

Nirantar Science & TEchnology

**Class
6**

Author

Dinesh Yadav

Vijaya Koirala

Yogya Raj Prasai

Language Editor

Suprima Pandey



Nirantar Prakashan

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Authors : Dinesh Yadav
Vijaya Koirala
Yogya Raj Prasai

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Contact : www.nirantarprakashan.com.np
Email: nirantaredu@gmail.com
facebook page: nirantar prakashan
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विषय : पाठ्यसामग्री स्वीकृति सम्बन्धमा ।

श्री निरन्तर प्रकाशन,

काठमाण्डौ ।

प्रस्तुत विषयमा त्यस प्रकाशनबाट मूल्याङ्कन र स्वीकृतिका लागि तोकिएको अवधिभित्र पेस हुन आएका तपसिलबमोजिमका पाठ्यसामग्री आवश्यक निर्णयार्थ पाठ्यसामग्री व्यवस्थापन तथा मूल्याङ्कन समितिमा पेस हुँदा विद्यालय शिक्षाको राष्ट्रिय पाठ्यक्रम प्रारूप २०७६, आधारभूत शिक्षा (कक्षा ६-८) पाठ्यक्रम, पाठ्यसामग्री विकाससम्बन्धी विद्यमान प्रावधान, ऐन, कानून, निर्देशिका, कार्यविधि, प्रकाशन शैलीका प्रावधान, पठ्यक्रम विकास केन्द्रले विभिन्न समयमा जारी गरेका र पाठ्यसामग्री सुधार/परिमार्जन/पुनर्लेखनका लागि दिइएका सुझाव र निर्देशनको परिपालना गरी स्वीकृति दिन सिफारिस भएअनुसार यस कार्यालयको मिति २०७८/०३/११ गतेको निर्णयानुसार तपसिलमा उल्लिखित निर्देशनको पूर्ण परिपालना गरी शैक्षिक वर्ष २०७८, २०७९ र २०८० गरी तीन शैक्षिक वर्षका लागि गुणस्तरीय एवम् त्रुटिरहित पाठ्यसामग्री विकास गरी प्रकाशन गर्न स्वीकृति प्रदान गरिएको छ । विद्यमान वैधानिक व्यवस्था, ऐन, कानून, निर्देशिका, कार्यविधि, पाठ्यक्रम विकास केन्द्रले विभिन्न समयमा जारी गरेका निर्देशनलगायतका प्रावधानहरूको पूर्ण परिपालना नगरी गुणस्तरहीन पाठ्यसामग्रीको विकास, प्रकाशन र बिक्रीवितरण गरेको पाइएमा, पाठ्यक्रम परिवर्तन भएमा वा यस केन्द्रबाट अन्य निर्णय भएमा यो स्वीकृति जुनसुकै बेला रद्द हुने छ ।

तपसिल :

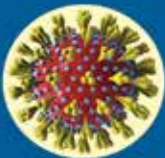
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१ Science and Technology	आधारभूत तह / कक्षा ६
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(ख) निर्देशन :

- आवरण पृष्ठको अघिल्लो (Front) भागको बायाँ (Verso) पृष्ठमा नेपालको आधिकारिक नक्सा र आवरण पृष्ठको पछिल्लो (Back) भागको दायाँ (Recto) पृष्ठमा कोभिड १९ सङ्क्रमण रोकथामसम्बन्धी सूचना यस केन्द्रको वेबसाइटबाट डाउनलोड गरी समावेश गर्ने । विषयवस्तुको प्रकृति र आवश्यकताका आधारमा पाठ्यसामग्री भित्रका विषयवस्तुमा समावेश गरिने नक्सा आधिकारिक र प्रामाणिक हुनुपर्ने ।
- स्वीकृति पत्र स्वयं गरी पाठ्यसामग्रीको शीर्षक पृष्ठभन्दा पछि दायाँ (Recto) पृष्ठमा समावेश गर्ने । पाठ्यसामग्रीको प्रत्येक पृष्ठको पुच्छर (Footer) मा पाठ्यक्रम विकास केन्द्रबाट स्वीकृत भन्ने व्यहोरा उल्लेख गरी प्रकाशन गरेको पाठ्यसामग्रीको तीन प्रति यस केन्द्रमा पेस गरेपछि मात्र बिक्रीवितरण गर्ने ।
- शिक्षा, विज्ञान तथा प्रविधि मन्त्रालयको निर्णयानुसारको मूल्य कायम गर्ने र मूल्य सर्वाधिकार पृष्ठमा राख्नुपर्ने । प्रतिलिपि अधिकार (Copy right) को सम्बन्धमा लेखक र प्रकाशक स्वयम् जिम्मेवार हुने ।
- पाठ्यसामग्री विकाससम्बन्धी विद्यमान प्रावधान तथा पाठ्यसामग्री सुधार र परिमार्जनका लागि यस अधि दिइएका निर्देशनको पूर्ण परिपालना गर्ने ।
- तथ्य र प्रमाणमा आधारित अद्यावधिक र आधिकारिक विषयवस्तु, तथ्यतथ्याङ्क एवम् जानकारी समावेश गर्ने ।
- आधारभूत शिक्षा (६-८) पाठ्यक्रमका तहगत सक्षमता र कक्षागत सिकाइ उपलब्धि हासिल गर्ने सहयोग पुग्नेगरी पाठ्यक्रमका सम्पूर्ण पक्ष र विषयवस्तुलाई समेटेी लम्बीय तथा क्षितिजीय सन्तुलन कायम हुनेगरी पाठ्यसामग्रीलाई पूर्ण रूप दिने ।
- विद्यार्थीलाई थप भार पर्ने गरी पाठ्यक्रममा समावेश नगरिएका विषयवस्तु, अभ्यास तथा सिकाइ क्रियाकलाप पाठ्यसामग्रीमा समावेश नगर्ने ।
- विज्ञान र प्रविधिको क्षेत्रमा स्थापित सिद्धान्त र मुख्य मान्यतालाई विशेष ध्यान दिई वैज्ञानिक सुझावसहितको असल, दक्ष र सक्षम नागरिक तयार गर्न सहयोग पुग्नेगरी पाठ्यसामग्री तयार गर्ने ।
- राष्ट्र, राष्ट्रिय एकता, सार्वभौमिकता, भौगोलिक अखण्डता, स्वाधीनता, राष्ट्रिय हित, पहिचान, सम्मान र समृद्धिमा आँघ आउने तथा विभिन्न जातजाति, भाषा, धर्म, संस्कृति, सामाजिक सहिष्णुता, सद्भाव, सांस्कृतिक मूल्यमान्यता, रहनसहन आदिमा प्रतिकूल प्रभाव पार्ने कुनै पनि विषयवस्तु, उदाहरण, चित्र, अभ्यास, सिकाइ क्रियाकलाप समावेश नगर्ने ।
- जातजाति, भाषा, धर्म, संस्कृति, वर्ण, श्रेष्ठ, वैज्ञानिकता, अपाङ्गता, पेसा, व्यवसाय, सामाजिक सांस्कृतिक अन्तराका आधारमा भावनात्मक रूपमा चोट पुऱ्याउने, आक्षेप लाग्ने, होच्याउने र बिभेदीकरण गर्ने किसिमका विषयवस्तु, उदाहरण, चित्र, अभ्यास, सिकाइ क्रियाकलाप समावेश नगर्ने ।

पुनश्च : यो स्वीकृति शैक्षिक वर्ष २०७८, २०७९ र २०८० का लागि प्रदान गरिएकाले सोहीबमोजिम प्रकाशन, बिक्रीवितरण र प्रयोग गर्नु गराउनहुन सम्बन्धित सरोकारवाला सबैमा अनुरोध छ ।



कोरोना भाइरस रोग (कोभिड-१९)

हाल विश्वभरी फैलिएको नयाँ कोरोना भाइरसको संक्रमणबाट जोगिन रोगलाई विषय स्वास्थ्य संगठनले "कोभिड १९" को नाम दिएको छ र यसलाई विषयव्यापी मामारीको रूपमा घोषणा गरिसकेको छ ।

कोरोना भाइरस स्वास्थ्यका माध्यमबाट सर्त रोग हो । यो संक्रमित व्यक्तिले खोक्दा वा हाड्दा गर्दा नाक वा मुखबाट निकले छिट्टाको माध्यमबाट एक व्यक्तिलाई अर्को व्यक्तिलाई सर्त ।

कोरोना भाइरस रोगको मुख्य लक्षणहरू



यस्ता लक्षणहरू देखा परेमा नजिकको तोकिएको स्वास्थ्य केन्द्रमा सम्पर्क गर्नु ।
यस रोगको संक्रमणको जोखिमबाट बच्नको लागि निम्न उपायहरू अपनाउनुपर्छ ।



नेपालको नक्सा (राजनीतिक तथा प्रशासनिक)



PREFACE

Nirantar Science & Technology as a series IV-X grade has been prepared strictly in a line to the recently upgraded syllabus and curricula issued by Curriculum Development Centre, Sanathimi, Bhaktapur, under the ministry of education, and the government of Nepal for the learners of basic level to secondary level with regard to educational framework 2063 B.S.

The series aims at providing both theoretical and practical cognitivity to the students of far and wide having some flair to science, scientific facts and processes with ample activities considering their needs, level, aptitude, intelligence and age factor by creating interest through proper selection and gradation of the subject matter to be taught and learnt. The entire desk of authors and editors claims that the series has come to adopt a thematic and activity centred approach, abundant illustrations and so on in order to make an understanding of science more effective and comprehensive.

The revised and updated version in your hand is solemnly dedicated to those scholars far and wide with a provision of richly sophisticated but only relevant pictures, diagrams, table, charts, fact files, reasons and logics, etc. as the soul of science. Apart from these, several other efforts have been put forward collectively in order to make the book more concise and student friendly so as to address the requirement of a perfect book to many students and teachers who like to culminate real practice in science in the days to come. Beside this, our another attempt through this presentation is to eradicate some misconceptions to science appeared in the growing mind of students especially in the classroom context by illuminating them in terms of these salient features incorporated within each book of the series.

Home Assignments/Worksheets: The revision exercises at the end of every chapter can be given as home assignments after teaching particular concepts.

Varieties of Questions: Objective type questions like, true or false, fill in the blanks, choose the correct answer, etc. are given in the exercises at the end of every chapter in this book, in order to fulfill the objectives of each lesson.

Activities : Numerous activities in the classroom can provide platform for active involvement of students in application of their theoretical knowledge and learning. Thus, interesting activities are given so as to arouse interest of the students in science.

Projects: Lots of activities in the book are dedicated to investigate research projects with information gathering and deducing. Some of these can be individual research projects and others assigned to group of students with an aim to make them more participatory.

Points to Remember: This section helps the students to understand the main points of each lesson.

Last, but not the least, our sincere thanks goes to **Nirantar Prakashan**, for their keen interest in publishing this series of books. We are also thankful to Mr. Shambhu Pd. Pokhrel (School Chairman), Mrs. Sujita Adhikari Pokhrel (Principal), Mr. Rudra Prashad Khanal (Vice Principal), Mr. Ram Shrestha (Science Teacher), Mr. Badri Neupane (Science Teacher), Mr. Bishnu Bhattarai (English Teacher) at different institutions for their constructive suggestions and support.

Any constructive suggestions and recommendations for the betterment of this series will be highly acknowledged.

- Authors

Nirantar Science & Technology

Class 6

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Unit 1

Scientific Learning

STUDENT'S LEARNING OUTCOMES

After studying this unit, the students will be able to :

- introduce and follow the scientific learning process.
- explain the use and importance of units in measurement.
- identify the local units being used for measurement.
- explain the importance of SI unit.
- compare the prevailing local unit with the SI unit.
- describe and use large and small SI units (units and sub-units) of physical dimensions.

What is science? Why and how is it studied? What other scientific knowledge do you have? Is it different from the other subjects? Discuss and present the findings to the class.

1.1 Introduction to scientific learning

Science is a branch of knowledge or study. It is knowledge of the physical or material world gained through observation and experimentation. It deals with a body of facts or truths systematically and in arranged way. For studying science, science process skills are required. The science process skills form the foundation for scientific methods.

Sir Isaac Newton discovered the force of gravity when he saw an apple fall from a tree. James Watt built a steam engine after seeing the water vapor lift the lid of the kettle. These discoveries have been made possible by scientific studies.



There are six basic science process skills:

- i. Observation
- ii. Classification
- iii. Measurement

- iv. Prediction
- v. Communication
- vi. Inference/Conclusion

Observation is the fundamental science process skill. We observe objects and events using all our five senses, and this is how we learn about the world around us. To sort objects or phenomena into groups based on their observations is classification. Measurement involves expressing physical characteristics in quantitative ways. Communication brings the first three skills together to report to others what has been found by experimentation. An inference is an explanation based on an observation. It is a link between what is observed and what is already known. Stating the outcome of a future event based on a pattern of evidence is prediction. Example: Predicting the height of a plant in two weeks time based on its growth during the previous four weeks.

Scientific learning process



Activity 1.1

Collect the sample of different food items like rice, maize, wheat, millet, orange, ghee, meat, pea, gram, papaya, potato, onion etc. Observe them using sense organ and classify according to their similar properties.

Roots of plant	
Leaf of plant	
Stem of plant	
Flower of plant	
Fruit of plant	
Seed of plant	
Food from animal	

Draw the conclusion on the basis of the classification.

Steps of scientific learning process

The scientific method is used when creating and executing an experiment.

The scientific method consists of six steps:

1. Study the objects and events of the surroundings
2. Ask a question or define purpose
3. Prediction of the probable result
4. Collection of data through experiment

5. Analysis of data
6. Draw conclusion
7. Communication of results

1. Study the objects and events of the surroundings

Many events are happening in our surroundings. For example, air is moving, water is flowing, snow is melting from the mountain, the sun rises and sets etc. To find out the actual reasons behind these events we have to study in the systematic way. This is the initial phase of the scientific method.

2. Ask a Question or define purpose

The scientific method starts when you ask a question about something that you observe: How, What, When, Who, Which, Why, or Where? For example, why is snow melting? Why do fruits fall down from the tree?

3. Prediction of the probable result

Prior to experimental proof, we predict or guess the probable answer. Prediction helps to find out the fact. For example, the melting of snow may be due to the sunlight.

4. Collection of data through experiment

In this phase, prediction is tested through the experiment with suitable method. This is the important step as it provides the facts. For example, to find out the fact behind the reason of melting of snow, take same amount of ice in two plates. Keep one in the sunlight and another in the shadow. Observe and note the time required for each plate of ice to melt completely. Hence data for the study can be collected. For the accuracy, we have to repeat the same experiment at least three times with same result.

5. Analysis of data

Once the experiment is complete, we have to collect measurements and analyze them to see if they support our prediction or not. In the above example, the time period to melt the ice of each plate is mentioned and compared.

6. Draw conclusion

On the basis of the analysis conclusion is drawn. In the above example, we can conclude that the reason behind the melting of ice is the heat of sunlight, as the ice placed in sunlight melts faster.

7. Communication of Results

To complete your science fair project you will communicate your results to others in a final report and/or a display board. Professional scientists do almost exactly the

same thing by publishing their final report in a scientific journal or by presenting their results on a poster or during a talk at a scientific meeting.

Example : Growing Bean Plants

Here is an example where the scientific method can be used to study the natural world.

1. Ask a question or Define Purpose: You want to know whether a bean plant will grow more quickly outside or inside. For the purposes of this experiment, you might decide on a time frame of three weeks.
2. Prediction of the probable result: The prediction is that there is no difference between growing a bean plant indoors or outdoors.
3. Collection of Data: Plant four bean plants in identical pots using the same type of soil. Place two of these in an outdoor location, and place the other two in an indoor location. Try to choose locations where the plants will get a similar amount of sunlight. Care for the plants in an identical way, like giving the same amount of water. Then, each day for the three-week experimental period, observe and measure plant growth. Carefully record the size of each plant in a notebook.
4. Analysis of Data: Review the data and determine how the plants in both environments progressed over the course of the three weeks. You may choose to find an average between the two indoor plants to determine the “typical” indoor plant growth, doing the same for the two outdoor plants to calculate the “typical” outdoor plant growth.
5. Draw Conclusion: Based on the data you collected, determine if there is a conclusive answer to the question as to whether a bean plant placed inside or outside will grow more quickly.
6. Communication of Results: Prepare a way to present the results of the experiment, like in the form of a written report, a slideshow presentation, or as a display at a science fair.

1.2 Measurement and Unit

What is the distance between your home and school? Which one is heavier cotton or iron? To find out the answer, we have to take the measurement of these quantities by using different instruments like, measuring tape, beam balance, etc.

Measurement is essential in everyday life. We come across through different types of measurement to do different activities. A tailor takes measurement of our body to stitch our clothes. To sell sugar, wheat or pulses, a shopkeeper should measure weight of them

using a balance. Purchase or sale of plotted land is done on the basis of its area. If a person is suffering from fever, the doctor measures the temperature of his body using a thermometer.

When should we walk to school to reach on time? For this, we measure time using a clock. If we ask for one kilogram onion, shopkeeper keeps one kilogram weight on one pan of physical balance and some onions on the other side. Then he compares the weight by raising the rod of physical balance. When both of the pans have equal weight, we say weight of onion is exactly one kilogram. To have an accurate measurement of a quantity, we use standard quantity. Examples of standard quantity are 'one standard second', 'one metre rod', one kilogram metallic cylinder, etc.

Thus, we define measurement as the process of comparing of an unknown quantity with a known standard quantity of the same kind.

Physical quantity

A physical quantity is that which can be measured directly or indirectly.



Activity 1.2

Some common devices are given in the figure. Identify each of them and discuss the use of each device with your friends in the classroom.

1. Beam balance
2. Clinical thermometer
3. Digital watch
4. Spring balance



Importance of Measurement

1. Measurement is useful for selling and buying goods.
2. It is essential for making and preparing food.
3. It is useful to measure raw materials in industries.
4. It helps to obtain the accurate result of physical quantities.

Examples of physical quantities

1. Mass, 2. Length, 3. Time, 4. Temperature

We use different devices to measure these quantities. We need scale to measure length, watch to measure time, beam balance to measure mass and thermometer to measure temperature. Look at these devices below.



fig. measuring tape



fig. beam balance



fig. watch



fig. thermometer

1.3 Local and Standard Units of Measurement

Local Measurement System

In the past, people used local units like haath, bitta, etc. to measure length, and mana, pathi, muri, dharni, etc. to measure mass. People in different places of our country still measure legumes, cereals, kerosene or cooking oil using 'mana' or 'pathi'. These measurement vary from place to place. Like in some places four 'pau' is equal to 'one kg' and in other places five 'pau' is equal to 'one kg'.



Activity 1.3

Request your 3 friends to measure the length of a table by their hand span. Do all of them get the same value? Can their hand span be used as a standard unit?

The above activities show that hand span can be taken as a unit but it can't be considered as a standard unit. It is because the length of hand



span or foot step may vary from person to person. So, the measurement made by using hand span is not satisfactory. Therefore, we need standard unit for reliable measurement.

Standard Unit of Measurement

The unit of measurement is an essential part of any physical quantity. The physical quantities are known by the unit of measurement. Let us suppose that the length of classroom is seven meter. This means one meter (1m) is the standard used for the measurement of length and the measured length is seven times more than the length of one meter (1m). Thus, to measure the length of an object, we have to choose a reference standard i.e. “One meter” **The unit of measurement is defined as the reference standard used for the measurement of physical quantity.**

Nowadays, standard units like meter, kilogram, second, cubic meter, etc. are widely used to measure length, mass, time and volume respectively.

The unit agreed by majority of people as a basic unit of measurement is called standard unit.

Unit

A unit is a reference standard quantity with respect to which we measure other quantities. Some units of physical quantities are given below:

S.N.	Quantity	SI Unit
1.	Length	Meter (m)
2.	Mass	Kilogram (kg)
3.	Time	Second (s)
4.	Temperature	Kelvin (K)
5.	Electric Current	Ampere(A)
6.	Amount of Substance	Mole (mol)
7.	Luminous Intensity	Candela (cd)

In the measurement of any physical quantities consists of two parts: **magnitude** and **unit of measurement**. The unit of measurement of physical quantities remains the same but magnitude keeps on changing depending on the actual amount of quality. If mass of the body is 10 kg it means that unit of mass is kg and the mass of the body is 10 times greater than 1kg.

Similarly, if the length of a room is 10m, it means that the unit of length is meter (m) and the length of the room is 10 times larger than 1 meter (1m). Thus,

Measurement of physical quantity = Numerical values and unit

Thus, a unit is the reference standard quantity with respect to which we measure other physical quantities.

System of Units

To bring uniformity in the measurement, some systems of measurement have been developed. These are discussed below.

i. FPS System

This is the British system of units. In this system, length is expressed in foot (f), mass in pound (p) and time in second (s).

ii. CGS System

In this system of units, length is expressed in centimeter (cm), mass in gram (g) and time in second (s).

iii. MKS System

This system is known as metric system. In this system of units, length is measured in meter (m), mass in kilogram(kg) and time in second (s). Most of the countries of the world follow this system.

SI System

SI stands for “System International De Unit”. SI System is improved and extended form of MKS system of units. The system of units which is agreed by the International Convention of Scientists held in France in the year 1960 AD is SI unit. Like MKS system, length is measured in meter, mass in kilogram and time in second. SI system is the advanced form of MKS system of units. Units are divided into two categories viz : fundamental unit and derived unit. But, before understanding them we need to know about fundamental quantity and derived quantity.

Fundamental quantity

Those physical quantities which are not derived from other and can't be divided into simpler quantities are called fundamental quantities e.g. length, mass, time, etc.

Derived quantity

Those physical quantities which depend on fundamental quantities are derived quantities e.g. volume, force, pressure etc.

Fundamental units

The units of fundamental quantities are fundamental units. E.g. unit of mass is kilogram (kg) which can't be expressed in terms of other unit.

Derived units

The units which can be expressed in terms of two or more fundamental units are called derived units e.g. m^3 , kgm/s^2 , kg/ms^2 .

1.4 Multiple and Submultiple Units

Multiples are factors used to create larger forms whereas submultiples are factors used to create smaller forms of the SI units. For example, a centimetre is a submultiple and kilometre is a multiple of a metre.

Length

What is the distance between your home to school? What is your height? How long is your bench? What is the width of a cloth? All these questions represent length of an object. Length can be expressed in terms of height, width, distance, etc.

The shortest distance between any two points is length. The length of a bench means the distance between the ends of two edges of bench.

Measurement of length

Depending on the length of a measuring instrument, different substances can be measured. Figure of different instruments are given below.



fig. scale



fig. measuring tape



Different types of scale can be used to measure different objects. Examples: geometry box ruler is used to measure length of small distance. A meter scale is used by a merchant to measure the length of the cloth. Measuring tapes are used to measure large distance such as length of road, length and breadth of rooms.

Multiples and sub- multiples of meter

10 millimeters (mm)	=	1 centimeter (cm)
10 centimeters (cm)	=	1 decimeter (dm)
10 decimeters (dm)	=	1 meter (m)
10 meter (m)	=	1 decameter (dam)
10 decameter (dam)	=	1 hectometer (hm)
10 hectometer (hm)	=	1 kilometer (km)

Correct measurement of length

Keep the ruler in contact with a small rubber. Make sure that the “zero” marking of the ruler coincides with one end of the rubber as shown in figure ‘A’. Hold the ruler straight along the length of the rubber. Note the reading of the other end of the rubber from the scale in this position. This will give the length of the rubber. ($10 - 0 = 10\text{cm}$)



fig. A

However, if the ruler is tilted as shown in figure ‘B’, it will not give us the correct length of the rubber.

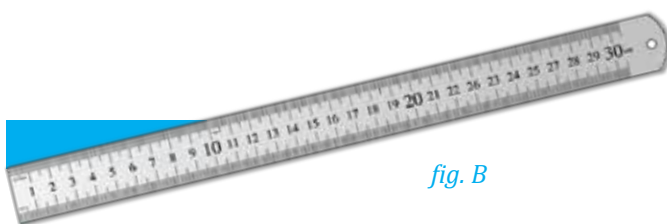


fig. B

One can measure the length of an object without using ‘zero’ markings. Like, if the starting point of measurement is 15.5cm and the end point is 5.5 cm. Then, the measured length will be $15.5 - 5.5 = 10\text{ cm}$.

However, for correct measurement not only does the ruler have to be placed properly, the position of the eye at the time of taking the measurement must be at the top of the point being measured as shown in figure ‘C’.

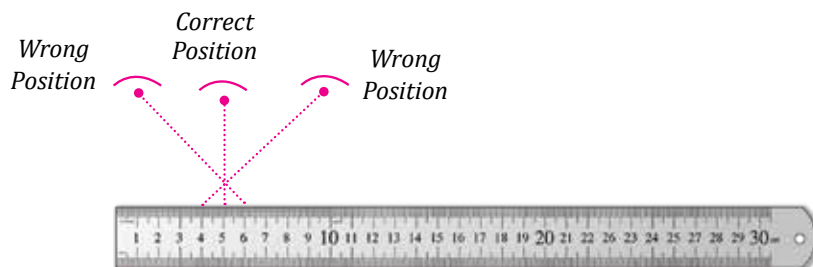


fig. C

Solved numerical problems :

1. Convert 3 m into cm

Ans: $3 \times 100\text{ cm} = 300\text{ cm}$

2. Convert 600 cm into m

Ans: $\frac{600}{100} = 6 \text{ m}$



Activity 1.4

Measure the length, breadth and height of your book with a ruler. Show it to your teacher.

Measurement of Mass

Mass is one of the fundamental quantities in Physics and the most basic property of matter. We can define mass as the measure of the amount of matter in a body. The SI unit of mass is Kilogram (kg).

Gold smith has to use small masses such as milligram, gram, etc. These units are called **sub multiples of kilogram**. But rice, pulses, wheat, etc. are bought in large scale and hence, they are weighed in bigger units of mass such as quintal, metric ton, etc. These units are the **multiples of kilogram**.

The mass of a body is measured by using a beam balance. Standard weight marked in gram or kilogram are placed on one pan of the balance while the body to be weighted is placed on the other pan by comparing the body with the standard weight, of the body is determined.

The following points should be remembered while measuring mass.

1. The beam balance should be in correct position. The beam of a correct balance is horizontal to the ground when its both pans are empty; and its point is coincided with the mark at the middle of the balance.



fig. Standard weights

2. The standard weights should be correct. In a correct standard weight, there is a small hole or a gap filled with lead and the official stamp of metrology department is marked.

Multiples and sub-multiples of mass

1000 milligrams (mg)	=	1 gram (g)
1000 gram (g)	=	1 kilogram (kg)
100 kilogram (kg)	=	1 quintal
1000 kilograms (kg)	=	1 metric ton

Solved numerical problems :

1. 10 kg into grams = $10 \times 100 = 10000\text{gm}$.

2. 2000 g into kg = $\frac{2000}{1000} \text{ kg} = 2\text{kg}$.

Measurement of Time

The SI unit of time is second (s). In old times, there was no watch to know time. People used to study regular events such as sunrise, sunset, change in season, position of stars, etc. to calculate time. Time interval between two consecutive noon is called a day. Time is the duration between any two events.



fig. watches

Nowadays, watch is used to measure time. There are different type of watches, such as table clock, wrist watch, digital watch, pendulum watch, quartz watch, etc. The quartz watch and digital watch measure accurate time.

Multiples and sub - multiples of time

Bigger units such as minute, hour, day, year, etc. are used to measure the longer period of time. These bigger units of time are called multiples of second. Microseconds and milliseconds are smaller units of time to measure smaller period of time. These are called sub-multiples of second.

How many seconds are there in a day? calculate:

1 day = 24 hours

= 24 x 60 minutes

(1 hr = 60 minutes)

= 24 x 60 x 60 seconds

(1 minute = 60 seconds)

= 86400 seconds

60 seconds	= 1 minute
60 minutes	= 1 hour
24 hours	= 1 day
30 days	= 1 month
12 months	= 1 year
10 years	= 1 decade
10 decade	= 1 century
10 centuries	= 1 millenium

One second may be defined as the $1/86,400^{\text{th}}$ part of a solar day.

The time taken by the earth to make one complete rotation about its own axis is called a day. If a day is divided in 24 equal parts, each part is called an hour. If an hour is sub-divided into 60 equal parts, each part is called minute.

The time taken by the earth to revolve once around the sun is called a year. The earth takes about 365 days to revolve once around the sun. Therefore, 1 year is equal to 365 days.

Measurement of temperature :

We feel hotness and coldness of any objects when we touch them. Ice is colder than water. We feel cold in winter than in summer. The quantity of hotness and coldness is temperature of that object. The SI unit of temperature is kelvin (K). It is also measured in $^{\circ}\text{C}$ and $^{\circ}\text{F}$.

The temperature of healthy person is 37°C or 98.6°F . We feel fever if the temperature of our body increases. Thermometer is used to measure the temperature.



Measurement of Area

Every body has its surface. A match box has the surface of six faces. Similarly, a paper sheet has the surface of two faces.

SI units of surface area is square meter (m^2).

Regular and irregular objects



Activity 1.5

Take a coin, place it on a paper and draw outline of coin on the paper. Now remove the coin from paper. How many area does the coin occupy on the paper? Observe it. The surface covered by the coin on the paper is called area of coin. Similarly. Our feet covers the surface on the ground.



Activity 1.6

Bring a piece of stone and a brick or a book. Now look at their outer structure and shape. What are the differences between these objects in their shape? How are the surface of brick or book? Again look at the piece of stone. What is the shape of stone? Is the shape of stone regular? Compare it.



The objects around us which have fixed geometrical shapes are called regular object. They have a definite shape. For example, brick, book, marble, football, etc. The objects around us, which do not have definite shape are called irregular objects. Pieces of stone, broken pieces of brick, etc. are same of the examples of irregular objects.

The plane surface covered by a body is called area.

Area of regular plane surface

Objects have various shapes. Some of them have definite and regular shapes, for example, coin has circular shape. Book and copy have rectangular shape. Using different mathematical formula, the surface occupied by these objects area can be determined.

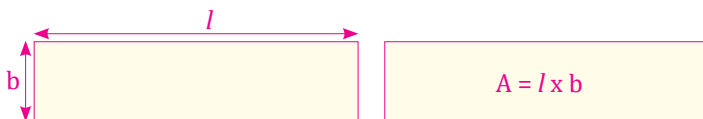
A. Area of rectangular shaped object

$$A = l \times b$$

A = area

l = length

b = breadth

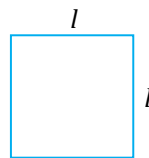


B. Area of square shaped object

$$A = l^2$$

l = length of square

A = area

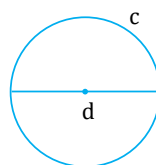


C. Area of circular shaped object

$$A = \pi r^2,$$

A = area

r = radius of object



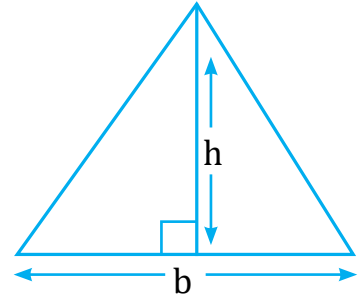
$$p(\pi) = \frac{\text{circumference}}{\text{diameter}}$$

$$= \frac{22}{7}$$

D. Area of triangular shaped object

$$A = \frac{1}{2} b \times h, \quad A = \text{Area}$$

b = length of base h = height of triangle



Solved Numerical Problem

A rectangular room has 5 meter length and 3 meter breadth, what is the area of the room?

Solution,

Here, length of room (l) = 5m

Breadth of room (b) = 3m

Area Of room (A) = ?

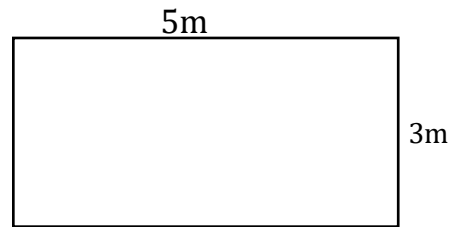
We have,

$$A = l \times b$$

$$= 5\text{m} \times 3\text{m}$$

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

\ Area of room is 15 m².



Area of regular plane surface

Table : sub multiples and multiplies of m²

Sub - multiples and multiplies of m²

100 square millimetre (mm²) = 1 square centimetre (cm²)

100 square centimetre (cm²) = 1 square decimetre (dm²)

100 square decimetre (dm²) = 1 square metre (m²)

100 square decametre (dam²) = 1 square hectometre (hm²)

100 square hectometre (hm²) = 1 square kilometre (km²)



Activity 1.7

Find the area of your science and environment book by using formula of area. Similarly, measure length and breadth of your class room and find its area.

Area of irregular plane surface

Many objects around us may not have regular shape. Turned piece of paper, piece of stone, leaf, etc. have irregular shape. Area of these objects can't be found by using formula. Area of such irregular shaped objects can be determined with the help of graph paper.



Activity 1.8

Take a graph paper and place it on a table. Place a green leaf on the graph paper and mark its outline using a pencil. Remove the leaf. The shape of leaf surface is obtained on the graph paper. It contains number of complete squares and fractional squares in the outlines of line. Count the number of complete squares, half squares and more than half squares in outline of leaf on the graph paper. Those fractions which are less than half, neglect them from counting. Find the total number of counted squares on graph paper. The total number of squares give an area of the leaf in squares units.



Volume

Liquid substances like milk, kerosene, oil, petrol, diesel, etc. are needed in our daily life. How are these liquid substances measured? Have you ever gone to shop to buy oil and kerosene? In which instrument does the shopkeeper measure these substances. In the past, these substances were measured in mana and pathi but, nowadays substances are measured in litre.

Litre gives volume of liquid substances. When the liquid is kept in measuring devices, they occupy space.

The space occupied by a substance is called its volume.

In SI unit, it is measured in cubic meter (m^3). It is also measured in litre. 1 cubic meter is equal to 1000 litre.



Measurement of volume of liquid

Volume of liquid is measured in litre (l). The smaller unit of litre is milli liter (ml).

1 litre (l)	=	1000 Millilitre (ml)
1 millilitre (ml)	=	1 cubic centimeter (cm ³ or cc)
1 litre (l)	=	1000 cubic centimeter (cm ³ or cc)
1 cubic meter (m ³)	=	1000 litre (l)

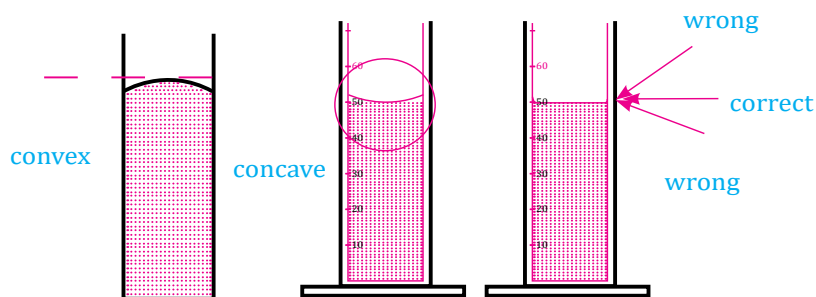
In science laboratory, measuring cylinder is used to measure volume of liquid. Capacity of 10 ml, 25 ml, 250ml, 500 ml and 1000 ml measuring cylinder are used.



Activity 1.9

Take a measuring cylinder and pour some water into it gently. What is the shape of water surface in measuring cylinder? Look at carefully. Is the shape of water plane surface or not?

The surface of water is not plane but curved in such a way that the middle portion is more depressed than its sides. Such a surface is called concave surface or lower meniscus. Along with water, kerosene, oil, alcohol, spirit, etc. liquids are in concave shape in the cylinder. But mercury-like liquid substance makes curve surface in such a way that the sides are depressed than at its middle in the cylinder. Such surface is called convex surface or upper meniscus. So, mercury does not wet the glass surface.



The liquid whose surface is concave that is measured from lower meniscus. But the liquid whose surface is convex that is measured from upper meniscus.

While taking the reading of liquid level, your eye should be kept straight at the liquid level (either at lower meniscus or upper meniscus). If our eye is either at lower or upper position than that of liquid level, it does not give correct reading.

Volume of regular solid object

Have you seen match box, paper box, brick, etc? What are the shape of these objects? These objects have rectangular shape. Volume of these objects are measured by measuring their length, breadth and height or thickness, We use mathematical formula to measure volume.

Volume of cuboid

Volume (V) = length (l) x breadth (b) x height/thickness (h)

$$V = l \times b \times h$$

If length, breadth and height are equal in cubical objects, their volume can be determined by:

Volume of cube (v) = (side)³

$$V = l^3$$

Sub-multiples and multiples of m³

Table : Sub multiples and multiples of m³

1000 cubic millimetre (mm ³)	=	1 cubic centimetre (cm ³)
1000 cubic centimetre (cm ³)	=	1 cubic decimetre (dm ³)
1000 cubic decimetre (dm ³)	=	1 cubic metre (m ³)
1000 cubic decametre (dam ³)	=	1 cubic hectometre (hm ³)
1000 cubic hectometre (hm ³)	=	1 cubic kilometre (km ³)

Volume of sphere

Marble, football, etc. are the examples of spherical object.

$$\therefore \text{Volume of sphere (V)} = \frac{4}{3} \pi r^3$$

$\therefore r$ = radius of sphere

$$\pi (\text{pi}) = \frac{22}{7}$$

Volume of irregular solid object



Activity 1.10

Take a measuring cylinder and fill it half with water. Read the level of water on the measuring cylinder. Note it in your copy. While taking the reading of the water level, keep the eye straight to lower meniscus of water.

Take a small stone and tie it tightly with string or rope. Keep it slowly into the cylinder till it is completely immersed into the water as shown in fig. The level of water rises in the cylinder. Note the final water level accurately. Take the differences between initial level and final level of water. The difference gives the volume of stone.

Therefore,

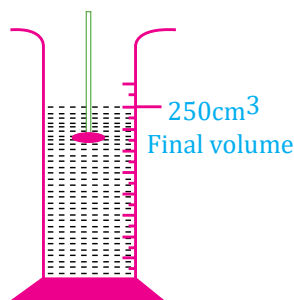
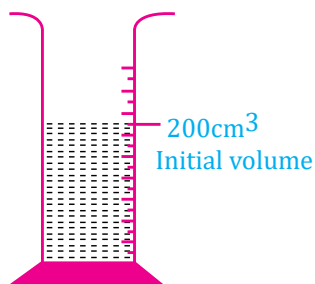
Initial level of water = V_1

Final level of water (with stone) = V_2

$\therefore$ Volume of stone (V) = $V_2 - V_1$

Solved Numerical Problems

1. What is the volume of stone in the given figure ? Find it.



Solution,

Initial volume of water (V_1) = 200 cm^3

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

Final volume of water with stone (V_2) = 250 cm^3

Volume of stone (V) = ?

Now, we have,

$$\begin{aligned} V &= V_2 - V_1 \\ &= 250 \text{ cm}^3 - 200 \text{ cm}^3 \\ &= 50 \text{ cm}^3 \end{aligned}$$

$\therefore$ Volume of stone is 50 cm^3

2. **The length of our science book is 34 cm, breadth 17.3 cm and thickness (height) is 1.3 cm. Calculate its volume.**

Solution,

Given,

Length (l) = 34 cm

Breadth (b) = 17.3 cm

Height (h) = 1.3 cm

volume of book (V) = ?

We know,

volume of cuboid (V) = $l \times b \times h$

$$\begin{aligned} \text{or, } V &= 34 \times 17.3 \times 1.3 \\ &= 764.66 \text{ cm}^3 \end{aligned}$$

$\therefore$ The volume of book (V) = 764.66 cm^3 .

Note : The cuboid having all sides equal is called cube. The volume cubical object is determined by using following formula.

Volume of cube = $(\text{side})^3$

i.e. $V = l^3$ ($\because l = b = h$)

Project Works

1. Take a physical balance and standard weights of different weight. Place any body on one side of pan of the physical balance and keep on putting standard weight on another pan of the balance until the rod becomes straight horizontal or check on indicator of the balance. Find the total weights of body when rod becomes straight.
2. Collect various irregular shaped objects and find their volume by using measuring cylinder.
3. What types of units are used to measure the different physical quantity at your society. Make a list.

Physical Quantity	Unit
Volume	Mana, Pathi, Litre

4. Measure the length, breadth and height of your classroom and discuss with your teacher.
5. Measure the length, breadth and height of your science book and find its volume.



GLOSSARY

- magnetism** : the attractive property of magnet towards the magnetic materials
- local** : confined to a particular region (Tola, pau, dharni : local units of measurement of mass)
- calibration** : the process of marking the scale of a measuring instrument
- consecutive** : in succession



A. Choose the best answer from the given alternatives.

- i. Force is measured in _____.
 - a. Foot
 - b. Newton
 - c. Inch
 - d. Kilometer
- ii. How many seconds are there in a day?
 - a. 86400 seconds
 - b. 84600 seconds
 - c. 48600 seconds
 - d. 68400 seconds
- iii. What is the SI unit of mass ?
 - a. pound
 - b. kilogram
 - c. dharni
 - d. ton
- iv. Which one is derived unit?
 - a. meter
 - b. gram
 - c. second
 - d. Newton
- v. One kilogram is equal to _____ gram
 - a. 10
 - b. 1000
 - c. 100
 - d. 10000

B. Fill in the blanks.

- i. Large quantity of matter contains more _____.
- ii. Duration between any two events is _____.
- iii. Mass of a body is measured by _____.
- iv. All measuring _____ have standard markings for accurate measurements.
- v. The standard unit of measurement of distance is _____.
- vi. The mass of a body is _____.

C. Use a tick (✓) for the correct statement and a cross (×) for the incorrect one.

- i. 4.94 m is equal to 49.4cm.
- ii. Mass of the body varies from place to place
- iii. Meter is the SI unit of mass.
- iv. FPS system is also called British system of units.
- v. The amount of matter contained in a body is called its time.

D. Match the following two columns.

Column 'A'

length
time
volume
weight
area
mass
1500 gram
temperature

'Column 'B'

1.5 kg
kg
kelvin
meter
cubic meter
second
spring balance
square metre

E. Answer these questions.

- i. What is standard unit?
- ii. Write any two demerits of traditional measurement system.
- iii. What is measurement? Write the importance of measurement.
- iv. What precautions should be taken while measuring the length?
- v. Define physical quantity.
- vi. The hand can not be used to measure length as standard unit. Why?
- vii. Define mass and write its SI unit.
- viii. SI units are used for scientific work. Why?
- ix. What kind of watch is used to measure time during sports events?
- x. Mass can be measured in local units like dharni, pau, etc. Write the advantages of using kilogram as a standard unit of mass over the local units of mass.
- xi. Why do we need standard units? Write the importance of measurement.
- xii. Write the multiples and sub-multiples of meter.
- xiii. Define a day.
- xiv. What is scientific learning?
- xv. List the six scientific skill processes with example.

F. Define :

- a. Mass b. MKS system c. SI system

G. Convert the following:

- a. 20 cm into m b. 11 gram into kg
c. 55 s into min d. 50 km into m

- | | |
|----------------------|-------------------|
| e. 83 min into sec | f. 90 hr into sec |
| g. 250 hrs into days | h. 60 mm into m |
| i. 6 kg into g | j. 20 km into cm |

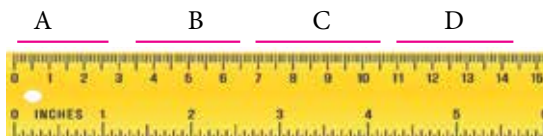
H. Diagrammatic Questions

- i. Figure shows a measuring scale which is usually supplied with a geometry box. which of the following distance cannot be measured with this scale by using it only once?

- | | |
|----------|-----------|
| a. 0.1 m | b. 0.15 m |
| c. 0.2 m | d. 0.05 m |

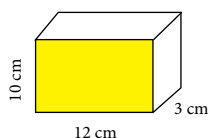


- ii. Four pieces of wooden sticks A,B,C and D are placed along the length of 30 cm long scale as shown in figure. Which one of them is 3.4 cm in length?

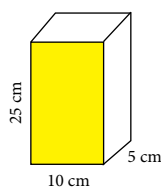


- | | |
|------|------|
| a. A | b. B |
| c. C | d. D |
- iii. Find the volume of the given solid

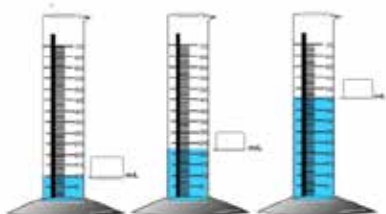
a.



b.



- iv. Find the volume of liquid in each cylinder.



Unit 2

Information and Communication Technology

STUDENT'S LEARNING OUTCOMES

After studying this unit, the students will be able to :

- introduce and give examples of simple technology and modern technology.
- Explain the use of mobile and computer in daily life.
- define Laptops, desktops, tablets, iPads, smartphones as computers.
- identify computer parts.
- create a table in word processor to fill in and edit data in it.
- present information on a topic through multimedia using presentation software.
- make general use of spread sheet.

2.1 Technology

In daily life, we do many activities, including cooking and doing farm work. Make a list of the work we do in our home or neighborhood. What techniques and equipment are used in these works ? Is all this work possible to do without technology and equipment? What kind of technologies are being used to make and use these tools? Let's discuss.

We do different kinds of work in daily life. To do these work different scientific knowledges are applied practically. The machines, and tools are invented based on these knowledge and techniques. The specific methods materials and devices based on scientific knowledge used to solve practical problems or invent useful tools, is technology. Using technology, we can perform and proceed the work much more efficiently. There are two types of technology.



1. Local/Simple Technology
2. Modern Technology

1. Simple technology

In simple technology, simple scientific knowledge and technique is used. The machine with simple technology have simple structure and composition. Mainly, locally available objects are used. Generally, there is no use of extra fuel to run the

machine based on simple technology. Some simple technologies used in practice are as follows:

a. Simple technology used in Agriculture :



plough



spade



sickle

b. To carry load (Transportation)



cart



basket (*Doko*)



boat

c. To grind grains, beans.



mortar and Pestle



janto



dhiki

d. To separate mixture



theki



kokro



nanglo

- e. To separate oil and juice from mustard, sugarcane and fruits.



kol



kol

- f. To cook/make food.



oven (*chulo*)



benla and Chauko

- g. To make alcohol



thosi, patasi (handa)

- h. To make clothes from fibre wool.



tan



Activity 2.1

Some tools of local technology are given below. Write the uses of these technologies with the help of your parents, friends, relatives, neighbors, etc. Make a table and discuss it in class.

Plough, spade, sickle, cart, doko, basket, mortar and pestle, janto, theki, dhiki, kokro, nanglo, conventional stove, mustard or chiuri peeling wood coal, lemon peeling coal, coal-fired iron, honeycomb, chulo, benla, chauko, thosi, tan etc.

S.No.	Tools	Uses
1.	Janto	Jato is used by hand to grind such as pulses, lentils, rice, kinds of wheat and other grains and normally a person is enough to operate it
2.		
3.		
4.		

2. Modern Technology:

What is used to plough the field in your society?

Even now oxen and he-buffaloes are used to pull the plough in village. This is the local technology but now a day tractors are used for this purpose as a modern technology.

Modern technology is the advanced form of old technology, with new additions and modification. Modern technologies helps us to work quickly and efficiently by improving the workflow.

Some modern technologies in practice as follows:

a. Agriculture :



tractor



harvester



tractor plough

b. Transportation



bus



train



aeroplane

c. To grind



grinder



mill

d. To cook food



gas stove



induction

e. For communication :



mobile



laptop

f. To wash clothes



washing machine

g. To preserve food.



refrigerator



Activity 2.2

Some tools of modern technology are given below. Write the uses of these technologies with the help of your parents, friends, relatives, neighbors, etc. Make a table and discuss it in class.

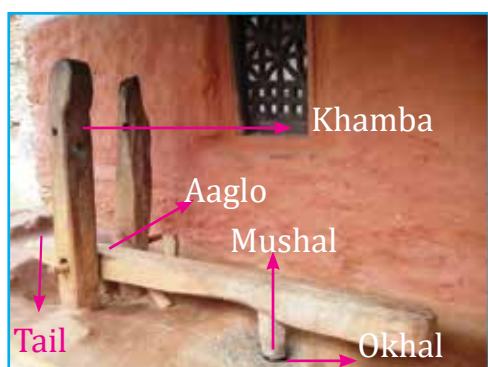
Tractor, Harvester, Room Heater, Air Conditioner, Refrigerator, Smart Phone, Computer, Scooter, Car, Jeep, Bus, Train, Aeroplane, Grinder, Mill.

S.No.	Technology/ Equipment	Uses
1.	Tractor	Tractors can be used to pull a variety of farm implements for plowing, planting, cultivating, fertilizing, and harvesting crops,
2.		
3.		
4.		

Some local technologies

We have been using some local technologies since ancient time. Dhiki and janto (stone grinding mill) are used for grinding grains. Hand mills are used for squeezing and pressing juicy things. Now-a-days these local technologies are being replaced by the modern technologies.

Dhikki and Janto



Dhiki and janto are kinds of traditional mills being in use since ancient time. It is used for pounding rice and making beaten rice. Dhiki is made up of a heavy wooden block of 2 meters in length, 5cm in breadth and 10cm in thickness.

Janto

This device is used for grinding grains into flour. It consists of two circular stone wheels. The lower wheel is fixed at ground and an iron nail is fitted at the centre of it. Nail is called as mani. A wide hole is at the centre of the upper disc. Grains are poured in this hole for grinding.

