

Its importance are:

1. For the process of photosynthesis, plants use carbon dioxide. All the animals in the world eat plants as a source of food.
2. It is used to extinguish fire.
3. It is used in manufacture of soda water, beer, coke etc.

(d) Water vapour

The presence of the water vapour in the air depends upon its surroundings. Due to the evaporation in the substance, there is water vapour in the air. The amount of water vapour in the air is called humidity. The water vapour present in the air is important for all living beings.

Its importance are:

1. It helps to protect the leaves of the plants from being dry.
2. It helps to keep the vegetables and fruits fresh and juicy.
3. It helps to protect the animal skin from being dry.

Experimental activities

1. Study activity 1, and prove that the air has oxygen, and write it in your copy.
2. Study activity 2, and prove that the air has carbon dioxide.
3. Study activity 3, and prove that air contains water vapour.
4. Study activity 5, and prove that oxygen present in the air causes rusting.

Summary

1. Air is the combination of different gases. It is not a compound.
2. Air contains nitrogen, oxygen, carbon dioxide, inert gases, water vapour and dust.
3. We are surrounded by air.
4. Air is colourless, odourless, and tasteless. But it has weight and can move from one place to another.
5. Air moves from one place to another in the form of wind.
6. Due to the presence of oxygen in the air, burning of substance is possible. Without oxygen a substance cannot be burnt.
7. Plants use carbon dioxide for the preparation of food.

Exercise

1. Fill in the blanks.

- (a) Air is the combination of different
- (b) gas changes the lime water into milky.
- (c) For a substances to burn, there should be the presence of gas.
- (d) Air can from one place to another.
- (e) makes rusting possible.
- (f) helps to make chlorophyll in the plants.

2. Choose the best answer:

- (a) What percent of nitrogen is present in the air?
(i) 21% (ii) 78% (iii) 0.03% (iv) 30%
- (b) Which gas makes the lime water milky?
(i) Carbon dioxide (ii) Nitrogen
(iii) Helium (iv) Oxygen
- (c) Which gas makes the rusting possible?
(i) Nitrogen (ii) Carbon dioxide
(iii) Oxygen (iv) Argon
- (d) What kind of matter is air?
(i) Solid (ii) Mixture (iii) Compound (iv) Element

3. Answer the following.

- (a) What are the gases present in the air? Write their percentage.
- (b) Write any four properties of air.
- (c) Write any four uses of air.
- (d) How can we prove that air contains water vapour.
- (e) Write any two uses of nitrogen gas.
- (f) Write any two uses of carbon dioxide gas.
- (g) How does rusting occur?

4. Write shot notes on:

- (a) Atmosphere (b) Rust (c) Humidity

Until now, about 118 elements have been found. On the basis of their properties, they have been divided into 3 groups or categories. They are metal, non-metal and metalloid. Some elements are hard, shiny and good conductor of electricity. These types of elements are called metal. Some examples are iron, copper, gold, silver, aluminum etc. Some elements are soft, non-shiny and bad conductor of electricity. These types of elements are called non-metal. Some examples are sulphur, oxygen, nitrogen etc. Some elements have the properties of both metal and non-metal. This type of elements are known as metalloid. Some examples are: silicon, arsenic etc. Human beings have been using metals for many years. We use it to make different containers, plates etc. Likewise, we have been using gold and silver as jewellery. We also use metals in the form of iron in the process of making house. Therefore, metals hold a great importance in our daily life. It is also essential for the development of the country. The country which has more use of metal, that country is regarded to be advanced. Most of the metals are found in the form of mixture in nature. Some metals like gold and silver are found in the pure form in nature.

General properties of metals.

The matter which is hard in the solid form but can be made thin and long by beating is known as metal. Iron, copper, gold etc are metals. Every metal has its own properties but some properties are same for every metal. We will discuss about some properties of the metal in this chapter.

1. It is shiny.

Pure metal is shiny.

Activity 1

Collect iron, copper, aluminium, etc. Clean them with water, cloth or paper. Now, put them on the top of a paper. Observe their surface. Do they shine or not? They reflect the light rays, that is why they shine.

2. Metals are hard

Metals are mostly hard in touch. But this hardness differs from metal to metal. Some metals like sodium, potassium etc are not hard. Hard metals cannot be easily cut.

Activity 2

Take the pieces of copper, zinc, brick and wood. Now, scratch them with a metal nail one by one. Which piece can be scratched easily? Observe it. It is hard to scratch copper and zinc as they are metal. While it is easy to scratch brick and wood. This is how we know that metals are hard.

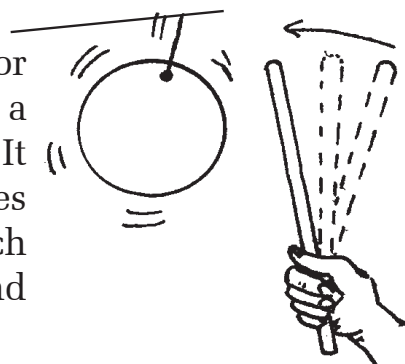


3. Metals Produce sound.

When metal hit other substance or hit each other then it produces sound.

Activity 3

Take a big piece of any metal like iron or copper and tie it up with the help of a string. Now, hit it with the help of a rod. It produces tinkling sound. The molecules in the metal are strongly packed with each other. And so it produces sound. Sound is produced by the vibration of bodies.



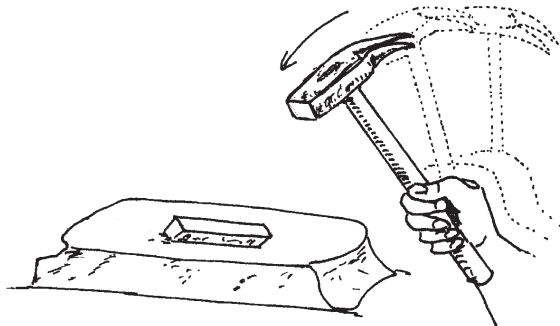
4. The metal can be made thin by beating.

Most of the metals are made thin by using a hammer. This property of metal is known as malleability.

Activity 4

Take a piece of metal or aluminum. Look at the breadth of it. Now hit it with a hammer and check if there is increase in its breadth or not.

When we hit the metal with a hammer there is increase in its breadth and it became thin. It proves that metals can be made thin by beating or they are malleable.



5. Metal can be made longer by beating.

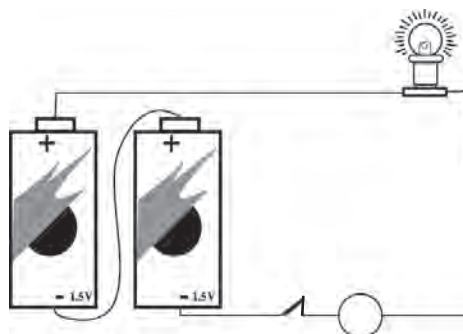
When we heat the gold, silver, copper etc and beat, it becomes longer and thin. This property of metal is known as ductility. One gram of gold can be made into two kilometer long thread. This property of the gold can be used to make Jewellery.

6. Metal are good conductor of electricity

Electricity can flow easily through metals. Electricity is supplied in our houses by using the wire made from copper and aluminum.

Activity 5

Take two dry cell, one long aluminum wire and one bulb. Now make an electric circuit as shown in the figure. Now put a metal coin in the middle of the wire and press it. Watch if the bulb lights up or not. The bulb lights up. Thus, we can conclude that metal is a good conductor of electricity.

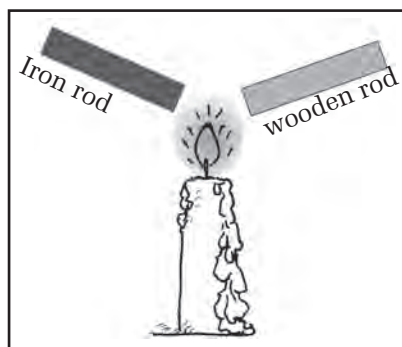


7. Metal is a good conductor of heat.

Heat can be easily transferred through the metals. Due to this property of metal, we use metal pots for cooking our food.

Activity 6

Take a metal rod and another wooden rod. Put them closer to a burning candle. After sometimes, what change will occur in both of them? The metal rod gets heated from one end to the other while as the heat does not transfer from the wooden rod. Thus, we can prove that metal is a good conductor of heat.



8. Metals are obtained in solid state.

Usually, metals are found in the solid state. But some metals are in liquid state in normal temperature and pressure. For example: mercury

Uses of metals

Metals are used in our daily life as well as in different industries.

Metals are used:

1. To make different utensils.
2. To make different weapons.
3. To make the electric wire.
4. To make house, bridge, bus, train etc.
5. To make ornaments.
6. To make coins.
7. Aluminum foil is used to wrap up the medicines, chocolate, etc for the safety.
8. Mercury is used in thermometer to measure temperature.

Non metals

Non metals are obtained in solid, liquid and gas states in nature. But they cannot be beaten into thin plate and thread like structure. For example: carbon, sulphur, phosphorus etc.

Non-metals have their own properties. However, some properties are in common. Some common properties are mentioned here:

1. Non-metals are found in solid, liquid and gaseous state.
2. Non-metals are comparatively softer than the metal.
3. Non-metals do not produce tinkling sound.
4. Non-metals do not possess lusture.
5. Non-metals cannot be pulled to thread like structure.
6. Non-metals cannot be beaten into thin plate like structure.
7. Non-metals are bad conductor of heat and electricity.

Uses of non-metals

1. Non-metals are used as insulator.
2. Non-metals are used to fill up the balloons.
3. Non-metals are used as fuels in the rocket.
4. Non-metals like sulphur is used to make explosives.

Some metals

Iron:

Iron is brownish in colour. Freshly cut iron posses lusture. Rust can be formed easily on iron. Iron is used to make steel. Iron has greater importance in our daily life. Iron is used to make houses, bridges, bus, car, train, etc and different utensils as well.

Copper:

Copper is red, brown in colour. It is good conductor of electricity. So, it is used to make electrical equipment. It is also a good conductor of heat. So, utensils are also made from copper. Brass is made from the mixture of copper and zinc.

Gold:

Gold is bright and yellowish in colour. It is not affected from air and water. So, it shines. It is used to make different ornaments. It is also used to make statue of gods and goddesses. It is one of the expensive metal.

Silver:

Silver is a white and shiny metal. Water and air do not have any effect on it. It is a good conductor of electricity than others. It is used in electric devices. It is also used to make Jewellery. It is also used to fill in the teeth.

Experimental activities

1. Prove that metal is a good conductor of heat.
2. Prove that metal is a good conductor of electricity.

Summary

1. Elements are divided into metals, nonmetals and metalloids according to their properties.
2. The elements which are hard in touch but can be made thin and long by beating are known as metals.
3. The elements which are found in solid, liquid, and gas state but cannot be made thin and long by beating are known as nonmetals.
4. The elements which possesses properties of both metals and nonmetals are known as metalloids.
5. Metals are hard, shiny and good conductor of heat and electricity.

Exercise

1. Fill in the blanks:

- (a) The element which possesses properties of both metals and nonmetals is called
- (b) Usually, metals are found in state.
- (c) The elements which are found in solid, liquid and gas state are
- (d) and are natural metals.
- (e) The process in which a metal is made thin by beating is called
- (f) The process in which a metal is made long by beating is called

2. Select the best answer from the given alternatives:

- (a) What kind of element is silicon ?
 - (i) metal
 - (ii) Nonmetal
 - (iii) metalloid
 - (iv) Alloye
- (b) Which of the following element is found in liquid state at normal temperature and pressure ?
 - (i) mercury
 - (ii) gold
 - (iii) silver
 - (vi) Copper
- (c) In which of the following metal will rust form?
 - (i) silver
 - (ii) iron
 - (iii) gold
 - (iv) copper
- (d) Which of the following metals is most good conductor.
 - (i) iron
 - (ii) copper
 - (iii) silver
 - (iv) Alminium

3. Answer the following questions:

- (a) What are the types of elements ?
- (b) Write any four properties of metals.
- (c) Write any four properties of Non-metal.
- (d) Write any four uses of metal.
- (e) Write any two uses of copper.

4. Define the following terms:

- (a) Metal
- (b) Non-metal
- (c) Metalloid

5. Differentiate between:

- (a) Metal and Non-metal
- (b) Non-metal and Metalloid.

Different types of organism are found around us. They are classified as animals and plants on the basis of their characteristics. Man, cow, dog, pigeon, fish etc. are the examples of animal kingdom. Likewise grasses, mushroom, fern, orange, banyan tree, peepal etc. fall in plant kingdom. The physical structure, features and characteristics of organisms differ according to their habitat. For example: The animals and plants which are found in Himalayan region differ in physical structures with the animals and plants found in Terai region. This unit will discuss about these subject matters.

Differences between Plant and Animal

Plant and animal are living being. There are some similarities between both living and nonliving beings. For example: In respiration, both of them take in oxygen and throw out carbon dioxide. Both have life processes like reproduction, growth etc. However, they have many differences; some of them are shown in the following table:

Plants	Animals
1. Generally they do not show movement.	1. They show physical movement.
2. They prepare their own food by photosynthesis process.	2. They get their food from plants or from other animals.
3. They do not show high level of sensitivity like animals.	3. They have high sensitivity in comparison with plants.
4. Their growth is continuous or infinite for whole life.	4. Their growth is for limited time.
5. Reproduction takes place from seed, leaf, stem, root etc.	5. Reproduction takes place by giving birth of babies, laying eggs, fragmentation of body etc.
6. Commonly they contain chlorophyll.	6. They do not contain chlorophyll.

Activity 1

On the basis of differences given in the above table, observe one plant and one animal found in your area. Try to find out the differences given in the points. Note down on what point you got difference. Discuss the point with the teacher which you cannot identify.

Activity 2

Observe plants and insects. What do insects eat? Observe the movements of plants and insects. Note down the differences of growth of plants and pet animals of your home or your surroundings.

Classification of Plants and Animals on the basis of their habitat:

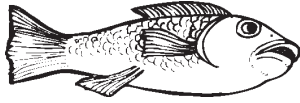
Thousands of animals and plants are found on the earth. They need environmentally better place for shelter, growth, food, protection etc. Nature has provided them ability to adjust their bodies for survival and growth, according to geographical diversities or climatic condition of himalaya, mountain, terai or cold, hot, land, water, air, snow etc. We study about plants and animals which survive in water, land, air and snow in this section.

A. Classification of Animals.

All the animals of the earth can be classified according to their habitat or their external features as follow:

1. Aquatic animals and their characteristics:

Aquatic animals commonly live in water. Their bodies are streamlined. These animals, in maximum, breathe in through gills. Body is covered by scales. Likewise, they can swim with the help of fins, their head and thorax are distinct, egg laying, and absence of lungs are their common features. For example: Katla fish, prawn, eel, sea horse, etc. Similarly, dolphin, crocodile etc. live in water but they have lungs.



Fish



Dolphin



Crocodile

2. Terrestrial Animals and their characteristics:

(a) Animals that are found in cold and warm places:

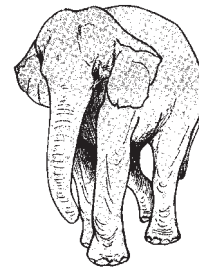
Bodies of the animals that are found in cold places are covered with hair whereas animals that are found in warm places have less hair. Land animals' legs are made of strong muscles and bones. Size of legs and paws differ from one animal to the other. Hoof of some animals are divided into two parts whereas some have only one. Animals that live in very hot places like desert have a pouch where they can store water for a long time. For example: Yak, polar bear, horse, tiger, elephant, camel etc.



Yak



Tiger



Elephant

(b) Animals that live on trees

Some animals live on trees, walls of houses and on hills. Animals like lizard that climb walls have adhesive pad on their legs. Chest of these animals have strong muscles. For example: Lizard, monkey, squirrel.



Lizard



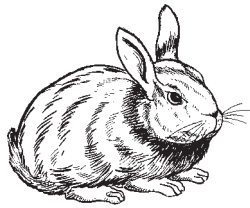
Monkey



Squirrel

(c) Animals that live in holes:

Some animals live in holes. Among them, some make their own holes whereas some live in holes that other animals have made. Rabbit and mouse make their own holes to live. Their toes' nails and mouth are strong. Animals like snake and python live in holes that other animals have made.



Rabbit



Rat



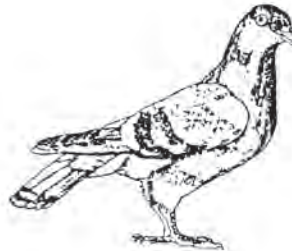
Snake

(d) Aerial Animals:

Bodies of aerial animals like birds are made of light bones. Their bodies have feathers and wings. They have air pouches inside their bodies. They eat with the help of their beaks and fly with the help of their wings. For example: crow, lophophorus, pheasant, peacock, pigeon etc.



Lophophorus



Pigeon



Peacock

B Classification of Plants:

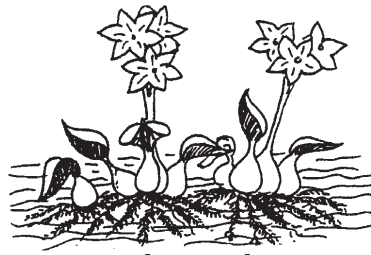
Similar to animals, plants are also found in different places – some in water, some in moist places and some in dry places. According to the environmental condition of air and water, they grow in different places. Shapes and types of plants differ according to the places where they grow. Plants that are found around us are classified below in accordance with the places they grow.

1. Aquatic Plants:

Plants that are found in water are also called hydrophytes. These plants are found in pond, river, lake and muddy areas. They may be of floating or immersed type. They absorb water soluble salts and gases through their root and other parts for breathing as well as for photosynthesis. The above mentioned characters are common in the hydrophyte. Also, these plants have weak roots, and soft and floppy stem. The outer parts of these plants are covered with waxy substance. For example: Algae, hydrilla, lotus, water hyacinth etc.



Hydrilla



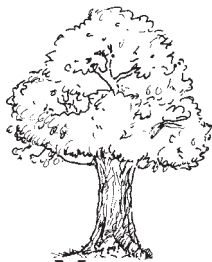
Water hyacinth

2. Terrestrial Plants:

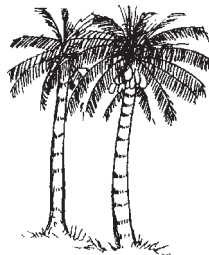
According to the environmental condition of air and water, terrestrial plants differ from Mountainous region to Terai. These plants grow in dry, moist and warm places and also in humid places. The shoots of these plants are hard and they are green in color. The classification of terrestrial plants is presented below in accordance with the areas of land where they grow:

(a) Plants growing in Hot and Moist Climates:

Plants that are found in hot and moist climates are tall and have hard shoots and generally more leaves are at top. For example: Mango, rubber, coconut etc.



Mango



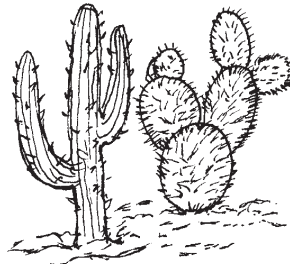
Coconut



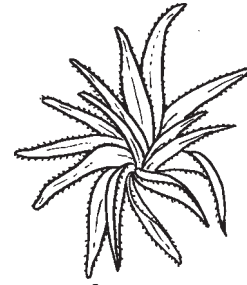
Rubber

(b) Plants growing in Dry and Hot Climate:

These plants have the ability to survive even in hot climate. They are also known as Xerophytes. These plants have thick and small leaves, round stem and their roots go deep inside the land. It makes them able to collect water and salt from deep inside the land. For example: Opuntia, aloe vera etc.



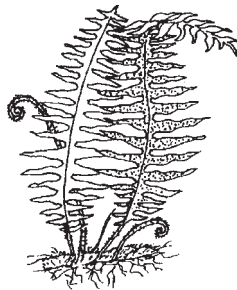
Cactus



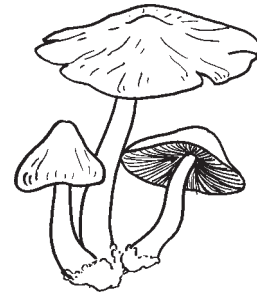
Aloe vera

(c) Plants growing in Moist and Shaddy Climate:

Plants that need less sunlight and more moisture are usually nonflowering plants that don't produce flowers. Some of them grow in stem of other trees, dry shoot of trees and between rocks. For example: Mushroom, Fern, Moss etc.



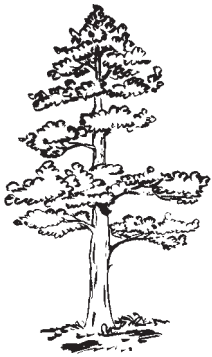
Fern



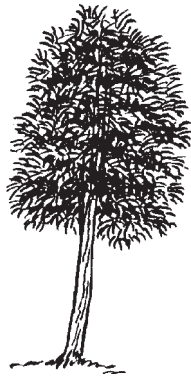
Mushroom

(d) Plants growing in Cold Climate:

Leaves of the plants that are found in Mountainous region or places where they have snowfall are long and pointed. Because their cone like shape, these plants are also known as coniferous plants. For example: Pine, dhupi (Thuja), cycas etc.



Pine



Dhupi



Cycas

Classification of Plants according to Life Span

Plants can be divided into following groups based on their life span:

1. Annual Plant:

These plants live only for one season. They sprout after seed germination, grow and produce flowers and seeds. Then these plants die after this process. For example: Mustard, paddy, wheat, pea, bean etc.



