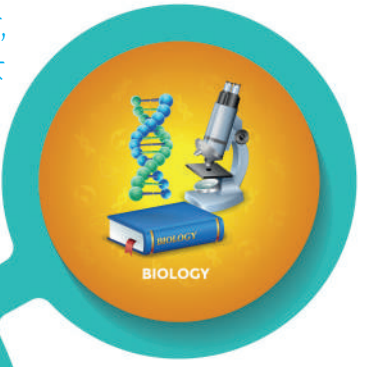
(नेपाल सरकार शिक्षा, विज्ञान तथा प्रविधि मन्त्रालय, पाठ्यक्रम विकास केन्द्र, सानोठिमी भक्तपुरद्वारा मिति २०७९/११/०३ मा शैक्षिकसत्र २०८०, २०८१ र २०८२ का लागि स्वीकृति प्राप्त)

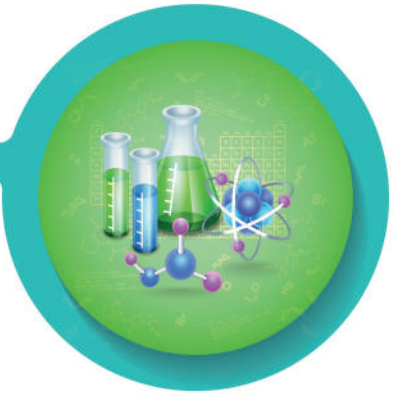


NIRANTAR SCIENCE & TECHNOLOGY

Class 5

Author

Dinesh Yadav



निरन्तर प्रकाशन

Nirantar Prakashan

www. nirantarprakashan.com.np

Book : Nirantar Science & Technology Book - 5

Author : Dinesh Yadav

Publisher : Nirantar Prakashan
Putalisadak, Kathmandu-29, Nepal
Copyright : © Nirantar Prakashan
Contact : www.nirantarprakashan.com.np
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Tel. 01-4546384

First Edition : 2080 (New Curriculum)

Design : Nirantar Desktop
Putalisadak, Kathmandu

Price : Rs. 348.00

Printed in Nepal.

Nepal

PREFACE

Nirantar Science & Technology as a series I-X grade has been prepared strictly in a line to the recently upgraded syllabus and curricula issued by Curriculum Development Centre, Sanothimi, 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 2076 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 author 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 new curriculum 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, 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.

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

- Author

Approved by CDC, Nepal

NIRANTAR
SCIENCE &
TECHNOLOGY
CLASS 5

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Unit 1

Scientific Learning

Total Estimated pariods (Th. 8+ Pr. 2=10)

Student's Learning Outcomes

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

- introduce the scientific learning process
- perform general activities related to observation, experimentation, and inquiry.
- explore the importance of observation, experiment, and inquiry in scientific study
- make schematic drawings of scientific instruments and mention their uses.
- using a meter scale, balance, and stopwatch, measure length, mass, and time.
- measure the volume of liquids and solids with the help of measuring cylinders

Look at the small garden below. Are the leaves and flowers of all the plants in the garden the same? Discuss the reasons for this in the classroom and draw conclusions.

1.1 Scientific Learning

An Introduction to the Scientific Learning Process

Scientific learning is the use of scientific knowledge to identify questions and objects or events to understand about them, finding logical answers to our curiosity to make a decision and reach a conclusion.Its allows an understanding of the scientific process and makes it possible to apply evidence-based knowledge across a broad range of issues that require individual and collective action (such as responding to COVID-19 and climate change, or understanding AI, machine learning and other new technologies).Scientists use a dynamic, open-ended process to investigate questions. Here are the five steps.

i. Define a Question to Investigate

As scientists conduct their research, they make observations and collect data. The observations and data often lead them to ask why something is the way it is. Scientists pursue answers to these questions in order to continue with their research. Once scientists have a good question to investigate, they begin to think of ways to answer it.

ii. Make Predictions

Based on their research and observations, scientists will often come up with a hypothesis. A hypothesis is a possible answer to a question. It is based on: their own observations, existing theories, and information they gather from other sources. Scientists use their hypothesis to make a prediction, a testable statement that describes what they think the outcome of an investigation will be.

iii. Gather Data

Evidence is needed to test the prediction. There are several strategies for collecting evidence, or data. Scientists can gather their data by observing the natural world, performing an experiment in a laboratory, or by running a model. Scientists decide what strategy to use, often combining strategies. Then they plan a procedure and

gather their data. They make sure the procedure can be repeated, so that other scientists can evaluate their findings.

iv. Analyze the Data

Scientists organize their data in tables, graphs, or diagrams. If possible, they include relevant data from other sources. They look for patterns that show connections between important variables in the hypothesis they are testing.

v. Draw Conclusions

Based on whether or not their prediction came true, scientists can then decide whether the evidence clearly supports or does not support the hypothesis. If the results are not clear, they must rethink their procedure. If the results are clear, scientists write up their fi ndings and results to share with others. The conclusions they draw usually lead to new questions to pursue.

General observational activities

The scientific observation definition is any sensory experience about a natural phenomenon. Scientific observations can occur in a lab setting or the natural world. For example, watching an apple fall from a tree could be an observation. Noticing that fish only come to a particular part of the river in the early morning is also an observation. Smelling garbage decomposing is another example of observation. Observations can use any of the five senses and include anything that can raise a question or start an investigation.

Fig.1.1 : Observing how apples tend to fall from trees is an example of a scientific observation

Observations are essential in science because they are

the starting material for scientific questions and experiments. Noticing different phenomenon in the environment is a necessary step to asking questions and finding out information. Sometimes, making observations will raise questions. But, observations are also used to answer questions. For example, a variable is changed during an experiment, and scientists make observations about those changes. These observations provide data to answer the question that was asked.

For example, suppose a gardener notices that the plants near the window are growing faster than the plants farther away. This is an example of scientific observation. This observation makes the gardener ask the question, "how does light affect plant growth?" To answer the question, the gardener conducts an experiment and uses two identical plants but places one in the window and one away from it. He gives them the same amount of fertilizer and water and records their growth. The observations about the plant growth help him answer the question and determine if the sunlight from the window is making the plants grow faster.

Scientists make observations using a wide variety of techniques. The most basic way to create observations is to view them, such as the gardener measuring the height of the plants. However, many observations are made about things that cannot be seen with the naked eye. Some things, such as cells, can be observed with a microscope. For others, like proteins or chemical structures, there are other ways to detect them, including immunofluorescence, sequencing, and crystallization techniques. For example, structures deep within the Earth cannot be seen with the naked eye but can be observed using different technologies such as seismology, which senses Earth's vibrations.

In addition, a scientist may grow two populations of cells and alter the DNA of one. Then, the scientist can isolate cells and examine protein location, function, and quantity as observations. This will tell the scientist about the importance of that specific section of DNA.

Activities 1.1

i. Making observations

Scientists make **observations** by using their five senses to collect informations about the natural world .

Let's go Grade 5 Scientists, it is time do some observing.

Which of your five senses could you use to observe a rock like the one is the picture below?

Instruction: Tick the correct box to select which of the five sense you cold use to get information about the rock.

1. **The rock is rough or smooth.**
   Seeing hearing smelling tasting feeling
2. **The rock is gray in colour.**
   Seeing hearing smelling tasting feeling
3. **The rock is odourless.**
   Seeing hearing smelling tasting feeling
4. **The rock is salty.**
   Seeing hearing smelling tasting feeling
5. **The rock does not make any sounds on its own.**
   Seeing hearing smelling tasting feeling

ii. Observe the two pictures given below. Compare and write your observation.

General activity related to practical

Science learning is practical-oriented and requires practical activities in the laboratory. It employs experiments using enriching learning materials to equip learners with appropriate knowledge, skills, attitudes and behaviours. It involves experimentation that uses hands-on and minds-on activities for better understanding.

Practical activities may be defined as an act of science students engaging and equipping themselves on hand-onskills. Practical work is important because it provides opportunities to perform various hand- on- activities. These practical works also give us many opportunities to use our minds to discover general laws and principles of science. Practical activities promote conceptual change, motivation and excitement for enriching science learning. Furthermore, practical activities develop skills, attitude and interest that simplify science concepts. Learning by doing can be achieved only by doing experimentation.

If you throw a stone in a pond of water, circular water waves (ripples) are produced on the surface of water like expanding rings. These water waves carry energy given by the stone in all directions without the actual movement of water. This is an example of elastic wave motion. Sound is also an example of wave motion.

If a glass of water covered with a piece of small cardboard is turned upside down slowly and carefully, the water does not fall down. This is due to the atmospheric pressure acting on the cardboard from below.

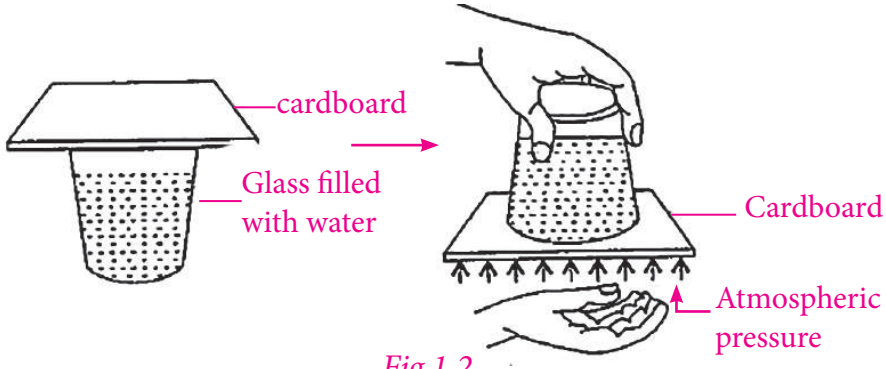


Fig.1.2

Lamps etc. are the artificial source of light. We can play with transparent, translucent and opaque objects and discover that only opaque objects form shadows. We can play with shadows of fingers on a wall. We can make a sun dial with the help of shadows of a stick in the sun.

Fig.1.3

Following are the importance of practical work of science:

i. Learning by doing:

Practical work follows the basic principle of Learning by doing. The students gets an opportunity to activity participate in the learning process.

ii. Training for adjustment:

When students know elementary things about electricity, electronics, sanitation etc. they depend less on others for minor repairs.

iii. Scientific knowledge and Scientific Outlook:

Practical work helps in acquiring of scientific knowledge and scientific outlook, the twin main objectives of teaching science.

iv. Handing of Objects:

By doing experiments students learn how to handle and operate apparatus etc.

v. Development of good habits:

Through practical work the students learn many good habits like resourcefulness, initiative, co-cooperation etc.

vi. Satisfaction of curiosity:

Validity of the concepts learned by the students can be tested by experimentation. This satisfies basic human desire of knowledge of what, how and why of things.

vii. Development of Scientific attitude:

Lab work develops scientific attitude and scientific temper.

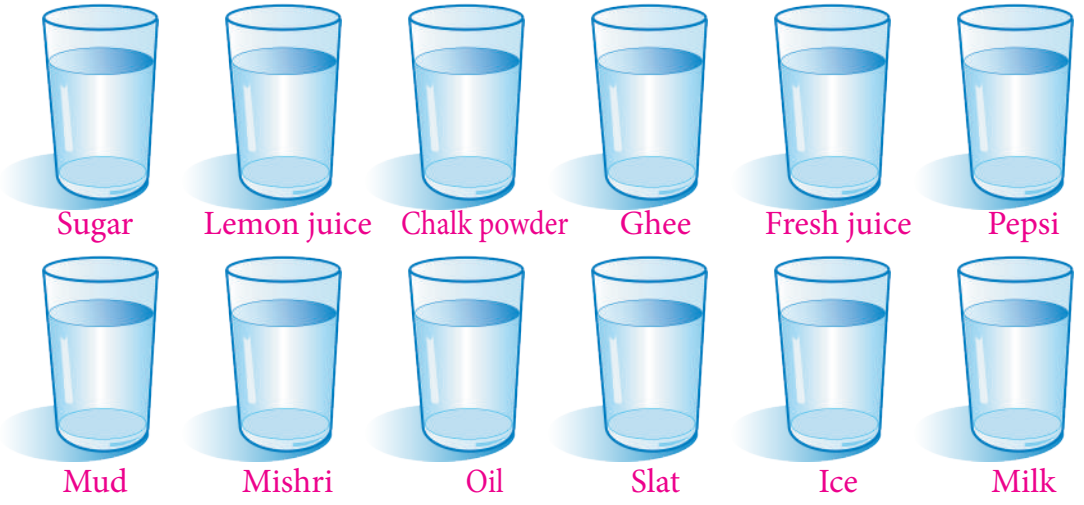
viii. Motivation:

By doing experiments, students are motivated to know more and more of science.

Activities 1.2

Experiments

Water is a universal solvent because it can dissolve many substances in it. Check by experimenting the following things and colour the glass with blue colour on which the soluble thing is written.



General activities related to inquiry

Scientific inquiry is a form of problem-solving and questioning that helps

people come to a greater understanding of observable phenomena. An understanding of this style of scientific reasoning forms the basis upon which the nature of science itself rests. Once you become familiar with scientific inquiry, you can use it for specifically science-related study or as just one additional tool in your arsenal of critical thinking skills.

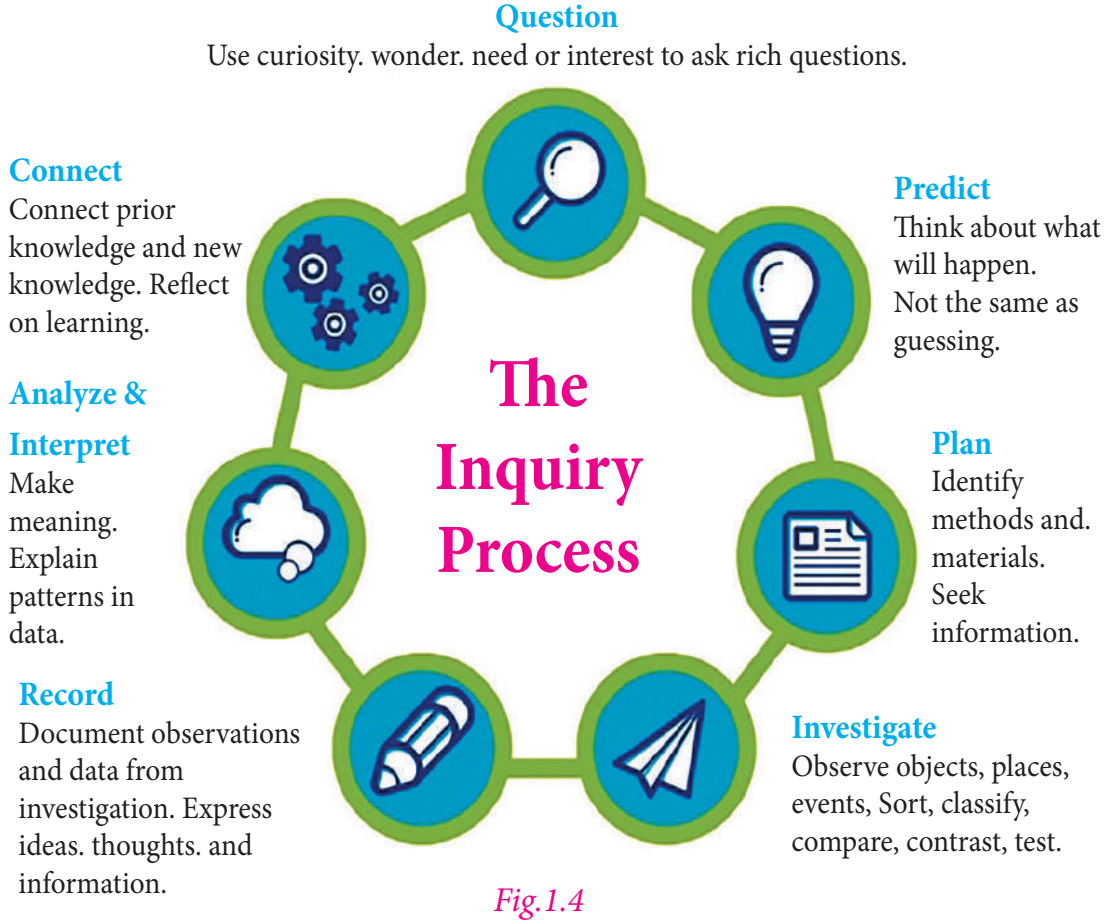


Fig.1.4

Scientific inquiry is a learning approach that combines the scientific process with inquiry learning. It refers to the steps and strategies used to investigate a science-related topic, question, or problem.

The scientific method (also known as the scientific process) refers to a process for experimentation. This process includes a series of steps. When students use the scientific method, they are doing things like observing, asking questions, and gathering evidence.

Activities 1.3

Scientific inquiry

Directions: On the line before each definition, write the letter of the term that matches it correctly. Each term is used only once.

☐	1. a statement of what will happen next in a sequence of events	A. science
☐	2. an explanation of observations or events that is based on knowledge from many observations and Investigations	B. observation
☐	3. a logical explanation of an observation that is drawn from prior knowledge or experience	C. hypothesis
☐	4. a possible explanation for an observation that can be tested by scientific investigations	D. prediction
☐	5. the investigation and exploration of natural events and the new information that results from those investigations	E. inference
☐	6. using one or more of your senses to gather information and taking note of what occurs	F. scientific theory
☐	7. a rule that describes a repeatable pattern in nature	G. critical thinking
☐	8. the practical use of scientific knowledge, especially for industrial or commercial use	H. technology
☐	9. comparing what you already know with the information you are given in order to decide whether you agree with it	I. scientific law

Activities 1.4

Your friend sees this image of a circle of mushrooms and excitedly tells you it was caused by fairies dancing in a circle on the grass the night before. Can your friend's explanation be studied using the process of science?

The importance of observation in scientific studies

Observing is something we often do instinctively. It helps us decide, for instance, whether it is safe to cross the road. But observation is simply more than noticing something. It involves perception–we become aware of something through our senses. It also involves the recognition of the importance of what we're perceiving. Standing on a roadside, our eyes tell us cars are quickly approaching. We recognise that stepping in front of a car is dangerous, so we wait until the road is clear.

The Importance of Experiments in Scientific Studies

Experiments have an important place in the development of science because experiments are used to test the reality of a thought, an axiom, or a phenomenon with a theoretical basis and to turn it into a law or a theorem such as Newton laws. However, in some cases, the results obtained from a single experiment do not resemble reality completely. In other words, obtaining the desired result in an experiment does not mean that the axiom in question is absolutely correct. Results may change over different trials or different conditions. Therefore, it is important that the experiment itself should be repeatable.

A repeatable experiment should yield the same results when conducted by different people at different times and preferably —but not

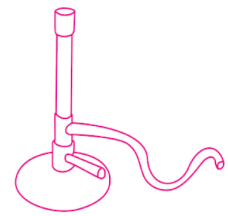
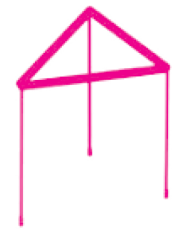
necessarily— under similar conditions. Scientists performing repeatable experiments must be well-known in their fields and have no connection to the claimant. The more a theory or an axiom is supported by experiments, the more its validity is accepted.

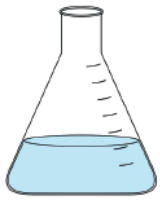
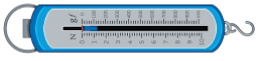
The importance of inquiry in scientific studies

Engaging students in scientific inquiry is an important component of science instruction that helps students develop scientific literacy and provides them with the opportunity to practice important science process skills in addition to critical thinking and problem solving skills.

Scientific instruments

A scientific instrument is a device or tool used for scientific purposes, including the study of both natural phenomena and theoretical research.

Scientific instrument	Introduction	Schematic diagram
Bunsen burner	The Bunsen burner, named after and co-designed by Robert Bunsen in 1854, is a common laboratory instrument that produces a hot, sootless, non-luminous flame. The Bunsen Burner allows for precise regulation of the mixing of gas and oxygen in its central barrel before combustion, which ignites the flame.	
Tripod	A laboratory tripod is a piece of three-legged equipment commonly used to conduct experiments in laboratories. It is used as a platform to hold and support glassware, such as beakers and flasks, during experiments and when the glassware is not in use. A tripod's height is easily adjustable to fit varying individual requirements.	

Conical flask	The Erlenmeyer Flask, also commonly known as the conical flask or titration flask was designed and named after the German chemist Richard August Carl Emil Erlenmeyer. Erlenmeyer Flasks have a wide, flat bottom and an inverted cylindrical neck.	
Round Bottom flask	The boiling flask, also known as a round bottom flask, is a chemical vessel with a spherical body and a cylindrical neck. It is most often used when heating solutions, particularly for distillation.	
Measuring cylinder	A Measuring Cylinders / graduated cylinder / cylinder measuring / mixing cylinder is a piece of laboratory apparatus used to measure the volume of a liquids, chemicals or solutions during the lab daily work. Graduated cylinders are more precise and accurate than the common laboratory flasks and beakers.	
Beam balance	A scale is a type of device, with the help of which we can know the total quantity of any object having a certain mass. This is a common device. It is used in other developing countries, including Nepal. But in other developed countries, this type of measuring device is rarely used.	
Spring balance	A spring balance is used to measure the weight of an object and the mass is measured by a beam balance.	
Thermometer	An instrument for measuring and indicating temperature, typically one consisting of a narrow, hermetically sealed glass tube marked with graduations and having at one end a bulb containing mercury or alcohol which extends along the tube as it expands.	

1.2 Measurment

Measurement is a comparison of an unknown quantity with a known fixed quantity of the same kind. The value obtained on measuring a quantity is called its magnitude. Magnitude of a quantity is expressed as numbers in its units.

Measurement is the basic concept in the study of Mathematics and Science. Measurement quantifies the characteristics of an object or event, which we can compare with other things or events. Measurement is the most commonly used word, whenever we deal with the division of a quantity. Also, in taking a certain amount of things to accomplish a particular task. In our daily existence, we often come across different measurement types for length, weight, times, etc.

Measurement is a technique in which the properties of an object are determined by comparing them to a standard quantity. Also, measurement is the essential metric to express any quantity of objects, things and events.

Measurement Units

We have units of measurement for different types of measurement as mentioned above. Let's have a look at the below units of measurement.