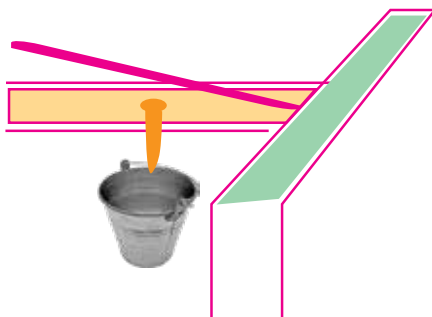


Kol

This device is used for extracting oil from seeds, juice from sugarcane stem and citrus fruits. After applying pressure on fruits, seeds or stems they yield juice or oil.

a. Kol for Citrus Fruits

This kol is used to extract juice from citrus fruits.



b. Kol for Mustard Seeds

Mustard seeds grinding kol is quite similar to like sugarcane kol.



c. Kol for Sugarcane

This kol is used to extract juice from the sugarcane stems.



Project Work

Make a list of local and modern technologies, write a report on the scientific principles they work on, and present it in the classroom.



GLOSSARY

biomass	:	plant materials and waste used especially as a source of fuel
combustion	:	the process of burning
defects	:	something that cause weakness or failure
extraction	:	the act or process of getting something by pulling it out, forcing it out, etc.



A. Choose the best answer from the given alternatives.

- i. It extracts oil or juice.
 - a. Kol
 - b. Janto
 - b. Dhiki
 - d. improved cooking stove
- ii. It grinds grains into flour.
 - a. Janto
 - b. Kol
 - b. Dhiki
 - d. improved cooking stove
- iii. It removes husk from paddy.
 - a. Dhiki
 - b. Kol
 - b. Janto
 - d. improved cooking stove
- iv. It is designed to produce less smoke.
 - a. Kol
 - b. Dhiki
 - b. Janto
 - d. Improved cooking stove
- v. It is also called husker.
 - a. Dhiki
 - b. Janto
 - b. improved cooking stove
 - d. Kol

B. Write “T” for true or “F” for false statements.

1. Janto is used to produce flour from seeds of some plants. ☐
2. Main principle of the mustard seeds and sugarcane stems are different. ☐
3. Traditional stove is better than improved stove for health. ☐
4. Beaten rice is eaten by animals only. ☐

C. Fill in the blanks with suitable words.

1. Handle of the janto is called as _____.
2. The improved stove helps to save energy and releases the _____ outside the house.
3. These local technologies can be seen in _____.
4. Traditional _____ needs lots of firewood.
5. _____ is used to produce beaten rice from rice grains.

D. Answer these questions.

1. What is technology?
2. What is local technology?
3. Why local technology is useful?
4. Name some examples of local technology used in your community.

E. Draw the diagram of the followings.

- | | |
|-----------|-------------------|
| a. Dhikki | b. Janto |
| c. Kol | d. Improved stove |

F. Diagrammatic Questions

- i. What is being done in the picture below? What kind of technology is this? Make a list of its applications in points:



- ii. What is being done in the picture below? What kind of technology is this? Make a list of its applications in point form.



- iii. What is being done in the picture below? What kind of technology is this? Make a list of its applications in point form.



- iv. Look at the picture and answer the question below.



- Identify the picture and write the name.
- What technology are these tools made of?
- What are the similarities between these tools in terms of usage?
- Describe the development of these tools.
- Before the development of these tools, what kind of tools may have been used?

2.2 Use of mobile phone and computer in our daily life

What are mobile phones and computers used for? Let's discuss this in the classroom.

Mobile phones are one of the most commonly used gadgets in today's world. Everyone from a child to an adult uses mobile phones these days. They are indeed very useful and help us in so many ways. Mobile phones make our lives easy and convenient but at what cost? They are a blessing only till we use it correctly. When we use them for more than a fixed time, they become harmful for us.

We use mobile phones for almost everything now. Gone are the days when we used them for only calling. Now, our lives revolve around it. They are used for communicating through voice, messages, and mails. We can also surf the internet using a phone. Most importantly, we also click photos and record videos through our mobile's camera. The phones of this age are known as smartphones.

Technology has changed every aspect of our daily life. A computer is one of them which has made our life better. When the computer was invented first; it was not as simple as it is now. It was too big and difficult.

Computer is currently the best option for communication. The computer gives very accurate answers to everything, including math and science. It is essential in life because it can do anything. We shouldn't overuse computer. It can affect our health. Also, we shouldn't waste time misusing computer and surfing videos.

Use of smart phone in our daily life

Smartphone

Smartphone is a portable device. It helps in communication and as well as computing. It consists of features that help in communication like voice calls, text messaging and internet services. It contains features like word processing, calculation etc. It can be used for viewing, editing, sharing documents, downloading files, perform financial transaction, monitor and control other electronic devices. The smartphone consists accessories like camera, voice recorder, watch, timer, radio, calendar and other several accessories that are frequently used in our daily life.





Activity 2.3

- i. Who uses a smartphone in your family? For what purposes do they use smartphones? Present the information you have collected in tabular form.
- ii. Have you ever used a smartphone? If so, for what purpose? Write down the importance of smartphones and present it in the classroom.
- iii. What problem will a student face if he watches cartoons on his mobile phone for a long time on a daily basis? Write down the table form.

Use of computer in daily life

From school and colleges to hospitals and banks, government to private sector, every institution and person uses computer today. This advancement in technology has made our lives easy and comfortable. Looking around at daily life, our lifestyles have undergone a huge change with the advancement in technology especially in the field of computer. All of these computerized facets of our society help to increase our daily productivity and help us to do whatever we need to accomplish in a day. Today, in modern society, computers have become an integral part of our lifestyle and are found at offices, homes, schools, colleges, research, medicine, hotels, shops etc.

The term “computer” is derived from the Latin word “computare”, this means to calculate. The term “computer” usually refers to the Center Processor Unit plus Internal memory. A computer is an electronic device designed to accept data to perform mathematical and logical operations at high speed, and display the meaningful information/result in the form of output on the computer screen.



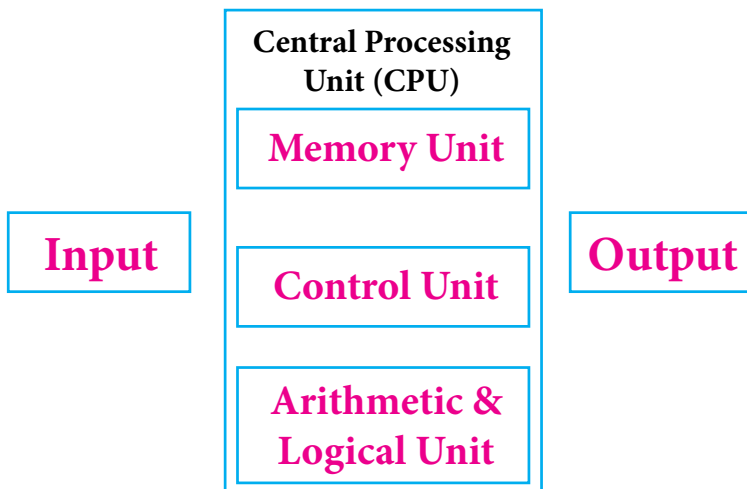
Activity 2.4

Have you ever used a computer? If so, for what purpose did you use the computer? Who uses computer in your family? What purpose do they use the computer for? Make a report and present it in the classroom.

Components of a computer

A computer device is made up of various elements which help in its effective functioning and processing. There are five basic components of the computer which help in making this processing of data easier and convenient.

By definition, components of a computer system are the primary elements which make the functioning of an electronic device smooth and faster. There are five basic components which include:



- i. Input Unit
- ii. Output Unit
- iii. Memory Unit
- iv. Control Unit
- v. Arithmetical and Logical Unit

The components of a computer can be divided into hardware and software. Physically touching components like keyboards, mouse, monitors, etc. are hardware. Since the hardware itself can not do anything, it needs programs to instruct it to work. A collection of programs that instruct hardware to work is called software. Windows, the operating system, microsoft word, and media player, etc. are software.

Working Principle of a Computer

You know that computer is an amazing electronic machine that processes the raw data and generates the meaningful result. In generating the information, computer follows the I-P-O cycle that is input- process – output cycle. There is one more stage involved in the working of a computer, namely storage which stores data, information and program for the future use.

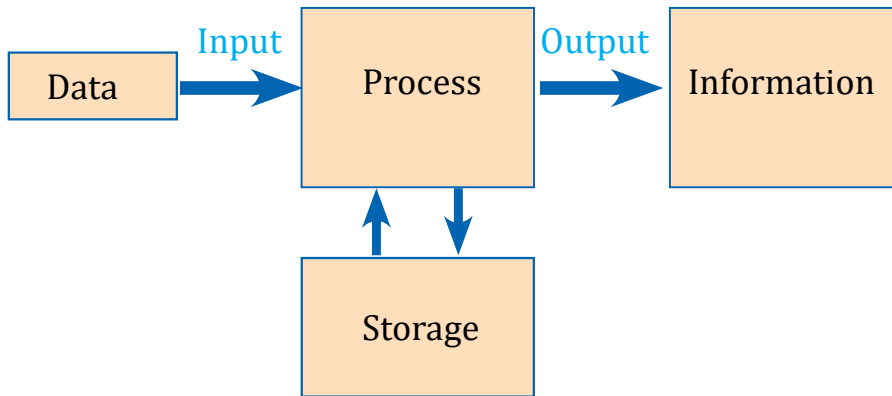


fig. I-P-O-S Cycle

Input :

The process by which a user gives data or instructions to a computer is called input. Input comes from various devices, such as: keyboard, mouse, microphone, scanner, etc.

A computer will only respond when a command is given to the device. These commands can be given using the input unit or the input devices.

For example: Using a keyboard we can type things on a Notepad and the computer processes the entered data and then displays the output of the same on the screen. The data entered can be in the form of numbers, alphabet, images, etc. We enter the information using an input device, the processing units convert it into computer understandable languages and then the final output is received by a human-understandable language.

Processing :

The data given to the computer is processed by the Central Processing Unit (CPU).

Output :

The results obtained after processing are obtained by the user through the output device. Monitors, speakers, printers, etc. are examples of output devices.

Storage device

A hardware device which can be used to store digital data and applications which may be in the form of images, video, audio, etc. is called a storage device. It is a key component of a computer and the hard drive is one of its examples. A computer uses different secondary storage devices, to store data and information such as hard disk, CD, DVD, pen drive and memory card.



Activity 2.4

- i. On your computer, open Microsoft Word and enter your name, age, class, and school name, and save it too. Close and reopen the Word file you saved.
- ii. In the exercise book, write the names of the hardware and software on the computer you are using. Write a brief introduction to it.

Function of a Computer

Let us read about functions performed by a computer during all these stages. A computer performs the following five main functions during its working.

1. Accept data from input device such as keyboard, mouse, and scanner.
2. Process input data.
3. Produce output through output devices like monitor, printer and speaker.
4. Stores data in the storage devices like hard disk, pen drive and CD.
5. Control above operations.

Parts of Computer

Computer comprises of different parts. They are connected with each other to make a computer system. Each parts of computer plays very important role whenever we use a computer. The main parts of computer are: mouse, keyboard, CPU, monitor and speaker.



Types of Computer

Desktop

Desktop is a personal computer designed for regular use at a single location. Usually it is kept on or near a desk. It has several discrete units i.e. monitor, keyboard and processing units separated from each other but connected by cables.



Laptop

Laptop is a portable personal computer. It is small and light weighted. It has a screen, keyboard and processing unit assembled in a single unit. It is powered by rechargeable battery. It is useful for person who has to use the same computer at different places.



Application areas of computer

Computer application has become very important in every area of our lives. Some of the common application areas of the computer are described below:

Computers in Education

Computers are being used actively at schools and colleges, to improve the learning process. Computers are useful for the students to make their project reports and to solve complex mathematical problems. Computers have proved to be excellent teachers. Computers help the teachers to prepare notes and presentations about their lectures.

Computers in Communication

Humans have always communicated. In the beginning of mankind, man and woman used speech and body languages, but today in the modern world, this is the age of information technology. A computer plays vital role in the field of communication. Now, we have mobile phones, internet, fax and other many methods for providing good way to communicate with each other throughout the world by sitting at home. We can talk anytime, anywhere through mobile phones and we can also send e-mail through internet to our family or friends throughout at any part of the world within a few seconds.

Computer in Business

The uses of computers in business are nearly infinite. Computers easily complete duties that are tedious and timely for humans. In business, computers help in several aspects of work such as to keep records, develop budgets and forecasts, prepare marketing documents, to control the branch offices from the main offices, in research centres, and stay in contact with other employees and customers, and so on.

Computer in Medical and Health

Medical history of a patient includes physical symptoms, diagnosis, treatments, and even family medical history are kept safe in a computer. Appointments are scheduled using a computer database. Billing information is also stored. Their uses include storing patient related data, providing the logic and circuitry for medical equipment, scanning and imaging the body, and facilitating speedy communications.

Computers in Government

The government uses computers to manage its own operations and also for e-governance. The websites of the different government department provide information to the users. Computers are used for the filing of income tax return, paying taxes, online submission of water and electricity bills, for the access of land record details, etc.

Computers in Entertainment

Computers have become good source of entertainment. The user can download and view movies, play games, chat, book tickets for cinema hall, use multimedia for making movies, incorporate visual and sound effects using computers, etc.

Computers in Advertising

Computers are used to create an advertisement using the visual and the sound effects. Advertisement can be displayed on different websites, electronic-mails can be sent and review of a product by different customers can be posted.

Computers in Transportation

Computers are used to help run rapid transit systems, load containerships and track railroads cars across the country. An important part is the air control traffic systems, where computers are used to control the flow of traffic between airplanes which needs a lot of precision and accuracy to be dealt with.

Introduction of Operating System

Introduction

An Operating system is a system software that enables the computer hardware to communicate and operate with the computer software or programs for various uses. Every computer must have an operating system. It may be regarded as the backbone of a computer, and is an intermediary between the user and the computer. Without an operating system, a computer would be useless. Some of the commonly used operating systems are:

- a. MS-DOS,
- b. Windows XP/Vista/2007, and
- c. Linux.

MS-DOS

Microsoft Disk Operating System (MS-DOS) is the first operating system developed by Microsoft Corporation. MS-DOS is a command line interface (CLI). MS-DOS controls the computer hardware and provides an environment for programs to run. MS-DOS is a very powerful operating system. There are many advanced application and games for MS-DOS. A version of MS-DOS underpins windows. It is a single tasking system, which means that the software is capable of performing only one function at a time. For example, if a program is saved using MS-DOS no other function can be performed until the save is completed.

Windows XP/Vista/2007

Microsoft Windows is the most popular computer operating system developed by Microsoft Corporation. The first version of windows was released in 1985 as a Graphical User Interface (GUI) to MS-DOS, providing multiple document support, mouse support, drop down menus, and color video drivers. It is multi tasking system, because which means that the software is capable of performing more than one function at a time. It allows users to enter commands by selecting icons or buttons. Later versions gradually replaced many of MS-DOS built in hardware functions with their own enhanced functions, until windows fully assimilated MS-DOS and become a full-fledged operating system.

Today, Microsoft Windows is the most widely used OS on personal home computers, laptop computers, and small business machines. Windows XP/7/Vista are the most popular operating system of Microsoft Windows.

Linux

Linux is a free open-source operating system. Linux is free download, edit and distribute. Linux is a very powerful operating system. You can create and edit documents and spreadsheets with Linux based office applications and most of these applications are included as part of operating system itself. It has email clients and server apps which will allow you to use your machine as file or web server. There are also image editing tools, MP3 playback and video editing applications, etc. Linux is gradually becoming popular throughout the world.

Features of Operation Systems

The features of the operating systems are totally dependent on the type of software. Every operating system differs from each other in some features while there are some features which are common in all operating system. Today, most operating systems perform the following important functions:

1. **Processor management:** It manages the assignment of processors to different tasks being performed by the computer system.
2. **Device management:** It is an important function of an operating systems. It manages the co-ordination and assignment of different input and output devices while one or more programs are executed.
3. **Memory management:** It manages the allocation of main memory and other storage areas to the system programmers as well as user programmers and data.
4. **File management:** It allows all files to be easily changed and modified through the use of text editors or some other file manipulation routines.
5. **Housekeeping:** It includes all the services necessary to ensure the smooth operation of the computer system like security, protection, resource accounting, back up etc.

Booting

Booting is a process that starts the operating system when the user turns on a computer system. During the booting, system will check all the hardware's and software's those are installed or attached with the system and this will also load all the files those are needed for running a system.

1. **Warm booting:** The operating system is restarted while the computer is already on.
2. **Cold booting:** The operating system is started when the computer is turned off.

Starting the Computer

Starting the computer is also known as booting the computer. It is important to switch your computer on in the correct way because the computer will check the peripheral devices on start up. Starting the computer will also start the operating system.

Follow these steps to start a computer properly:

1. First, check peripheral device connections.
2. Switch on power at the power outlet.
3. Turn on the UPS if you have added it to your computer.
4. Turn on the CPU button and wait for the computer to boot up. A screen will come up, as this is the initial "boot up" screen.
5. After boot up screen, if there's an account on the computer that requires a password, then enter your password and press Enter button from keyboard.
6. Finally, wait until the window desktop appears on the screen.

Shutting down the computer

By now you are well aware that Windows remain in the computer memory till the power is on. After completing the work, these Operating System files are sent back to the hard disk properly so that no damage is caused to these files. This process is known as 'Shut Down' of an Operating System.

If you switch off the computer without giving a proper shut down command then there are very high chances of losing the data and it may also damage the Windows Operating System.

Follow these steps to shut down a computer properly:

1. Click on Start menu and then click on Turn Off Computer option.
2. The Turn off computer dialog box appears. It has three options. They are:
 - a. **Stand By:** When the work is not complete, and you do not wish to shut down the computer, the Stand By option is selected. It puts the computer in a low power state so that the work can be quickly resumed.
 - b. **Turn Off:** When you need to shut down the computer, you do so by using the Turn Off option. It helps you to shut down the computer.
 - c. **Restart:** If the computer needs to be shut down, due to some error, then it can be restarted by using the Restart option. This option shuts down the Windows properly, and then starts it again immediately.

Desktop

When you start the computer, the area you are looking at is called the desktop. It occupies the entire screen, and unlike a window, it can't be reduced in size. The desktop consists of a colored or patterned background, containing small pictures called Icons that represent programs or data stores. Double-clicking on an icon opens the corresponding program or file inside a window. For example, there will be icons for:

- **My Computer**-to see the computer contents and manage files.
- **Recycle Bin**- a temporary storage place for deleted files, which can be used to retrieve files deleted in error.
- **My Document**- provides a default storage location for data files.
- **Internet Explorer**- to browse websites.

Project work

- i. Prepare a report on the benefits of smartphones and computers in daily life.
- ii. What are smartphones and computers used for? Make a list and present it to the classroom.



A. Choose the best answer from the given alternatives.

- i. Portable device is _____
 - a. Desktop
 - b. Smartphone
 - c. Computer
 - d. Monitor
- ii. A computer is _____
 - a. a physical device
 - b. an electronic device
 - c. a portable device
 - d. a light device
- iii. Input device is _____
 - a. hard disc
 - b. CD
 - d. keyboard
 - e. pen drive
- iv. Output device is _____
 - a. monitor
 - b. mouse
 - c. scanner
 - d. keyboard
- v. Which is not a part of computer?
 - a. monitor
 - b. mouse
 - c. pen drive
 - d. keyboard

B. State whether the following statements are True (T) or False (F):

- a. Every operating system differs from each other in some features.
- b. Windows XP is an operating system.
- c. MS-DOS is the first OS used before MS-Windows.
- d. MS-DOS is multi tasking system.
- e. Linux is a free open-source operating system.
- f. Shutdown is the synonym of ON in computer.

C. Fill in the blanks:

- An operating system may be regarded as the _____ of a computer
- _____ shares characteristics with both hardware and software.
- MS-DOS stands for _____
- The first version of windows was released in _____
- A few examples of operating systems are _____
- The computer turn off dialog box has _____ options.

D. Match the followings pairs A and B by drawing the lines across:

Group A

MS-Windows

MS-DOS

Linux

GUI

Desktop

Turn off

Group B

stands for Graphical User Interface

is a free open-source operating system.

occupies the entire screen.

is a computer operating system.

helps you to shut down the computer.

is a single tasking system.

E. Give one word for the following statements:

- A system software that enables the computer hardware to communicate and operate with the computer software or programs for various uses.
- An OS that is capable of performing only one function at a time.
- An OS that requires command to be entered by typing.
- An OS provides multiple document support, mouse support, drop down menus, and color video drivers.
- An OS that allows users to enter commands by selecting icons or buttons.

F. Answer the following questions:

- What is an operating system?
- List three types of operating system.
- What is MS-DOS?
- What is MS-Windows?
- Explain any four features of computer.
- Write the steps to start the computer.

G. Write short notes on.

- a. Linux
- b. Desktop
- c. Features of computer
- d. Stand By

H. Diagrammatic questions

- a. Answer by looking at the picture below:



- i. What is shown in the picture?
 - ii. What is the common name for all these?
 - iii. What are the disadvantages of overuse of these devices?
- b. Answer by looking at the picture below:



- i. What is shown in the picture?
 - ii. What are these devices related to?
 - iii. Write down the use of any three devices.

2.3 Introduction of Hardware and Software

The blending of hardware and software gives life to a computer system. The hardware is the physical part of a computer, it is nothing unless it has software to control it. Hardware refers to all the devices which you can see and touch, and software refers to the computer programs that are loaded into a computer system, which are assembled together to build a computer system.

In a way, without software, hardware is like a car without a driver; so both are essential to get the work done. Software is a set of instructions that tells the hardware what to do and how to perform the requested actions. Thus, hardware and software share a special relationship. If hardware is the heart of a computer system, software is its soul. Both are complimentary to each other.

Computer hardware

Computer hardware is a comprehensive term for all of the physical parts of a computer and related devices either internal or external hardware devices; the parts that you can see and touch. For example: Motherboard, CPU, hard disk, RAM, etc are the items of internal hardware device. External device items include Monitor, Keyboard, Mouse, Printer, Scanner, Pen drive, etc. Computer hardware also involves the wires and cables, NIC (Network Interface Card), Modem (Modulator and Demodulator), connectors and power supply units. Computer hardware directly involves all the equipment that is needed in processing of data.

The internal hardware parts of a computer are often referred to as components, while external hardware devices are usually called peripherals. Together, they all fall under the category of computer hardware. There are basically three main categories of hardware:

- a. Input Unit b. System Unit c. Output Unit

Input Unit:

The input unit of the computer system is used for feeding data and instructions to the computer. These data and instructions given to the computer are called as input and the devices used for giving input are called input unit or devices. Some examples of the input devices used in the computer are listed below with figures:



System Unit:

The system unit is also known as a Casing and it is commonly pronounced as CPU, which is the main part of a desktop computer. The correct name of this unit is System Unit. System unit components include the processor, memory module, cards, ports, expansion slots, battery and connectors, etc. are reside on a circuit board called the Motherboard. The motherboard contains many different types of chips, or small pieces of semiconducting material, on which one or more integrated circuits(IC).

Motherboard separated from casing

The system unit consists up of the processing unit and the storage unit. The processing unit contains the hardware like: Motherboard and CPU (Central Processing Unit) or a processor, etc. and the storage unit consists up of the hardware like: Main memory (RAM, ROM), Hard disk drive, Floppy disk drive, CD/DVD-ROM drive and Pen drive, etc.

Output Unit:

The output units of the computer system through which all the information is display or give the meaningful results are called as output unit or devices. Some examples of the output device used in the computer are listed below with figures:



Computer software

Computer software or just software is the collection of computer programs and related data that provide the instructions telling a computer what to do or how to do it. Software is capable of performing many tasks, as opposed to hardware which only perform mechanical tasks that they are designed for. Software is the electronic instruction that tells the computer to perform a task. Windows XP/7, PC Games, Word Processing software, Electronic spreadsheet software, data base software, Presentation graphics software, Communication software, Electronic mail software, etc. are the examples of software. Computer Software is classified into two categories. They are:

- a. System Software
- b. Application Software

System Software

The software that helps to activate the computer system and provide operating environment for other application software is called system software. Its primary work is to control, integrate and manage the individual's hardware components of the computer system. System software is the basic requirement of a computer system. System software is classified into three categories. They are:

- i. Operating Systems
- ii. Language Translator
- iii. Utility Software

Input Devices

Without any input devices, a computer would only be a display device and not allow users to interact with it, much like a TV. Input devices are the type of the computer devices that are used to enter data and instructions to the computers are called input devices. Input devices come in several forms and the most common input devices are :

Keyboard

Keyboard is used to input data into the computer system so that the system gives output to the user. Any data and instructions are given into the computer through the keyboard. Without keyboard we can't operate a computer. There are different keys on a keyboard. Different keys perform different operations.

1. Alphabet keys (A to Z & a to z)
2. Numeric keys (0 to 9)
3. Function keys (F1 to F12)
4. Cursor or Arrow keys(
5. Punctuation keys, such as (:), semicolon (;), Question mark (?), Single & double quotes (").
6. Special keys (Enter, Spacebar, Caps Lock, Delete, Shift, Tab, Control, Home, Page up, Page down, End, etc.)

Mouse

A computer mouse is a handheld hardware input device that controls a cursor in a GUI (graphical user interface) and can move and select text, icons, files, and folders on your computer.

Mouse is a pointing device that is used to control the movement of the cursor on a monitor screen as you move it around on a pad. It is used to point, click, drag and select

icons, options and menus to the computer. Nowadays, optical mouse is more popular as compared to simple mouse. A mouse has two or three buttons on its top with either a rotating ball or an optical sensor at the bottom. Different buttons have different functions depending on the running program. The left one is the most frequently used button which is used to select objects and text, and the right one is used to access menus. There will be a wheel between the left and right buttons.

Scanner

A scanner is an input device that scans documents such as photographs and pages of text. Scanner is a light-sensing input device that is used to copy and print images, printed text or graphical matter etc.

Joystick

A joystick is an input device that can be used for controlling the movement of the cursor or a pointer in a computer device. The input device is mostly used for gaming applications and, sometimes, in graphics applications.

Web Cam

A webcam is a camera that connects to a computer. It captures either still pictures or motion video, and with the aid of software, can transmit its video on the Internet in real-time.

Digital Camera

A digital camera is a hardware device that takes photographs and stores the image as data on a memory card. Digital cameras use different media to store images, which include flash memory card, and also can be transferred to the computer through a cable. Then, the images can be edited, printed out and send it out as a fax or email it to your family or friends through World Wide Web (Internet).

Microphone

Microphone is an input device, which takes voice as input. It is used to convert sound signals into electrical signals and stores recorded sound and voices into computer, generally as a wave file. It is also called MIC.

Output devices

Output devices receives the processing information from the CPU and presents or display it to the user in the desired form. Output devices are the type of the computer devices that are used to display the results. Output devices come in several forms and they are distinct from the input devices. The output devices which are found in a computer system are described below:

Monitor

Monitor is an output device used to display results of processing. It has a TV like shape. It is also referred as Visual Display Unit (VDU). The monitor display wide variety of information, including text, pictures, graphics, video and animation. Monitors may be Monochrome that will display results in Black & White. Today, color monitors are mostly available in the market. They display results in multi colors. There are two types of computer monitor. They are:

- a. CRT monitor
- b. LCD monitor

CRT monitor

CRT monitor is the typical monitor that you can see on a desktop computer. It looks a lot like a television screen, and works the same way. This type of monitors uses a large vacuum tube, called Cathode Ray Tube (CRT). This older monitors were bulky and consume more electric power than LCD but it is cheaper than the LCD monitor.

LCD monitor

LCD monitor is a type of Flat-panel monitor. It uses special kinds of Liquid Crystal Display (LCD) to render images. It is portable and consume less electricity but it is expensive than CRT monitor. Images produced by these monitors are of better quality than that of old CRT monitors. It has very high resolution and emits less radiation than CRT monitor.

LED Monitor

LED monitor is a very recently introduced and it is preferred over LCD monitor, because of the better images quality and comfort of viewing. LCD monitor is a type of Flat panel display, which looks like same as LCD monitor. It uses special kinds of Liquid Emitted Diode (LED) for render images. It is portable and consume much less electricity but it is expensive than LCD monitor.

Printer

A printer is an output device that prints characters, symbols, and photos on a physical medium such as paper. Some printers only print in black and white, but most include a color option as well. The printed output is generally referred to as Hardcopy because it is in relatively permanent readable form, usually on a paper. Softcopy refers to temporary readable form such as those displayed on a monitor. Printers can be grouped into impact and non-impact printers.

Impact and Non-impact printers

Printers are categorized based on the physical contact of the print head with the paper to produce a text or an image. An impact printer forms characters and graphics on a piece of paper by striking the printer head against an ink ribbon that physically contact the paper. In a non-impact printer, it forms characters and graphics on a piece of paper without actually striking the paper. The Dot matrix printer is considered as an Impact printer, and Ink-jet printer, Laser printer and plotter are considered as Non-impact printer.

Plotter

Plotters are very accurate at reproducing line drawings. This plotter is commonly used for technical drawings, charts, maps and graphic, etc on the paper. Plotter is a high quality of printing output device that draws images with ink pens.

Speaker

Speaker is the most commonly used output device used to produce sound. Speakers receive the sound in the form of electric current from the sound card and convert it to sound format. These are used for listening to music, chatting, seminars for presentations, etc.

The I/O devices that are attached externally, to the computer machine are also called peripheral devices.



A. Choose the best answer from the given alternatives.

- a. What part of the computer system cannot be physically touched?
 - i. Computer system
 - ii. Hardware
 - iii. Input devices
 - iv. Software
- b. Which one item is the internal hardware device?
 - i. motherboard
 - ii. Pen drive
 - iii. Scanner
 - iv. Joystick
- c. Which one is the example of output device?
 - i. Motherboard
 - ii. CPU
 - iii. Webcam
 - iv. Monitor
- d. Which one is the example of computer software?
 - i. System software
 - ii. Application software
 - iii. Spreadsheet software
 - iv. All of the above

- e. Which one of these is an input device?
 - i. Scanner
 - ii. VDU
 - iii. Printer
 - iv. Speaker
- f. Which one of the following is an output device?
 - i. Joystick
 - ii. Microphone
 - iii. Hard disk
 - iv. Monitor
- g. Which is not a means of entering data into a computer?
 - i. Mouse
 - ii. Keyboard
 - iii. Monitor
 - iv. Scanner
- h. Which one of these is used to playing computer videos game?
 - i. Monitor
 - ii. Webcam
 - iii. Microphone
 - iv. Joystick
- i. Which one of these is an output device used in a computer aided design (CAD) system?
 - i. Keyboard
 - ii. Joystick
 - iii. Plotter
 - iv. Monitor
- j. What is the name of the device that is used take pictures?
 - i. Speaker
 - ii. Digital camera
 - iii. Microphone
 - iv. CPU

B. State whether the following statements are True (T) or False (F).

- a. A computer is the combination of hardware and software.
- b. Hardware is the heart of a computer system.
- c. Keyboard, printer and power supply are computer software.
- d. System unit contains CPU, RAM and other hardwares inside the casing.
- e. MS-Window is a computer hardware.
- f. Word processor and Spreadsheet are the examples of system software.
- g. Peripheral devices are connected to the computer machine.
- h. Mouse is not a pointing device.
- i. Softcopy refers to temporary readable form.
- j. Microphone converts sound into electrical signal.

- k. Output device is a part of computer.
- l. There is only one type of printer.
- m. Speaker is used for listening music.

C. Fill in the blanks:

- a. The blending of _____ and _____ gives life to a computer system.
- b. Software is the _____ of a computer system.
- c. There are basically _____ main categories of hardware.
- d. The data and instructions given to the computer are called as _____ devices.
- e. _____ software and _____ software are the two categories of computer software.
- f. The correct name of CPU is _____

D. Match the following pairs A and B by drawing the lines across:

Group A

Input device

Speaker

Application software

CPU

MS-Windows

Group B

Spreadsheet

Processing unit

Keyboard

Computer software

Output device

E. Answer the following questions:

- a. What do you mean by hardware? What are the two categories of hardware?
- b. List out any eight types of computer hardware.
- c. What is system unit?
- d. What do you mean by computer software?
- e. List out any five types of computer software.
- f. What do you mean by system software? What are the three types of system software?

- g. What is application software? What are the two types of application software?
- h. What is an input device? Give any five examples of input device.
- i. What is a keyboard? What are the different types of keys on the keyboard?
- j. What is a mouse? How does it work?
- k. What is a scanner? How does it work?
- l. What is an output device? Give any four examples of output device.
- m. What are the differences between LCD monitor and LED monitor?
- n. What is an ink-jet printer?
- o. What is a laser printer?

F. Answer by looking at the picture below:



- i. What is shown in the picture?
- ii. What are these devices related to?
- iii. Write down the advantages of any three devices.

2.4 Microsoft Word

STUDENT'S LEARNING OUTCOMES

After studying this unit, the students will be able to :

- introduction to microsoft word.
- different elements of microsoft word window.
- starting microsoft word.
- saving, opening, closing document.
- formatting document, inserting table, border, word art etc.

Introduction

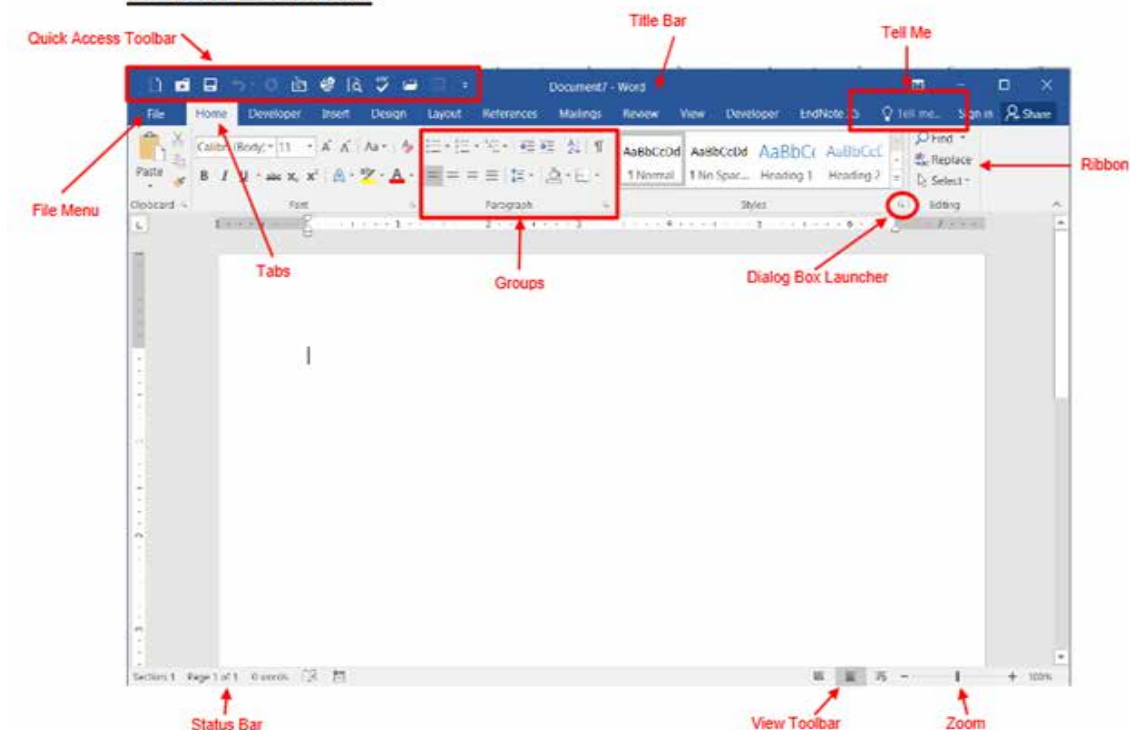
MS-Word is the most widely used word processing application software program offered in the Microsoft Office package. MS-Word was developed by Microsoft Corporation, USA. It is also called word processing program. Word processor helps to create any kinds of document having text data, pictures, tables, charts and other objects. Text data is any letter, number, or symbol that you can type on a keyboard. The grouping of the text data to form words, sentences, paragraphs, and pages of text results in the creation of a document. Through a word processor, we can create, modify, store, retrieve, and print a document.

Start with Ms-Word

- Click the Windows Start Menu button.
- Then select All Programs.
- Click on Microsoft Office folder.
- Then, click the Microsoft Office Word 2010 option.

Then Word 2013 window will be displayed.

Screen Elements



Title Bar

The horizontal bar which is located at the top of the document is known as title bar. This title bar is used to display name of the document and document type. The title bar also consists of Minimize, Maximize and Close buttons at the right side and office button and short cut bar at the left side.

Tab

Tab is also called menu bar. Tab consists of multiple toolbars on ribbon. Each tab has one corresponding ribbon. The number of tabs will be increased according to the situation raised. The second row where Home tab is located is called the menu. Each tab consists of detail components beneath it which is called ribbon.

Ribbon

Ribbon is a container to hold similar type of tools which contains text and graphic components. The Ribbon is designed to help you quickly find the commands that you need to complete a task. Commands are organized in logical groups, which are collected

together under tabs. Each tab relates to a type of activity, such as writing or laying out a page.



Ruler

The document margin can be measured by rulers. There are two rulers. The top ruler is called horizontal ruler and left side ruler is called vertical ruler. Ruler is also used to measure tab position on the document.

Scroll Bar

The option which is used to moving page from left to right and top to bottom is called scroll bar. There are two types of scroll bar; one vertical scroll bar and second horizontal scroll bar.

Working Area

It is the area in the document windows where in you enter the text of your document. The area where we type the text (create document) is called working area.

Zoom Pane

Zoom pane is at the right side of the document bottom. It is also used to zoom in or out.

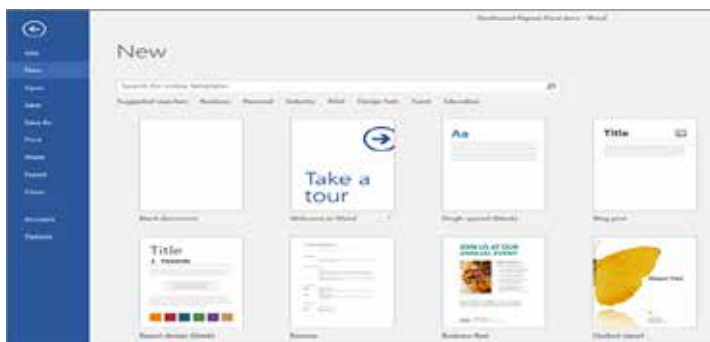
Status Bar

The left button bar of the document is called status bar. This bar is also used to show the information of the document where you are working on. It displays the current page, total pages, total number of words and language set to the typing text on the document.

Create New Document

The new option or command is used to create a new document; you can follow the following steps to create a new document on the Microsoft word.

- Press Ctrl+N by Keyboard.
- OR
- Click on File Menu



- Click New option.
- Choose Blank Document.
- Click on Create.

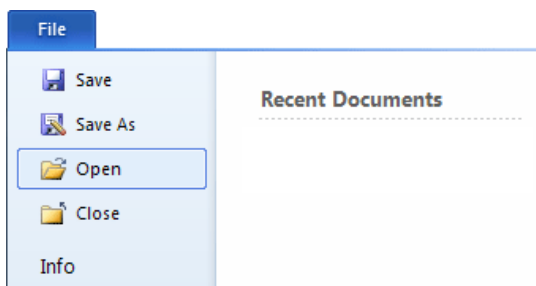
Open Saved Document

Microsoft word provides different tools, which help to work easier or faster. Microsoft word provides open command for opening save document. You can open document by the following steps.

Press Ctrl+ O by Keyboard.

OR

- Click On Open.
- Then Open Dialog box will appear in word screen.
- Choose an appropriate file location from which you want to open a document.
- Click on Open to Open a Document.



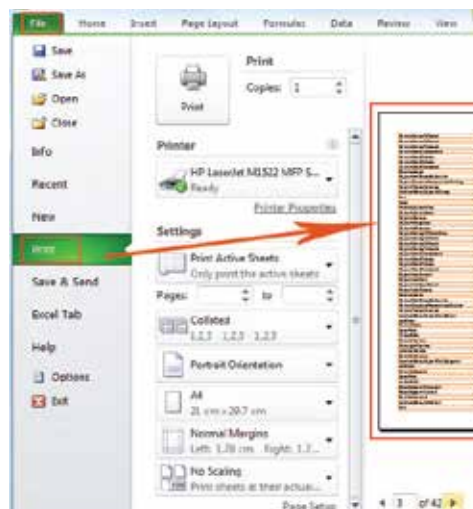
Print Document

After completing your document such as report or other document, you need to print on the paper. You can follow the following steps to print out document on paper.

Press Ctrl + P by Keyboard.

Or,

- Click on File menu.
- Click on Print.
- Then dialog box will appear.
- Choose your required option.
- Click on Print.



Editing a Document

Typing and Inserting Text

To enter text, just start typing. The text will appear where the blinking cursor is located. Move the cursor by using the arrow buttons on the keyboard or positioning the mouse and clicking the left button. The keyboard shortcuts listed below are also helpful when moving through the text of a document:

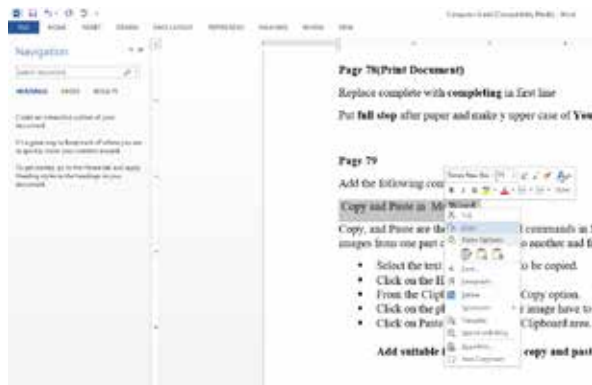
Move Action → Keystroke

Beginning of the line → Home

End of the line → End

Top of the document → Ctrl + Home

End of the document → Ctrl + End



How to Close Active Document

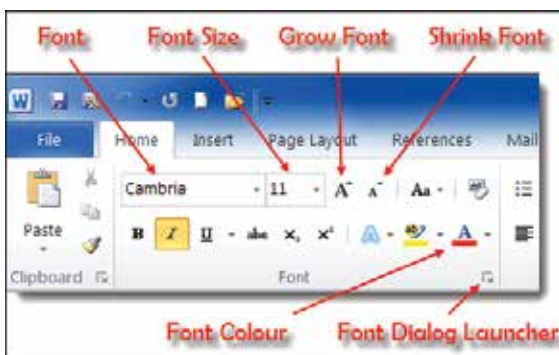
This option is used to close the active document. Closing a document is different from exiting a program. After closing a document, the program is still running.

1. Click on File Menu.
2. Click on Exit or Close.

Copy and Paste in Ms Word

Copy, and Paste are the two most used commands in Microsoft Word. These commands are used to copy text and images from one part of the document to another and from one document to another.

- Select the text or image that is to be copied.
- Click on the Home tab.
- From the Clipboard area, click Copy option.
- Click on the place where text or image have to be copied.
- Click on Paste option from the Clipboard area.



Font

In the font group area, you have the most used font feature.

- Go to Home Tabs/Ribbon.
- Click on Home Group.
- Choose Font, Font style, Font size, Color.
- Click on Ok.

Options for Viewing the Document

When we are working with Microsoft Word 2007, we may find the need to see our document in a different way so we can better create and edit it. By selecting the View tab, we can choose from five different document views: Normal, Web Layout, Print Layout, Outline and Draft.

Print Layout : View to see what your document would look like once it is printed.

Full Screen Reading : View the document in full screen reading view in order to maximize the space available for reading or commenting on the document. This is an ideal layout for reading long document and need not be used to work on them.

Web Layout : View the document as it would look like a web page. This layout can be used for designing for designing documents for the web. So the view enables you to get an idea of how your document would look as a webpage.

Outline : View all of the headings and subheadings in your document. This is the view you will want to use to rearrange pages and sections of your document.

Draft : View the document as a draft to quickly edit the text. Certain element of the document such as the headers and footers will not be visible in this view. Draft layout helps you to concentrate only on the text of the document.

Formatting Paragraphs

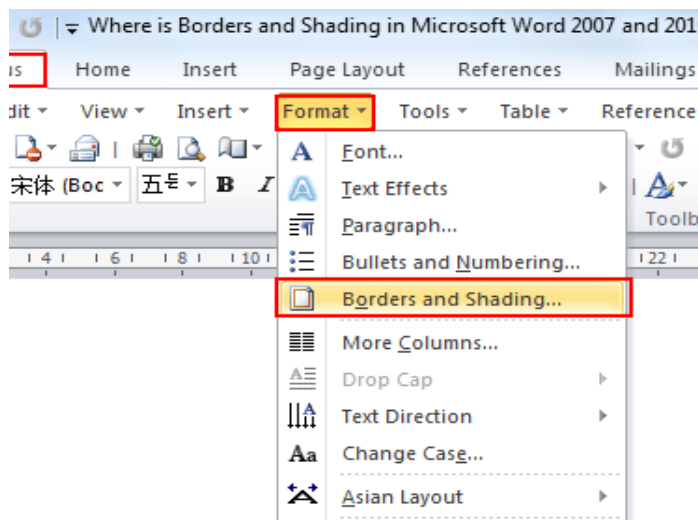
Formatting paragraphs allows you to change the look of the overall document. You can access many of from the tools of paragraph formatting the Paragraph Group on the Home Tab of the Ribbon.

- Go to Home Tabs/Ribbon.
- From the Font area
- Display the paragraph setting options group.
- Choose paragraph alignment right, Left, Center and Justify.
- Click on Ok.

Add Borders and Shading

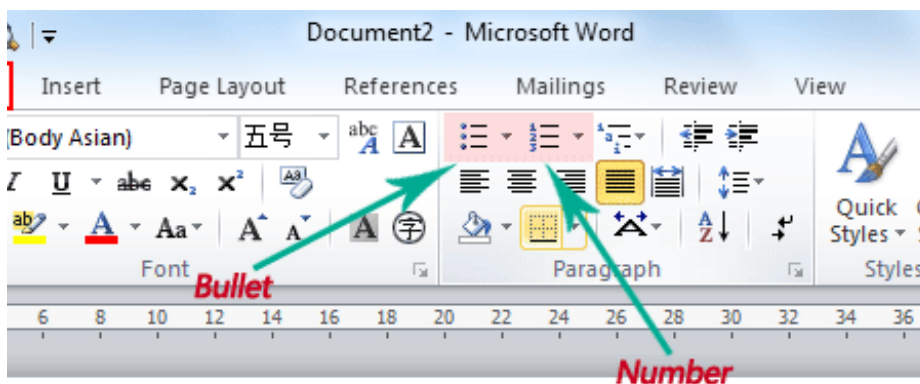
You can add borders and shading to paragraphs and entire pages. To create a border around a paragraph or all document.

- Select the area of text where you want the border or shading.
- Click the Borders Button on the Paragraph Group on the Home Tab.
- Choose the 'Borders and Shading'.
- Choose the appropriate option.



Add Bullets, Numbering and Multilevel List

Bulleted lists have bullet points, numbered lists have numbers, and outline lists combine numbers and letters depending on the organization of the list.



To add a list to existing text

- Select the text you want to make a list.
- From the Paragraph Group on the Home Tab, Click the Bulleted or Numbered Lists button.
- Choose your required Bullet and Number from list box.

Insert Tab

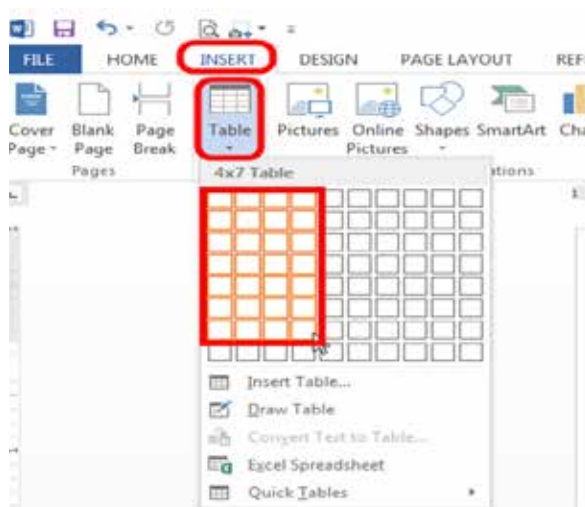
Insert Tab consists many command like insert page, Tables, Illustrations, links, header & Footer, Text and Symbols. This tab is used to insert page, tables, Illustrations, links, header & footer, text and symbols in your required document.



Insert Tables

Tables are used to display data in a tabular format. It is combination of row and column. Create a Table as a following step.

- Place the cursor on the page where you want the new table
- Click on Insert Tab.
- Click on Tables Button. You can create a table by one of four ways given below.
 - a. Highlight the number of row and columns.
 - b. Click Insert Table and enter the number of rows and columns.
 - c. Click the Draw Table, create your table by clicking and entering the rows and columns.
 - d. Click Quick Tables and choose a table.

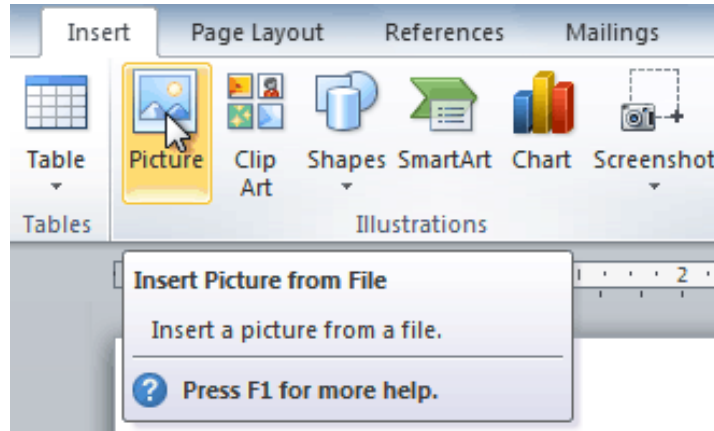


To Insert a Picture

You can insert any types of pictures (Graphics) in your document by using insert image tab (menu) to make your document meaningful, useful and more interesting.