Mustard



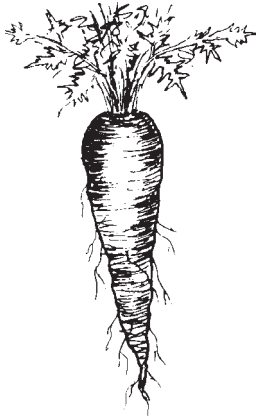
Paddy



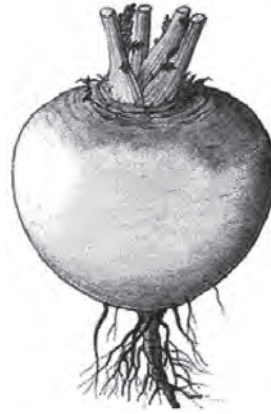
Bean

2. Biennial Plants:

Life span of these plants is generally two seasons. They grow in first season and then produce flowers and seeds in the second season. For example: Carrot, turnip, radish, cabbage etc.



Carrot



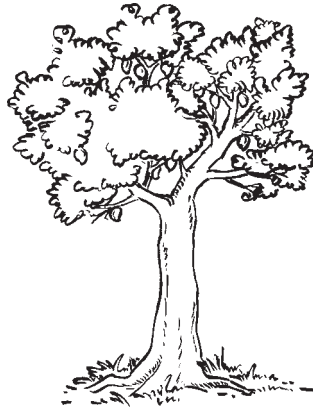
Turnip



Radish

3. Perennial Plants:

Plants that can live for two or more than two years are called perennial plants. These plants grow more and bloom flowers and seeds during rainy summer season. For example: Mango, litchi, apple, orange etc.



Mango



Litchi

Activity 3:

Divide the names of plants and animals that you can find and recognize in your surrounding in two groups and show it to your teacher. Discuss where these plants and animals are found and fill in table number 1 for animals and table number 2 for plants.

Table - 1

Animal's Name	Aerial	Found in water	Found in Desert Areas	Found on land	Found in both land and water	Found in snow land	Found in holes	Found inside land	Found in Moist Places
1.									
2.									
3.									
4.									
5.									
6.									
7.									

Table - 2

Plant's Name	Plants that grow or float in water	Plants that grow in cold places	Plants that grow in dry/hot places	Plants found in hilly areas	Plants found in moist/shady areas	Plants found in humid places
1.						
2.						
3.						
4.						
5.						
6.						
7.						

Activity 4

In the table given below, divide the plants that are found in your surrounding according to their life span.

Table - 3

Annual Plants	
Biennial Plants	
Perennial Plants	

Monocotyledonous and Dicotyledonous Plants:

Among the plants found in nature, some produce flowers and some don't. Plants that produce flowers have seeds. Shape and size of the seeds vary according to the plants. Some plants have only one cotyledon in their seeds and they are called monocotyledonous plants. Some plants have two cotyledons in their seeds. These plants are called dicotyledonous plants. Depending on the number of cotyledons roots, stem and leaves of the plants vary. Few examples of roots, stem and leaves of monocotyledonous and dicotyledonous plants are given in the table below:

Table - 4

Plant's Name	Root	Leaf	Seed
Mustard	Tap root: Brown color, one main root and other roots branching out from the main one.	Broad leaf with midrib and reticulate venation.	Seed is dicotyledonous, embryo is present, the seed coat can be easily peeled if the seed is properly soaked in water.
Rice	Fibrous root	Parallel venation	Seed is monocotyledonous, it contains a small embryo which is covered with seed coat, it is hard.
Maize	Fibrous root	Parallel venation	Seed is monocotyledonous, it contains a small embryo which is covered with seed coat, it is hard.
Gram	Tap root: Brown color, one main root and other roots branching out from the main one	Small leaves are spread along the branch	Seed is dicotyledonous, embryo is present, the seed coat can be easily peeled if the seed is properly soaked in water.

Activity 5:

Note down the name of the plants found in your locality and sort out them in monocotyledonous and dicotyledonous. Also, divide them into different groups and write a report on the shapes and sizes of their roots, leaves and seeds. Finally, each group leader should present their report in turns. Discuss among yourself whether the plants that you have collected are flowering plant or not.

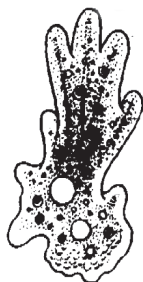
Classification of Invertebrates:

We have seen different types of animals around our homes and through newspaper, TV, videos etc. Among these animals, we have gained some knowledge about the invertebrates. For protection, invertebrates have strong outer covers in their bodies. Animals like scorpion, earthworm, snail and crab, etc. and those animals which cannot be seen by our naked eyes fall under the category of invertebrates. We will now categorize invertebrates based on their physical features and will discuss their characteristics. The invertebrates have been divided into nine phyla. They are as follow:

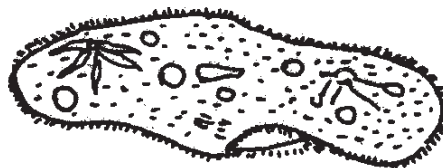
1. Protozoa:

- a. Body is made of only one cell.
- b. Generally found in water.
- c. For movement they have pseudopodia, flogella and cilia like structures.
- d. Reproduction takes place through cell division.

Examples: Amoeba, Paramecium etc.



Amoeba



Paramecium

2. Porifera:

- Body is made up of many cells.
- Mostly they are aquatic and remain attached to substratum.
- Body consists of many pores.
- Though body is diploblastic, there are no organs developed for respiration, excretion, and nervous system.

Examples: Sponge, Sycon.



Sponge

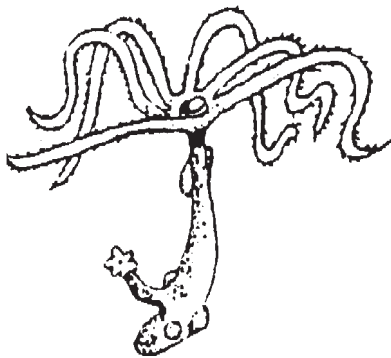


Sycon

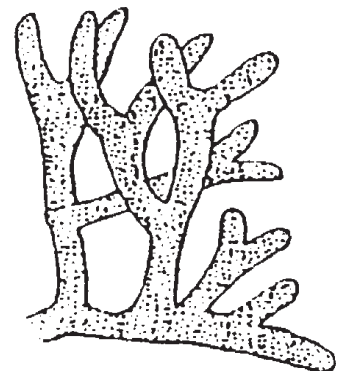
3. Coelenterata:

- Body consists of hollow cavity (coelenteron).
- Body is made up of two layers (diploblastic).
- Mouth is surrounded by small thread like structure called tentacles that helps in locomotion and feeding.

Examples: Hydra, Coral, Jellyfish.



Hydra

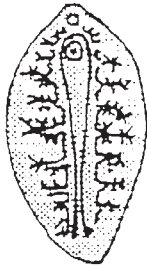


Coral

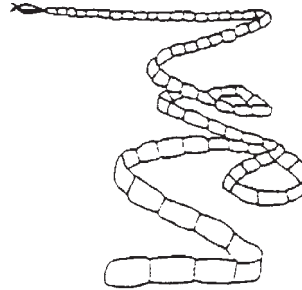
4. **Platyhelminthes:**

- a. Body is flat.
- b. Some are small and some are long.
- c. Body is made up of soft layer of cells.
- d. Mouth consists of sucker but there is no anus.
- e. Mostly parasites fall in this phylum.

Examples: Tapeworm, Liver fluke.



Liver fluke

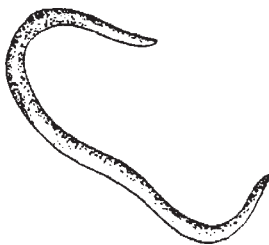


Tapeworm

5. **Nemathelminthes:**

- a. Mouth, anus and sucker are well developed.
- b. Some are found in the form of parasites.
- c. Their body tapers at both the ends. Male and female can be distinguished.

Examples: Hook worm, Round worm etc.



Ascaris



Hook worm

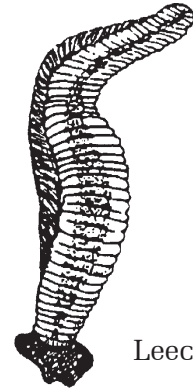
6. **Annelida:**

- a. Body is round and segmented.
- b. Usually found in damp places.
- c. They are hermaphrodites.

Examples: Earthworm, leech etc.



Earthworm

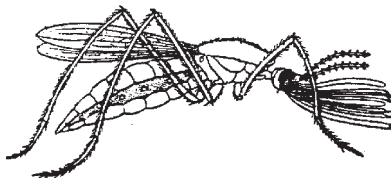


Leech

7. Arthropoda:

- Body is divided into head, thorax and abdomen.
- They have joint appendages.
- They are found in air, water and land.
- Males and females are different. They have internal fertilization.
- Usually life cycle is completed in four stages (egg, larva, pupa and adult).

Examples: Mosquito, butterfly, Ant etc.



Mosquito



Butterfly

8. Mollusca:

- Found in both land and water.
- Legs are made of strong muscles.
- They have soft bodies, which are usually covered with hard shell.
- They have tentacles on their head.
- They are unisexual.

Examples: Clam, Snail, Octopus etc.



Snail



Octopus

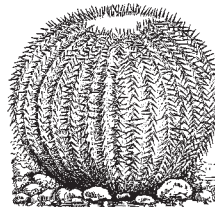
9. Echinodermata:

- Body is covered with hard spines made of calcium carbonate.
- Usually found in sea.
- Male and female are separate.

Examples: Starfish, sea urchin, sea cucumber etc.



Starfish



Sea urchin

Activity 5:

According to given information, discuss about the characteristics of animals in groups or on your own and present the conclusion. Also, write down the names of the animals found in your surrounding and from the help of this list, divide them into different phylum and write down their characteristics and show it to your teacher.

Project Work:

- Make a list of all the animals that you find in your surrounding (home, school, garden, pond, and river). Add more names to the list by asking your elders. Bring the list to the class and classify the animals.
- Pluck the leaves of some monocotyledonous and dicotyledonous plants from your surrounding and draw each of them separately in a

white paper. You will know the differences between monocotyledonous and dicotyledonous leaves after drawing them on paper.

3. Collect the roots of onions, dabo (common garden grass), radish, potato and bean, and then find out the differences between them.

Practical Work:

1. Collect some water animals from any water body near your surrounding (go with your teacher). Study the physiology and characteristics of those animals and note it in your practical copy. After the study, leave the animals where you found them.
2. Collect some animals from your school playground. Study those animals and classify them into different phyla and write down their characteristics. After the study, leave the animals where you found them.
3. Collect the seeds of gram, peas and corn. Soak them in water until they germinate and study its different parts. Study carefully where the germination occurs. Also, study some without soaking them in water. Write down your observation and show it to your teacher.

Summary:

1. Some plants grow on land, some in water, some in warm places and some in damp palaces.
2. Plants that grow in water have waxy stem and air sacs.
3. Plants that grow in warm places have small and thick leaves.
4. Plants that grow in water have soft stems and plants that grow on land have hard and strong stems.
5. Plants have differing life spans. Some are seasonal and some are annual.
6. Plant and animal have differences on the basis of food, mobility, reproduction, sensitivity etc.
7. Different types of animals have different habitats.

8. Animals differ in the physiology and life style according to their habitat.
9. Animals that live in water breathe through gills and skin whereas animals living on land breathe through lungs, skin, etc.
10. Animals that can fly (aerial animals) have streamlined bodies. Air sacs are present in their bodies.
11. Invertebrates are classified into nine phyla namely protozoa, porifera, coelenterata, platyhelminthes, nemathelminthes, annelida, arthropoda, mollusca and echinodermata.
12. Dicotyledonous plants have brown colored roots with tap root system. Their leaves consist of midrib with reticulate venation. They have two seed leaves.
13. Monocotyledons plants have fibrous root system and parallel venation. They have one seed leaf.

Exercises

1. Fill in the blanks

- a. Animals which are found both on land and in water are called
- b. The plant called cactus is found in
- c. Usually, animals found in water breathe through
- d. Amoeba is a organism.
- e. Animals like mosquito and butterfly fall under phylum
- f. Animals which fall under phylum Echinodermata have bodies covered with

2. Pick the correct answer:

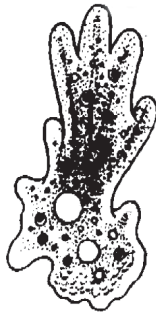
- a. In which place of the following Hydrilla grows?
 - i. land
 - ii. Damp place
 - iii. Dry place
 - iv. floating water

- b. Which animals of the following is found in desert?
- i. Cow
 - ii. Pigeon
 - iii. Duck
 - iv. Camel
- c. Which of the following animal does not have its body covered with thick hair?
- i. Rhino
 - ii. Polar bear
 - iii. Yak
 - iv. goat
- d. Which of the following animals reproduce by cell division?
- i. Earthworm
 - ii. Goat
 - iii. Amoeba
 - iv. Man
- e. Which phylum does octopus belong to?
- i. Annelida
 - ii. Mollusca
 - iii. Coelenterate
 - iv. Echinodermata
- f. Which one of the following is an invertebrate?
- i. Rabbit
 - ii. Bat
 - iii. Elephant
 - iv. Spongilla
- g. Which one of the following is not a monocotyledons plant?
- i. Maize
 - ii. Paddy
 - iii. Mustard
 - iv. Wheat

3. Answer the following questions:

- a) Write the names of two invertebrates each that live in water and on land.
- b) Write any two characteristics of invertebrates.
- c) Depending upon the habitat, write names of two animals each that live on land, water and air.
- d) Write name of any one aquatic plant and draw a picture of it.
- e) Write names of animals that live under holes and write one character for each animal.
- f) Write any four differences between plants and animals.
- g) Draw picture of any one plant and write name of its parts.

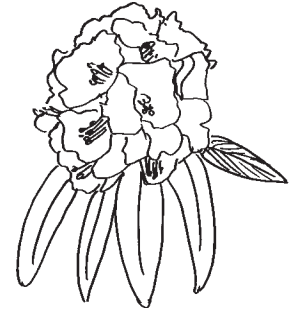
Structure of body of an organism is made up of cells. A combination of different small bricks makes up a full house. Similarly, animal's body is made up of combination of one or more cells. Body of animals that cannot be seen with naked eyes like amoeba, bacteria and chlamydomonas is made up of only one cell. Body of multicellular animals is made up of many cells. Animals like earthworm, rabbit, human beings and plants like Sal, Rhododendron and Peepal are some examples of multicellular living beings.



Amoeba



Human being



Rhododendraon

A cell conducts all the life processes like growth, sensitivity, movement, respiration and reproduction, which are very important for animals to survive. Therefore, cell is the foundation of life of all organisms.

Cell is the structural and functional unit of animal organisms.

Can you tell what are the constituent elements of fundamental unit cell that make our body? A Combination of different parts makes up a cell. Most of the parts of cells of animals and plants are similar. Function of these parts is also similar. Certain parts of cell are different in plants and animals. Their work is also different. Each cell consists of cell membrane, cytoplasm and vacuole. Apart from these, cell wall, plastid, centrosome, mitochondria, centriole and chromosome are also found in cells. Each of these parts is described below:

1. Cell Membrane

Outer part of cell of animals is covered with thin membrane. This is called cell membrane. It is very thin and flexible. It filters important particles and sends them in and out of the cell.

2. Cell Wall

Plant cell consists of a thick and rigid layer lying outside the cell membrane. This is called cell wall. It is made up of cellulose. Cell wall protects and gives fixed shape to the cell.

3. Cytoplasm

Cell membrane of animal cell contains of jelly like semi liquid substance, which is called cytoplasm. It contains all the chemicals, which are needed to perform different functions and keeps the cell alive. Different cell organelles float in cytoplasm.

4. Nucleus

Cytoplasm consists of one circular or oval shaped dark object, which is called nucleus. It is found in every cell of organism. Substances inside nucleus are thicker than the substances inside cytoplasm. It controls different functions of the cell. It also helps in the transformation of hereditary characters from parents to offspring.

5. Vacuole

Cytoplasm consists of some parts that look like empty sacs. In fact, these parts are not empty sacs but are filled with transparent liquid substance. These parts are called vacuoles. They control the amount of water inside the cell.

6. Plastid

Plastids are spread in cytoplasm of plant cells. They do the work of providing different colors to plants. Chloroplast, chromoplast and leucoplast are the three types of plastids found in plant cells. Chloroplast contains chlorophyll. It is green in color. It helps in the process of photosynthesis. Chlorophyll is found in stem and leaves of plants. Therefore these parts of plants are green in colour. Chromoplast is found in fruits and flowers whereas leucoplast is found in roots and stem that is below the ground.

7. Mitochondria

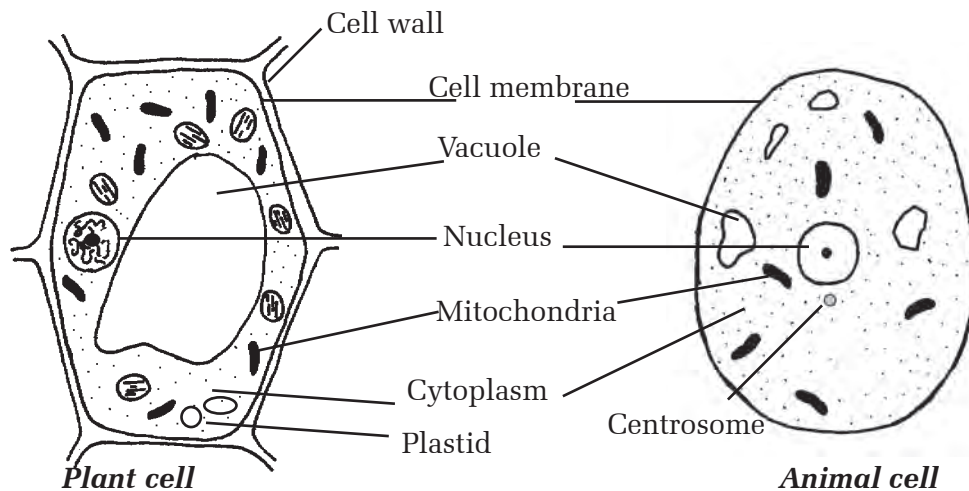
Another important organelle found inside the cell is mitochondria. It is granular and cylindrical in shape. Mitochondria are found in cells of all organisms. It plays an important role to run respiration process in animals and also stores energy. Hence, mitochondria is also called power house of cells.

8. Centrosome

Near the nucleus of animals there is a microscopic cylindrical shaped structure. This is called centrosome. It plays an important role in cell division.

Apart from these, cell also contains other parts. We will discuss about those parts in next class.

Differences between Plant and Animal Cells:



Bodies of plants and animals are formed of cells. Even though shape and function of both cells are similar, there are certain parts that are unique to either plants or animals. Plant cells have cell wall outside the cell membrane whereas animal cells don't have it. Even though both plant and animal cells have vacuole, their shape and numbers are different. Plant cells have a big permanent vacuole. It is situated in the middle part of the cell. Vacuoles in animal cells are small, temporary, more in numbers and are found in different parts of cytoplasm. Plant cells have plastids. Hence, roots, stem, leaves, fruits and flowers are of

different colors. Animal cell doesn't have plastid. Thus, we can find various differences between plant and animal cell. Main differences between plant and animal cells are given below:

Plant Cell	Animal Cell
1. Generally the shape of the cell is rectangular.	1. Shape of the cell is circular, flat and oval.
2. Outer part of the cell contains cell wall.	2. Cell walls absent.
3. The cell contains plastid.	3. Plastid is absent.
4. Vacuole is big, permanent and is situated in the middle of cell.	4. Vacuole is small and more in number which are found scattered.
5. The cell doesn't have centrosome.	5. Centrosome is present.
6. In comparison to animal cell, fewer mitochondria are found.	6. Many mitochondria are found.

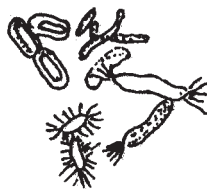
Study of Plant and Animal Cell:

Plant and animal cell are found in different shape and sizes. Some are long, some are flat and some are rectangular in shape. Generally, cells are tiny and cannot be seen through naked eyes. Some cells are big and can be seen through naked eyes. Ostrich egg is an example of this. Among the cells found in human body, blood cell is the smallest one and neuron is the biggest and longest one. In order to find out the shape and structure of the plant and animal cell, one can study onion cell for plants and cheek cell of human beings for animals.

Activity 1:



Muscle cell



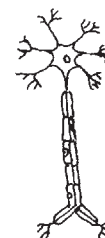
Bacteria cell



Red blood cell



Cheek cell



Nerve cell

Study of Onion Cell

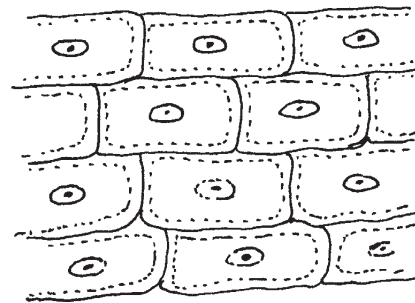
Take one onion and cut it. As shown in the picture, take one layer from the layers of the cut onion.