Time: Units for expressing time include seconds, minutes, hours, days, weeks, months, years, etc.
Length: Units for measuring length include millimetres, centimetres, meters, kilometres, etc.
Weight: Units for expressing the weight of certain objects include grams, kilograms, tons, etc.
Volume: Units for expressing volume include cm^3, m^3, litres, etc.
Temperature: The major units of temperature include centigrade and fahrenheit.
It is also possible to perform the conversion of units from one unit to another.

Applications of Measurement

Measurement is an important concept for the following situations.

- To construct buildings, we need to consider proper dimensions.
- For trading, purchasing, and selling of goods
- For preparing food, we generally take the ingredients in specific quantities
- For conducting scientific experimentations in labs
- To complete a certain task, time is the crucial thing to count.

Measures of length

Length is the longest extent of anything as measured from end to end. Measurement of Length is the one in which lengths are measured in varied forms. A small length is measured in cm and mm. While a large length is measured in m and km. Other than this, if we see the Standard Unit of Length = 'Meter'. Or, we can express it as 'm'.

1 m Length is divided into 100 equal coins. Moreover, each division is called cm or Centimetre. So, 1m = 100 cm. The largest distance is generally measured in Kilometre, whose Length is divided into 1000 equal divisions. Furthermore, this division is named Meter. In this manner, 1 km = 1000 m.

Length

In the above figure, length is used to measure how long the line is.

As per the length conversion charts, units of lengths and their counterparts are:

- 1 Kilometre (km) = 10 Hectometres (hm) = 1000 m
- 1 Hectometre (hm) = 10 Decametres (dam) = 100 m
- 1 Decametre (dam) = 10 Meters (m)
- 1 Meter (m) = 10 Decimetres (dm) = 100 cm = 1000 mm
- 1 Decimetre (dm) = 10 Centimetres (cm)

- 1 Decimetre = 0.1 Meter
- 1 Centimetre (cm) = 10 Millimetres (mm)
- 1 Centimetre = 0.01 Meter
- 1 Millimetre = 0.001 Meter

Likewise, remember

- 1 mile = 1760 yards
- 1 mile = 5280 feet
- 1 yard = 3 feet
- 1 foot = 12 inches

Measures of mass

Mass can be best understood as the amount of matter present in any object or body. Everything we see around us has mass. For example, a table, a chair, your bed, a football, a glass, and even air has mass. That being said, all objects are light or heavy because of their mass.

There are various units for calculating mass, like, kilograms, grams, lbs, pounds, etc., but the SI unit of mass is "kilograms" or kg. Every unit of mass can be converted to other units by using a proper conversion formula without affecting the meaning and essence of the quantity to be measured.

Note: 1kg is equal to 1000 grams.

Formulae to measures the Mass

Mass can be calculated with three potential ways:

a. Mass=density x volume ($m=\rho V$)
b. Mass= force/acceleration ($m=F/a$)
c. Mass= weight/gravitational acceleration ($m=W/g$)

Mass is a fundamental property that cannot be defined as per the other units like newton (in which weight is measured in) or joule. Other ways are also there to explain 'how to measure mass.'

People often get confused between mass and weight and they end up using these two terms interchangeably. However, mass and weight are two different terms and it is important to understand the difference between them. The difference between mass and weight is shown in the table given below.

	Mass	Weight
Definition	Mass is defined as the amount of matter in a substance	Weight is defined as the amount of force acting on the mass of an object because of acceleration due to gravity.
Denotation	Mass is represented by “M.”	Weight is represented by “W."
Formula	• Mass is always constant for a body. • One way to calculate mass: Mass = volume × density.	• Weight is the measure of the gravitational force acting on a mass. • Formula of weight: Weight = mass × acceleration due to gravity
Unit of Measurement	The SI unit of mass is "kilogram".	The SI unit of weight is Newton (N).
Quantity Type	• Mass is a base quantity. • Mass only has magnitude and hence, it is a scalar quantity	•Weight is a derived quantity. • Weight has both magnitude and direction (toward the center of gravity) and hence, it is a vector quantity.
Measuring Instrument	Mass can be easily measured using any ordinary balance. For example, beam balance, lever balance, pan balance, etc.	Weight can be measured by a spring balance or by using its formula given above.

Did you know that we have different weights on the earth, the moon, and in space? However, our mass is the same everywhere.

Fact on Mass and Weight

Mass on Earth = Mass on Moon = Mass on Space

Weight on Earth ≠ Weight on Moon ≠ Weight on Space

Mass is constant, Weight is variable

Now, let us look at some important facts related to mass:

- Mass only has magnitude, hence, it is a scalar quantity.
- Weight has both magnitude and direction; it is a vector quantity.
- Mass can also be defined as "stored energy in particles."
- Mass represents the total atoms or particles that it contains.

Activities 1.5

i. Collect any five different objects around you. Measure the mass of all those items using a physical balance, a pan balance, or another balance. Write all of them in kilogram and gram units. What is the heaviest thing you have collected?

ii. Measure your weight with the help of a balance. Measure the weight of your classmates as well. Write the name of the friend who has the most and least mass.

Mass (weight) Units

The Metric System of Measurements uses the mass units: miligram (mg), gram (g) and kilogram (kg) . Standard unit of mass is kilogram. We commonly use grams and kilograms to measure mass. Gram is the basic/standard unit of mass which is written as 'g'. All units of mass are related to each other.

We measure small masses in cg and mg and large masses g and kg.
Kilogram (kg) → Biggest unit
Gramm (g)
Miligram(mg) → Smallest
Note : Sometimes we use the tonne (t) , too.

Unit of mass conversion table

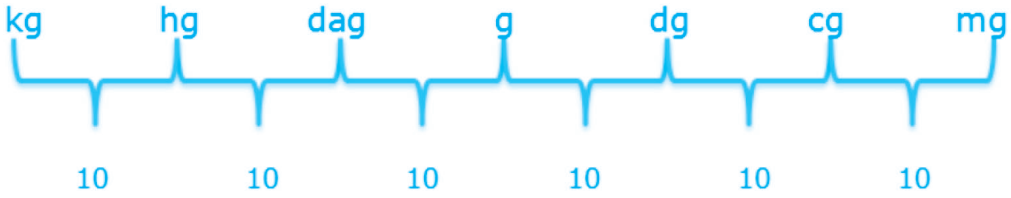


Fig.1.5

According to the mass conversion charts, units of masses and their equivalents are:

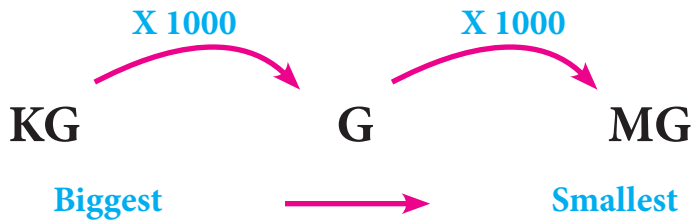
1 kilogram (kg) = 10 Hectograms (hg) = 1000 g
1 Hectogram (hg) = 10 Decagrams (dag) = 100 g

1 Decagram (dag) = 10 Grams (g)
1 Gram (g) = 10 Decigrams (dg) = 100 cg = 1000 mg
1 Decigram (dg) = 10 Centigrams (cg)
1 Decigram = 0.1 Gram
1 Centigram (cg) = 10 Milligrams (mg)
1 Centigram = 0.01 Gram
1 Milligram = 0.001 Gram

An easy way to remember the above conversion chart is the following statement:

King	Harry	Died	Grandma	Didn't	Cry	Much
Kilogram	Hectogram	Decagram	Gram	decigram	centigram	miligram

While converting from a larger unit to a smaller unit, we multiply



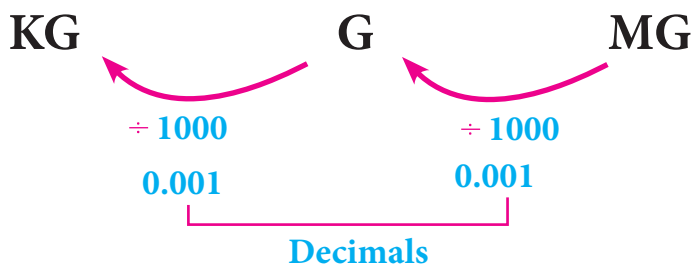
Activities 1.6

Convert

i. 3 g to mg.

ii. 2.5 kg to grams

While converting from a smaller unit to a larger unit, we divide.



Activities 1.7

Convert

i. 20 g to hg.

ii. 5 g to kg.

Measures of time

Time is a period which is measured in second, minutes, hours, days, years, etc. The tool used to measure time is the clock.

60 seconds = 1 minute
60 minutes = 1 hour
24 hours = 1 day
365 days = 1 year

Time can also be defined as a function that takes in three numbers, a day (1 to 31), a month (1 to 12), and a year (say 2079) and gives back an integer.

For example,

Consider 2026/06/21, this function has 3 numbers, a day (21), a month (06), and a year (2026). When time is defined in this way, it is also called a date. When we convert higher units of time to its lower units, we multiply. When we convert lower units of time to higher units, we divide.

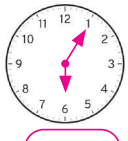
Activities 1.8

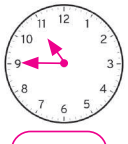
i. You form a group of friends. Make a mark at a distance of 100 meters. Now run a distance of 100 meters in turns and complete it. Let the stopwatch measure the time taken to cover that distance. Express the time in minutes and seconds. Find the fastest running buddy.

ii. Match the time with clock.

01 : 15

06 : 05


07 : 40


05 : 10

08 : 20

10 : 45

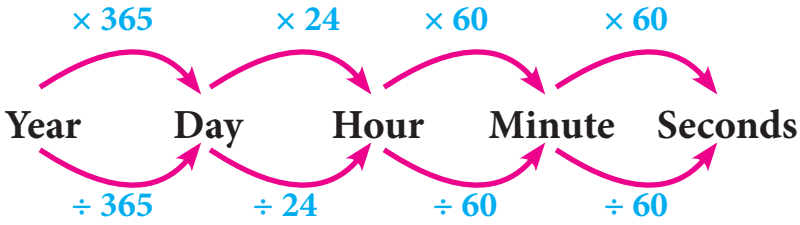


Fig.1.6

Example

i. Write 4 hours 5 minutes 60 seconds in terms of seconds.

Solution:

Converting hours & minutes into seconds we get:
4 hours= 4X60 minutes= 4X60X60 seconds= 14400 seconds
5 minutes= 5X60 seconds= 300 seconds
Adding all the units in seconds term we get:
= (14400+300+60) seconds
=14760 seconds

Hence, 4 hours 5minutes 60 seconds in terms of second is 14760 seconds.

ii. Phulkumari's date of birth is the thirtieth day of the eighth month of the year nineteen ninety-six. Write it in date format.

Solution:

The day is 30^{th} day

Month= 8th

Year= 1996

Therefore, Date of Birth= 30/8/1996 [Ans]

Measures of volume

Look at an object next to you and describe it. There are many ways to describe an item. For example, you might talk about its color, shape, and size or whether it's hard or soft. When you talk about an object in this way--based on what it looks like, feels like, or by taking simple

measurements--you are describing its physical properties. Objects have many physical properties. One physical property that you may not have heard of is volume.

Volume refers to the amount of space the object takes up. In other words, volume is a measure of the size of an object, just like height and width are ways to describe size. If the object is hollow (in other words, empty), volume is the amount of water it can hold.

Activities 1.9

Take a large cup and a small cup. Fill the small cup with water, then pour the water into the big cup. Since the amount of water that filled the small cup is not enough to fill the large cup, what can you figure out about the volume of the cups?

The smaller cup has less volume.

It is important to keep in mind that volume is NOT the same as weight. Weight is also a physical property, but unlike volume, it refers to how heavy something is. For example, something that is large and made of plastic, like an empty milk jug, is going to weigh a lot less than something that is large and made of metal, like a cooking pot.

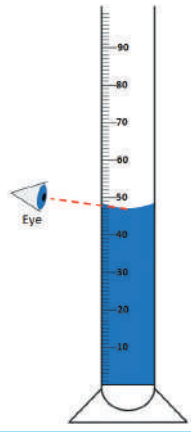
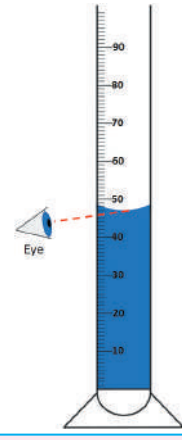
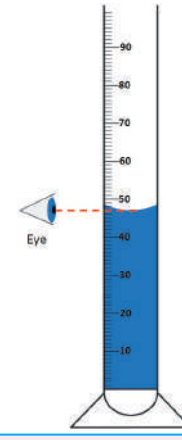
The volume formula of a regular object can be derived. The volume of an irregular object can be determined using a measuring cylinder. The volume of liquids, including water, is expressed in units of cubic meter or cubic centimeter, liters, and milliliters.

A graduated cylinder, also known as a measuring cylinder or mixing cylinder, is a common piece of laboratory equipment used to measure the volume of a liquid. It has a narrow cylindrical shape. Each marked line on the graduated cylinder represents the amount of liquid that has been measured.

There are many different size measuring cylinders. Measuring cylinders measure volume in millilitres (also known as centimetres

cubed). You must get down to 'eye level' to read a measuring cylinder accurately.

Reading a Measuring Cylinder

			
When water is in a tube the water sticks to the sides making a 'U' shape called a meniscus. This makes it difficult to read a measuring cylinder accurately.	If you are too high you will read a bigger volume than there is. In this case 48ml.	If you are too low you will read a smaller volume than there is. In this case 46ml.	When you get to 'eye level' you will read an accurate volume of water. In this case 47ml.

It depends on whether you are trying to measure the volume of a solid object or of a liquid. For both materials, the basic idea is that the volume or volume change within the cylinder is correlated with the motion of the top surface of the liquid. To measure a liquids volume, find the nearest tick to the top surface of the liquid,also known as the "meniscus", and record ththe value next to the tick. This value is the volume of the liquid in the cylinder. To measure the volume of solid objects, you will need to

i. Measure the volume of the initial liquid, via the tick marks on the cylinder.

ii. Place the object in the liquid, ensuring that the object is completely submerged.

iii. Measure the volume of the liquid/solid combination, via the ticks on the cylinder.

iv. Subtract the volume of the initial liquid from the volume of the liquid/solid combination.

The subtracted value is the volume of the solid object.

One final point to note is that the meniscus will not normally look like a straight line, but rather as depicted below. To get a correct volume value, take the measurement from the apparent center of the meniscus, as shown in the figure.

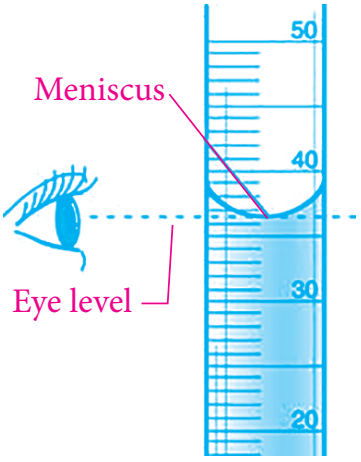


Fig.1.7

Liquid measuring cups are the most accurate way to measure thin liquids, like water, milk, juice, and oils. Other instruments for measuring liquids include a measuring cylinder, a measuring flask, a beaker, a pipette, a burette, etc.

Activities 1.10

Fill a pot halfway with water. Find the volume of the water by pouring it into the measuring cylinder.

There are multiple units or standards of measurement. The most common and preferred measurement standards for solids and liquids are cm^3(CC) or cubic centimeter or millilitres (ML). CC and ML can

be considered as the same because 1 CC is equal to 1 ML and hence are synonymous.

The amount of a liquid that would accommodate in 1 CC will be the same that will accommodate in 1 ML. So, from this perspective CC and ML could be considered equivalent words.

1 cubic meter will equal 1000000 CC and if one has to relate it to ML it would be 1000000 ML. 1,000 cubic centimeters of water will fit into a 1-liter bottle. CC is precisely 0.0001 percent of a cubic meter.

However, there are subtle differences between the two. The difference between CC and ML is that CC is used for the measurement of solids, while ML is used for the measurement of liquids.

The measures to volume of solid (irregular and regular objects)

The method for determining the volume of a solid depends on its shape.

Regular Geometric Shapes

The volume of a solid object with a regular geometric shape (rectangular box, cube, cylinder, sphere) can be determined using the volume formula for the shape.

Here are the formulas for some of the most common shapes:

1. Cube = s^3 where s is the length of the side.
2. Sphere = $(4/3)\pi r^3$, where r is the radius.
3. Cylinder = $\pi r^2 h$, where r is the radius and h is the height.
4. Cone = $(1/3)\pi r^2 h$, where r is the radius and h. is the height.
5. Rectangular solid (volume of a box) = lwh where l is the length, w is the width and h is the height (a simple pool may serve as an example of such shape).
6. Pyramid = $(1/3)Ah$ where A is a base area and h is the height. For a pyramid with a regular base, another equation may be used as

well: Pyramid = $(n/12)hs^2 \cot(\pi/n.)$, where n is a number of sides s of the base for a regular polygon.

For example, a good approximation of the volume of the battery shown below could be made using the formula for the volume of a cylinder.

Fig.1.8

This battery measured 4.94 cm in height and 1.42 cm in diameter, giving a volume of 7.82 cm^3 or 7.82 ml.

Irregularly Shaped Objects

Because many objects are not regularly shaped their volume cannot be determined using a volume formula. The volume of these objects can be found by water displacement. A volume of water sufficient to cover the object is placed in a graduated cylinder and the volume read. The object is added to the cylinder and the volume read again. The difference between the two volumes is the volume of the object. This method is demonstrated using the same battery used above.

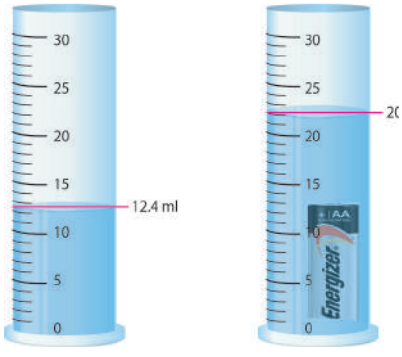


Fig.1.9

The first volume reading (on the left) is 12.4 ml. After the battery has been added, the second volume reading (on the right) is 20.2 ml. The volume of the battery is 20.2 - 12.4 or 7.8 ml.

Activities 1.11

i. Measure the volume of any container used in your kitchen. Make a report about it and present it to the class.

ii. Calculate the volume of regular objects like a classroom, a geometry box, and a desk and present it in the classroom.

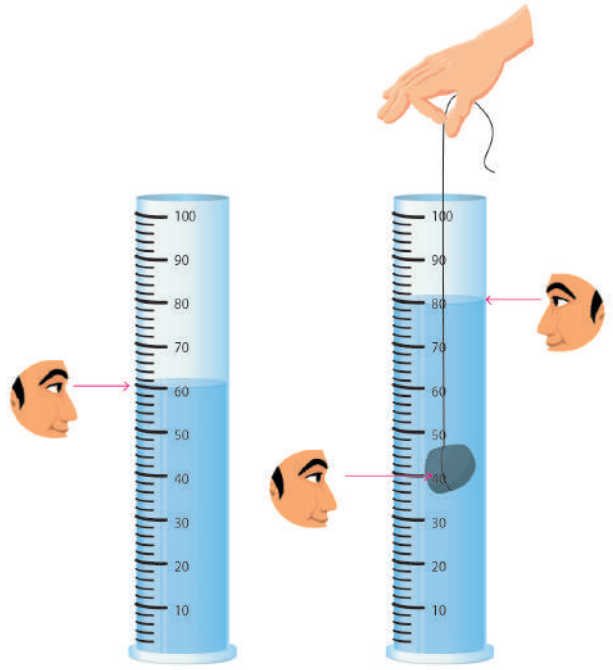
iii. To measure the volume of a piece of stone.

Things required:

A piece of brass, A measuring cylinder, Fine thread of sufficient length, Water

Procedure:

Place a measuring cylinder on a table and fill it partially with water. Note the reading of the water level carefully. Now tie the piece of brass with a thread and dip it completely into water. We will see that the level of water rises. Note the reading of the new water level.



Volume is the measure of the space taken up by something.

- 1000 cubic millimetres (mm^3) = 1 cubic centimetre
- 1000 cubic centimetres (cm^3) = 1 cubic decimetre
- 1000 cubic decimetres (dm^3) = 1 cubic metre
- 1000 cubic metres (m^3) = 1 cubic decametre
- 1000 cubic decametres (dam^3) = 1 cubic hectometre
- 1000 cubic hectometres (hm^3) = 1 cubic kilometre (km^3)

Volume = Length (m) × Breadth (m) × Height (m)
Unit of volume is cubic length, i.e. cubic metre (m^3) cubic centimetre (cm^3) etc.

Example 1: Express 1357.912 metres in higher units and lower units.