- Place your cursor in the document where you want the insert picture.
- Click on Insert Tab.
- Click on Picture.

- Browse to the picture you wish to include.
- Click on Picture.
- Click on Insert.



Word Art

WordArt is a text styling utility available in Microsoft Office applications such as Microsoft Word, Excel, PowerPoint and Publisher. It helps in providing special effects like outlines, gradient glow, shadow, bevel, textures and 3-D effects to the text. You can add WordArt by follow the following steps.

- Click on Insert Tab.
- Click on word art.
- From the word art style choose any one option from the list.
- Then typing box will appear.
- Type your required text.
- Click on Ok.

Inserting shapes

You can insert any types of shapes in your document and type any text that you like inside the shapes.

- Click on the Insert tab.
- Click on Shapes option.
- Choose any shape from the list.
- Your cursor will be converted into + sign. Place the + sign in any part of the document and drag it.
- The selected shape will be formed.



A. Fill in the blanks with suitable words.

- _____ is an example of word processing software.
- _____ is a text styling utility available in Microsoft Office applications such as Microsoft Word, Excel, PowerPoint and Publisher.
- _____ option is used to format the text.
- _____ is a container to hold similar type of tools which contains text and graphic components.
- _____ is an application program that allows you to create different types of document.
- _____ is combination of row and column.

B. State whether the following statement are true (T) or false (F).

- Word processing is a type of system software.
- The default font type in Ms-Word 2010 is 'Calibri (Body)'.
- The Insert button contains some common menu such as page, table, illustrations, links, header & footer etc.
- Paragraphs formatting means to change the look of the overall document.
- The document margin can be measured by rulers.

C. Match the following.

Group "A"

Copy

Cut

Open

Save

Print

Group "B"

Ctrl + P

Ctrl + S

Ctrl + C

Ctrl + X

Ctrl+ O

D. Answer the following questions.

- a. What is word processing? Write any two examples of word processing software.
- b. What is Ms-Word? Write its features.
- c. What is WordArt?
- d. Define title bar, tab, ribbon.
- e. What is formatting paragraph?

E. Write down the steps to perform the following tasks in ms-word.

- a. To open Ms-Word 2013.
- b. To save Ms-Word document.
- c. To copy the text.
- d. To insert picture in the document.
- e. To print the document.

In the Lab

1. Visit the computer lab and do the following activities:

- a. Type the following paragraph and do the activities that follows.

Human Milk

Human milk is biologically specific for human babies. Simply put, this means that each species of mammal makes milk that is uniquely suited for its young. Cow's milk is high in protein and minerals because baby calves are up and running within hours after birth- rapid muscle and bone growth is necessary for their survival. In contrast, human survival organ is the brain. Human milk is high in factors that promote brain growth. This means that the children who were breastfed tend to score higher on IQ tests, due to the beneficial effects of human milk on neuro development. As a side note: why not choose a mammal closer to humans to provide an artificial milk supplement for human infants- a primate, perhaps? Can you imagine a gorilla sitting passively, attached to a milking machine like a cow? Not very likely, but a kind of fun to think about.

- b. Bold the heading and put the header and footer.
- c. Change the font colour in red and set the border.

2. Open Ms-word program, insert the following table and fill the data given with the help of your teacher.

S.N	Name	Address	Cont No.	Age
1.	Rajaram K.C.	BKT	9848000000	20 years
2.	Rita Sharma	KTM	9848100000	18 years
3.	Aasish Shrestha	PKH	9841111111	19 years
4.	Nirmala Shrestha	PKH	9842211111	19 years
5.	Shristy Neupane	KTM	9852121212	20 years
6.	Nirmal Lama	KTM	9841111113	18 years
7.	Sapana Bhatta	PKH	9800000000	19 years
8.	Ram P. Basnet	KTM	9811111111	19 years

- a. Change the font color of the data into green
- b. Make the field name of the above table into bold and italic.
- c. Insert header and footer for the above table.
- d. Change the font into Arial font.
- e. Change the font size of the above data into 14Pt.

2.5 Introduction to Presentation Software

Presentation software is specifically designed to allow users to create a presentation of ideas by stringing together text, images, audio/video and animation. It is very useful for business, education and training center to show the information in more interesting and attractive way. There are many types of presentation software available in this day such as Microsoft PowerPoint, OpenOffice.org Impress, Powerdot, Magic Point, Keynote etc. In this chapter we will learn about Microsoft PowerPoint.

Microsoft PowerPoint

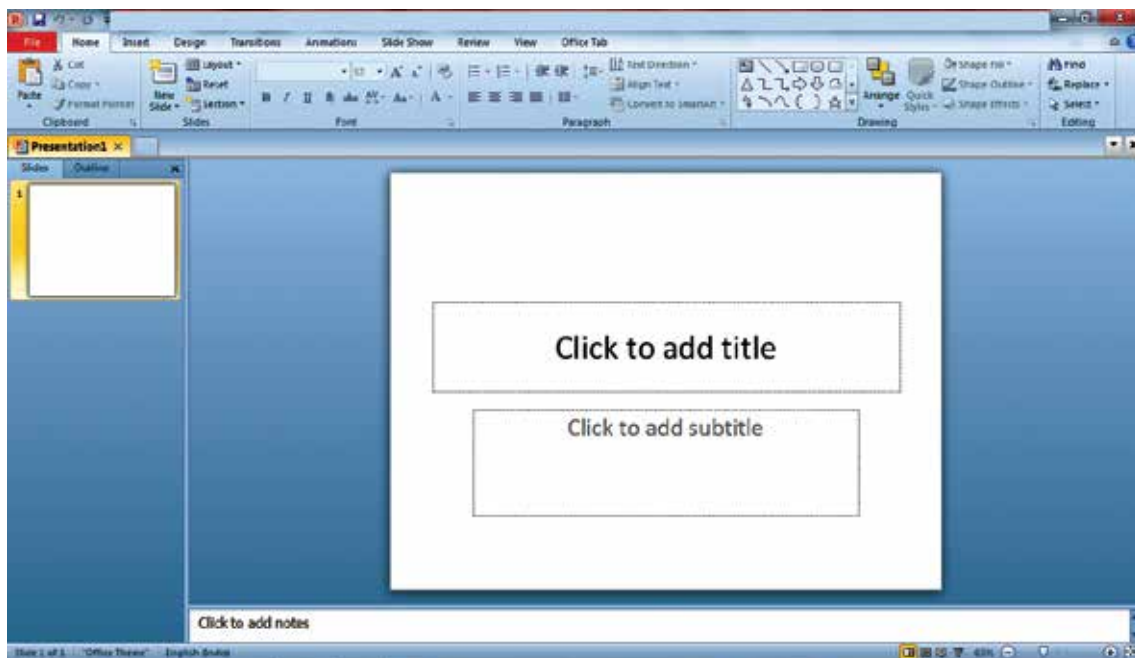
MS-PowerPoint is a widely used powerful application. It is also called presentation package. Presentation package allows us to design a presentation that consists of multiple slides. These slides may contain images, text, video clips, and related types of information. It is useful for delivering a speech, because the user can utilize text on the screen to remind his/her of the information to be conveyed to the audience or to summarize his/her dialogue into more manageable and friendly sizes, as well as to entertain or explain graphs, charts, and related data.

Steps to open Ms PowerPoint.

- ➔ Go to the Start Button on the Desktop and press it.
- ➔ Click on All Programs.
- ➔ Then click on Microsoft Office, then Microsoft Office PowerPoint.
- ➔ This opens the PowerPoint 2010 program.

Then following PowerPoint window will be displayed.





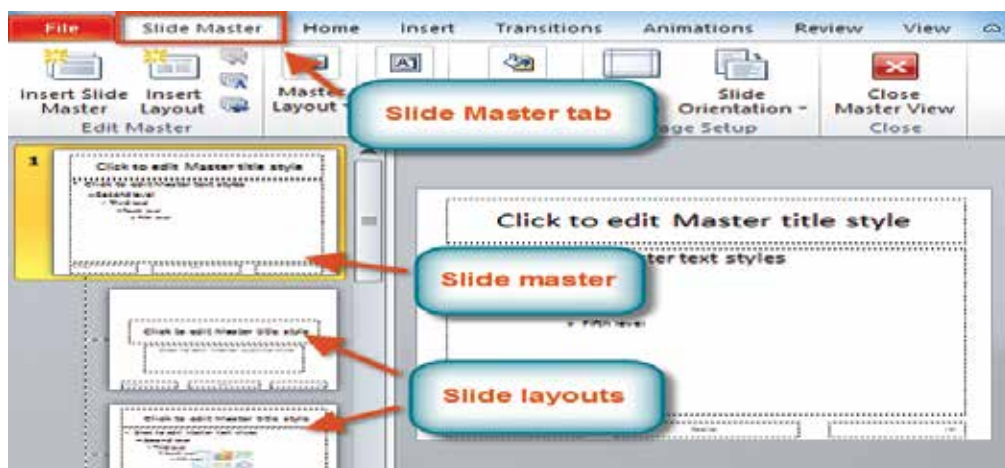
Components of a PowerPoint

Slide Outline Tab

This slide is used to display a list of thumbnails of the entire slide available in the presentation.

Slide

A slide is a page on which the information is stored in the form of text, picture, sound, video etc. There are different types of slide available in the program, and you can select and design your document or presentations.



Slide Title

It is the title given to the slide which contains the information store on it.

Slide Text

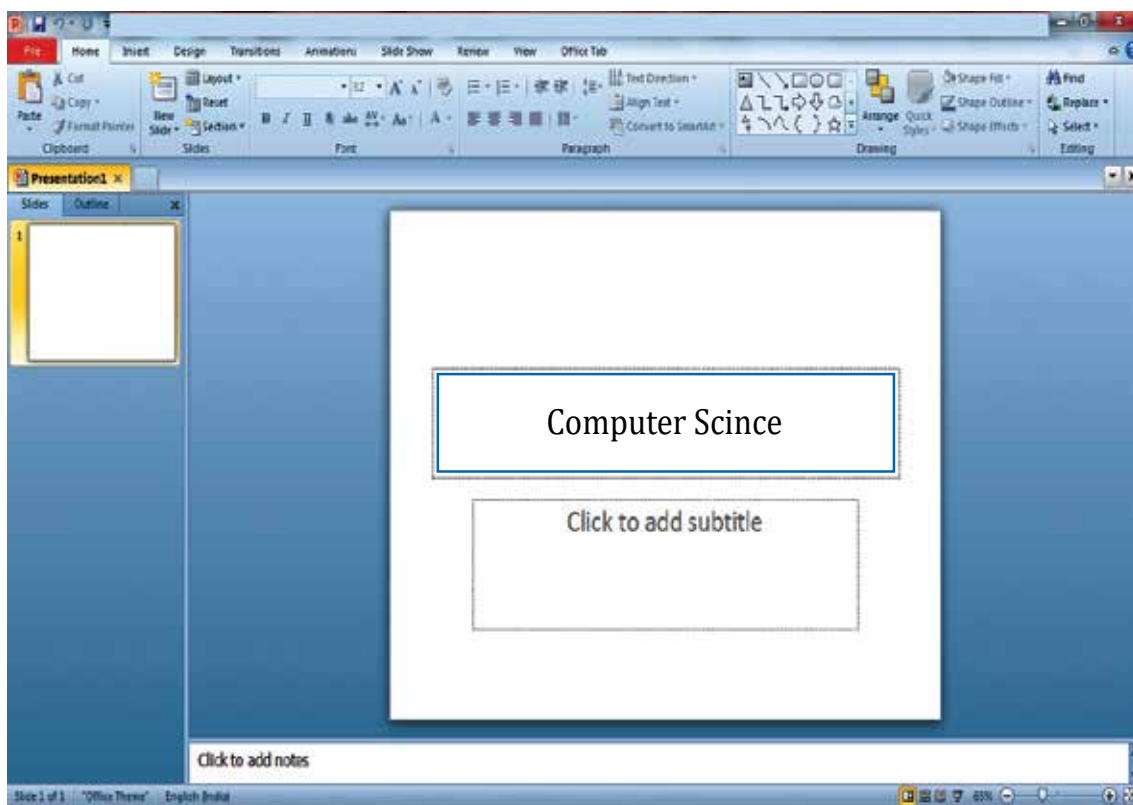
It is subtitle given to the slide which contains the information stored on it.

Adding Text to Title Slide

In the Slide area of the Title Slide, there are two types of titles that can be entered, a main title and a subtitle.

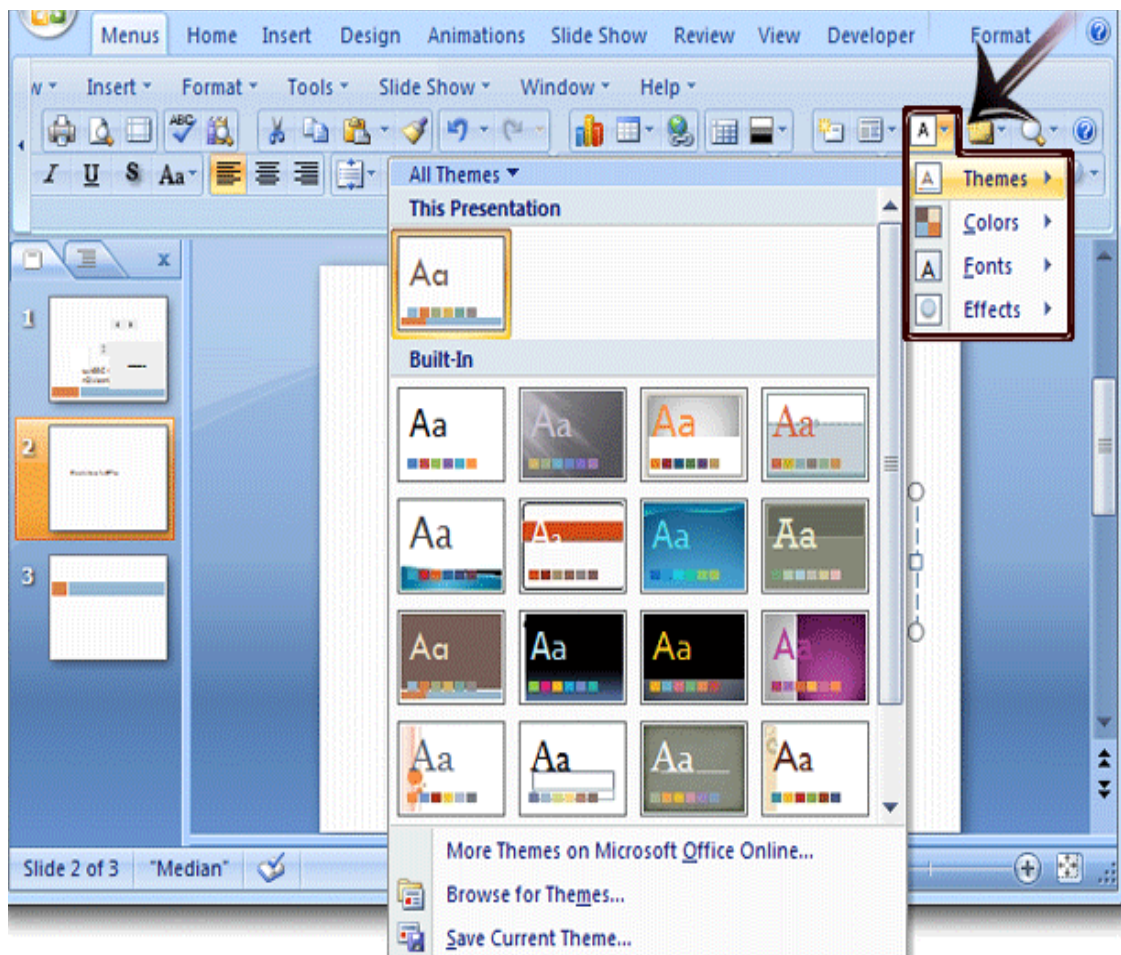
1. Click in the box that says “Click to add title”.
2. Type “This is where the title is entered”.
3. Press Ctrl + Enter to move to the subtitle box.
4. Type or past the text “Subtitles can add details to help explain the title”.
5. Click outside the text box to accept the entry.

The title and subtitle will then display on the slide and next to the number 1 in the slide/outline pane of the screen.



Applying the design theme

- Click on Design tab.
- A design command button appears on the screen.
- Choose the design theme in your choice and apply the theme.



Animation

Animation is the optical illusion of motion created by the consecutive display of images of static element. It is used to set special effect that will be applied during the transition between the previous slide and the current slide.

Custom animation

Custom animation is used to animate the text, graphic and other thing to create new presentation.



- First select the text, graphic which you want to animate.
- Click on Animation Tab.
- Click on Custom animation.
- When you choose the custom animation tool, the custom animation panel appears on the right-hand side of the current slide.
- Select the object to which you want to apply animation.
- Click the add effect button and choose an animation style.
- Frequently used effects are found in “Entrance” styles in the menu.
- Click the play button to preview the animation.

Slide Transition

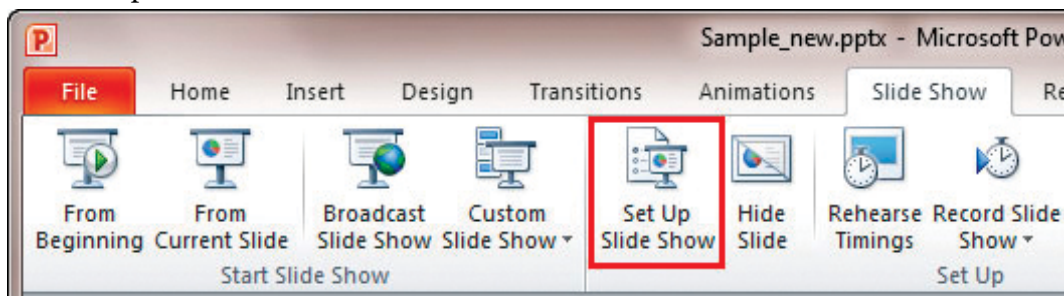
The display of slide to the audience in appropriate format is called transition of slide. Transition means change of form one state to other. Slide transition means displaying or appearing the current slide or next slide in different format. Slide transition can be changed according as the mouse clicks.

- Click on Animation tab-
Animation - Transition to this slide.
- Move the cursor over the transition button to preview the effects.
- Click on the transition effect button to apply the slide transition effect.
- Click on transition sound button to apply sound effect for transition on the slide.
- Click on transition speed button to adjust the speed.
- Click on apply to all to apply the same transition effect to all the slides.

Slide Show View (F5)

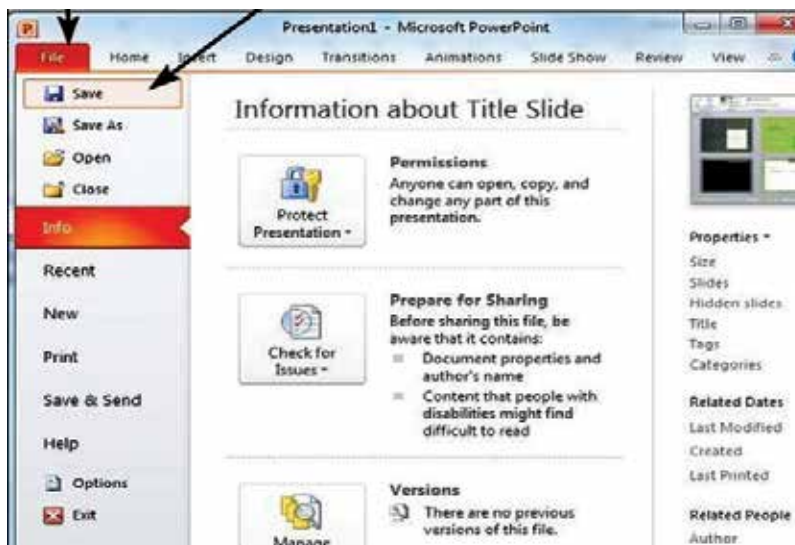
Slide show view takes up the full computer screen. You can see how your graphics, timing, movies, animation elements, and transition effects will look in the actual show.

- From beginning
- From current slide
- Custom slide show
- Setup slide show



Saving new presentation (CTRL+S)

- Click on File menu.
- Click on Save.
- Then save dialog box will be displayed
- Choose save location. Eg local disk D:, E:, any one.
- Give file name and choose save style.
- Click on Save.



 Exercise**A. Fill in the blanks with suitable words.**

- _____ shortcut key used to slide show.
- Ms-PowerPoint is an _____ software.
- _____ is the optical illusion of motion created by the consecutive display of images of static element.
- A _____ is a page on which the information is stored in the form of text, picture, sound, video etc.
- _____ shortcut key is used to save a presentation.

B. State whether the following statement are true (T) or false (F).

- Presentation software is used to prepare result sheet.
- Microsoft PowerPoint is a type of presentation software.
- You can't add animation in the presentation.
- Ms Powerpoint is very useful for business, education and training center to show the information in more interesting and attractive way..
- Slide is a page where we keep an information.

C. Answer the following questions.

- What is presentation software?
- What is Ms-PowerPoint?
- What is animation?
- What is slide transition?

D. Write down the steps to do the following task.

- Applying the design them
- To add custom animation.
- Saving animation.

2.6 Introduction to Spreadsheet Software

STUDENT'S LEARNING OUTCOMES

After studying this unit, the students will be able to :

- Introduction to Spreadsheet Software
- Introduction to Microsoft Excel
- Terms used in Ms Excel
- Formatting Excel Sheet
- Operators in Ms Excel
- Saving document

Introduction

A spreadsheet is an interactive computer application program for organization and analysis of data in tabular form. An electronic spreadsheet is a logical worksheet consisting of rows and columns. Spreadsheet is used as a computerized simulations of paper accounting worksheet. The program operates on data represented as cells of an array, organized in rows and columns. Modern spreadsheet software can have multiple interacting sheets, and can display data either as text and numerals, or in graphical form. Spreadsheets have now replaced paper based system throughout the business world. Today there are various types of spreadsheet software such as Microsoft Excel, Lotus 1-2-3, Gnumeric.

Microsoft Excel

A Microsoft Excel is a spreadsheet application program offered in the Microsoft office software package. Ms-Excel is one of the most popular spreadsheet softwares. This program allows you to perform different mathematical, accountancy problem calculations. In addition, Excel can also be used to create chart and graphs. There are many version of Ms-Excel like Ms-Excel 98, 2000, 2001, 2003, 2007 and 2010. The extension of Ms Excel file is .xls or .xlsx. In this chapter we will be studying Ms-Excel 2010.

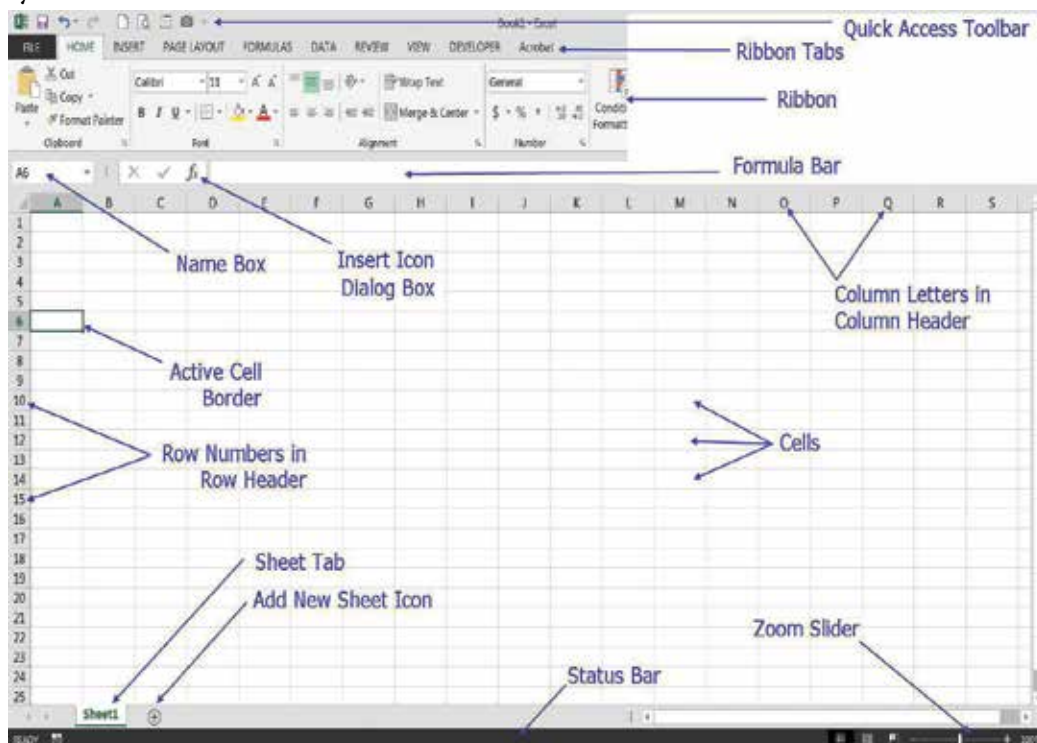
Spreadsheets are used in the following fields

- ➞ Prepare home budget
- ➞ Tax calculation
- ➞ Prepare audit report
- ➞ Sales analysis
- ➞ Financial accounting
- ➞ Sales invoicing, Statistical analysis

Starting Microsoft Excel

Go to the Start Button on the Desktop and press it.

- Click on All Programs.
- Then click on Microsoft Office, then Microsoft Office Excel 2010.
- This opens the Excel 2010 program. Then following Ms-Excel window will be displayed.



Basic Terms Used In Ms-Excel

Name Box

The name box refers to the address of the currently active cell in terms of row and column references. For e.g. A1, B1, C1 and A1, A2, A3 etc.

Formula Bar

It displays the current cell entry. It also displays the filling of a cell as you type it.

Worksheet Tab

It consists of a list of all the sheets available in an Excel workbook. When you open Microsoft Excel workbook, there are 3 worksheets. You can add new worksheets in the same workbook.

Cells

A cell is the smallest unit used to store data and information. It is the intersection of row and column.

Active Cell

It is the current position of the cell pointer. Active cell is a selected cell in which data is entered when you begin typing. Only one cell is active at a time.

Cell Range

A cell range is defined as two or more cells on a sheet. It is a rectangular block of adjacent or non-adjacent cells. It can have several row or columns. For e.g., the cell range A1:H5 start from the cell A1 to H5.

Work Book

A workbook is a collection of many worksheets. All worksheets are stored in a workbook. By default, there are 3 worksheets in a workbook. You can add more worksheets on a workbook as your needs.

Worksheet

The worksheet is a collection of cells where you can keep the record or data. By default, each workbook contains three worksheets. You can add many number of new worksheet as per your requirement.

Entering Data

In the cell in which you would like to enter data, you type data and press enter key by keyboard. You can follow the following instructions and enter data in the cell.

- ➡ Place the cursor in cell.
- ➡ Type any text (character or number)
- ➡ Press the enter key.

	A	B	C	D
1	S.N	Name	Address	Age
2	1	Manisha Bhandari	Birendranagar Surkhet	12 Year
3	2	Mohan Sahai	NPJ	10 Year
4	3			
5	4			
6	5			
7	6			

Note: If you type any mistake in the cell, you can erase this word by using backspace key. The backspace key erases one character at a time.

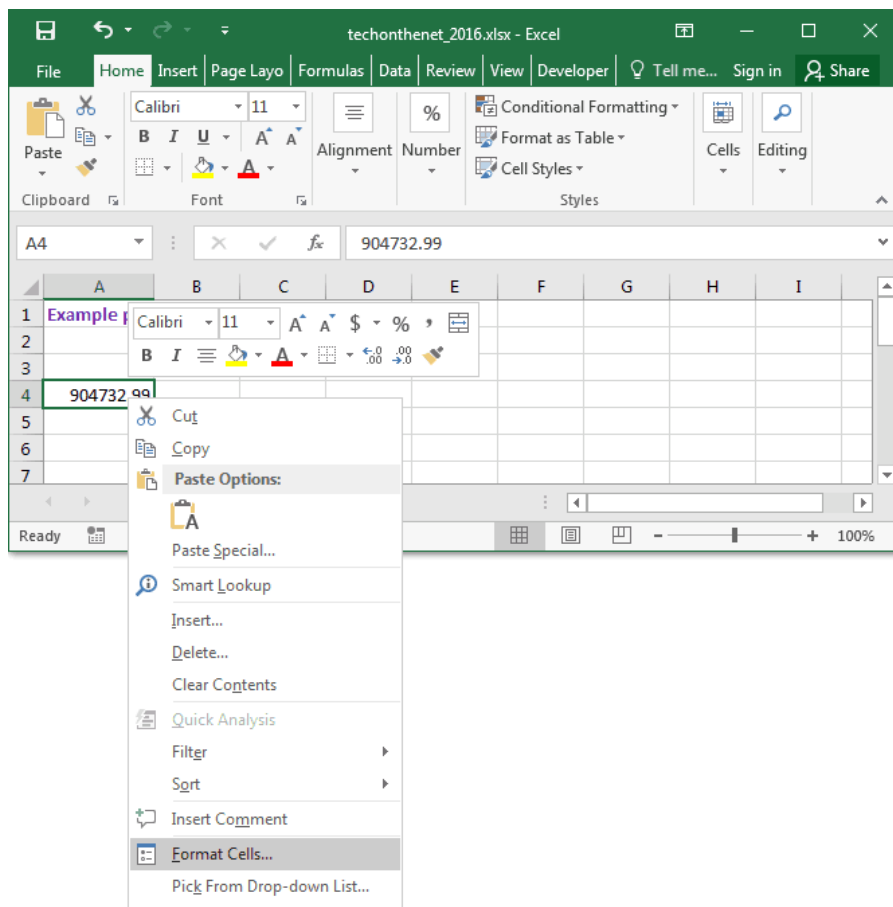
Editing Data

After you enter data into a cell, you can edit it by pressing F2 key by keyboard. While you are in the cell and you wish to edit, you can also edit the data in the cell by using the formula bar.

- ➡ Move the cursor to cell.
- ➡ Press F2 key and change the data.
- Or,
- ➡ Click on cell.
- ➡ Click on formula bar and change it.

Formatting Cells

In Ms Excel you can insert column, row, and new worksheet. Similarly you can delete row, column, worksheet and format worksheet.



Insert column

- ➞ First place the cursor where you want to insert.
- ➞ Go to Home Tab.
- ➞ Click on Insert.
- ➞ Click on Insert Sheet columns.
- ➞ Click on Ok.

Insert Row

- ➞ First Place the cursor where you want to insert.
- ➞ Go to Home Tab.
- ➞ Click on Insert.
- ➞ Click on Insert Sheet Rows.
- ➞ Click on Ok.

Insert new worksheet

- ➞ Go to Home Tab.
- ➞ Click on Insert.
- ➞ Click on Insert worksheet.
- ➞ Click on Ok.

Delete Row and Column

- ➞ Go to Home Tab.
- ➞ Click on Delete option.
- ➞ Choose what you want to delete cells, row, column, and worksheet.
- ➞ Click on Ok.

Borders

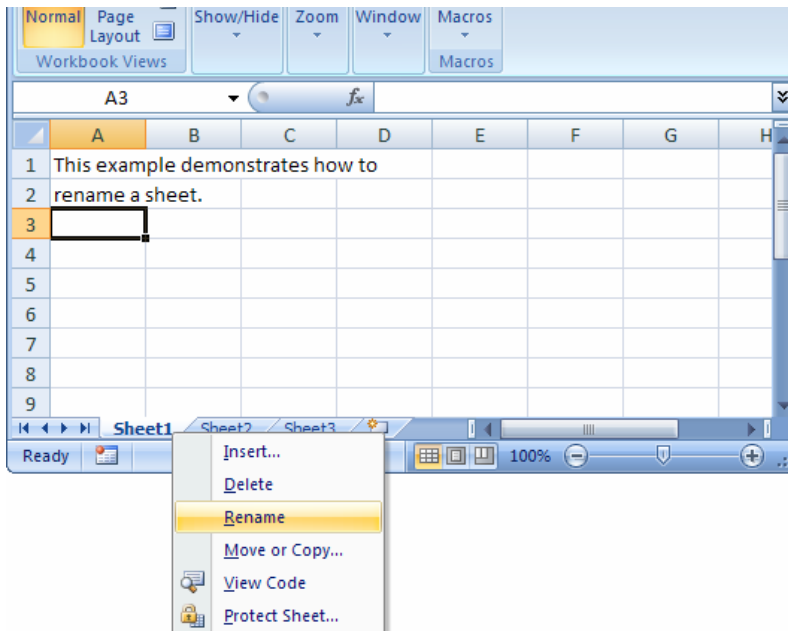
This option is used to make a table easily visible on the printed formatted.

- ➞ First select Row and Column which you want to make a border.
- ➞ Click on Home tab.
- ➞ Click on Border and then border style will be displayed.
- ➞ Choose your required style such as: All Border.

Rename Worksheet

- ➞ Right click on sheet which you want to rename.
- ➞ Click on Rename option.

- Give Sheet name.
- Click on working area or press enter key.



Create Serial Number

- First type serial number such as; 1, 2.
- Press ctrl key and drag by mouse.

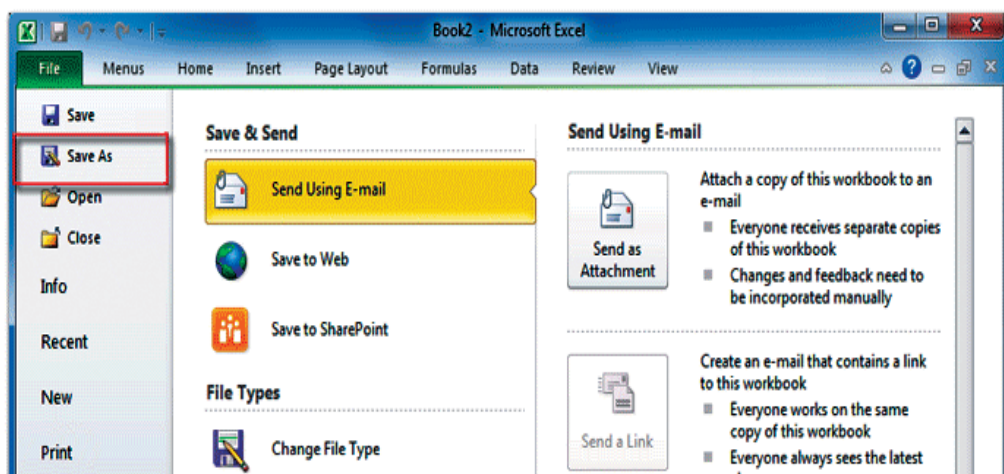
Save or Save As

This save option is used to save new created document. And save as option is used to save to another name or rename document.

- Press (CTRL +S) by Keyboard)
- Or,
- Click on File menu
- Click on Save or Save As.
- Then Save Dialog Box will appear.
- Choose appropriate drive and location.

Ex: local disk E

- Give Document Name. Ex: Result Sheet
- Click on Save.



Operators

An operator is a symbol that performs an operation, such as a plus sign (+). The arithmetic operators for performing standard mathematical operations are: + for addition, - for subtraction, * for multiplication, / for division, ^ for exponentiation, and () for grouping terms.

Formula in Ms Excel

A formula is an expression which calculates the value of a cell. Functions are predefined formulas and are already available in Excel. The following steps illustrate the method of writing formula in Excel.

	Jan	
Sale	120	
Overhead	100	
Profit	=B2	

120
100
=B2-B3

1. Select a cell.
2. Type the equal to sign =.[Formulas in Excel always begin with the equal to sign].
3. Select a cell or type its address in the selected cell.
4. Enter an operator. For example, - for subtraction.
5. Select the next cell, or type its address in the selected cell.
6. Press Enter. The result of the calculation appears in the cell with the formula.

When a formula is entered into a cell, it also appears in the Formula bar. Formulas are not case sensitive. This means =B2-B3 is the same as =b2-b3

Example:

Calculate the Total price of the items, Discount amount and Grand Total.



The screenshot shows an Excel spreadsheet with the following data:

S.N	Item	Qty	Rate	Total	Discount	Grand Total
1	Rice	12	33			
2	Oil	20	160			
3	Salt	30	20			
4	Shop	20	13			

1. To calculate Total, click on the cell E3. Then enter the formula: $=C3*D3$
2. Copy the above formula to calculate the Total of other items.
3. You can easily copy the formula to the desired cell.
Select the cell which contains formula to be copied.
Place the mouse pointer in the lower right corner of the cell and then drag the fill handle over the cells to be filled.
4. To calculate Discount, click on the cell F3. Then enter the formula: $=20\%*E3$
5. Copy the above formula to calculate the discount of other items.
6. To calculate Grand Total, click on the cell G3. Then enter the formula: $=E3-F3$
7. Copy the above formula to calculate the Grand Total of other items.

Project work

Use a spreadsheet to enter the names, genders, and ages of all members of your household. Now sort everyone's names alphabetically.



A. Fill in the blanks with suitable words.

- _____ is an example of spreadsheet software.
- The extension of Ms Excel is _____
- _____ is a combination of row and column.
- The _____ operator is used for performing addition.
- _____ is a collection of cells where you can keep the record or data.

B. Match the following.

Group "A"

Cell ☐

Excel ☐

Operator ☐

Workbook ☐

Group "B"

☐ +

☐ intersection of row & column

☐ collection of worksheet

☐ spreadsheet software

C. Answer the following questions.

- What is spreadsheet software? Write the name of some popular spreadsheet softwares.
- What is Ms-Excel? Write down the popular version of Ms-Excel.
- Write down the features of spreadsheet software?
- What is operator? Write down the types of operators used in the Ms-Excel.
- What is cell?
- What is active cell?

D. Write down the steps perform the following task.

- Save the workbook.
- Insert row and column.
- Delete row and column.
- To fill the border.

Unit 3

Organisms and their structure

STUDENT'S LEARNING OUTCOMES

After studying this unit, the students will be able to :

- identify and display the characteristics and adaptive organs of animals and plants with special adaptations.
- classify animals on the basis of food and to give examples.
- describe the characteristics of each phylum by classifying the invertebrates animals on the basis of external features of the body.
- distinguish similarities and differences between flowering and non-flowering plants.

3.1 Adaptation of Organism

There are various types of living organism around us. All living organisms are categorized into kingdom of plant and animal according to their characteristics features. They have adopted in different habitats. Different type of herbs, shrubs, trees, etc. are included in plant kingdom. All unicellular and multicellular animals are included in animal kingdom. Plants and animals of Himalayan region are different than terai region and mountain. Plants and animals are also different in many ways.

Habitat

Habitat is a place where the plants and animals live. Habitat supports the survival of an organism. It provides food, shelter and protection to the organism. It also provides suitable environment for reproduction and growth of organisms. Habitat of different living organisms are different.

Many plants and animals are found in this planet since millions of years. All living organisms need shelter, food, place for growth and good environment. Plants and animals of different climates and geography are different.

The adjustment of animals or plants according to the environment is known as adaptation. All animals of the earth are divided into two groups according to their habitat. They have different structure according to their habitat.

i. Aquatic Animals

The animals which live in water are called as aquatic animals. These animals are adopted to survive in water. They have streamlined body and gills for respiration. Most of the animals' body is covered with scales and swim with the help of fins. They take dissolved oxygen from the water. Most of them lay eggs. Dolphins and whales directly give birth to babies.



fish



octopus



sea horse



whale



dolphin



shark



frog



crocodile



toad

Dolphin and whale respire through lungs. Fish, whale, shark, lobster, octopus, sea horse are some of the examples of aquatic animals. Some animals like snakes, frogs, crocodile, toad, duck, seal, etc. take oxygen from the atmosphere but spend lot of time in water. All the aquatic animals are cold-blooded.

ii. Terrestrial Animals

Those animals which live on the land are called terrestrial animals. The climatic conditions of the land are different in different places. Therefore, the animals found in one place can not be found in the another place. Animals have different body structures. Animals living on the land are divided into the following groups.

a. Animals living in cold climate

They have thick, long hair covering their whole body. They have short legs and strong body. They have lots of fat below the skin. They have a single hoof or it is divided into two. They can not live in a hot climatic condition.



yak



polar bear

b. Animals living in hot climate

They have thin hair in their body. Some animals like camels live in very hot place which is known as desert. So, camels can survive with very less quantity of water. Camels also store food as fat on its back in large humps. The stored fats are broken down to help the camel to survive for long duration without food and water. The animals like tiger, lion, leopard, rhino, buffalo, zebra, etc. are also animals of hot climate. Some of them are good runners as well. They have strong muscles and bones.



tiger



elephant



camel



rhino



buffalo



Activity 3.1

Write the names of the animals around you and then write their adaptations in a table like the one below:

S.No.	Animals' Name	Adaptations
1.	Yak	They have thick and long hair covering their whole body
2	Sheep	

iii. Arboreal Animals

Animals that live on trees or some other objects, but cannot fly in air are called arboreal animals. They have well developed palm with fingers and grasping tail for their adaptation. Wall lizards have adhesive pad in their feet which helps them to walk on the walls. They have strong chest muscles. They can jump from one branch to another branch of a tree. They coil their tail around the branches for support.



chameleon



monkey



squirrel

iv. Animals living in holes

Some animals spend most of their time burrowing underground or in holes. They have pointed mouths which help them to dig the soil. Some of them have strong claws for digging purpose. Snakes cannot dig the ground but live in the holes which is already made by other animals. They are also called as fossorial animals.

v. Aerial Animals

Animals which spend most of their life in air are called as aerial animals. They have hollow bones and body is covered with feathers. They have wings, stream lined body

to fly. They eat grains with the help of beak and fly with the help of wings . Air sac is found inside the body which helps them to stay in air.



danffe



pigeon



peacock



Activity 3.2

Observe the various birds found around you and the various organs found in them. Note the texture and characteristics of them. Which organs help in which tasks? See and fill in the table below.

S.N.	Birds	Organs	works
1.	Pigeon	Wings	For fly
2.	Duck		
3.	Crow		
4.			

vi. Cave animals

Animals that live in the caves are called cave animals. These animals have reduced eyes or functionless eyes due to the absence of light on the caves. They are adapted to live without food for a long time.



bat



scorpion

Adaptation in plant

There are many plants around us. Plants are of different shapes and sizes. These plants grow in different places and in different climatic conditions. On the basis of the habitat, plants are classified into two groups: aquatic and terrestrial plants.

Aquatic plants

Plants which grow in water are known as aquatic plants or hydrophytic plants. These plants are found in pond, river, lake or sea. These plants may be free floating or fully or partly submerged. They have poorly developed roots with soft weak and flexible stems. Their stems and leaves are provided with air spaces which help them to float in water. The entire parts of the aquatic plants are covered with waxy substances which protect them from decaying. They take gas and minerals through roots and stems from water to prepare food materials. Some of them are flowering and others are non flowering. Spirogyra, Water hyacinth, Hydrilla, Vallisnaria, lotus and water lily are some of the aquatic plants.



lotus



spirogyra



water hyacinth

Terrestrial Plants

Plants which grow on different types of land are known as terrestrial plants. They have well developed plant bodies. According to the different climates, they are of different types. Most of them have strong and green stem. They grow in different types of land.

i. Plants Growing in Warm and Moist Climate

They are tall plants with hard stem and leaves. They require more minerals and salts from the soil. They usually grow in seashore or plain.



mango



coconut

ii. Plants Growing in Dry and Warm Climate

These type of plants grow in the desert where the climate is warm and dry. Such plants are called xerophytes. Their leaves are thick having few stomata and leaves are often reduced to spines or thorns which decreases the transpiration rate. They have fleshy stems with highly developed roots that help to absorb water from the soil. The stems are green in colour. So, they help to prepare food for the plants during photosynthesis.



agave



aloe vera



cactus

iii. Plants Growing in Moist and Shady Climate

Some plants need less sunlight and grow in moist and shady places like under trees or on the hills. The plant's body is not so developed and they are non-flowering plants. They are small in shape and size. Some of them like ferns, moss, etc. prepare their own food while others like mushroom do not.



mushroom



moss



fern

iv. Plants Growing in Cold Climate

Some plants grow in cold climate with well developed roots and stems. Their leaves are small and needle shaped. The surface of the leaves are covered with wax. Waxy leaves prevent the loss of excess water from the surface. Most of them are tall and some are medium sized. Generally, they look like cone shaped, seeds are naked. So they are called as coniferous plants. They also need less quantity of water for survival.



Distinction between Aquatic and Terrestrial Plants

S.N.	Aquatic Plants	Terrestrial Plants
1.	They are also known as water plants.	They are also known as land plants.
2.	They live in water.	They live in the land.
3.	Roots are poorly developed.	Roots are highly developed.
4.	The stem is soft and flexible.	The stem is strong and hard.
5.	The plant body is usually covered with waxy substances.	Waxy substances are rarely found.

Adaptation of organism

Animals and plants are living together on the land as well as in water. Living creatures are found in different places under different sets of environmental conditions. All organisms are adapted to their environment. Habitat is a place where an organism lives. Habitat must offer food, shelter and climatic condition suitable for an organism to survive, breed and develop.

Adaptation can be defined as structural and functional features of organisms which develop over a period of time. It enables them to survive and reproduce in a particular environment.

An organisms can show adaptation by the following ways,

- **By gaining or losing some organs :**

Animals living on land have lungs to breathe whereas aquatic animals have no lungs but have gills to do the same job.

- **By changing the body colour :**

Some animals like frog and lizard change their skin colour to adapt in their environment.

- **By modification of organs :**

Birds have modified forelimbs into wings to adapt aerial environment.

Aquatic Adaptation

Water is the major part of hydrosphere. More than 70% of earth surface is covered by water. Different kinds of plants and animals adapt inside the water. They are capable to obtain food, air and light from their surroundings.

Aquatic plants (Hydrophytes)

All the plants which live, grow and adjust themselves inside water are called aquatic plants. They are of three types.

i. Free floating plants

The plants which float freely on water surface are called free floating plants. For example, water hyacinth, lemna, pistia etc.

ii. Submerged plants

The plants which remain fully under water area are called submerged plants. For example, hydrilla, vallisneria etc.



lemna



water hyacinth



hydrilla



vallisneria

iii. Emergent plants

The plants whose lower part of the body remain under water and rooted in the soil but upper parts remain above the water surface are called emergent plants. For example, lotus, water lily, marsilea etc.



Adaptationla characteristics of aquatic plants

- i. They have water proof body and waxy coat to prevent from rotting and decaying in water.
- ii. They have air cavities that make them light and easier to float.
- iii. They have poorly developed root system without root cap and root hairs.
- iv. They have less developed xylem and phloem.
- v. Floating plants have flat leaves where as submerged plants have thin, small, long and ribbon shaped leaves.
- vi. They have long, slender, spongy and flexible stems.

Aquatic animals

Animals that live, grow, derive food, reproduce and adjust themselves in water are called aquatic animals. For example, Fish, whale, duck etc.

Adaptationla characteristics of aquatic animals

- i. They have boat shaped (streamlined) body.
- ii. They have water proof scales on their body.
- iii. They have gills for respiration.
- iv. They change their body temperature according to surroundings.
- v. They have air sacs and air bladder which help them to float even at rest.
- vi. They have fins, flippers, paddles and webbed tail to change the direction while swimming.

Terrestrial Adaptation

Organisms that adapt themselves on land is called terrestrial adaption.

Terrestrial plants

Plants that live, grow and reproduce on the land are called terrestrial plants. They are of two types : mesophytes and xerophytes.

i. Mesophytes

The plants that grow on average moisture and temperature are called mesophytes. For example, rose, mustard, mango, etc.



mango



apple tree

Adaptational characteristics of mesophytes

- i. They have well developed root and shoot system.
- ii. They have developed conducting tissues (xylem and phloem).
- iii. Leaves are generally large and broad with numerous stomata.
- iv. They throw excessive water from their body during transpiration.
- v. They have long roots provided with root hairs.

ii. Xerophytes (Desert plants)

The plants that grow on hot and dry places are called xerophytes. For example, cactus, aloe vera, opuntia etc.



cactus



aloe vera

Adaptational characteristics of xerophytes

- i. Roots of xerophytes grow very deeply in soil to absorb water.
- ii. Stems are thick, flattened and fleshy stem to store water.
- iii. They have thick cuticle at the surface of leaves and stems and deeply seated stomata to avoid the loss of water.
- iv. They have modified leaves into thorns or spines to reduce transpiration.
- v. They are generally bushy, small and covered with thick barks.

Terrestrial animals

Animals which live on the land are called terrestrial animals. They are further grouped into five types. They are listed below.

- | | |
|----------------------|----------------------|
| a. Cursorial animals | b. Fossorial animals |
| c. Arboreal animals | d. Aerial animals |
| e. Desert animals | |

a. Cursorial animals

Animals which live on open place and are adapted to run on hard ground are called cursorial animals. For example, deer, tiger, lion, horse, dog etc. These animals have following adaptational characteristics :

- i. They have streamlined body which help them to reduce friction and fast movement.
- ii. They have long and strong limbs to run faster.
- iii. They move on their digits.

b. Fossorial animals

Animals which are adapted for burrowing mode of life are called fossorial animals. For example : rat, rabbit, mole etc.



rat



rabbit

- i. They have small head and tapering snout for digging.
- ii. Forelimbs are shorter and powerful claws.
- iii. They have small or reduced eyes and ears.

c. Arboreal animals

Animals which are adapted for climbing and spending most of time on trees are called arboreal animals. For example : monkey, squirrel, snakes, chameleon, chimpanzee etc.

- i. They have curved ribs.
- ii. They have strong muscles on the chest.
- iii. They move on palm and sole or whole foot.
- iv. Lizards have digits with adhesive pads which help them to move or climb on the walls.
- v. They have tail to balance their body.



squirrel



monkey

d. Aerial animals



sparrow



parrot

Animals which are adapted for flying and spend most of their time in air are called aerial animals. For example, birds like dove, pigeon, crow, parrot etc. and insects like, butterfly, housefly, firefly etc.