Now separate the thin membrane slowly from the inner part of the



Showing onion cell

layer by using a blade or knife and put it on a slide. Put one drop of safranin on the slide and spread it on the membrane and then cover the slide with cover slip carefully without allowing the air to get in. Then observe the slide under a microscope. You will see small boxes like structures as shown in the picture. Each box is one cell. The line seen on the outermost



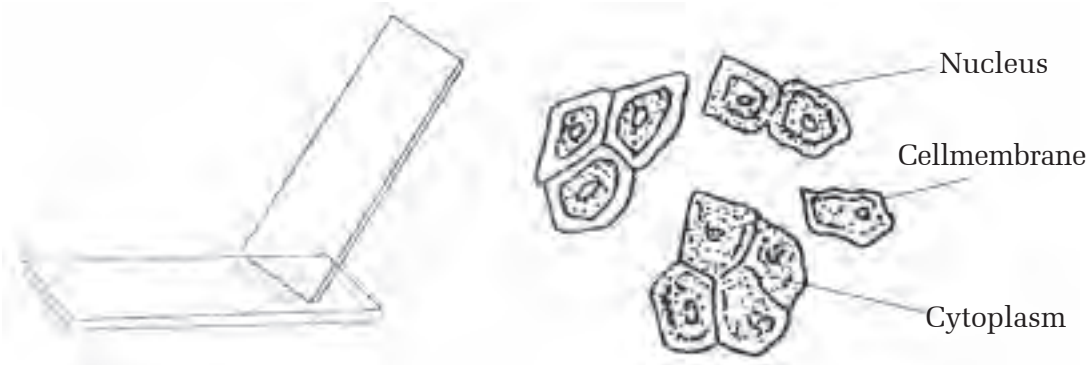
Onion cell

part of the cell is cell wall. The red black dot on the cell is nucleus. In this way, find out other parts of the cell along with their shape. Draw the picture of the cell that you have seen.

Activity 2:

Study of Cheek's cell

In order to observe animal cell's structure and shape, we can see our cheek's cell under a microscope. For this, you have to scratch the inner part of the cheek using a toothpick or matchstick and then put it on a glass slide. Then with the help of a side of another slide rub the substance to make it thin and then put cover slip without allowing the air to get in. Now, with the help of microscope, find out the shape and different parts of the cell.



Cheek cell

Activity 3:

Construction of model of plant and animal cell

Collect threads of different colour, Styrofoam, small coloured beans and seeds of different plants. According to your need, collect a piece of plywood. On that wood, paste plant cell and animal cell shaped foam. Mark their different parts by pasting colored thread and beans and also write their names.

Function of a cell:

Bodies of all animals are made of cells. Cells have different parts. Each part has its own distinctive work. Depending on the nature of functions, shapes of cells differ. Different life process that are needed for the animals to live like growth, movement, reproduction, photosynthesis, respiration, transportation etc. are all run by cell. Therefore, animals can only live when cells live. Main functions of the cells are as follow:

- a) They construct the body structure of animals.
- b) They provide shape to body of animals.
- c) They conduct run the life processes.
- d) They help to continue generation.
- e) They transfer the hereditary characters from parents to their offspring.

Summary:

1. Bodies of all plants and animals are formed of cells.
2. Inside a cell, all life processes of organisms are conducted .
3. Shape and size of cell differ from one to another.
4. Cells have different parts, shape and function of each cell differ.
5. There are some similarity and some differences between plant and animal cells.
6. Cell wall, plastid and big vacuole are present only in plant cell.
7. Centrosome and small and temporary vacuoles are present only in animal cells.
8. Animals can live only if cells are alive.

Practical Work:

1. Study the cell of onion and draw the picture of different parts of the cell in your practical notebook that you observe.
2. Study animal cell and write down the findings in your notebook.
3. Based on activity 3, finish the plant and animal cell and present it to your class.

Exercise:**1. Fill in the blanks:**

- a) Different works of cells are conducted by
- b)is found in an animal cell only not in a plant cell.
- c) Cell organelles are spread in
- d) Cell wall is made of
- e) The transfer of hereditary characters of parents in to off offspring is done by

2. Pick the correct answer:

- a) What is the outermost part of an animal cell called?
- i. Cell wall
 - ii. Cell membrane
 - iii. Nucleus
 - iv. Plastid
- b) Which of the following isn't found in plant cell?
- i. Plastid
 - ii. Nucleus
 - iii. Centrosome
 - iv. Mitochondria
- c) What is the work of cell membrane?
- i. Protects the cell
 - ii. Controls the amount of water in the cell
 - iii. Protects the things inside the cell
 - iv. Changes the shape of the cell
- d) Which of the following part of the cell stores the energy gained from food?
- i. Nucleus
 - ii. Cytoplasm
 - iii. Chlorophyll
 - iv. Mitochondria

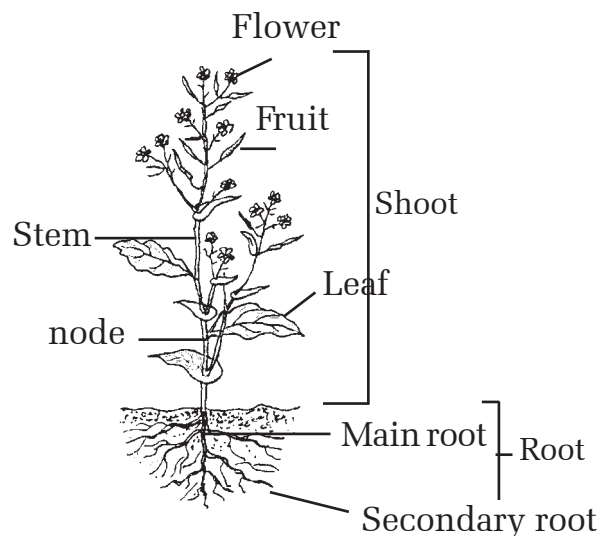
3. Answer the following questions:

- a) What is cell?
- b) Write down one work of each of the following parts of a cell.
- i) Cell wall
 - ii) Nucleus
 - iii) Vacuole
 - iv) Mitochondria
- c) Write down three differences between plant and animal cells.
- d) Write down any three main functions carried out by a cell.

For organisms to live, different processes like respiration, transportation, excretion, etc. are run inside their bodies on a regular basis. These processes are called life processes. Different parts of the body take part in running these processes. In this chapter, we will learn about different parts of plants and life processes they perform.

Root, stem and leaf of a flowering plant:

Different types of plants are found in our surrounding. Have you noticed that all the plants seen bear flowers in them. Plants can be divided mainly into two groups: flowering and non flowering plants. Generally, life of all flowering plants starts when seed comes in contact with soil. During seed germination, one part grows above the soil and the other below the soil. Part of the plant above the soil is called shoot and the part below the soil is called root. Shoot contains stem, leaves, fruits and flowers. Roots also have different parts. In this way, a whole plant can be divided into two groups: shoot and root.

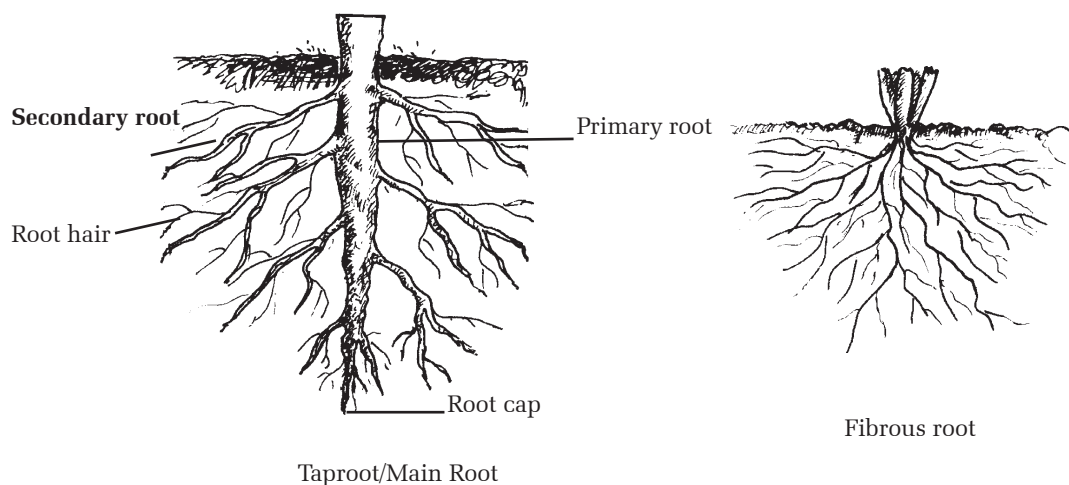


Part of the plant above the soil is called shoot and the part below the soil is called root. Shoot contains stem, leaves, fruits and flowers. Roots also have different parts. In this way, a whole plant can be divided into two groups: shoot and root.

Root:

Generally, root is the descending portion of the plant. They are usually pale and creamish brown in color. Depending upon the nature of the roots, the roots of plants can be divided into tap root and fibrous root. In tap root, one main root descends down the land. This root is called primary root. Other branches on the lower part of the tap root are called secondary roots. Small hair like structures on the secondary

roots are called root hairs. Since the end part of the tap root is very soft, it is covered with cap like thing which is known as root cap. Dicotyledonous plants like mustard, gram, mango, apple etc. have this type of root. In fibrous root, small clusters of roots come out of the lower part of the stem. These roots don't divide into other small roots. In this type of root, main root, root hairs and root cap aren't present. Fibrous root is found in monocotyledonous plants like wheat,



maize, rice etc.

Activity 1:

Take a plant with its root. Observe different parts of the plant. Find out the difference between the structure and color of parts found below and above soil.

Activity 2:

Take two watch glasses. Put wet cotton or a piece of cloth in them. In one watch glass spread fenugreek seed and in another watch glass spread maize seeds. Store them in a warm place for few days. After seed starts germinating, find out different parts of the root. Compare the two different types of roots and find out the types of the root that each of them fall under. In plants like banyan and maize, roots from

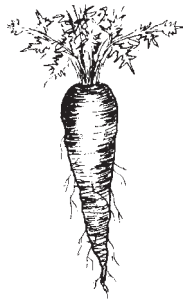
can be seen grown from stem or branch. These roots help to support the plant to remain straight. These roots are called props roots.



Banyan tree

Function of root:

Roots help plants to stand straight on land. Therefore, plants do not fall down easily. Another important function of root is to absorb water and mineral salt from the land. Roots of plants are spread under the ground like a web. Roots tightly hold the land. Because of this it is hard to pull the plants from the ground. When we pull the plants, it comes with some soil. As plants hold the soil in this way, soil erosion cannot take place in the areas where there are plants. Roots absorb water and nutrients from the soil and send it to stem and other parts of plants. Some roots are modified as food storage of plants. We can use these roots as our food. Radish, carrot, sweet potato, sugar beet etc. are some of such examples.



Carrot



Radish



Sweet Potato

Activity 3:

Take one plant with its root and wash it in water. Take two cylinders or bottles. Fill both with water and put the plant in one bottle. Root of the plant should be submerged fully in water. Add one or two drops of oil in both bottles and mark the level of water in them. Put both the bottles



in a warm place or in sunlight. What difference can you observe in the level of water in bottle with and without plant and why?

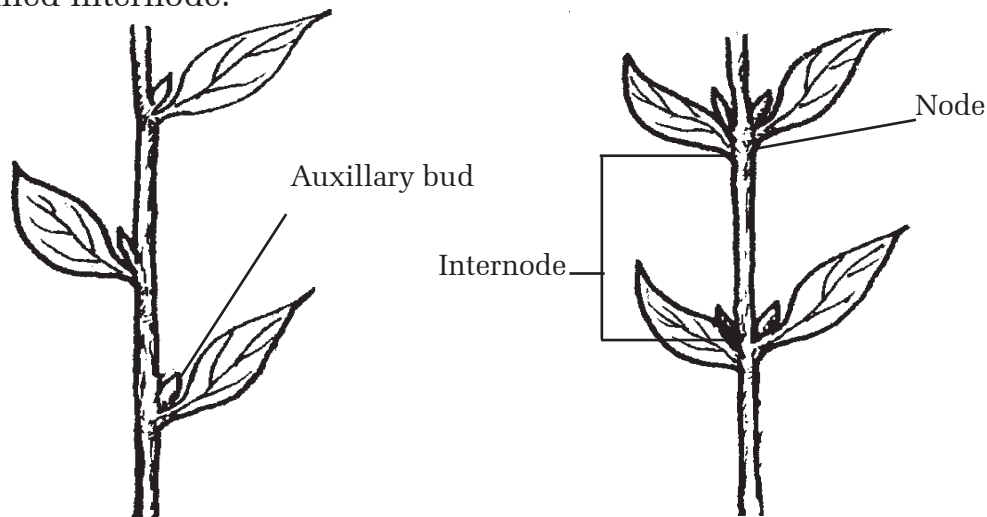
Root is one of the important parts of a plant. Root provides support to the plant. Roots take in water and nutrients from the soil and send it to stem, leaves, fruits and flowers. Some roots also store food.

Shoot:

The part of the plant above the ground is called shoot. Stem, leaves, fruits and flowers are parts of shoot.

Stem:

Stem is a part of the upper part of the plant. The lower part of the stem, which is near the land, is thick and is gradually gets thinner at the top. Generally, the stem is straight and round. It helps the plants to remain straight. Leaves and branches come out of the stem. Part of the stem from where leaves and branches grow is called node. Nodes of stem remain in fixed proportion. Space between two nodes is called internode.



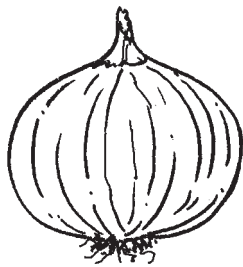
Upper end of the stem contains bud, which is called terminal bud. This helps the plant to grow. In some plants, buds come out from the part where stem and leaves are attached. These types of buds are called auxiliary buds. Some plants have thick and strong stem whereas some have thin and weak stem. Tall trees have thick and strong stem. Plants like pumpkin and cucumber have thin and weak stem.

Activity 4:

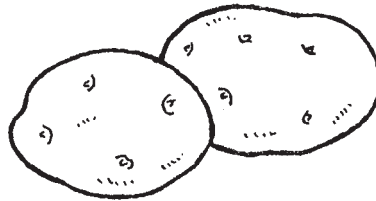
Observe different plants in your garden or school and find out, how do leaves come out on the stem, node, internode, terminal bud and auxiliary bud. Draw a picture of one of the plants that you observed clearly showing different parts of stem and present it in your class.

Function of stem:

The main function of stem is to take the water and nutrients that is absorbed by the roots to other parts like fruits and flowers. Also, stem is responsible for taking food prepared by the leaves to other parts of the plant. Two tissues called xylem and phloem, found in stem, perform this work. Xylem transports water and salt whereas phloem transports food. Stem provides support to branch, leaves, fruits and flowers. It spreads the flowers in a way that the leaves can get more sunlight. Stem of some plants are modified into food storage under the ground. Onion, potato, ginger etc. are some of its examples.



Onion



Potato



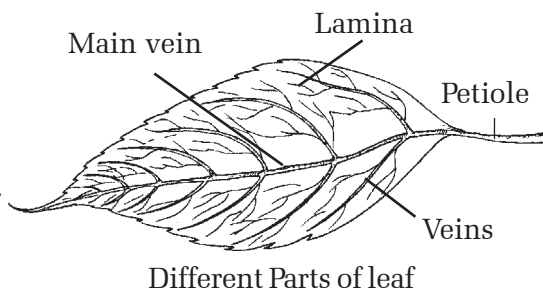
Ginger

Activity 5:

Take a plant of mustard or rapeseed. Put it in a beaker or any other utensil. In the beaker, pour some water until it covers some part of the plant. Add some red ink or any other colored ink and leave it for some time. Observe what changes occur in the leaves of the plant and discuss the reasons for this change.

Leaf:

Leaves come out of the stem and branches of plants. The way in which the leaves come out of the stem and branches differ depending on the types of plant. Because of the presence of chlorophyll in leaves, it looks



green. In some plants yellow, red and violet colored dots can be seen. Therefore leaves have more colors apart from chlorophyll.

Generally, leaves are flat. This part of the leaf is called lamina. End part of some leaves is straight whereas some is cut. Lamina provides shape to the leaves. The part of the leaf that connects lamina to the stem is called petiole. If only one leaf comes out from the petiole, then that leaf is called simple leaf. If more than one leaf comes out from the petiole, then those leaves are called compound leaves. For example: Leaf of mustard plant is simple leaf whereas leaf of gram is compound leaf. From the base of lamina, veins come out and these veins are spread throughout the lamina. The thick vein which lies on the middle part of the lamina is called mid rib. In some leaves, other small veins come out of the mid rib and these are spread around the leaf like a web. This kind of arrangement of the veins is called reticulate venation. In some plants, other veins are spread parallel to the mid rib. This kind of arrangement of the veins is called parallel venation.



Bamboo leaf
Parallel venation



Peepal leaf
Reticulate venation

The veins present in the leaves take the water, salt and prepared food to other parts of the plant.

Activity 6:

Collect different types of leaves found in your surroundings. Observe the leaves and find out the following things:

	Plant's Name	Way in which leaf comes out	Veins of leaf	Shape of leaf	Type of leaf
1.					
2.					
3.					

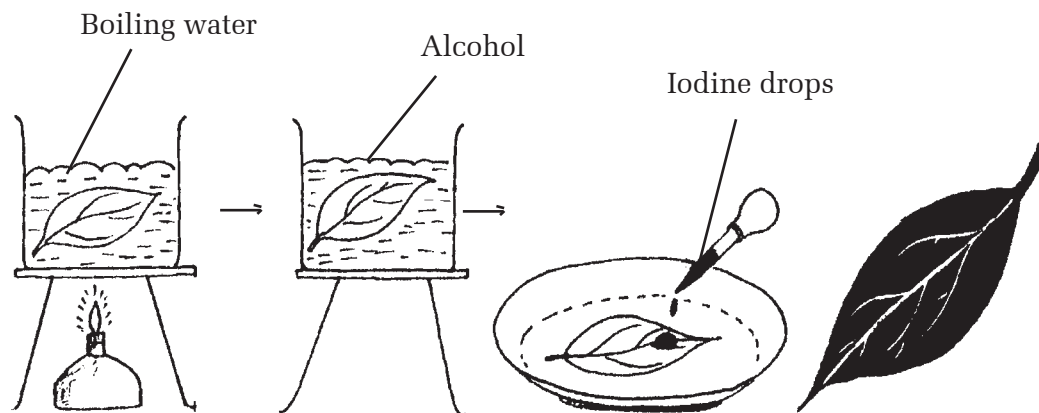
Function of Leaves:

The main part of plant that makes food is leaf. With the help of chlorophyll and in the presence of sunlight, leaves prepare enough food needed for the plant. That food of the plant is called starch. Since the food of plant made in leaves, leaves are also known as kitchen of the plants. In order to make food of plant, water, carbon-dioxide and sunlight are needed. Leaves of plant contain small pores, which are called stomata. With the help of the stomata, plant performs respiration. During the process of respiration, like animals plants also take in oxygen and throw out carbon-dioxide. With the help of the stomata present in leaves, plant sends the unwanted water to the atmosphere in the form of vapour. In some plants, leaves are modified into thorns, which protect the plant. Cactus is an example of this.

Leaf of the plant is the main part where food is prepared for the plants. Plant's food is prepared in the form of starch. With the help of stomata present in leaves, plant throws out the unwanted water in the process called transpiration.

Activity 7:

Take one green leaf of a plant. Boil the leaf in water for some time. Then dip the leaf for sometime in a pot of boiling alcohol. It removes chlorophyll and leaf is not green anymore. Then, wash the leaf with water and keep it in a watch glass and add 1-2 drops of iodine and leave it for a while. Observe carefully what difference you can see in the leaf and find the reason for the change. (Note: When iodine drops are put on starch, starch turns into blue. If the amount of iodine is more the color will be black or blue-black instead of pure blue.)



Absorption and Transportation in Plants:

If we don't provide water to the potted plants for a long time, the plants will wither or die out. We have heard the news of drought and reduced production of crops time by time. That is why we should know the importance of water for the life of plants. Can you tell where and how do plants get water from?

The roots of the plants spread under the soil like a web. The roots of small plants spread in a lower depth below the land while the roots of bigger plants, different trees spread in a very deep. In this part water and minerals mix in the water. The roots of the plants take in this water and minerals. This process among the plants is called 'absorption'. In this way the 'absorption' process in plants make the water and minerals of soil reach to the roots of the plants. This is a continuous process.

Water and minerals attained from the roots get passed along stem, leaves and other parts. When they reach the leaves, the necessary food and nutrition form which is called 'starch' through photosynthesis. The food formed in the leaves pass along stem, fruits, flowers, roots and the plants grow. In this way, water, minerals and nutrition come and go within the plant body in a continuous process. This process in the plants is called 'transportation'. For the process of transportation, there are xylem and phloem in the stem of the plants. Xylem transports water and minerals taken from the roots to the leaves and phloem transports nutritive elements formed in the leaves to roots and other parts which are responsible for 'storage'.