Solution:

Kilometre	Hectometre	Decametre	Metre	Decimetre	Centimetre	Millimetre
1	3	5	7	9	1	2

1357.912 metre
= 135.7912 decametres
= 13.57912 hectometres
= 1.357912 kilometres
= 13579.12 decimetres
= 135791.2 centimetres
= 1357912 millimetres

A. Choose the correct one and put the tick mark(√).

i. Which is not a scientific learning-

a. scientific knowledge
b. identify questions and objects or events to understand about them

c. finding logical answers to our curiosity to make a decision and reach a conclusion
d. a tool used for scientific purposes

ii. Which is not the step of scientific learning-

a. measurement of an object
b. define a question to investigate
c. make predictions
d. gather data

iii. The scientific observation definition is

a. nvolve experimentation that uses hands-on and minds-on activities for better understanding.
b. any sensory experience about a natural phenomenon.
c. validity of the concepts learned by the students can be tested by experimentation.
d. a form of problem-solving and questioning that helps people come to a greater understanding of observable phenomena.

iv. A _____ is a device or tool used for scientific purposes, including the study of both natural phenomena and theoretical research.

a. practical activity b. observation
c. scientific instrument d. experiment

v. Which is not scientific instrument

a. beam balance b. tripod stand
c. measuring cylinder d. lever

vi. _____ is a technique in which the properties of an object are determined by comparing them to a standard quantity.

a. Time b. Measurement
c. Mass d. Experiment

vii. Units for expressing time is not include-

a. seconds b. days
c. weeks d. tons

viii. Units for measuring length is not include-

a. millimetres b. centimetres
c. litre d. meters

ix. Units for expressing the weight of certain object is not include -

a. grams b. kilograms
c. tons d. litres

x. Units for expressing volume is not include-

a. tons b. cubic centimeter
c. cubic meter d. litre

xi. The major units of temperature is not include -

a. centigrade b. fahrenheit
d. kelvin d. tons

xii. The distance between Kathmandu and Janakpur is 180 km. Raju travels 85 km by bus and 94.5 km by bike. Rest of distance he travelled walking. How much distance did he walk?

a. 500 m b. 0.5 m
c. 5 m d. All of the above

xiii. Convert 2567 mm into m.

a. 256.7 m b. 25.67 m
c. 2.567 m d. 2567 m

xiv. Prashant thinks that the weight and mass of a body are the same. Prove that the mass and weight of a body are different based on their formula. Choose the formula that correctly describes their relationship.

a. Mass = volume × density and Weight = mass × acceleration due to gravity.
b. Weight = volume × density and mass = mass × acceleration due to gravity.
c. Volume=weight × density and mass = mass × acceleration due to gravity.
d. None of these .

xv. Urmila is puzzled about the formula of mass. Help her choose all the correct formulas from the options given below

a. Mass = volume × density
b. Mass=Weight/acceleration due to gravity
c. Mass=newton
d. None of these

xvi. 2 hours into minutes are-

a. 60 b. 120
c. 180 d. 360

xvii. 10 meters into centimeters –

a. 100 cm b. 1000 cm
c. 10000cm d. 100000cm

xviii. Rajesh ran in a park in 3 slots. In the first slot, he ran 20 m 30 cm. In the second slot he ran 63 m and in the third slot, he ran 5000 cm. Total how long did he run?

a. 13330 cm b. 83330 cm
c. 9430 cm d. 12230 cm

xix. Sushant runs half a kilometre per day. How many centimetres does he run in 3 days?

a. 350000 b. 15000
c. 150000 d. 35000

B. Use the following words to fill in the blanks .

Science, observations , scientific, hypothesis, Scientists, laboratory, prediction,

i. _____ use a dynamic, open-ended process to investigate questions.

ii. Based on their research and _____ , scientists will often come up with a hypothesis.

ii. The _____ observation definition is any sensory experience about a natural phenomenon.

iii. Based on whether or not their _____ came true,

scientists can then decide whether the evidence clearly supports or does not support the _____.

iv. A _____ tripod is a piece of three-legged equipment commonly used to conduct experiments in laboratories.

v. Measurement is the basic concept in the study of Mathematics and _____.

C. Differentiate between these pairs.

i. Scientific learning and Scientific process.

ii. Observation and Practical.

iii. Experimentation and inquiry.

iv. Scientific instruments and measuring cylinders

v. Volume of regular objects and Volume of irregular objects.

D. Explain the following:

i. Scientists conduct their research, they make observations and collect data.

ii. A hypothesis is a possible answer to a question.

iii. Scientists organize their data in tables, graphs, or diagrams.

iv. Evidence is needed to test the prediction.

v. Observing is something we often do instinctively.

vi. Volume is a measure of the size of an object.

vii. Mass and weight are two different terms

E. Answer the following questions :

i. What is scientific learning?

ii. Write down the steps of scientific learning.

iii. Write down some examples of general activities related to observation, experimentation, and inquiry.

iv. Explore the importance of observation, experimentation, and inquiry in scientific study.

v. Write down the name of any five scientific instruments and mention their uses.

vi. Make schematic drawings of some scientific instruments.

vii. Write down the uses of a meter scale, balance, and stopwatch.

viii. How do you measure the volume of liquids and solids with the help of measuring cylinders?

F. Diagrammatic Questions :

i. Which scientific skill (observation, experiment, or research) is appropriate in the picture given below? Based on this skill, which boys in the picture feels hotter? Write for a reason.

Read the statements below each picture . Write an 'O' if the statement is an observation.

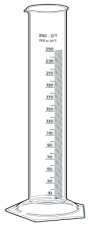
_____ I think the woman is a vet. _____ The girl is holding a cat. _____ The cat is very sick. _____ The woman likes cats.	_____ The children arc wearing backpacks. _____ They're at camp. _____ I see 3 hats.	_____ I think these kids are brother and sister. _____ They're playing chess. _____ The girl's winning because she's smiling.

ii. Write the name of each lab instrument or aquipment.

_____

_____

_____



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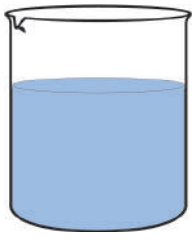

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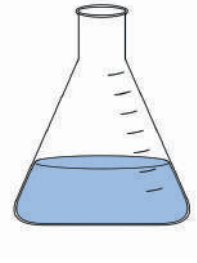

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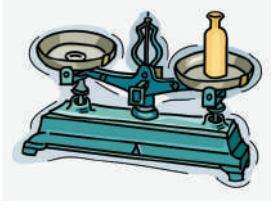

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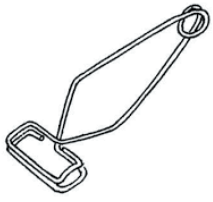


_____

balance	beaker	bunsen burner	tongs
erlenmeyer flask	funnel	graduated cylinder	ring stand
test tube clamp	test tube		

iii. The length shown in black on the scale below is that of an object. Write the length of the object in the box provided in centimeters.

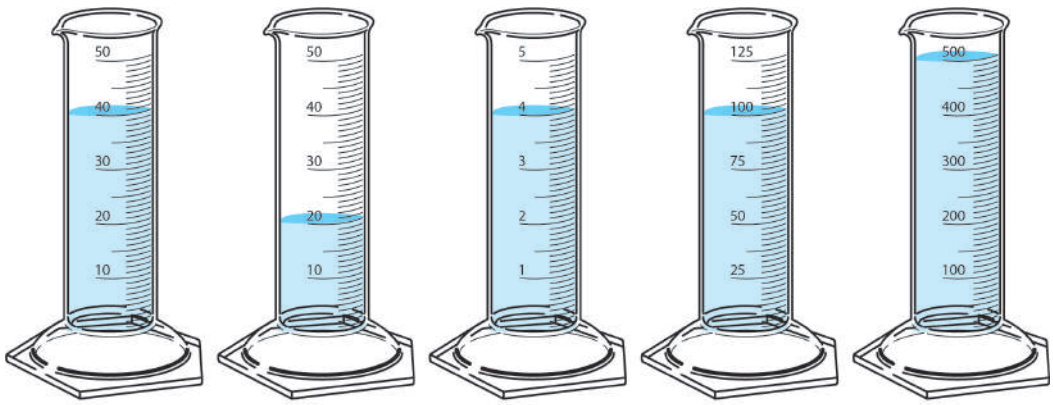
_____ cm

_____ cm

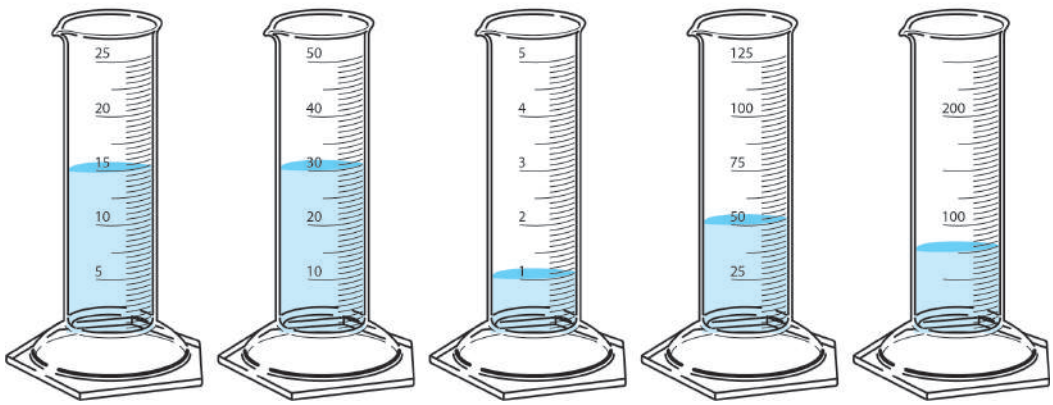
_____ cm

_____ cm

iv. Measure the amount of liquid in the graduated cylinder.Record the measurement below. Remember to include ml in your answer.

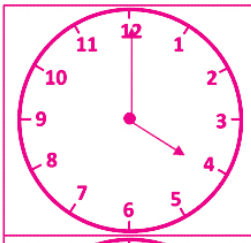
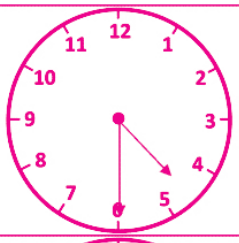
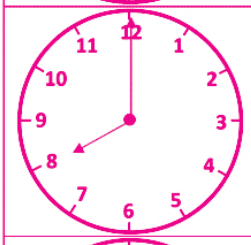
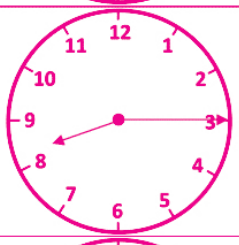
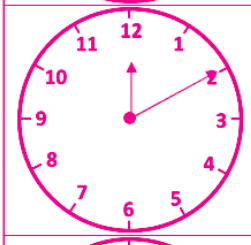
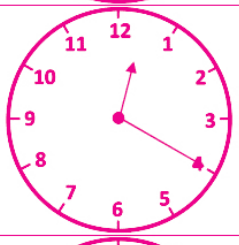
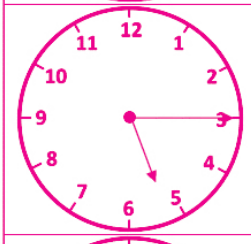
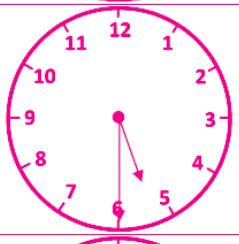
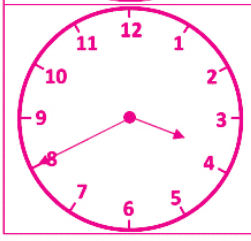
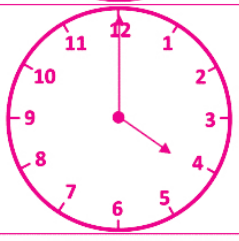


____ ml ____ ml ____ ml ____ ml ____ ml



____ ml ____ ml ____ ml ____ ml ____ ml

v. Write the elapsed time in the space provided.

	TO		30 minutes
	TO		_____ minutes
	TO		_____ minutes
	TO		_____ hours _____ minuts
	TO		_____ hours _____ minuts

Unit 2

Information and Communication Technology

Total Estimated pariods (Th. 20+ Pr. 10=30)

Student's learning outcomes

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

- give examples of different sources of communication and to find the necessary information from those sources
- introduce and use types of communication (personal communication interpersonal communication, and mass communication)
- use mobile phones for learning
- differentiate between similarities and differences between computers and humans
- prepare a simple document using a word processor
- practice using painting software and typing software

i. Write the name of each device. What are these tools for? What is the source of the information?

ii. Audio, video, etc. Multimedia is used for what? Discuss and write a conclusion.

iii. Make a list of devices used for communication in your home.

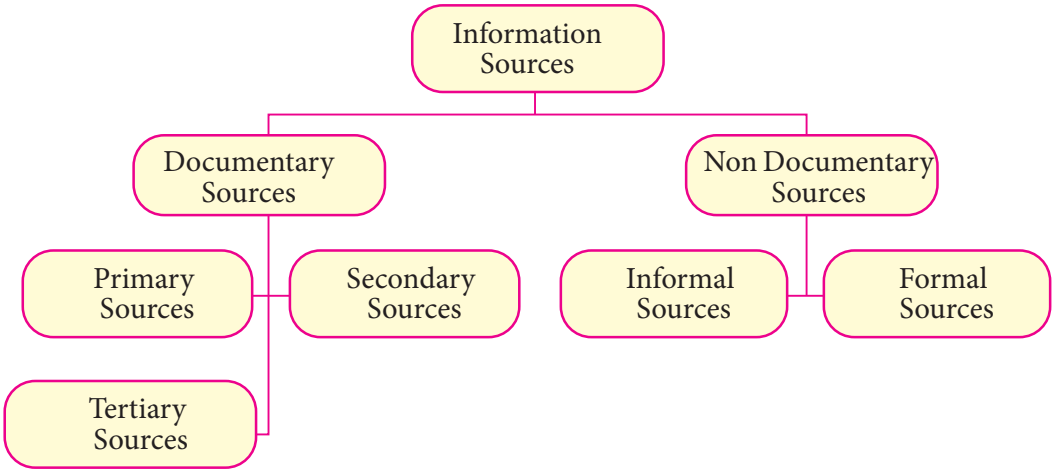
2.1 Sources of Information

An Information Source is a source of information for somebody, i.e. anything that might informs a person about something on provide knowledge to somebody. Information sources may be observations, people speeches, documents, pictures, organizations etc. Different epistemologies have different views regarding the importance of different kind of information sources. Empiricism regards sense data as the ultimate information sources, while other epistemologies have different views . The various types of information sources can be divided into two broad categories.

a. Documentary Sources

b. Non-Documentary Sources

Types of Information Sources



Examples of sources of information

Reference material

Reference materials are various sources that provide background information or quick facts on any given topic. While there are many different types of resources, here are a few: almanacs, atlases, bibliographies, biographical resources, dictionaries, encyclopedias (both

general and by subject), handbooks, indexes, statistics, and citation guides.

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Local Information

Local Information means an awareness of the local navigational rules that a harbour or navigation authority may have in place under its local byelaws or regulations. In the real world of complex systems, no agent knows what all the other agents are doing. At most, each person gets information from a relatively small subset of the set of all agents and processes this "local" information to come to a decision as to how they will act.

Print Information

It is a form of mass media in which it shares the news or concerning pieces of information via the printed form of publications. Print media is the oldest means by which people still share information across an entire group of audiences. It only publishes info in a printed form (hard copy) and then releases it to its users to make it more reader-friendly than the electronic media.

Some very popular types of print media include books, magazines, newspapers, etc. No live reporting, live discussion, or live show is possible with the print media. It follows the methodology of an interval update.

Electronic Information

It is a form of mass media that shares news or any other pieces of information via an electronic medium to all of the viewers and audiences.

Electronic media serves as a very advanced means of sharing data and info/ news. In this type of media, the publisher needs to upload the information (or broadcast it)- after which any user can easily view it through their electronic mediums (devices). Thus, it acts more user-friendly than print media.

Some of the most popular types of electronic media include mobile app news, television news, desktop streams, and many more. As a matter of fact, electronic media makes it possible for its users to hold live discussions, live updates, live reporting, etc. It is because this media makes use of a method of an immediate update.

Activities 2.1

Match the two columns.

1. Magazine	a. To check the spelling of words
2. Newspaper	b. To get current information about local events
3. Journal	c. To get information from a group of people by asking questions.
4. Encyclopedia	d. To add depth and references to a research topic.
5. Internet	e. To find opinions about popular culture.
6. Dictionary	f. perform the function of providing contexto r background information.
7. Survey	g. major uses arc e-commerce, e-learning, knowledge sharing, social connectivity, variety of media, file transfer, communication, etc.
8. Book	h. They contain original research, conclusions based on data, footnotes or endnotes, and often an abstract or bibliography.

Searching for information from different sources

After you have listed search terms and subject terms describing your topic, you create a search statement with them. Then, you will choose the source where you will search with the statement. Books, journals, encyclopedia, standards, statistics, laws, patents, databases, online resources, experts - there are many sources of information!

Choosing the information source is influenced by your topic, information need and criteria. It is good to search for information from several different sources, printed and electronic. Knowing the essential information sources and learning to use the key databases in your field is helpful. Disciplines differ when it comes to publication cultures and practices. So-called "hard sciences" focus on international peer reviewed journals, whereas national books and journals are more important for humanities and social sciences. It is, however, sometimes possible to find relevant information from sources which are not directly related to your field.

Learning with mobile phones

Technology is rapidly growing in all aspects of modern societies, and education is no exception. In line with this trend, information and communication technology is increasingly utilized as a teaching and learning tool in educational activities .Academic institutions, like a learning organization, also pay considerable attention to the use of advanced technologies to facilitate their progress, especially in the areas of teaching and learning . Mobile learning has also emerged as a new technological achievement and educational trend that provides both educators and learners with ample opportunities. With the use of mobile technologies, the potential for effective teaching and learning is growing. This is due to the benefits of mobile learning, including the ability to

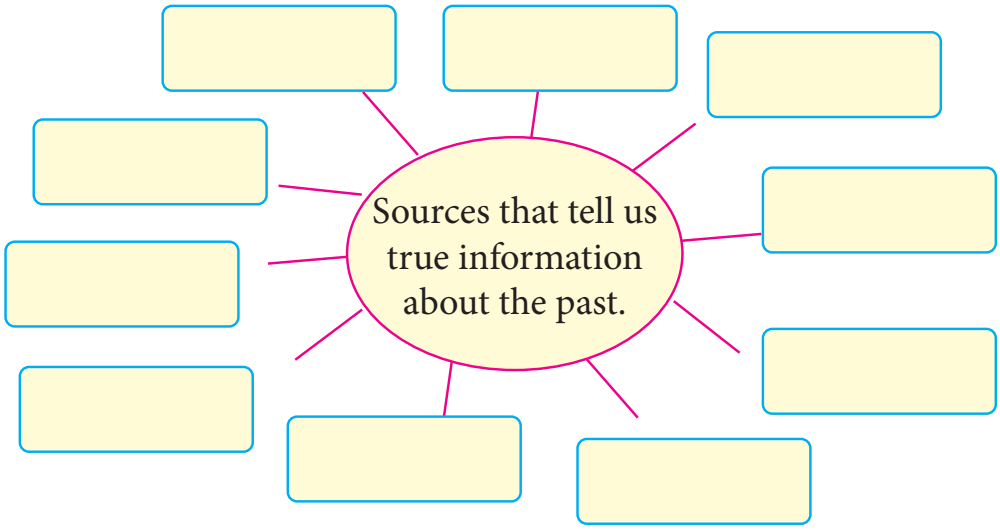
share knowledge without any limits in space and time, the capacity to facilitate the development of critical thinking, participatory learning, problem solving, and the development of lifelong communication skills.

The term “mobile learning” is still developing day by day and its exact meaning is still unclear. Despite the ambiguity, there are some keywords to explain this concept. Mobile learning as a learning model that enables learners to access educational materials anywhere and anytime using mobile and internet technologies. Some features of mobile devices are that they are generally cheap, portable and flexible. Therefore, mobile technology seems to be very attractive to learners and usable in the learning process. Mobile phones have several applications that can be useful in the teaching and learning process, including general software, such as Word, Excel, and PowerPoint and other applications, such as language learning, mathematical problem-solving software, etc. The main feature of mobile learning that distinguishes it from other learning technologies is its mobility. Despite the aforementioned benefits of mobile learning, it can never fully replace traditional education, but if used correctly, it can increase the value of existing learning styles .

Globally, there has been a growing trend of using mobile phones for educational purposes, and many groups, especially teachers and students, use these devices for sharing information, consulting dictionaries and thesauri. They have been portrayed as one of the applications and as one of the application for teaching and learning in which it is portrayed as new opportunity for the ICT use in education . 'Mobile learning acceptance' is considered as the intention to use mobile technology or the attitude toward using that technology.

Activities 2.2

i. What sources can we use to find out about the past?



ii. Look at the picture and label the sources of information.

Poster	Television	Billboard	Magazine
Flyer	Newspaper	Internet	Radio

2.2 Types of Communication

Picture Based Discussion

Compare and contrast these pictures. In your description, answer the following questions:

- What similarities and differences can you name?
- What are the advantages/disadvantages of traditional letters/ e-communication devices?
- Do you think that e-communication can replace traditional letters?.Why/Why not?
- How does e-communications affect personal contacts?
- How often do.you write-traditional letters talk on the phone/ tend text messages/ write emails / use instant messaging?
- Do you keep letters/emails/texts? Why/why not?
- What is your favourite means of communication? Why?
- Do you think that mobile phones can be hazardous to your health?
- What health problems can texting/Timing cause?

Word Bank

- traditional letters: snail mail, write out a letter by hand, address an envelope, take a letter to the post office, wait for the postman, thrilled to receive a personal letter, official documents, love letters, a message form your heart, letters of sympathy, give a personal touch
- e-communication: mobile phones, text messages, voice massages, emails, ecards, IM (= instant messages) chatting, faxes
- convehient, fast, impersonal, attach files/documents/ photos, send/ receive viruses, communicate with several people at the same time, have a direct contact with customers, send a quick note, use emoticons
- insecure, hack into sy's emails, messages can be lost in cyberspace, receive spam/junk mail, the elderly may find it difficult to use.

Fig.2.1

Communication is a process that involves sending and receiving of messages through a verbal and non-verbal method. The sender sends

a message, the receiver receives a message and sends it back with the feedback to the sender again. The methods of communication involve oral and speech communication, written and graphical representations. Additionally, it includes the cultural sphere, a tool utilized to communicate, location, etc. Though it looks simple, communication is generally a very complicated subject.

In other words, communication is a two-way means of communicating information in the form of thoughts, opinions, and ideas between two or more individuals with the purpose of building an understanding.

The four main categories of communication are :

Verbal – It is a method that uses speech in the form of speaking to convey a message or information. It is the most popular and effective mode of communication, usually practised during video conferences, phone calls, presentations, one-on-one conversations, and meetings. It supports both nonverbal and written communication.

Nonverbal – It is basically a practice of gestures, facial expressions, and body language to send information. It can be implemented intentionally and unintentionally when communicating. For instance, a person can smile unintentionally when they hear an interesting piece of information or a pleasant idea.

Written – It is all about typing, printing symbols, numbers, letters, and writing to send a piece of information. Sometimes used to record information for evidence or reference purpose. In general, the written style of communication is used in books, blogs, pamphlets, memos, and letters to share and spread information. In the workplace, e-mail is a common example of written communication.

Visual – It uses art, photographs, sketches, graphs, charts, and drawings, to pass on the information. It is used especially during presentations to present to give a visual effect and support written or verbal communication.

Different Levels of Communication

While discussing the different levels of communication, it is important to mention the four levels laid out by the classical theory of communication. They are known as intrapersonal communication, interpersonal communication, mass communication, and cultural communication. Each of these different levels of communication has a different purpose and is used in different situations.