- i. They have streamlined body that reduces friction and makes easier to fly.
- ii. They have hollow and air filled bones called pneumatic bones.
- iii. Forelimbs are modified into wings.
- iv. Birds have sharp and well developed eyes.

e. Desert animals

Animals which are adapted for hot and dry places are called desert animals. For example, camel, lizard, rodents etc.

- They have thick skin to avoid loss of water.
- They have keen sense of vision, smell and hearing.
- They conserve water in pouches.
- They have nostrils protected by valves.
- Camels have humps on their back to store fat.



desert lizard



camel



Activity 3.3

Prepare a list of animals and plants found around your home. Observe the differences in their body structure and habitat. Do plants and animals living in different habitat have similar structure? Do different plants growing in same habitat have any common characteristics? Write the conclusion of your observation.

Project Work

- Observe different plants and animals of your surrounding and write some of their characteristic features.
- Observe animals and plants of your locality and fill in the table given below.

Name of animals	Aerial	Aquatic	Desert	Terrestrial	Water & Land	Snow	Holes	Under Ground	Moist Place

Name of Plants	Aquatic	Cold place	Dry/hot place	Mountains	Moisty Shady	Warm, humid place

A. Choose the best answer from the given alternatives.

- i. In which place does hydrilla plant grow?
 - a. Land
 - b. Moist place
 - c. Dry place
 - d. Water
- ii. Which animal is found in desert?
 - a. Cow
 - b. Pigeon
 - c. Duck
 - d. Camel
- iii. Which animal has thick hair in body?
 - a. Rhino
 - b. Polar bear
 - c. Yak
 - d. Pengion

B. Fill in the blanks.

- i. Aloe-vera plant is found in _____ place.
- ii. Terrestrial animals normally respire through _____.
- iii. Monkey, squirrel, etc. are _____ animals.
- iv. Wheat plants live for _____ year.
- v. Mango is a _____ plant.
- vi. _____ of the cave animals are reduced or functionless.

C. Answer these questions.

- i. Name any two water animals, terrestrial animals and aerial animals.
- ii. Draw a diagram of an aquatic plant and write its name.
- iii. Write the names of three animals that live in holes with one characteristic of each.
- iv. Name any two animals which are found in cold climate.
- v. What are the common characteristics of aerial and arboreal animals?
- vi. Why do animals living in cold climate have thick and long hair?
- vii. Why are the leaves of desert plants reduced to spines or thorns?
- xiii. How does camel survive in scarcity of food and water for a long period of time?
- ix. Why do xerophytes have well developed long root system?
- x. Why do biennial plants need two years to complete their life span?

D. Define the following.

- | | |
|---------------------|-----------------------|
| a. Habitat | b. Adaptation |
| c. Gills | d. Annual |
| e. Biennial | f. Perennial |
| g. Life span | h. Terrestrial animal |
| i. Aquatic animal | j. Cursorial animal |
| k. Fossorial animal | |

E. Differentiate between the following.

- a. Aquatic and Terrestrial plants.
- b. Aquatic and Terrestrial animals.

F. Name any two species of the following.

- i. Aquatic animals
- ii. Terrestrial animals
- iii. Animals living in cold climate
- iv. Animals living in hot climate
- v. Arboreal animals
- vi. Animals living in holes
- vii. Aerial animals
- viii. Cave animals
- ix. Aquatic plants
- x. Plants growing in warm and moist climate
- xi. Plants growing in moist and shady climate
- xii. Plants growing in dry and warm place
- xiii. Plants growing in cold climate.

G. Give reasons.

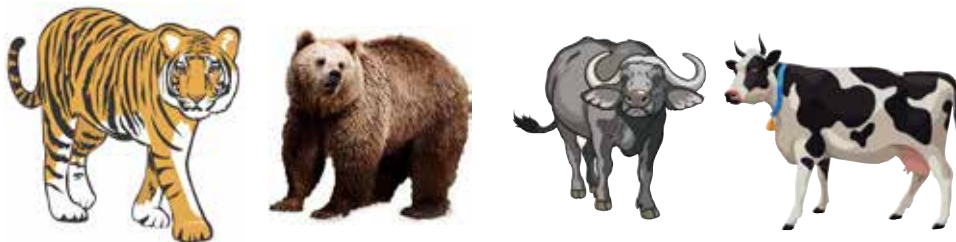
- ii. The stem of aquatic plants is waxy.
- iii. The stem of terrestrial plants is strong.
- iv. Terrestrial plants have a well-developed transport system.
- v. The camel is the ship of the desert.

H. Diagrammatic Questions

- i. Below is a picture of the beaks of various birds. Write down how the beak helps in adaptation.



- ii. Write down the characteristics of adaptation of the organisms given below.



- iii. Write down the characteristics of adaptation of the plants given below.



- iv. Write down the characteristics of adaptation of the arboreal animals given below.



3.2 Classification of animal on the basis of food.

All animals need foods to live and grow. Food gives them energy to move and work. Animals cannot prepare food unlike plants. Animals obtain food from their surroundings. Animals can be divided into three groups according to their feeding habits.



Activity 3.4

Make a list of the different animals found around your home or school. Now what do these animals eat? Observe and fill in the table below.

S. No.	Animals	Food
1.	Ant	
2.	Eagle	
3.		
4.		

Plant-eating Animals (Herbivores)

Animals that eat only plants are called herbivores. These animals have sharp and strong front teeth for biting grass and leaves. They have broad and strong grinding teeth on the side of the jaw to chew food. Some animals such as butterflies and bees suck nectar from flowers with the help of their long tube-like tongue. Grain and fruit-eating birds and animals also come under this group; example: Cow, goat, deer, buffalo, rabbit, grasshopper, elephant, etc.



monkey



elephant



goat



sparrow



butterfly

Flesh-eating Animals (Carnivores)

Animals that eat only the flesh of other animals are called **carnivores**. They have long and pointed teeth to tear the flesh and strong grinding teeth to chew flesh and bones.

These animals tear, chew and then swallow their food. Frogs have a long, sticky tongue that is used to catch insects. Snakes swallow their food; e.g. tiger, lion, eagle. Some animals such as leeches, bedbugs and mosquitoes suck the blood of other animals.



tiger



crocodile



eagle



frog

Plants and Flesh eating Animals (Omnivores)

Animals that eat both plants and the flesh of other animals are called **omnivores**. They have wide front teeth making them useful for biting plants and sharp canine teeth for tearing flesh. They have sharp claws. e.g. crow, bear, human, rat, etc.



bear



dog



cat



man



crow

Scavengers

Some animals such as hyenas and vultures feed on the left over flesh of creatures killed by other animals are called as **scavengers**. They are called scavengers.



vulture



hyena



ant



Activity 3.5

Observe the animals around you and divide them into herbivores, carnivores, and omnivores groups.

Herbivores	Carnivores	Omnivores
1.	1.	1.
2.	2.	2.

3.3 Vertebrates

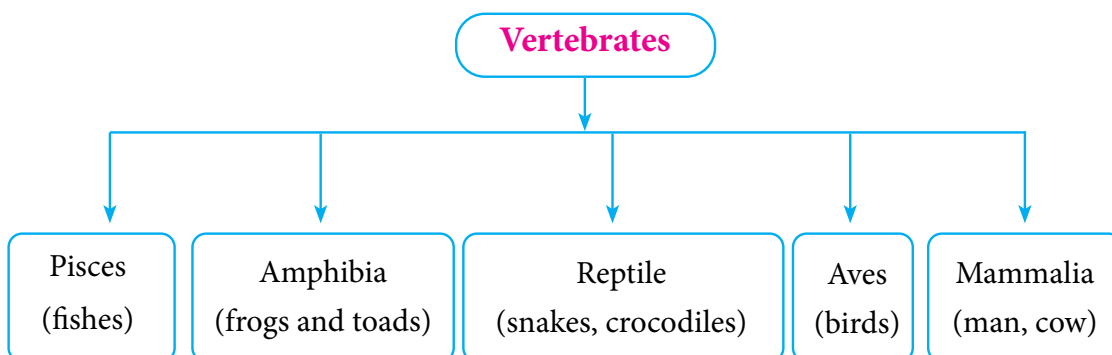
There are many animals around us. Animals are of different shapes and sizes. On the basis of the presence or absence of backbone, all the animals can be divided into two major groups:

1. Vertebrates
2. Invertebrates

1. Vertebrates (Animals with Backbone)

Those animals that possess backbone are called as vertebrates. They are found both on land and in water.

Vertebrates are classified into five separate classes namely :



a. Fish (Pisces)

Those animals which are adapted to live in water are known as pisces. They are aquatic animals. They are the largest group of vertebrates.

General Characteristics of Pisces

- They have long and streamlined body that helps to reduce water resistance.
- Their body is covered with smooth scales.
- They breathe through gills.
- The body can be divided into head, trunk and tail.
- They have sac-like air bladder (swim bladder) which makes their body light and helps them in floating.
- Female fish lay their eggs in the water.
- They are poikilothermic animals (cold blooded animals). It is because they can change their body temperature according to the environmental temperature.
- They have a two-chambered heart.
- They have paired fins for locomotion.

Examples : Labeo (rohu), sharks, carp, goldfish, sea horse, flying fish, clown fish, sword fish, etc.



shark



seahorse



fish

b. Amphibia (Animals with Double Moded Life)

Those animals which are adapted to live on land as well as in water are called amphibia.

General Characteristics of Amphibia :

- They have smooth and moist skin.
- Their body consists of a head and a trunk.
- They breathe through gills at their early stage and through skin or lungs in adult stage.
- They are cold blooded animals.

- They have a three-chambered heart.
- They have four limbs and two hind limbs. (i.e. They have two pairs of pentadactyl limbs).
- These animals have a long tongue which is used for catching their prey. are some examples. Frog, toad, newt, caecilians, hyla, salamander, diplocaulus, etc.



frog



toad



newt



salamander

C. Reptilia

Those animals which crawl on the ground are called reptiles.

General Characteristics of Reptilia

- They have dry and horny scales.
- The body is divided into head, neck, trunk and tail.
- They have two pairs of pentadactyl limbs with claws (except snakes).
- They lay eggs and fertilization is internal.
- They crawl on land so they are called crawling animals.
- Reptiles are fully adapted to live on land.
- They breathe through lungs.
- Generally, they have three-chambered heart (except crocodile). They are cold blooded animals.

Examples : Tortoise, lizard, alligator, snake, chameleon, gecko, python, rattle snake, etc.



lizard



snake



tortoise



crocodile

D. Aves (Birds)

Those animals which fly with the help of wings with feather-covered are called as aves.

General Characteristics of Aves

- Their body is streamlined and it is divided into head, neck, trunk and tail.
- Their fore limbs are modified in the form of wings.
- Their wings help in flight.
- They have toothless beak.
- They have lungs for breathing and air sacs for easy flight.
- They are oviparous.
- They breathe through lungs.
- They are homoeothermic animals (warm blooded) animals. It is because they cannot change their body temperature according to the surrounding temperature.

Examples: Parrot, peacock, crow, duck, ostrich, eagle, humming bird, king fisher, pigeon, sparrow, vulture, woodpecker etc.

Birds have hollow bones. Some birds such as the kiwi and ostrich can not fly. Penguins can swim using their wings, and ostriches can run very fast. Birds have scales on their legs and toes. Most birds build nests to lay eggs in and raise their young.



ostrich



duck



pigeon



peacock



sparrow



kiwi

E. Mammalia

Those animals which have mammary glands and suckle their young ones are known as **mammalia**. Mammals are the only animals that have a body covered with hair and fur. They are terrestrials and viviparous because the young develop inside the female's body.

General Characteristics of Mammalia :

- They are highly developed animals.

- Their body is covered with hairs.
- Females have mammary glands to suckle milk to their young ones.
- They give birth directly to their young ones.
- They have four chambered heart.
- They breathe through lungs.
- Their body is divided into head, neck, trunk and tail. Tail is absent or reduced in some animals.
- They are warm blooded animals.
- They have a pair of external ears called pinnae.
- Their brain is highly developed.
- They move from one place to another with the help of their limbs

Examples : Man, tiger, deer, elephant, cow, goat, bat (a flying mammal), dog, pig, whale and dolphins (aquatic mammal), camel, kangaroo, rabbit, rhinoceros, squirrel, zebra etc.



bat



pig



woman



whale



cow



dog

3.4 Flower and Non- flowering Plants

There are many different types of plants on our planet. They are found in water as well as on land. Plants are of various shapes and sizes. The process of arranging plants into different groups according to certain characteristics is known as classification. Biologists classify plants into different groups. Classification makes it easier to study about plants. On the basis of flowers, plants are classified into two groups:- Non-flowering plants and flowering plants.

Non- flowering Plants

The plants that do not produce flowers are called **non-flowering plants (cryptogams)**. They do not bear fruits or seeds. They reproduce by vegetative parts or spores. Some of them are green and others are non - green. Green coloured plants can prepare food by themselves, due to the presence of chlorophyll. Non-green plants cannot prepare food by themselves. These ones feed on dead and decaying substances and are known as **saprophytes**. Some of them depend upon living plants for their food and these are known as parasites. These are further classified into algae, fungi, moss and fern.



algae



fungi



moss



fern

Flowering Plants

The plants that produce flowers are called as **flowering plants or phanerogams**. They are highly developed green plants. They produce flowers, fruits and seeds. Their roots, stems and leaves are well developed. They can prepare food themselves. Plants that produce seeds can be further classified into two groups:

- Plants with seeds that are not enclosed in the fruit (Gymnosperm)
- Plants with seeds that are enclosed in the fruit (Angiosperm)



gymnosperm



angiosperm

Project works

- i. What are the animals found around your habitat? By collecting the names of backed animals, you can see by visiting lakes, rivers, and forests near your village. What groups do these animals belong to? Make a table like the one below.

S. No.	Pieces	Amphibia	Reptilia	Aves	Mammalia
1.					
2.					
3.					
4.					

- ii. Collect some small plants from the nearest garden, farm, or nearby forest and school. Let's cover those plants separately with newspaper and make them heavy from above. Keep pressing the object for a few days. Cover by changing the paper every two to three days. Now tap the dried plants on cardboard paper and separate them between flowering and non-flowering plants. Make a chart and show it in the classroom.
- iii. Collect 30 different pictures of vertebrates and write their class with two characteristic of each.



GLOSSARY

ancestor	:	animal that lived in the past by which a modern animal developed from
swamp	:	very wet ground or the ground covered with water
puddle	:	a small amount of water collected in one place on the ground
nostrils	:	the paired openings of the nasal cavity in vertebrates
exoskeleton	:	a hard cover that protects the body of certain animals
hermaphrodite	:	animal which has both male and female reproductive organs
parasites	:	organisms living in, on or with another's organism in order to obtain nutrients, grow or multiply

 Exercise**A. Choose the best answer from the given alternatives.**

- i. Animals that eat only plants is called-
 - a. Carnivores
 - b. Herbivores
 - c. Omnivores
 - d. Scavengers
- ii. Ant is-
 - a. Carnivores
 - b. Herbivores
 - c. Omnivores
 - d. Scavengers
- iii. Crow is-
 - a. Carnivores
 - b. Herbivores
 - c. Omnivores
 - d. Scavengers
- iv. Dog is-
 - a. Carnivores
 - b. Herbivores
 - c. Omnivores
 - d. Scavengers
- v. Cow is
 - a. Carnivores
 - b. Herbivores
 - c. Omnivores
 - d. Scavengers
- vi. Animals with backbone is:
 - a. Carnivores
 - b. Herbivores
 - c. Omnivores
 - d. Vertebrates
- vii. Vertebrates animals are classified into -
 - a. 6 classes
 - b. 5 classes
 - c. 4 classes
 - d. 2 classes
- viii. Animals which live in both land and water:
 - a. Pieces
 - b. Amphibia
 - c. Reptilia
 - d. Aves
- ix. Which is aquatic mammal?
 - a. pig
 - b. rabbit
 - c. whale
 - d. zebra
- x. Which is not correct?
 - a. algae
 - b. moss
 - c. bat
 - d. fern

B. Match the followings :

Bat	insect without wings
Whale	parasite
Millipede	flying mammal
Tapeworm	webbed feet
Frog	aquatic mammal

C. Fill in blanks with suitable words.

1. Herbivore feeds on _____
2. Carnivores have strong and _____ teeth to tear flesh.
3. _____ animals breathe through gills.
4. Reptiles have _____ chambered heart.
5. Aves have _____ body for flying.
6. Saprophytes obtain food from dead and _____ substances.
7. _____ are non-flowering plants.
8. Angiosperms have their _____ enclosed inside the fruit.

D. Answer these questions.

1. How can birds fly?
2. How can fishes swim in water?
3. How does a sparrow differ from a bat?
4. What are parasites?
5. Write the functions of tentacles.
6. Write general characteristics of phylum reptilia with examples.

E. Give reasons.

- a. Bat is a mammal.
- b. Frog is an amphibian organism.
- c. Whale belongs to class mammalia.

F. Define the followings.

- | | |
|-----------------|---------------|
| a. Invertebrate | b. Vertebrate |
| c. Amphibia | d. Reptilia |
| e. Aves | |

G. Differentiate between:

- a. Fish and frog
- b. Lizards and birds
- c. Bat and sparrow
- d. Invertebrate and vertebrate

H. Write two characteristics of each class:

- a. Pisces
- b. Amphibia
- c. Reptilia
- d. Aves
- e. Mammalia

I. Diagramatic questions.

- i. Classify the following animals with one characteristic feature:



- ii. Classify the following plants with one characteristic feature:



Unit 4

Environment and Biodiversity

STUDENT'S LEARNING OUTCOMES

After studying this unit, the students will be able to :

- To introduce the environment.
- To identify solid waste.
- To adopt environment friendly behavior.
- To describe the interrelationships between plants, animals and microorganisms.
- To introduce the ecosystem.
- Explain the types of ecosystems.
- To describe the components of forest ecosystem.

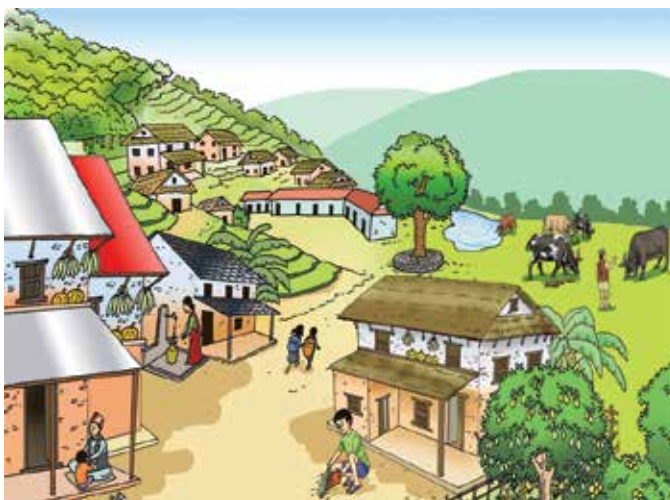
4.1 Environment

Our environment is made up of all living and non-living things in our surroundings. All forms whether living or non-living are dependent to one another. Man and other different animals need healthy environment in order to grow and fulfill their necessities. Thus, all the living organisms, non-living things as well as the social and economic conditions surrounding us which interact with each other is called environment.

Environment and its balance

The animals and plants are inter-dependent with each other. The environment should be always suitable for all animals for shelter, food, reproduction and recreation. We need fresh air and water from the environment. Dirty environment is not suitable for any type of living organisms.

It is very important to understand about the interaction among non-living, living components and the environment. Humans, animals,



birds, plants, soil, etc. are the components of the environment. Human beings use land for growing vegetables, fruits and other crops. Good irrigation and use of manure help on the better yield of vegetables and other crops in the field. Terrace fields are suitable for agriculture in the mountains. Terrace farming prevents soil erosion. The life of plants and animals are also dependent on the land and its surroundings.

There is a close relationship between living and non-living components in the environment.

Animals and plants are interrelated to each other. Animals take oxygen, food, shelter, medicine, etc. from plants directly and indirectly. Similarly, the plants get manure from the animals. The wastes of animals pass in the soil which is absorbed by the roots of the plants and that is used in synthesizing the food in the leaves. The animals in turn eat the plants in different forms. The process continues and the natural balance is maintained.

In a balanced environment, only living organisms can survive. If any component (abiotic or biotic) imbalances the environment, it affects negatively to all the other components. Imbalanced amount of oxygen and carbon dioxide in air become the causes of death of biotic factors of the environment. Lack of water may change the population of organisms. In the same way, if the number of producers or any type of consumer changes in a large scale, the whole biotic component is affected by it. Human generated activities such as deforestation and urbanization destroy the forest and causes imbalance in nature. The relation between animals, plants and non- living things should be balanced. The imbalance in the relation will produce adverse effects in the environment.



Environmental Components

Environmental components are categorized into two groups. They are : abiotic components and biotic components

Abiotic Components

Non-living components of the environment are known as abiotic components. Air, water, soil, energy, humidity, sunlight, etc. are some abiotic components.

Air

Air is all around us. Surface of the earth is covered with air. Layer of the air that surrounds the earth is known as atmosphere. Air consists of nitrogen 78%, oxygen 21%, and other gases 1%. Carbon-dioxide, neon, helium like gases are also present in the air. Oxygen makes all living organisms to survive. All living organisms need oxygen during respiration. All animals including human beings take oxygen and release carbon dioxide during respiration process. There should always be balance of gases in the atmosphere. Increase in the amount of carbondioxide in the atmosphere causes environmental pollution. Environmental pollution also disturbs the life process of living organisms and makes difficult for living organisms to survive. Plants are responsible for the prevention of environmental pollution. Afforestation is essential for the control of environmental pollution. It is essential to minimize the production of carbon dioxide, sulphur-dioxide and other harmful gases from the industries. It is necessary to minimize the use of fossil fuels like diesel, petrol, etc. Harmful gases released from the solid wastes also make air dirty. Management of solid wastes should be done properly. All these methods help in the balance of atmospheric gases and air becomes pure.

Water

Water is one of the essential component of life. It is an important component of ecosystem and environment. Major area of the earth is occupied by water. Water is available in different forms such as river, pond, lake, spring, well, sea, etc. Water remains on the surface of the earth or under the ground.

Below the surface of the ground in depth water remains as water table. People get water from the water table by using water pumps. The water is used in irrigation, washing, drinking, etc. Water can be reserved in a big tanks. All types of water which is available in this planet is not suitable for drinking. About 3% of water available on the earth is only suitable for drinking. Nepal is very rich in fresh water. All plants and animals need water for survival. Life without water is not possible in particular.



Land

The surface or the ground is known as land. Land generally refers to the top soil of the earth. Depending on the structure of the earth the amount of soil on the ground differs from place to place. Very less portion of the earth is covered by land. Land is in different

forms like flat land, mountains, valley, etc. Land is made up of components of the environment. Breaking of rocks due to heat, water and wind in a long duration of time causes the formation of soil. It takes about 200 to 500 years for the formation of 1 inch of soil. Soil consists of all the essential components essential for the proper growth of plants. Soil is also a home of many type of animals. We get fruits, vegetables, medicinal herbs and other many food materials from the plants.



Big trees like *saal*, *sisso*, juniper, etc. grow on the ground. Human beings, animals, birds, plants need soil for their survival. The meaning of the environment cannot be completed without soil.

Energy

The sun is the main source of energy. Sun light gives us heat and light. Living organisms cannot survive without heat and light of the sun. We can see things of our surrounding due to light. We need heat of the sun during winter to make our body warm. Plants need heat and light for the germination of seeds and photosynthesis. Heat of the sun makes plant's parts dry, which can be used to produce heat and light as well.

Biotic Components

Living organisms are considered to be biotic components. All plants and animals are included in biotic components. Shelter, food and life process of the living organisms are related to the environment. Biotic components are divided into three groups, i.e producer, consumer and decomposer.

Producer

All the green plants of the earth are producers. Living organisms which can prepare food materials themselves are known as producers. We get most of the food from plants. Fruits, vegetables, rice, wheat, maize, etc. are obtained from plants. Producers do not depend upon others for food. Producers are also called as autotrophic plants.

Consumer

The living organisms which cannot prepare food themselves are known as consumers. They depend upon others for survival. They are also called heterotroph. Heterotroph gets their

food from various sources. Those heterotroph that feed on plants are called herbivores. Herbivores are the first consumers or primary consumers. Cows, goats, elephants, deer, zebra, etc. are some herbivores.

Those heterotroph which feed on the flesh of other animals are called carnivores. These are also called primary carnivores or secondary consumers. Lions, tigers, wolves, foxes, hyenas, vultures, eagles, etc. are some carnivores. Those heterotroph which feed on dead animals are known as scavengers. Vultures, eagles, jackals, foxes, wolves, etc. are some scavengers. Some heterotroph eat both flesh and plants are known as omnivores. Panda, bear, crow, cat, etc. are some of the examples of omnivores.

Decomposer

Organisms which decompose the dead plants and animals are known as decomposers.

Bacteria and fungi are responsible for decomposing the dead organisms. Decomposers help in disposing the wastes and dead bodies of plants and animals. They clean the environment. They break the complex organic compounds into simpler substances. The dead portions are broken down to minerals that get mixed up with the soil. These minerals are then taken up from the soil by the plants. This process is called recycling of minerals. The substances which are decomposed by decomposers are called biodegradable substances.

4.2 Environment Friendly Behaviours

Environment friendly behaviours are human activities that protect and promote environment. It refers to adaptation of behaviours that reduces the destruction of environment. The activities like segregation of biodegradable and non-biodegradable waste, proper utilization of natural resources, use of organic fertilizers, afforestation, using clean energy etc are environment friendly behaviours. The implementation of laws and policies to control pollution and preserve environment like by providing subsidies in electric vehicles, organic farming; imposing heavy tax on polluters; ban on harmful chemicals etc. help in developing environment friendly behaviours.

Environment conservation and environment friendly behaviour

We have already studied that human activities are mainly responsible for the destruction of the environment. The following things should be done to control the imbalance of the environment which is caused by human activities.

a. Reducing Unnecessary Production of Smokes and Dusts

Smokeless cooking stoves should be used while cooking food.

Firewood, kerosene and coal should be minimized and use of biogas, electrical energy and solar energy should be encouraged.

Industries should be established far away from cities.

Waste products should be managed properly and should be sorted out as biodegradable and non biodegradable, which help to reduce air pollution to a great extent.

b. Stop Poaching of Animals

Animals help in maintaining the balance in ecosystem and food chain. There is always balance in the number of plants and animals going on naturally. Poaching of animals by human beings imbalance the environment. Thus, human beings should stop unnecessary killing of wild animals.



c. Controlling Forest Fire

Forest is the habitat for wild animals and their sources of food. Human set fire to the forest knowingly or unknowingly which causes loss of valuable animals, plants and other organisms.

Such activities increase the chances of forest fire causing loss of many flora and fauna. During picnic fire should not be set randomly which increases the possibility of forest fire. Smoking in forest area should be strictly prohibited. Setting fire in and around the forest area should be banned.



d. Development and Growth of Forest

Forest is an important natural resource of the earth. Unplanned destruction of forest should not be done. Domestic animals should not be sent inside the forest for grazing. All human beings should work for the protection of forest and finally for conservation of forest.

e. Protection of Water Sources

Water source protection involves the protection of surface water sources (e.g. lakes, rivers) artificial resources and ground water (e.g. Spring protection, dug well protection, and drilled well protection) and avoiding water pollution.

We should not pollute water by mixing unwanted and harmful chemical substances into the sources of water.

Dirty water and other pollutants should not be mixed in water sources. Wastes management should be done properly. Human should stop releasing stool and urine in the sources of water.

f. Suitable Farming Method

Farming should be done according to the geographical structure of place. For this contour ploughing and terrace should be done in hilly regions. The use of organic fertilizers should be encouraged instead of chemical fertilizers which help to maintain the moisture and fertility of soil. Scientific farming technique must be applied for sustainable farming in different geographical regions of the country.

g. Making Embankment

A raised bank or wall which is built in order to carry a roadway or hold back water is called embankment. Embankment prevent us from harmful effects of natural disasters such as landslide and floods.

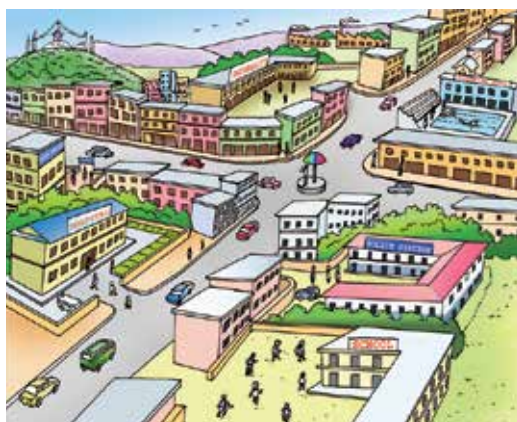
Afforestation should be done in the river sides.



h. Planned Urbanization

The systematic constructions of buildings, homes and other developmental structure along plantation of trees in and around city area to balance environment is called planned urbanization or systematic urbanization.

A planned urbanization includes well managed sewage systems, proper system of drinking water, communication etc. Planned urbanization prevents environmental disaster.



i. Management of Garbage

Waste management is the process of treating solid wastes and offers variety of solutions for recycling items that do not belong to trash. It is about how garbage can be used as a valuable resource. Garbage management is all the activities and actions required to manage waste from its inception to its final disposal. Waste management includes sorting wastes as biodegradable and non-biodegradable. The 3Rs formula is useful for the management waste, which include 'reduces' 'reuse' and 'recycle' according to native of waste products.

As we can see there are plenty of important things that we should learn about the management of garbage and its disposal in order to ensure that we are safe, as well as that we are keeping the environment safe. It is our choices as how to dispose waste, however, for disposal garbage, the best alternative should be selected to balance the environment.

4.3 Ecosystem

'Eco' means environment and 'system' means a set of parts in which each part depends, on the other. A.G. Tinsley (1935 AD). a British ecologist was the first person to define the term ecosystem meaningfully.

An ecosystem is an ecological unit that consists of both biotic and abiotic factors of the environment. The organism and environment are inseparably inter-related and are interactive in their nature.

Ecology is the branch of biology which deals with interrelation between living organism and the environment.

Ecosystem are of different types. Among them major types of ecosystem are :

1. terrestrial ecosystem,
2. aquatic ecosystem,
3. marine ecosystem,
4. pond ecosystem,
5. grassland ecosystem etc.

Components of Ecosystem

There are two major components of ecosystem. They are : biotic and abiotic components.

i. Biotic components

All living organisms in an ecosystem belong to biotic components. They are closely related and interdependent with each other. Biotic factors of an ecosystem can be classified into producers, consumers and decomposers.

Producers

Producers are those members of an ecosystem that are capable to produce their food themselves. Autotrophic green plants are producers.

Consumers

Consumers are the living members of ecosystem which consume the food prepared by the producer. On the basis of nutrition, consumers are categorized into primary, secondary and tertiary.

a. Primary consumers

Consumers which use up producers directly as food are primary consumers. They are herbivores eg. goat, deer, cow etc.

b. Secondary consumers

Consumers that feed on primary consumers and are mostly carnivorous are called secondary consumers. eg. sparrow, crow, frog, dog etc.

c. Tertiary consumers

They feed on secondary consumers are mostly carnivores eg. Tiger, lion, big fish etc.

Decomposers

They are also living components of an ecosystem and are composed of microorganisms. They break down the complex organic compounds present in dead plants and animals into simple substances. Such simple substances mix into soil and utilized by producers as fertilizers. e.g. Bacteria, fungi, etc.

ii. Abiotic components

It includes non- living components. The distribution of organisms mainly depends on biotic components which vary from place to place. Abiotic components are as follows.

Air

Air is a mixture of various gases. Air generally contains oxygen (21%), nitrogen (78%) and carbon dioxide (0.03%). It also contains water vapours, neon, argon, methane etc.

During photosynthesis, plants give out oxygen into environment. This oxygen is used by animals and plants themselves for respiration.

During respiration, carbon dioxide is evolved by animals and plants. The carbon dioxide is utilized by green plants to produce carbohydrates during photosynthesis. In this way, the different gases found in air is very important for the survival of organisms.

Sun

Sun is the main source of energy. All the green plants prepare food in the presence of sunlight. Different parts of the earth have different temperature because of geographical structures. It causes difference in climate, rainfall and distribution of plants and animals. Light and temperature both are essential for productivity, growth, pigmentation of flower, breeding etc. of organisms.

Soil

It forms the substratum for plants and animals on the land. It is an important abiotic factor that provides natural habitat and store house for different organisms. Soil contains minerals, organic matter, water, air etc. which are required by the plants for their development. Plants prepare food by using nutrients contained in soil and is used by animals as food.

Water

It is essential for maintenance of life activities of organisms. Water is raw material for photosynthesis. It plays an important role in fertilization, pollination, dispersal of seeds and respiration of aquatic plants and animals. Aquatic animals derive oxygen from water by using their body surface or gills.

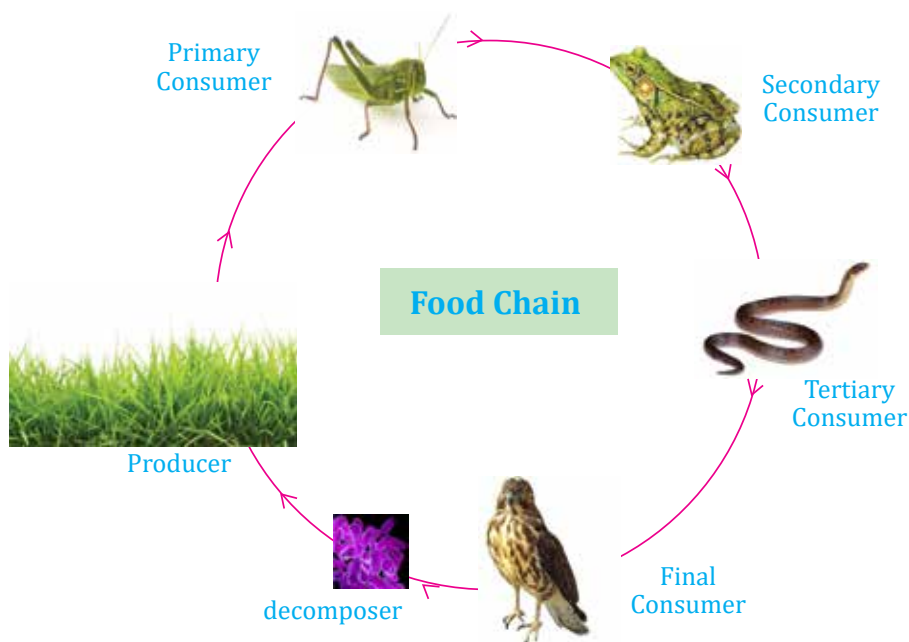
4.4 Interrelationship among plants, animals and microorganism

Green plants prepare food for all. Animal can not prepare food themselves. Energy is necessary to all organisms to continue their life process. The relationship is maintained while fulfilling their nutritional requirements.

Food Chain

The process of eating and being eaten is known as food chain. A simple food chain starts with a producer, which is eaten up by primary consumer (small animals) which in turn is eaten by a secondary consumer. The final place in the food chain may be occupied by tertiary or quaternary consumer. There is a transfer of energy from producers to consumers in the food chain.

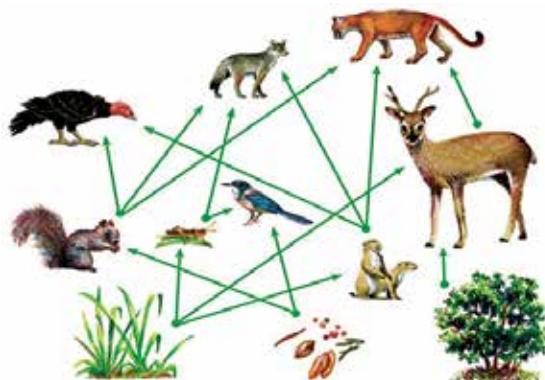
In nature, simple food chain rarely exists, since the same animals may eat one or more animals and it may be eaten by others. Thus, eating and being eaten will constitute an interlocking pattern which is known as food web.



Food Web

It is a network of food chains inter-connected at various trophic level. Food web provides the alternative path ways of food availability. This also helps in checking of animals and plants. In natural conditions, food chains are not isolated from one another.

In a grassland food web, many food chains are interlinked by various organisms. For example, in the above food web, mouse eats grains and it may be eaten by a hawk or snake.



Food web

In an ecosystem, plants and animals are related to each other. Plants use simple inorganic matters and produce complex organic matter. Living organisms are categorized into two groups i.e. autotrophy and heterotrophy.

Project work

1. Study the interrelationship between animals and plants of that community. Make a detail report of all the components of the food chain.
2. What are things available in the land of your surrounding ? Explain in 10 to 15 sentences.
3. Observe different components of the environment and classify them into abiotic and biotic components.



GLOSSARY

terrace farming	: farming in series of flat areas like steps
dykes	: thick walls to stop floods
hydroelectricity	: electricity generated from water
humus	: soil consisting of dead plants, etc.
mine	: a place where deep holes and tunnels are dug in order to obtain minerals



A. Choose the best answer from the given alternatives.

- i. Which one is the abiotic component?
 - a. Grass
 - b. Bacteria
 - c. Soil
 - d. Zebra
- ii. Which one is the decomposer?
 - a. Producer
 - b. Parasite
 - c. Primary consumer
 - d. Bacteria fungi
- iii. Which one of the following is the producer?
 - a. Green plants
 - b. Fungi
 - c. Bacteria
 - d. Animals
- iv. Which gas is needed for our survival?
 - a. Nitrogen
 - b. Neon
 - c. Oxygen
 - d. Carbondioxide

B. Fill in the blanks.

- i. Light, temperature, soil, etc. are included in _____ components.
- ii. _____ are responsible for the break down of dead parts of plants and animals.
- iii. Primary consumers depend on _____ for food.
- iv. Carnivores are also called _____ .
- v. The _____ is the main source of heat and light.

C. Answer these questions.

- i. Name any two natural resources and explain them in short.
- ii. Write the relationship between producer, consumers, and decomposers with examples.
- iii. Describe in short about different types of consumers with examples.
- iv. The sun is the main source of energy. Why?
- v. Complete food chain by using the following words.
[plants, frog, insects]
- vi. What are abiotic components of the environment? Write any three examples.
- vii. What are biotic components of the environment? Write any three examples.
- viii. What are natural resources ? Also mention their importance.
- ix. What is environmental balance ? Also write its importance.
- x. Describe different types of consumers with examples.
- xi. How is forest advantageous for us ?
- xii. What is environment? How are different organisms related to each other and to the environment ?
- xiii. How can we maintain environmental balance ?
- xiv. Write the importance of the environment ?
- xv. Write briefly about the condition of water resources of our country.

D. Match the following two columns.

Column 'A'

Rhinoceros
Brown bear
Trees
Himal
Copper

Column 'B'

Tertiary consumer
Terai
Tiger
Mineral
Producer

E. Tick (✓) the correct statement and cross (x) the wrong one.

- a. Jackal is a tertiary consumer.
- b. Soil is an a biotic factor.
- c. Grass is an example of a decomposer.
- d. Forest is an example of natural resources.
- e. Medicinal plants are found in forest.

F. Give reason.

- a. Land is a natural resource.
- b. Mineral is the determiner of the prosperity of a nation.
- c. The sun is the main source of energy.
- d. We cannot survive without water.
- e. Plants help to balance the amount of oxygen in the environment.
- f. Natural resources are important to us.

G. Name any three species of the following.

- a. Animals of the terai region
- b. Animals of the himalayan region
- c. Natural resources
- d. Primary consumers
- e. Secondary Consumers
- f. Tertiary consumers
- g. Producers

H. Differentiate between:

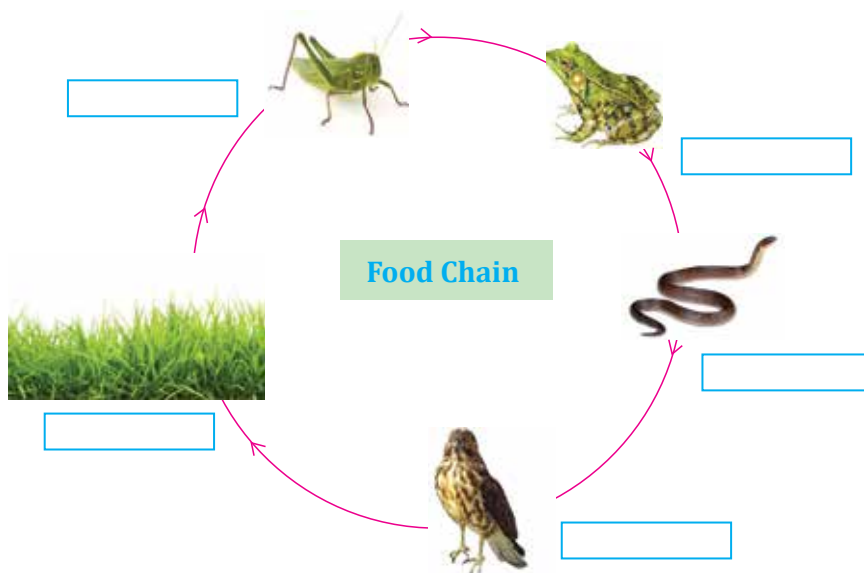
- a. Producers and consumers
- b. Abiotic component and biotic component
- c. Producers and decomposers

I. Define the following.

- | | |
|---------------------|----------------------|
| a. Environment | b. Abiotic component |
| c. Biotic component | d. Producer |
| e. Consumer | f. Decomposer |
| g. Scavenger | h. Food chain |
| i. Food web | |

J. Diagrammatic questions

i. Fill the following blanks :



ii. Place the animal in the correct order in form of each food chain.

			
1	2	3	4

Unit 5

Life Process

Total estimated periods [Th. 8 + Pr. 2 = 10]

STUDENT'S LEARNING OUTCOMES

After studying this unit, the students will be able to :

- To describe the nutritional process of living things.
- Explain the importance of the fact that plants take up carbon dioxide and give oxygen during photosynthesis.
- To describe the digestive system in the human body.

Mode of Nutrition

In an ecosystem, plants and animals are related to each other. Plants use simple inorganic matters and produce complex organic matter. Living organisms are categorized into two groups i.e. autotrophy and heterotrophy.

a. Autotrophic organisms

Living organisms which can prepare food materials themselves are known as autotrophic organisms. Green plants prepare food materials with the help of chlorophyll. Solar energy water and carbon dioxide. This process is known as photosynthesis. During the process of photosynthesis, inorganic components are converted into organic components. This process is known as autotropism.



b. Heterotrophic organisms

Living organisms which can not prepare food materials themselves are known as heterotrophic organisms. These organism depend upon other for food materials

which are known as consumers. This type of nutrition is known as heterotrophism. Depending upon the food, these organisms are separated into three groups.

i. Parasite

Those organisms which obtain the nutrition from other living organisms by sucking are known as parasites. This type of nutrition is called parasitic nutrition. Organisms which provide nutrition are known as host. Tapeworm, leech, roundworm, mosquito, bed bugs, etc. are some examples of parasites.



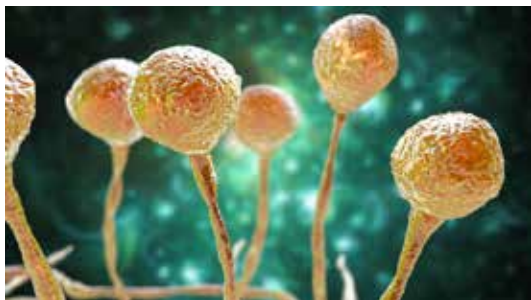
Tapeworm



leech

ii. Saprophyte

Living organisms which obtain nutrition from dead and decayed organisms are called saprophytes. Fungi, mushroom, mucor etc. are some examples of saprophytes.



mucor



mushroom

iii. Holozoic

The organism which feed on organic substance obtained from plants or animals or both are called holozoic animals. Higher animals, birds and human beings are holozoic organisms. Holozoic nutrition includes four different life processes. They are ingestion, digestion, absorption and excretion. During the digestion process, complex food materials are converted into simpler form and essential simpler nutrition are absorbed in the body. Unnecessary waste products are removed out from the excreting system.

Photosynthesis

The process of preparing food by the green plants by using carbon dioxide and water in the presence of sunlight trapped by chlorophyll is known as photosynthesis. All living beings need food to survive. Only green plants can prepare food materials by themselves. All green plants take carbon dioxide from the air, absorb water from the soil and sunlight with the help of chlorophyll of the green leaves prepare food materials. Chlorophyll of the green leaves take energy from the sunlight. This process of photosynthesis makes glucose and oxygen.

The following chemical reaction takes place during photosynthesis process.

Animals cannot prepare their food.

So, all the animals directly depend on plants for their food.

Plants take water from the soil through the roots and carbon dioxide of the air through the stomata. Glucose which is prepared by the photosynthesis is changed into starch and collected inside the cells. Oxygen is released in the atmosphere through stomata.

Condition required for photosynthesis

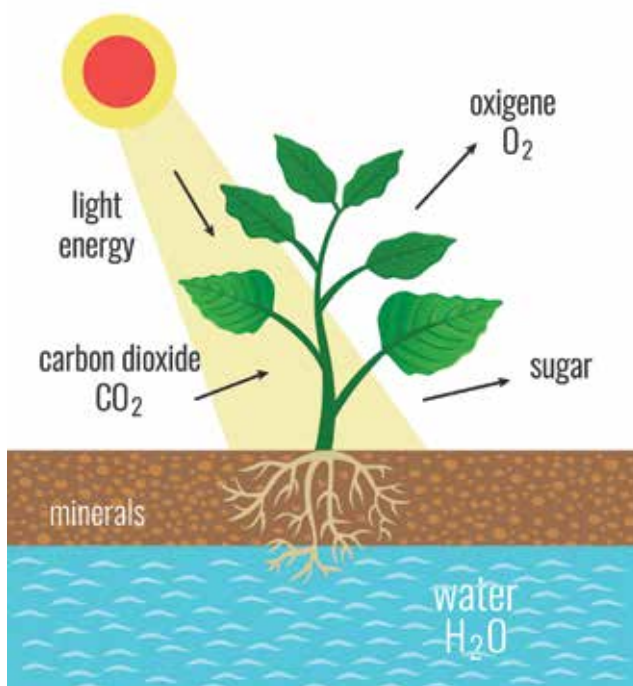
Carbon dioxide, water, chlorophyll and sun-light are the essential factors for photosynthesis.

Carbon dioxide

Carbon dioxide is the most essential raw material for photosynthesis process. It is taken by plants from the air through stomata. Plants can not survive without carbon dioxide.

Water and minerals

It is the most important raw material for photosynthesis process. It is absorbed by roots and transferred to the leaves with the help of oxygen. Hydrogen of the water mixes with the carbon dioxide to form carbohydrate. Plants also absorb essential minerals from the soil with water to manufacture proteins.



Sunlight

Sun is the only main source of energy. It is trapped by chlorophyll of the leaves. While preparing food materials by the green plants, they change solar energy into chemical energy. Chlorophyll of the leaves absorbs solar energy and use during the photosynthesis process.

Chlorophyll

It is the green pigment present in the chloroplasts. It traps sun-light and hence it is the most important factor for the photosynthesis. Photosynthesis process is not possible without chlorophyll.



Activity 5.1

To show that sun-light is necessary for photosynthesis.

Put the potted plant in a dark place for two to three days. Place a black tape in the middle part of the leaf. Pluck the leaf from the plant and remove the tape and do the starch test.

You will find that the uncovered portion of the leaf changes into blue black showing that photosynthesis has occurred, whereas the covered portion gives negative results for starch test.

This proves that sunlight is necessary for photosynthesis.



Activity 5.2

To prove that a green leaf contains starch

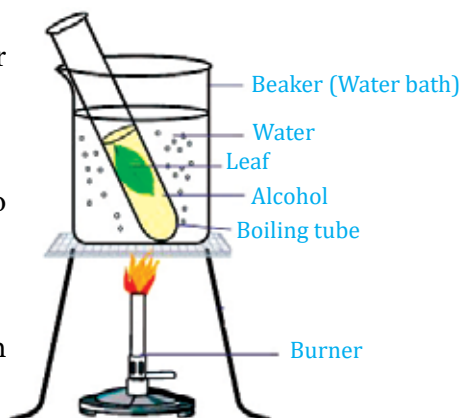
Take a green leaf from a plant and boil it in water for about four minute.

After that, again boil it in alcohol.

Now, wash it with cold water, leaf has turned into yellow.

Now, put few drops of iodine in the leaf.

The leaf has changed into blue- black in colour, which shows the presence of starch in the leaf.





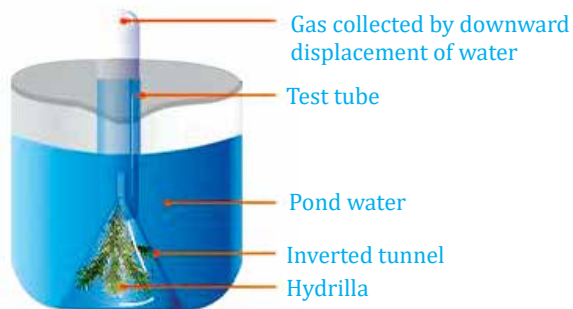
Activity 5.3

To show that oxygen is evolved during photosynthesis

Put a few pieces of hydrilla plant in a big beaker and insert a funnel over it.

Pour water in the beaker and invert a test tube filled with water above the tube of funnel by pressing its mouth with thumb and entering it inside the water.

Place the apparatus under the sunlight for some hours.



You will find that the gas bubbles coming out of the plant and gets collected in the test tube by the downward displacement of water. For testing the gas, insert a burning matchstick inside the test tube after the gas has been collected fully. The match stick burns more brightly which shows the gas is oxygen. It proves that oxygen is evolved during photosynthesis process.