Activity 8:

Take any withered plant in a pot and pour some water in it. Observe what difference you can see after you pour water and find the reason for the difference. (You can observe the change quickly in Sunflower plant)

Transpiration in Plants:

Through the process of absorption and transportation there is regular supply of water from the soil to the leaves. Do leaves use all the water they gain? Some part of the water that reaches the leaves is used to make food and some is thrown out to the atmosphere. With the help of the stomata present in leaves, a plant sends the unwanted water to the atmosphere in the form of vapour. This process of sending the water outside in the form of vapour is called transpiration. Since the unwanted water reaches the atmosphere through transpiration process, there is more rainfall in forest areas than other areas and the air is also moist. The amount of water that the plants take in from the soil is the same as the amount of water the plant throws out through the transpiration process.

Activity 9:

Take a potted plant. Cover it with a transparent plastic as shown in the picture. Tighten the plastic so that air cannot enter inside the bag and observe what you can see in the bag after some time and find out the reason for this.



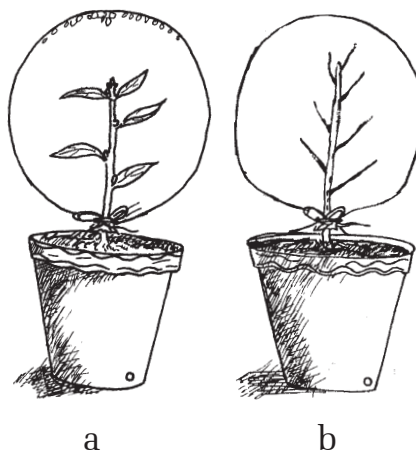
Activity 10:

Take a potted plant. Put grease on both sides of one of the leaves and cover it tightly with a transparent plastic. Also, cover another leaf with a transparent plastic and make observation. Discuss where the drops of water came from in the bag of the leaf without grease.



Activity 11:

Take a potted plant with leaves and another potted plant without leaves. As shown in activity 10, cover both plants with transparent plastic in a way that air cannot enter inside. Pour some water in both of them and keep both the pots in the sun. After some time observe the water part in both pots and discuss about the change.



Project Work:

1. Observe the leaves of similar plants that are found in moist and sunny places. Measure the size of the leaves to find out whether they are of the same size or different. Write down your report and discuss in your class.
2. What colour do the leaves become when they are about to fall? Make observation and find out and discuss your result in class.

Summary:

1. Parts of plants can be divided into two main parts: root and shoot.
2. Main root, root hairs and root cap are parts of tap root.
3. Roots support the plants and don't let them fall off the ground. Also, they absorb water and salt from soil and also store food.
4. Stem, branch, leaves, flowers and fruits are parts of shoot.
5. Leaves and branches come out from the node of the stem.
6. Stem helps in keeping the plant straight. Apart from taking the water and nutrients that is absorbed by the roots to other parts like fruits and flowers, stem also stores food.

7. Shapes and sizes of leaves differ from one to another. Leaves prepare food, carry out respiration and transpiration.
8. Food prepared by leaves is taken to different parts of the plants by the tissue called phloem.
9. Through the process of absorption and transportation, water and salt from the roots reach the leaves and food prepared by the leaves reach the roots and other parts.
10. Plants throw out extra water through stomata of the leaves by the process of transpiration.

Practical Work:

1. Prove through an experiment that stem of the plants carry out transportation process.
2. Prove through an experiment that leaves of the plants prepare food.

Exercise:

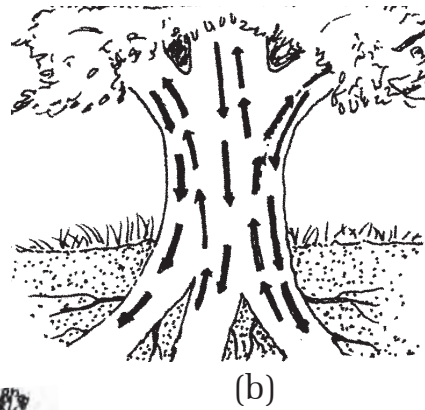
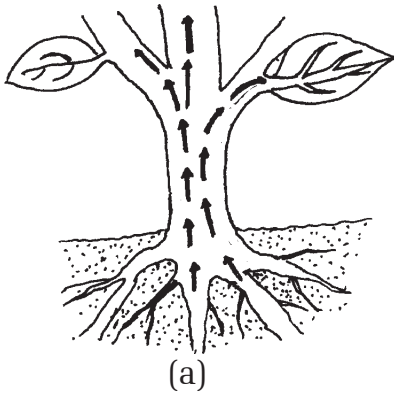
1. Pick the correct answer:

- a) Which of the following is not a part of shoot?
 - i. Leaf
 - ii. Node
 - iii. Terminal bud
 - iv. Root cap
- b) Which of the following is the work that stem performs?
 - i. Transportation of water and salt
 - ii. Absorption of water and salt
 - iii. Preparation of food
 - iv. Stop soil erosion
- c) Which of the following plant has underground stem?
 - i. Radish
 - ii. Carrot
 - iii. Potato
 - iv. Sweet potato
- d) Which of the following work do leaves do?

- i. Transpiration work
- ii. Photosynthesis
- iii. Respiration
- iv. All of the above

2. Answer the following questions:

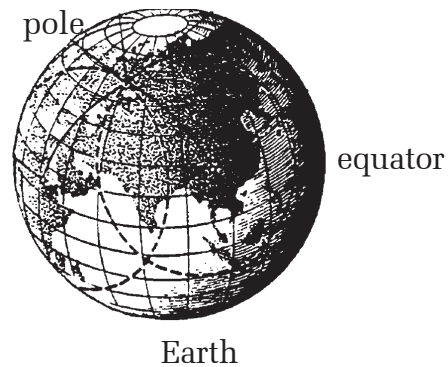
- a. Write down the parts of plants.
- b. Write a function each of root, stem and leaf.
- c. Which part of the root absorbs water and minerals?
- d. In which type of root is root cap found and why?
- e. Where is terminal bud found and what is its work?
- f. How can it be proved that leaves prepare food? Describe an experiment.
- g. Which process does each of the following pictures show ? Write down.



(c)

The earth is our common habitat. However, it is considered spherical in shape but it is not like a ball at all. Its equatorial region is bulged and the polar part is slightly flattened. The diameter of the equatorial part of the earth is about 12800 km whereas that of polar part is about 12751 km. The earth is only one planet where the existence of life is possible. Water, sunlight, suitable temperature and presence of oxygen in the atmosphere available on the earth are the basis of survival of life on it. It is looked blue in colour from the space. It is because of water present on it.

The earth is divided into three parts as lithosphere, hydrosphere and atmosphere. The land part of the earth is called lithosphere and its water part is called hydrosphere. The earth is surrounded by a layer of air called atmosphere.



Structure of the earth is also divided into two parts as External part and Internal part.

External structure of the Earth

The outer part of the earth is found to be hard and about 50km in thickness. One fourth of the earth's surface is land whereas about three fourth part is covered by water. The maximum water part is occupied by seas. The highest peak of the land is Mt. Everest present in our country which is 8848 m high from the sea level. The water body of the earth consists of rivers, lakes, seas, oceans etc. The geological disturbances and changes cause the formation of mountains, valleys, plains etc. The outer part of the earth can be separated into water part and land part.

Activity 1

Look out from the classroom. Can you see rivers, hills, mountains etc? Draw such scene in your copy.

Mountains:

Generally the land mass about 300 m or higher than it from the sea level is called mountain. Some of them are higher in altitude where as others are lower. The mountain with lower altitude and steeped land surface are called hills. On the basis of the (height) altitude their height is lower than 300 m. The height and the steepness of mountain are different. Some of them are too steep where as others are less steeped. So many mountains are there in the northern belt of our country. There is snowfall on the mountains at the height of more than 1829 metre (6000 feet) throughout the year. Such mountains are called Himals. The row of Himals is called Himalayas. Including smaller and higher, there are so many Himalayas in our country. Out of ten top peaks in the world, seven top peaks are there in our country.



Himal, mountain and hill

The inner part of the earth is generally made up of hard rocks. Few feet of outer surface of the mountain is covered by soil and gravel. Some mountains are formed by hard rocks where the plants do not grow.

Plain:

The plane land mass upto 200m in altitude from the sea level is called plain. It is formed by the deposition of soil and humus of animals, plants etc carried by the streams and rivers from the himals and mountains. Therefore, the plain is fertile. The soil of plain is suitable for cultivation. The Terai region of Nepal is one of its examples.

Valley:

The plain surrounded by the mountains is called valley. The shape of valley is like a bowl. Since it lies in the low altitude, the fertile soil and biomass are carried by the river and rivulets lets of surrounding mountains in the plain. As a result, such valleys become more fertile. The capital city Kathmandu of our country is the same type of valley. Pokhara, Dang, Surkhet, Arun etc are also the valleys. Valleys can be formed by the deposited soil of river, dried or burried lakes etc.



Kathmandu Valley

Plateau:

The high land mass with a plane surface at the top is called plateau. Plateaus are also the Himalayan region but with plane surface instead of steepness at the top. Tibet is a type of plateau.

River:

The big mass of water which flows continuously is called a river. Rivers are originated from any lakes, sources of water or Himalaya. While flowing down rivers mix with each other and end at the sea or ocean.



River

The flowing rivers carry soil, leaves, rocks etc. from the surrounding and its speed decrease in the plain surface. As a result such things get deposited at the bottom. The river is a base for human life. The ancient civilizations of the world are found to be developed on the banks of the rivers. In Nepal rivers are used for fishing, irrigation, hydropower production etc. The main rivers of Nepal are Koshi, Gandaki and Karnali.

Lake:

The big mass of water surrounded by the land is called lake. It is the main need for the aquatic, wet land animals and plants. Big lakes are regarded very attractive from the tourism point of view. Fish farming, rowing (boating), swimming etc can be done in the lakes. Many lakes like Rara lake, Tilicho lake, Phewa lake, Ghoda Ghodi lake etc are in Nepal.



Lake

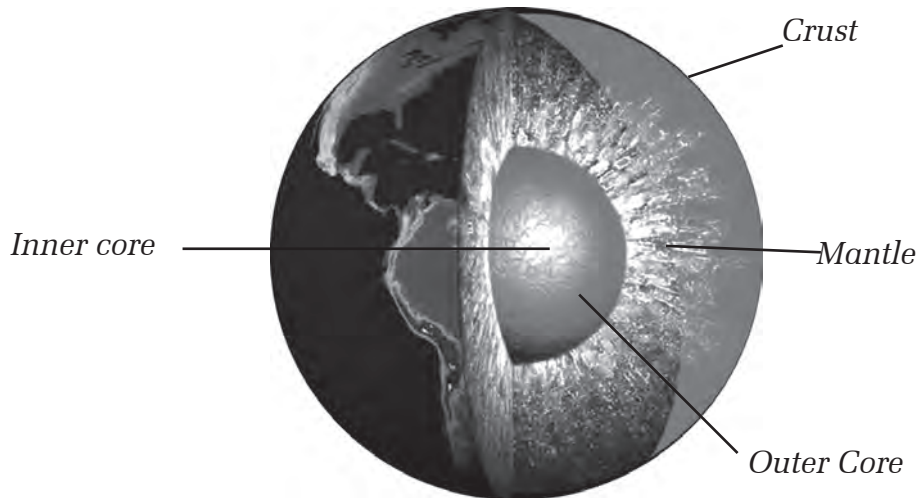
Sea:

The huge mass of water on the surface of the earth is called sea. The maximum part of the earth is covered by seas. The huge ocean like Pacific Ocean, Atlantic Ocean, Indian Ocean, etc are the seas. Shipping, fishing, cultivation of marine plants and animals can be done in the seas. Due to easy and chief transportation, it is also known as the base of development. Ranging from unicellular organism to huge multicellular organism like whale are found in the seas. Thus the sea is the huge habitat of the aquatic life.

Internal structure of the Earth

The earth was like a red hot molten sphere when it was formed. Since it is cooling slowly, although its outer part is seen to be hard and cold, the inner part is still red hot and in the molten state. Even the outer part contains, mountains, plains, oceans and solid rocks, the inner part contains molten rocks and metals. On the basis of state of rocks and structure, the earth is divided into four layers, they are

- (a) Crust
- (b) Mantle
- (c) Outer core
- (d) Inner core



structure of the Earth

(a) Crust:

The outer most layer of the earth is crust. The thickness of the crust is not uniform. It lies upto 50 km below the earth's surface. It is made up of soil and rocks. Activities like housing, cultivation, urbanization, road construction, etc. are done on this layer. Oceans, rivers, forests, mountains etc. all are situated on the crust. Mainly the silicate mines are in this layer.

(b) Mantle:

Mantle lies below the crust. Its thickness is about 2900 km. Although its temperature is comparatively higher than that of crust, substances (objects) are still found to be in the solid and flexible state. It is made up of hard silicate and the minerals like iron and magnesium. The density of the rocks in this layer is more than two to three times than that of outer layer. The temperature of this layer ranges from 750°C to 2500°C.

(c) Outer core:

The thickness of this layer is about 2100 km. Heavier metals like iron, cobalt and nickel are there in this layer. Since the temperature of this layer ranges from 2500°C to 3000°C, these rocks and metals are in molten state.

(d) Inner core

Inner core of the earth is its central core. The thickness of this core is about 1300 km. Due to the tremendous high pressure in this core, the temperature ranges from 3000°C to 5000°C. Result of the high pressure on it, the molten matters remain in the dense and tight solid state. Rocks in this layer are about five times heavier than those in the outer layer.

Activity 2

Take a hot boiled egg. Cut it into two identical halves along with outer shell. Compare its internal structure with the internal structure of the earth. Insert a thermometer inside its different layers. Does the temperature go on increasing as it moves down?

Practical activity:

1. Soften certain amount of soil mixing water and husk. Make the structure of mountains, rivers, lakes, valleys etc keeping it on a ply wood or on a smooth and plane surface. When it gets dried, colour it with suitable colours.
2. Soften certain amount of soil with water and provide the shape of a sphere. Take one fourth part of it out with the help of a knife.

Let it dry up for some days (1 to 2 days) and colour its inner part with white enamel or water colour. Colour the different layers with different colours to the thickness of the layers of the earth. (Suitable fruit can be used instead of the soil)

Summary

1. Instead of being a perfect sphere, the polar region of the earth is slightly flattened at the top and it is bulged in the equatorial region.
2. The external structure of the earth is not uniform everywhere.
3. There are mountains, valleys, plains, plateau as the land mass and ocean, rivers, lakes etc as the water mass on the surface of the earth.
4. There is about 30% of land part and about 70% of the water part in the earth.
5. The part of land raised slightly compared to its surroundings and reaching above 300 m high is called mountain.
6. The plane surface up to 200 m high from the sea level is called plain.
7. The plane land surrounded by the mountains is called valley, Kathmandu, Pokhara, Dang, etc. are the valleys of our country.
8. The huge mass of water in the earth is called ocean.
9. The internal part of the earth is made up of three layers.
10. The temperature below the earth surface rises with increase in depth.

Exercises

1. Fill in the blanks

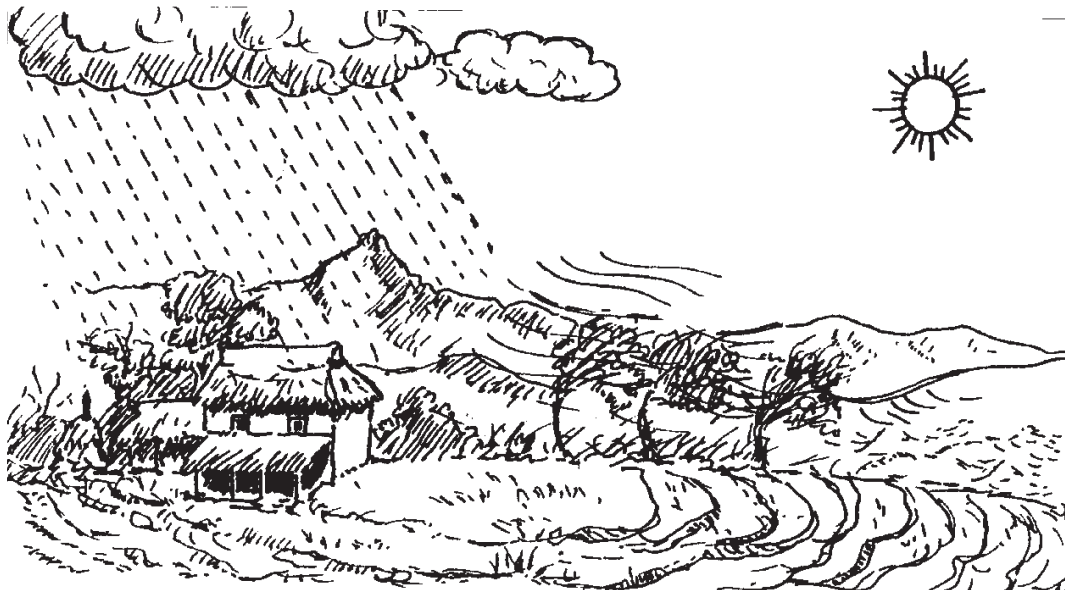
- (a) The layer that surrounds the earth is called
- (b) There are layers in the earth.
- (c) is formed by the deposition of soil carried by streams from the surrounding mountains.
- (d) The land mass of height above m is called mountain.
- (e) is the base of life.
- (f) The innermost layers of the earth is called
- (g) The density of the rocks in the inner core of the earth is than that towards its surface.

2. Write short answer to the following questions.

- (a) By what substance is the outer layer of the earth made up?
- (b) In how many layers is the inner part of the earth divided?
- (c) Which inner layers of the earth are thicker and thinner? Write their thickness as well?
- (d) What is the region behind being the minerals and rocks in the solid state at the inner core of the earth despite the high temperature?
- (e) How is a river formed? Write its importance?

When we observe the sky, either we find cloud or sun. Some times there is rain or blowing air. Such conditions cannot be remained stable forever. Immediately after the cloudy day, it may become sunny day. Immediately after the sunny day, it may become windy and rainy day. Such varied condition of the atmosphere is called weather. The change in temperature, pressure condition of wind and rain, humidity etc of a particular place is called weather of that place. Being cold, hot, cloudy day, sunny day, rainy day, etc. are the different types of weather. Weather changes with time. The effect of weather seems in a small region of the earth. It may be a cloudy day in the neighborhood of a sunny day. In the same way it may be raining in another place. The duration of the weather is short and uncertain because it changes even with very short interval of time.

The condition of sun light, water, wind (air), temperature, humidity etc of a particular place for a short interval of time is called weather.



Activity 1

Study the weather (eg sun light, cloud, rain etc) of your place at 10am, 1 pm, and around 4pm and fill the following table drawing it on a chart paper. Also keep the records of a week end conclude on the basis of this record.

Place:

S.no.	Date	10am	1pm	4 pm

Conclusion:

Thus the weather of a particular place can be forecasted by studying the average result of the long term condition of sunlight, air, rain, etc of that place.

Factors affecting the weather

The weather depends upon various factors, Sunlight or position of the sun, speed of wind, water, temperature, humidity of air, rain, cloud etc are the factors that affect the weather. Here we will have short discussion about the affect of temperature, relative humidity and rain in the weather.

Temperature:

The sun is the main source of energy. When the sunlight falls on the surface of the earth normally, there is rise in temperature. Movement of air is caused by the change in temperature in the earth surface and atmosphere. Being hot, cold, blow of air and storm etc are the effects of temperature.

Relative humidity:

Presence of water vapour in air or its moisture is called humidity. The ratio of the actual amount of water vapour (absolute humidity) present in the air to the saturations point at the same temperature is called humidity. It is expressed in percentage. Higher the relative humidity, more the moisture of the air. Generally the relative humidity closer to 100% indicates the possibility of rain. The weather becomes wet or dry due to moisture in the air.

Rain:

When water particles in the cloud are combined to form bigger size it can not be held in the cloud. Then it falls towards the earth in the form of water drops. It is known as rain. The rain also affects the weather even the rain itself is a condition of the weather the effects like (decrease) fall in temperature, humidity and others effects can also be seen due to rain. Water droplets in the form of cloud cast shadow on the earth which causes cold weather on the earth.

Types of weather

There are different types of weather. As mentioned above the condition of atmosphere in the short interval of time is the weather. Being hot and cold, storm, dryness, cloud formation, raining etc are the different types of weather. Specially the weather is classified into following four types.



Hot weather



storm



Rain



Cold weather

Different types of weather

When the sunlight falls normally and the cloud does not block it, there is hot weather at a place. During this time, the earth's surface as well as the air closer to it get heated up. Since the hot air rises up and cold air moves down there is blowing air in such weather. Consequently it can be felt very hot. The air in this weather is dry because of the evaporation of water vapour on the earth's surface due to the heat from the sun.