It is vital to recognize and use all four levels of communication in order to have an effective conversation. When used together, these four levels create a much more persuasive effect than if any one level was to be used alone. The best way to understand these different levels of communication is to consider different examples of each type.

Intrapersonal communication

Thinking Vocal Written

Fig.2.2

Intrapersonal communication is communication that a person does with themselves. This type of communication is known as self-talk and is the internal process that people use to think, reflect, and make sense of their experiences. It can be considered surface-level communication as both the sender and the receiver of the message is the same person. Since one person is playing these dual roles, intrapersonal communication is the most simple and straightforward form of communication. This type of communication is often used for tasks such as writing a reminder note, talking to oneself, or thinking about a problem that needs to be solved.

Interpersonal communication

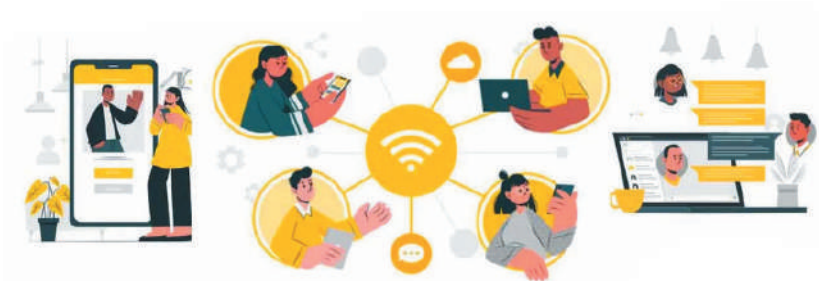


Fig.2.3

Interpersonal communication is communication between two people. This can be in the form of a conversation, message, or even nonverbal cues, such as a shrug or a nod. For interpersonal communication to be successful, the receiver must understand the message that the sender is trying to communicate. This understanding is often facilitated by common experiences, knowledge, and language between the two individuals. It can also be helped by the use of nonverbal cues, such as body language and tone of voice.

For example, imagine a person trying to communicate with someone from a different culture who does not speak their language. In this situation, it would be difficult to have successful interpersonal communication through language alone. However, if the message sender were to use nonverbal cues, such as facial expressions and gestures, it would be much easier to communicate their message.

Activities 2.3

i. With the help of the teacher, search for an e-book on your favorite subject on the computer. Read the e-book in the classroom.

ii. How can information exchange be provided by mobile? Discuss and practice this among your friends in the classroom. Write your conclusion about this and present it to the class.

iii. Find the necessary information from various sources. Present that information and other information to your friends in the classroom.

Mass communication

Mass communication is defined as the act of a person, group of people, or organization relaying a message through a channel of communication to a large group of anonymous and heterogeneous people and organizations. These large groups include the general public or a segment of the general public. Most often, the sender of the message is a professional representative who communicates on behalf of an organization.

Mass communication is a field of study in social sciences and a sub-field of communication studies. It is an expensive process that is often slow and indirect between the sender and the receiver. Usually, mass communication is one-way, meaning the receiver of the original communication does not have any means to respond or provide feedback to the sender.

Fig.2.4 One of the earliest forms of mass communication was the newspaper. Though they are less common today, printed newspapers continue to act as an important source of mass communication.

Mass communication is present in most forms of media. There are many outlets to view mass communications and it is a field of study that has various career opportunities. For example, most individuals who work in the field of mass communication also participate in the analysis and research aspects of the communications field. Vocations such as a news media director, photographer, filmmaker, journalist, web producer and content creator, public relations officer, and researcher all take part in the study

of mass communications. These fields can help influence purchase behaviors, encourage opinions through campaigning, and influence the public opinion of a product or organization.

The first form of mass media was the newspaper, enabled by the invention of the printing press. Through time, the radio, television, internet, and new social media platforms have encouraged progress in the field of mass communications. Political ads, television commercials, and news programs are all forms of mass communication. The following media platforms are just a few places where mass communication is exemplified:

Newspapers and magazines: Gorkhapatra, Kantipur , The Kathmandu Post, Annapurna Post, Himalayan times, Nari Magazine, Times etc.

Television: Nepal Television, Kantipur TV, NBC, FOX, CNN.

Social media: YouTube, Twitter, Instagram

Activities 2.4

i. Prepare a list of different means of communication in the class with the help of teachers and peers. In the list you have prepared, classify them as personal communication, interpersonal communication, and general communication.

ii. Make a list of the media you use or hear about. Classify them all.

iii. Write examples of self-communication, person-to-person and person-to-group communication, and communication in a large group at the same time. Write a short note about them and present them in the classroom with pictures.

2.3 Similarities and differences between computers and humans

There is an invincible, indestructible and co-dependent connection between humans and computers.

Human & Cumputer

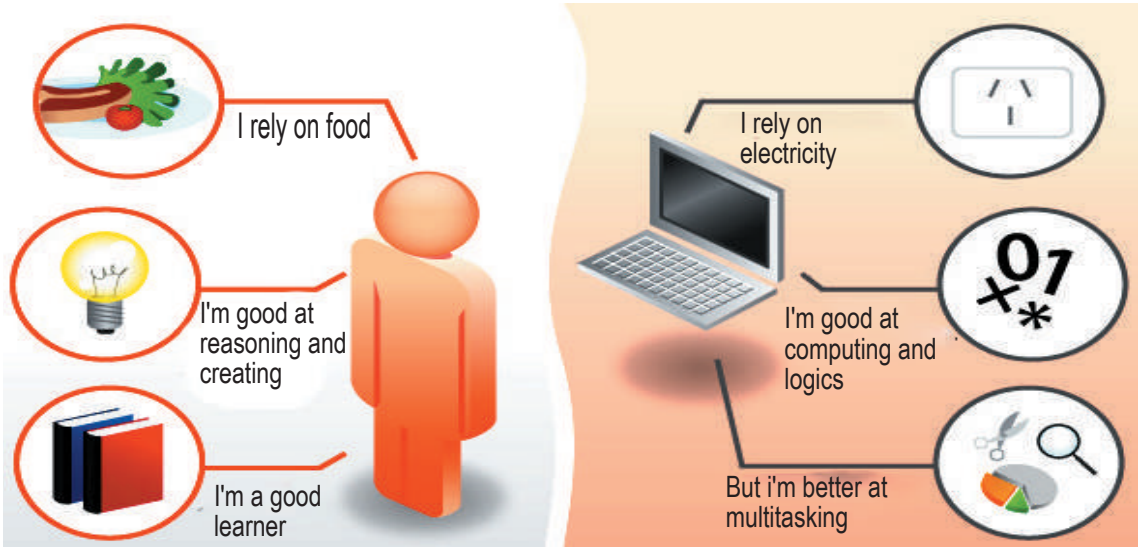


Fig.2.5

Humans and computers inhabit one and the same world in which they seem to be existing in symbiosis. To present it in the most easy to comprehend way, computers need people in order to be created in the first place, while people need computers in order to evolve. The progress of media, banking, electricity, telecommunication, railways as well as other means of transportation depends on technology. The more advanced it is, the more advanced they are in return. Just think of the modern-day cars which are basically computers on wheels. Without innovative software projects and dozens of sensitive electronic brain-like-functioning components (entertainment systems, brakes, infotainment systems, cockpits and so on), the automotive sector wouldn't have been as successful as it is now. But computers are not integrated in the structure of vehicles only. They are integrated in the very process of making a vehicle too. Car manufacturers have come a long way using high-tech tactics when building an automobile. And nowadays, there is a more effectively working generation of auto assembly line which is comprised of collaborative computerized robots that are part machines part humans. Carmakers such as Kia, Ford, Haval, BMW, for example,

have all used and are using robotic machines for more cost-efficient and productive assembly line. But it does not end with the automotive industry only. Other industries, including Pharma, largely rely on computers for tasks ranging from filing and keeping of records to monitoring and service-offshoring. And if science wouldn't have been the same without computers, what is left for the IT sector itself? Without computers IT would have been non-existent; a program would have remained just a TV show; memory would have been something that one lost with age and hard drive – a long trip on the road.

Similarities between Humans and Computers

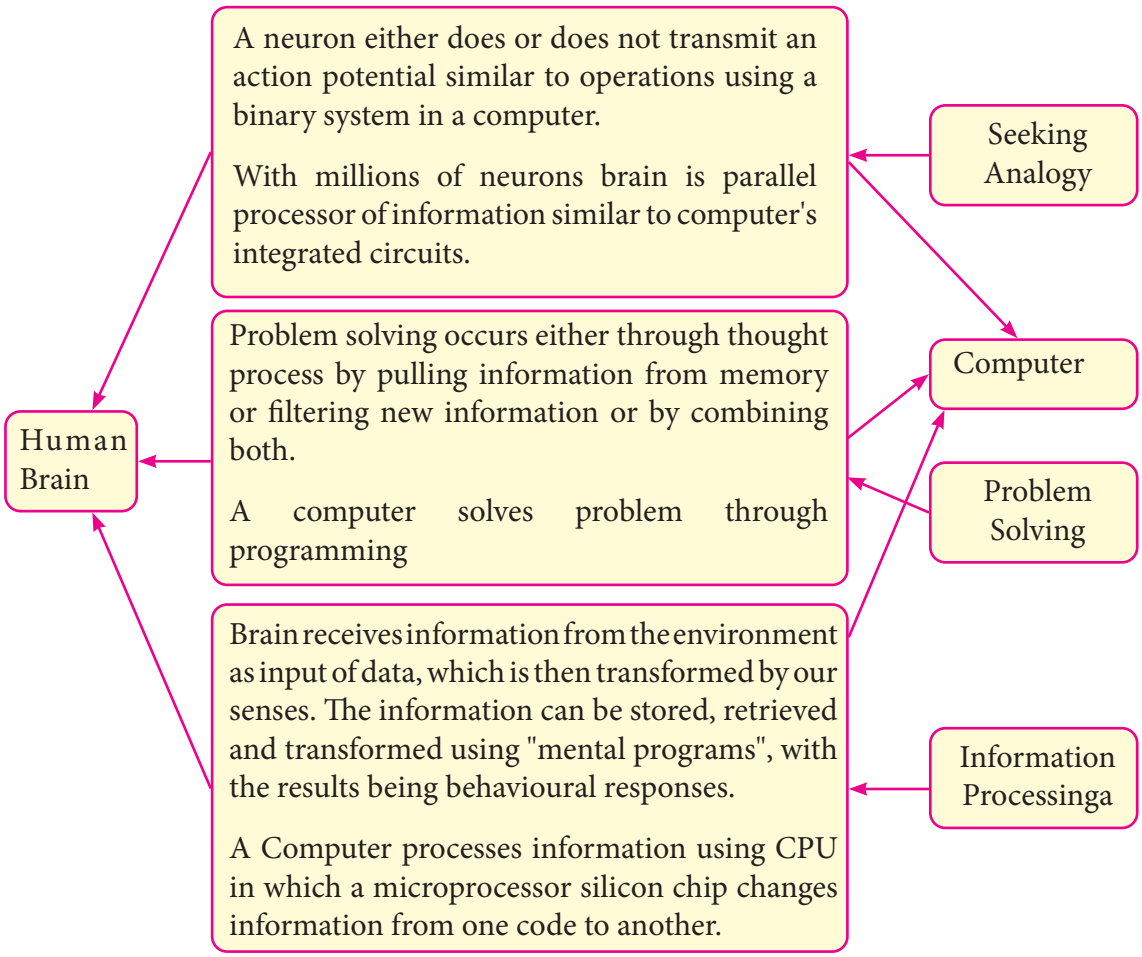


Fig.2.6

Computers are clever and sometimes even cleverer than humans. The computer evolution never slows down and does not seem to be getting any nearer to settling down. Even though they are not entirely operating on human levels, computers progressively improve their intellectual activities and capabilities. But what is the common thing between them and humans apart from the fact that both of them are most valuable when they are working and being productive?

Learning

Just like people, machines can learn too. They gain knowledge and then they gain more knowledge on how to enhance what they already know. Some might argue that this is possible due to humans and the programming on computers but think of students and their teachers. Isn't this exactly what happens in the humans-computers situation as well? One is the giver, the other is the receiver. The interaction between them and the outcome is what matters. And what is the outcome – computers being able to absorb new information and to reproduce it proactively thanks to algorithms such as "deep learning." Watson and Deep Blue are typical examples of computers being able to learn and to outsmart humans. The formal one represents a chess-playing computer created by IBM, an American technology and consulting corporation. On February 10, 1996 Deep Blue played against the famous world chess champion Garry Kasparov and defeated him. Watson, then, demonstrated another set of artificial skillfulness and depth in the Jeopardy! show. It competed against two of the best contestants, Brad Rutter and Ken Jennings, and managed to outplay them. Without human interference of course.

Understanding

Machine-learning based systems also enable computers to show some sort of understanding. This learning is based on pure data and not on manually programmed codes. Just like humans, then, computers do not understand by what there are being told, but by what they see and observe on their own. Companies and websites such as Netflix, Amazon

and eBay take advantage of such machine-learning abilities in order to suggest products to their users based on their preferences and previous choices. Another example is the Chinese website Baidu which uses a leading edge image recognition system. The system can understand and search for pictures, for instance, which are similar in many ways (like position, facial expression, contours, shapes, color, etc.) to the picture one has uploaded before that. This proves that computers and computer-based systems can comprehend what they see, can generate descriptions and can deliver results based on received data. It is not exactly human performance and understanding but it is analogues.

Brain/Database

Drawing parallels between human brain and computer database there comes up a variety of other similarities. Both of them have memory, both of them use electrical signals, both of them can retrieve and transmit data, both of them have partitions and both of them connect data in order to reach to conclusions which are logical and working. Being able to analyse and link scattered and proportionate data, computers, consequently, have the capabilities to create logical structures, allowing them to understand and learn.

Drawing assumptions from all this, people come to realize that human-like capabilities of computers grow exponentially and at rates faster than those of any person. No doubt that machines follow commands but it is the way in which they follow those commands that amazes us. What is more, computers succeed in exhibiting that they can function as separate agents, without the direct presence of a computer programmer or engineer. They learn, comprehend and respond in the most profound ways. They come up with images based on descriptions, produce answers based on questions and evoke meaning based on understanding. And just like people, computers adapt and evolve over time. But is this enough to make them superior once and for all? Let's find out in our Humans vs Computers series Part II!

Differences between computers and humans

Human has a brain which thinks and creative things born. It has the power to make decisions. Human has more efficiency than a computer. A Computer is a machine that needs software to execute any action. It needs a high speed for processing. It is a serial machine, and it works digitally.

Parameters of Comparison	Human	Computer
Definition	A living soul with mind and body who breathes air and eats food for survival.	Amachine that needs electricity and an operating system.
Machine	No	Yes
Number of users	One user at a time	Multi-user at a time
Execution part	Brain	Operating System
Speed	Different at different time	High every time
Growing Factor	Age, height	Versions of software

Activities 2.5

Write Yes or No for each of the function given below under humans and computer. The first one has been done for you.

Function		Human	Computer
a.	It works very fast.	**No**	**Yes**
b.	It sleeps to rest.		
c.	It needs food.		
d.	It remembers everything.		
e.	It has feelings.		
f.	It always gives the correct answers.		
g.	It nerver gets bored.		

Activities 2.6

i. Compare the parts of the computer with the standard parts, draw conclusions point by point, and present them in the classroom.

ii. Discuss in the classroom the similarities and differences between what computers and humans can and cannot do. Write down the conclusions after the discussion and stick them on the classroom wall.

iii. "Is a computer more powerful than a human?" Organize a debate competition on the subject in the presence of the teacher. Write down the scientific arguments and reasons raised during the debate and tape them to the classroom wall.

2.4 Word Processing Software

Word processing software is used to manipulate a text document, such as a resume or a report. You typically enter text by typing, and the software provides tools for copying, deleting and various types of formatting. Some of the functions of word processing software include:

- Creating, editing, saving and printing documents.
- Copying, pasting, moving and deleting text within a document.
- Formatting text, such as font type, bolding, underlining or italicizing.
- Creating and editing tables.
- Inserting elements from other software, such as illustrations or photographs.
- Correcting spelling and grammar.

Word processing includes a number of tools to format your pages. For example, you can organize your text into columns, add page numbers, insert illustrations, etc. However, word processing does not give you complete control over the look and feel of your document. When design becomes important, you may need to use desktop publishing software to give you more control over the layout of your pages.

Word processing software typically also contains features to make it easier for you to perform repetitive tasks. For example, let's say you need to send a letter to all your customers regarding a new policy. The letter is the same for all customers except for the name and address at the top of the letter. A mail merge function allows you to produce all the letters using one template document and a table with customer names and addresses in the database.

Text editors shouldn't be confused with word processing software. While they do also allow you to create, edit and save text documents, they only work on plain text. Text editors don't use any formatting, such as underlined text or different fonts. Text editors serve a very different purpose from word processing software. They are used to work with files in plain text format, such as source code of computer programs or configuration files of an operating system. An example of a text editor would be Notepad on the Windows platform.

There are a number of different word processing applications. One of the most widely used ones is Word, which is part of Microsoft Office. Another widely used one is WordPerfect by the Corel Corporation. A third one is Writer, which is part of OpenOffice by Apache. While the first two are commercial software, OpenOffice is open source and can be downloaded and used free of charge. Finally, there is Pages, which is part of iWork by Apple.

While there are many differences between the various word processing applications, they all accomplish pretty much the same thing. Which one you use is partly a matter of personal preference. It is also important to consider which software is being used by the people you normally collaborate with. In many cases, people within the same organization will use the same software to make it easier to share documents or to work on the same document together.

2.5 MS Paint

MS-Paint is a simple graphics editing program that is included with MS Windows. The program opens and saves files. Basically, it saves in Windows Bitmap (BMP), JPEG, GIF, PNG, and single-page TIFF formats. MS-Paint is also known as Paint or Paintbrush.

How to Start MS-Paint?

To start MS-Paint you need to follow the following steps;

- Click Start.
- Select Programs.
- Click Accessories and Select Paint.

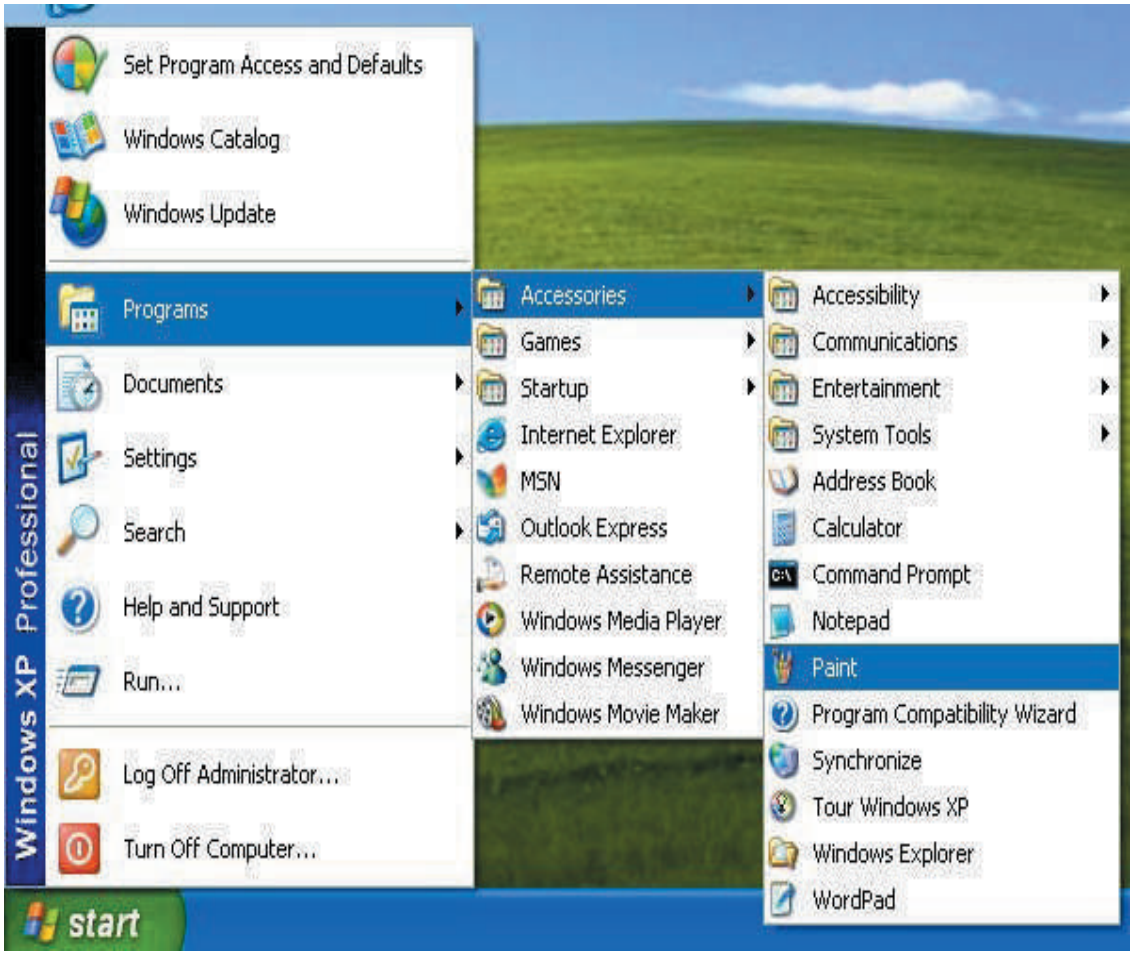


Fig.2.7

Introduction to The Paint Screen

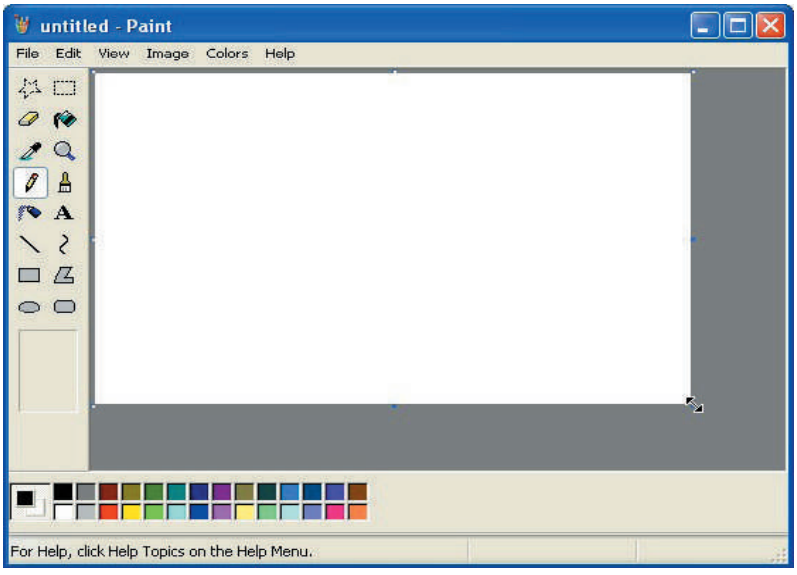


Fig.2.8

Components of the Paint Screen

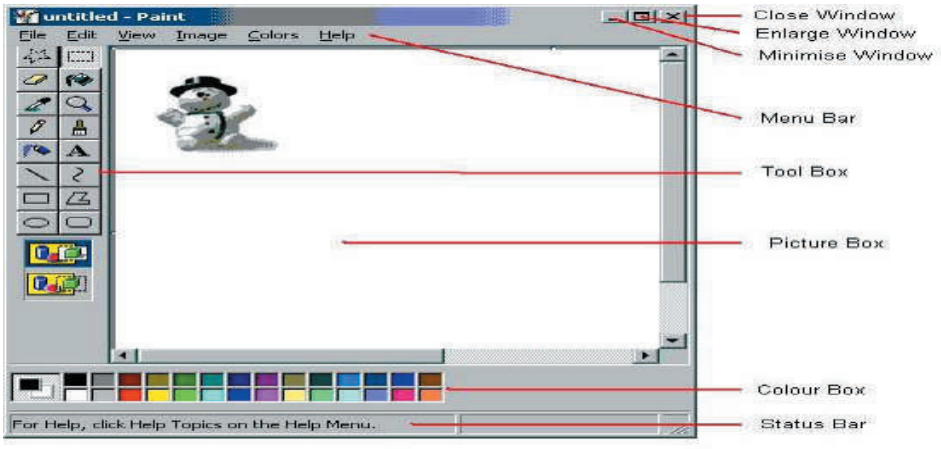


Fig.2.9

In the Paint Screen, you see that there is a Toolbox in extreme left side and a colour palette downwards. The Toolbox contains various tool icons to work on MS-Paint.