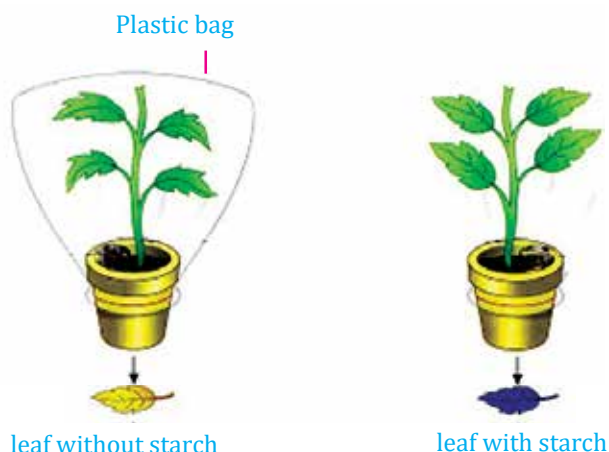


Activity 5.4

To show that carbon dioxide is needed for photosynthesis

Keep a potted plant in the dark for two days. Put some caustic potash in a polyethene bag and tie it around one of the leaf of the plant. Place the apparatus in bright light for some time. Now, take one covered leaf and an uncovered leaf and perform the starch test.

The leaf which is open in the air gives positive starch test and leaf covered with bag will not give starch test because of not getting carbon dioxide gas from air.

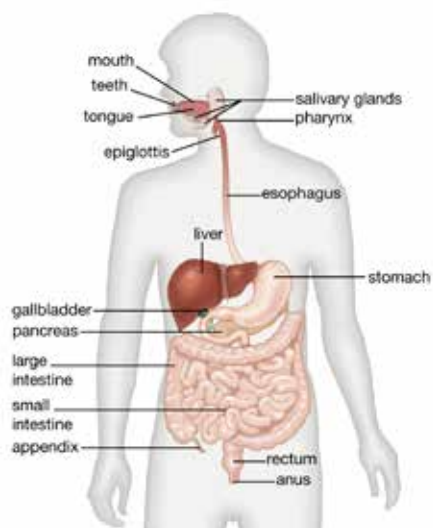


Human Digestive System

We take food everyday. The food is digested in the body of animal and remaining waste is removed out. The process of taking food, break down, absorption and removal of wastes take place in the digestive system. Food is taken through the mouth, chewed and mixed with saliva which is secreted by the salivary glands.

i. Alimentary canal

The digestive tract from the mouth to esophagus, stomach, small intestine, large intestine and anus is generally called alimentary canal. After chewing food, it passes through the esophagus to the stomach. The esophagus is responsible to deliver the chewed food to the stomach.



ii. Digestive glands

In different parts of the alimentary canal the food is mixed with different kind of juices secreted by different glands. Many chemicals are needed for the digestion of the food which are known as enzymes. Glands are responsible for the production of digestive juice and enzymes. Enzymes make food simple and easily absorbable.

Glands and enzymes of alimentary canal are as follows.

Place	Gland	Juice	Enzyme
Mouth	Salivary gland	Saliva	Salivary amylase
Stomach	Gastric gland	Gastric juice	Hydrochloric acid and Pepsin
Liver	Bile		
Duodenum	Pancreas	Pancreatic juice	Trypsin, Amylase, Lipase
Small Intestine	Intestinal glands	Intestinal juice	Amino, Peptides, Lipase

Process of Digestion

Food is chewed in the mouth. The process is called as mastication and the food is moistened with the help of saliva. The food is swallowed in the form of small balls called bolus.

Partially, carbohydrates are digested here with the help of an enzyme salivary amylase called ptyalin.

The masticated and partially digested food then passes through the esophagus into the stomach. Here, it is digested by the gastric juice of the stomach that contains hydrochloric acid, pepsin and other enzymes. Now, the mixture of food is called chyme.

Hydrochloric acid kills some harmful germs and makes acidic medium.

In acidic medium pepsin breaks the proteins of the food and renin change milk into casein. The food then passes into the small intestine.

Food passes in the small intestine in the form of chyme. The small intestine consists of duodenum, jejunum and ileum. In the duodenum, food is digested by bile juice produced by the liver and pancreas. The bile juice contains enzymes like trypsin, amylase and lipase. Trypsin digests the protein, amylase digests the starch and lipase digests the fat. All the food digested by different organs is ultimately absorbed by the cells of the villi in the ileum.

The villi are small projections found at the inner surface of the small intestine. The folds formed at the surface greatly increase the absorptive surface of the intestine. The villi have a rich supply of blood capillaries. The absorbed food is sent to different parts of the body through the blood. Undigested materials then reaches to large intestine. Here, water is absorbed and finally solid waste materials are removed out through anus.

After the break down the complex food materials are changed into simple food materials like glucose, fructose, lactose, etc. these simpler food reach to every part of body through villi of small intestine and in the presence of oxygen that gives energy. Carbohydrate of food gives us energy.

Project work

1. Collect some plants with their roots. Differentiate them as tap root and fibrous roots. Dry those plants and paste them in your science exercise copy.
2. Collect different type of leaves of plants from your surroundings. Observe those leaves carefully and fill in the table below.



GLOSSARY

delicate	:	soft
embryo	:	the structure that develops from the fertilized egg photo germination
synthesis	:	manufacture of chemical compounds from simple compounds
apex	:	tip of plant's parts
dicotyledonous	:	having two seed leaves in the seed.
monocotyledonous	:	having one seed leaf in the seeds
vitality	:	extremely in an essential way
nourished	:	alive and healthy with food
pollination	:	the process of transfer of pollen-grain from another to the stigma
stoma	:	singular form of stomata
guard cells	:	bean shaped cells found around a stoma



A. Choose the best answer from the given alternatives.

- i. Which part of the plant is not found in stem?
 - a. Leaf
 - b. Terminal bud
 - c. Root cap
 - d. Node
- ii. Which one is the function of stem?
 - a. Transport of water and minerals
 - b. Absorption of water and minerals
 - c. Transport of water, minerals and nutrients
 - d. Prevention in land slide
- iii. Which one has underground stem?
 - a. Radish
 - b. Carrot
 - c. Potato
 - d. Sugarcane
- iv. Which one is the function of leaves?
 - a. Transpiration
 - b. Photosynthesis
 - c. Respiration
 - d. All of the above

B. Fill in the blanks.

- i. Different _____ takes part in life process.
- ii. The part of the plant under soil is called _____
- iii. Transpiration takes places through _____ of leaves.
- iv. The process of preparing food by green leaves is known _____
- v. _____ tissue is responsible for the absorption of water and minerals from the roots.

C. Answer these questions.

- i. Name different parts of a plant.
- ii. Write any two functions of root, stem and leaf of each.
- iii. Which part of the roots absorb water and minerals from the soil?
- iv. What type of root consists of root cap? Why?
- v. What is the location of terminal bud? What is the function of it?
- vi. How can you prove that plants prepare food materials in leaves? Explain with diagram.
- vii. Describe an experiment to demonstrate transpiration.
- viii. Write the functions of xylem and phloem.
- ix. Draw a diagram of a plant and label all the parts.
- x. Name any five plants which bear tap root.
- xi. Name any four plants which bear fibrous root.
- xii. What is shoot system ? write its parts.
- xiii. Write the functions of the stem.
- xiv. Write the function of the leaf.
- xv. What do you mean by stomata ? What are their functions ?
- xvi. Define chlorophyll and bleaching.
- xvii. What do you mean by plant physiology ?
- xviii. List the raw materials a plant needs to prepare food during photosynthesis.
- xix. What do you mean by transportation of nutrients in plants ?

D. Write the functions of the following.

- | | | |
|------------|------------|-------------|
| a. Root | b. Stem | c. Leaf |
| d. Radical | e. plumule | f. Root cap |

E. Define the following:

- | | | |
|-----------------|------------------|-------------------|
| a. Tap root | b. Fibrous root | c. Root system |
| d. Shoot system | e. Transpiration | h. Photosynthesis |
| i. Chlorophyll | j. Stomata | |

F. Differentiate between :

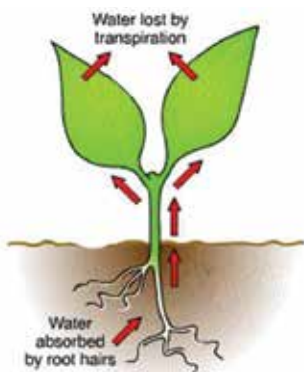
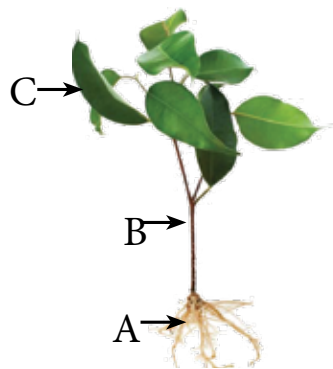
- Parallel and reticulate venation
- Vegetative part and reproductive part
- Stem and root
- Tap root and fibrous root

G. Give reason :

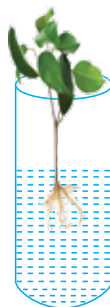
- A leaf can be considered as the food factory of a plants.
- Internal transportation is necessary for plants.
- Watermelon cannot stand erect.
- A pea plant has tendrils.
- Leaf of a plant are green.

H. Diagrammatic questions.

- Study the given figure and answer these questions.
 - Name A, B and C.
 - Write the function of B.
 - Which part of it absorbs water form soil ?
- Draw a well-labelled diagram of a peepal leaf.
- Sketch the figure of stomata.
- Which life process is shown by the following diagrams?



a.



b.

Unit 6

Force and Motion

STUDENT'S LEARNING OUTCOMES

After studying this unit, the students will be able to :

- To introduce rest and motion conditions.
- To distinguish between linear and curvilinear motion.
- Introduction to velocity and speed.
- Introduce the force and measure it using spring balance.
- To describe and demonstrate the effects of force.
- To give the example of transformation of force in a simple way.
- Introduce simple machine and give examples of simple machines used in daily life.

6.1 Rest and Motion

Motion of an objects

If an object is moving, we would be curious to know what are the things that make a body move. How long will a body move? And many other queries pops in.

To understand the motion, we have a clear examples mentioned below.



Following are the terms to be recognized before learning motion. They are:

- i. Rest
- ii. Motion

i. Rest

When the body doesn't change its position with respect to the surrounding, the body is said to be at rest. Examples: table, book, a boy sitting on a bench, land, bridges, stone, etc.

ii. Motion

Motion is defined as change in position of an object . It is a process of moving or being moved. When the body changes its position with respect to its surrounding, the body is said to be at motion. Examples: flowing water, moving cyclist, flying aeroplane, a moving car, etc. Rest and motion are relative terms. The same object can be considered as rest with respect to one object. Whereas the same object is said to be in motion with respect to another object. For examples: in a moving bus, passengers are at rest with respect to each other, but the bus and passengers are at motion with respect to its surroundings.



Activity 6.1

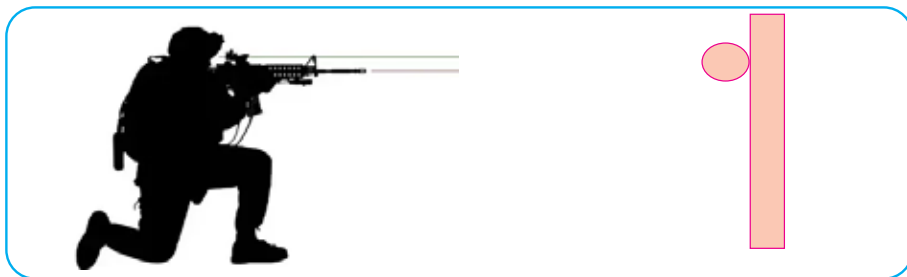
Find the differences between the object at rest and motion. Show it to your teacher within five minutes.

Types of Motion

There are several types of motion, some of them are listed below.

i. Translatory Motion

An object is said to be in translatory or linear motion if it travels on a straight line or path. Examples of translatory motion are : an apple falling down from the tree, motion of a man on straight line, a bullet fired from a rifle, motion of bicycle and vehicle, etc.





Activity 6.2

With the help of 2m long rope, draw a straight line on a blackboard. For this process, attach a stone at one end of the rope and draw a straight line following the rope. In which direction does the stone fall? The stone falls directly downward on the earth surface in a straight line. In every part the stone falls with same velocity. This kind of motion is known as translatory or linear motion.

ii. Curvilinear motion

A body is said to have curvilinear motion if its direction of motion changes continuously. Turning of vehicles on the road, zigzag movement of bus on the hilly roads are curvilinear motion.



iii. Circular motion

The motion of body in circular path is circular motion. In ceiling fan, the blades move around the fixed central point in a circular path. The motion of ceiling fan represents circular motion. Circular motion is the special type of curvilinear motion.



iv. Rotatory motion

A motion in which different parts of an object move around a central fixed point or axis is rotatory motion. The motion of rotaping, motion of spinning top are rotatory motion.

In rotaping, the persons are in circular motion and the rotaping is in rotatory motion.



v. Spiral motion

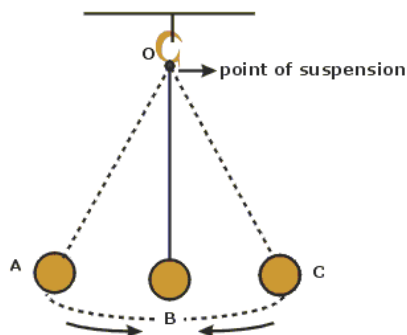
The motion of a body having both linear and rotatory motion simultaneously is called spiral motion. Examples: motion of screw driver while tightening screw nails, a man stepping down a spiral stair case makes it tight.



vi. Oscillatory motion

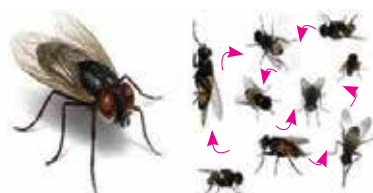
A kind of motion in which a body moves back and forth about its mean position is called an oscillatory motion. In other words, an oscillatory motion is a to and fro motion of a body.

The pendulum of a clock as a whole does not move from one position to another. The pendulum moves back and forth at a given place. The movement of the pendulum is about its central or mean position.



vii. Random motion

The motion of an object which is not in one direction is known as random motion. Movement of dust due to fast blowing wind or flying of a housefly is in different directions. Random motion can be understood in terms of speed and velocity.



Force

When we think of motion, we often think of cars, bicycles, kids running, footballs and aeroplanes flying. Simply, people do different activities from different field such as running, carrying loads, pushing and pulling, etc. This push and pull on an object is simply referred to as force. For example, if somebody is pushing or pulling a chair, then he/she is applying force on it. Force makes an object to change their state. If we need to stop a rolling football, this can be done by applying force. Hence, force is applied to pull or push an object.

i. Pulling Force

A force which is applied to pull or try to pull an object is known as pulling force. For example: A pulling force is required to pull a bucket of water from the well.

ii. Pushing Force

A force which is applied to push an object is pushing force. For example: pushing a friend in a swing, kicking a ball, ringing a doorbell, etc.

Effects of Force

There are different effects of force which are listed below.

1. Force can change the state of an object

When a certain amount of force is applied on an object at rest, it changes into motion.



If we kick a football, it moves as we have applied force on it. Similarly, some forces can be applied to stop a moving football.

Force can stop a moving object

If an object is moving, we need force to stop it. Examples: we apply brake to stop a moving bicycle. While applying brake, force is used. Without using external force we cannot stop any objects. Similarly, a moving bus can be stopped by applying a brake.

2. Force can change the direction of a moving body

In a cricket match, the batsman changes the direction of the cricket ball by hitting it with the bat. The change in direction is due to the applied force. Hence, force can change the direction of moving body.



3. Force can change the shape of body

If we apply force on any body, the shape of the body changes. For example, if we take a balloon filled with air and press it. Observe the differences, its original shape changes. Therefore, force can change the shape of a body.



4. Effect on the volume of body

Generally, force cannot change the volume of solid and liquid object but volume of gases can be changed by force. Air can be compressed in the tubes of vehicles or balls due to force.



Activity 6.3

Take a syringe without needle. Cover its tip of opening with your finger. Now, push the syringe piston with another finger. After pushing little bit, it becomes difficult to push again. Why? What causes difficulty in pushing syringe piston further? What is inside the syringe? Air is present inside the syringe. Air cannot be seen. When the piston is pushed, air is compressed inside the syringe and volume of the air is decreased. In this way, force can change the volume of the things.



Measurement and Unit of Force



Measurement of force and its unit

Every object has weight. The weight is produced on the body due to attraction of the earth. Hence, the weight of a body is a force. Different objects having different mass have different weight. For example; a big stone is heavier than a small stone. Similarly, apples are heavier than grapes. We need to measure the weight of several objects in our daily life. The weight is measured by using a spring balance.

A spring balance has a spring attached to a hook. The object is hanged in the hook while measuring the weight. The spring balance has a graduated scale with a pointer which shows the weight of the object.

Unit of Force

The SI unit of force is Newton (N).

Types of Force

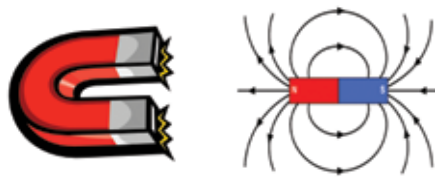
i. Muscular Force

The force applied by the muscles of human body and other animals is known as muscular force. While walking, running, kicking the ball, dancing or carrying loads from one place to another, muscular force is applied. Our muscles get tired after applying the force. Bulls carry loads using muscular force. While doing different types of work, we need muscular force.



ii. Magnetic Force

The force which is exerted by a magnet on magnetic substances is known as magnetic force. A magnet can attract iron nails. A magnet has two poles i.e. a north pole and a south pole. It attracts another magnet when unlike poles are brought together.

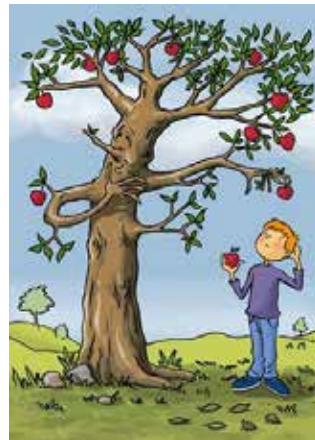


iii. Gravitational Force

The force with which earth pulls everything towards its center is called gravity. Throw a ball up, after sometimes the ball returns down on the ground. A fruit falling from a tree always comes straight down.

It is difficult to carry a bucket full of water because the earth's gravitational force pulls the bucket full of water. Gravitational force only pulls but do not push the objects.

The force of attraction between two bodies due to their masses is called gravitational force. The gravitational force between the two bodies depends on their masses and distance between them.



iv. Electrostatic Force

The force which is associated with the electrically charged bodies is called electrostatic force. When you comb your dry hair with a dry plastic comb and when you bring the comb near tiny pieces of paper, you will see the comb attracts these pieces of paper towards it. Here, due to the collection of charges on the comb, it can exert some force on the pieces of paper. The unit of force is Newton (N).



Transmission of Force

Force can be transferred from one point to another. For example; when we pull water from well using pulley, we apply force on the rope. The force applied on the rope is transferred to the bucket. Similarly when a bus driver rotates the steering wheel, the force is transmitted



to the wheels of the bus. While playing see-saw, we apply force on one side, but that force is transmitted to other side. There are several devices that help in transmission of force. For example; broom, knife, pulley, lever etc makes our work easier by transmission of force from one point to another.



GLOSSARY

gravity	:	the force of the planets that attracts objects towards their centre
spin	:	to turn round and round quickly
hurl	:	to throw something in particular direction
pendulum	:	a long straight part with a weight at the end that swing freely



A. Choose the best answer from the given alternatives.

- i. Which force is used to attract an object by the earth towards its centre?
 - a. muscular force
 - b. frictional force
 - c. gravitational force
 - d. magnetic force
- ii. Which one is the effect of force?
 - a. it changes a moving body into rest
 - b. it changes mass of a body
 - c. it changes a body from rest to rest.
 - d. it changes weight of a body
- iii. What is the motion of *Roteping*?
 - a. circular
 - b. random
 - c. translatory
 - d. oscillatory
- iv. How many poles are there in a magnet?
 - a. one
 - b. two
 - c. three
 - d. four
- v. What is the reason of falling an object to the ground, when it is thrown upward?
 - a. electrostatic force
 - b. gravity
 - c. magnetic force
 - d. frictional force

B. Fill in the blanks.

- i. The unit of force is _____.
- ii. Falling of paper piece is said to be in _____ motion.
- iii. Attraction of pieces of paper by a charged plastic comb is known as _____.
- iv. We need _____ to change the shape of an object.
- v. A house does not change its position with respect to its _____.
- vi. The motion of a pendulum is _____.

C. Answer these questions.

- i. Define force and motion.
- ii. Write down three effects of force.
- iii. How can force change the volume of a body? Explain.
- iv. What should be done to increase the speed of moving bicycle?
- v. What is oscillatory motion?
- vi. A kite flying in the sky falls down due to the breakage of its string. What is the motion of falling kite?
- vii. What is circular motion? Give examples.
- viii. How is the motion of a moving wheel of a bicycle different from that of a moving fan?
- x. Draw a neat and labelled diagram of an object to show a circular motion. A bus covers a distance of 300m in 30 seconds. What is its speed?
- xi. What do you understand by pulling and pushing force?
- xii. Name any five different effects of force.
- xiii. What is the unit of speed?

D. Differentiate between:

- a. rest and motion
- b. random and oscillatory motion
- c. translatory and curvilinear motion
- d. speed and velocity
- e. circular and rotatory motion

E. Numerical problems :

- a. A bus covers a distance of 600 m in 60 seconds. What is its speed?
- b. A man runs on a straight road. If he covers 200 m in 1 minute. What is his velocity?

F. Diagrammatic questions

- i. What type of force do you see in this picture?



- a. push b. pull
- ii. What type of force do you see in this picture?
- a. push b. pull



- iii. Fill in the blanks with the correct answer.

Speed Slow Start moving stop Change

- a. Force can make object at rest to _____



b. Force can _____ up or _____ down movin object.



c. Force can _____ the direction of a moving object.



d. Force can _____ a moving object.



6.2 Simple machine

We use different kinds of simple machines in our daily life. We use knife to cut an apple, axe to chop firewood, and so on. Similarly, a hammer is used to push the nails into the wooden board, crowbar is used to lift or move load, pulley is used to pull water from wells, to load heavy objects in a vehicle an inclined plane is used. Different types of simple machines can be used in houses, industries, schools, offices, etc. These machines do different types of work according to purpose. Scissors, knife, axe, saw, crowbar, screw bar, forceps, fire tongs, pulley, hammer, etc. are simple machines. In order to make our work easier, faster and convenient, these devices are used. Some machines are quite simple whereas some are complicated and expensive. Buses, cars, trucks, aeroplanes, etc. are complicated machines. Complicated machines are made with the combination of simple machines. These are some of the examples of simple machines.

The devices having simple structure which makes our work easier, faster and more convenient are called simple machines.



sickle



wheel and axle



scissor



plough



screw



inclined plane

Functions of simple machines

Simple machine plays a very important role in our daily life. We can perform different types of work using simple machines.

Some examples are given below.

S.N.	Name of devices/ Simple machines	Uses/ Functions
1.	Axe	to chop firewood
2.	Knife	to chop vegetables
3.	Scissors	to cut clothes
4.	Screw driver	to unbolt a nut
5.	Crow bar	to lift load
6.	Wheel borrow	to carry load like bricks
7.	Bottle opener	to open the lid of a bottle
8.	Shovel	to lift soil and throw

Therefore, those tools or devices which can be used in our daily life to make our work easier and convenient are simple machines. Some simple machines however, like bicycle, sewing machine and typewriters are made up of many kinds of simple machines and the construction is complicated. These are therefore, called complex machines. Simple machines are operated using muscular force. But complex machines can be operated using other powers. Such as, sewing machine can be operated using electric power.

We use simple machine for the following purposes.

- It makes our work easier (magnifies applied effort)
- It helps us to change the direction of force (comfortable)
- It helps to do our work faster (save time)

i. It makes our work easier

To do any type of work, we need to apply force. We cannot complete any work without force. If a force is applied to the simple machine, it multiplies the force applied on it and makes our work easier. Difficult work can be done with less effort with the help of simple machines.



ii. A simple machine helps to change the direction of force

Pulley can change the direction of force. With the help of pulley, a body can be lifted by applying force to downward direction. Due to this, force can be applied in a required direction. The water bucket is lifted upward applying less effort by pulley. Here, we will be able to lift the load by pulling down a rope. In this way, the pulley helps to change the direction of force.



iii. It helps us to work faster

Simple machines are basic needs nowadays. We use different devices such as scissor to cut cloth, nail cutter to trim nails, etc. which makes our works faster as well as easier. The handle of a sewing machine is provided with a wheel and axle to rotate it very fast. Pedals are used in the bicycle so that the cycling becomes faster. In this way, we can do work quickly by the use of simple machines. Similarly, the scissors that are used to cut cloth have longer blades which make our work faster.



Force is needed to apply for a work to be done. We can't perform work without applying force. Thus, work is defined as the force acting on an object in the direction of motion. If we apply force on a simple machine in order to perform work, it multiplies the force applied in it and makes our work easier.

For example, we have to overthrow a big stone of mass 500 kg. It is not possible to move the stone by a single person. However, if we use simple machine (lever) we can lift the stone easily.

Types of Simple Machines

On the basis of the structure of simple machines and their uses, they are classified into the following six types:

- | | | |
|-------------------|-------------------|-----------|
| 1. Lever | 2. Wheel and axle | 3. Pulley |
| 4. Inclined plane | 5. Screw | 6. Wedge |

i. Lever

A lever is a rigid bar, maybe straight or bent capable of rotating around a fixed point called fulcrum or pivot.

We take a long beam of wood as a lever and slip its one end under the stone. We support the beam (lever) with a small stone so that the small stone is as close to the

stone to be moved as possible. Then, we apply force at the other end of the lever in a downward direction. Now, you will find the stone gets moved or lifted. In this case, the lever (wooden beam) turns around the small stone and the small stone is called the fulcrum.

The force applied by you on the lever is called effort. The big stone to be lifted or moved by the lever is called load. The distance between load and fulcrum is called load arm. Similarly, the distance between the fulcrum and the effort is called the effort arm.

When the lever is balanced,

$$\text{effort} \times \text{effort arm} = \text{load} \times \text{load arm}$$

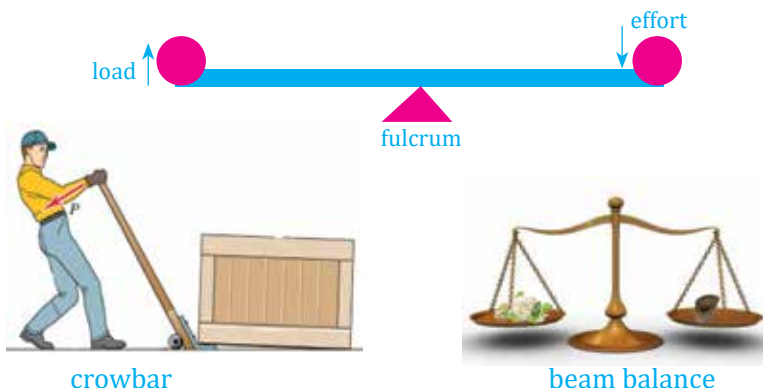
When we have to lift a heavy load with a less effort, effort arm should be longer than load arm. It is easier to lift a heavier load, when the load arm is longer.

Types of lever

On the basis of the position of fulcrum, load and effort, levers can be classified into three types.

a. First class lever

It is a lever in which fulcrum is situated in between the load and the effort.



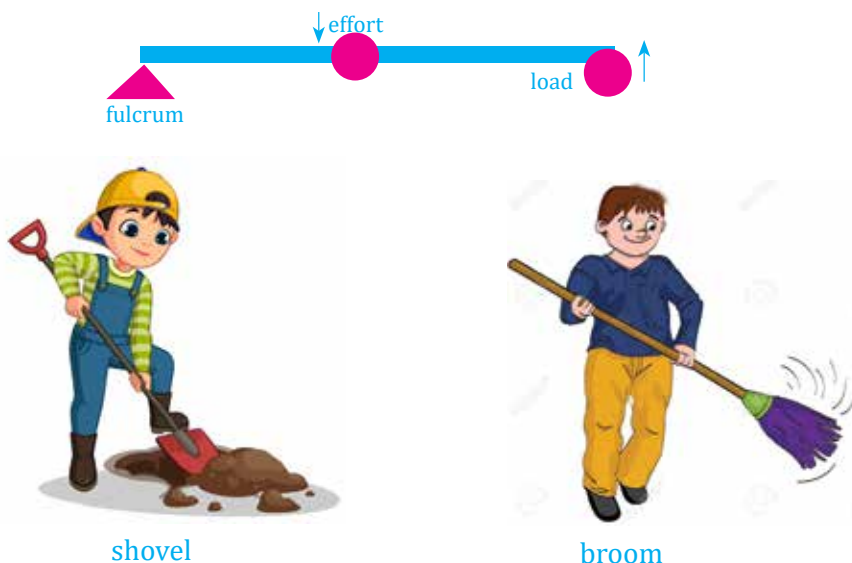
b. Second class lever

It is a lever in which load is in between the fulcrum and the effort.



c. Third class lever

It is a lever in which effort lies in between the fulcrum and the load.



Simple machines used in daily life.

We use several simple machines in our daily life. These simple machines make our work easier and faster. Some simple machines used frequently in our daily life are given below.



Project work

Make a list of different type of simple machines which are available at your home and school. Categorize them into different groups and discuss with your teacher.



GLOSSARY

rigid	:	very strong and difficult to change the shape
knob	:	a round handle-like structure
steering	:	the machinery of a vehicle, used to control the direction goes in
groove	:	a long narrow cut in the surface of something
drillers	:	the device used to drill a hole
plank	:	a long narrow flat piece of wood

 Exercise**A. Choose the best answer from the given alternatives.**

- i. A scissors is a lever of the type _____.
 - a. first class
 - b. second class
 - c. third class
 - d. none of the above
- ii. A wheel barrow is a lever of the _____ type.
 - a. first class
 - b. second class
 - c. third class
 - d. none of the above
- iii. A grooved wheel used to lift well water is called _____.
 - a. complex machine
 - b. lever
 - c. pulley
 - d. gear
- iv. Which of the following is not a simple machine ?
 - a. car
 - b. scissor
 - c. axe
 - d. knife
- v. An axe which is used to split wood is example of _____.
 - a. lever
 - b. wedge
 - c. inclined plane
 - d. pulley

B. Fill in the blanks.

- i. A sewing machine is a _____ machine.
- ii. Sharp instruments are called _____.
- iii. The simple machine changes the direction of _____.
- iv. $\text{Effort} \times \text{effort arm} = \text{_____} \times \text{load arm}$
- v. First class lever contains _____ between load and effort.

C. Answer these questions.

- i. What is simple machine? Mention its uses.
- ii. Mention types of simple machine.
- iii. What is lever? Discuss its types.
- iv. What is pulley?
- v. What are the types of pulley?
- vi. What is wheel and axle?
- vii. What are the uses of jack screw?

- viii. What is an effort arm?
- xi. Why is it more difficult to climb a vertical staircase than a slanted one?
- xii. Why a pulley used in the well helps us in pulling water?
- xiii. Mention the principle of lever.
- xiv. Write the purpose of simple machines.

D. Draw a figure of the following:

- a. Lever
- b. Pulley
- c. Wheel and axle
- d. Inclined plane

E. Write short notes on:

- a. inclined plane
- b. wedge
- c. screw

F. Write any two difference between.

- i. Pulley and wheel and axle
- ii. Wedge and screw
- iii. First class lever and second class lever

G. Give reason:

- i. It is more difficult to climb a vertical staircase than a slanted one.
- ii. A pulley used in well helps us in pulling out water.
- iii. A pair of scissors is simple machine.
- iv. A simple machine makes our work easier and faster.
- v. Wedge is important in our daily life.

H. Diagrammatic questions.

- i. Answer the following questions with the help of the given figures.

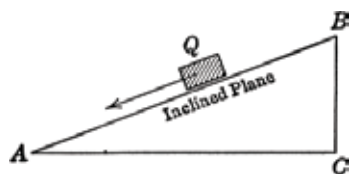


fig. (a)

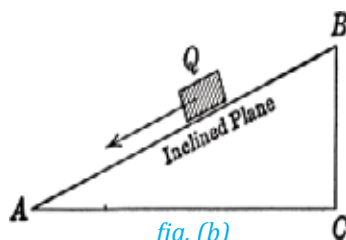


fig. (b)

- a. What type of simple machines are shown in (a) and (b)?

b. Which one of the above simple machine has more advantages ?

c. Which inclined machine can lift a load easily?

ii. Drag and Drop.

Leaver

Pulley

Whell and axle

inclined plane

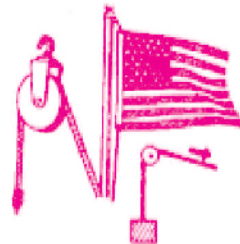
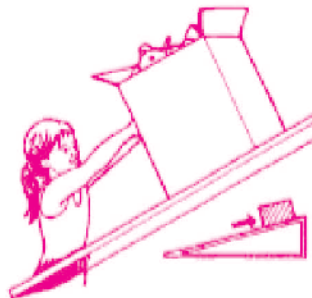
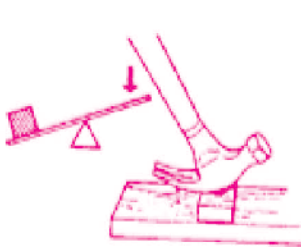
wedge

screw

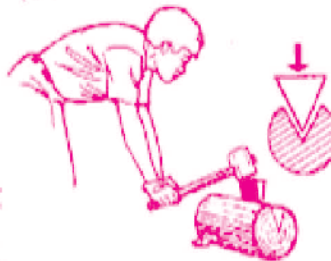
A. _____

B. _____

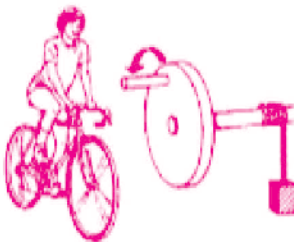
C. _____



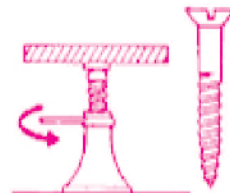
D. _____



F. _____



E. _____



Energy in Daily Life

STUDENT'S LEARNING OUTCOMES

After studying this unit, the students will be able to :

- define potential energy and give example of the objects having potential energy.
- define and give examples of kinetic energy.
- identify the factors that affect potential energy based on examples.
- prove the fact that an object with more mass and more velocity has more kinetic energy.
- give examples of transformation of energy, including potential and kinetic energy.

7.1 Energy

The capacity or ability of doing work is called energy. Work is done in expense of energy. The SI unit of energy is same as work that of Joule (J). In CGS system energy is measured in calorie.

[4.2J = 1 calorie]

Forms of Energy :

There are different forms of energy. Some major forms of energy are:

- | | |
|----------------------|-------------------------|
| 1. Mechanical energy | 2. Electrical energy |
| 3. Heat energy | 4. Light energy |
| 5. Sound energy | 6. Magnetic energy |
| 7. Chemical energy | 8. Geothermal energy |
| 9. Tidal energy | 10. Nuclear energy etc. |
| 1. Mechanical Energy | |

We know that men are doing different types of work. Similarly, various types of machines are doing work too. But the capacity of doing work of the men and machine is transformation of energy. Here, energy means capacity of doing work.

In our daily life energy is needed to do various work. Without energy no work is done. We get energy from various types of foods. If we are sleeping whole day, we need food for energy. The capacity of doing work is called energy. Sound energy, light energy,

chemical energy, potential energy, etc. are the some examples of energy. Some energies are discussed below:

The energy possessed by a body by virtue of its motion or position or configuration is called mechanical energy. Mechanical energy is of two types:

- i. Kinetic energy
- ii. Potential energy

i. Kinetic energy

What happens to a bird when fired bullet hits the bird? The bird can be hurt or it dies. It is because bullet has energy. This energy is kinetic energy. Flowing water, wind, etc, have kinetic energy. We can produce electricity from flowing water. We can also produce electricity using wind mills. Flowing water, wind, flying bird, moving car all have kinetic energy.

The energy possessed by a body due to its motion is called kinetic energy.

We can do following activity to find out factors affecting kinetic energy.



Activity 7.1

Once throw slowly a cricket ball or any other ball and let your friend catch the ball. Throw the ball with more speed. Again the next friend catch the ball. What are your friend feel? It is difficult to catch the ball moving with great speed because it has more kinetic energy. Thus, when speed increases, the kinetic energy of the body also increases. Therefore, great speed body can hurt more.

Now, throw the table tennis ball with same speed and catch it. The mass of cricket ball is greater than the mass of table tennis ball. So, cricket ball has more kinetic energy even if both are being thrown same speed. Cricket ball can hurt. Therefore, cricket player wears gloves.

From the above activity we can conclude that kinetic energy of a body depends upon

- i. Mass of a moving body, and
- ii. Velocity of the body.

Mathematically, kinetic energy can be written as,

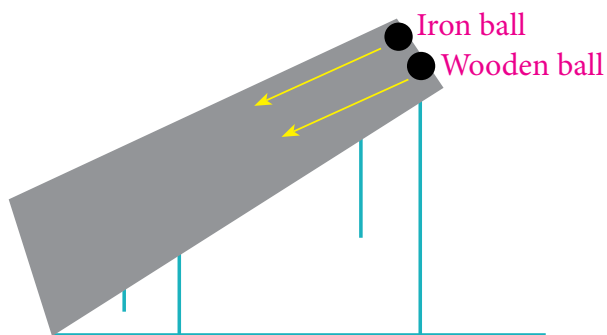
$$\text{Kinetic energy (K.E)} = \frac{1}{2} mv^2 \text{ Where, } m = \text{mass}$$

$v = \text{velocity}$



Activity 7.2

Take an iron ball and a wooden ball of same size. The iron ball has more mass than a wooden ball. Now make an inclined plane using a wooden plank. Ask your friend to roll the both balls from the top of wooden plank simultaneously. Try to stop the ball using your hands at the floor. What do you feel? Which ball possesses more energy? What conclusion do you draw from this activity? Discuss with your friend and teacher.



Out of two bodies moving with same velocity, the body having more mass has more kinetic energy.

ii. Potential energy

Energy possessed by a body by virtue of its position and configuration is called potential energy. Stretched rubber, stretched bow, compression spring, leg lifted to kick the ball, water stored in dam. etc. have potential energy. Potential energy of a body at certain height from the ground is calculated by using formula,

$$\text{P.E.} = mgh$$

(m = mass of a body, g = acceleration due to gravity, h = height from ground)

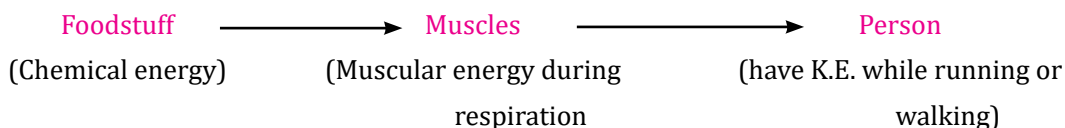
Transformation of Energy

Energy exists in various forms. One form of energy can be converted into other form. The process of conversion of energy from one form to another form is called transformation of energy. The process of transformation of energy is common in daily life.

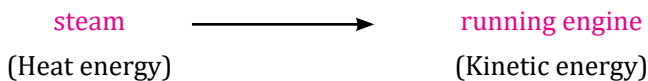
For example, electric bulb converts electrical energy into light and heat energy.

Examples of transformation of energy

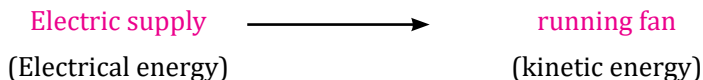
1. We get chemical energy when we eat different types of foodstuffs. The chemical energy is converted into muscular energy by respiration. When we walk or run, muscular energy gets converted into mechanical energy (Kinetic energy). i.e.



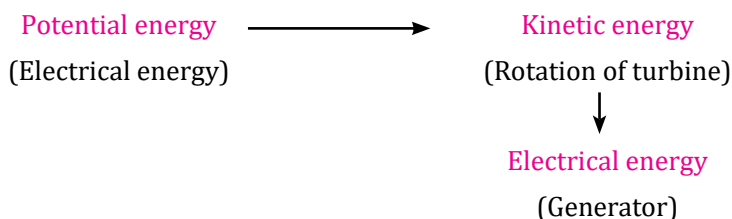
2. Steam engine converts heat energy into mechanical energy. i.e.



3. Electric fan converts electrical energy into kinetic energy.



4. Loud speaker converts electrical energy into sound energy.
5. Green plants convert light energy into chemical energy during photosynthesis.
6. When we tune on radio, the chemical energy of the battery used in the radio is changed into electrical energy. This electrical energy then gets converted into sound energy.
7. In hydro power stations, water is collected in a high dam which possesses potential energy. When water flows, the potential energy change into kinetic energy rotating the turbine. The rotating turbine then operates the generator which converts the kinetic energy into electrical energy. i.e.



Conservation of Energy

When energy is transformed from one form to another form, actually no energy is lost in the process. The sum of total forms of energy in the universe remain constant. Therefore, energy can neither be created nor be destroyed however, it can only be changed from one form to another. This is law of conservation of energy (or principle of conservation of energy).

Let a body is placed at rest at a height 'h' from the ground. At certain height, body possesses potential energy.

When the body falls, it possesses both KE and PE. The kinetic energy is due to motion of body and PE is due to height from the ground.

During falling of body PE gradually decreases and KE increases so that sum of total KE and PE at each point of motion remains constant. Here, PE finally converted into KE. When the body hits the ground, the KE gets changed into heat and sound energy.

In this example energy gets converted from one form to another form but it is never lost nor created.

Glossary

accumulated	:	collected
energetic	:	having more amount of energy
frequency	:	number of vibration per seconds
gravity	:	the attractive force of the planets towards their centres
transformation	:	conversion process of energy



A. Choose the best answer from the given alternatives.

- i. Which one of the following has potential energy?
 - a. Wind
 - b. Water stored in a dam
 - c. Flying bird
 - d. Running water
- ii. What is the capacity of doing work called?
 - a. power
 - b. energy
 - c. work
 - d. pressure
- iii. _____ converts kinetic energy into electrical energy.
 - a. Fan
 - b. Radio
 - c. Torch
 - d. Dynamo
- iv. Energy stored in leg ready to kick a ball has _____.
 - a. Kinetic energy
 - b. Potential energy
 - c. Chemical energy
 - d. Nuclear energy
- v. Steam engine converts heat energy into _____.
 - a. heat energy
 - b. mechanical energy
 - c. chemical energy
 - d. light energy

B. Fill in the blanks.

- i. _____ has kinetic energy.
- ii. _____ is the capacity of doing work.
- iii. Compressed spring has _____ energy.
- iv. On heating ice, it changes into _____.
- v. Substances _____ on heating.

C. Differentiate between :

- i. Potential energy and kinetic energy.

D. Name the form of energy stored in each of the following items.

- i. Battery ii. Stretched rubber iii. Petrol iv. Magnet

E. Give the name of instrument/device used to transform the following energy.

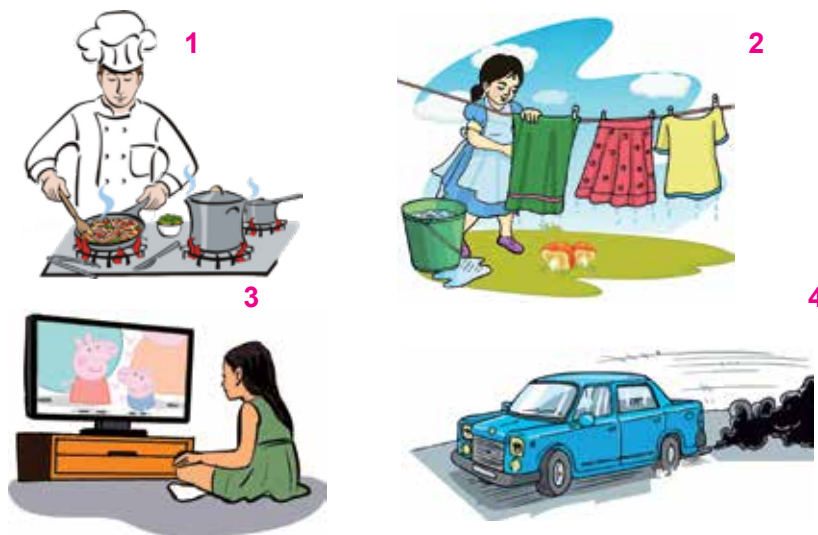
- i. Heat from electricity
ii. Electricity from sun light
iii. Light from electricity
iv. Kinetic energy from electricity

F. Answer these questions.

- i. What are the factors that affect the kinetic energy of a body ?
ii. What do you mean by transformation of energy?
iii. Enlist different forms of energy.
iv. What kind of energy transformation occurs when a bullet is fired from a gun?

G. Diagrammatic questions

- i. Look at the pictures below and label what form of energy is being used.



- ii. Tick the boxes that show a source of heat energy.



7.2 Heat

STUDENT'S LEARNING OUTCOMES

After studying this unit, the students will be able to :

- introduce heat energy.
- prove the fact that the ability of an object to absorb heat depends on its area and its usefulness in daily life.
- prove that the ability of an object to absorb heat depends on its colour and explain the use of this fact in daily life.

Simply, heat is defined as a form of energy that produces the sensation of warmth. We cannot see heat but we can feel it. We can find out whether an object is hot or cold by touching it gently with our fingers.

When we touch a piece of ice, we feel cold. This is because the heat from our body flows into the ice. This is a sensation of coldness due to the flow of heat. Similarly, when we touch a glass of hot tea, the heat from the hot glass flows into our body. This is also the sensation of warmth. In other words, heat can be defined as the form of energy that flows from a body at high temperature to a body at low temperature.

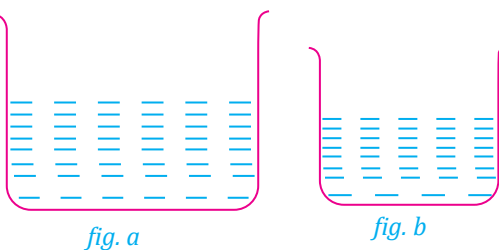
The sun is the main source of heat on the earth's surface. We use sun's heat for various purposes such as seed grain germination, drying our clothes, cooking food through solar cookers.

James Watt invented the steam engine in the 18th century. He succeeded in converting the heat energy into useful work. The steam engine was soon used to pull trains and drive machines in factories. In the steam engine, wood or coal is burnt to boil water and produce steam. This steam produces enough force to drive the engine. Thus, heat energy has the capacity to do different kind of works.

Heat is used to cook food, to keep our body warm, to run factories, to run vehicles and so on. Besides the sun, we get heat from fuel, electricity, friction and combustion of food. Heat produces various effects on different bodies.

Amount of Heat

Molecules in a body vibrate continuously. The sum total of the energy of vibration of all the molecules of the body is called its heat energy, i.e. the amount of heat contained by the body. The average heat energy of these vibrating molecules measures the temperature of the



body. The amount of the heat of a body depends not only on the temperature but also on the number of molecules in it, i.e. on the amount of the material in the body.

Take two beakers, a big one and a small one with half filled boiling water. The water in both the beakers is at the same temperature. As the number of water molecules in the first beaker is larger than the number of molecules in the second beaker, the water in the first beaker has more heat than the water in the second beaker.

The amount of heat energy in a body depends upon the mass of the body, and the nature of material in it that changes in temperature of the body.

Unit of Heat

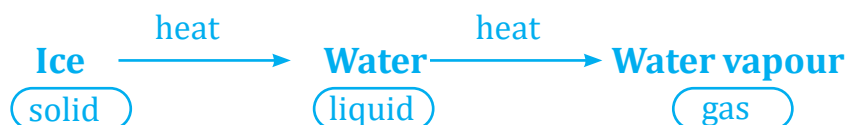
Heat is measured in calorie or joule. The SI unit of heat is joule and CGS unit of heat is calorie. Hence $1 \text{ calorie} = 4.2 \text{ Joules}$.

Effects of Heat

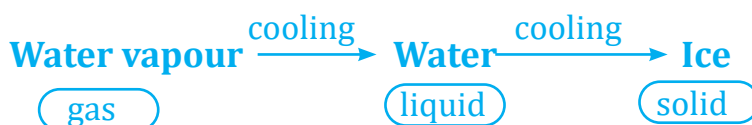
Some effects of heat are listed below.

1. Change in state of matter

Solid, liquid and gas are the three states of matter. When solid is heated, its intermolecular distance increases and changes into liquid. Similarly, on further heating a liquid changes into gas as shown in the following process.



Water vapour can be changed into ice by cooling as in the following process.



Activity 7.3

Take some pieces of ice on plate. Keep the plate within the reach of sun rays. Observe the ice. We can see ice is turning into water on further heating of water. We can observe evaporating water on plate. Why is water evaporated? Because of heat from the sun, water(liquid) changes into vapour. Hence, we can observe change in states of matter.

2. Expansion of matter

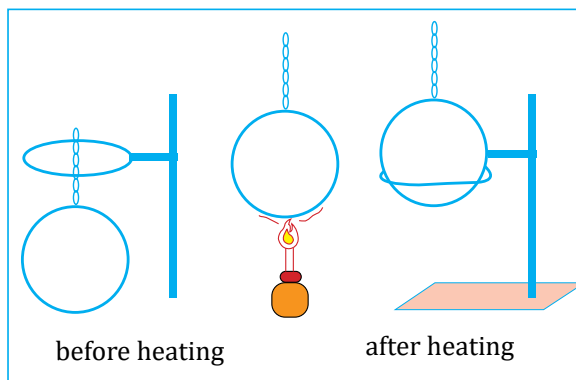


Activity 7.4

Matter expands on heating.

a. Expansion of solid

Take an iron ball and pass it through the iron ring. It passes through the ring easily before heating. Now, heat the iron ball with the help of spirit lamp for few minutes and pass the ball through ring. The ball does not pass through the ring. After heating the ball, it expands and increases the size.



b. Expansion of liquid

Liquid doesn't have definite shape. It takes the shape of a container. Expansion of liquid is much greater than that of solid.