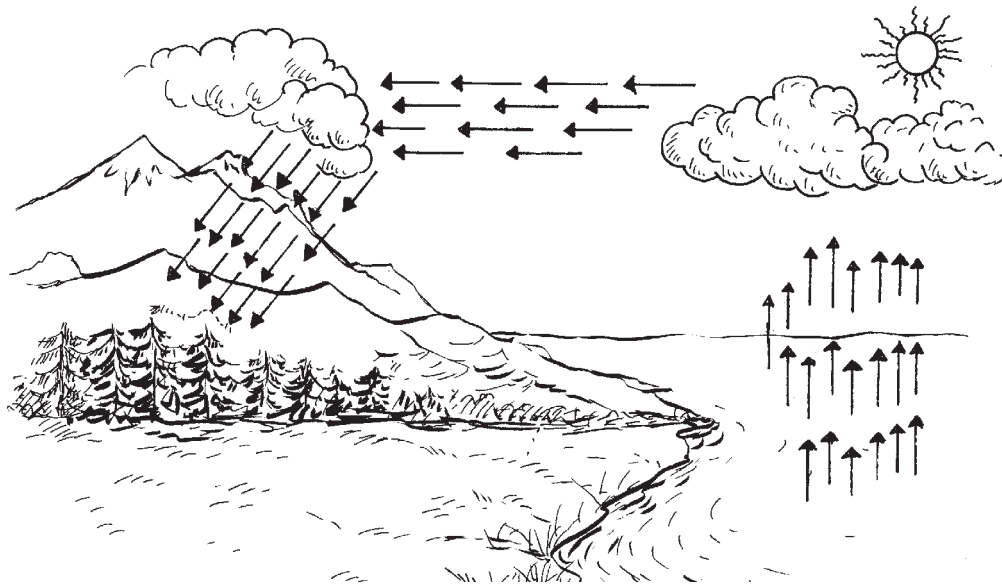
In the condition when the sun is blocked by the cloud or is the cloudy weather, there is low temperature and dim light on the surface of the earth. When there is cloud in the sky during the summer season we (experience) feel cool but we feel cold in the same condition during the winter season. Sometimes there may be speedy wind unexpectedly. Specially during the intensified sunlight, there can be speedy wind because of increase in speed of the wind. The speedy wind is called storm.

As the storm in the winter breaks the branches of the trees, up roots trees blows away the roofs, it is very disadvantageous to us.

If there is a large amount of moisture in the cloud, it changes into water drops and it may cause rain. There is heavy rain fall in the rainy season whereas it rarely rains in the winter season. Since the plants grow properly during the rainy season, it is considered better for the plants. The rain fall in the summer season gives somewhat relief from the hot. The heavy rain may cause soil erosion, floods and land slides etc.

Water cycle:

The water from the sea, lake, pond, river, etc reaches to the atmosphere in the form of water vapour due to the heat from the sun. Since this water vapour is lighter, it rises up. As the vapour rises up, it keeps on condensing. When condensation of water vapour takes place, the water particles get collected to form cloud. As the water vapour rises upto the significant height whole the vapour gets condensed to change in the form of water droplets. When the water droplets combine to form bigger drops, it cannot be held in the atmosphere and finally fall down to the earth's surface. This is called rain fall. This rain water gets collected again in the sea, lakes, rivers, ponds etc. This process is continuously repeated in the same way. Thus change of water on the earth into water vapour due to heat from the sun and returning back from the atmosphere to the earth again after the condensation is called water cycle. For the determination of types of weather and



Water Cycle

weather change, the water cycle plays a vital role.

Practical activity

1. Making weather chart : draw pictures of four types of weather in a news print and paste on a card board paper. Make a needle at the centre so that it points out the weather of your locality.
2. Boil one half kettle of water. When water vapour comes out from the nozzle hold a cold plate above it. You will see hanging drops of water on the lower part of the plate which fall down after a while. Conclude a result on the basis of this experiment.

Summary:

1. Weather is formed by recent condition of atmosphere, sunlight, speed of wind, temperature, humidity, cloud etc.
2. Sunlight, water, and air are the main factors of weather.
3. The process of raising the hot air up and downward movement of cold air to occupy the vacant space, causes the blow of air.
4. There can be different types of weather. Generally we can observe four types as sunny day, cloudy day, rainy day and windy day.

5. The cycle in which there is movement of water on earth's surface in the form of vapour towards the atmosphere and returning back to the earth in the form of rain is called water cycle. This is a continuous process.
6. Water cycle plays a vital role for the weather condition.

Exercise

1. Fill in the blanks

- (a) The atmospheric condition of a particular place in a short interval of time is called
- (b) occurs due to the current of hot air and cold air.
- (c) The air moves from to in the sea bank during the day time.
- (d) falls at the high mountains during the winter season.
- (e) It may rain when the relative humidity reaches to
- (f) When water vapour raises up, it changes into

2. Answer the following questions:

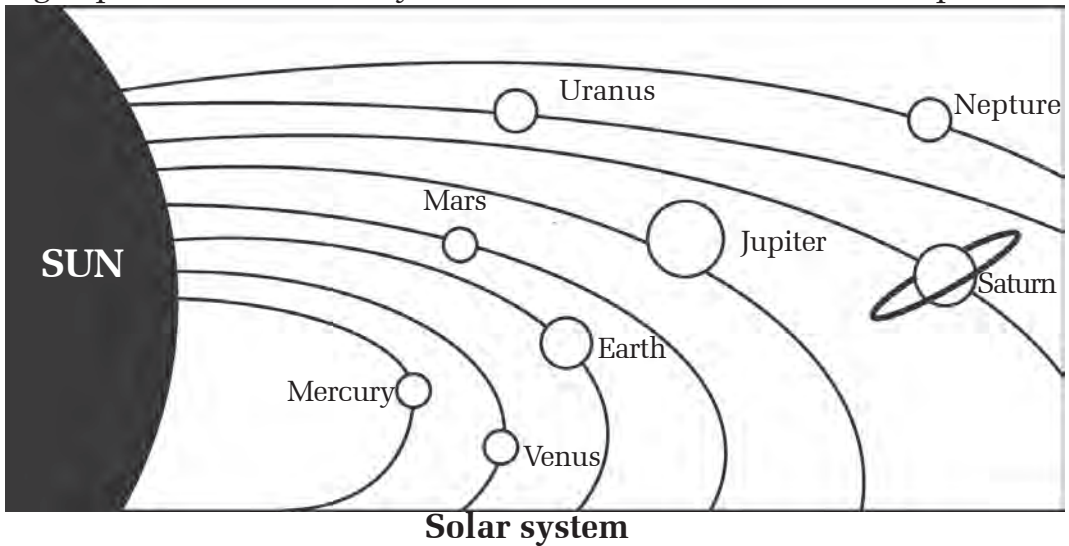
- (a) What is weather?
- (b) What are the factors that affect the weather?
- (c) How does relative humidity affect on the weather?
- (d) Write any four types of weather and explain in short about the windy weather.
- (e) How does water cycle continue in the earth? Explain it.

3. Give reasons.

- (a) We feel cold in the cloudy day.
- (b) As the relative humidity increases, there is possibility of rain fall.
- (c) The water cycle is not possible in the absence of sun.
- (d) When the water vapour raises up from the earth's surface, there is formation of cloud.

4. Draw a clean picture of water cycle and colour it.

The group of eight planets, their satellites and other heavenly bodies including the sun is called solar system. Almost all the masses in the solar system revolve around the sun in their fixed orbit keeping it at the centre. The earth is a planet of our solar system. There are eight planets in our solar system. They are ; Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. Besides these eight planets there are other small heavenly bodies like moon, meteors, comet etc in the solar system. All the planets rotate about their axis and revolve around the sun as well. Even the planets do not have their own light, they appear brighter by reflecting the light from the sun. Due to the gravitational force between the sun and the planets they revolve a round the sun maintaining a fixed distance. Out of these eight planets the Mercury is nearest to the sun and the Neptune is



farthest to the sun. Jupiter is the largest planet where as the Mercury is the smallest one. Even though almost all the planets look bright, the Venus is the brightest one.

On the basis of the closer distance from the sun, the eight planets in the solar system are as follows.

Mercury:

Mercury is the smallest and the nearest planet to the sun. As it lies

very nearer to the sun, there is very hot during the day time and very cold during the night time. There is no atmosphere on the Mercury.

Venus:

The second nearest planet to the sun is Venus. Its size is about similar to the Earth. It is the brightest planet. It can be seen in evening time and early in the morning.

Earth:

Our home planet where all the requirements for the lives are available is the Earth. Since there is water, atmosphere and suitable temperature for life on the Earth, lives have become possible.

Mars:

The light red planet in the sky is Mars. Since water and oxygen is found in its atmosphere, it is predicted to have lives in the mars.

Jupiter:

The largest planet in the solar system is Jupiter. Till now, the maximum number of satellites are found around this planet.

Saturn:

The planet which looks as big as Jupiter is Saturn. There are three elliptical rings in its outer surface.

Uranus:

Uranus is about 14 times heavier than the earth. It is a very cold planet due to its maximum distance from the sun.

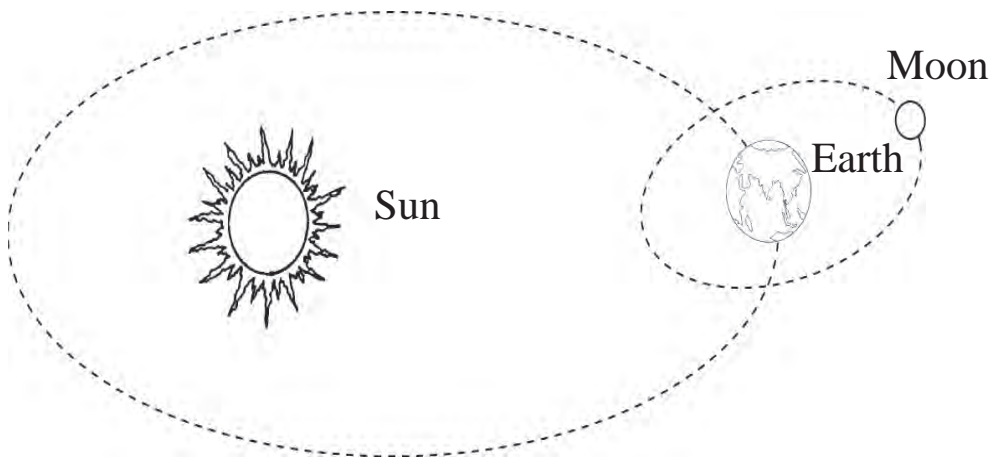
Neptune:

Neptune is the farthest planet to the sun. There is a black spot on it as big as the Earth.

All the planets revolve a round the sun in elliptical orbits. The orbits of all the planets lie on the same plane. Some of them are slightly tilted in their orbit. Along with the rotation, all of them have annual motion. The speed rotation (daily motion) and the annual motion (revolution) of each and every planet are different. As the distance from the sun increases, the time period for the rotation of a planet also increases.

Comparison of the sun, the earth and the moon

Almost all the heavenly bodies are spherical in shape. The sun, the earth and the moon are spherical. Although the moon and the sun look identical in shape and size, the sun looks so due to its longer distance from the earth even it is too much bigger than the moon. As the distance of the objects increases they seem smaller in size. When a big flying kite covers longer distance it is seen to be smaller in size.



While comparing the size of the moon the sun and the earth, it is necessary to have study about their diameter.

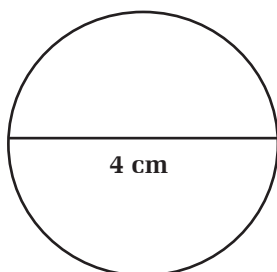
Diameter of the sun: about 1400000 km

Diameter of the earth: about 12751 km

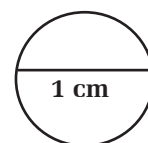
Diameter of the moon: about 3456 km

The given data shows that diameter of the earth is about four times more than that of the moon whereas the sun is 110 times bigger than the earth. We can compare the size of the moon, the earth and the sun by comparing a mustard seed, a pea seed and a football respectively.

When the diameter of the earth is taken as 4 cm, the diameter of the moon is to be supposed 1 cm only.



Earth

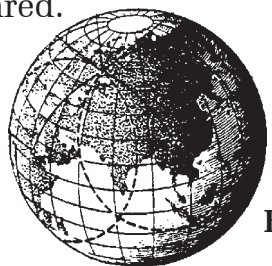


Moon

While comparing the distance between the moon, the earth and the sun, the moon is very close to the earth and the sun is very far from the earth.

The distance of the moon from the earth is about 347000 km where as the distance of the sun from the earth is about 150000000 km.

If a marble with diameter 1 cm at a distance of 1 m and 20 cm from a pea seed with diameter 2.5 mm the marble and the pea seed can be considered as the earth and the moon respectively. Similarly if the marble (the earth) kept 430 m apart from a sphere of diameter 1m and 10cm considering it as the sun, the size of the earth and the sun can be compared.



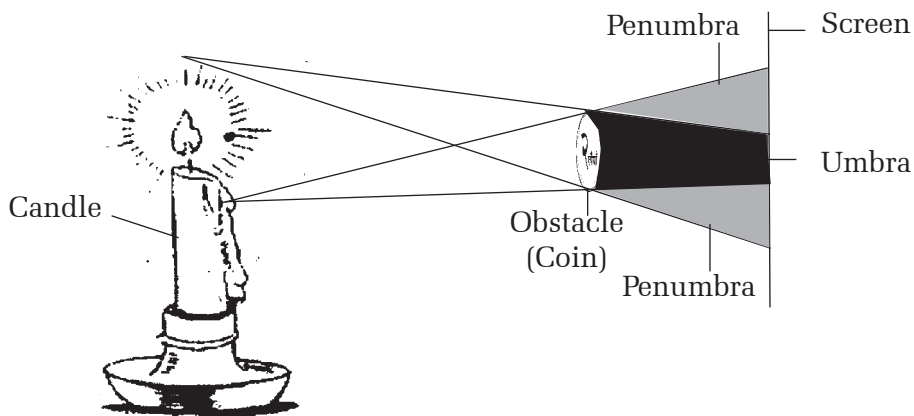
Earth



Moon

Umbra and Penumbra:

Adjust a white screen and a burning candle at a distance on a table. Now place a 2 rupee coin in between them. The coin should be close to the screen. You will get shadow of the coin casted as the screen. The shadows are of two types on the screen. The shadow at the centre is dark and that at the side is light. The region where the total light is blocked a dark shadow is formed and where the light is blocked partially light shadow is formed. The dark shadow is known as Umbra and the light shadow is known as penumbra.



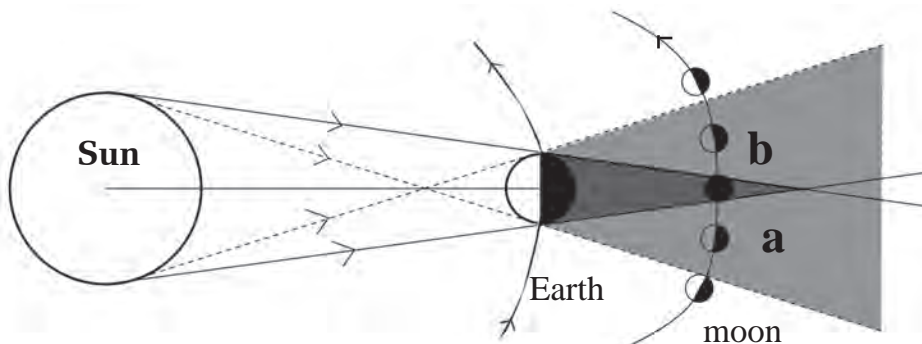
Eclipse:

The moon revolves around the earth and the earth revolves around the sun. Therefore, the moon sometimes comes between the sun and the earth and the earth sometimes comes between the moon and the sun. As a result the shadow may fall on the moon or on the earth. This process of falling of the shadow on a heavenly body is called the eclipse. Mainly there are two types of eclipse, solar eclipse and lunar eclipse. Now we will study about these two types of eclipse.

Lunar eclipse:

During the revolution of the earth around the sun and that of the moon around the earth, these three bodies may come in a straight plane being the earth at the middle. In this condition the earth blocks the sunlight for moon. The earth casts its shadow on the moon.

If the whole moon lies inside the umbra (figure b) the moon is darkened taotally. This is called total lunar eclipse. If only a certain part of the moon lies inside the umbra (fig a), that part is seen dark. This type of lunar eclipse is called partial lunar eclipse. Lunar eclipse occurs on the full moon.

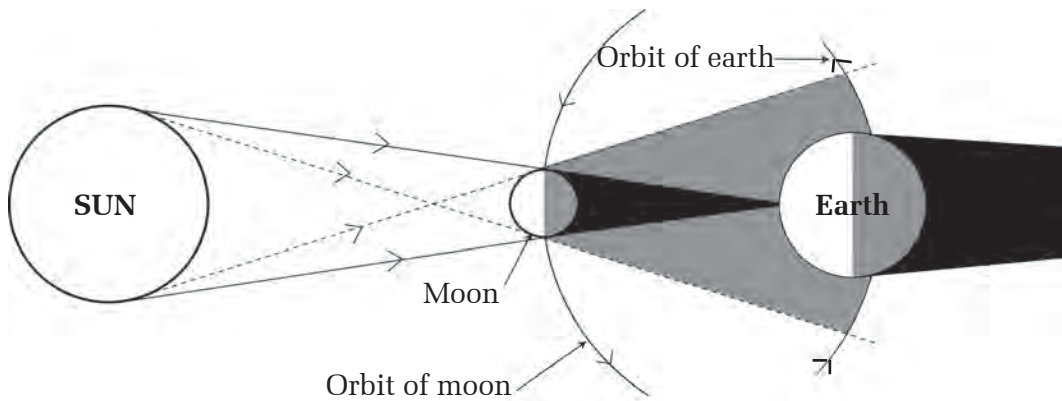


Lunar eclipse

Solar eclipse:

During the revolution of the earth around the sun or the revolution of the moon around the earth the three heavenly bodies may come in a straight plane being the moon at the centre. In this condition the moon casts its shadow on the earth. Since the moon is smaller than

the earth, it can not block whole earth by casting its shadow. Thus both types of shadow fall on the surface of the earth at the same time. If an observer is in umbra region he/she observes total solar eclipse. Similarly from the penumbra only a certain part of the sun is seen on the earth. This is known as partial solar eclipse. It occurs in new moon day.



Solar eclipse

In each new moon and full moon there is a condition of being the sun, the earth and the moon on the same straight line. Since, the orbital plane of the earth and the moon are tilted by certain angle, the eclipse does not occur on each new moon and full moon. Thus the eclipse does not occur on each new moon and full moon.

Practical activity:

1. Prepare a model showing solar and lunar eclipse and demonstrate. With the help of this model, describe how solar and lunar eclipse occur.
2. Take some round lumps of soil or different round objects and compare the size of earth, moon and sun.

Summary

1. Solar system is formed by the group of eight planets, their satellites and other heavenly bodies including the sun.
2. There are eight planets in the solar system. They are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune.
3. All the planets are not similar – Jupiter is the biggest planet and Mercury is the smallest one. Earth is the only planet where living beings exist.
4. Though the Sun and the moon are seen of similar size from the Earth, the Sun is very big in reality. They are seen of equal size because the sun is further than the moon.
5. The sun is 15 crore km far from the Earth whereas the moon is about 3 lakh 47 thousand km far from the Earth.
6. The diameter of the earth is 4 times more than that of the moon whereas the diameter of the sun is 110 times more than that of the earth.
7. Lunar eclipse occurs when the moon lies in the shadow of the earth and solar eclipse occurs when the shadow of the moon falls on the earth.

Exercise:

1. Fill in the blanks:

- (a) There are planets in the solar system.
- (b) is the biggest planet.
- (c) eclipse occurs when the shadow of the earth falls on the moon.
- (d) During solar eclipse lies between sun and
- (e) Except the earth is the planet where life may exist.

2. Answer the following question:

- (a) What is called solar system?
- (b) Write all the planets serially according to the distance from the sun.
- (c) Write in short about the biggest and the smallest planet.
- (d) Compare the size of Sun, Earth and Moon.
- (e) What is eclipse? How does it occur?
- (f) What is called total eclipse and partial eclipse?
- (g) Draw a neat figure of lunar eclipse and describe how does it occur.
- (h) Draw a neat figure of solar eclipse and write down how does it occur.
- (i) Why is there no eclipse in every new moon and full moon?

3. Draw a neat figure of solar system.

Introduction to Environment and its Importance

All living beings are related to environment. The word environment comes in different contexts. People use this word for various meanings. We will study in this unit about the environment and its balance on the basis of the aspects of living and non-living things, their dependencies, interrelations, their activities and conservation.

Introduction

The Earth is covered with air around it. Therefore, the environment includes the whole Earth and the air wherever it has extended. In simple words it can be said that, air, land, water, sound like aspects are included in the environment. Therefore environment is the surrounding around us. Environment is the combination form of living and non-living things in such a context. Environment is the collective form of various aspects such as physical, natural, biological, social, economic and chemical. They interact with each other in some or many aspects. Such interactions and activities occur continuously, therefore there is one or the other form of change in the environment.



Environment Situation

Activity 1

Observe the field nearby your school and prepare a list of all the objects that you see there. Write a short description about environment on the basis of those objects.

Importance

We should know the mutual relationship of living and non-living things to understand the importance of environment. Similarly, we should also understand the interdependence of them. Some examples which are related to the importance of environment are given below.

Land is one aspect of the environment. Similarly, human beings, animals and birds are also the other aspects. Human beings make their habitat on the land. Humans receive grains, leafy vegetables, fruits, medicinal plants that they need from the land. Humans put fertilizers in the land to protect the land. They also make efforts to stop landslides. Animal and birds also make their habitat on the land. They obtain food from the land. They grow up on the land. They survive their lives on the land.

Water is another aspect of environment. All the living beings need water. Humans use water for cleanliness, to cook food and for farming. Land becomes dry if there is no water. Animals and birds need water for food and for water pleasure. Similarly, water is also the habitat for water animals such as fish, frog, snakes etc. This shows the relationship among humans, animals, birds and water which are environmental aspects.