Every icon has a different function to play and here are the different functions-

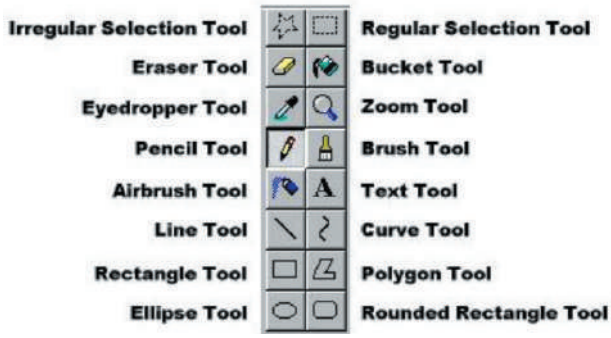


Fig.2.10

How to select a drawing tool

You can select a Drawing Tool using the mouse.

Point to the tool which is needed and click on the tool. It is easy to work on MS-Paint.

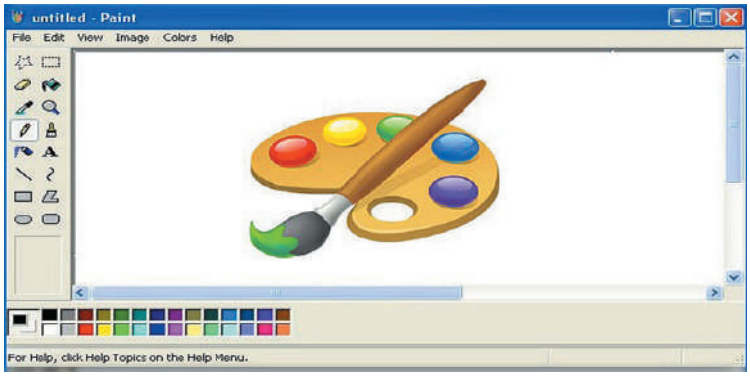


Fig.2.11

How to Draw With the Selected Tool?

When you have selected a tool you need to draw on the drawing area. To draw using the Selected Tool is easy and it is done through the following given steps

- Move the cursor to the point where you want to start.
- Press and hold the mouse button.
- Drag the cursor across the drawing area.
- When you are done release the mouse button.
- And, if you want to erase something then you can use the erase button from the Toolbox.

How to Close The MS-Paint?

With respect to class 5 computer lessons, to close the MS-Paint you need to follow 2 simple steps

- Click Close.
- And, Click No in Save as Dialog Box.

Activities 2.7

i. Match the following options with their functions:

COLUMN A	COLUMN B
a. Crop	i. Stylised text
b. Color	ii. An organized arrangement of text in rows and columns
c. Clipart	iii. cut unwanted part of an image
d. Word Art	iv. A placeholder where text can be entered
e. Table	v. Grayscale
f. Text box	vi. A gallery of predesigned pictures.

ii. Rameshwar has designed his tutorial timetable in tabular formate. To enlarge the size of his table which option will he apply to do it quickly.

iii. Anuradha has created a 4 page document in MS Word 2010 on Himalayan ranges. Her teacher has instructed her to mention the projecttopic, date and page number on every page. Can you suggest which suitable options will make her work easy?

Typing Software

Typing is the process of writing or inputting text by pressing keys on a typewriter, computer keyboard, mobile phone or calculator. It can be distinguished from other means of text input, such as handwriting and speech recognition.

Various typing software programs have been developed to help people learn to type on a computer quickly and easily. Typing software includes

TypeShala, Typing Master, Typing Tutor, etc.

Typing helps you improve and learn new skills through a computer or any other device that is keyboard based. From learning to code to learning a new language online, you can improve your employability and marketability just because your typing skills accelerate these learning processes.

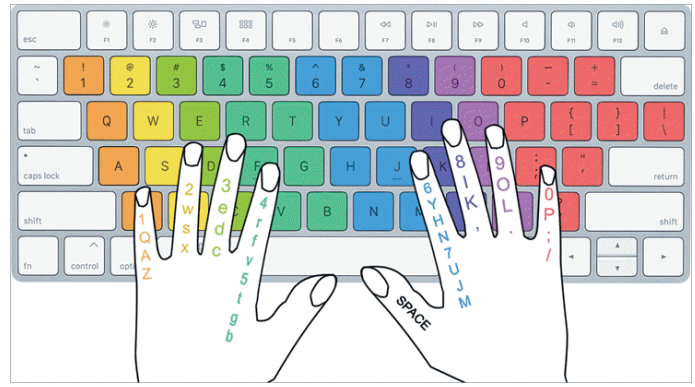


Fig.2.12

Activities 2.8

Open a word processor on the school computer and prepare a leave application like the one given below, and save it in a folder on the computer with the name "application."

To Principal **Date:** 6th March 2023
Shree Sharda Rastriya Primary School,
Rajgadh-06, Phakira, Saptari,

Subject: Application for Attending a Family Function

Sir/ Ma'am,

I would like to bring to your notice that I, Nishant Yadav, of class 5, will not be able to attend school for the coming 5 days as I have to go out of the station to attend my elder brother Prashant's wedding in Kathmandu.

I would like to request leave for the 12th, 13th, 14th, 15th, and 16th of April 2023.I will be highly obliged.

Thanking You,
Your's Truly,
Nishant Yadav,
Class -5

Recap

- MS-Paint is a simple graphics editing program that is included with MS Windows.
- To start MS-Paint
- Introduction to Paint Screen
- Components of Paint Screen
- Functions of each tool in Toolbox
- To select the Drawing Tool
- To work with the Drawing Tool
- To close MS-Paint.

Project Work

i. Prepare a simple document using a word processor with the help of the teacher.

ii. Do the exercises related to MS Paint and typing software on the computer with the help of the teacher. Prepare a report on how to use this software.

A. Choose the correct one and put the tick mark(√).

i. Information sources may not be -

a. observations b. people speeches,
c. documents d. listen to songs

ii. Information sources may be _____ people speeches, documents, pictures, organizations etc.

a. talk b. debate
c. walk d. observations

iii. Which is not an information source

a. Electronic information b. Local information
c. Print information d. Secret information

iv. Which is not documentary sources-

a. Primary b. Secondary
c. Tertiary d. Formal

v. Which is not reference material-

a. atlases b. dictionaries
c. handbooks d. letters

vi. Some very popular types of print media include books, _____, newspapers, etc.

a. magazines b. radio
c. television d. facebook

vii. Local Informations means an _____ of the local navigational rules that a harbour or navigation authority may have in place under its local byelaws or regulations.

a. awarness b. communication
c. information d. none of these

viii. Which is not a Print media

a. books b. magazine
c. newspaper d. television

ix. Which is electronics media-

a. books b. magazine
c. newspaper d. television

x. Which of the following is not a part of multimedia presentation?

a. Graphics b. Audio
c. Memory/Keyboard d. Video

xi. _____ is a two-way means of communicating information in the form of thoughts, opinions, and ideas between two or more individuals with the purpose of building an understanding.

a. Information b. Mass media
c. Communication d. Multimedia

xii. There are _____ main categories of communication.

a. two b. three
c. four d. five

xiii. Which is not mass media

a. Newspaper b. Magazine
c. Television d. Email

xiv. Mass communication is present in most forms of _____.

a. radio b. media
c. information d. newspaper

xv. Computers are _____ and sometimes even cleverer than humans.

a. funny b. clever
c. entertainer d. foolish

xvi. Which statement is correct for human-

a. one user at a time b. high every time
c. multi-user at a time d. needs operating system

xvii. Which statement is correct for computer-

a. different in different time b. one user at a time
c. multi-user at a time d. none of aboves

xviii. Word processing _____ is used to manipulate a text document, such as a resume or a report.

a. click start b. software
c. computer d. MS-paint

xix. Which is not the functions of word processing software -

a. Creating, editing, saving and printing documents.
b. Copying, pasting, moving and deleting text within a document.
c. Formatting text, such as font type, bolding, underlining or italicizing.
d. Social media: YouTube, Twitter, Instagram.

B. Use the following words to fill in the blanks .

bibliographies, verbal, anonymous, navigational, information, advanced , encyclopedias, technological, Print media, databases, Mass

i. An Information Source is a source of _____ for somebody, i.e. anything that might informs a person about something on provide knowledge to somebody.

ii. Reference materials are atlases, _____ , biographical resources, dictionaries, _____(both general and by subject), handbooks, indexes, statistics, and citation guides.

iii. Local Information means an awareness of the local _____ rules that a harbour or navigation authority may have in place under its local byelaws or regulations.

iv. _____ is the oldest means by which people still share information across an entire group of audiences.

v. Electronic media serves as a very _____ means of sharing data and information/ news.

vi. Knowing the essential information sources and learning to use the key _____ in your field is helpful.

vii. Mobile learning has also emerged as a new _____ achievement and educational trend that provides both educators and learners with ample opportunities.

viii. _____ communication is defined as the act of a person, group of people, or organization relaying a message through a channel of communication to a large group of _____ and heterogeneous people and organizations.

ix. The _____, vonverbal, written and visual are four main categories of communications .

C. Differentiate between these pairs.

i. Documentary Sources and Non-Documentary Sources

ii. Reference material and Local Information

iii. Local Information and Print Information

iv. Print Information and Electronic Information

v. Communication and Communication sources

vi. Print media and Electronic media

vii. Verbal communication and Nonverbal communication

viii. Written communication and Visual communication
ix. Interpersonal communication and Mass communication
x. MS-Paint and Typing Software
xi. Computers and Humans
xii. Computer learning and Mobile learning

D. Explain the following:

i. Reference materials are various sources that provide background information or quick facts on any given topic.
ii. As a matter of fact, electronic media makes it possible for its users to hold live discussions and updates.
iii. Political ads, television commercials, and news programs are all forms of mass communication.
iv. Human has more efficiency than a computer.
v. MS-Paint is a simple graphics editing program

E. Answer the following questions :

i. What is information?
ii. What are the information sources? Write down the names of any five information sources.
iii. Write down examples of different sources of communication and find the necessary information from those sources.
iv. Introduce and use types of communication
v. Defined : (a)personal communication, (b) interpersonal communication, and (c) mass communication)
vi. How do we use mobile phones for learning?
vii. Write down the similarities between computers and humans.
viii. Write down the differences between computers and humans.
ix. Prepare a simple document using a word processor.
x. How do we practice using painting software and typing software?
xi. What is MS-Paint? How do you launch MS-Paint?
xii. What are the components of Paint Screen?

xiii. What are the functions of each tool icon in the Toolbox?

xiv. How do you select a drawing tool? How do we work with the Drawing Tool?

xv. How do you close MS-Paint?

F. Diagrammatic Questions :

i. Join the image with correct word.

Journal

Paintings

Books

Television

Internet

Magazine

Radio

Newspaper

II. Complete the text with the word in the blank space.

eyes, source, advantage, cameras, pages

Television is the main _____ of news for millions of

people. People like TV news because they can see everything with their own _____ . And that's an important _____. Seeing, as we know, is believing. Besides, it's much more difficult for politicians to be in front of the _____ than on the _____ of a newspaper.

iii. Fill in the paragraph with words from the list.There are two extra words:

Communication is basically defined as the transfer of _____ from one place to another or from one person/source to another. Thus, it is a _____ process in which thoughts, feelings, ideas etc. are _____ in a verbal or non-verbal manner. There are many_____ ways of communication in today's world. Some of the most _____ used _____ are:

-phones -Fax
-chatting -SMS
-Letters -e-mails.
-Video-conferencing technologies
-pagers / beepers

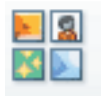
iv. Use words from the previews paragraph to label the pictures:

1. _____ 2. _____ 3. _____ 4. _____

5. _____ 6. _____ 7. _____ 8. _____

v. Identify the following icons of MS word 2010.

a. _____ b. _____

c.  _____ d. _____

e. _____ f. _____

vi. Match the following.

left align	
short cut for bold	CTRL + E
short cut keys for center align	
short cut keys for find	CTRL + B
justify	CTRL + F

Unit 3

Organisms and Environment

Total Estimated pariods (Th. 8+ Pr. 2 =10)

Student's Learning Outcomes

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

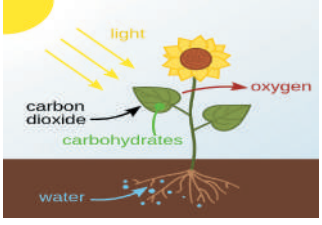
- present the facts and arguments that living beings need heat and light energy
- identify the sources of energy available in the environment
- explain the effects of excessive and unnecessary use of energy on the environment
- explain and implement measures to reduce the impact of excessive use of energy on the environment

Check the picture where living things use the sun's heat and light.

___1. Morning sunlight

___2. Solar energy

___3. Drying clothes



___4. Photosynthesis of plant

___5. Bright the Earth

3.1 Energy need for Organisms

The sun is the closest star to Earth. Even at a distance of 150 million kilometers (93 million miles), its gravitational pull holds the planet in

orbit. It radiates light and heat, or solar energy, which makes it possible for life to exist on Earth.

Plants need sunlight to grow. Animals, including humans, need plants for food and the oxygen they produce. Without heat from the sun, Earth would freeze. There would be no winds, ocean currents, or clouds to transport water.

Solar energy has existed as long as the sun — about 5 billion years. While people have not been around that long, they have been using solar energy in a variety of ways for thousands of years.

Solar energy is essential to agriculture —cultivating land, producing crops, and raising livestock. Developed about 10,000 years ago, agriculture had a key role in the rise of civilization. Solar techniques, such as crop rotation, increased harvests. Drying food using sun and wind prevented crops from spoiling. This surplus of food allowed for denser populations and structured societies.

Early civilizations around the world positioned buildings to face south to gather heat and light. They used windows and skylights for the same reason, as well as to allow for air circulation. These are elements of solar architecture. Other aspects include using selective shading and choosing building materials with thermal mass, meaning they store heat, such as stone and concrete. Today, computer programs make applications easier and more precise.

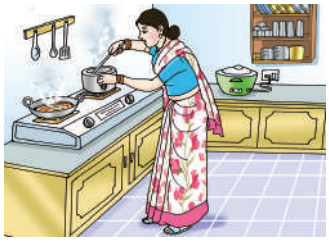
The greenhouse is another early solar development By converting sunlight to heat, greenhouses make it possible to grow plants out of season and in climates that may not be suited for them. One of the earliest greenhouses dates to 30 CE (Common Era), before glass was even invented. Constructed from translucent sheets of mica, a thin mineral, it was built for the Roman emperor Tiberius, who wanted to be able to eat cucumbers all year. The general technique is the same today,

although there have been many improvements to increase the variety and amount of crops grown.

The continual input of energy, mostly from sunlight, sustains the process of life. Sunlight allows plants, algae, and cyanobacteria to use photosynthesis to convert carbon dioxide and water into organic compounds like carbohydrates. This process is the fundamental source of organic material in the biosphere. There are a few exceptions to this, such as ecosystems living around hydrothermal vents on the ocean floor, which derive their energy from chemical compounds such as methane and hydrogen sulfide. In either case, the overall productivity of an ecosystem is controlled by the total energy available.

Activities 3.1

i. Write the words light or heat to say the type of energy that is being use to do work in our homes.



Activities 3.2

i. Decide whether the following light and heat sources are natural or artificial.

1. fire is _____

2. lightning are _____

3. light bulb is _____

4. torches are _____

ii. Write down the reasons why organisms need heat and light.

iii. Where do plants grow best—in sunny places or in places where the sunlight doesn't reach? Discuss in the classroom and write a summary.

iv. Which of the cold and summer seasons is more cultivated? Discuss in the classroom and write a summary.

v. Where are tall plants found in cold places and hot places? Discuss in the classroom and write a summary.

vi. List the sources of heat and light. Write down your statements that prove the fact that living things get energy from the environment and stick them on the classroom wall.

3.2 Identification of energy sources

Sources of energy can be classified into:

- Renewable Sources
- Non-renewable Sources

A renewable source is the natural resource that causes no impact on nature. Renewable sources of energy are available plentiful in nature and

are sustainable. These resources of energy can be naturally replenished and are safe for the environment. Examples of renewable sources of energy are: Solar energy, geothermal energy, wind energy, biomass, hydropower and tidal energy.

Non-renewable sources of energy cause an impact on the nature and are a limited supply source. Non-renewable sources can be extracted from the earth and will run out as time passes.

Examples of non-renewable sources of energy are: Natural gas, coal, petroleum, nuclear energy and hydrocarbon gas liquids.

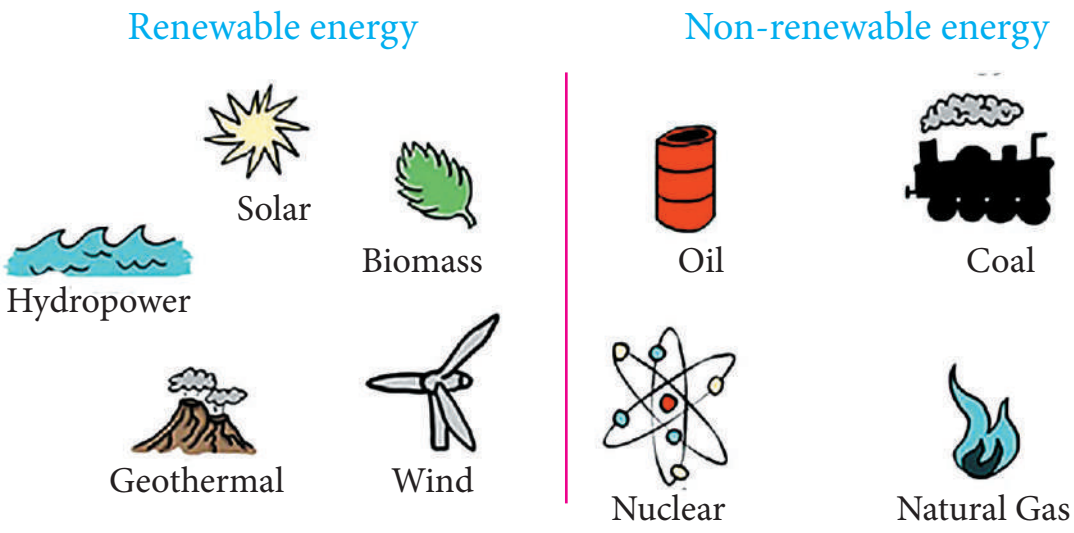


Fig.3.1

Difference Between Renewable and Non-renewable Sources of Energy

Renewable	**Non-renewable**
The resources that can be renewed or replaced are called renewable sources of energy.	The resources that cannot be renewed once they are consumed are called non-renewable sources of energy.
These resources do not cause any pollution to the environment.	These resources cause pollution to the environment.
Renewable resources are inexhaustible.	Non-renewable resources are exhaustible.

Renewable resources are not affected by human activities.	Non-renewable resources are affected by human activities.
Examples of Renewable resources- Air, water and solar energy.	Examples of Non-renewable resources- Mineral, oil, and Coal.

Effects of excessive and unnecessary use of energy on the environment and ways to reduce it

Energy and environmental problems are closely related, since it is nearly impossible to produce, transport, or consume energy without significant environmental impact. The environmental problems directly related to energy production and consumption include air pollution, climate change, water pollution, thermal pollution, and solid waste disposal. The emission of air pollutants from fossil fuel combustion is the major cause of urban air pollution. Burning fossil fuels is also the main contributor to the emission of grenhouse gases. Diverse water pollution problems are associated with energy usage. One problem is oil spills. In all petroleum-handling operations, there is a finite probability of spilling oil either on the earth or in a body of water. Coal mining can also pollute water. Changes in groundwater flow produced by mining operations often bring otherwise unpolluted waters into contact with certain mineral materials which are leached from the soil and produce an acid mine drainage. Solid waste is also a by-product of some forms of energy usage. Coal mining requires the removal of large quantities of earth as well as coal.

Effects of excessive and unnecessary use of energy

Today, world energy consumption contributes to pollution, environmental deterioration, and global greenhouse emissions. Increases in energy consumption are driven by population growth and economic development that tend to increase energy use per capita. Thus the inevitable increase in population in the near future and the economic development that must necessarily occur in many countries pose serious implications for the environment.