Activity 7.5

Take a round bottom flask and fill it with water. From the middle of the cork, insert a glass tube and fit it in a mouth of round bottom flask. Mark the level of water in glass tube. Cork should be made air tight. Keep the round bottom flask on the tripod stand and supply heat for 15 minutes. We can observe the level of liquid rising in the glass tube because liquid expands on heating.

c. Expansion of gases

Expansion of gas is more than the expansion of solid and liquid.

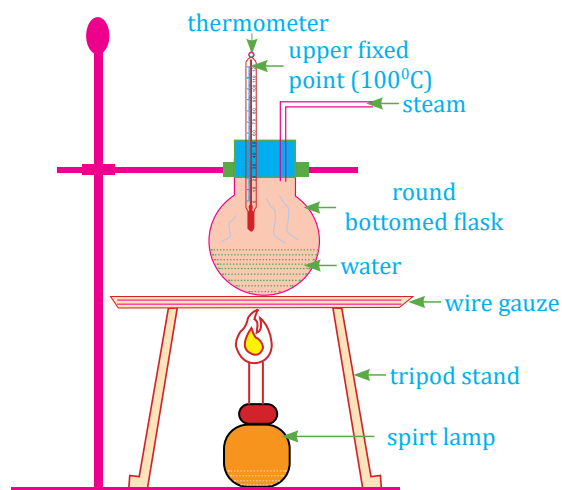


fig. expansion of liquid



Activity 7.6

Take a flask and close its mouth with a long narrow tube fitted with a cork. Invert the flask on a beaker of water in such a way that the open end of the narrow tube dips into the water as shown. Now, heat the flask with the candle flame. What will happen? Study carefully.

The air bubbles will come out of the tube. This shows that the air in the flask expands on heating. Therefore, bubbles come out of the water.

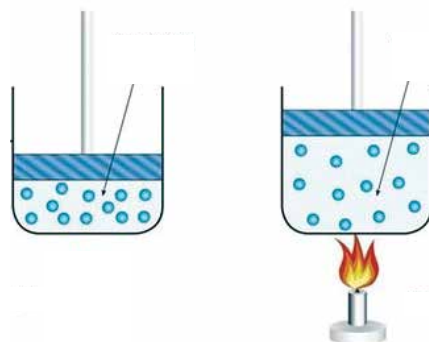


fig. expansion of gas

Absorption of Heat

When objects reach near the source of heat such as sun, fire, heater, etc. they absorb heat.

Capacity of object to absorb heat

Different objects have different nature. The amount of heat absorbed by the body depends on several factors. The amount of heat absorbed by the substance depends on the following factors:

- Nature of the substance
- Colour of the substance
- Surface area of the substance

Nature of the substance

The absorption of heat also depends upon the nature of substance. Heat enters the objects making them warm so that their temperature increases. Conversely, when objects are allowed to cool, they lose heat energy to the surroundings and the temperature falls down. Different objects absorb heat at different rates. Some objects are good absorbers of heat while others are very poor absorbers. Generally, the rate of absorption of heat depends on the nature of the object. For example, sand absorbs heat faster than water.

For example, sand absorbs heat faster and its temperature increases faster than water. To prove this, take 100 gm. sand and 100ml. water and keep in a petridish each. Put both petridishes in the sunlight for some time then touch the sand and the water with finger one by one. What do you feel? Discuss with your friend in the classroom after discussion, you will come to the conclusion, that sand absorbs heat faster than water due to their different nature.

Colour of the substance

Black or dark coloured objects absorb heat faster than the light coloured objects. Due to these reasons, we wear black or dark coloured clothes in winter. This is because black coloured clothes absorb more heat from the sun and keep us warm. On the other hand, we wear white or light coloured clothes in summer. This is because the white coloured clothes reflect most of the heat from the sun and absorb only a little heat.

Surface area of the substance

The amount of heat absorbed by substance depends upon the surface area of the substance. Larger the surface area of the object, more heat it can absorb. For example, we spread our wet clothes while drying because spreading wet clothes increases their surface area. Hence the wet clothes can absorb more heat and become dry quickly. Conversely, larger the surface area of the body, more is the amount of heat loss. Hence animals curl their body in winter to prevent loss of heat.



Activity 7.7

Take four pieces of clothes, i.e. red, black, white and blue. Take thermometer and insert it into each piece of clothes (bulb should be kept inside the each clothes). Now, take these clothes outside where heat reaches to each piece. Place these clothes at wooden plate. Note the reading of each thermometers at an interval of 5 minutes. In the similar way, note increase in temperature and fill the table.

Clothes	1 st temp	2 nd temp	3 rd temp	4 th temp	5 th temp

Observation

Note down which coloured clothes temperature increases the most? Here, we observe increase in temperature of black colour is the highest and the lowest in white colour because white colour reflects the most and black colour absorbs the most energy.

Conclusion

Black colour absorbs heat faster than any other colour. White colour has low absorption capacity.

Uses of Heat

Some of the uses of heat are given below.

1. **To cook food:** We require heat to cook food. Without heat, cooking is not possible. Heat for cooking can be obtained by burning wood, kerosene, oil, coal, gas, etc. All the germs which are in food are destroyed after cooking it properly.

2. **To keep our body warm :** Heat is produced inside our body by the combustion of food. In winter, we feel cold because environment absorbs large amount of heat from our body. To maintain body temperature, external heat is to be supplied with electric heater or sun.
3. **Plant survival:** Plant needs water and sunlight to grow. Green house allows farmers to grow plants or foods earlier or later than the growing season by trapping heat and producing a more ideal climate for plant survival.
4. **To run factories:** Heat is the most essential element to run factories. Heat energy for running factories is obtained by burning wood, coal, etc.
5. **For water purification:** Water contains several micro-organisms which may be harmful for our health. In order to eliminate these organisms and purify water, it should be heated by supplying adequate amount of heat.
6. **To dry clothes :** In order to dry wet clothes, we need heat. Wet clothes absorb heat from sunlight which vapourises water. Thus, clothes get dried.
7. **To dry cereals, lentils, meat, fish :** Dry food materials are to be safe from fungi and other insects. Before storing these food materials, it is essential to make them dry. For this purpose heat is necessary.

Project work

Take a medium – sized empty bottle and fit a balloon to its mouth. Place the bottle in the vessel containing hot water for sometime. What will you find? What is its reason?



GLOSSARY

mines	:	deep holes under the ground where minerals are dug
pollution	:	an unwanted change in the natural environment brought about by human activities
artificial satellite	:	a man made heavenly mass which revolves around a planet
sensation	:	the ability to feel through the sense of touch
renewable source	:	a source which can be used repeatedly and replaced naturally

 Exercise**A. Choose the best answer from the given alternatives.**

- i. Which one is SI unit of heat?
 - a. J
 - b. N
 - c. Pa
 - d. K
- ii. The main source of heat is
 - a. coal
 - b. kerosene
 - c. sun
 - d. wood
- iii. Which of the following colour absorbs more heat?
 - a. red
 - b. black
 - c. blue
 - d. white
- iv. Which of the following purposes doesn't require heat?
 - a. cooking food
 - b. running vehicle
 - c. drying cloth
 - d. running windmill.
- v. Which of the following state of matter undergoes maximum expansion?
 - a. solid
 - b. liquid
 - c. gas
 - d. none of the above

B. Fill in the blanks.

- i. Heat is a form of _____.
- ii. The sun is the main source of _____.
- iii. Wood, coal, kerosene, etc. are called _____.
- iv. _____ increases the temperature of a body.
- v. On heating, water changes in to _____.
- vi. _____ expands more than solid and _____ expand most when heated.

C. Answer these questions.

- i. What is heat? Write the major sources of heat.
- ii. Why does black body absorb more heat than white body?
- iii. What happens when water is heated?
- iv. What are the uses of heat?
- v. Why do we wear black cloth as in winter and white in summer. Give a specific reason ?
- vi. Wet clothes dry faster in the sunlight. Why ?

- vii. Describe with an experiment to show that solid expands on heating.
- viii. Why is the sun considered as the major source of heat?
- ix. Which device converts electrical energy into heat energy?

D. Diagrammatic questions.

- i. Identify the method of heat transfer that takes place in each illustration. Write the method of heat transfer underneath the picture.



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7.3 Light

STUDENT'S LEARNING OUTCOMES

After studying this unit, the students will be able to :

- demonstrate the process of moving light in a straight line.
- define light ray and beam and present it in the picture.
- make a pinhole camera and describe the working principle.
- explain and demonstrate the formation of shadow.
- show and explain the change in the length and direction of the shadow by experiment.
- construct and explain the concept of Sundial.

Light is a form of energy. Like water and air, light is also an essential energy to sustain the life of human beings, animals and plants. The main source of light on earth is the sun. The speed of light is 3×10^8 m/s. It takes 8 minutes 20 seconds for the sun light to reach on the earth surface. There is nothing in the universe that can travel as fast as light.

We cannot see anything in the absence of light. But as soon as we lit a candle or lamp, the things around us become visible. So, we can say that light is an agent which enables us to see things around us. In order to see an object, light from the object must reach to our eyes. Light itself is not visible but it makes things visible. Light is a form of energy, which gives sensation of sight.

Sources of Light

The universe is filled with objects that emits light. Light is a form of energy and like all other energy, it is produced from a source. The bodies or substances which emit light are called the sources of light. The sources of light are categorized into two types is : Natural and Artificial sources.

Natural Sources

Some natural sources of light are sun, star, moon, fireflies, etc.



Sun

The sun is the major source of light and emits light itself in the form energy. Solar panel uses sunlight to produce electricity. It is the most important source of light in the earth. The light travels through the space at the speed of 3×10^8 m/s (300000 km/s).

In the absence of sun light, night occurs. At this time, it becomes dark and visibility is reduced.



Artificial Sources

Artificial sources are actually man made light sources such as lamp, candle, electricity, torch light, electric bulb etc.



i. Electricity

Electricity is also a man made source, which is produced by wind, water, etc. Electricity is used to light a bulb, florescent lamps. Electricity in other words is the most widely used artificial source of light other than sun. In the absence of sun light, electricity is the major source. In cities, electricity is used to make streets, homes, brighter at night.



ii. Lamp

Candle, lantern, etc. are also sources of light. Lamp is a man made source. There are other lamps in which kerosene is used like lantern, tuki, etc. Lamps are used in the places where there is unavailability of electricity. Lamps are generally used in remote areas.

i. burning candle



ii. burning lamp



iii. torch light



On the basis of source of light, there are two type of objects viz: luminous and non-luminous objects.

i. Luminous

Any objects which have their own source of light are called luminous objects. e.g. sun, electricity, fire, star, firefly, etc. Heat energy is also formed along with light in luminous objects.

ii. Non-luminous objects

All the objects which do not produce light are called non-luminous objects. Mostly, all the things around us are non-luminous objects. Examples are table, chair, pen, trees, blackboard, etc . They do not have their own source of light. Hence, they are non-luminous objects. Moon is also non-luminous object because it does not have its own source of light. It reflects the light coming from the sun.

There are different types of non-luminous objects, which are described in the following sub-sections.

a. Transparent Object

Any object through which light can easily pass is called transparent object such as air, water, glass, clear plastic, cell phone, papers, etc. We can take an example of sunlight coming to the earth surface through the atmosphere covered with air travelling hundred of kilometers. These transparent substances do not form a shadow.

b. Translucent object

Any object through which only a part of light can pass through it is called translucent object. Tracing paper, polythene bags, etc. are the examples of translucent objects. Only a part of light can pass through such objects so that when we see other objects from translucent objects, they cannot be clearly seen. The shadow of translucent objects are dim.

Look at the burning candle through a tracing paper. Although, you will see some of the light coming from the other side of the paper, but you can't see the candle clearly. This shows tracing paper allows only some of the light to pass through it.

c. Opaque object

Object through which the light cannot pass is called opaque object. Walls, tables, books, cardboard, etc. are opaque objects. Keep a piece of cardboard in front of you. Burn a candle on the other side of the cardboard. Can you see candle? You cannot see the candle. Therefore, cardboard acts as an opaque object.



Activity 7.8

- i. Collect the objects like: mirror, piece of glass, piece of ground glass, a piece of tracing paper, transparent paper, etc. Now place each object on the sunlight (rays of sun). Does it form a shadow or not? Write down object through which sunlight can pass. And again put those objects in front of your eyes and see whether you can view other objects or not. How was your experiment and result? Write down in the following table.

Name of object	Light passes/slightly passes/not passed	Shadow/No shadow	Transparent/ Translucent/Opaque
1. stone	do not pass	not seen	opaque
2.			

- ii. Collect different objects such as mirror, bangle, printed bangle, tracing paper, oil coated paper, etc. Place each of them in the rays of sun and observe whether a shadow is formed or not. Note those objects through which light passes and other objects are seen. From the experiment, write down the results in the following table:

Name of object	Light passes/slightly passes/not passed	Shadow/No shadow	Transparent/ Translucent/Opaque
1. stone	do not pass	not-seen	opaque
2.			
3.			

Propagation of Light

Light can travel from one place to another. This process is called propagation or transmission of light. The light from the sun comes in the same way. It does not need any material medium to pass from one place to another. It travels in a straight path.

Rectilinear propagation of light



Activity 7.9

Take a straight rubber pipe of about 1 metre length. Light a candle and place it at one end of the pipe and look through the other end as shown in figure. Can you see the candle?



Now take a bending pipe and follow the above process. Can you see the candle? Why?

Obviously; you can see the candle through straight pipe because light can travel in a straight line and candle can be seen. And you cannot see the candle through bending pipe because light cannot pass through curved path.

Light rays travel in a straight line, this property of light is called rectilinear propagation of light.

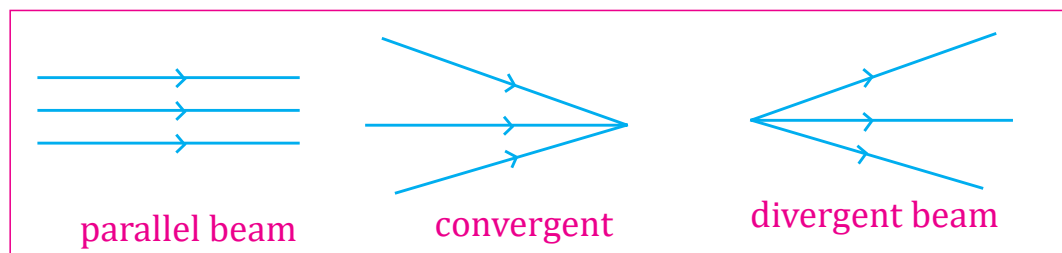
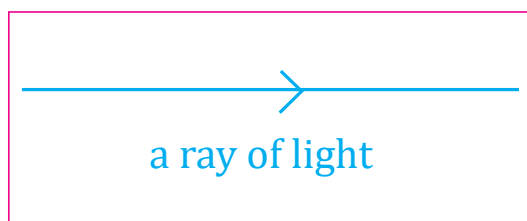
Ray and Beam of Light

When sunlight enters through the window, if there is smoke or dust particles in the room, you can see them through the sunlight in straight path. Hence, this proves that light travels only in the straight path.

We have already learnt that light travels in a straight line. The path of light is represented by single or many lines. An arrow is also given on the line that indicates the direction of light.

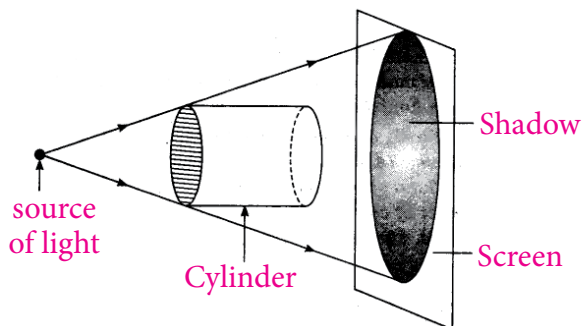
A very narrow path of light represented by a straight line is called a ray of light.

A bundle of rays that is represented by a number of lines is called a beam of light. Beam of light may be parallel, convergent or divergent as shown bellow.



Shadow

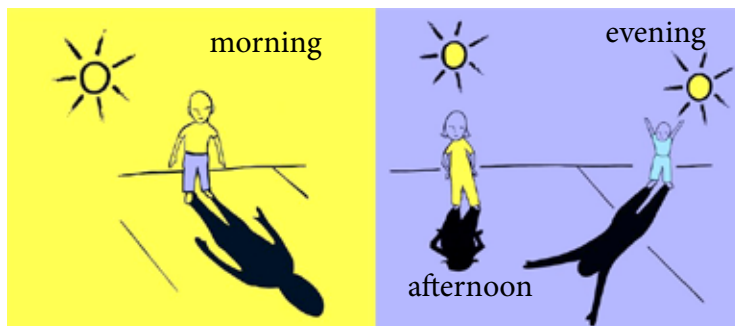
Shadow is formed because of the rectilinear propagation of light. When an opaque body is placed against the path of light, light is blocked completely and the space behind the body does not receive any light from the source of light. Such space behind the opaque body, where the light is wholly or partially cut off, it is called a shadow.



The shadow of an opaque body is dark but a translucent body casts a faint shadow. A transparent body casts no shadow at all.

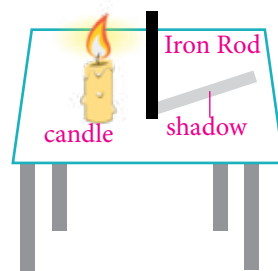
Length of a shadow

The length of a shadow can change. It depends upon the position of the source of light. When the position of the source of light changes, the length of a shadow also changes. For example, the shadow of a pole is longer in the morning and evening but shorter at noon.



Activity 7.10

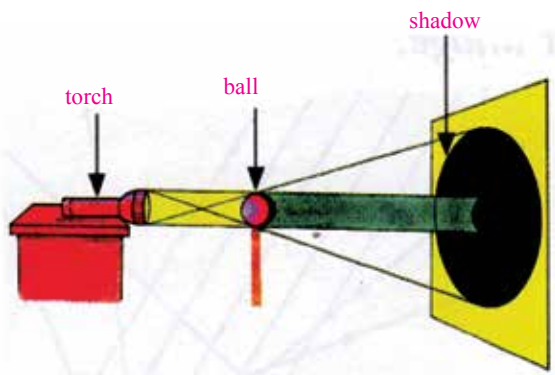
Place a tall opaque object on a table in a room. Make the room dark. Now lit a candle near the object. Do you see the shadow of the object? Observe the length of the shadow. Now slowly move the candle around the object. What do you see? Does the length of the shadow remain same? Draw the conclusion from your observation and discuss with your friends.



Types of shadow

Observe your shadow in ground in sunny day. How is it formed? Think about it.

When an opaque object is placed, it bends the light sources and screen, the dark portion formed in the screen is called shadow. There are two types of shadow umbra and penumbra. To form the shadow, sources of light, opaque objects and screen are required.



The completely dark portion of the shadow is called umbra and partial dark portion of the shadow is called penumbra.



Activity 7.11

Place cardboard at one corner of a table and torch light at another corner of the table. Place a ball between them. Try to form the shadow on the cardboard with the help of torch light. Two parts of shadow are formed. In the middle called umbra and around it there will be a partly dark shadow called penumbra.

Pinhole Camera

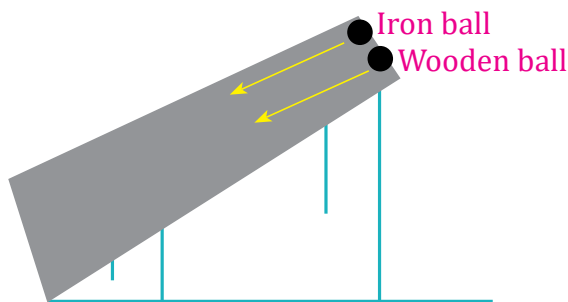
A pin hole camera is a toy camera without a lens and with a single small aperture (hole) at one place. It consists of an elective light proof box with a small hole at one side. While light from an object passes through the hole, it projects an inverted image on the screen of the pinhole camera.

Principle of pinhole camera : Light rays from an object pass through a small hole to form a real, small and inverted image.



Activity 7.12

Take a small rectangular cardboard or a tin box with one end covered and the other open. Fix a tracing paper or a wax paper at the open end of the box by using a tape or rubber band. This end now forms your screen. Make a small hole at the centre of the closed end. This hole allows light to enter into the box. Now, your pinhole camera is constructed. Point the hole towards an object like a tree, a tall building. Observe the image on the tracing paper screen of your pinhole camera. Also point the hole towards a lighted candle.



What do you see? You will see the inverted image of the object on the screen. A light ray from the top of an object 'x' passes through the hole and strikes on the screen at 'x'. Similarly, a ray from the bottom of the object 'Y' strikes on 'Y'. Thus, you can see the inverted image 'X¹Y¹' of the object. The light rays travel along a straight line. Therefore, the image produced is inverted.

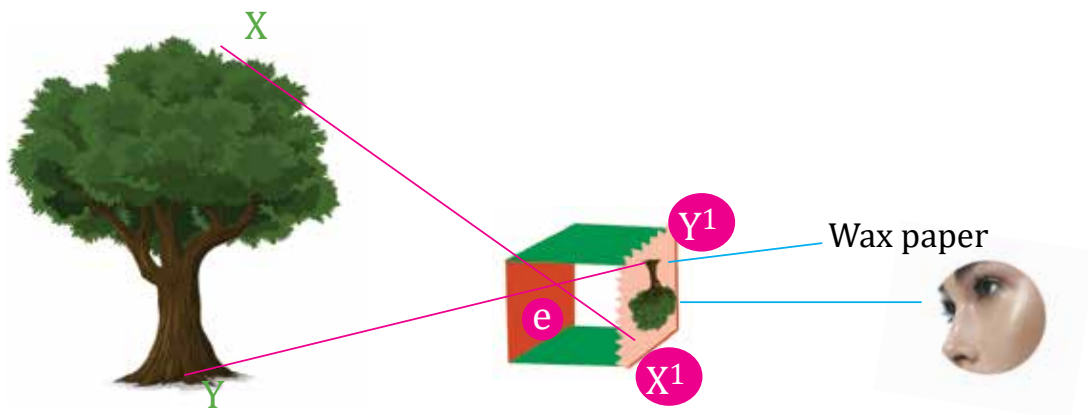


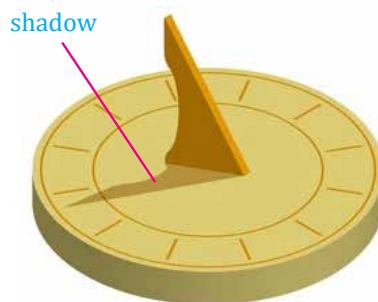
fig. Pinhole Camera

If we replace the tracing paper screen by a photographic plate, we will have a photograph of the object placed in front of the hole. Hence, it is called pinhole camera.

Sundial

Do you Know, before the invention of clock, which device or method was used to know the time?

The length and the direction of the shadow of a specific object was used to determine time. That device was used to keep in open place where the sunlight appears throughout the day. This device is called sundial.



Sundial

Project work

1. Make a list of five transparent, translucent and opaque objects.
2. Place a cup on a table and focus light on it using torchlight through different positions and identify the shadows formed and draw their shapes.

A. Choose the best answer from the given alternatives.

- i. Which of the following is a non- luminous object?
 - a. fireflies
 - b. electric bulb
 - c. moon
 - d. star
- ii. Which one of the following objects is opaque ?
 - a. polythene bag
 - b. cardboard
 - c. tracing paper
 - d. water
- iii. In which direction light travels?
 - a. straight
 - b. slanted
 - c. curved
 - d. sprial
- iv. Which is not the source of light?
 - a. sun
 - b. star
 - c. mirror
 - d. fireflies
- v. The time taken by the sunlight to reach the earth is
 - a. 8 minutes 5 seconds
 - b. 8 minutes 15 seconds
 - c. 8 minutes 22 seconds
 - d. 8 minutes 20 seconds

B. Fill in the blanks.

- i. The main source of light is the _____.
- ii. The objects which produce light are _____ bodies.
- iii. _____ is a form of energy which gives the sensation of vision.
- iv. _____ object forms a shadow.
- v. The material through which light passes completely is _____.
- vi. The velocity of light in vacuum is _____.

C. Answer these questions.

- i. What do you mean by the sources of light? Name any three sources of light.
- ii. Write down the differences between non-luminous body and luminous body.
- iii. Define transparent, translucent and opaque objects with examples.
- iv. How is the image formed in pinhole camera? Describe with diagram.
- v. What is rectilinear propagation of light?
- vi. How can we see light travels in a straight line?

- vii. Why cannot a transparent object form a shadow?
- viii. How can you verify light travels in a straight line?
- ix. Name any five artificial sources of light.
- x. Name any five natural sources of light.
- xi. Why does sea look blue in colour?
- xii. Name the different colours of the rainbow.

D. Write the differences between:

- a. luminous and non- luminous bodies
- b. natural and artificial sources of light
- c. ray and beam of light
- d. transparent and opaque bodies

E. Draw the following diagrams.

- a. two natural sources of light
- b. two artificial sources of light
- c. two luminous bodies
- d. two non luminous bodies

F. Give reason.

- a. Glass is a transparent object.
- b. The sun is a luminous object.
- c. The moon is a non - luminous body.
- d. Shadow is formed by opaque object.

G. Diagrammatic gestions.

Put a check mark ✓ by the thing that reflect light.

☐

bear

☐

mirror

☐

glass

☐

laptop

☐

tree

7.4 Sound

STUDENT'S LEARNING OUTCOMES

After studying this unit, the students will be able to :

- demonstrate the practical activities of wave origin.
- demonstrate the fact that sound is produced by the vibration of an object.
- explain that material medium is needed to transmit sound.
- demonstrate that sound is transmitted to all solids, liquids and gases and to explain its daily use.

We hear various types of sound every day, every time at any place and any where. We hear sound while talking, teaching, listening music and also from animals and birds. Some sounds are pleasant to hear while others are very irritating.

Sound is a form of energy which gives sensation to hearing. Sound is produced by the vibration of objects. Sound near the vibrating objects are the strongest. Therefore, if we go closer to the source of sound, it gets louder and vice-versa. Unwanted and irritating sounds are called noise which causes noise pollution.

Sources of Sound

When a bell is struck with a hammer, a sound is heard. If we touch the bell, a vibration is felt.

If we pluck a guitar string, it can be seen rapidly moving back and forth producing a sound. Such back and forth movement of an object is called vibration. When we speak, our vocal cords vibrate. Thus, the vibrating bodies that produce sound are sources of sound. Sound is a type of energy produced by the vibration of the particles of body. It produces a sensation of hearing in the ears. Sound is produced by different sources such as our vocal cords, guitar, madal, dholak, sitar, bell, thunders, drum, etc. Look at these pictures.



fig. guitar



fig. madal



Activity 7.12

Place finger below chin on throat and produce sound. What do you feel? Did you feel the vibration on finger? There is vibration when sound is produced. Thus, we can say vibration of an object produces sound.



Activity 7.13

Put a steel glass and steel bowl on the table. Hit with the pen on the edge of glass. As the sound is produced, then catch the glass with hand while sound is coming. What do you feel?. Sound is stopped to produce after you catch the glass with hand, why?

Similarly, ring the school bell. Sound is produced due to vibrating bell. After the vibration stops, sound also stops. Any object that vibrates is the source of sound.

Can you say how is the sound produced under following actions?

- | | |
|-------------------|-----------------|
| a. playing guitar | b. playing drum |
| c. playing madal | d. ringing bell |

What kind of instruments are found in your locality? How sound is produced from them? Discuss with friends and note down any five instruments.

Tuning Fork

A tuning fork is used as a source of sound in a laboratory. Tuning fork is made of steel and its shape is as shown in figure.

The 'U' shaped part has two arms, are called prongs; whereas the lower handle is called the stem. If prongs are stuck against a rubber pad, it gets vibrated and sound is produced.

Propagation of Sound

If a body vibrates, it makes the adjacent air molecules vibrate. These molecules in turn transfer their vibrations to other molecules and so on. When these vibration reach our ears, we hear the sound. The phenomenon due to which sound travels from one place to another is called as propagation of sound. The speed of sound in air is 332m/s and in water is 1450-1500m/s.

Medium

There needs to be any matter that acts as a medium to travel sound. Without medium the sound cannot travel. Sound needs medium such as solid, liquid and gas. Sound travels faster in solid than that of liquid and gas. In gas, the sound travels slower than in other media.

i. Gas

Air is the mixture of different gases. Air mainly consists of nitrogen and oxygen. Air also contains some amount of carbon dioxide and other gases. Our surrounding comprises of different gases. Sound which are produced from any sources are transmitted through air. Sound cannot be transmitted in the absence of air. There is no air in moon so that sound cannot be transmitted like on the earth.

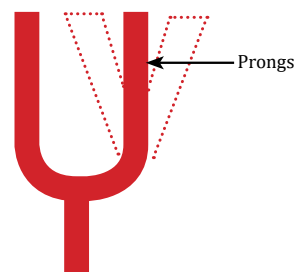


fig. tuning fork

ii. Liquid

Like gas, sounds are transmitted through liquid. Place a bell inside water and strike it with a hammer. The bell should not touch the walls of the bucket. We may hear very weak sound. Now, touch the bell with the walls of the bucket and ring the bell. We can hear louder sound. Whale, dolphin and like other water animals which produces sound are transmitted through water.

iii. Solid

Sound is also transmitted through solid substance. The following activity proves that sound is transmitted in solid substance.



Activity 7.14

(This activity is especially for the teacher)

For this activity, you need two students. Keep one student at one side of desk and another at the other side. Ask one student to keep his/her ear close to the desk and another to strike the desk with pencil. Ask the first student to stand and second student to strike the desk. Note the sound from both activities. This shows that the sound can be heard faster when the student put his/her ear close to the desk than standing. This shows the sound travels faster in solid than in gas.

Propagation (Transmission) of Sound Wave

Sound is produced by a vibrating body and it can travel in all directions from the source. Sound wave requires a material medium (solid, liquid or gas) for its transmission. The waves coming from a vibrating body propagates through air and reaches to our ears. As a result, we are able to hear the sound.

The distance travelled by a sound wave in unit time is called its speed. Its SI unit is m/s. The speed of sound is different in different media.

The speed of sound in air is about 332 m/s. Similarly, speed of sound in water is about 1500m/s. Whereas, the speed of sound in glass is about 5500m/s.

Sound waves travel faster in solid than in liquid or gases. It is because of compactness of molecules in solids is more than in liquids and gases.

Note: Sound wave cannot travel in the absence of material medium (e.g. air). As there is no air on the surface of the moon. Therefore, sound cannot transmit (or propagate) on the surface of the moon unlike on the surface of the earth.

We can hear sound with our ears. Have you seen a hanging bell in the temple? When a person rings the bell at the temple, we can hear the sound of the bell even outside the temple. Sound travels in all direction in the form of longitudinal wave.

The process of travelling of sound from the source to reach our ear is called propagation of sound.

Sound requires material medium to travel. So, sound wave travels through liquid, solid and gas medium. When sound wave travels in a medium, the molecules of the medium execute longitudinal wave motion, It means they move back and forth along the direction in which the wave is travelling. So, sound wave travels in medium in the form of compression and rarefaction. The propagation of sound wave depends upon density, temperature and humidity of the material medium.

Speed of sound through different Media

Sound needs material medium for its propagation. But its speed is different in various media. In solid, molecules of substance are closely packed. The vibration of one molecule immediately transmits to nearby molecules. So, waves transmit very fast in solid medium. So, speed of sound in solid is high. The molecules of liquid is loosely packed than in solid. So, it takes some time to transmit vibration from one molecule to another molecules in liquid. Thus, speed of sound is less in liquid than in solid. Similarly, in case of gas medium, gas molecules are very far apart than liquid. Thus, the speed of sound is least in air.

Speed of sound in solid



Activity 7.15

Take empty can and a long thick thread of about 20 metre. Make a hole at the bottom of each can, pass the thread through this hole and make a knot at each end. Now, you will find each end of the thread is attached to the bottom of two cans. Hold a can and tell your one friend to hold the another can and walk from each other to keep the thread completely stretched.

One keep it near ear and the next one keep it near to mouth and speak. Do you hear sound or not?



Activity 7.16

Keep your one ear pressed down on the surface of the table and close the other ear with finger. Tell your friend to knock gently at the edge of the table. Did you hear a sound ?

Propagation of sound in liquid



Activity 7.17

Take a plastic bottle and fill it with water. Press the bottom of the bottle to your ear. Scratch lightly on the side of the bottle. Do you hear sound ?

You will hear the scratching sound coming through the water.



Activity 7.18

Fill a bucket with water. Take two stones and strike against each other inside the water. Do you hear the sound of striking ?

You will clearly hear the sound of the striking stones.

Propagation of sound in gas medium

Sound wave travels in all directions in gas medium. When these waves come in our ear, and then we hear sound. As compared to solid and liquid, speed of sound in gas is very low. In air, speed of sound is 332 m/s.

In this way sound waves need solid, liquid or gas medium for their propagation. In vacuum sound can't travel.



GLOSSARY

- vibration** : to and fro motion of a body
- gurgling** : making a sound by the flow of water through a narrow space
- chirping** : a short high sound formed by birds and insects
- violently** : with great energy or strong movement
- stretch** : to pull something so that it becomes long
- projected** : something that sticks out from a surface
- adjacent** : next to or near something
- frequency** : the number of vibrating particles over a specified time

 Exercise**A. Choose the best answer from the given alternatives.**

- i. What is required to produce sound from objects?
 - a. vibration
 - b. solid object
 - c. medium
 - d. gas
- ii. What does sound need to travel?
 - a. vacuum
 - b. electric wire
 - c. liquid medium
 - d. none of the above
- iii. In which medium, sound travels fastest?
 - a. solid
 - b. liquid
 - c. gas
 - d. vacuum
- v. What is the shrillness or flatness of sound called?
 - a. pitch
 - b. wave
 - c. frequency
 - d. amplitude

B. Fill in the blanks.

- i. Sound is produced from _____ bodies.
- ii. Playing flute produces _____.
- iii. Sound produced from metal is _____.
- iv. Sound travels in the form of _____.
- v. Sound needs _____ to travel from one place to another.
- vi. Sound travels in air at the speed of _____.

C. Answer these questions.

- i. What is sound? Write any four sources of sound.
- ii. What is the difference between sound of male and female?
- iii. What should we do to increase the pitch of sound of the guitar? Give two reasons.
- iv. Draw the figure of wave produced in water.
- v. Why does the sound decrease while the distance is increased? Explain.
- vi. How sound is produced?
- vii. What do you understand by the transmission of sound?
- viii. In which medium does the sound travel faster and why?
- ix. Define pitch of sound.

- x. What is propagation of sound?
- xi. What do you understand by tuning fork?

D. Differentiate between:

- a. Water wave and sound wave.

E. Give reasons.

- a. Sound produced by different bodies differ.
- b. Sound is not heard in the moon.
- c. Tuning fork is a source of sound.

F. Diagrammatic questions.

- i. Tick in the right column.

Name of musical instruments	Reason of producing sound		
	By colliding	By vibrating	By rubbing
 Violin			
 Ravan-haththo			
 Madal			
 Maracas			

Unit 8

Electricity and Magnetism

STUDENT'S LEARNING OUTCOMES

After studying this unit, the students will be able to :

- explain the magnetic field.
- identify the magnetic field of the bar magnet with the help of iron dust and to identify the area where the magnetism is maximum.
- make a magnet by stroking method.
- make a magnet using electricity.
- To demonstrate the method of increasing the magnetism of an electromagnet (increasing the number of coils and the amount of electricity).
- To explain the usefulness of electromagnet in daily life.

8.1 Magnet

The substances which are made of iron are attracted by magnet in the form of magnetic force. Magnet is an essential object. Small pieces of iron dust can be easily collected with the help of magnet. But, magnet doesn't attract materials like book, wood, copper, brass, plastic, rubber, etc. Magnets are widely used now a days. They are used in radios, telephone, speaker, transistor, etc. Without magnet, these devices can't be operated. To produce electricity from generator magnet is used.

Originated -nearly 2000 years ago, a man of Magnesia accidentally found a type of stone which could attract iron. Magnesia was a city in ancient Asia Minor. The stone was named as "Magnesia" after the place was discovered. It was also found out that when the stone was suspended freely with a fine thread, that showed north-south direction. Thus, they gave a name 'leading stone', which is also identified as "load stone".

Every magnet has its own magnetic force due to which it can attract iron pieces. There are two types of magnet that are discussed below.



i. Artificial magnet :

The magnet, which can be made from magnetic substances are of this kind. Examples are bar magnet, U-shaped magnet, horse-shoe magnet.

ii. Natural magnet :

The magnet which is obtained from the nature is natural magnet. Loadstone is of this kind.

Magnetic and Non-magnetic Substances

Every object cannot be attracted by magnet. There are some objects which feel the effect of magnet while the others cannot have those magnetic effects. The objects that can be attracted by a magnet are known as magnetic substances. For example, iron, nickel and cobalt can be attracted by magnet. Hence, these metals are magnetic substances. Magnetic substances can be magnetized to form a magnet by different techniques. Those substances which cannot be attracted by magnet are known as non-magnetic substances. For example, gold, silver, copper, wood, air, plastic, rubber, etc. cannot be attracted by magnet. So, they fall under non-magnetic category.

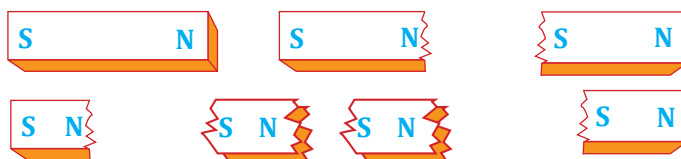


Activity 8.1

To identify whether an object or a substance is magnetic substance or not we need a magnet itself. Place the object under test on a wooden table and bring a pole of magnet near the object. If the magnet attracts the object, the object is a magnetic substance. If there is no attraction between the magnet and the object under test of the object is a non-magnetic substance.

Magnetic Poles

A magnet has two poles irrespective of its dimension. They are north pole and south pole. The poles in magnet can never be separated. No matter how many smaller pieces are made from a large magnet, each piece will have individual north and south pole. Magnetic energy is concentrated on the magnetic poles. The force of attraction or repulsion is maximum on the poles. As shown in activity 2, the ends of the magnet have more force of attraction and the force of attraction gradually decreases towards the middle. However, the magnetic poles are not located exactly at the sharp end points of a magnet. They are located a little bit inside the end points.



The length of a magnet from one end to another end is called 'the length of a magnet' or 'magnetic length'. The length between the poles of a magnet is called the "effective magnetic length".



Activity 8.2

Fix a white sheet of paper on a table with the help of fixing pins. Place a bar magnet at the centre of paper sheet and mark its outline with the help of a pencil. Take a compass needle and place it near the magnet. Observe the deflection of the needle. Move the compass needle a bit from the magnet. Again observe the deflection in the needle.

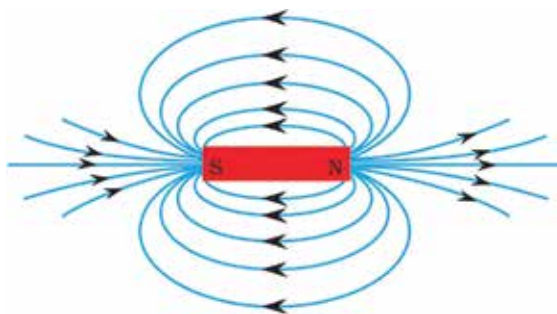
Now, move the compass needle further away from the magnet and go on observing the effect of the magnet on the needle. When you find a position of the needle where there is no effect on the needle, mark a dot with a pencil. Now, place the compass needle at the other end of the magnet and repeat the above process to find a position of the middle and mark another dot.

Find many other positions repeating the above process and mark a dot on each position. Join each dot line with a pencil. This line obtained is the magnetic line of force.

Magnetic Field

It is an area around a magnet up to where it can attract any other magnetic substances. The magnetic fields are represented by magnetic lines of force. The magnetic lines of force has the following properties.

- Magnetic lines of force are the continuous closed curves.
- They start from the north pole and end to the south pole of a magnet.
- These lines never intersect with each other.





Activity 8.3

To show the magnetic field of a magnet, we need various things and the procedures to be followed.

Material required

Some thick paper, a drawing board, some iron fillings and a bar magnet

Procedures

1. Keep a bar magnet in the middle of drawing board.
2. Place a thick paper over the bar magnet which is placed facing N-S direction.
3. Scatter iron filings over the paper carefully.
4. Now, hit the paper gently and study the arrangement of iron fillings. The arrangement of the particles shows the magnetic field of the magnet.

Magnetic field is defined as the space around a magnet up to which it can show its effects of attraction or repulsion of a magnet or magnetic substances. Magnetic field is represented by lines of force.



Activity 8.4

To show the magnetic field of magnet

Required material : A bar magnet, iron fillings, a chart paper, a drawing board.

Procedure

- Place a piece of chart paper over a bar magnet as shown in the figure.
- Scatter the iron filling over the paper.
- Now, shake the paper gently and observe the arrangement of iron fillings on the paper.

Observation

The arrangement of iron fillings will show the magnetic field of the magnet.

Magnetic Compass

A magnetic compass is an instrument designed for the measurement of directions with reference to the magnetic meridian. It has a magnetic needle that can rotate freely on pivot at the centre of a round box. It is used by navigators, miners and sailors to find out the direction.



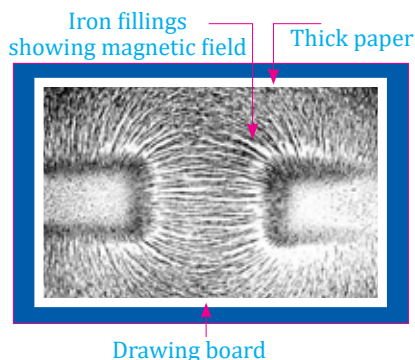
Methods to make magnet

There are many methods of making magnets. Only magnetic substance can be made into magnet. Non-magnetic substance can't be made into magnet. Among magnetic substances, iron and steel are used to make magnet. The methods to make magnets are as follow:

- i. rubbing method
- ii. electrical method

i. Rubbing Method

Rubbing method consists of single touch method and double touch method.



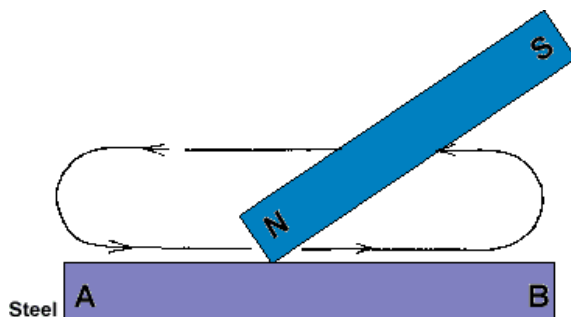
Single touch method



Activity 8.5

Place an iron bar or a nail on a table. Take a bar magnet and keep its one pole (south) at one end of the nail (say A) as shown in fig. Rub the magnet along the nail to the other end (say B) of the bar.

At the other end B, lift the magnet and again place on the first end A, as shown by the arrow path in the figure.

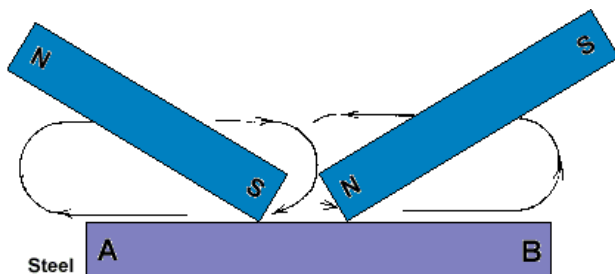


Repeat the process about 50 times. The iron bar has now become a magnet. Using this method, paper pin, blade, iron clip and steel needle can be easily converted into a magnet.

Double touch method

Place an iron bar on a table. Take permanent, opposite poles of two magnets inclined at the centre of the iron bar. Rub the magnets in opposite direction along the bar as shown in figure. Repeat this process a number of times.

The bar becomes a magnet. It is found that the ends of the bar where the south pole of magnet leaves, becomes north pole and where the north pole of the magnet leaves becomes south pole.



ii. Electric Method

When the magnetic substances are magnetized by using electricity, the process is called electrical method. The magnets which are made by passing electric current are electromagnets. By electric method we can make temporary magnets which are very powerful.

A temporary magnet which is made by magnetizing a magnetic substance by using electricity is known as electromagnet. Electromagnets are used in the devices like telephone, electric fan, telegraph, electric bell etc.

[Note : Electromagnets are generally used more than the permanent magnets. It is so because their magnetic poles and magnetic force can be altered according to our requirements.]

Points to be considered while making an electromagnet (a temporary magnet)

- Naked wire should not be used rather we should use insulated wire. If it is not done, and naked wire is used, the battery will not work longer due to short circuit.
- Soft iron should be used to make an electromagnet. It is so because such soft iron materials can be magnetized and demagnetized easily, which is necessary condition for making a temporary magnet.
- A switch should be installed in the electric circuit.
- The winding should be done from one side only.

Process of increasing the strength of an electromagnet

The strength of an electromagnet can be increased by following ways.

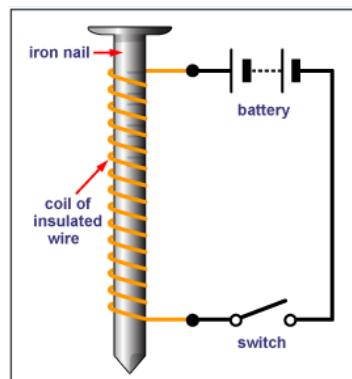
- By increasing the number of turns in the wire.
- By passing more amount of electric current through the coil.
- By using soft iron materials for making an electromagnet.



Activity 8.6

Collect one-metre insulating wire and an iron nail - about 5 cm. in length. Wrap the insulated wire around the nail. The terminals of the wire are connected to the terminal of a battery and keep the switch on.

Bring some paper pins close to the iron nail. What do you observe ? You will find that the nail attracts certain number of pins showing that the iron nail has become a magnet.



As long as the current flows through the wire, the iron nail remains a magnet on stopping the current, the iron nail loses its property of magnet. Such magnet is known as electromagnet.

Uses of Magnet

Magnets have lots of applications in our daily life. Some of them are given below.

- i. They are used to construct the electrical motors and generators which convert the electrical energy into mechanical energy and vice versa.
- ii. Magnets are used in industries and factories to lift heavy loads of iron and steel.
- iii. They are used in loud speakers which convert the electrical energy into sound energy.
- iv. Electromagnets are used in the devices such as telephones, electric bells telegraphs, generators, electric motor, etc.
- v. Magnets are used to separate magnetic substances from non-magnetic substances.
- vi. They are used by candy or cold drink vendors to separate metallic cap from the other things.
- vii. The most important use of the magnet is the magnetic compass which is used to find out the geographical directions.
- viii. Magnets are used in the maglev trains. In the maglev trains, the super conducting magnets are used on the tracks on which trains floats (run). These types of trains work on the repulsive force of magnets.

Note: The use of the magnets in the medical science is very effective. We can use magnet therapy for the pain management without use of medicines. Magnets can stimulate the nerves in the human body and increase the blood circulation, which carries oxygen to the tissues. Magnetic mattress are used for relaxing the body. In MRI, we use magnets. Magnets are used to cure depression, headaches and migraines.

The major differences between ordinary magnet and electromagnet are :

Ordinary Magnet	Electromagnet
i. Ordinary magnet is a permanent magnet.	i. An electromagnet is a temporary magnet.
ii. Polarity of ordinary magnet cannot be altered	ii. Polarity of an electromagnet can be altered by reversing the direction of electricity
iii. It gets demagnetized when stored for a long time.	iii. It is not demagnetized by storing.

iv. The strength of a ordinary magnet cannot be altered.	iv. The strength of an electromagnet can be altered.
v. Ordinary magnet cannot be used to produce large magnetic field.	v. An electromagnet can be used to produce large magnetic field.

Think about

1. Why should we not use naked wire to make electromagnet?
2. We should wrap the wire around the nail along the same direction. Why?

Uses of Magnet

Magnets are very essential in our daily life. Ancient people also used magnets to find out direction. Some important uses of magnet in modern days are given below. It is used in electronic device, i.e. radio, TV, etc.

1. Magnets are used in factories for lifting heavy masses of iron and steel.
2. They are used to separate magnetic materials from food stuffs.
3. ATM card, credit card, and other identity cards have a strip or magnetic materials that stores secrete information.
4. They are used in hospitals to remove tiny iron or steel particles from the eyes or wounds of patients.
5. To generate hydroelectricity.

Project work

Suspend a bar magnet freely with the help of a thread. Bring one pin near to it. Magnet attracts the pin. Again bring another pin to the attracted pin, it also gets attracted by it. Bring another pin, this pin also gets attracted. Why does it happen? Detach magnet from the pin and observe other pins whether they are attracted by the first pin or not. Why does it happen? Discuss with your teacher.



GLOSSARY

- navigator** : a person who directs the route of his ship, aircraft
- heap** : an untidy pile of something
- repulsion** : the force by which objects tend to push each other way
- directive** : the property of showing directions

A. Choose the best answer from the given alternatives.

- i. Which substance is attracted by a magnet?
 - a. plastic
 - b. iron pieces
 - c. book
 - d. eraser
- ii. A freely suspended magnet always points..... directions.
 - a. N-S
 - b. E-W
 - c. S-N
 - d. W-E
- iii. Which one is non magnetic substance?
 - a. nickel
 - b. cobalt
 - c. brass
 - d. iron
- iv. A magnet has poles.
 - a. 1
 - b. 2
 - c. 3
 - d. 4
- v. Magnetic lines of force of a magnet is indicated by.....
 - a. straight line
 - b. curve line
 - c. spiral line
 - d. none
- vi. The region around a magnet upto where its influence can be experienced is called
 - a. attractive property
 - b. directive property
 - c. magnetic substance
 - d. magnetic field.