The sun is an important aspect of environment. Living beings cannot live without the sunlight and heat. We need light to see any objects. We need heat to be safe from cold and to cook food. Heat gives energy to live. Similarly, other animals also need heat to be alive. Therefore all the creatures including human beings cannot live without the environment.



Importance of Light and Heat

Environmental Components

The scope of environment is unlimited. Environment includes living and non-living systems. They can be divided into two groups i.e. abiotic and biotic components.

(a) Abiotic Components

Non-living aspects are included in abiotic component. Its examples are – air, water, land, soil, energy etc. We will study about it below.

Air

Air is an important aspect of environment. Air has covered the Earth from all the sides. This layer of air is called atmosphere. There is an estimate that there is 78% Nitrogen, 21% oxygen and 1% other gases in the air. Air also contains the gases like carbondioxide, neon and helium. Oxygen is life air. All the animals and birds need oxygen for respiration. Animals and birds take in oxygen and throw out carbondioxide. The air in the atmosphere should be balanced. The environment is polluted when the oxygen decreases and carbondioxide increases in the atmosphere. When this happens, there

is an obstruction in the life system of the living beings. It is difficult for them to be alive. To stop such condition, we should protect jungle. We should stop carbondioxide, sulphur dioxide like gases that the industries produce. We should also decrease the consumption of the fuels like petrol, diesel etc. Pollutant gases that are produced from the litter also pollute air. Therefore, rubbish should be managed properly. These efforts will help to maintain balance in the atmosphere. Due to this, the air will remain pure.

Water

Water is a necessary thing for all living beings. Water is formed by two part of hydrogen and one part of oxygen. This is a compound object. At all locations of the Earth, there is water in one or the other form.

In different part of the Earth, water is found in the form of lake, pond, river, sea, glacier etc. There is water on and under the surface of the Earth.



Use of underground water

People bring out underground water by penetrating pipe or by making well. They use this water for cleanliness and for irrigation. Such water is also collected in large amount and is supplied for drinking. Water found in all the sources is not useful for drinking. There is an estimate that only 3% water is useful for drinking. Therefore there is importance of drinkable water.

Land

Environment is always attached to the earth. Generally, the word land refers to the earth. Among three parts of the earth, there is only one part land. Land is in different forms such as plain, steep hill, high land, low land etc. Land is formed by soil and rock. Rock and soil both are the environmental objects. Soil is formed after hundreds of years weathering of rocks by the sun, water and air. Weathered rock becomes soil after chemical and biological processes. It is estimated that it takes two hundred to five hundred years to form an inch of soil. Soil contains necessary nutrition and moisture needed for plants. Human beings grow grains, vegetables, fruits, medicinal plants etc in the soil.



Forms of land

Sal, sisau, mango, banana, lemon like trees grow in the soil. Human beings, animals and birds need plants to survive. There will be scarcity of habitat and food if there is no soil.

Energy

The sun is the main source of energy. Light produced from the sun gives heat and brightness. Therefore the light of the sun is an important source of energy. Living beings will be in dark in the absence of light. Animals and birds see the surrounding objects with the help of the light. They sit under the sun in order to get heat in the winter season. Plants use sun light to prepare their food. They need sunlight and heat to grow. Humans use plants as source of energy after they dry and decay. They obtain light and heat from them.

(b) Biotic Components

Biotic components include the community of animals. Their habitat, food, life cycle are related to the environment. Biotic component can be divided into three categories i.e. producer, consumer and decomposer.

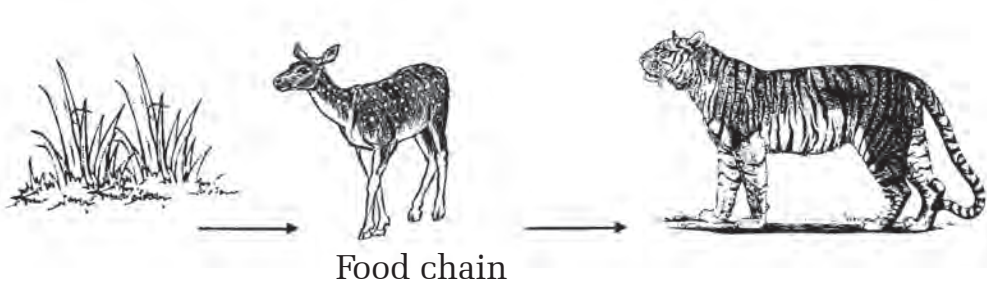
Producer

There are different types of green plants on the earth. They produce foods for the animals. Therefore green plants are called producer. Paddy, corn, millet sesame etc are green plants that produce food for the human beings. Similarly, mango, banana, orange, apple, pear etc are produced by green plants. Green plants take air, water and nutrients from the environment. They grow with the help of these facts. Therefore, the green plants are called autotrophs.

Consumer

Animals that depend upon others to obtain food are called heterotrophs. Consumer are herbivorous, carnivores and omnivorous. Omnivorous eat plants, fish, meat, etc. The consumers feed on producers for their food. Consumers survive by eating to them. Such foods help them to grow. Animals eat grasses, plants and other agricultural products. Animals that eat meat, fish and plant related products are called omnivorous. Human beings eat grains, vegetables, fruits etc. Some animals and men also eat meat.

Food chain



They receive energy that they need from such food. They can survive and grow their body from this. Therefore consumer is an important aspect of environmental activity. They consume things available in the environment. They cause some changes in the environment as well.

Decomposer

Decomposer is such an organism that decomposes dead bodies. Bacteria and fungi are the examples of decomposers. Decomposition is to help to break and decay the food. Decomposers use their digestive juice to decay objects. Some of the objects is used for their food. Decayed materials mix in soil. Plants use them as nutrients again. Almost all decomposers are heterotrophs. Some depend upon dead animals for survival.

Activity 2

Observe biotic and abiotic things at any location. Make a list of five biotic and five abiotic objects. Discuss the mutual relationship of these things.

Practical Activity

Observe your school ground and make a list of various components available in that environment. Write down in your practical notebook dividing them into biotic and abiotic component.

Project work

What things are available in the locality where you live? What has happened there, observe and describe in ten to fifteen sentences.

Summary

1. Environment is the collective form of living and non-living things.
2. Various aspects such as biological, natural, physical, social and cultural aspects are included in the environment.
3. Environmental aspects such as land, water, minerals, air show the importance of environment.
4. Land is the habitat of different animals including human beings. Human beings use grains, fruits, herbs, fire woods, grown on the land to support their lives.
5. Animals and birds survive by eating grass plants and grains.
6. Environment can be divided into two categories i.e. abiotic component and biotic component.
7. Abiotic environmental aspect includes nonliving things such as air, water, land, soil, energy etc.
8. Biotic environmental aspect includes human beings, animals, birds, micro-organism etc.
9. Green plants i.e. grass, paddy, maize, sesame, fruit trees etc prepare their food in their own body so they are called producers. They are autotrophs.
10. Animals that depend on others for their food are called heterotrophs. Consumer and decomposers are its examples.
11. Consumers are herbivorous or omnivorous. Herbivorous eat food produced from the plants but not the meat.
12. Carnivorous eat meat to survive. Those who eat the food produced from the plants as well as meet are called as omnivorous.

Exercise

1. Fill in the blanks with appropriate words.

- (a) The other word related to the environment is
- (b) Physical object fall under..... category of the environment.
- (c) help to decay the objects.
- (d) Consumers depend on for their food.

2. Select the correct answer.

- (a) What is called heterotroph?
 - i. Those who do not depend on others for their food.
 - ii. Those who depend on others for their food.
 - iii. Those who depend on others for their food.
 - iv. All of the above.
- (b) Which one of the following is abiotic component of the environment?
 - i. Grass
 - ii. Bacteria
 - iii. Soil
 - iv. Deer
- (c) Almost all the decomposers are
 - i. Omnivorous
 - ii. Heterotrophs
 - iii Autotrophs
 - iv. Parasite

3. Answer the following questions.

- (a) What do you mean by environment?
- (b) Write the names of any two natural resources and describe them in short.
- (c) Describe with examples the interrelationship of producer consumer and decomposer.

Environmental Balance

There is interaction, movement exchanges and other various activities among environmental aspects. Environmental balance is concerned with these activities. We will study here about the significance of environmental balance.

Introduction, Importance and its Need

Living and non-living things are the components of the environment. Weakness or damage in one of them affects the other. This breaks the environmental balance.

The relation between human beings and water can be taken as an example. Human beings use water for various purposes such as for drinking, cleanliness, irrigation etc. However the sources of water does not finish by its use. It is because the water we use goes under the ground through various ways. Some amount of it changes into vapour and goes high. The vapour changes on water and falls on the land in the form of rain. This is like a cycle that goes on continuously.

Animals survive by eating grass available on the land. They drink water collected in ponds, lakes, rivers, streams, etc. the excretion by the animals is fertilizer for the plants. They mix into the soil after they die.

The above example shows the inter-relationship among animals, grass/plants and water. This activity is an example of the exchange of components and energy between living and non-living things. Their lives exist if they operate such an activity continuously. When this relationship between living and non-living things is maintained and remains stable, the balance between them is maintained. Therefore, environmental balance is the relationship between living and non-living things in the form of continuous cycle. To maintain it should be a cycle of use of environmental component and return of such component in the same or other form into the environment. There remains environmental balance between living and non-living things if it happens in the environment. If there is obstruction in this process the balance between them is lost. Environmental balance is broken when the balance between living and non-living things breaks. Therefore environmental balance helps for the survival of all the living beings.



Himalayan environment

Natural Resource

Natural resource is one aspect of the environment. When we describe the earth, we describe the natural resource in one or the other form. We will study its general meaning, importance and condition here.

Introduction and Importance

The resources available on and under the surface of the earth are natural assets. Natural resources are the things that are available and provided by the nature. Land, plant, water-resource, minerals air etc are natural things. They are environmental aspects. They are connected each other.

The forms of land are different such as plain, steep-hill, low land etc. Some land is cultivable and some is not. The land in our country has been divided into Himalayan, Hilly and Terai region. The land in Himalayan region is covered with snow and it is dry. This region has less cultivable land. The land in hilly region is steep and low. Some land is plain. The land in terai region is plain.



Cultivation on land

Human beings build their houses on the land. They grow grains, vegetables, cash crops, fruits etc on the land. Land is the main sources of growing food. Animals survive by eating crops grown on the land. Medicinal plants are available on the land.

Plant kingdom is a big aspect of natural resource. Various kind of plants are included in it. Plants protect land from their erosion and deposition. Fern, mushroom, algae, herbs are small plants. Chap, mango tree, sallo, saal, chilaune etc are big plants. Forest is the habitat of wild animals. They survive by eating grass, fruits etc available there. Human beings collect woods, fire woods, grass, medicinal plants etc from the forest. They use wood to build houses and to prepare different furnitures. This also provides them employment. It also helps them to be economically strong. Similarly, they can take cattle for grazing in the forest.

There are different kinds of animals and birds in nature. They increase the beauty of that place. Tourists come to observe them. Nepal earns

foreign currencies through this. People want to study the life cycle, their habitat, nutrition process etc of the birds and animals. It has provided employment to many people. Such a study helps to develop skill and knowledge about birds and animals. The country gets benefit from it.

Birds and animals are important environmental aspect of nature. There are various types of birds and animals in the Himalayan, Hilly and Terai region of our country. Birds and animals like brown bear, naur (wildsheep) hispid, wild yak, lophophorus, munal, chilme etc are found in Himalayan region. Jackal, Marten (malsapro), monkey, wild pig, chitah, barking deer, dove, crow, bulbul (jureli), etc are found in Hilly region. Tiger, bear, chitah, elephant, rhinoceros, wild buffalo, alligator, crocodile, python, ghariyal, black antelope, peacock, crane heron, dhanesh etc are found in Terai region. They have added beauty of our country. We can earn foreign currencies through them.

Water resource is the collection of water. Water is on and under the surface of the land. The water in sea, river, lake, pond, glacier is on the surface of land. Under ground water is found in well. We can bring out the underground water by digging deep hole or by penetrating pipe. Water is the main source of electricity and irrigation.

Copper, iron, stone, lime stone, mineral oil, natural gas, coal etc are minerals. Minerals containing copper, iron like metals are found very less amount in our country. Mineral oil, coal, natural gas etc are about nill. We have enough stone and lime stone. They are raw materials for the cement factories established in our country.

Mineral oil such as petrol; diesel is needed to run vehicles. Natural gas is needed for cooking and running small vehicles. Coal is used to burn. It is also used in brick factories. This shows the importance of natural resources.

Activity 1

What are the sources of water in your locality? What are they used for? Observe and write the efforts made to protect these sources.

Status of natural Resources

There is no uniformity in the distribution of natural resources in the world. Natural resources are scattered in different places of the world. Each country has its own natural resources. Some countries have more natural resources and some have less. Our country has various natural resources. Now we will study about them here.

Vegetation

The land of Nepal has been divided into three regions: they are Himalayan region, Hilly region, and Terai region. Growth and development of plants is affected by different aspects such as formation of land, fertility of soil, water, air pressure, temperature etc. Due to these environmental components, the distribution of vegetation varies. Therefore, different type of plants are found in different places of our country. Nepal has variety of land formation and climate. Therefore, various type of plants are found in our country. According to the environmental report of 2008 there are about 10633 types of vegetation found in Nepal. There are 3991 type of flowering plants. There are around 400 types of trees. It is estimated that around 700 types of plants are used as medicinal herb.

Because of the snow, plants are not found in Himalayan part. Coniferous plants such as bhojpatra, chilme, dhupi, devdar, gobre salla, thingre salla etc are found in Hilly region. Rhododendron, phalant, khasru, baanaj, katus, uttis, kalikath, chilaune etc are found in Mahabharat region.

Land

Land is found in the form of plain, hill and steep field. Land is divided into agricultural, forest, field covered with shrubs (butyan), snow covered land and others. Human and other animals use land. Land is a base for their survival. According to the environmental report (2008) Nepal has 14718100 hectare land in total. 21% land is cultivable and 7% land is not suitable for cultivation. Around 29% (42 lakh 70 thousand hectare land is covered with forest. 10.6% land is covered with shrubs and bushes. 12% land is grassy land or grazing area. 17.8% land is covered with snow, uncultivated, land with rock, stone and sand. 2.6% land is covered by water and lake.

Animal

Although Nepal is a small country there is variety in land formation and climate. Due to the variation in environmental aspects, Nepal is in animal diversity. There are different types animals and birds in Nepal. According to the Environmental Report (2008) there are 185 types of mammals in Nepal. Similarly, it has estimated that there are 874 types of birds and 118 types of amphibians in Nepal. Similarly, there are 651 types of butterfly, 78 types of reptiles, 187 types of fishes, and 175 types of spiders.

There is a cold climate in the northern part of Nepal. Snow leopard, Himalayan brown bear, naur, hare, wild yak, wild donkey etc are found there. Junge giddha, golden eagle, lophophorus, himalayan pheasant (munal), chilme etc birds are also found. Warm climate is found in southern part of Nepal. Animals as tiger, bear, leopard, elephant, rhinoceros, wild buffalo, alligator, crocodile, python, ghariyal, black, antelope, stage etc are found in this region. Birds such as peacock, crane, heron, dhanes, etc are also found. Mixed type of climate is found in the middle hilly part of Nepal. Therefore, there are animals that are found in hot and cold environment. Jackal, malsapro, langur monkey, wild pig, leopard, ratua deer etc are found in this part. Similarly, birds such as dove, crow, Nitingale or Bulbul (jureli), sparrow etc are found there.

Activity 2

Observe an animal or a bird for a week that is found in your locality. Find out the relation between animals, birds and land. Write a couple of paragraphs about the relationship of animals, birds and land on the basis of your observation.

Water Resources

Water Resource is the main natural resource of Nepal. Monsoon rain, snow and underground water are the main sources of water in Nepal. In Nepal, almost 75% rain takes place in rainy season. We can use it for economic development of the nation. Around 2.6% is covered by lakes, ponds, rivers etc. Among them, river covers 3 lakh 95 hectare. Similarly, it is estimated that water pool covers 1500 hectare and rural

ponds include 6500 hectare. If we include all of them, they cover 4 lakh 8 thousand hectare. In Nepal, there are 660 lakes that have their area more than one hectare.

Minerals

In Nepal, minerals like limestone, lead, zinc, marble, copper, iron, etc are found to some extent. It is estimated that in Udayapur and Sindhuli, there is 7 crore tons limestone that can be used to produce cement. Similarly, limestone is estimated to be found in Surkhet. Chovar in Kathmandu is also the sources of limestone. It is estimated that there is 1 crore, 53 lakh ton limestone. Similarly, 80 lakh tons limestone is in Bhaise and 1 crore ton in Okhare of Makwanpur district. Limestone is used in cement factory. Agricultural and chemical lime are also made from limestone.

Iron is estimated to be found in Lalitpur, Ramechhap, Rolpa, Tanahu and Chitwan. It has not been dug and brought in use. There is 10 lakh tons iron in Phulchoki of Lalitpur district. There is 1 lakh 40 thousand tons in Kalitour of Makwanpur and 1 lakh 74 thousand tons in Wapsa of Solukhumbu district. Similarly, it is estimated that there is 78 thousand tons lead in Ganesh Himal of Rasuwa, 28 lakh tons lead and zinc in Lawang and Khairang of Dhading district. Around 30 crore cubic metre natural gas is estimated to be found in Kathmandu valley. These resources will support for the economic development of the country if they are used properly.

Project work

1. Observe the surrounding of your school. Make a list of only ten plants available there. Also make a list of ten items/objects that are obtained from them. On the basis of this description, write the importance of plants in ten sentences.
2. Go a bit far from your school and observe the surrounding there. Find out what animals and birds are there. Make a list of any ten animals and birds. Observe the relationship between animals, birds and plants there. On the basis of this description, mention the importance of animals, birds and plants.

Summary

1. Maintaining mutual and stable relationship between living and non-living thing in the environment is the balance between them. This is also called environmental balance.
2. Natural resources are the resources that are available on and under the surface of the Earth. Natural resources are various things that are available or gifted by the nature.
3. Natural resources include different types of animals, plants and physical objects. Their relation is connected to one another.

Exercise

1. Fill in the blanks with appropriate words.

- (a) Forest, minerals etc are resources.
- (b) Environmental is mutual relationship between living and non-living things.
- (c) Out of the total land of Nepal percent land is cultivable.
- (d) The northern part of Nepal has climate.

2. Answer the following questions.

- (a) What is the meaning of environmental balance?
- (b) Describe with examples why environmental balance is necessary.
- (c) Describe in ten sentences showing the relationship between animals-birds and land.

Environmental Degradation and Conservation of Environment

Concept of Environmental Degradation

Environmental aspects such as natural, biological, social and cultural, aspects are around us. Air, water, land, minerals etc. of them are natural aspects. Men, other animals and birds, forest etc living things are biological aspect. Society, rituals, religion, customs etc. made by men are social and cultural aspects. Similarly, humans do different works in the society. The environment created by human activities is called man-made environment. The ruination, damage or change in the quality of these various aspects is called as environmental degradation. Bad effects are seen when there is environmental degradation. These bad effects are also called negative effects. Therefore, environmental degradation refers to the degradation of quality of environmental aspects. Adverse effects are seen on animals when there is environmental degradation.



Environmental degradation

People farm on the land. They want to produce more by using chemical fertilizer and pesticides. They continuously grow crops and do not give rest to the land. Fertility of the soil is decreased due to its continuous use. Degradation of cultivable land is an example of environmental

degradation. Similarly, cutting down the plants and trees from the forest also leads to its end. It affects the habitat of animals and birds, their food and life style. This decreases their number. It is also the damage of environment of forest. It also degrades the condition of animals and birds. In this way, the damage in any aspect of the environment can be taken as an example of environmental degradation.

Activity 2

Observe any forest nearby your school on the basis of the following points.

- (a) What is the condition of the forest (good or bad)?
- (b) Why is the condition so?
- (c) What should be done to improve its condition? Find the answers to these questions through observation and write a short description about the forest.

Causes and Effects of Environmental Degradation and Preventive Measures

Environment is the collection of various aspects. In the environment, the interrelation between living and non-living things should be maintained in a balanced way. Promotion or demotion of this relation between environmental aspects is continuous. The damage of environmental aspect takes place naturally in the nature. They are also maintained in a slow speed naturally. Landslide flow of the sides of rivers, addition of mass of land in some place etc occur in the nature. Small environmental damages are maintained slowly. In this way the condition of environment is damaged and maintained in the nature. Similarly, promotion or demotion of environment is caused by men also.

There may be good or bad condition of living or non-living things because of the humans. Due to poor relation among them, the environmental condition degrades. Respect and care of animals and birds by the humans is a good behavior. Poaching of animals and birds and giving them pain is a bad behavior. Their condition will be degraded because of such behavior of the humans. Such human activities speed up the environmental degradation. As a result, environmental degradation increases gradually. The following two

reasons are responsible for environmental degradation.