Effects of excessive and unnecessary use of energy are :

i. Increased Carbon Footprint
ii. Increased Risk of Climate Change
iii. Reduction in Supply
iv. Higher Energy Costs

i. Increased Carbon Footprint

The primary environmental effect of energy overuse is an increase in your carbon footprint, but there are simple changes you can make at home to avoid this. For example, if you keep devices plugged in and running when they're not in use, the result is an increase in electrical use and, consequently, a bump in the amount of greenhouse gases that enter the atmosphere. Leaving your laptop plugged in all the time will use nearly 300 kilowatt hours (kWh) of electricity each year, and a desktop computer left to idle will use more than 600 kW of electricity annually. Even leaving your fully charged cellphone attached to its charger can waste almost 20 kWh a year.

ii. Increased Risk of Climate Change

The burning of fossil fuels produce greenhouse gases (such as carbon dioxide) that trap heat in the atmosphere causing global warming. The additional heat in the land, ocean and atmosphere is driving worsening extreme weather. If we do not rapidly and deeply reduce greenhouse gas emissions, then even more harmful and potentially catastrophic consequences for humanity will occur.

Fossil fuels – coal, oil and gas – are by far the largest contributor to global climate change, accounting for over 75 per cent of global greenhouse gas emissions and nearly 90 per cent of all carbon dioxide emissions. As greenhouse gas emissions blanket the Earth, they trap the sun's heat. This leads to global warming and climate change. The world is now warming faster than at any point in recorded history. Warmer temperatures over time are changing

weather patterns and disrupting the usual balance of nature. This poses many risks to human beings and all other forms of life on Earth.

iii. Reduction in Supply

In areas with heavy population densities, the price you pay for home electricity is determined by supply and demand. Some power plants charge consumers more during peak hours. Your overuse will contribute to a scarcity in this energy supply and thus an increase in overall electricity costs. Over the long term, the rise in demand may place additional burdens on threatened environmental areas.

iv. Higher Energy Costs

A natural consequence of overusing energy is increased costs for you. This can come in the form of fuel and energy bills; you will be paying more without an appreciable return on your investment. You may also risk lowering the expected lifespan of appliances and other electronics. When you have to replace spent devices, you further impact the environment by generating waste and purchasing replacement equipment. Your wise use of electricity, therefore, can translate into long-term savings in energy bills and also reduce the need for other purchases .

Measures to minimize the impact of excessive and unnecessary use of energy

For many, going green means saving green – as in money – by reducing energy bills. But going green through home energy efficiency also means protecting the environment.

Simply put, energy efficiency is about using less energy to get the same job done and, in the process, avoiding high energy bills and unnecessary pollution. Many homes and business consume far more energy than needed.

Seemingly minor changes, like turning off the lights when not in use, washing laundry in cold water and using ceiling fans to keep cool in summer, can produce big results. If every American household traded out just one incandescent light bulb for an efficient LED bulb, the reduction in pollution due to fossil fuels would be equal to taking 670,000 cars off the road.

And even more rewarding, when you reduce your energy usage, you are playing a role in helping the environment. According to the Environmental Protection Agency, the residential and commercial sectors are responsible for nearly half of all energy consumption in U.S. buildings. Clearly, energy efficiency is a critical component in curbing climate change and protecting our environment.

When fossil fuels (gas, coal, oil) are burned in power plants to produce electricity, greenhouse gas emissions are also produced. By making a commitment to reducing your energy consumption, power plants will need to produce less electricity, thus reducing the amount of fossil fuels burned every day.

Energy efficient homes and businesses bring us closer to a greener and healthier planet. Reducing your energy usage reduces the demand for fossil fuels and, in turn, lower the levels of carbon dioxide in the atmosphere.

By being energy efficient, you will:

Help Reduce Climate Change

Climate change results in heat waves, drought, higher sea level, abnormal weather patterns and a greater likelihood of natural disasters. Small steps such as reducing your use of single-use plastics or installing low flow water systems can have a big impact.

Protecting Ecosystems

Simple things that can reduce fossil fuel emissions and protect our

ecosystems include purchasing products with minimal packaging, recycling half of your household waste, reusing water bottles and plastic bags, or just adjusting the heating and cooling systems in your home while you're sleeping at night or away during the day so you are not making them constantly run.

It Starts at Home

Less demand for energy means less need for harvesting fossil fuels. Here are easy ways to conserve at home:

- Wash full loads of laundry
- Run the dishwasher only when full
- Turn off the faucet while brushing your teeth
- Start a compost pile
- Create a lawn watering schedule using a watering calculator
- Harvest rainwater and install water-efficient appliances and showerheads.

Help Make the Air and Water Cleaner

Using water-saving techniques, such as not disposing of household chemicals/cleaning agents down the sink or toilet and avoiding using a garbage disposal, can:

- Save money
- Divert less water from our rivers, bays and estuaries
- Reduce water and wastewater treatment costs

Effects of excessive and unnecessary use of energy on Water

There is a unique connection between the use of water and the production of energy. Energy production heavily depends on our limited resource of water during the creation process, while providing fresh water to our population uses a great deal of energy. The multidimensional dynamic of these two resources causes growing concerns, as their accessibility becomes limited over time. Let's take a look at how energy production negatively impacts water pollution.

Measures to minimize the Water pollution by use of accesive energy

Without water conservation, we won't go very far. It is central in making sure the world has better access to clean water. It means being aware that water is a scarce resource, taking care of it accordingly, and managing it responsibly.

Effects of excessive and unnecessary use of energy on forest

Biomass energy damages our climate and air, our forests, and our communities while the industry hides behind veils of misinformation.

When energy companies burn trees to make electricity, the result is increased climate-changing carbon dioxide emissions, devastated ecosystems, and displaced wildlife. Forests are one of our best tools for fighting climate change and one of our best defenses against its impact. They're also where we hike, camp, hunt, and fish. Forests enhance our quality of life and our well-being—benefits that disappear when giant wood pellet manufacturers like Enviva contribute to forest destruction by sourcing wood from clearcut forests.

Project Work

i. What sources of energy are used in daily life to cook food, run means of transport, run household appliances, and run factories? Prepare a list and write a brief introduction.

ii. If you collect too much firewood from the forest, the forest will disappear and so will the animals. Write an essay to support this statement.

iii. Excessive use of coal, mineral oil, etc. causes air pollution, negative effects on people's health, and fuel depletion. Present your arguments about this statement and describe the measures to reduce the use of coal and mineral oil.

iv. Identify sources of energy used in schools and homes. How are those sources used? Prepare a short description and present it to the class.

Exercise

A. Choose the correct one and put the tick mark(√).

i. _____ fuels our body's internal functions, repairs, builds and maintains cells and body tissues.

a. Force b. Energy
c. Power d. None of above

ii. The continual input of energy, mostly from _____, sustains the process of life.

a. oil b. water
c. coal d. sunlight

iii. Sources of energy can be classified into-

a. two b. three
c. four d. five

iv. Examples of renewable sources of energy is-

a. Natural gas b. petroleum
c. biomass d. nuclear energy

v. Examples of non-renewable sources of energy is-

a. coal b. solar energy
c. geothermal energy d. hydropower

vi. Which is not fossil fuel -

a. gas b. coal
c. biomass d. oil

B. Use the following words to fill in the blanks .

solid waste, Non-renewable, renewable, climate change , climate, photosynthesis

i. Sunlight allows plants, algae, and cyanobacteria to use _____ to convert carbon dioxide and water into organic compounds like carbohydrates.

ii. A _____ source is the natural resource that causes no impact on nature.

iii. _____ sources can be extracted from the earth and will run out as time passes.

iv. The environmental problems directly related to energy production and consumption include air pollution, _____, water pollution, thermal pollution, and _____ disposal.

v. Biomass energy damages our _____ and air, our forests, and our communities while the industry hides behind veils of misinformation.

C. Differentiate between these pairs

i. Energy and Sources of Energy

ii. Biomass and Biogas

iii. Renewable and Non-renewable energy

iv. Solar power and Hydropower

D. Answer the following questions :

i. Why do we need energy?

ii. Why do living beings need heat and light energy ?

iii. Identify the sources of energy available in the environment .

iv. How many types of sources of energy?Write down an example of it.

v. Explain the effects of excessive and unnecessary use of energy on the environment.

vi. Explain and implement measures to reduce the impact of excessive use of energy on the environment.

vii. How do we reduce the effects of excessive and unnecessary use of energy on the environment?

viii. Put each of the statements into the correct boxes on the table below-

   a. Supply will eventually run out the and cannot be replaced.

   b. Supplies can be replaced quite easily.

   c. Can be used anywhere to release a lot of heat energy.

d. Produces no pollution and will not run out.

e. Not fossil fuel, but releases emissions when used.

f. Can only be used in certain conditions.

Energy Sources	Advantage	Disadvantage
Biomass		
Solar Power		
Coal		

D. Diagrammatic Questions :

i. What type of energy source is shown in the figure below? Write down the benefits of using these sources.

Water/ Hydroelectric Power

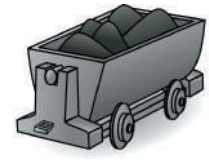
Wood

Geothermal Energy

Soalr energy

ii. What type of energy source is shown in the figure below? Write down the effect of using these sources.

Natural Gas



Coal

Nuclear energy

Rocks and Minerals

Unit 4

Classification of Living Beings

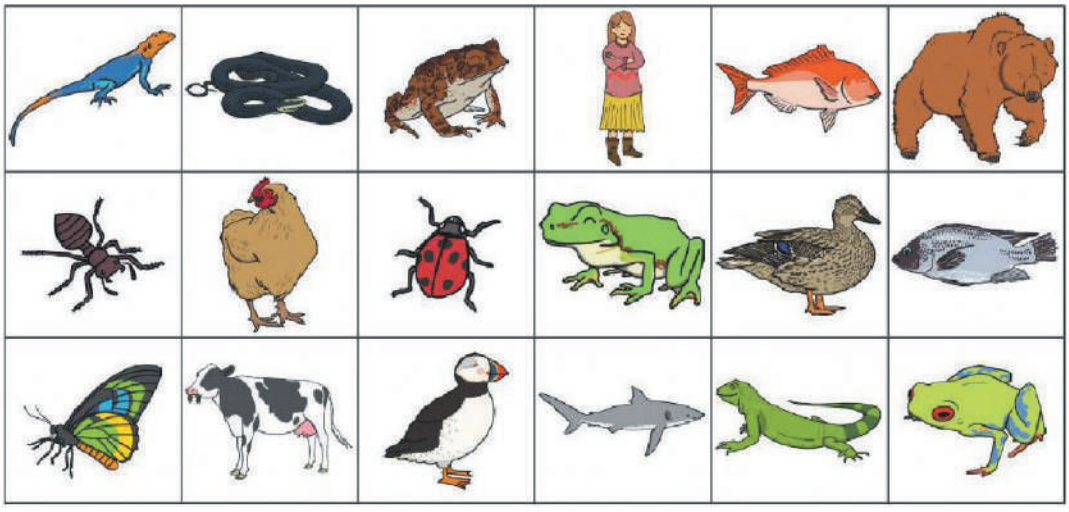
Total Estimated pariods (Th. 15+ Pr. 5 =20)

Student's Learning Outcomes

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

- describe the general characteristics of vertebrates
- compare the characteristics of seeds, roots, stems and leaves of plants to classify them into monoecious and dioecious groups
- describe the functions of different parts of plants (roots, stems, leaves, flowers, fruits)

Answer based on the picture given below:



i. What kind of animals are seen in the pictures above?

ii. Make a list of the animals you see around your home and school. Classify them as aquatic, terrestrial, crawling, feathered, flying, giving birth, lactating, etc.

4.1 Vertebrate Animals

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

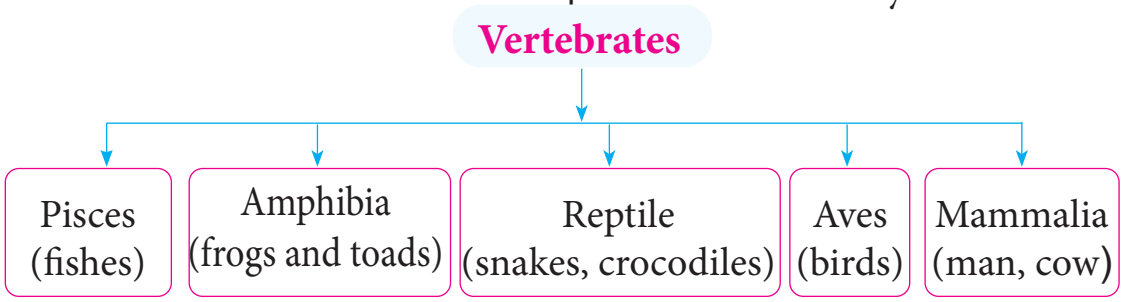
animals can be divided into two major groups:

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.

Fig.4.1

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.

Fig.4.2

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.
- They have generally three-chambered heart (except crocodile). They are cold blooded animals.

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

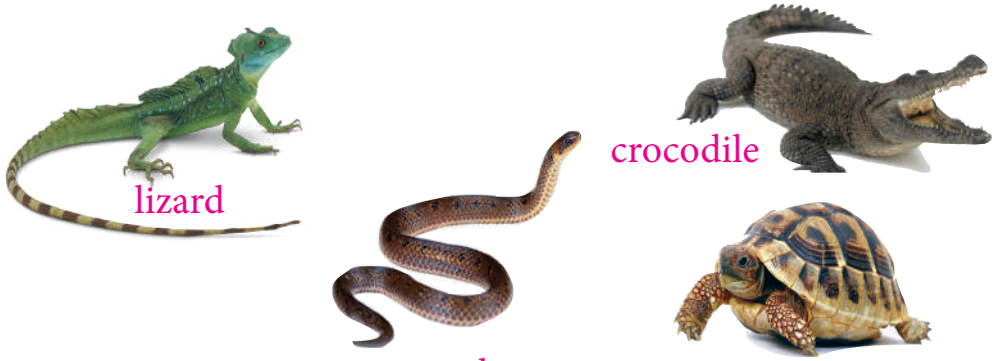


Fig.4.3

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.

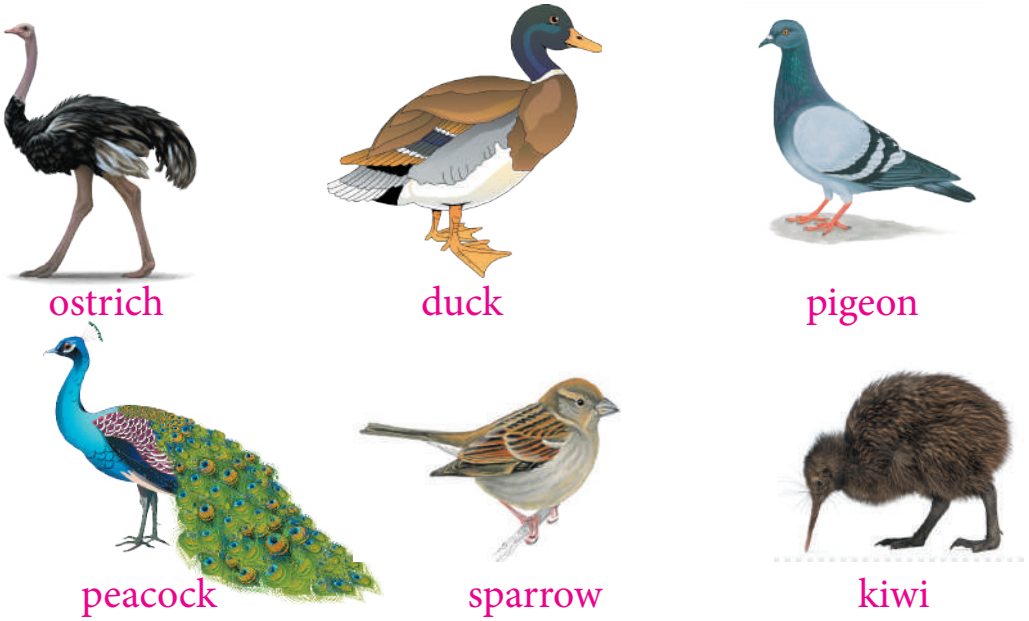


Fig.4.4

E. Mammalia

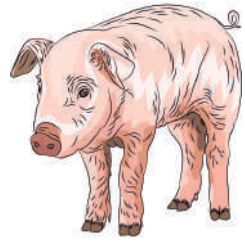
Those animals which have mammary glands and suckle their young ones are known as mammalia. Mammals are the only animals that have a body covered with hair and fur. They are terrestrials and viviparous because the young develop inside the femals body.

General Characteristics of Mammalia :

- These 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 in some animals or reduced.
- 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 doplhins (aquatic mammal), camel, kangaroo, rabbit, rhinoceros, squirrel, zebra etc.

bat

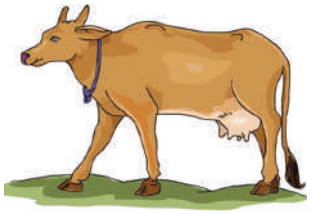


pig

woman

Fig.4.5

whale



cow

dog

Fig.4.6

Activities 4.1

i. Select the correct answer.

a. A _____ has hair and feeds their babies with milk.
b. A _____ has feathers and lay eggs.
c. A _____live underwater and breathe through their gills.
d. A _____ is a cold- blooded animar that has dry, scaly skin.
e. A _____ has moist skin and absorbs oxygen through it.

ii. Complete the following table by writing characteristics of vertebrate animals.

Vertebrates	Legs	Habitat (Land/Water)	Shin	Movement
Fish				
Frog				
Sparrow				
Liard				
Dog				

4.2 Monocotyledon and Dicotyledone Plants

Seed

Seeds are enclosed in the fruits. After the fruits have ripen, the seeds come out. When the seeds get suitable conditions, they germinate and grow into new plants. Plants contain different structures of seeds. According to the structure of the seeds, plants can be divided into two groups : monocotyledon and dicotyledon.

a. Monocotyledon

The seeds of some plants have only one part in their seed, so they are known as monocotyledon. These plants have narrow types of leaves with parallel venation. They also have fibrous root system. Their flowers are not very attractive.

maize

paddy

wheat

Fig.4.7

b. Dicotyledon

The seeds of some plants have two parts in their seed, so they are known as dicotyledon. These plants have broad leaves with reticulate venation. They also have a tap root system. The flowers are attractive and they are of different colours.

pea

soyabean

gram

Fig.4.8

Reproduction from Seeds

Seeds are hard, dry and cannot broken easily. The thick outer covering of the seed is called the seed coat. Dicotyledon

Fig.4.9

seeds contain two parts. Between the cotyledons parts is the baby plant, called the embryo. The embryo contains a baby shoot and a baby root.

The seeds, when in a suitable environment develop into young plants is known as germination.

Difference between monocot and dicot plants :

S.N.	Monocot plants	Dicot plants
i.	The seeds of monocot plant consists of only one cotyledon.	The seeds of dicot plant consists of two cotyledons.
ii.	These have fibrous root system.	These have tap root system.
iii.	They have long and narrow leaves with parallel vanation.	They have broad leaves with net like structures.
iv.	The stems of these plants have distinct nodes and iternodes.	The stems of these plants do not have distinct nodes and internodes.
	Examples: maize, banana, sugarcane, coconut etc.	Examples: gram, pea, mango, mustard, etc.

Just for Your Knowlege

- The plants that do not produce flowers are known as non - flowering plants (cryptogams).
- The plants that produce flowers are known as flowering plants (phanerogams).
- The part of the plant above the ground is called the shoot. It contains stems, branches, leaves, flowers and fruits.
- The part of the plants under the ground is called the root. It is divided into two types: fibrous and tap roots.
- Leaves absorb carbon dioxide and give out oxygen through fine pores called stomata.

- A complete flower consists of four main parts : calyx, corolla, androecium and gynoecium.
- Each seed consists a baby plant which is called the embryo.
- Some plants are monocotyledon and others are dicotyledon.
- Flowers which have either androecium or gynoecium are called unisexual flowers papaya, cucumber, bitter gourd, birch, pumpkin, etc.
- Flowers which consist of both male and female reproductive organs are called bisexual flowers. eg. rose, tulip, daffodil, brinjal, hibiscus, mango etc.
- Androecium and gynoecium help in sexual reprodution.
- Matured ovules produced inside the fruits are called seeds.
- Dicotyledonous plants have two cotyledons in their seeds.
- Monocotyledonous plants have single cotyledon in their seeds.
- Tap root system is present in dicot plants and fibrous root system is present in monocot plant.

4.3 Parts of Plants

The part of the plants that lies under the soil is called the root. The part of the plants above the ground is called the shoot. The shoot of a plants includes stems, branches, leaves, flowers and fruits.

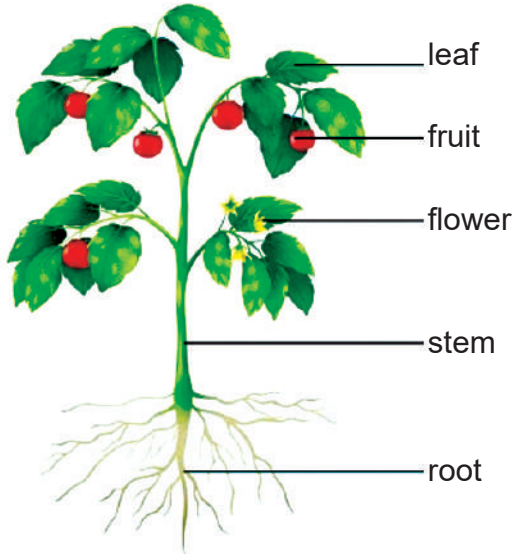


Fig.4.10

Root

Root is the most important part of the plants. It is one of the first part of the plants that starts to grow. It supports the plant body by holding the soil. Root is usually brown. The main root, which is thick and large, and grows deep in the soil, is called the primary root. There are many small thin roots that are developed from primary roots. They are known as secondary roots.

Types of Root

There are mainly two types of root: Fibrous Root and Tap Root

1. Fibrous root

The root system of some plants which contain a large number of roots of about the same size and spread out in all direction is known as fibrous root. Grass, maize, wheat, millet and rice have fibrous roots.

2. Tap Root

The root of some plants which contain a main root with small roots growing from its side is known as tap root. Mustard, bean, pea, carrot, raddish etc. have tap root system.

Fig.4.11

Functions of Root

- It gives fixation to plants.
- The root absorbs water and minerals from the soil.
- The roots of some plants store food materials.