B. Fill in the blanks.

- i. Loadstone is a _____ magnet.
- ii. Magnet has a property to attract _____.
- iii. Magnet _____ small dust particles of iron.
- iv. A north pole of a magnet _____ another north pole of a magnet.
- v. Magnetic force of attraction is maximum at _____.
- vi. _____ are not separated, when a magnet is broken into pieces.
- vii. Magnet cannot attract _____ substance.

C. Match the following two columns.

Column 'A'

Natural magnet
Artificial magnet
Magnetic field
Magnetic poles
Magnetic length
Length of magnet

Column 'B'

distance between magnetic poles
the area around a magnetic
loadstone
distance between two ends of a magnet
distance between magnetic poles
horse shoe magnet

D. Answer these questions.

- i. What is a magnet? Name any four instruments that need magnet to operate.
- ii. Why does a bar magnet kept on the table not point towards N-S direction?
- iii. List some magnetic and non magnetic substances.
- iv. What is magnetic field? Which magnet has large magnetic field?
- v. Write the differences between magnetic length and effective magnetic length.
- vi. Draw a horse shoe magnet indicating its poles.
- vii. What are magnetic materials ? Describe an activity to identify a magnetic material.
- viii. Why does a magnet attract steel but not the plastic?
- ix. Why iron fillings are attracted at the two ends of a magnet than in the middle?
- x. If a bar magnet is broken into two pieces, each piece will become a complete magnet. Why?
- xi. Write five properties of magnet.
- xii. Write any five uses of magnet.
- xiii. How do you test whether a given rod is a magnet or not?
- xiv. Describe an activity to show that a magnet has maximum magnetic force at its poles.
- xv. Iron nails are attracted much more at the end of a magnet than at the middle. What is the reason?

E. Differentiate between:

- a. Magnetic and non-magnetic substances.
- b. Natural and artificial magnet.

F. Give reasons.

- Poles of a magnet cannot be isolated.
- A magnet can attract iron but not plastic.
- More nickel pins are attracted at poles than at the middle.

G. Diagrammatic questions.

- Label the magnets as artificial or natural.



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- Label the shapes of the magnets using their correct name.



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8.2 Electricity

STUDENT'S LEARNING OUTCOMES

After studying this unit, the students will be able to :

- introduce a simple cell
- make simple cells using simple acid or sour substance, copper and zinc plates.
- draw electrical circuit using the symbol of conductor wire, switch, cell and load.
- generate heat from nicrome or constantan wire with dry cell and switch.
- explain the safety measures of fuse wire and MCB in electrical circuit.
- demonstrate the method of increasing the magnetism of an electromagnet (increasing the number of coils and the amount of electricity).
- explain the usefulness of electromagnet in daily life.

Electricity can be defined as the flow of electric charge. The charge is a property of matter. There are two types of charge: positive charge or proton and negative charge or electron. Electricity is a form of energy that can be easily changed to other form using electrical appliances.

Electricity is very essential energy for us. It is very important to do day to day activities. We use various electric appliances to perform daily activities such as mobile phone, television, radio, etc. which require electricity to operate them. Similarly, to run heater, to heat iron, to run vehicles and so forth, electricity is used. These electric appliances convert electric energy into different forms of energy as sound energy, heat energy, light energy, etc.

Sources of Electricity

A device which produces electricity is called a source of electricity. Sources of electricity can convert various forms of energy into electrical energy. The major sources of electricity are :

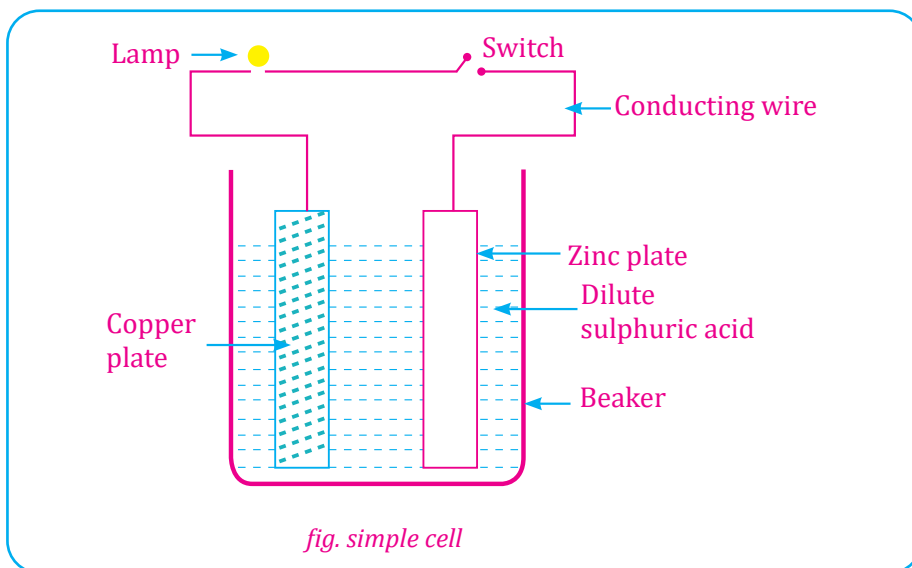
- i. cell ii. photo cell iii. dynamo or generator

i. Cell

A device that produces electricity due to the chemical change of the substance kept inside is called cell. It converts chemical energy to electrical energy. Examples: simple cell, dry cell. Dry cells are used to operate radio, torch light, transistor, etc. A cell has two terminal, i.e. negative terminal and positive terminal.

a. Simple cell

A simple cell consists of a beaker containing dilute sulphuric acid. Copper and zinc plates are dipped in the acid which are known as electrodes.



A zinc plate acts as a negative and a copper plate acts as a positive terminal. When these terminals are connected with the help of conducting wire, the electric current flows and the bulb glows.

Electric Circuit

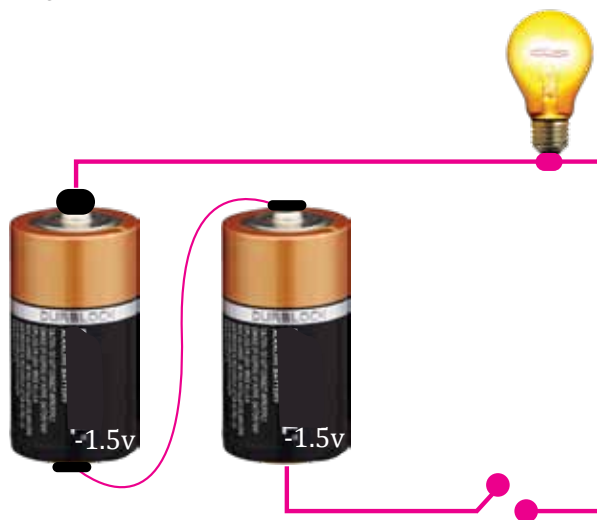


Activity 8.1

Take a dry cell, 30 cm long, two connecting wires, one bulb and a switch. Join them as shown in figure.

The conducting path of flow of current made by connecting a source of electricity, electrical appliances, switch and conducting wires properly is called an electric circuit. In an electric circuit there is a combination of a battery connecting wires and the devices to be operated like a bulb. They are connected in a manner to provide complete path or the flow of electrons from one terminal of the battery to the other.

Then, a complete electric circuit is connected across the battery, there is a flow of charges which constitutes the movement of a current from the positive terminal of the battery towards its negative terminal. In



an electric circuit, the direction of the flow of current is always taken from the positive terminal to the negative terminal of the battery through the circuit. Conventionally, the direction of the flow of current is opposite to the direction of the flow of negatively charged electron. Only when current passes through the filament of the bulb, it glows.

Types of Electric Circuit

The following are the types of electric circuit which are described below.

1. Open circuit

A circuit which is not complete and electric current cannot flow is called an open circuit. When the switch is turned off, the electric current cannot flow in the electric circuit and the bulb doesn't glow. Thus, this circuit is an open circuit.

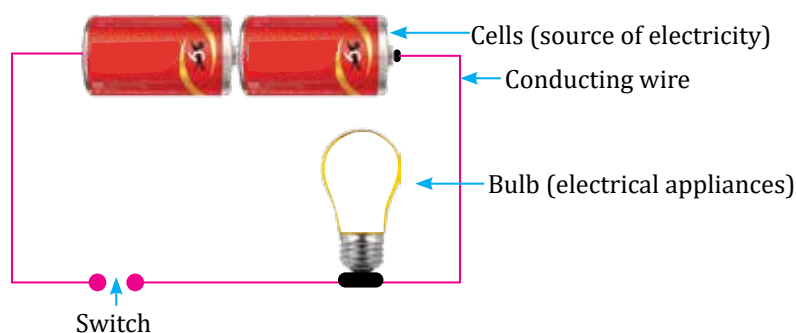


fig. open circuit

2. Closed circuit

The circuit which is complete and through which electric current flows and the bulb glows is called a closed circuit. When the switch is turned on, the circuit becomes complete and electric current flows through it.

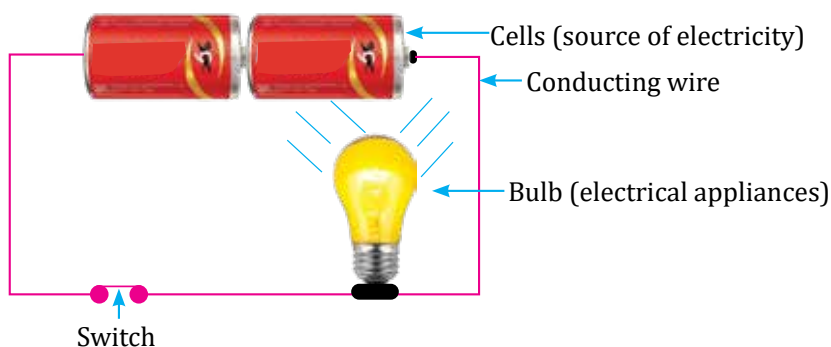


fig. closed circuit

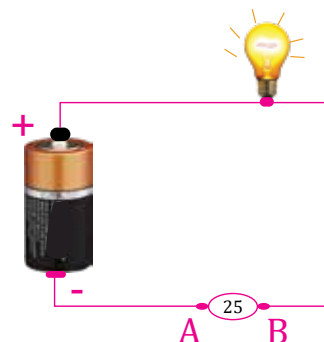
Electric circuit is essential while using electrical appliances. Electric appliances convert electric energy to other useful forms of energy like light in an electric bulb, heat in an electric heater, sound in a radio, etc. These electric appliances are called electrical loads. An electrical load is not required to be working every time. For this purpose, the circuit should be made closed or open as required. This is done by the use of a switch or a key in the electric circuit. When the switch is “on” it connects the wire in the circuit to complete it and the circuit becomes closed in which loads starts working. In the “off” position of the switch, the wire is not connected and the circuit becomes open in which the electric load does not work.



Activity 8.2

Join the circuit as shown in the figure using a copper wire leaving a gap between points A and B. Now, insert different materials such as wood, rubber, plastic, stone, copper, coin, eraser, etc. one by one in the gap between A and B.

Observe, if the bulb glows when you join the gap between A and B using each of these substances. Note it on the table given below.

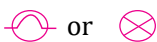


S.N.	Name of things	Bulb glow	Bulb does not glow	Good conductor	Bad conductor	Semi-conductor
1						
2						
3						
4						
5						

You will find that the bulb glows when you join the gap using copper and coin, but it does not glow when you join the gap using plastic, rubber, stone, eraser, wood.

Symbols in Electric-circuit

While drawing an electric circuit, it is difficult to draw the picture of the various components connected. This problem is overcome by replacing different components of electric circuit by their symbols. Some symbols are as below:

S.N.	Electrical Components	Symbol of the Components
1.	A single cell	
2.	Two cells	
3.	Bulb	
4.	Connecting wire	
5.	Open switch	
6.	Closed switch	
7.	Ameter	
8.	Resistor	
9.	Voltmeter	
10.	Non-connected wire	
11.	Wire	

Effects of Current Electricity

Current electricity can be transformed into different forms of energy. This is known as the effects of electric current. They are:

- i. Heating effect
- ii. Lighting effect
- iii. Magnetic effect
- iv. Chemical effect

i. Heating effect

When electric current is passed through electrical appliances, they change electricity into heat energy. This is called heating effect of electricity. The wire which is used to produce heat by passing electricity through it is called heating element. They have high resistance and melting points. Most of the heating devices have nichrome as heating element. Nichrome is an alloy of nickel and chromium metals. Its resistance is very high and it produces heat in a comparatively short period of time. Its melting point is 1400°C . So, It does not react with oxygen and does not melt even when the temperature reaches to about 900°C . It does not show corrosive effect. Electric heater, iron, toaster, kettle, immersion heater etc. are connected with electricity and convert electrical energy into heat energy.



heater



immersion rod



iron

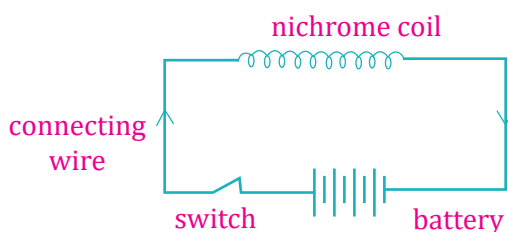


kettle



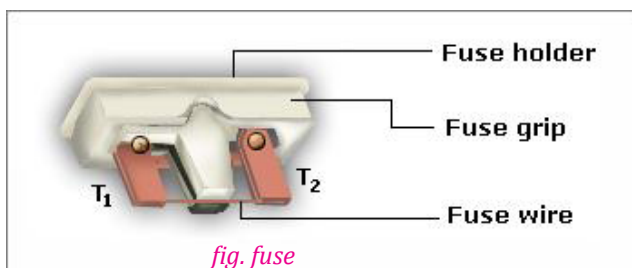
Activity 8.3

Take a piece of a nichrome wire. Coil it around your pencil to form a solenoid. Now take a battery and connect the ends of the solenoid to the battery. Observe the change in solenoid. What happens to the solenoid? Does it produce heat?



Fuse

Fuse is a thin wire of an alloy of tin and lead. It has low melting point. It is a safety device used in electrical circuit. It protects electric appliances from damage. When current overflows, fuse melts and disconnects the circuit. Fuse wire should be replaced by another wire to work again. Fuse is



found in different capacities. Miniature Circuit Breaker (MCB) is the improved form of fuse. It is easy to use and safer than fuse. In MCB, wire doesn't need to be replaced.



fig. MCB

Project work

1. Collect different materials from your locality and separate them as conductors, semi-conductors and insulators.
2. Perform an activity to show the electric circuit.



GLOSSARY

electric charge	:	electrically charged particles
chemical energy	:	the stored energy which can be possessed by a chemical reaction
photo	:	light
positive terminal	:	the end through which electric charge comes out
negative terminal	:	the end through which electric charge passes in



A. Choose the best answer from the given alternatives.

- i. Which appliances converts light energy into electrical energy?
 - a. Chemical cell
 - b. Photo cell
 - c. Dynamo
 - d. Generator
- ii. Which appliances cannot produce electricity for a long period of time?
 - a. Simple cell
 - b. Dry cell
 - c. Photo cell
 - d. Dynamo
- iii. Which appliance is required to generate electricity from flowing water?
 - a. Simple cell
 - b. Dry cell
 - c. photo cell
 - d. Generator
- iv. Which one of is them conductor?
 - a. Stone
 - b. Lead
 - c. Copper
 - d. Rubber
- v. Which of the following is an insulator?
 - a. Aluminium
 - b. Iron
 - c. Silver
 - d. Plastic

- vi. The material through which an electricity passes partially is
- | | |
|-------------------|-------------------|
| a. Conductor | b. Semi conductor |
| c. Non- conductor | d. Insulator |

B. Fill in the blanks.

- i. Dynamo converts _____ energy into electrical energy.
- ii. Electricity produced by the flow of water in high speed is _____.
- iii. The materials which allow electricity to pass through them completely are called _____.
- iv. The materials which allow electricity to pass partially are called _____.
- v. Bulb glows in _____ circuit.

C. Answer these questions.

- i. Describe simple cell with a diagram.
- ii. What is photo cell?
- iii. What is hydro electricity? Explain in brief about the production of hydro electricity.
- iv. Define electric circuit. Mention the types of circuit.
- v. Why is a layer of plastic coated around copper wire?
- vi. What is insulator? Give three examples.
- vii. What is a closed circuit? Sketch a diagram.
- viii. Write various uses of electricity in our daily life.
- ix. Draw an electrical circuit containing cell, wire and 'on' and 'off' switch.
- x. Draw and label a diagram of dry cell.
- xi. What is a generator?
- xii. Explain the simple cell with a suitable diagram.
- xiii. Give an example of conductor and insulator.
- xiv. Draw a bicycle dynamo. How does a dynamo work?
- xv. Draw a neat and labelled diagram of open and close circuit.

D. Give reason

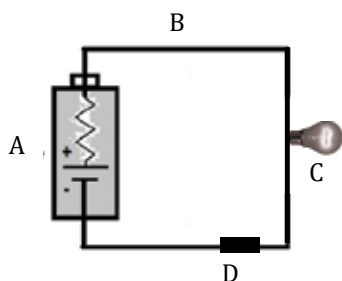
- a. A bulb does not glow when circuit is opened.
- b. Rubber is an insulator.

E. Differentiate between :

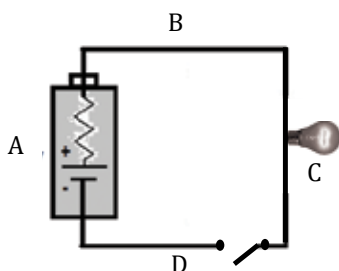
- a. simple cell and dry cell
- b. conductors and insulators
- d. dry cell and photo cell
- d. open circuit and closed circuit

F. Diagrammatic questions:

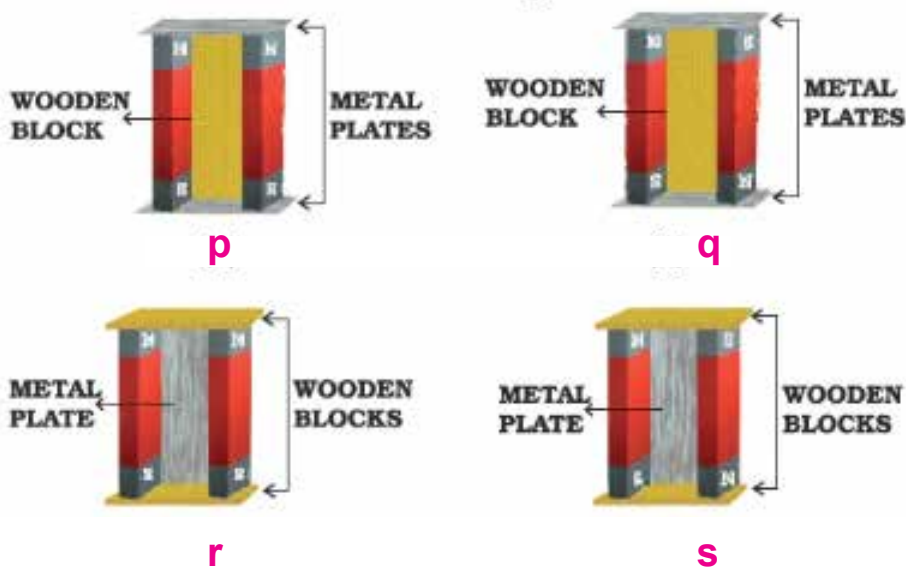
- a. Answer the following questions on the basis of the given diagram.
 - i. Name A, B, C and D.
 - ii. Why is the lamp not glowing?
 - iii. Re-sketch the diagram in such a way that the lamp can glow.



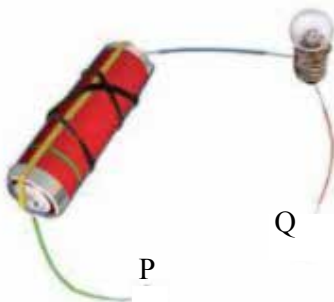
- b. Study the given figure and answer the following questions.
 - i. Write the names of A, B, C and D.
 - ii. What is shown in the figure?
 - iii. How is it different from a simple cell? Mention any two points.



- c. The arrangement to store two magnets is shown by figure p, q, r and s in given figure, Which one of them is the correct arrangement?



- d. In the following arrangement, the bulb will not glow if the ends P and Q are connected with
- A steel spoon
 - A metal clip
 - A plastic clip



STUDENT'S LEARNING OUTCOMES

After studying this unit, the students will be able to :

- To introduce the mixture and to distinguish the types.
- Explain the methods of separating the mixture.
- To define solution (solvent and solute), colloid and suspension.
- To prepare a solution from the substances used in daily life.
- To make a list of the use of solution in daily life with examples.
- To introduce distillation.
- To explain the process of separating the mixture by distillation.
- To separate the mixture by distillation using local technology and explain the process.
- To separate the coloured components from the mixture of colour by paper chromatography and explain the reason.
- To separate the mixture by centrifusing method and explain the reason.

We find different objects around us which we can see, touch, and feel physically. Things like water, air, book, rock, fruits, vegetables, etc. can be seen, touched or felt by our senses. Every object around us has different properties. But, they have common properties which we can point out. The things mentioned above have mass and they occupy space. Anything that has mass and occupies space is known as matter.

Everything we can see, physically feel, and touch are matter. Matter is made up of atoms and molecules. Light, sound, shadow, etc. do not have mass and they do not occupy space. They are neither made up of atoms or molecules. So, they are not matter or a form of matter. Matter exists in three forms namely solid, liquid and gas. Solid and liquid can be seen but all kinds of gases may not be visible. However, these gases can be physically felt in some ways by their characteristics such as smell or other features. If not, their presence can be justified by some chemical mechanism too. Anyway, they have mass and they occupy space. Hence, they are matter.

Mixture

We utilize and consume different things in our daily life. For instance, grains, sugar, tea, milk, etc. We find several objects around us which are characterised by their forms and

sizes. The form of a substance may be pure or impure. We often encounter stone granules or rice husks in rice grains. We mix milk with sugar and tea dust while making tea. Similarly, the air we breathe is the mixture of several different gases including nitrogen, oxygen and carbon dioxide.

Substance is a matter that contains only one type of atom or molecules, e.g. water, sugar, salt, etc. If anything is composed of the combination of two or more than two substances, it is known as mixture. The individual constitute of a mixture is referred to as component. The substances which take part in the formation of a mixture are called components of a mixture. Air is a mixture because it has the constituents such as nitrogen, oxygen, carbon dioxide and other gases. The constituents of a mixture have definite properties and they do not have fixed proportion. Moreover, the constituents of mixture can be separated by physical means.

Water + Sand	→	Sandy Water
Water + Sugar	→	Sugar Solution

Importance of Mixture

- Sarbat is made by mixing sugar, water and lemon juice for drinking.
- Many medicine are made by mixing different chemicals
- Mixture of varieties of colour is used for painting.
- Coca-Cola, soda water, etc. are used as mixture.
- All the plants absorb mineral salts dissolved in soil water from the soil in the form of mixture.

Pure and Impure Substances

A substance that is made up of only one kind of molecules and has definite composition and properties is pure substance. Elements and compounds are pure substances. Examples of pure substance are diamond, pure water, tin, etc.

A substance that is made up of two or more kinds of molecules and has no definite composition and properties is impure substance. The impure substance is called mixture. Examples of impure substance are glucose water, husk in rice, sugar water, etc.

Types of Mixture

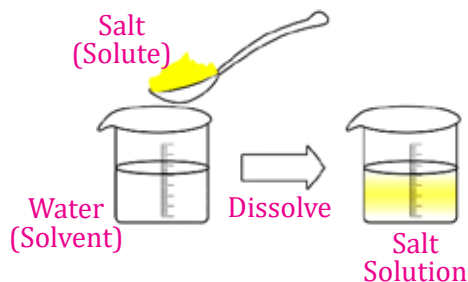
On the basis of the components or constituents of mixture, there are two types of mixtures.

1. Homogeneous mixture

The homogeneous mixture is a mixture of two different substances in which each component particles are equally distributed and cannot be seen through naked eyes. Mixture of salt and water is a homogeneous mixture because the salt is evenly mixed

in the water. Here, salt particles cannot be seen with our naked eyes. Examples are alcohol water, soda water, sugar water, etc.

Solution is an important product of a homogeneous mixture. It is homogeneous mixture of solute and solvent. A solution is usually formed by mixing suitable solid in liquid or liquid in solid. The size of the particles in the component in solution is 10^{-7} cm or less.



2. Heterogeneous mixture

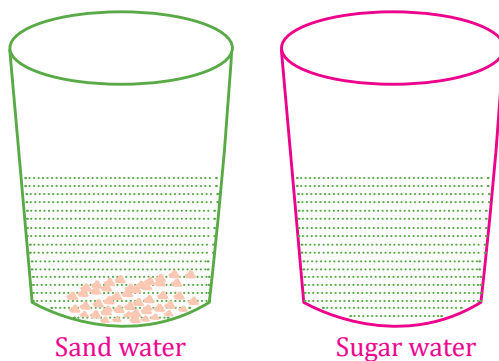
Heterogeneous mixture is a mixture of two or more substances in which the particles of components of the mixture are not equally distributed and can be seen with naked eyes. Some examples are muddy water, smog, oil, rice coats in rice, etc. Sand particles do not distribute equally in water and they can be seen through our naked eyes.

If the components of the mixture are not distributed uniformly through out the solution such type of mixture is called heterogeneous mixture.



Activity 9.1

Take two glasses and fill both of them with clean water. Put a spoonful of sugar in one of them and a spoonful of sand in the other. Mix both of them properly with spoon or a glass rod. Now, ask to your friends whether they can see the sugar or sand grains in those mixtures. These masses in both glasses are mixtures of two different kind. The sugar mixed with water completely dissolves and hence one cannot see the sugar particles in it. But, the sand granules do not dissolve in water. So, the particles get visible in water and after certain period, the particles sediment down and settle at the bottom of the glass.



Method of Separating Mixtures

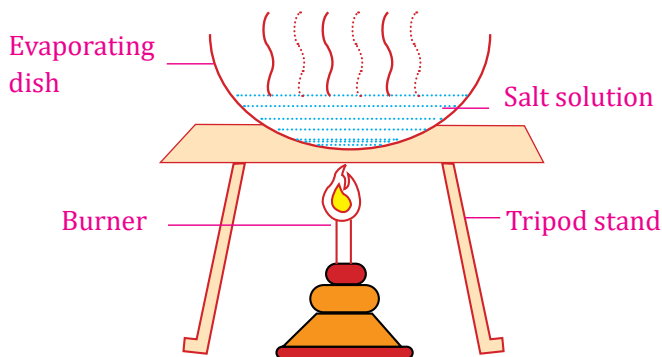
The separation of different components from a mixture is called separation of mixture. For the purpose of obtaining useful component from a mixture, we use different techniques for separating mixture. In our daily life, we separate the components of a mixture to remove the unwanted components in order to get the pure substance. The component of a mixture can be separated on the basis of the principle that “different materials have different properties.” For example, in a mixture of iron fillings and sand, iron filling can be separated by using its magnetic property. Sand is non magnetic in nature. So, a magnet

can be used to attract and pull out the iron filings from the mixture. There are several methods of separating mixtures. Some of them are given below.

- **Evaporation**

This method is generally used to separate a homogeneous mixture of a solid and liquid. Using this technique, we can extract a solid solute particles from a solution. Here, the solvent evaporates out leaving behind the solid solute component. For example: if we have a solution of salt

and water, we can obtain the dissolved salt in solid form by evaporation. For this, the mixture of salt and water is placed in an evaporating dish and heated using a burner from below. The heat is provided until all water evaporates out. Finally, we obtain the solid salt left on the evaporating dish. Hence, the process of separating solid solute component from the solution (homogeneous mixture) by the application of heat is known as evaporation.



- **Centrifuging**

The process of separating very fine suspended solid particles or semi solid from a mixture by rotating the mixture kept in a centrifuging machine at high speed is known as centrifuging. This method is used to separate the components of those mixtures that contain fine suspended particles in a very little amount.



Nowadays, to separate the components of a mixture, a special instrument called centrifuging machine or centrifuge is used. The mixture is poured into test tubes at a very high speed either by hand or electricity for a while. After sometimes the machine is allowed to stop and then tubes are taken out from it. You can observe that heavier particles are settled at the bottom. This machine is used to separate cream from milk in dairies, to separate platelets from blood in hospital, to separate molasses from crude sugar in sugar industries, etc.



Activity 9.2

Take some chalk powder in a beaker and mix it with water. Pour the mixture into a plastic bottle that has a tight fitting lid. Tie one end of the string around the neck of the bottle. Rotate the bottle with high speed by using the string. After sometimes you will observe that the chalk has settled at the bottom while the clear water on the top of the bottle. The clear water on the top can be carefully separated by decantation process.

• Distillation

The process of evaporation of liquid component on heating mixture followed by the condensation of vapours into liquid by cooling is called distillation. Distillation process is applied to separate a solvent in pure form from its solution. This method can also be applied to separate the mixture of two miscible liquids having different boiling point. The liquids which can be mixed with each other forming a solution are called miscible liquids. For example, water and alcohol are miscible liquids. However, water and kerosene are non-miscible liquids as they form different layers when we mix them.



Activity 9.3

Separation of salt and water from a salt solution

Material required

A report stand, a distillation flask, a thermometer, a tripod stand, wire gauze, conical flask (Receiver, condenser etc.)

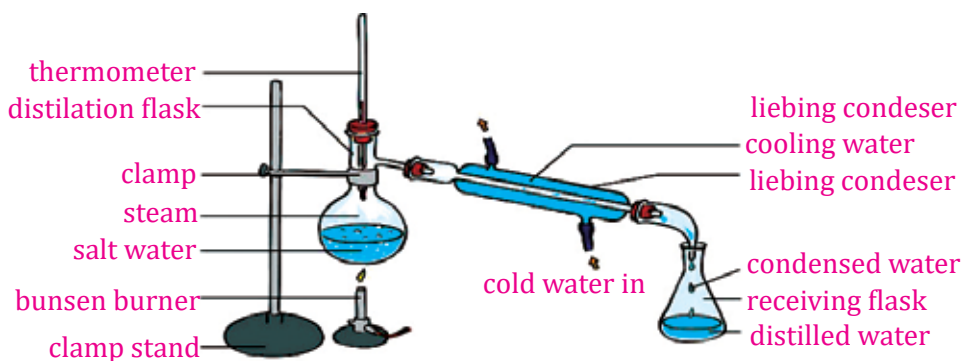


fig. distillation process

Procedures

- Take a distillation flask and fill it half with prepared salt solution.
- Fit the flask in a tripod stand and connect the flask to the condenser. Here, the cold water is circulated in the condenser to cool and vapour.
- Place the distillation flask over a tripod stand as shown in the figure.
- Fit a conical flask as receiver at the end of the condenser.
- Heat the salt solution in distillation till water boils there.

Observation

When the water vapour passes through the condenser, it condenses into small droplets of water which is collected in the receiver. The collected water in the receiver is known as distillate. When all the water is boiled off, the salt remains in the distillation flask.

Conclusion

Hence, water gets separated from a salt solution. The water obtained by the distillation process is very pure which is commonly called distilled water.

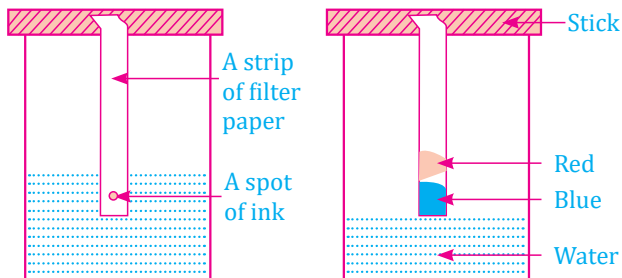
Note : In the gulf countries, drinking water is obtained by distillation process. A special type of distillation process (called fractional distillation) is generally applied to separate petroleum from a crude oil.

• Chromatography

Chromatography is the process of separating colored substance from its solution. This process was invented by Russian Scientist Tswett in 1906 AD. This process is used to separate and identify the coloured as well as colourless substances. Different components of a mixture are absorbed in different extents and move down at different rates. This is the principle of chromatography. There are various types of chromatography.

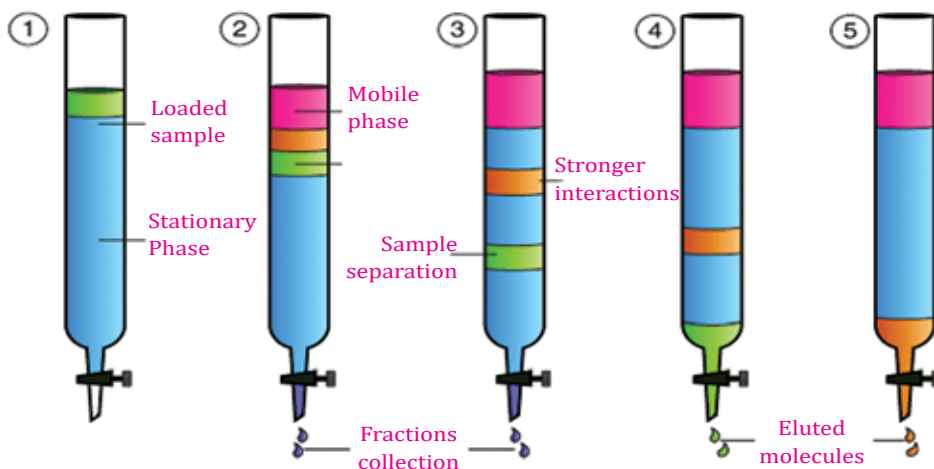
a. Paper chromatography

Paper chromatography is a useful technique used to separate the components of a solution. In this technique the mixture of red and blue ink to be separated is first applied at a spot about 1.5 cm from the bottom edge of the paper.



The paper is then placed in a beaker containing water with the tip of the paper touching the water. Water is absorbed by the paper and moves up the paper by capillary action. As the water crosses the spot of ink, it dissolves and moves up the paper. The components of ink are not equally soluble in water. So, different rates of movement of the colouring matter is seen on filter paper. This causes colour separation. This process is called paper chromatography.

b. Adsorption/ Column chromatography



[Fig : adsorption chromatography]

The adsorption chromatography is based on the fact that “some adsorbent adsorb different substances to different amount” . In this method, the solution containing two or more than two dissolved substances which is to be separated is allowed to pass into a vertical glass tube which is finely packed with different types of adsorbents such as alumina, silica gel, chalk powder, etc. When the solution passes down through the adsorbent, different colours of dissolved substances of a mixture get separated forming different bands.

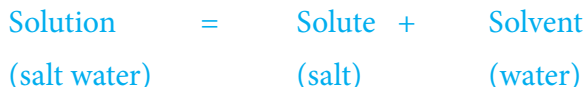
In this way, components having different colours are separated by using adsorption chromatography. It is also called column chromatography.

Uses of chromatography

- It is used to separate the various inks and dyes from the mixture.
- It is used in forensic science for investigation.
- It is used to detect the presence of alcohol and other drugs in blood and urine.
- It is also used to check the level of adulterants in the manufactured food.

Solution

A homogeneous mixture of two or more substances that can be formed by mixing a solid in a liquid or a liquid in a liquid is known as solution. The particles of a component of solution can not be seen with the naked eyes. Solution of sugar and water, salt and water, etc. are some of the examples of solution.



Solute and solvent

The components of a mixture which gets dissolved into some other substances to form a solution is called solute. The substance which dissolves solute to form a solution is called solvent. In a sugar solution, sugar is dissolved in water and the water dissolves it, so the sugar is a solute and the water is a solvent. Similarly, in a salt solution, salt is a solute and the water is a solvent. In general, the amount of solvent in a solution is more and solute is less.

Distinction between Solute and Solvent

Solute	Solvent
- It gets dissolved in the solvent. - If the solute and solvent are in different states, the solute changes its stage. - Its amount is relatively less in solution. - Solute is generally in solid state. e.g. salt, sugar, etc.	- It dissolves the solute. - If both solute and solvent are in a different states the solvent does not change its state. - Its amount is relatively high in solution. - A solvent is generally in liquid state. e.g. water, alcohol, etc.

Uses of Solution in Daily Life

- Plants absorb essential nutrients from the soil in the form of solution which helps plants to prepare food.
- Foods which we eat changes into solution and is absorbed in the blood streams.
- Aquatic animals and plants take the oxygen which is mixed in water.
- Materials like paint ink, etc. are in the form of solution.
- Many drinks are available in the form of solution.
- Some medicines are in the solution form.

Project Work

Make a list of the pure and impure items in your home. How to separate these items from each other. Illustrate the separation method.



GLOSSARY

sieve	:	a tool for separating larger solid particles from smaller solid particles
thrash	:	to beat for the separation of grains from plants
components	:	the substances by which something is formed
density	:	amount of mass per unit volume
soda water	:	mixture of carbon dioxide in water
alum	:	a water lump of chemical used as antiseptic substance formed from aluminum and other substances
chaff	:	the inedible part of grains



A. Choose the best answer from the given alternatives.

- i. How do you separate the mixture of mud and water?
 - a. filtration
 - b. sedimentation and decantation
 - c. sublimation
 - d. both (a) and (b)
- ii. Which of the following is heterogeneous mixture?
 - a. sugar and water
 - b. sand and water
 - c. alcohol and water
 - d. soda water
- iii. Components can be easily seen in
 - a. heterogeneous mixture
 - b. homogeneous mixture
 - c. solute
 - d. solvent
- iv. The process of separating the heavier grains from the lighter chaff is known as
 - a. sieving
 - b. sublimation
 - c. winnowing
 - d. decantation
- v. A mixture of iron filings and sand can be separated by
 - a. magnetic method
 - b. evaporation
 - c. sieving
 - d. filtration
- vii. What type of mixture is oil and water mixture?
 - a. Heterogeneous mixture
 - b. Homogeneous mixture
 - c. Mixture of solids
 - d. Mixture of gases

viii. Which of the following two substances are mixed together to form homogeneous and heterogeneous mixture?

- | | |
|----------|-------------|
| a. Water | d. Kerosene |
| b. Oil | e. Salt |
| c. Sand | f. Sugar |

B. Fill in the blanks.

- i. The combination of two or more components is called
- ii. The mixture of salt and water is mixture.
- iii. The components of mixture can be clearly seen in..... mixture.
- iv. The solid remains in filter paper after filtration is called
- v. Sublimation method separates and components from a mixture.
- vi. Muddy water is mixture.
- vii. Oil and water mixture can be separated by method.

C. Answer these questions.

- i. What is mixture?
- ii. Mention various types of mixture with examples.
- iii. Name any two ways by which undissolved particles present in water can be removed.
- iv. Write any three methods to separate mixture.
- v. Draw a neat and labelled diagram of the process of decantation and filtration.
- vi. How can you determine whether tap water contains other components mixed in it?
- vii. Define filtration.
- viii. What is evaporation and condensation?
- ix. Sugar and water can not be separated by filtration. Why?
- x. Sand water is a heterogenous mixture. Why?
- xi. What do you mean by components of a mixture? Explain with example?
- xii. What are the importance of mixture?

D. Define the following :

- | | |
|-------------------|---------------------|
| a. Pure substance | b. Filtrate |
| c. Solute | d. Solvent |
| e. Residue | f. Impure substance |

E. Differentiate between :

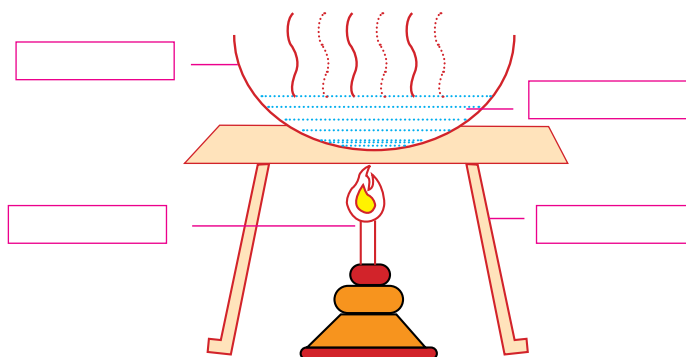
- a. Heterogeneous and Homogeneous mixture.
- b. Pure and Impure substances.

F. Write short notes on:

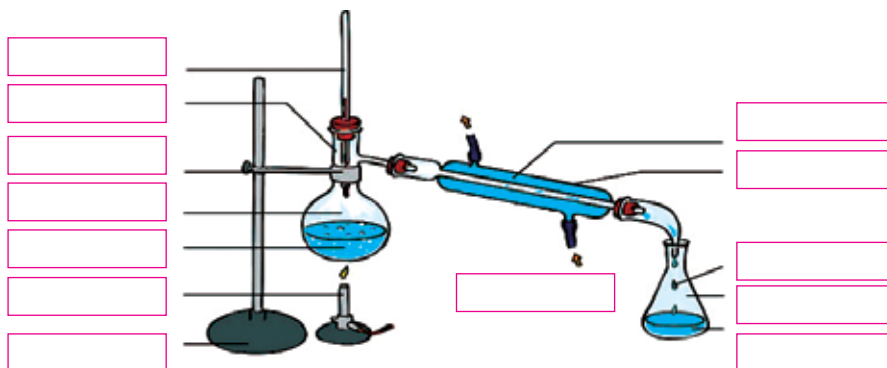
- a. Homogeneous mixture b. Heterogeneous mixture

G. Diagrammatic questions:

- i. Label the following figure:



- ii.



Unit 10

Materials used in Daily Life

STUDENT'S LEARNING OUTCOMES

After studying this unit, the students will be able to :

- Give examples of chemicals used in daily life.
- To identify and distinguish metals and non-metals on the basis of physical properties.
- To mitigate the effects of not managing the substances used in daily life on the environment.

10.1 Some chemicals used in daily life

We consume and utilize different things in our daily life which are made up of different chemicals. The soap we use every morning, tooth paste to brush our teeth, etc. are all made up of chemicals. We consume salt as a part of our regular food which is itself a useful chemical. Similarly, baking soda and yeast in bread and biscuits are some examples of a useful chemicals.

The chemicals we use in our daily life are obtained from naturally occurring organic materials and minerals. Many useful chemicals are manufactured artificially too.

Different chemicals are used for different purposes. Some chemicals are essentially required for taste and flavour. For example, sugar is used as a sweetening agent. Salt, turmeric, black pepper and lime are used in certain quantities to add taste and flavour in curry and vegetables.



Activity 10.1

observe your kitchen and make a list of the chemicals being used and arrange them in tabular form.

S.N.	Chemicals	Uses
1.	Lemon	Making pickles
2.		
3.		
4.		

i. Baking Soda

It is probably the most important chemical used in bakery industry. The salt has many related names such as bread soda, cooking soda, and bicarbonate of soda. It is used in bakery to enlarge and colour the biscuits, cookies, bread and cake. It is also used to make soft drinks.



Chemically, baking soda is sodium bicarbonate or sodium hydrogen carbonate. It is a white solid that is crystalline but often appears as a fine powder. It has a slightly salty, alkaline taste resembling that of washing soda (sodium carbonate, Na_2CO_3).

The molecular formula of sodium bicarbonate (baking soda) is NaHCO_3 .



Activity 10.2

Take a small quantity of baking soda. Mix it properly in some wheat flour and add water to make a paste. Place the combination in a pan and heat them to observe the result. What changes do you find in the paste? Discuss and note down the result.

Baking soda reacts with acidic components releasing carbon dioxide which causes expansion of the matter and forms the characteristic texture and grains in pancakes, cakes, breads and other baked items.

There are medical uses of baking soda (NaHCO_3) too. Sodium bicarbonate is used in aqueous solution as an antacid taken orally to treat acidity, indigestion, and heart burn. It can be used to cover an allergic reaction to relieve some of the itching. It can also be useful in removing splinters from the skin.

ii. Sugar

The chemical name of sugar is sucrose. Sugar is typically prepared from sugarcane juice and sweet potato. Some fruits like pineapple, grapes, banana and mango contain some amount of sugar in them. The physical appearance of sugar is white crystalline form. It is used as sweetening agent in different food items such as tea, coffee, ice-cream, soft drinks, etc. It is soluble in water. So, it is used as a sweetening agent in liquid. Human body contains sugar in blood in the form of glucose. Sugar may be used to preserve some foods too. It is made up of carbon (C), hydrogen (H) and oxygen (O).



sugar

iii. Ghee

Ghee is a fatty product, (substance) obtained from the milk of cow or buffalo. It solidifies on room temperature. Its chemical name is triglyceride. In modern days, a kind of ghee is manufactured by hydrogenation of vegetable oil, known as Vanashpati Ghee. Ghee provides energy to human body and human body also demands for fat diet to certain extent. Our body requires fat to absorb vitamin A, D, E, and K. That is why, we require consuming fat to certain extent. Ghee makes our food delicious. It is used in cooking as well as in Ayurvedic medicines. It is an energy giving food. However, excessive consumption of fat causes accumulation of unnecessary fat on our body.



iv. Turmeric powder (Besar)

Turmeric is a medicinal herb generally consumed in South Asia to give colour to curries. It has many medicinal values and is used in small amount in vegetables and curry. The edible part of turmeric plant is its rhizome which is sliced, dried and grinded to make fine powder.



It is cultivated in tropical and the subtropical regions. The rhizome of turmeric gives rise to the new plant. Rhizome is the modification of stem. The rhizome of turmeric is similar to ginger.

How turmeric powder is produced?

- Step-1. The rhizome is washed and dried.
- Step-2. Dried rhizome is sliced and dried.
- Step-3. Dried slices are grinded and yellow powder is obtained.

Benefits of turmeric powder

Some of important benefits of turmeric powder are given below.

- a. It purifies blood and improves skin condition.
- b. It purifies, mind and helps the lungs to expel cough.
- c. It is used to treat ulcers.
- d. It helps to reduce fever, diarrhoea and urinary disorder.

v. Yeast

It is a kind of fungi generally used for fermentation and baking. Fermentation is a process of obtaining alcohol from carbohydrate. Yeasts are unicellular fungi, although some species with yeast forms are multicellular through the formation of a string of connected budding cell. Zymase is the enzyme found in yeast which grows very fast in fructose and glucose rich substance. It converts carbohydrate to alcohol i.e. through fermentation.



Yeast is used in baking and for fermentation of beverages. The wheat or barley is put in water and some amount of yeast is added in it which helps in fermentation. After some days, a liquid product known as ferment is formed. Alcohol is obtained by heating and filtering the ferment.

vi. Common salt

The chemical name of common salt is sodium chloride (NaCl). Common salt usually contains some amount of magnesium chloride (MgCl_2) too. It is also known as table salt or rock salt and is a crystalline mineral. It is essential for animal life in small quantities.

Salt is obtained from sea water. The salty water is collected and stored in an open space.

After a certain period of time, the water evaporates due to excessive heat and salt is obtained. The salt obtained in this way is packed and delivered to the factories where further refinement takes place. Finally, small amount of iodine is added in it which is an essential component required to prevent diseases like goiter. Goiter is a disease with swollen gland on the neck caused of deficiency of iodine.

Salt is used to flavor our food and pickles. It is an essential substance in preservation of food item.



Phenol

Phenol is an organic compound. Its molecular formula is $\text{C}_6\text{H}_5\text{OH}$. It is carbolic acid. It is prepared from petroleum. Phenol is included in alcohol group. Phenol is slightly soluble in water. It is antiseptic and protects wounds from further infections. Phenol is used as disinfectant in the surrounding of houses, hospitals, etc. and also remove the foul smell of the surrounding and kills houseflies. In factories, phenol is used in the preparation of medicine, threads, colour plastics, etc. It can even kill bacteria. Solid and concentrated

phenol can damage skin and causes irritation. Tablets of phenol is used to kill different types of insects.

Uses of Phenol

Phenol is widely used as antiseptic disinfectant, aesthetic and for cleaning household articles.

The major uses of phenol are given here under.

- i. Phenol is widely used as antiseptic, disinfectant, aesthetic and household cleaning product.
- ii. Phenol is also used as starting material or product as an intermediate in industry.
- iii. Phenol sprays are aesthetic and analgesic in combination that work in painful and irritating areas.
- iv. Phenol derivatives are used in the preparation of cosmetics including sun screen, hair dye etc.
- v. Phenol is used in the production of adhesives, paints, varnishes etc.
- vi. Phenol is used to disinfect bathrooms, toilets, dirty rooms etc. Phenol gives pleasant smell besides killing the germs.
- vii. It is used in the production of durable plastics e.g. bakelite and other related materials.

Detergent

It is a cleansing agent, a synthetic powder or liquid that removes dirt and oil from clothes. It is similar to soaps but it is more soluble than soaps. Detergents are also called as soapless soap. In our houses, it is used as laundry detergent and dish detergent. Some perfumes can be added to soap and detergent. Detergents are not useful to plants, So we should be very careful while using detergent water.

Uses of Detergent

- i. Detergent is used to wash clothes in our home and laundry.
- ii. Mixed with water, detergents can be used to clean surfaces of gas stove, kitchen table, etc.
- iii. They are used to wash dirty cemented ground and floors.
- iv. Dish wash detergent, cakes, etc. are used to wash kitchen utensils.
- v. They are used to disinfect different apparatus and articles in laboratory.
- vi. Detergents are used to remove stain on clothes which are not removed by washing with soaps. Some detergents have fragrance in them which remove bad odour from the clothes.

- vii. Some special detergents are used to clean jewellery.
- viii. They are used to clean sink and bath tub as well.

Ingredients of washing powder (detergents) and their purposes.