(a) Natural causes

(b) Human causes

(a) Natural causes

Environmental degradation caused by natural disaster is taken as natural cause. Various incidents such as flood, landslide, soil erosion, fire, forest fire, maximum rain, snow fall, earth-quake, volcano, drought, thunderbolt, hail stone. Sea wave, spread of epidemic etc are natural disaster. Flood, landslide, soil erosion, fire, forest fire are caused by both the reasons i.e. natural and human. Of these disasters, any natural incident is harmful. Out of the various natural disasters, we will study about flood, landslide, soil erosion and fire here.

Flood

Streams, rivers and sea flow at their own pace. The volume of water in them increases when there is heavy rain, earth quake and when the glaciers get melted. Their speed also increases by such activities.

Due to this, they flow here and there. In this way, when the amount of water in stream, river



Harms caused by flood

etc increases they begin to flow in a greater speed. This is called flood.

During rainy season, streams of hill are collected at one place and begin to flow in a greater speed. This causes flood. Similarly, in terai, water collected from different places begins to flow over the surface of land at greater speed. As a result, flood is caused.

Causes, Effect and Preventive Measures

Flood is caused by natural and human causes. During earthquake, flood may be caused by the damage of sources of water. Similarly, in raining season, continuous rain causes flood in streams and rivers. They are natural causes.

People cultivate in steep field to increase their production. Grazing also weakens the field. Construction of road, bridge and canal damages the condition of land. This makes the soil loose. People destroy forest to fulfill their need. It makes the land open and loose. Such human activities degrade the land. The degraded and loose land cannot absorb water. As a result, water flows in a greater speed during rainy season. When more water is collected in a place it takes the form of flood.

Flood ruins the natural environment. It also ruins the habitat of the humans. Many dwelling areas are drowned-cultivable land is covered and damaged by the flood. Fertile soil flows and reaches somewhere else. Landslide occurs in many places. This stops the road, street, canal and sources of water. It breaks land and destroys forest. It damages habitat of aquatic animals. It also causes lack of food for them. Some of them are died. We should plant trees in open areas. Forest lessens speed of water and helps to stop the flood. Flood occurs less if steep field and grazing areas are protected, weaker field should not be cultivated. It helps to stop flood if plantation is done in such areas.

Landslide

The process of separating and sliding some part or rock of hill or steep-field downward is called landslide. Generally in rainy season, when there is heavy rain for a long time, the water is absorbed and the land becomes weak. In such condition, weak land or rock slide downward. In this way the landslide occurs.

Causes, Effects and Preventive Measures

Landslide occurs due to natural or human causes. In rainy season, landslide occurs due to the heavy rain. Similarly, land becomes weak due to the earthquake and landslide. Landslide is also caused by the steep and weak formation of land.

There is heavy rainfall in rainy season. Some water is absorbed by land. Some water flows and reaches somewhere else. Water from rain, streams and melting of the glaciers or due to the damage of water resources take the form of flood. This makes the land loose. This causes the fall of land mound. There is possibility of the land to be splatted due to earthquake. Similarly, sources of water may shut up

during earthquake. Release of such water may cause flood. This also causes landslide. Flood and landslide are related to each-other.

Landslide also occurs due to human causes. People destroy forest. Similarly, people use grazing area for cultivation. They also cultivate in steep field. Due to this the land becomes loose and weak. Natural condition of land is ruined due to the construction of road, canal, bridge etc. When rain falls on such type of land, it becomes weaker and landslide occurs.

Landslide destroys natural environment. It destroys forest, cultivable land, road and sources of water. It destroys human habitat as well. It destroys the habitat of animals and their sources of food. Therefore landslide may change the environment by destroying the natural environment.

Humans have important role to prevent landslide. First of all they should not damage the weaker type of land. Plantation should be done there. It makes the land strong. We should not destroy the forest by cutting it carelessly. We should plant trees where the trees have been cut down. Steep field should not be cultivated. Plantation should be done in such places to make them green. We should improve the condition of land by growing plants where construction works have been done. These activities will protect the natural conditions of land. It lessens the speed of landslide.

Soil Erosion

There are plains, steep fields, low land etc on the earth. Some lands are hard and some are soft. Some lands have loose soil and some have tight. This shows how strong or weak the land is. On the basis of land formation, it can be estimated that how often soil erosion takes place. Soil erosion is a process of flying or carrying away the soil of the surface of land by means of air or water. Soil erosion takes place more in steep field. Soil erosion takes place because of natural as well as human causes.

Causes, Effect and Preventive Measures

Soil erosion takes place because of natural causes such as air, storm, rain, flood, landslide etc. similarly, it also takes place because of various human activities. People construct road, building, bridge etc. Similarly, they also dig steep field for cultivation. They make canal for irrigation. These are human activities. These activities may cause soil erosion. Following preventive measures can be implemented to prevent soil erosion.

- (a) The soil of the surface of land is carried away by the wind in greater speed. Similarly storm also flies the soil particles. Though the activities are simple they waste the soil. They speed up soil erosion. Plantation should be done in open field. Similarly, seeing the condition of the land, grass can also be planted. Plantation of grass and trees lessens the process of carrying away soil by wind and storm.
- (b) There is heavy rain in rainy season. Water makes the surface of land loose and weak. The land becomes thinner and flows. Streams, rivers and other water sources become huge when there is more rain. They begin to flow in a greater speed and leave their tract. This may cause flood and landslide. Flood and landslide harms the cultivable land. It also harms the habitat of humans, animals and birds. Proper drainage should be made to stop soil erosion caused by flood and landslide. Due to this, water cannot flow here and there. The speed of soil erosion also lessens.



Soil erosion, flood and landslide caused by rain

- (c) People use the land variously. They dig land for cultivation. Soil is blown by air or storm while doing this. Similarly, soil is also blown from the loose land while raining. Agricultural product decreases when soil erosion takes place on cultivable land. Terrace should be formed while cultivating on steep surface of hilly land. We should dig channels to flow water in left and right side. It stops breaking and flowing of land. It lessens the soil erosion.
- (d) People dig land while doing construction works such as road, bridge, canal, building, house etc. While digging land for such marks more soil is taken out. Soil also becomes loose. By doing this, soil of a place reaches somewhere else. Again the water in rainy season carries it away. This makes somewhere pit and somewhere land mound. Plantation should be done in left and right side of steep field after the construction of road. Plants should be protected if there are. They help to stop soil erosion.
- (e) People use forest products such as wood, firewood, out branches grass etc. It destroys the plants in the forest. The land becomes open. Open land becomes weak. The land becomes dry when we uproot grass etc from the land. Similarly, while grazing cattle the land becomes loose. Soil erosion takes place in such area. Forest begins to decrease if soil erosion takes place there. It also harms in life style of the animals that live there. Land becomes loose and dry. Therefore grazing should not be made regularly in order to protect the land. Grazing should be made turn by turn in different grazing fields.

Fire

Sudden breaking of fire in sheltering area and forest is called fire. When fire breaks in forest, ground, grassy land etc then it is called forest fire. We hear about the break of fire in different places in summer session. Fire destroys property, people and shelter area. Forest fire destroys forest and wild animals.



Cause, Effect and Preventive Measures

Fire is caused either by natural or human activities. Thunderbolt also causes fire. This is natural cause. Fire also sets when we handle fire carelessly. Throwing remaining piece of cigarette and tiny particle of fire also cause fire. Misuse of match box by the children also causes fire. It may damage the habitat for humans. In summer session, we hear news of fire in hilly and terai region, Such fire destroys life and property in a greater extent. It also destroys plants. Many animals and birds are killed. It destroys natural environment. Human beings cannot prevent the fire caused by natural causes but they can control after it breaks. We can prevent fire by making careful use of match box, fire and means of fuels.

Activity 2

Observe the land near by your school on the basis of the following points .

- (a) What is the condition of the land?
- (b) What purposes has the land been used for?
- (c) Has soil erosion taken place or not? Why?

On the basis of the above points, write a short description of the observed land.

Human cause

Human beings use resources and means available in the environment. Objects in the environment are used to fulfill the need of the humans. They use land to grow crops vegetables etc. Similarly, they use water for drinking, cleanliness, irrigation, to generate electricity etc. This way, human beings use environmental resources to fulfill their needs. When they use these things it is important that how do they use and in what amount they use the resources. Environment does not degrade if they use them appropriately and conserve them. But careless and their excess use degrades the environment. We learnt that these works of humans cause flood, landslide, soil erosion and fire. Therefore various human activities bring environmental degradation. We will study here some major human activities of them.

Cause, Effect and Preventive Measures

Population growth, excess use of natural resources, urbanization and operating industries cause environmental degradation. We will study the cause, effect and preventive measures to these aspects.

- (a) Population growth is a complex global problem. Human beings receive habitat, food, cloth, medicine, water etc from the environment. When there is less population there will be less use of environmental resources. But the increment in population increases their use. Less population needs less food. More food is needed when there is increase in the population. This increases the use of land. Price also increases when there is more demand. In this way, there is increment in the use of environmental resources when there is increment in population. As a result they degrade the environment. People should be made aware to control the environment. There should be necessary awareness programme towards controlling the population growth. There should be optimum level of population in the country.



Sewage drained into the rivers

- b. People should not use forest, land, minerals, water, medicinal plants like natural resources excessively. On one hand, they use them excessively and on other hand, they are not working towards protecting these resources. This may reduce the natural resources. Some resources are destroyed, this degrades the environment. Therefore, we should cultivate the habitat to use them appropriately. We should use them less. It is necessary to protect them.

- c. Big cities are built in a process of development. Generally, a village changes and becomes a big city. Due to this, land, forest, natural places, water resources, ground etc are destroyed. Degradation in their condition brings degradation in the environment.
- d. People run various type of industries for development. Sugarcane is grown to run sugar factories woods are brought from the forest to run furniture industry etc. In this way, the raw material needed to run the factories are received from the natural resources. When there are more factory then there is no avaiiability of the demanded raw materials. When there are more factories, there is more use of natural resources. Excess use of resources and means ruins the environment.

Factories release dust, smoke and garbage. It ruins the condition of the environment. It degrades the environment. Therefore, we should consider the natural resources while running the factories. We should follow the measures so that they will affect less to the environment. It helps to protect the environment fulfills the need of the human beings.

- e. Construction of road, bridge, canal etc take place in the environment. They make the land high or low. They may damage the water resources. It affects the life style of the humans and animals of that place. This also causes environmental degradation. Therefore, conservation works should be carried out together with the construction works. This is also the duty of the human beings.

Activity 3

Select anyone of the works done by man in your place where you stay. Study the work on the basis of the following points.

- a. Name of the work done by man
- b. Advantage of the work
- c. Positive and negative impact on environment of the selected work.
- d. Efforts made at the local level to prevent those negative effects on environment.

Describe in brief about the selected work on the basis of the answers to the above questions.

Practical work

1. What is the condition of cleanliness of your school surrounding?
Prepare a report by observing the school's cleanliness.
2. Observe the source of water near by your place.
Prepare a report mentioning the condition of the source and alternative measures to protect the source.

Summary

1. Environmental degradation refers to the degradation of quality or level of any of environmental aspects.
2. Environmental degradation may be caused by natural and human causes.
3. Environmental degradation takes place because of natural causes such as earthquake, volcano, flood, landslide, thunderbolt, snow fall, soil erosion etc.
4. Environmental degradation takes place due to the excessive use of natural resources.

Exercise

1. **Fill in the blanks with appropriate words.**
 - a. When forest is destroyed becomes loose.
 - b. When population increases..... are used more.
 - c. Landslide destroys
 - d. Environment is place for all.
 - e. Environmental degradation takes place due to human and causes.

2. Answer the following questions.

- a. What do you mean by environmental degradation? Give an example.
- b. Write any four reasons for soil erosion. Describe in short.
- c. Write any four effects of fire.
- d. How does construction work by man cause environmental degradation? Write with an example of construction work.

3. Observe the following picture and describe in about 150 words.



Need for Environmental conservation

Environmental conservation is related to environmental aspects. Aspects such as natural, biological, social and cultural aspects are included under environment. Protection of them is human duty. The literal meaning of conservation is protection, growth and utilization. We have already studied the general meaning of environment, importance, relationship of population and development. We will study here the need for environmental conservation connecting the above aspects with conservation.

a. Common habitat

The earth is like a delicate ball. There are clouds, oceans, greenery and land on it. In other words, there are land, water, forest, animals, birds etc on the earth. Similarly, there are man made buildings, roads, canals, crops etc. The earth is the habitat of all animals. A creature has helped the other to survive. Our habitat begins to ruin when there is harm in any one of the aspects; land, water resources, lakes etc. Therefore, to protect common habitat, it is necessary to protect environment.

b. Conservation of Natural Resources

Aspects like air, water, land, animals, minerals etc are included in the environment. Developmental works are impossible without the use of these aspects. Human need is also not fulfilled. There should not be excess use of them though it is needed. Conservation of natural resources is conservation of environment.

c. Existence of fauna

The animal community is one of the important communities of environment. All animals have their own need and aspirations. Animals survive interacting with the environment. They have their habitat on the land, trees, water, air like places. They receive their food from the environment. Man is the most superior wise animal. Human beings take needed things from the creature in the environment. They receive milk, curd etc from cows, buffaloes like animals.

Animals and birds are used for meat. Men poach them also. Therefore, animals and birds are helping friends to men. Human beings should not kill them carelessly, destroy their habitat and food chain. This ruins their condition. We can't make them survive without environmental conservation. Therefore, human beings should conserve them. It is necessary to protect environment for the survival of the animals.

d. Continuity of food

Environment is the source of food needed for the animals. Some animals survive by eating things produced from green plants. Some eat other's flesh. Food chain continues in the environment. Human beings cultivate and grow different crops on the land. Similarly, they obtain fruits, medicinal plants roots etc from the forest. Animals receive their food from land, water sources and forest. Food chain of animals break when there is break in these aspects. It makes them difficult to survive in the environment. The environment begins to ruin. Therefore, it is necessary to protect the environment to provide food needed for the animals.

e. Social development

Men should protect their society. For its existence, it is necessary to conserve environmental resources. There is continuous development of society in one or the other form. Such development is related to any of the physical, social or cultural aspect. There is an obstacle in the development of society when any environmental resource begins to ruin. When there is damage in the cultivable land, there is less food for man. The number of animals birds reduces when the forest destroys, if water resources are destroyed, there will be less food for animals and less water for other works. We should conserve environment to protect environmental resources. This develops the human society. Human society becomes sustainable.

Introduction to protected areas

National parks, wildlife reserve, hunting reserve and conservation areas have been established to conserve natural resources. They are called conservation areas. It helps to protect land, water resources,

forest, wildlife and other natural resources of these places. This supports to do research of natural resources and for the tourism development. This also supports for the protection and promotion of national parks, wildlife reserve, hunting reserve and conservation reserve.

a. National park

National park is the area separated for the conservation of natural resources and wildlife. It also protects from soil erosion. Management of national park conserves the environment of the place. Natural resources of parks are also used as denoted by the park management.

National parks have been established in different parts of Nepal according to the geographical region and need. There are ten national parks in Nepal. Chitwan National Park, Sagarmatha National Park, Langtang National Park, Rara National Park, Se-phoksundo National Park, Khaptad National Park, Makalu-Barun National Park, Bardiya National Park, Shivapuri National Park and Banke National Parks have been established.

Chitwan National Park is situated in the terai region of Nepal. It is extended to Chitwan, Makwanpur and Parsa districts of Narayani zone. Tiger, bear, leopard, python like animals are found in this park. One-horned rhinoceros is the main attraction of this park. Sagarmatha National Park is located in Solukhumbu district of Sagarmatha zone. Gobresalla, bhojpatra, dhupi, rhododendron etc are found here. Kasturi, thar, ghoral, lophophorus, kalij, himkukhura, himchuche crows etc. are found here.

It is extended in Rasuwa, Nuwakot and Sindhupalchok district. Plants like Khotessalla, Kharsu, rhododendron etc. are found here. Animals like leopard, red panda, Himalayan bear, thar, ghoral etc. are found.

Rara National park is situated in the Himalayan region of Karnali zone. It is extended in Mugu and Jumla district. Rara lake has its special significance in the Rara National Park. Himalayan bear, kasturi, etc. are found here. She-phoksundo National park is in Karnali zone. This National park is extended in Dolpa and Mugu district. Himalayan leopard, Tibetan hare and different birds are

found here. There are various monasteries in this national park. Khaptad National Park is situated in the Far-Western region. This national park is extended in Bajhang, Bajura, Doti and Achham districts. Kasturi, ghoral, leopard, wild dog, red monkey lophophorus etc. are found here. Makalu-Barun National Park is extended in Sankhuwasabha and Solukhumbu districts of Eastern Development Region. Kasturi, ghoral, himalayan thar etc. are found here. Bardiya National Park is situated in Bardiya district of Mid-Western Development Region. Tiger, leopard, black deer, spotted deer, wild elephant and various types of birds are found here. Shivapuri National park is situated in Kathmandu district of central development region. Various type of plants are found here. This national park has helped to conserve water-sheds. Spotted deer, leopard etc. are found here.

b. Wildlife Reserve

Wildlife reserves are the areas separated for the conservation of wild animals and birds. These reserves are managed for the protection of them. There are three wildlife reserves in Nepal. They are Koshitappu Wildlife Reserve, Shuklaphanta Wildlife Reserve and Parsa Wildlife Reserve situated in different parts of Nepal.

Kositappu Wildlife Reserve is extended in Saptari, Udayapur and Sunsari districts of Sagarmatha zone in the Eastern Development Region. There are various plants in this region. Lagnna, heron, garud, crane etc are found here. Shuklaphanta Wildlife Reserve is situated in Kanchanpur district of Mahakali zone in the far-western development region. Wild elephants, red tiger, leopard, antelope, spotted deer are found here. Parsa Wildlife Reserve is extended to Chitwan, Makwanpur, Parsa and Bara district of Narayani zone in the central development region. Wild elephant, antelope and various birds are found here.

c. Hunting Reserve

A hunting reserve has also been established in Nepal. There is only one reserve of its kind in Nepal. In such reserves, management of wildlife and bird is done. Permission is granted for hunting in such reserve. Dhorpatan Hunting Reserve has been established

for this goal.

d. Conservation Area

Conservation areas are established to conserve natural environment and resources. Conservation areas help to develop and conserve the natural resources. There are 6 conservation areas in Nepal. They are Annapurna, Makalu-Barun, Kanchanjunga, Gaurishankar and Krishnasar conservation areas.

Activity

Select any one of the natural objects such as, land, plant nearby your school. Discuss in brief mentioning its importance, significance and reasons for its conservation.

Local Efforts on Environmental Conservation

a. Public Awareness

Natural resources are used more due to the population growth. Therefore, public awareness is necessary to rise to control population. Such efforts have been made at local level in different forms. This lessens the growth of population. As a result, they help to protect the environment.

b. Activity for Integrated Conservation

There are continuous construction works such as road, bridge, canal, drainage etc. These construction works change the natural condition of the environment. This degrades the natural aspects such as land, water, forest etc. Construction works should go along with the conservation of nature. These works have been carried out at local level. As a result, these works help to protect environment from its degradation.

c. Public Participation

Participation of all is needed for the conservation of environment. Public participation is ensured in environmental conservation work at local level. Public participation increases human responsibilities for environmental conservation. Public participation for the conservation of environment at local level helps to conserve the

environment.

d. Cleanliness

Cleanliness lessens environmental degradation to some extent. Haphazard dumping of garbage pollutes the environment. It affects the creatures there. It ruins human health. Therefore, there are works to clean home, community at local level to keep the environment fresh and clean. This work helps to conserve the environment.

Summary

1. National park, wildlife reserve and hunting reserves are called conservation areas.
2. Conservation areas help to conserve natural environment.
3. Participation of all is needed for environment conservation.
4. Construction works and environment conservation works should be carried out at the same time.
5. Raising public awareness helps to conserve the environment.

Exercise

1. Fill in the blanks with appropriate words.

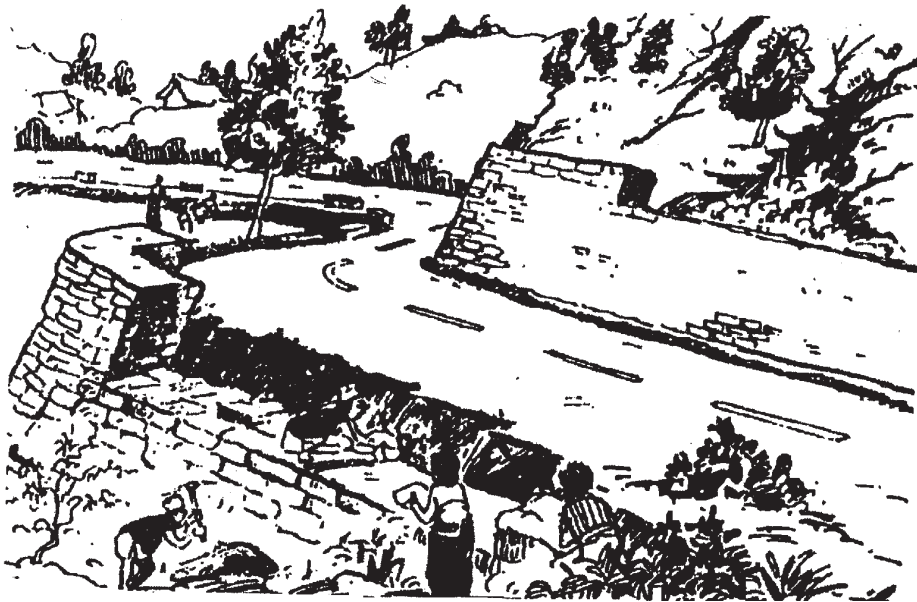
- a. Environmental conservation is of environmental aspects.
- b. Environmental conservation helps to conserve all
- c. Conservation area and promotes the natural environment.