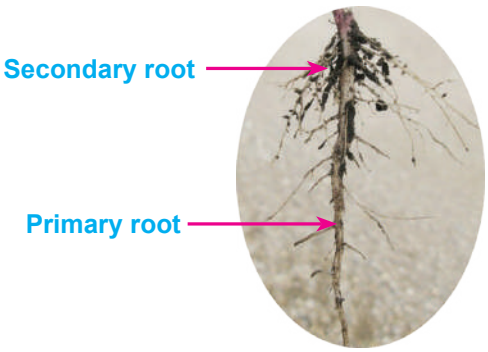


Fig.4.12

Stem

This is the main part of the shoot system. The stem bears branches, leaves, buds, flowers and fruits. Some plants stems do not have branches. The place where a leaf is attached to the stem is called as branches. The place where a leaf is attached to the stem is called node. The parts of the stem that is between two nodes is known as internode. Some plants do not have any branches.

Functions of Stem

- The stem supports the leaves and branches
- It passes water and minerals from the root to the other parts of the plants.
- It supplies food from leaves to other parts of plants.
- In some plants such as potato, ginger, onion and sugarcane, the stems stores food.

Leaf

Leaf is a thin flattened green part of a plant. It arises from the stem and branches, a leaf has leaf base, petiole and lamina. The leaf base is the stalk of the leaf, the main vein is situated in the middle of leaf lamina. There are also small veins coming out of the main vein which are known as side veins. On the under side of a leaf, there are tiny pores which are known as stomata. Through these stomata leaf takes in carbon dioxide for making food. Stomata also help the plants to breathe in oxygen. Leaf lamina is also the main site for photosynthesis.

Functions of Leaf

- The leaf helps in making food for the plants.
- It removes excess amount of water from the plants.
- It helps in the exchange of gases during photosynthesis and respiration.

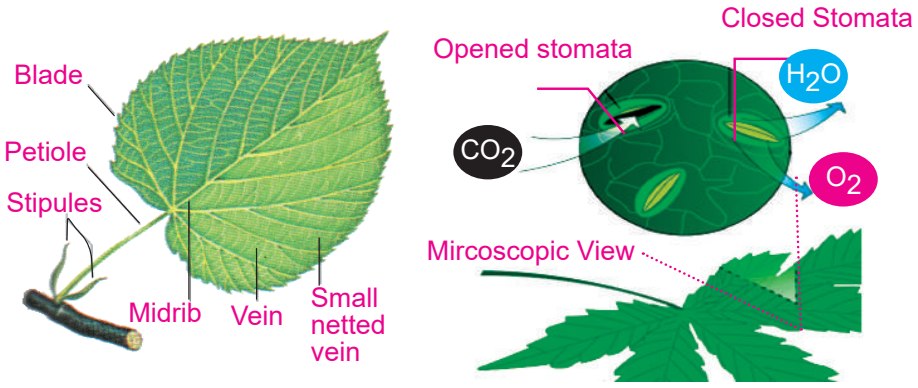


Fig.4.15

The Flower

Most of the plants bear flowers. Different plants bear flowers in different seasons. A flower is a colourful and attractive part of a plant. Flowers give rise to fruits and seeds. Thus, the flower helps the plants to reproduce. A stalk which helps the flower to attach on the stem is known as pedicel.

A flower has four main parts . They are : calyx, corolla, androecium and gynoecium. The swollen part of the flower is called thalamus. The shape, size and colour of the flower differ in different types of plants. Some flowers are unisexual and others are bisexual. Flowers having only one sex organ is unisexual and both sex organs is bisexual.

Calyx

The calyx is the outer green part of the flower. The calyx consists of sepal. These sepals protect the flower in the budding stage. The number of sepals may vary from plants to plants.

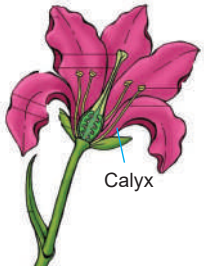


Fig.4.16

Corolla

The second part of the flowers is called the corolla. It consists of petals found in the inner part of the calyx. It is brighty coloured and scented, which attracts and helps in the fertilization and reproduction of the flower. Androecium and gynoecium are surrounded by petals.

Fig.4.17

Androecium

The androecium is the third part of the flower and it is the male reproductive part. It consists of stamens. Each stamen consists of two parts: Filament and Anther.

a. Filament

A long stalk of the stamen is called the filament.

b. Anther

Just above the filament there are pin head like structures called as the anther. Inside the anther there are powder like things called pollen grains. Pollen grains are the male reproductive cells, These cells help in fertilization in flowers.

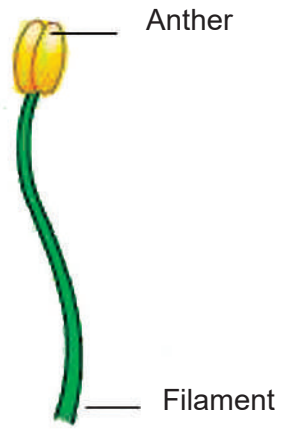


Fig.4.18

Gynoecium

The gynoecium is the innermost part and the female reproductive part of the flower. It is situated at the centre of the thalamus. It consists of one or more pistils (carpels). Each pistil has three parts:

a. Stigma

The uppermost part of the pistil is called the stigma.

b. Style

The long stalk below the stigma is called the style.

c. Ovary

The lower most swollen part of the pistil is called the ovary. Many eggs or ovules are present inside ovary.

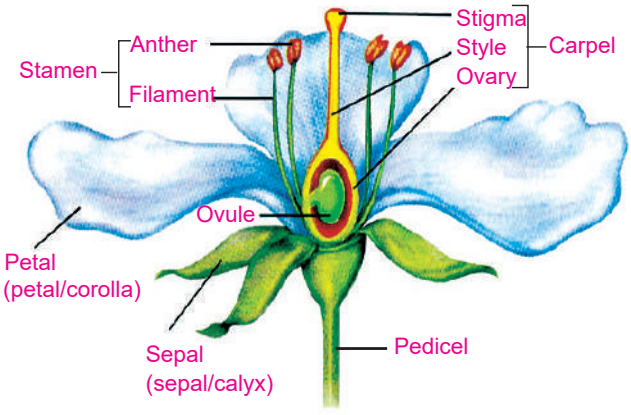


Fig.4.19

The ovules (eggs) are the female reproductive cells.

Ovary develops into fruit and ovules develop into seeds. Ovary is the edible part of the fruit.

Functions of Flower

The major functions of flower are :

i. Flower attracts insects and birds prior to pollination.
ii. It adds beauty of the plant.
iii. Each part of a flower has a direct-indirect role in the overall development and survival of the plant.
iv. Flowers help in the reproduction of flowering plants.

Fruits

A flower develops into a fruit. The green fruit grows in size and finally ripens. The colour of the fruits changes when it is ripen. The ovary of the gynoecium develops into fruits which consists of seeds. Fruits help in the protection and spread of seeds.

fruits seeds

Fig.4.20

Functions of fruits

i. They help to protect seeds from unfavourable conditions.
ii. Fruits help in dispersal of seeds.
iii. They provide nutrition (food) to the developing embryo.
iv. Fruits are taken as source of food (nutrition) by human beings.

Activities 4.2

i. Match the parts oc the plants with their characteristics.

roots	It holds up the plant.
stem	Hold the plant in place.
leaf	It hold the seeds.
fruit	It makes food for the plant.

ii. Collect leaves and flowers of different plants and fill the table as follows.

Leaf shape	Leaf venation	Number of sepals in flower	Number of petals in flower	Monocot or Dicut
Plant 1				
Plant 2				
Plant 3				
Plant 4				
Plant 5				

Project Work

i. Observe the physical characteristics of animals with backbones (frogs, fish, lizards, cows, chickens, dogs, pigeons, etc.) and separate them according to the characteristics of which group each animal belongs, with the reasons, and present them on a table in the classroom.

ii. Classify the following animals into five classes-
fish, snake, pigeon, frog, bat, horse, shark, bear, duck, crow,tiger, sea horse, toad,tortoise,sparrow,whale

iii. Write the two names of the following groups:

a. Aquatic animals
b. Water and land animals
c. Terrestrial animals
d. Flying animals.

Project Work

iv. Draw diagrams of the following animals with two characteristics: fish, bird, snake, frog, and cow.

v. Separate the following plants into monocotyledons and dicotyledons. mango, apple, pumpkin, wheat, maize, soyabean, pea, garlic, orange, wheat, gram

vi. Differentiate between monocotyledon and dicotyledon plants with diagrams.

vii. ou should observe any five plants around your house and present them in the classroom by drawing a picture showing the parts of those plants.

Exercise

A. Choose the best answer from the given alternatives.

i. _____ is a dicotyledonous seed.

a. gram b. soya bean

b. grass d. i and ii

ii. _____ fixes the plant firmly into the soil.

a. root b. stem

c. leaves d. flower

iii. Plants respire through _____

a. stomata b. chlorophyll

c. midrib d. root

iv. Corolla attracts insects and birds for _____

a. all of below b. dispersal

c. pollination d. fertilization

v. Ovary converts into _____

a. fruit b. seed

c. leaf d. cotyledon

vi. Which of the following animals has backbone?

a. snake b. snail

c. earthworm d. crab

vii. _____ has a soft body.

a. octopus b. bee

c. cow d. dolphin

viii. A snake is a _____

a. reptile b. Aamphibian

c. mammal d. protozoa

ix. Which class of animals produce sweat?

a. dog b. mammals

c. aves d. porifera

B. Fill in the blanks with suitable words.

i. Roots keep the plants _____ in the soil.

ii. _____ grow above the ground.

iii. The outer part of the flower is _____ .

iv. The male part of the flower is called _____ .

v. Thalamus is attached to the stem by the _____ .

vi. Plants are green in colour due to the presence of _____.

vii. Birds have _____ and which help them to fly.

viii. The pore bearing animals are called _____.

C. Write 'T' for true or 'F' for false statements.

i. Petals are the most colourful part of a flower. ☐

ii. Plants only grow from seeds. ☐

iii. The ovary of a flower develops into fruits. ☐

iv. Dicot plants seeds have only one cotyledon. ☐

v. Mushroom is a flowering plant. ☐

vi. Bat is a mammal. ☐

D. Match the followings :

Gynoecium	stamen.
Androecium	tiny pores
Calyx	carpel
Corolla	green parts
Stomata	colourful parts
Bat	insect without wings
Whale	parasite
Millipede	flying mammal
Tapeworm	webbed feet
Frog	aquatic mammal

E. Answer these questions.

i. Define the following :

a. Non - flowering plants
b. Flowering plants
c. Shoot system
d. Root system
e. Tap root
f. Fibrous
g. Thalamus
h. Unisexual
i. Bisexual

ii. Differentiate the following :

a. Non- flowering and flowering plants
b. Monocotyledon and dicotyledon plants
c. Androecium and Gynoecium
d. Calyx and corolla
e. Tap root and fibrous roots
f. Primary and secondary roots

iii. Write the function of root, stem and leaf.

iv. Name the four parts of a flower.

v. Why do plants produce seeds?
vi. How does carbondioxide enter the leaf?
vii.. Draw a diagram of a plant with labelling.
viii. Draw a diagram of a flower with labelling.
ix. Draw a diagram of a leaf with labelling.
x. Draw a diagram of a seed with labelling.
xi. Name different parts of stamen.
xii. Name different parts of pistil.

xiii. Define the followings.

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

xiv. How can birds fly?

xv. How can fishes swim in water?

xvi. How does a tapeworm get its food?

xvii. Differentiate between:

a. Fish and frog
b. Birds and ascaris
c. Lizards and birds
e. Bat and sparrow
f. Invertebrate and vertebrate

xviii. Write two characteristics of each group:

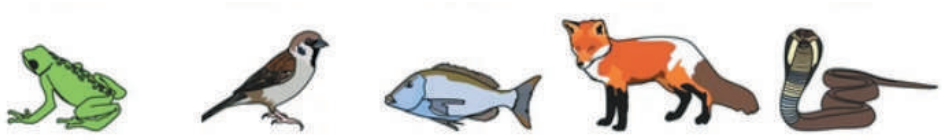
a. Pisces
b. Amphibia
c. Reptilia
d. Aves
e. Mammalia

xix. Give reasons.

a. Bat is a mammal.
b. Frog is a amphibian organism

F. Diagrammatic Questions :

i. Name and classify the animals given below. Also, write three characteristics of each.



ii. Name and classify the any five animals given below. Also, write three characteristics of each.

iii. Select the correct animals in each group.

Mammals	
Birds	
Reptiles	
Amphibians	
Fish	

iv. Identify the animal, its group and write its two characteristics.

Name of Animal _____

Vertebrate group _____

Characters 1. _____

2. _____

Name of Animal _____

Vertebrate group _____

Characters 1. _____

2. _____

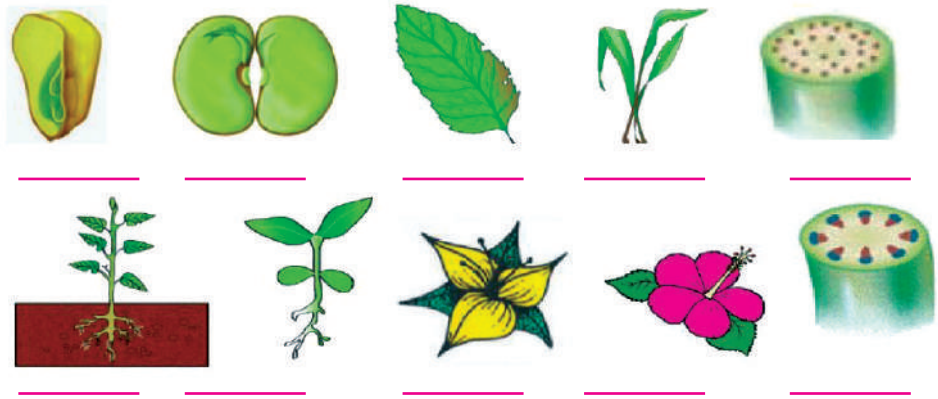
Name of Animal _____

Vertebrate group _____

Characters 1. _____

2. _____

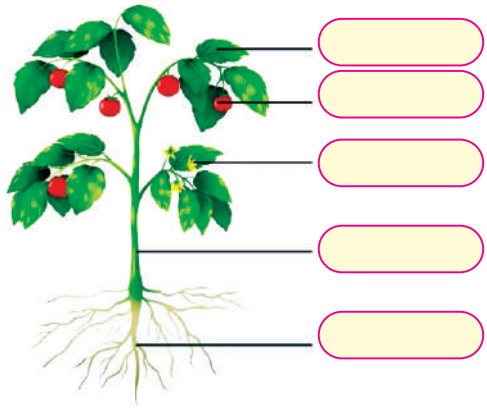
v. Drag the word to match with the picture of monocot and dicot plants.



Monocot leaf | Monocot seed | Dicot leaf | Dicot vascular bundle | Monocot roots | Monocot vascular bundle | Dicot seed | Dicot roots | Monocot flower | Dicot flower

vi. Drag and drop the parts of he plant.

roots | flower | stem | fruit | leaf



vii. Based on the picture, let's drag and drop the correct answer for these questions.

a. What is the function of the roots?

_____

b. What is the function of the stem?

_____

c. What do plants need to make food?

_____

d. What is the part of the plant that uses light to make food?

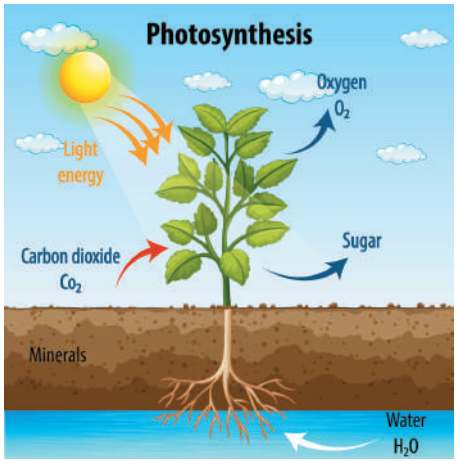
_____

e. What is absorbed from the air into the leaves?

_____

f. What is released from the leaves into the air?

_____



transports water to the leaves | leaves | oxygen | carbon dioxide

roots | absorb water and minerals from soil

water, minerals. carbon dioxide, sunlight

viii. Select the letter of the correct answer.

a. What part of the plant absorbs water and nutrients from the soil?

a. stem b. roots c. branches

b. What part of the plant transports water and minerals from the roots to the leaves and other parts of plants?

a. stem b. roots c. branches

c. What part of the plant produces food by photosynthesis?

a. fruits b. flowers c.leaves

Unit 5

Life Process

Total Estimated pariods (Th. 11+ Pr. 4 =15)

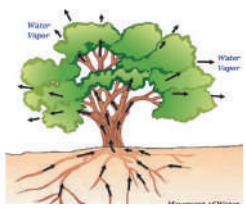
Student's Learning Outcomes

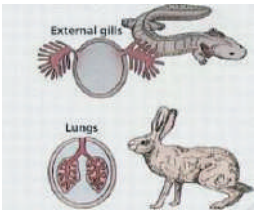
After studying this unit, the students will be able to :

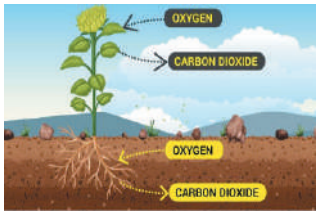
- provide an overview of life processes
- explain nutrition, excretion, respiration, transport, and reproduction as life processes
- differentiate between animals and plants based on life processes

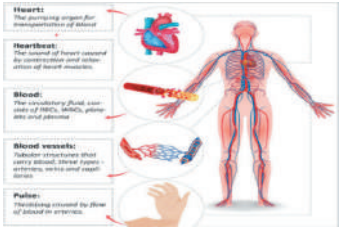
The pictures below are related to the life processes of animals and plants. Which are related to animals and plants in these pictures? Discuss with your friends and separate them. What life processes are related to all these animals and plants? write.

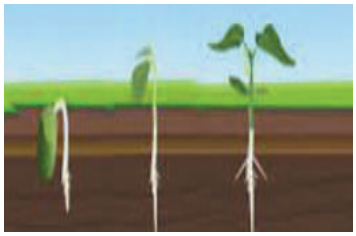
nutrition, excretion, respiration, transport, reproduction





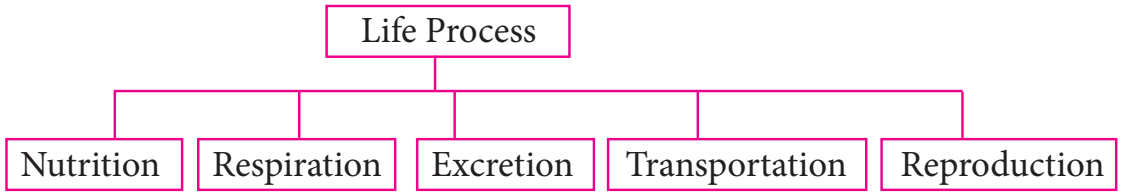






All living things perform certain life process like nutrition, respiration, excretion, transportation, and reproduction etc. The basic functions performed by living organism for their survival and body maintenance are called life process. Basic life processes are :-

The important activities that are performed by all living organisms are called life processes.

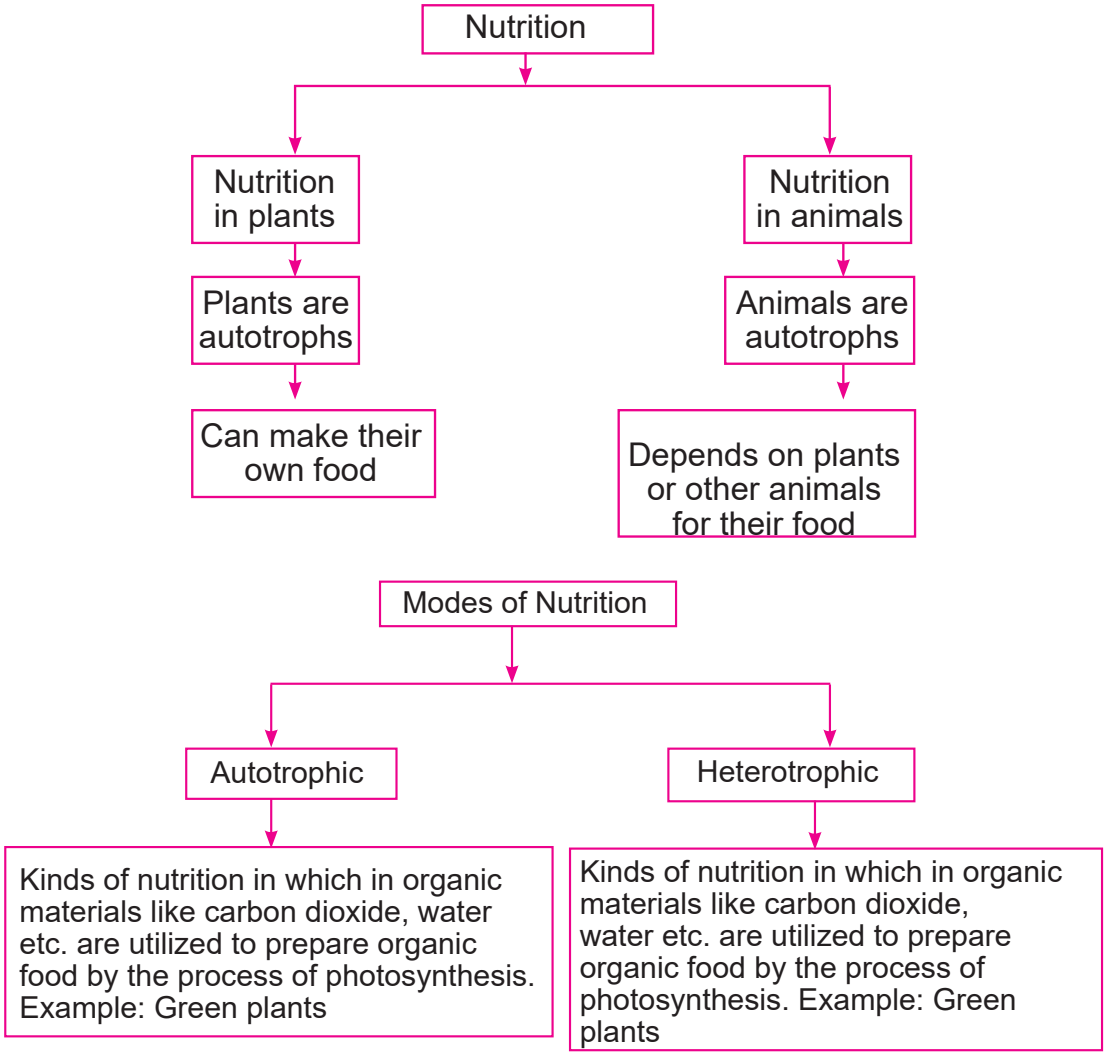


Nutrition

The process of taking food for getting energy is known as nutrition. All living organisms need food to grow, to get energy and to remain healthy. There are mainly two types of nutrition i.e. autotrophic and heterotrophic nutrition.