Ingredients	Purposes
Active detergent	Cleaning
Water softener	Softening hard water
Bleaches	Removing cloured stains
Enzymes	Removing food stains

Harmful effects of chemical substances

We use many chemical substances in our daily life. We use soap, detergent, phenols, synthetic cleansers, chemical fertilizers, insecticides etc. These have adverse effect on environment. Most of them are non-biodegradable and they cause pollution. Some of them release harmful gases whereas some of them contain toxic substances. Some harmful effects of chemical substances are given below:

- Detergents and chemical fertilizers cause water and soil pollution.
- Chemical fertilizers also release harmful gases like nitrous oxide.
- Some insecticides contain harmful heavy metals which are absorbed by plants and animals.
- Use of phenols kill the useful micro-organisms in the soil.

Management of chemical substances

Chemical substances are useful to us. However, excessive and improper use of chemical substances causes several harmful effects on us and our environment. Hence the chemical substances should be used in appropriate amount only when necessary. The use of very harmful chemicals in agriculture should be banned. The chemical released from industries should be treated before disposal. The insecticides should be stored in proper place. They should not be allowed to mix in water resources. The organic fertilizers should be used instead of chemical fertilizers. People should be made aware of harmful effects of chemical substances.

Project work

Collect different types of useful chemicals which are available at your home and discuss their uses with your friends and teacher.

Note:

1. Detergents are commonly available as powder or concentrated solution.
2. Generally, detergents which are used for washing clothes contain water softeners, surfactant, alkyl benzene sulphonates, enzymes, brighteners, fragrance and other components.
3. Generally, detergents are called soapless soap because like soaps they have cleansing property but they do not contain chemicals which are found in soap (i.e. they are chemically different from the soap).
4. The use of detergents is not environment friendly because detergents are not degraded by decomposer in the nature and their unwise use pollutes the environment.



GLOSSARY

bake	:	to prepare and mix together ingredients to make bread, etc.
slice	:	thin pieces cut from a larger piece
syrup	:	a sweet liquid made by cooking sugar with water
lotion	:	a liquid used to clean, improve or protect skin or hair



A. Choose the best answer from the given alternatives.

- i. The chemical name of baking soda is _____.
 - a. Sodium carbonate
 - b. Sodium sulphate
 - c. Sodium chloride
 - d. Sodium bicarbonate
- ii. What part of turmeric plant is used to produce yellow turmeric?
 - a. Root
 - b. Leaves
 - c. Modified stem
 - d. Flower
- iii. Salt is prepared from _____.
 - a. plants
 - b. sea water
 - c. fresh water
 - d. well water
- iv. The enzyme used for fermentation is _____.
 - a. amylase
 - b. lipase
 - c. zymase
 - d. maltose

- v. The chemical name of sugar is _____ .
a. sucrose b. maltose
c. lactose d. fructose
- vi. Lack of iodine causes _____ .
a. Dwarfism b. Fever
c. Cough d. Goitre
- vii. Which of the following is/are used to preserve food?
a. Yeast b. Salt
c. Sugar d. Both b and c

B. Fill in the blanks.

- Yellow turmeric is obtained from _____ part of plant.
- The chemical name of table salt is _____.
- Yeast is a kind of _____.
- Yeast is used for _____ purpose.
- Salt is obtained from _____.

C. Answer these questions.

- i. Write down any five chemicals used in our daily life.
- ii. Write down some uses of baking soda? Explain what happens when we mix baking soda with a paste of wheat flour and heat them.
- iii. Enlist the uses of salt and sugar.
- iv. What are the advantages of consuming ghee in proper amount? What are the sources of the ghee we consume?
- v. How is salt prepared?
- vi. What enzyme is used for fermentation? List out the uses of yeast.
- vii. What are the benefits of turmeric powder in our health? How is it prepared?
- viii. What is the taste of common salt?
- ix. What kind of plant is yeast? How does yeast help in making alcohol?
- x. What do you understand by vanaspati ghee?

D. Differentiate between:

- Baking soda and common salt
- Turmeric powder and yeast

E. Diagrammatic questions:

- i. Write the name of the picture below and write any three uses of it.

Lemon, salt, washing soda, ghee, Besar, yeast, phenol, detergent ko
figurerakhne



10.2 Introduction to Metals and non-metals

Everything in the world is made up of elements. There are 118 elements discovered so far. Based upon the properties of these elements they are classified as metals, non-metals and metalloids. Some elements are hard, lustrous, and good conductor of heat and electricity. Such elements are classified as metals. Some examples of metals are copper, iron, aluminium, gold, silver, etc. Some elements are non-lustrous, soft and bad-conductor of heat and electricity. These kind of elements are classified under non-metals. Examples: oxygen, nitrogen, chlorine, carbon, etc. Similarly, some elements have the properties of both metals and non-metals which are classified under metalloids. Metalloids may conduct heat and electricity to some extent. Some examples of metalloids are silicon, arsenic, bismuth, antimony, germanium, etc. Humans are utilizing metals for a long period of time. Metals like copper, aluminium and iron are used as cooking utensils from the past to the date. Copper is used in electricity wiring. Iron and alloy of iron is used to manufacture different parts of car, train and aeroplane. This is why, metals have occupied important aspects of human life. Metals are extensively required for the infra-structural development of a country. However, in nature many metals do not exist in metallic form. They exist in the form of mineral or ore. However, some metals like gold and silver exist in metallic form too.

General Properties of Metals

Metals are generally shiny, hard solids and a good conductor of heat and electricity. They are malleable and ductile. Examples: iron, copper, gold, silver. Different metals have different properties. There are some common properties of metals. Some of them are mentioned below.

i. Metals have lustre

Metals give a characteristic shine in their pure form. This property of metal is known as metallic lustre.



Activity 10.3

Collect some pieces of iron, copper and aluminium. Clean these pieces properly with water, cloth or rough paper. After cleaning them, place them on a clean paper. Observe the result. You will find that these metals start to shine. This is because they reflect the light due to the property of them known as metallic luster. This property of metal makes them attractive.

ii. Metals are hard

Metals are generally harder than non-metals and metalloids. However, different metals have different degree of hardness. Some metals like sodium, potassium and

calcium are not so hard. Hardness of metal can be increased by forming the mixture with other metals which is known as alloy.



Activity 10.4

Take some pieces of iron, copper, zinc, brick and wood. Take an iron nail and scratch these pieces individually by the nail. What did you observe? The pieces of iron, copper and zinc do not get any scratch easily. But, the brick and wood easily get scratched. This proves that metals are hard while non-metals like wood and brick are generally soft things.



iii. Metals produce clink sound

Take an iron or copper sheet and a wooden plank of approximately equal size. Tie them with a string and hang them. Hit them with a small stick turn by turn. Now, observe their sound. Which one produces a clink sound? You will find that, on getting struck by stick, the iron or copper sheet will produce a kind of clink sound while a dull sound will be produced by the wooden plank. This is because of the compact structure of molecules in metal. Similar clink sound can be heard if you drop a copper coin on a plastered floor. Such clink sound cannot be produced by non-metals.



iv. Metals can be beaten to make it thinner (malleability).

Most metals can be struck by hammer to make them thinner. This property of metal is known as malleability.



Activity 10.5

Take a sheet of iron, zinc or aluminium. Observe their initial breadth and thickness. Now, strike these sheets by a hammer for a while and observe whether their breadth has increased and thickness has reduced or not. You will find that the breadth of these sheets has been increased and correspondingly, their thickness has been reduced. This verifies that metals are malleable.

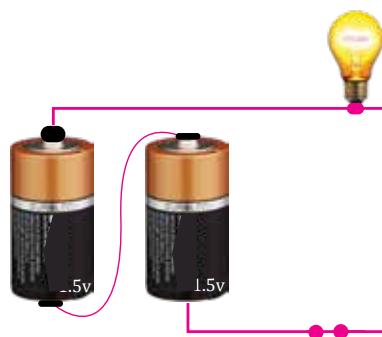


v. Metals can be drawn into wires (ductility).

Different metals like iron, aluminium, zinc, gold, silver, etc. can be beaten by hammer to make them longer. They can be stretched out in the form of thin long wire. This property of metal is referred to as ductility. Even a single gram of gold can yield approximately 2 km long wire. This property of metal is utilized in making of jewellery.

vi. Metals are good conductor of electricity.

Metals can easily conduct electricity. This is why, we use copper or aluminium wires to bring electricity to our homes. Different metals have different level of conductivity. In other words, some metals conduct electricity more than the other. Silver is the metal with best conductivity. However, in our homes we generally use copper or aluminium wires because silver is more expensive metal while copper and aluminium are cheaper. The conducting property of metal is due to the presence of large number of free electrons on them.



Activity 10.6

Take two dry cells, some aluminium wires and a bulb. Now, construct the circuit according to the given figure. Turn on the switch. Does the bulb glow? Yes, the bulb will glow. This experiment verifies that metals are very good conductor of electricity.

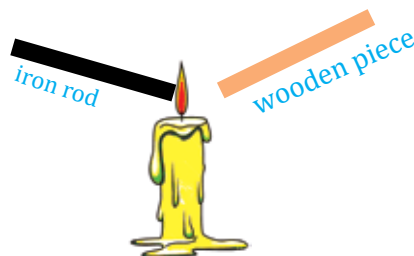
vii. Metals are good conductor of heat.

Metals can readily conduct heat too. This is the reason why we use metal utensils in kitchen to cook food. Different metals have different levels of heat conductivity. The conduction of heat by metals is also due to the presence of large number of free electrons which aid in the conduction of heat.



Activity 10.7

Take an iron rod and a glass rod of equal length. Hold one end of each rod and place the next end on the flame of burning candle. Hold them for a while and observe the differences. You will find that the iron rod will get heated faster and the heat reaches the other end of iron rod. It is because iron is a metal and it is a good conductor of heat.



The process of transfer of heat from one place to another through solid medium is known as conduction. And, the conduction of heat through metal is faster and efficient than conduction through non-metals.

viii. Metals are generally found in solid state

Most of the metals are solid at normal temperature and pressure (NTP). But, some metals like mercury are liquids at NTP. Metals, if heated up to high temperature, can be melted and even boiled. These temperatures are known as melting points and boiling points respectively. Generally, metals have high boiling point and melting point.

Uses of metals

We use metals in our daily life for several purposes. Metals are used for domestic purposes and industrial purposes too. Some of the uses of metals are listed below.

- Metals are used to manufacture different kitchen utensils.
- They are used to make different day to day tools (like hammer, spanner, screw driver, etc) and weapons.
- Metals are used to make different parts of house, vehicles, bridge, etc.
- Jewelleries are made by using metals like gold and silver.
- They are used to manufacture wires to carry electricity.
- Metals are used in making coins and coin like artifacts.
- Metal like mercury is used in thermometer.
- Aluminum foil is used to preserve medicine, chocolate and cigarettes, etc.
- Metals are used in musical instruments like guitar, drum, etc.

Some Useful Metals

We use various types of metal in our daily life. They are used to make tools, arms, vehicles, doors, windows, etc. Some of the common metals are described below.

a. Iron

Iron is known from the ancient time. It is the second most abundant metal found in the earth's crust. It is found in the combined state in the earth's crust. It is taken out by mining. It is extracted by refining from its combined state or impurities. It is a grey metal and good conductor of heat and electricity. It rusts in moist air rapidly.



Uses

1. It is used to make stainless steel, rods, pipes, knots and bolts, nails, vehicles, railways, utensils, etc.
2. It is important to most living organisms.
3. It is present in blood and makes it red in colour.

b. Aluminium

Aluminium is a silvery white metal. It is a good conductor of heat and electricity. It does not rust. It is used for many purposes in our daily life. Its alloy is also common in use.



Uses

1. Aluminium is used for making, wrapping chocolates, medicines, domestic utensils, coins etc.
2. It is also used for making electric wire, bodies of vehicles, aeroplanes, frames of doors and windows.

c. Copper

Copper is a reddish brown metal in colour with a metallic lustre. It is known as a hot metal and it conducts heat and electricity. It is malleable and ductile. It does not get rusted but it becomes dull in colour when it is kept for a long time in the air. It is used to make alloys like brass, a mixture of copper and bronze (copper + tin).



Uses

1. Copper is used in making electric wires, domestic utensils, coin, medals and ornaments.
2. It is used for making alloys like brass for many purposes.

d. Silver

Silver is a white lustrous metal. It is known as a coinage metal because it is used to make ornaments. It is found in free as well as in combined states in the earth's crust. It is a very good conductor of heat and electricity. It is also malleable and ductile. It is not affected by air and water.



Uses

1. Silver is used for making coins, jewelleries, medals, utensils, decorative materials, silver plating and filling teeth cavities.
2. It is used in the manufacture of ayurvedic medicines and electronics.

e. Gold

Gold is a lustrous yellow metal. It is a coinage metal as it is used for making coins and jewelleries. It is also malleable and ductile. It is very expensive metal in comparison to the other metals mentioned above. It does not rust. It is found in the free state with alluvial soil or quartz.



Uses

1. Gold is used for making coins, medals and jewellery.
2. It is also used for filling teeth and for gold plating.
3. It is also used in the manufacture of Ayurvedic medicine.

Non-metals

Non-metals are usually softer and lighter which may be present in solid, liquid or gaseous form. They are not lustrous, malleable and ductile. Some examples of non-metals are carbon, sulphur, phosphorous, oxygen, nitrogen, etc. Like metals, different non-metals have their own properties. But, some properties of non-metals are common in all of them. They are listed below.

- They are present in solid, liquid and gaseous state.
- They are softer than metals.
- They do not possess characteristic of clink sound.
- Non-metals do not produce metallic luster (i.e, they are not shiny).
- They cannot be beaten to form thin sheets (i.e, they are not malleable).
- Non-metals aren't ductile.
- They are poor conductor of heat and electricity.

Uses of Non-metals

- They can be used as insulators to block the flow of electricity.
- Rocket fuel is a non-metal.
- Non-metals are used to manufacture explosive substances. For example, sulphur is used to make an explosive material.

- Gaseous hydrogen is used to fill the balloon which is also a non-metal.
- Chlorine is used for purifying water.
- Oxygen is used for breathing.
- Non metals like fluorine are used to make tooth paste.

Difference between Metals and Non-metals

Properties	Metals	Non-metals
State	All the metals except mercury are solid at the ordinary temperature.	Non-metals are found in all three states.
Lustre	Metals possess metallic lustre when freely cut.	Non-metals except iodine, graphite do not possess metallic lustre.
Hardness	They, except sodium are generally hard because the molecules are closely packed in them.	They, except diamond, are generally soft in nature.
Breakability	Metals are hardly broken into pieces.	They are easily broken
Melting and boiling points	The melting and boiling points are generally high.	The melting and boiling points are generally low.
Clink sound	When struck with a hammer, they emit sound which is known as metallic clink sound.	Non-metals do not emit clink sound.
Malleability	Metals can be beaten into a plate, i.e. malleable.	Non-metals are non malleable.
Ductility	Wire can be made from metals, i.e. they are ductile.	Non-metals are non-ductile.
Conductivity	Metals are generally good conductors of heat and electricity.	All non-metals except graphite generally do not conduct heat and electricity.
Alloy formation	Metals have the power of dissolving other metals to form homegenous mixture, i.e. alloy	They do not form alloys.

Project work

Collect different objects from your surroundings and identify them as metals and non-metals.



GLOSSARY

boiling point	: the temperature at which a liquid changes into vapour
melting point	: the temperature at which a solid changes into liquid
malleable	: that can drawn into a sheet
ductile	: that can be made into a thin wire
luster	: the shining quality of a surface
diamond	: shining pure state of carbon
moulded	: shape (soft substance) it to a particulars form
cutlery	: knives, forks and spoons used for eating and serving food



A. Choose the best answer from the given alternatives.

- i. Arsenic is a
 - a. metal
 - b. non-metal
 - c. metalloid
 - d. alloy
- ii. Which one of the following exists in liquid form although it is a metal?
 - a. Iron
 - b. Mercury
 - c. Zinc
 - d. Water
- iii. Which of the following is the most conductive metal?
 - a. Mercury
 - b. Copper
 - c. Gold
 - d. Silver
- iv. Which one of the following cannot be moulded to form wire?
 - a. Wood
 - b. Aluminum
 - c. Silver
 - d. Brass
- v. You need a brittle and strong substance which can be formed a thin wire. Which one would you select ?
 - a. Metalloid
 - b. Metal
 - c. Alloy
 - d. Non-metal
- vi. Why are metals good conductor of heat and electricity?
 - a. Because they are shiny solids.
 - b. Because they are ductile.
 - c. Because they have large number of free electrons.
 - d. a. Both (ii) and (iii)

B. Fill in the blanks.

- i. _____ have the properties of both metals and non-metals.
- ii. Metals are mostly found in _____ state.
- iii. Metals are good conductor of _____ and _____.
- iv. Metals can be moulded into a thin wire. This property of metal is known as _____.
- v. Non-metals are found in _____, _____ and _____ states.
- vi. _____ and _____ naturally occur in metallic form.
- vii. _____ is a liquid metal.
- viii. _____ is a solid mixture of metals.

C. Answer these questions.

- i. List the types of elements found on the earth.
- ii. What are metals and non-metals? In what states are they found? Give some examples of each of them.
- iii. Mention any five properties of metals.
- iv. Enlist any four properties of non-metals.
- v. Note down some usefulness of metals.
- vi. List the properties of metalloids and alloys. Give any two examples of alloys.
- vii. Briefly explain an experiment that verifies 'metals are the good conductors of electricity'.
- viii. Briefly describe the usefulness of iron and coinage metals.
- ix. Why is iron felt colder than wood in winter?
- x. Explain experimentally that iron is a good conductor of heat.
- xi. Write any three properties of metals.
- xii. Name five metals and five non metals which are used in our daily life.
- xiii. Make a list of the metals and non-metals which are used in constructions of building.

D. Differentiate between :

- a. Metal and non-metal

E. Write the uses of the following:

- a. Iron b. Aluminium c. Copper d. Silver e. Gold

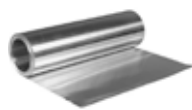
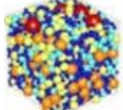
F. Diagrammatic questions:

- i. Some properties of non-metals are given below. Complete the following table :

Properties of Non-Metals:

Dull : 	 	Brittle : 	
Insulator: 	 	Poor Conductor: 	
Low Density: 	 		

- ii. Some properties of non-metals are given below. Complete the following table :

Ductile : 	 	Malleable : 	
Luster: 	 	Conductor: 	
Magnetic: 	 	High Density: 	

Earth and Space

STUDENT'S LEARNING OUTCOMES

After studying this unit, the students will be able to :

- describe the internal structure of the earth with model and introduce each layer.
- explain the position of the sun and the earth in four seasons by demonstrating the earth's orbit around the sun in 365 days.
- to define the solar system and name the objects that revolve round the sun.
- introduce the soil.
- explain the process of soil formation and conservation measures.
- introduce soil profiles with figure.
- explain the causes, effects and prevention measures of soil pollution.

Soil

Most of the part of land is covered with soil. Soil is the loose material which consists of organic and inorganic substances. Humus is the organic substance which is formed from decayed dead bodies of organisms. Soil is the uppermost covering layer of the earth's crust. It contains small pieces of rock, sand, minerals, dead bodies of plant and animal, etc. Soil provides minerals and water to the plants. It is also necessary to support life on the earth. Soil provides a habitat to many animals like rats, mongooses, snakes, insects, foxes, jackals etc. Many animals complete their life cycle in soil.

Formation of Soil

- River water transports stones with it. When the stones strike each other, small particles of rocks are formed.
- Day is hot and night is cold. The differences in temperature on rocks causes their weathering. The weathered particles form soil.
- The speedy wind also removes the weathered rock particles which participate in the formation of soil.
- In the Himalayan region when water falls in the cracks, rock gets frozen at cold nights, it expands and it leads to splitting of rocks which form soil.
- Roots of plants also increase the distance between the cracked rocks which cause erosion leading to the formation of soil.

The soil which is still over the parent rock is called residual soil and the soil that is removed from the parent rock by erosion is called transported soil. The scientific study of soil is called pedology.

Soil is defined as the weathered rock because soil is formed from the particles of rocks such as clay, silt, and sand.

In other words, soil can also be defined as the topmost layer of the earth's crust. Plants derive their nutritional requirement from the soil. Soil is formed by minerals, organic matter (humus), water, air and living organisms (e.g. bacteria and fungi) since the formation of soil is an extremely real process, soil can be considered as a non-renewable resource.

Small particles of rocks, minerals and humus combine to form soil. Soil also consists of air, water and organic substances. Components of the soil are different in different type of soil. Top layer of the soil consists of more organic substances, second layer consists of less organic matters, roots of plants, insects and other substances, third layer consists of minerals like iron, or other minerals. In the last layer of the soil consists of bed rocks. In this way decaying organic matters, air, water and rock combine to make soil.



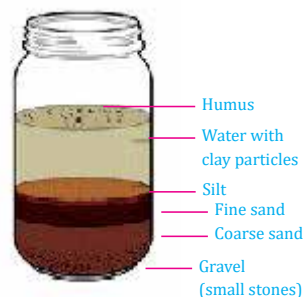
Activity 11.1

Take a small quantity soil from a garden and put it in a beaker.

Mix it with water, shake it well.

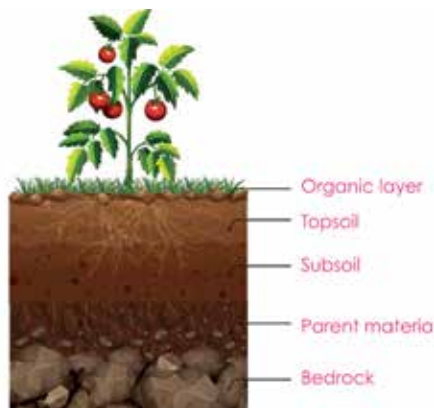
Keep the beaker without disturbing for few hours.

You will notice that different layers of soil particles are formed in the beaker. The large sized particles which are settled at the bottom of the beaker is known as gravel. Just above the gravel layer, the sand layer is present which is followed by clay particles. Water is found above the clay particles. Humus substances are floating on the surface of the water. Humus is very light in weight.



Soil Profile

The soil profile is a vertical section of the soil that depicts all of its horizons. The soil profile extends from the soil surface to the parent rock materials. By close examining a soil profile, we can obtain valuable insight of soils fertility. Infertile soil generally contains a light coloured layer in the sub-surface soil from which nutrients have reached away. A highly fertile soil often has deep surface layer that contains high amount of organic matter.



Soil profile consists of non rotted organic matters at the uppermost part of soil. Below it, top soil is found. It is best layer for the nutrition of plants as it contains more humus in it. The third layer of soil is sub soil. It contains less humus than top soil. The second last layer is the parent rock from which the soil is formed. It is composed of fragmented rock. The deepest layer is composed of big rocks or bed rock.

Erosion and Deposition

The sweeping away of top most part of soil is known as erosion. The collection of soil and rock particles in one place is known as deposition. Erosion and deposition is the process which takes place continuously. Erosion takes place due to the speed of wind, river water, sea water, heavy rainfall, etc. River water is responsible for erosion of soil from the bank of river and deposits it in some other places. During rainy season water of rivers are not clear due to mixing of soil. Wind, river water, rain water, sea water etc. are responsible for erosion and deposition process.



Methods of soil conservation

Soil is one of the most important factors of earth that makes our earth a living planet. Therefore, it is our responsibility to conserve the soil. Nepal is prone to soil erosion because most of its land's topology is hilly. Unplanned development and un-scientific agriculture practices cause soil erosion in our country. There are different measures to slow down the rate of soil erosion. Some of them are mentioned below.

- Counter ploughing should be done on hilly regions. i.e. the fields on slopes should be ploughed sideways rather than up and down. The rows of sideways crops can slow down soil erosion.
- Strip crop farming should be done at mild slopes. In this technique, different types of crops are grown on the same piece of land. Row crops and cover crops are grown in different strips of land and every year the position of row crops and cover crops should be exchanged.
- Terrace farming is used throughout the world for cultivating different types of agricultural crops. In this technique, step like fields called terraces are made on slopes. Such structures slow down the speed of running water on the steep surface and thereby, minimize soil erosion.

- d. Construction of roads and dams should be restricted to fragile area.
- e. Afforestation must be promoted and intensive grazing of domestic animals should be prohibited.

Note: After weathering of rocks, the weak particles transported by wind, water and other agents. This process is called soil erosion.

After soil erosion, the removed particles are accumulated at another place which is called deposition. Therefore, erosion and deposition of soil occur side by side. Geological activities such as earthquake, volcanic eruptions, landslides etc. are also responsible for soil erosion and its deposition. These processes sometimes form new landscapes.

Protection of Soil

Soil is the main natural resource of the earth. Our country is a mountainous country where soil erosion is very common. Soil erosion also takes place in mountains in Nepal by rain and river water due to traditional method of agriculture. Following ways can be implemented for the protection of soil:

- i. Deforestation should be stopped.
- ii. Afforestation should be done in barren land.
- iii. In steep mountains fruits and other plants should be planted.
- iv. In mountains terrace farming should be done.
- v. Bamboo like plants should be planted at the bank of rivers. Roots of these plants are very strong.
- vi. In steep mountains and barren hills, cattle grazing should not be done.
- vii. Use of explosives should be reduced while making roads, houses and establishing industries.
- viii. Embankments should be made at the bank of rivers which reduces soil erosion.

Internal Structure of the Earth

The earth's outer surface is cool and as we go deep down, the temperature increases. Outer surface of the earth is hard but internal portion is in red, hot and molten state. Mountain, plain, river and hard rocks are found on the outer surface of the earth but internal portion still consists of rocks and metals. The internal structure of the earth is divided into four layers.

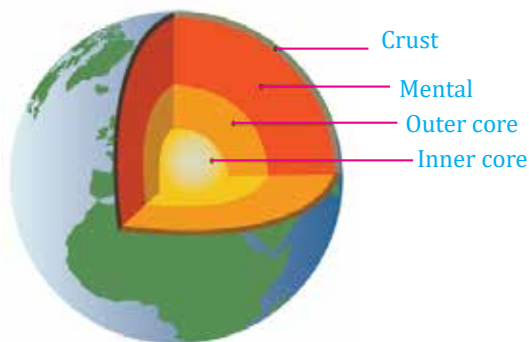


fig. model of internal structure of earth.

Crust

The outer layer of the earth is called crust. It has thickness of about 5km to 75 km. The crust has major composition of silica and alumina. The ocean, rocks, soil, vegetation, etc. are found on this layer. Human beings, animals and plants live on the crust.

Mantle

It is the layer which is situated below crust. Its thickness is about 2900 km. The rocks in this layer are red, hot, and they are flexible. This layer contains iron, magnesium, and silica. The density of the rocks in this layer is 2 to 3 times denser than the rocks on the crust. The temperature at this layer is about 7500 C.

Outer Core

This layer lies below the mantle. Its thickness is about 2100 km. The temperature of this layer may be 2500°C to 3000°C. The metals like iron, cobalt, nickel, etc. and rocks are found in molten state.

Inner Core

This is the innermost part of the earth. It has a thickness of about 1300 km. The temperature of this layer is about 3000°C to 5000°C. The materials at this layer are found in solid state due to high pressure. The rocks at this layer are 5 times denser than the rocks of the outer core.

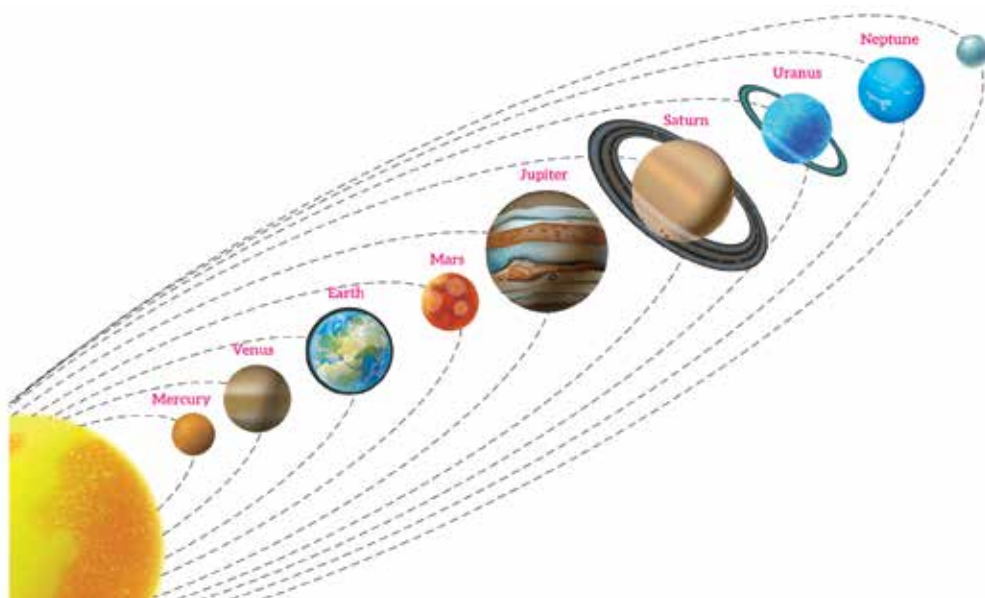
The sun

The sun is the centre of the solar system. It is the closest star to the earth. It is about 1.5×10^8 km. away from the earth. It is a medium sized star and its diameter is about 1,392,400 km., its weight is 330 times more than the weight of the earth. All the members of the solar system are remaining around the sun due to the gravitational force of the sun. It is a luminous body and produces heat and light energy. Light takes about 8 minutes 20 seconds i.e. 8.3 light minute to come on the earth from the sun. Its surface temperature is about 5,700°C and centre temperature is about 15,000,000°C.

Solar system

The whole group of planets, their satellites, asteroids, comets and meteors which move around the sun is called the solar system. There are eight planets including the earth in our solar system. The satellites (moons) move around the planets. Planets move around the sun in elliptical paths called orbits. Planets do not have their own light but seem brighter due to the reflection of the sun's light. There are : Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. Some of the planets are very hot and some are extremely cold. The coldest planet is the Neptune and the hottest planet is the Venus. The smallest planet is the Mercury and the largest planet is the Jupiter. Venus is the brightest planet

and it is brighter than any other star seen from the earth. Eight planets in order of their average distance from the sun are described below:



planets

Mercury

Mercury is the closest planet to the sun and also the smallest planet. It has no atmosphere. It is extremely hot during the day and extremely cold at night.

Venus

Venus is the closest planet to the earth. It is approximately same size as that of the earth. It is the brightest planet and can be seen as a morning star in the eastern sky just before the sunrise or as an evening star in the western sky just after the sunset.

Earth

Earth is the planet on which we live. Life is possible in this planet due to suitable environment, plenty of water, atmosphere and suitable temperature.

Mars

Mars is the reddish coloured planet . The planet has atmosphere, water and oxygen. This makes possibility of existence of living organisms.

Jupiter

Jupiter is the largest planet. Its outer surface is covered with clouds. This planet consists of many satellites.

Saturn

Saturn is the second largest planet . It has three rings in its outer surface.

Uranus

Uranus is around 14 times bigger in size than the earth. It is far from the sun. That's why, it is known as a cold planet. It has rings that are made up of dust.

Neptune

Neptune is far from the sun. It is the coldest planet. It is the farthest planet from the earth. It has rings much like that of Jupiter and Uranus but they are very dark.

Name of planets	Distance from the sun(km)	Diameter (km)	Period of rotation	Period of revolution	No. of moons (satellites)
Mercury	5.76×10^7	4851.2	58.65 days	87.97 days	0
Venus	10.7×10^7	12035.2	243.02 days	224.7 days	0
Earth	14.88×10^7	12672	23 hrs. 56 min.	365.25 days	1
Mars	22.56×10^7	6742.4	24 hrs. 37 min 22 seconds	686.98 days	2
Jupiter	76.8×10^7	1139040	9 hrs 55 min 30 sec	12 years	67
Saturn	144×10^7	115811.2	10 hrs 30 min	29.5 years	62
Uranus	288×10^7	50441.6	17 hr 14 min. 24 sec	84 years	27
Neptune	448×10^7	48972.8	16 hrs 6 min 36 sec	164 years	14

Sun, Earth and the Moon

All heavenly bodies are spherical in shape. The sun, earth and the moon are in round shape. The sun is bigger than the earth and the moon. The diameter of the sun is approximately 14,00,000 km, the diameter of the earth is approximately 12,751 km and the diameter of the moon is approximately 3,456 km. Earth is four times bigger than moon, sun is 110 times bigger than the Earth. Moon and Earth by distance is closer to each other but the Sun is very far from the Earth and the Moon. As the object moves further away it appears smaller. The distance between the earth and moon is about 3,47,000 km and the distance between sun and earth is 15,00,00,000 km.



earth



moon



sun

If we compare the sun to a ball of 110 cm diameter, the earth would be a ball of 1 cm diameter. Similarly, if we suppose the earth to be a ball of 4 cm diameter, the moon would be a ball of 1 cm diameter.

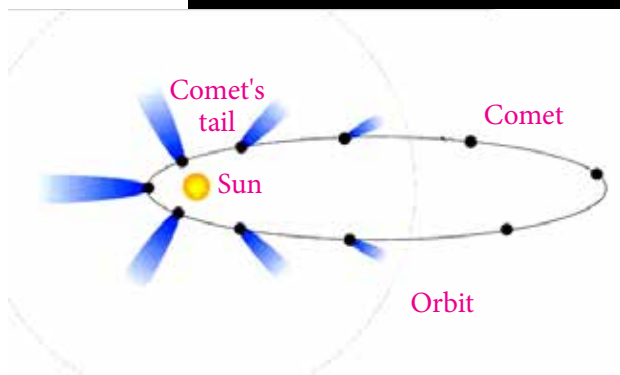
Asteroids

The rocky and metal objects which are present in between the orbits of Mars and Jupiter that revolve around the sun are called asteroids or minor planets. Although asteroids orbit the sun like planets, they are much smaller than planets. There may be as many as 100000 asteroids in the solar system. Some examples are : Mathilde, Gaspra, Ida, Ceres (biggest asteroid), Eros, Juno etc.



Comets

Comets are heavenly bodies that revolve around the sun in a highly elliptical path. They are very cold and made up of frozen gases. When they come near the sun, the frozen gases start evaporating due to heat of the sun. The evaporating gases look like a tail



behind the body of the comet. Hence they are also called tailed stars. The tail disappears when comet travel away from the sun.

Meteor/ meteorites

Sometimes small rocky or metallic objects in space come near the earth. The earth attracts such objects towards it. Hence they fall towards the earth with great velocity. They become hot due to friction with air and start burning. Some of them burn out completely before reaching the earth surface. Such objects are called meteor.

Sometimes the rocky or metallic object falling towards the earth may be very big. Hence they do not burn completely. They reach the earth surface. Such objects are called meteorites. They form meteor crater on earth surface.

Motion of Earth

Earth has two types of motion. One is rotation along its axis and another is revolution around the sun are called diurnal motion and annual motion of the earth respectively.

Rotation of the earth or diurnal motion of the earth

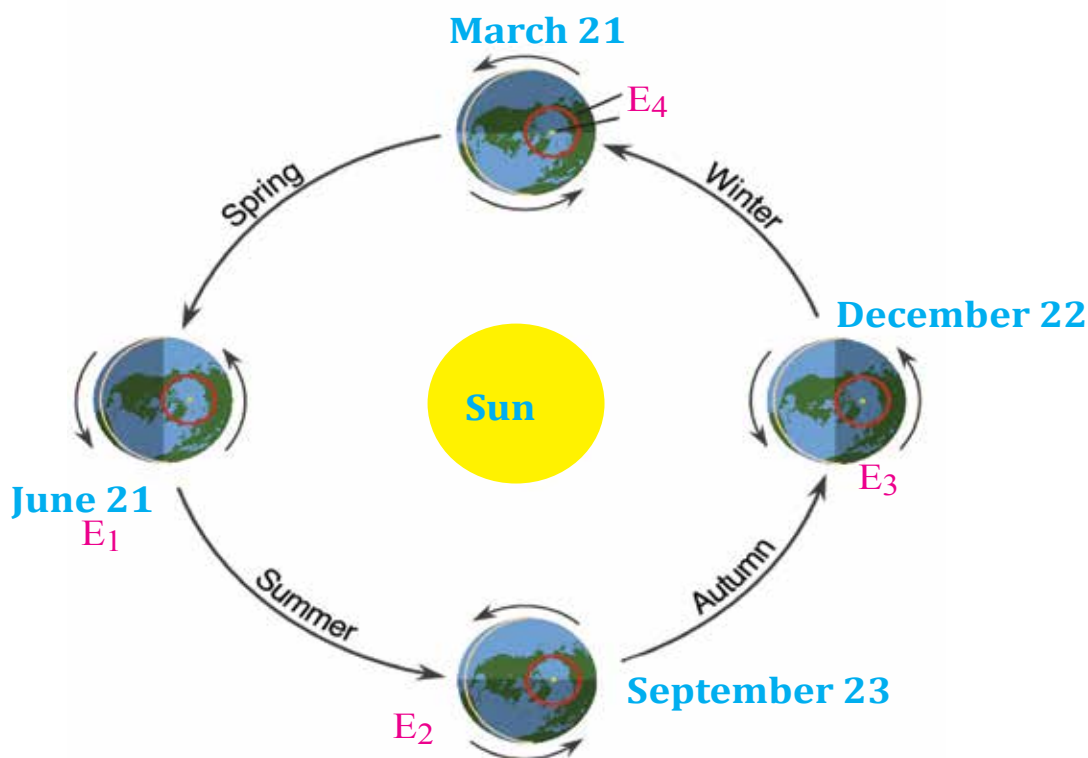
The earth takes 23 hours 56 minutes 4 seconds to complete one rotation along its axis which is called diurnal motion of the earth. This duration is also called solar day. The earth rotates from the west to the east in its axis. The surface of the earth where sun light falls that part has day and the surface of earth where sunlight can't reach has night. Due to this rotation motion of the earth, the dark region of the earth slowly changes to bright and bright region changes to dark. In this way, day comes night and night comes day.

Effects of rotation of Earth

- i. Rotation motion of the earth causes day and night.
- ii. Apparent motion of the sun and stars (e.g sun rises from the east and sets to the west) causes sunset and sun rise.

Revolution of the Earth (Annual motion)

The earth revolves around the sun in its elliptical orbit which is called orbital motion of the earth. It takes 365 days 5 hr 48 m and 46 s. For a year, there are 365 days. But every fourth year has 1 more day. The particular year having 366 days is called a leap year. The extra day in a leap year is added in February. So, February has 29 days in the leap year. As the earth revolves around the sun in elliptical orbit, sun sometimes comes near to the earth and sometimes it goes farther from the earth. When earth is nearer to sun, sun rays fall normally. So that from it becomes hot and when earth is farther from the Sun, sun rays are slanted to the earth surface so that it becomes cold. It is the cause of changing seasons.



Like in figure at position E_1 the sun light falls straight in the northern hemisphere, where days are longer than night. This state or position of the earth is called summer solstice. Similarly, at position E_3 the sun rays fall straight in southern hemisphere at this position days are longer than night in that hemisphere. From March to September ($E_4 - E_2$) in northern hemisphere there is summer season and in the southern hemisphere ($E_2 - E_4$) there is winter season.

In 22 December, the day is shorter than night in northern hemisphere whereas the day is the longest in southern hemisphere on that day. When the sun just lies above equator at that time days and night are equal. These days are March 21 and September 23. These days are called equinoxes as day and night are equal.

Effects of annual motion

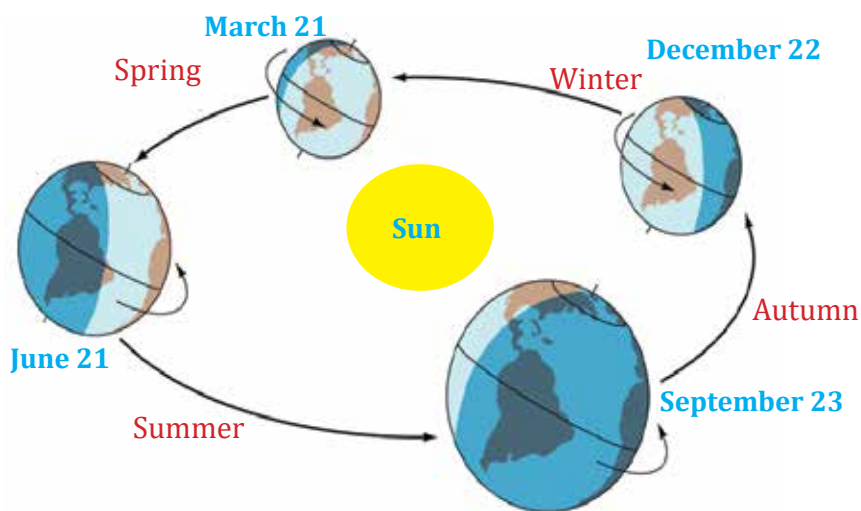
- Change in season eg. winter, spring, summer and autumn.
- Change in the duration of days and nights.
- Leap year occurs once in a four years.

Seasons

An overall change in the weather is known as season. There are four seasons that are normally seen in our country.

- Spring (Falgun, Chaitra, Baisakh)
- Summer (Jestha, Ashad, Shrawan)
- Autumn (Bhadra, Asoj, Kartik)
- Winter (Mangsir, Poush, Magh)

These seasons go on changing one after another in a cyclic order. The change in season is caused by two factors; namely : Tilted axis of the earth and revolution of the earth.



Tilted Axis of the Earth

The sunlight does not fall equally on the earth. In the portion of the earth, where sunlight falls directly, the temperature rises and becomes hot. Whereas in the portion of the earth where sunlight falls tilted, the temperature falls. It does not get sunlight directly and becomes cold.

Revolution of the Earth

The earth revolves around the sun and the position of the earth goes on changing with respect to the sun. The portion of the earth tilted towards the sun gets more sun light directly so, it becomes hot. The portion of the earth tilted away from the sun gets less sunlight, so it becomes cold. The earth takes about 365 days to complete one round around the sun. This is known as **revolution of the earth**.

Summer Season

During summer season, the rays of the sun fall straight to the earth. So it is hot. Days are longer and night are shorter. Plenty of rain falls during this season. As days are hotter, the animals which live under ground come out. We see lots of animals and insects during summer season. The trees are covered with the leaves. The flowers bloom, farmers start planting paddy and maize in this season.



Autumn Season

It is the season between summer and winter. The season is neither hot or cold during autumn season. Rainfall decreases, hot days become cooler. As the rain and heat decreases the leaves of plants become yellow and brown. They fall from the tree. Ripe fruits fall on the ground. Crops begin to ripe and look yellow. Most of the festivals are also celebrated in this season.



Winter Season

This is a cold season. The sun rays fall with the less heat and light. The sun rays falling also gradually decreases. Days are shorter and nights are longer. The weather is very cold and very little or no rainfall occurs in this season. Leaves of plants turn brown and fall. Insects, birds and animals are seen less. Some of the animals undergo hibernation in this season. There is snowfall in the mountains. We like to sit near by burning fire, taking hot drinks and wearing thick clothes.



Spring Season

The season is neither hot nor cold. The days become long and nights become short. Grasses grow, plants develop new leaves. Lots of animals start to appear. The nature looks beautiful. Wind blows with a pleasant environment.

We see four seasons in a year. After the end of one season, another season starts. The cycle of the seasons goes on year after year.



Project work

1. Draw a diagram of the solar system in a chart paper arranging the planets in the order of their average distance from the sun.
2. Observe at night in the sky for about one week. Write a short note about your observation about moon, stars or planets.



GLOSSARY

heavenly body	: the body found in space
asteroid	: members of the solar system which are found between the orbit of mars and Jupiter and revolve around the sun
satellite	: member of the solar system, which revolves around planet
elliptical	: elongated round
axis	: the imaginary line which connects north and south poles
anti clock wise	: in the opposite direction of the motion to the hand of a watch
full moon	: when the total bright part of the moon faces towards the earth and it appears complete
new moon	: when the total dark part of the moon faces towards the earth and it is not seen in the sky
umbra	: dark shadow of a body
penumbra	: bright shadow of a body



A. Choose the best answer from the given alternatives.

- a. The heavenly body which revolves around a planet is a:
 - i. Satellite
 - ii. Comet
 - iii. Meteor
 - iv. Star
- b. The path of the earth around the sun is called _____.
 - i. Axis
 - ii. Orbit
 - iii. Eclipse
 - iv. Year
- c. Which one of the following planets is a swift planet ?
 - i. Mercury
 - ii. Neptune
 - iii. Earth
 - iv. Saturn
- d. The heavenly mass which has a tail-like structure is.
 - i. Planet
 - ii. Satellite
 - iii. Comet
 - iv. meteor
- e. Which planet can float in the water and considered as the lightest one?
 - i. Jupiter
 - ii. Saturn
 - iii. Uranus
 - iv. Venus
- f. Which of the following is known as the blue planet ?
 - i. Mercury
 - ii. Venus
 - iii. Earth
 - iv. Saturn

B. Fill in the blanks.

- i. There are _____ planets in our solar system.
- ii. Soil is formed by the _____ of rocks.
- iii. _____ is the biggest planet.
- iv. The path of revolution of a planet around the sun is called its _____.
- v. There is possibility of living organisms in other planets like _____.
- vi. Diameter of the earth is about _____ km.
- vii. Mercury has no _____.

- viii. The diameter of the moon is about _____ km.
- ix. The diameter of the Sun is about _____ km.
- x. The diameter of the earth is about _____ km.
- xi. The distance of between the earth and the moon is about _____.
- xii. During a lunar eclipse , the _____ caste its shadow on the _____.

C. Match the following.

Column A

Earth's day

Moon's day

Season

Umbra

Day and Night

Column B

Shadow

27.33 days

24 hours.

rotation of earth

revolution of earth

D. Answer these questions.

- i. What do you understand by solar system?
- ii. Name the planets according to the distance from the sun.
- iii. Write in short about biggest and smallest planet.
- iv. Compare the size of the sun, earth and moon.
- v. What do you understand by umbra and penumbra?
- vi. Define planets.
- vii. Why is life possible on the earth?
- viii. What are the earth's day and earth's year?
- ix. Write in short about the Sun.
- x. What are planets ? Name all the planets.
- xi. There is a very great difference between the size of the moon and the sun but both of them are seen roughly equal in size in the sky. Why ?
- xii. How is soil formed?
- xiii. Why does it take many years to form soil from rock?
- xiv. What is soil profile? Draw labelled diagram of soil profile.

E. Differentiate between:

- i. The Sun and the Earth

- ii. The Earth and the Moon
- iii. Stars and planets
- iv. The Moon and the Sun
- v. Umbra and penumbra

F. Give reasons.

- a. Living things cannot survive on the moon.
- b. We cannot survive in the absence of the sun.
- c. Living things can survive on the earth.
- d. There is no possibility of organisms on mercury.
- e. Mars is also called the red planet.

G. Digrammatic questions

- i. Fill in the blanks.

moon	month	light	star
hours	planet	year	sun

The sun is a _____ .

It puts out heat and _____ .

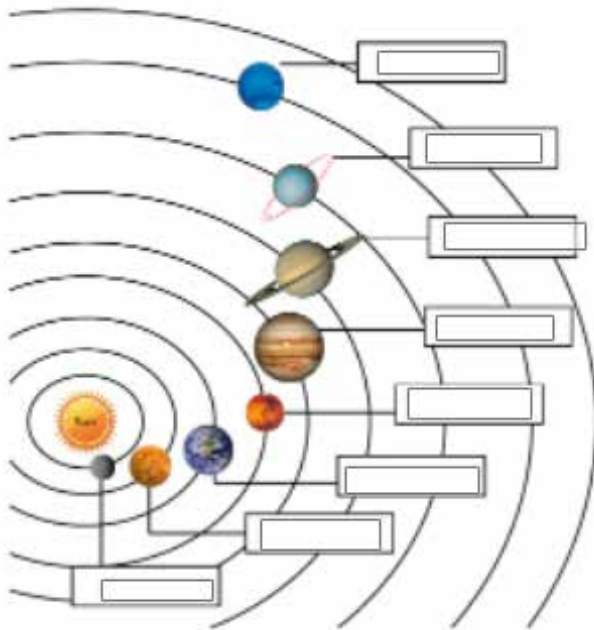
The earth is a _____ . it spins around,
or revolves, once every 24 _____ .

The earth goes around the _____
in about one _____ .

The _____ goes around the earth
in about one _____ .

How many times have you traveled with the earth around the sun?

ii. Identify the planets and write their names.



Label the following figure.

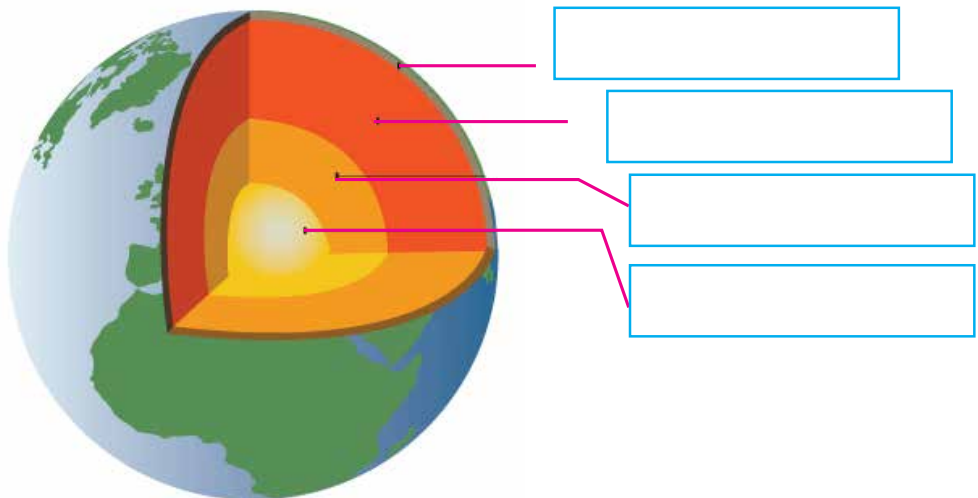


fig. model of internal structure of earth.