2. Answer the following questions.

- a. Why should we conserve environment? Mention any three points and describe them.
- b. Why have national parks been established? Describe in brief.
- c. How does wild life reserve help to conserve wildlife? Describe.
- d. How can you help in environmental conservation? Describe.

Environment and Sustainable Development

The earth is a common habitat of all creatures. The earth is the habitat for human beings, animals-birds, plants and micro-organisms. They receive food from the earth to survive. Humans do various kind of development works on the earth. They build small homes to big castles. There are continuous construction works such as roads, bridges, canals, tunnels etc. on the earth. Similarly, there is development and use of means of electricity and communication, industries, modern agriculture works etc. These all development and construction works take place on the earth.



Construction works

The above developmental works have been to meet human interest. These help in economic, social and cultural development of human beings. What are the advantages that we get from development works? How long do we get their advantages? To what environmental aspects such as land, water, air, animals are affected by these works? We must consider the answers to these questions while doing developmental works. The answers to these questions are connected to sustainable

development. In 1983, World commission published a report on “Our Common Future”. This report had focused on sustainable development. As a result, the terminology Sustainable Development got significance in different fields. At, present, its importance has been increasing. What is sustainable development? The term "Sustainable Development" is formed when the word sustainable is added to the development works. The literal meaning of 'sustainable' is remaining something for long term.. It also suggests that something that is durable. Shortly, sustainable development means development that stays for long time and does not harm other aspects of nature. In other words, sustainable development is the utilization of environmental means and resources to fulfill the present need of human beings. But sustainable development also means that the advantages from such resources should be protected for the future generations.

Activity 1

Observe any one of the construction works of road, street, bridge, house, building etc. nearby your home. What environmental resources have been used in these works? What are the negative effects of these works to environment? Find answers to these questions and write a short description.

Importance of Sustainable Development

Sustainable development is also called durable development. Development works should be sustainable so that we can get the advantages for a long time. Such works do not affect environmental aspect. They become sustainable. As a result there will be a balance in the environment. Animal’s life will run continuously. Sustainable development is a global need. It has advantage at local, national and international level. Therefore, there are numerable advantages of sustainable development. Some of the advantages are given below:

a. Fooding and Caring of the Animals

There are various type of creatures on the earth. Human is a special creature. Therefore, it is his duty to protect other animals. Humans should not misuse them to fulfill their needs and aspirations. It means they should not destroy the forest for their benefit. They

should not use total water source for their benefit only. If they do so, other creatures do not get water for drinking. It will be difficult for other animals to survive, if we do not think about the sustainable development. Human beings should protect all the creatures. Therefore, when we consider about the sustainable development it will be helpful to protect other creatures. It will be beneficial to human beings as well. Sustainable development is connected to respect and care of animals.

b. Management and Improvement

Human beings receive needed things by using resources and means of nature. They produce grains, fruits, vegetables etc on the land. They use water for irrigation. They receive wood, firewood, medicinal plants from the forest. They run industry and produce many foods. In this way they use natural resources to conduct their lives. When these objects are received in less or more quantity, it will be difficult to run our life properly. There won't be uniformity in our life. If we work according to sustainable development, then there is no fluctuation in the benefits. In such a situation, it won't be difficult for us to conduct our life. Therefore, sustainable development helps to make our life easy and standard. It will help to improve our life. It also sustains our life style.

c. Sustainability: Means and Measures

We should protect all the means and resources in the environment. They are called environmental resources. The main objective of sustainable development is to protect the means and resources of environment. We should not think only for the development neglecting the environmental things. Such a destructive work does not match with the sustainable development. Development without protection of nature is against the concept of sustainable development. Irrigation is helpful to agriculture but if we do not leave water in the rivers-streams, it will destroy the natural habitat of water animals. There will be lack of food to them. The surrounding land becomes dry. Therefore we should follow the measures to stop negative impact when we make dam and use total water for irrigation. Sustainable development focuses on the

protection of means and resources in the environment.

d. Limitation of Means and Measures

Natural resources have limitation in their production capacity. In other words, they have limited production capacity. There is limitation in the number of plants that can be grown in a particular piece of land. Therefore, more plants than the land can bear can't be grown there. They don't grow properly. The soil of that region is degraded. There is limitation to what extent we can graze animals there. Grazing more animals than the capacity of land will harm the land. There will be negative impact when the resources and means are excessively used. These resources are destroyed. They give less advantages. Sustainable development gives emphasis to the proper use of natural resources. We should protect them along with their use. When we follow it in practice then only this is possible. When we properly follow the concept of sustainable development, the resources are not used excessively. It will help to protect and sustain them. It also helps to make the development sustainable.

e. Improving Personal Behavior

Sustainable development will bring change in human concept and behavior. When a human is determined to do sustainable development, change is realized in his/her works. He/She should practice the concept of sustainable development in his/her behavior. This behavior will change his/her habit of using land, water, forest, animals and birds. They will develop the concept that they should not use all the resources by themselves. They will develop the feeling that they should protect these resources to future generations. In this way, human behavior is improved and it will help to conserve the environmental resources. The feeling of sustainable development will also be extended to other people generally. Therefore, the activities to sustainable development will bring improvement in human thought and behavior.

f. Capacity Building at Local Level

We should practice to bring the concept of sustainable development

in our behavior. The concept to sustainable development should be extended to towns and villages. If we do so, sustainable development and environment protection will go together. Beginning of this work will bring awareness to sustainable development. Their interest to sustainable development also increases. They do sustainable development works. This develops the capacity of people at local level to do sustainable development. It brings change in their work pattern. This helps in the conservation of environment.

g. Developing Sense of Conservation

Environment conservation is a common duty of all the persons. It can't be done by a single person. Common participation is necessary in this campaign. Concept and practice of sustainable development should go along with developmental activities. It develops thought to conserve all the environmental aspects. Developing such a human feeling is an achievement. It helps to protect environmental aspects. This will protect lives of all creatures. It also develops their sustainable lives.

h. Utility for Future Generations

There are limited natural resources on the earth. Human beings should not use them excessively. They should work towards protecting and increasing the used resources. In this way, the protection of means and resources will be helpful to our future generations. It won't be difficult to future generations to conduct their lives. Sustainable development helps to use and protect the natural resources.

i. Developing Mutual Cooperation

Sustainable development is a global necessity. Sustainable work is good for all. There will be proper utilization of means and resources by sustainable activities. It reduces the ratio of destruction of means and resources. International organizations give interest to invest in the works of sustainable development. Due to this, we receive foreign aid to developmental works. It strengthens the mutual relationship, sustainable developmental works of country will assist the other country. When all the countries work towards

sustainable development, the whole world can get benefit from it. It helps for conservation of the earth. Similarly, there will be development of a sustainable society.

Interrelationship among Population, Environment and Development

Population, Environment and development are three different terms. Population includes human being. We know environment is the entire surrounding of us. Similarly, development is called the change. Development is also the works done by humans for their benefits. We have already studied about them. We also know that development should be based on sustainable development. From these studies, we can predict many things about population, environment and development. Population, environment and development are inter connected with each another. Among these, population is one of the important aspects. Growth in population increases needs. It forces to increase the ratio of development. These activities may harm or improve the environment. Therefore, there is strong inter relationship among population, environment and development.

Environment includes human, natural, social and cultural aspects. We've already studied about this. What is the relationship between man, land and development? What is the internal relationship between human, social customs and their development? What is the dependency among humans, air, water and development activities? What are the activities between humans, animals and their development of human beings? We know the interrelationship among population, environment and development only when we know their relationship. We will study here about these aspects here.

a. Population

Population has been increasing day by day in the world. As the population increases, there is increment in the needs also. How can we fulfill these needs? If we consider only towards the fulfillment of human needs and demands what will be the condition of the environment? Thus if we fulfill human welfare only by development work, their habitat will be spoiled. Population growth is one of the major problems of the world today. There is increment in the demand of food shelter, clothes, health, security, education,



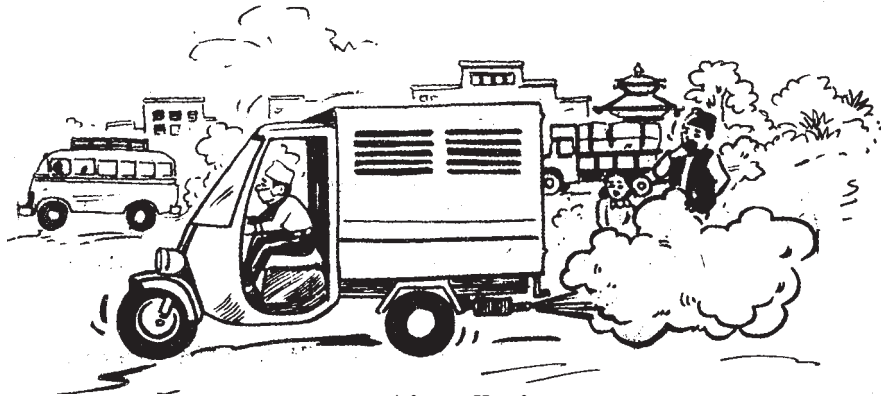
Over Population

employment, transportation etc along with the population growth. If these things are not managed wisely, environmental aspect useful for human beings, may be destroyed. Developmental works will no be sustainable. People will fight against each other.

The more population grows the higher the needs of human beings. When there is limited population, peoples' needs can be easily managed. When the development activities are carried out randomly to fulfill the human needs, the environmental aspects begin to destroy.

b. Air

Air is an important aspect of the environment. Pure air is necessary for healthy life. In the same way it is necessary to have healthy environment too. People involved in the development activities should not destroy the purity of the air. If the air gets polluted, it affects human beings, animals, birds, plants and other environmental aspects.



Air pollution

To minimize the bad effects caused by development activities, the preventive measures should be adopted along with the development activities. Thus, development is beneficial to the human beings and the environmental aspects also get preserved. It helps to fulfill the needs of all.

c. Water

Water is one of the important aspects of the environment. It is inter-related with human beings and development activities. All the living beings need water for survival. The demand of water increases with population growth.



Shortage of water

In the same way, water is necessary for irrigation. Therefore, dams, canals, water reservoirs etc are constructed. Such activities are related to the environment. But the activities like blocking the water source, changing the direction of water streams, carry water from everywhere should not be done to fulfill the necessity of the water. Such type of activities do not sustain. This creates difficulty for the survival of human and other living beings. The condition of environment gets damaged. It harms the life style of all of us.

d. Habitat

It is necessary to have healthy habitat for human beings. If the population increases, people keep on constructing buildings, drains, roads etc. such activities reduce the open land. There is desertification of fertile land. People destroy forests to make their habitat. There can be destruction of the habitats of birds and animals. The sources of water start to dry up and the habitat of human beings cannot be healthy. Therefore, population growth, construction of buildings (habitats) and the environmental aspects are inter-related to each other.



Urbanization

e. Forest

It is one of the important aspects of the environment. There is increase in the necessity of the forest products with the population growth. People collect fire wood, timber, grass, medicinal plants, leaves, etc from the forest. The number of domestic cattles can also be increased along with the population growth and the demand of grazing lanes increase. Due to such demands the use of the forest can be increased.



De forestation

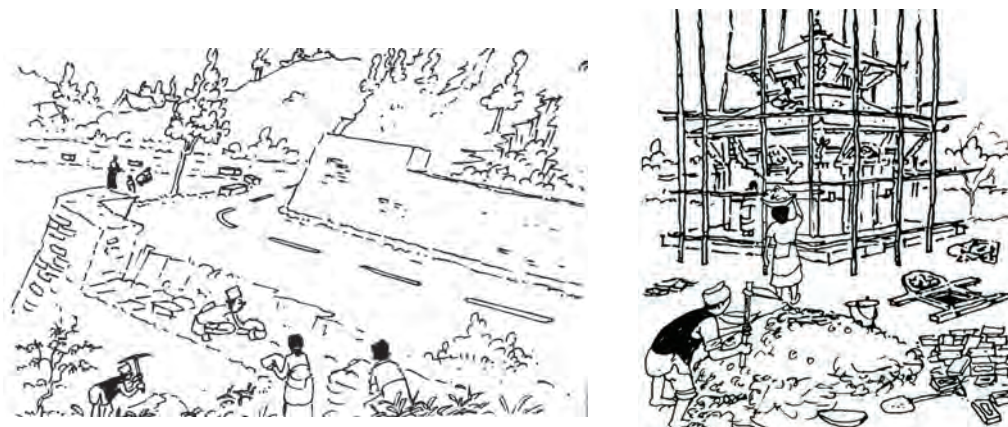
Only the old trees are to be removed from the forest. Cattle should not be grazed continuously in the same grazing land. Only the dry leaves and branches are to be collected from the forest. There should be afforestation after cutting the trees. Such activity increases the number of plants in the forest. Human beings can get advantages continuously from the forest and the environment of the forest cannot be destroyed. It continues the food, life style and habitats of the animals and birds.

Activity 2

What do the people carry from the forest? Find it by discussing with the people in your neighborhood. What type of effects will be seen in the forest when the population goes on increasing? What is to be done for the conservation of the forest? Write a short description on the basis of answers of these questions.

f. Construction Work

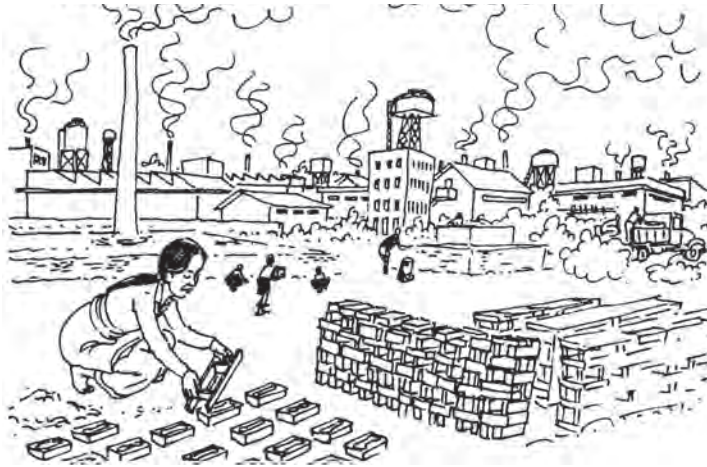
There is some change in the environment during the construction of roads. It is our duty to make such changes which are environment friendly. We should increase the forest by planting trees in the deforested areas. We should help to repair the damaged water sources and grow plants around them. Land slide should be prevented by planting trees on both sides of the constructed road. Such work helps to sustain the coconstruction of road. This type of development is beneficial for long time. We should equally look after the environmental aspects as well as the development activities. From this, we need to know the relation among the human beings, environment and development.



Construction work

g. Operating Industries

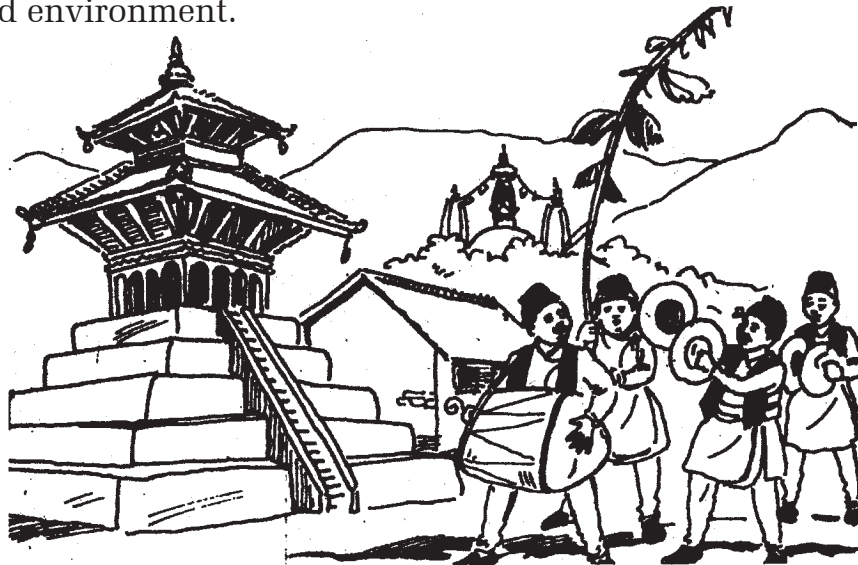
Development brings change in the life style of the human beings. If there is economical development, there is change in life. People get involved in the different professions for survival. They will conduct small occupations to big industries. Such activities help to generate personal income. But such activities increase as the population increases. Such type of industries need to utilize the means and resources of the environment. There is use of stone, coal and fire wood in the cement factory. In the same way soil, fire wood, coal and other fuels are used while making bricks. Thus to fulfill the needs and desires of the human beings and for the development activities, the environmental resources are used.



Brick Kilns

h. Social Custom

Human beings are one of the aspects of the environment. Man creates his own society. People have their own languages, religions, customs, traditions and celebrate their own festivals. As there is increase in population, there is increase in their activities. People use food grains, fruits, water and transportation means to conduct their own social activities. If there is high increase in ratio (speed) of use of such environmental resources, it cannot be held by the environment. It creates difficulty to conduct human life. From this we can know that the relationship between social customs and environment.



Social custom

Local Efforts on Sustainable Development

Population, environment and development are inter-related to each other. The earth exists even if there is no existence of human beings. There is continuity of activities of environmental aspects like physical, natural, animals and birds in the earth. There is no human and social environment in the absence of human beings. In absence of human beings there is no human activities with earth. As a result there are no activities done by the human beings. Thus the development can not be imagined in the absence of human beings. Development has been grown by human needs. Some of the development activities conducted by the human beings are environmental friendly where as some are not. Human beings should do the development works in favour to the environment. The development works in favour of the environment are related to the sustainable development. Maintaining the sustainable environment is the responsibility of human beings. We should improve the environment so that it sustains for the future generations. It is good for the human beings as well as for the environment. As a result there is sustainable development. People keep on getting advantages from the environment and development. Thus the development activities done by the human beings in their own sector should be sustainable. It is necessary to have all our efforts for the sustainable development. Various efforts are made of local level for the sustainable development. Some of the major efforts are as follow.

(a) Afforestation

Human beings acquire timber, fire wood, grass etc as forest products. Some of the trees in the forest are old and some of them dry up themselves and die. Thus afforestation programmes should be conducted from time to time for the conservation of forest. Afforestation programmes are being conducted from national level to local level. It helps to conserve forest, land and sources of water. Thus afforestation is an activity which helps for the sustainable development. Every house in the local level should conduct plantation programmes. Afforestation helps for the sustainability of the forests. Along with this, it helps to sustain other aspects of the environment.

(b) Use of Organic fertilizer

Use of chemical fertilizer is increasing in the agricultural works. Although it increases the production, the fertility of the soil is decreasing by it. Therefore, it is encouraged to use the organic fertilizer along with the chemical fertilizer. More or less farmers use organic fertilizer in their field. It helps to sustain the agricultural work to some extent. Like wise, it helps to maintain the fertility of the agricultural land. It is necessary to encourage more of such type of efforts.

(c) Conservation of Water Sources

Water is the base for the survival of all the organisms. Water sources may be destroyed after getting buried or damaged. Like wise they may get destroyed during various development activities and construction works. Therefore, various efforts are being made in the local level to conserve the sources of water. These efforts help for sustaining the water resources in the long run. Similarly, the environmental aspects in such places like animals, birds and plants can also sustain for the long time. Schools should also help to conduct such work.

(d) Raising Consciousness

The awareness programmes for raising consciousness about environment are being conducted in the local level. Different attempts for the conservation of environment are being done by the government and non-governmental organizations (NGOs). Some of the environmental works are done at personal level as well. Such activities help the sustainable development.

Practical activity

1. Observe the development work done at a place in your area. What type of impact is seen in the environment due to that activity? Prepare a report on it.
2. Make a list of activities being done for the conservation of local environment. Prepare a report on “Help of the activities that can assist the sustainable development.”

Summary

1. Sustainable development means use of environmental resources for present generation in such a way that it can be conserved for future generation.
2. Different development activities should be based on the thought of sustainable development. If it is done so, all the development works sustain for the long time.
3. Sustainable development is good for all the organisms.
4. If the development is based on sustainability it sustains for the long interval of time and people get benefitted for the long time.
5. The attempts of sustainable development should be made from the national level to the local level. We should help for such activities.
6. Sustainable development helps for the conservation of environmental aspects. This is beneficial for all the organisms.
7. Sustainable development reduces the adverse effects on the environment. It helps to conserve the environment.

Exercise

1. Fill in the blanks.

- a. Sustainable development is also known as
- b. The development that is not based on sustainable development does not remain for
- c. Sustainable development helps to conserveaspects.
- d. Increment in the needs of people due to population growth results in excessive use of
- e. Efforts of is necessary for the sustainable development.

2. Answer the following questions.

- a. What is sustainable development?
- b. Why is it necessary to have sustainable development? Write any four points.
- c. What are the (benefits) advantages of sustainable development for the future generations?
- d. Write any two points that show the inter-relationship among population, environment and development. Explain them.
- e. What type of sustainable development programmes are being conducted in the local level? Make their list and explain any two of them.

3. Observe the picture given below and explain it in 150 words.