Non green plants such as mucor, mushroom, etc, cannot prepare their food by themselves. They derive their foods from dead and decayed organic materials. Therefore, they are called saprophytes (or decomposers). On the other hand, tapeworm, flatworms lice, fleas, etc. depend on other living organisms for obtaining foods. Therefore, they are called parasites.

Herbivores, carnivores, omnivores, saprophytes and parasites are commonly called heterotrophs. It is so because they cannot prepare their own food. They obtain their food from plant directly or indirectly.



Autotrophic Nutrition

The living organisms (i.e. green plants) which are able to prepare food by themselves, are known as autotrophs. All green plants are autotrophs. Leaves of green plants consist of chlorophyll which helps in manufacture of food. The process of making food by plants using carbon dioxide and water, in the presence of sunlight is called photosynthesis.

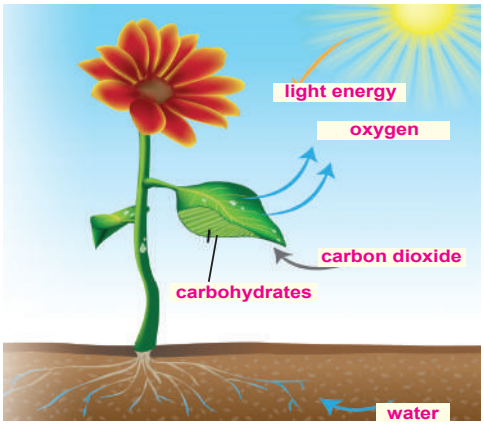


Fig.5.1

Heterotrophic Nutrition

These living organisms which cannot prepare their own food are known as heterotrophs. All animals are heterotrophs. Non-green plants are also heterotrophs as they cannot make food due to lack of chlorophyll.

mushroom yeast cell

Fig.5.2

Mushroom, yeast and other fungi are non-green plants.

The animals and non-green plants that cannot prepare their own food depend upon green plants directly or indirectly for their food supply.

Fig.5.3

Some animals eat plants only which are known as herbivorous Thus, they are plant eaters. Cow, goat, horse, buffalo, sheep are some examples.

Some animals eat only flesh of other animals which are known as carnivorous. They do not eat plants for food. Examples: Tiger, lion, snake.

tiger snake

Fig.5.4

Some animals eat both plants and flesh of animals which are known as omnivorous. Examples: Dog, crow, cat.

crow dog cat

Fig.5.5

Respiration

All living beings respire. Oxygen is necessary for respiration. The process of taking oxygen into the body and using it for releasing energy and waste products (carbon dioxide and water) from the body is called respiration. It helps to balance the amount of carbon dioxide in the air. Carbon dioxide is consumed by plants during photosynthesis process.

We respire through our lungs. Fishes respire through its gills.

Insects respire through air tubes.

Fig.5.6

Plants respire through small opening in their leaves called stomata.

Respiration

Plants use carbon dioxide and water from the air and release oxygen into the atmosphere during the process of photosynthesis i.e.

$$\text{carbon dioxide + water} \xrightarrow[\text{chlorophyll}]{\text{sunlight}} \text{food (glucose) + oxygen}$$

The respiration by other living organisms decreases the level of oxygen and increases the level of carbondioxide in the atmosphere. However, green plants reduce the level of carbon dioxide and increases the level of oxygen in the atmosphere. Thus, the respiration process help in the balance of carbon dioxide and oxygen in the atmosphere.

Internal Transport

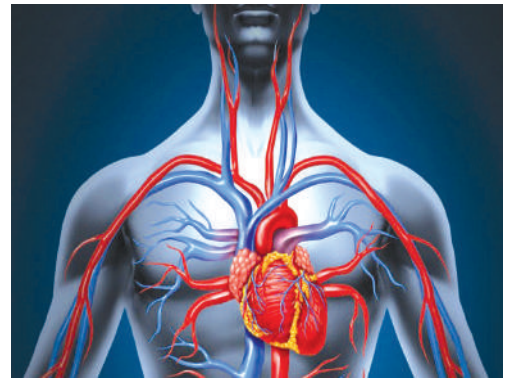


Fig.5.7

There is a transport system of food, water, oxygen and other substances inside the body of animals and plants is known as internal transport. In the body of developed animals, there is a system of transport of food, minerals, water and oxygen to all the parts of body. Blood circulates around in their body and the internal transport is due to the blood circulation. In tiny unicellular organisms, substances are transported in and out of the cell. This transportation is done by the protoplasm (all living substances) present in their cell. Plants take water and mineral from the soil through the conducting tissue called xylem. Xylem helps to transport water and minerals from the root to the different parts of the plant body. Similarly, a conducting tissue called phloem helps to transport food prepared in the bares to the different parts of the plant body.

Excretion

The process of the removal of the waste substance from the body is known as excretion. During several life processes in the body waste materials are also produced. These waste products are harmful to the living organisms and need to be removed.

In the animals stools, urine, sweat, mucus and carbon dioxide are the waste products. In some plants, gums and resins are waste products.

Reproduction

Living organism which is capable of producing new living organism of it own kind is known as reproduction. The new one grows to become adults.

Fig.5.8

Some plants develop new plants from seeds or stems or roots. Wheat plants seeds germinate to develop wheat plants only. Some animals such as bird, snake, crocodile, frog, fish and insects lay eggs and from eggs new animals are developed. Human, dog, cow, rat, cat, horse, etc. give direct birth to young babies during reproduction.

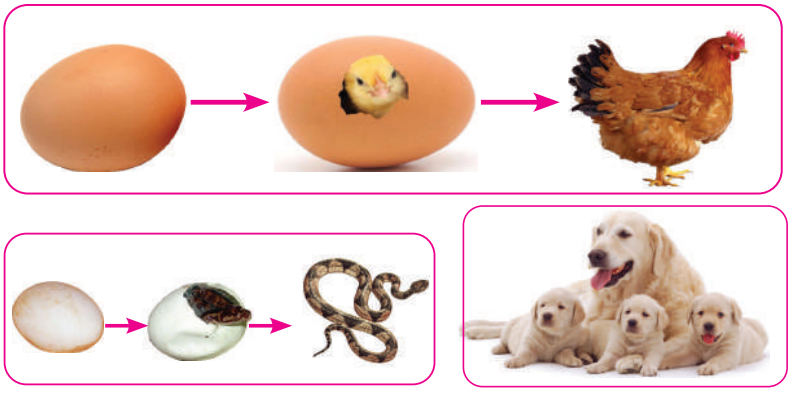


Fig.5.9

Differentiate between animals and plants based on life processes

Following are the important difference between the life processes of plants and animals

Plants	Animals
Meaning	
These are green in colour due to the presence of chlorophyll and provide oxygen to the atmosphere.	The animals cannot prepare their own food and consist of a specialized system to carry out different life processes.
Nutrition	
Plants are autotrophs and can prepare their own food.	Animals are heterotrophs and depend on plants and other animals for their food.
Transportation	
Transportation in plants refers to the movement of water and minerals from the roots to different parts of the plants. It also includes the movement of the food prepared by the leaves to the entire plant.	Transportation in animals is the movement of food, water, and oxygen to different parts of the body. Such a system consists of a circulatory system and excretory system. The main parts of the circulatory system are – blood, blood vessels, and heart.
Respiration	
Respiration in plants takes place through the stomata.	Exchange of gases occurs through lungs, gills, skin, etc.
Reproduction	
They reproduce asexually through budding, vegetative propagation, etc. They also reproduce sexually by a process called pollination.	Animals mostly reproduce sexually. Asexual reproduction occurs in lower animals by fragmentation and budding.

Excretion

Excretion is carried out in the plants in the following ways: The gaseous wastes, oxygen, carbon dioxide, and water vapor are removed through the stomata of leaves and lenticels of stems. Some waste products collect in the leaves and bark of trees. When the leaves and bark are shed, the wastes are eliminated.

Animals are generally more complex in nature when compared to plants, especially the animals belonging to the higher order phyla. Even among some lower organisms, excretion occurs through specialized organs, such as the nephridia seen in earthworms. In others, excretion happens through diffusion.

In the higher phyla and classes of the animal kingdom, animals such as fish, birds, reptiles, etc. have a specific excretory system in place to get rid of the metabolic wastes.

Activities 5.1

i. Collect information about life processes in animals and plants from various sources and prepare a report. Compulsorily include pictures related to the life process in your report. Now present the report you have prepared in the classroom.

ii. Prepare a list of differences between plants and animals based on life processes and present it to the classroom.

Interrelationship between Animals and Plants

Animals and plants are interdependent for their survival. Food gives energy to all living organisms. Plants and animals cannot live without food. Animals and plants help each other for food. Plants which prepare food materials themselves are known as producers. Animals eat plants or animals as food are known as consumers.

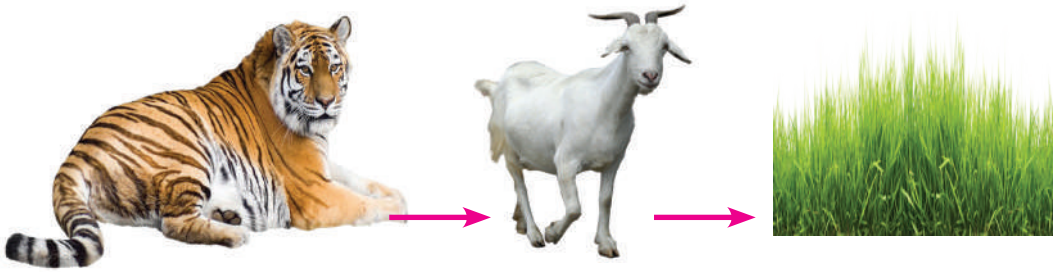


Fig.5.10

The process of eating and being eaten process is known as food chain. The main source of energy in any food chain is the sun because the sun helps green plants to manufacture foods. So, plants are called as producers. Food chain always starts from producers followed by herbivorous and carnivores which are consumers. Omnivores eat both plants and animals. Plants and animals are interrelated with each other.

Interrelationship between Living Things and Environment

Plants depend on the environment for the things required for preparing their food. All animals depend directly or indirectly on plants for their food. A plant leaf has tiny pores which are called as stomata. The carbon dioxide in the air reaches in to the leaf through the stomata. When water, carbon dioxide and minerals reach the leaf, plants prepare food (glucose) with the help of chlorophyll in presence of sunlight through photosynthesis. During photosynthesis oxygen gas is produced which goes out through stomata. Animals inhale oxygen and exhale carbon dioxide gas. During respiration glucose is broken down with the help of oxygen to release carbon dioxide and energy. Thus, living organism have a great role in maintaining environmental balance.

Role of the Environment

Environment plays an important role in the life of living organisms including human beings. It provides air, water, soil, foods etc. to all living organisms plants use water for preparation of foods. Different animals depend on plants directly or indirectly. Living organisms live on land, (in) air and/or in water.

All living organisms oxygen for their survival which is provided by environment (from atmosphere). Air also contains nitrogen which is mixed micro organisms and used by plants for their growth. Wind (blowing air) helps in pollination in flowering plants.

The ozone layer present in the atmosphere protects all living organisms from harmful effects of the sun's ultraviolet (uv) radiations.

A. Choose the correct one and put the tick mark (√) .

i. The process of taking food for getting energy is known as _____.

a. excretion b. respiration
c. nutrition d. reproduction

ii. The process of taking oxygen into the body and using it for releasing energy and waste products (carbon dioxide and water) from the body is called _____.

a. excretion b. respiration
c. nutrition d. reproduction

iii. There is a transport system of food, water, oxygen and other substances inside the body of animals and plants is known as internal _____.

a. transport b. nutrition
c. respiration d. reproduction

iv. The process of the removal of the waste substance from the body is known as _____ .

a. reproduction b. nutrition

c. respiration d. excretion

v. Living organism which is capable of producing new living organism of it own kind is known as _____ .

a. respiration b. nutrition

c. reproduction d. excretion

vi. Respiration in plants takes place through the -

a. lungs b. gills

c. stomata d. skin

B. Use the following words to fill in the blanks .

Transportation , heterotrophs , reproduce , movement, excretion, lungs, autotrophs,

i. Plants are _____ and can prepare their own food.

ii. Animals are _____ and depend on plants and other animals for their food.

iii. _____ in animals is the movement of food, water, and oxygen to different parts of the body.

iv. Transportation in plants refers to the _____ of water and minerals from the roots to different

v. Animals mostly _____ sexually. parts of the plants.

vi. Even among some lower organisms, _____ occurs through specialized organs, such as the nephridia seen in earthworms.

vii. In some animals, exchange of gases occurs through lungs, gills, skin, etc.

C. Differentiate between these pairs.

i. Nutrition and Excretion.

ii. Respiration in animal and Respiration in plant.

iii. Transportation and Reproduction.
iv. Reproduction in animal and Reproduction in plant.
v. Excretion in animal and Excretion in plant.
vi. Living things and Life process.

D. Explain the following:

i. All green plants are autotrophs.
ii. All animals are heterotrophs.
iii. Carbon dioxide is consumed by plants during photosynthesis process.
iv. Xylem helps to transport water and minerals from the root to the different parts of the plant body.
v. Phloem helps to transport food prepared in the bares to the different parts of the plant body.
vi. Some plants develop new plants from seeds or stems or roots.
vi. Excretion happens through diffusion in some animal.

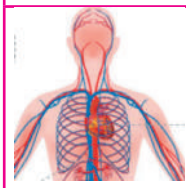
E. Answer the following questions :

i. What are the life processes?
ii. Write down the name of any five life processes that occur in living things.
iii. What is nutrition? Briefly explain it.
iv. What is respiration? Briefly explain it.
v. What is excretion? Briefly explain it.
vi. What is the definition of transport in animals and plants? Briefly explain it.
vii. What is reproduction in animals? Briefly explain it.
viii. Differentiate between animals and plants based on life processes.

F. Diagrammatic Questions :

i. Look at the picture. What life process is it .

nutrition, excretion, respiration, transport, reproduction

ii. Write only the letter. Use lowercase. Match the organ invalved breathing with the corresponding animal.

Answer	Animal	Organs
	axolotl	a. trachea
	grasshopper	b. lungs
	dog	c. internal gills
	fish	d. external gills

iii. Which life processes are the following pictures related to? Write about the process in brief.

Unit 6

Matter

Total Estimated pariods (Th. 20+ Pr. 10 =30)

Student's Learning Outcomes

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

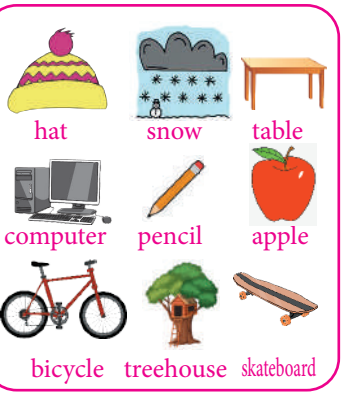
- define matter as something that has mass and occupies space
- test the physical properties of matter
- classify substances into solids, liquids, and gases based on their physical properties
- study the comparative physical properties of solids, liquids, and gases
- explain the effects of heat on matter
- explore the advantages and disadvantages of heat effects in daily life
- mix different substances to make a mixture and introduce the mixture
- give examples of different types of mixtures (solid and solid, solid and liquid, liquid and liquid, liquid and gas, gas and gas)
- recognize equal and unequal mixtures and distinguish between them
- separate and interpret mixtures using common methods of separation (hand picking, sedimentation and decantation, straining, stirring, sifting)

Some objects are shown in the picture below.

i. Classify all these as solid, liquid, or gas based on their properties.

ii. In the picture, group A, B, and C can be defined as what state of matter?

A



B

C

6.1.1 Matter

Matter is referred to as a substance that has a certain mass and takes up a certain volume in space. A pen, a pencil, water, and milk are all examples of matter. As a result, it is classified as both living and non-living.

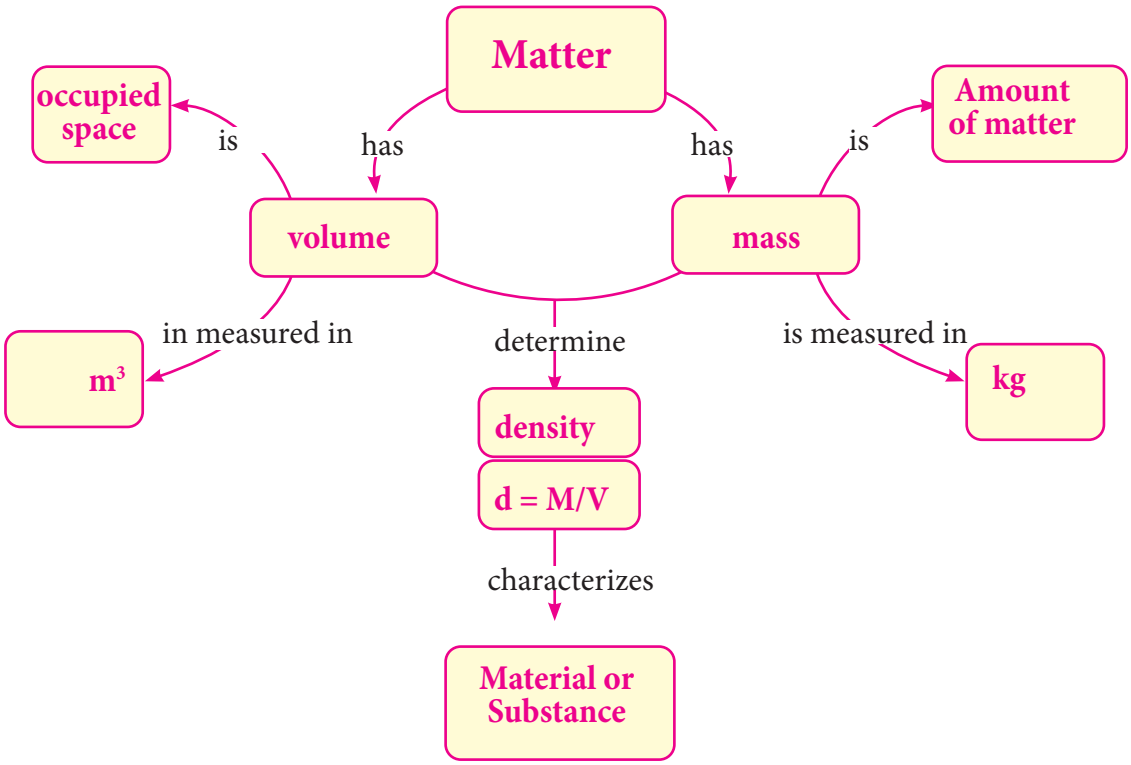


Fig.6.1

Matter is anything that occupies space and has mass. All physical objects are composed of matter, and an easily observed property of matter is its state or phase. The classical states of matter are solid, liquid and gas. Several other states, including plasma and Bose-Einstein condensate, do exist, but it is the classical states that can transition directly into any of the other classical states.

For example, an ice cube (solid water) left on a bench at room temperature quickly changes to liquid water, whereas a jet of steam (gaseous water) from the spout of a boiling kettle changes to liquid water when directed onto a cold surface.

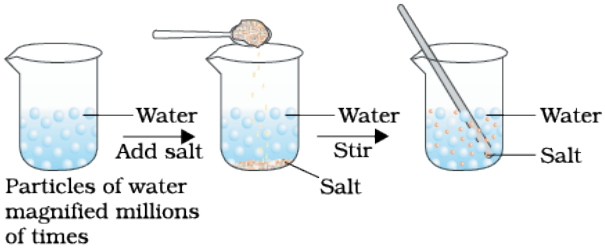
Activities 6.1

Matter is made up of particles and occupies space

Procedure:

i. Take a 100 mL beaker.
ii. Fill half the beaker with water and mark the level of water.
iii. Dissolve some salt/ sugar with the help of a glass rod.
iv. Observe any change in water level.
v. What do you think has happened to the salt?
vi. Where does it disappear?
vii. Does the level of water change?

In order to answer these questions we need to use the idea that matter is made up of particles. What was there in the spoon, salt or sugar, has now spread throughout water. This is illustrated in Fig. below:



When we dissolve salt in water, the particles of salt get into the spaces between particles of water.

A solid's particles are packed closely together. The forces between the particles are strong enough that the particles cannot move freely; they can only vibrate. As a result, a solid has a stable, definite shape and a definite volume. Solids can only change shape under force, as when broken or cut. In crystalline solids, particles are packed in a regularly ordered, repeating pattern. There are many different crystal structures, and the same substance can have more than one structure.

Solids are defined by the following characteristics:

- Definite shape (rigid)
- Definite volume
- Particles vibrate around fixed axes

Activities 6.2

The Solid State

i. Collect the following objects— a pen, a book, a needle and a piece of wooden stick.

ii. Sketch the shape of the above objects in your notebook by moving a pencil around them.

iii. Do all these have a definite shape, distinct boundaries and a fixed volume?

iv. What happens if they are hammered, pulled or dropped?

v. Are these capable of diffusing into each other?

vi. Try compressing them by applying force. Are you able to compress them?

All the above are examples of solids. We can observe that all these have a definite shape, distinct boundaries and fixed volumes, that is, have negligible compressibility. Solids have a tendency to maintain their shape when subjected to outside force. Solids may break under force but it is difficult to change their shape, so they are rigid.

Consider the following:

(a) What about a rubber band, can it change its shape on stretching? Is it a solid?

(b) What about sugar and salt? When kept in different jars these take the shape of the jar. Are they solid?

(c) What about a sponge? It is a solid yet we are able to compress it. Why? All the above are solids as:

i. A rubber band changes shape under force and regains the same shape when the force is removed. If excessive force is applied, it breaks.

ii. The shape of each individual sugar or salt crystal remains fixed, whether we take it in our hand, put it in a plate or in a jar.

iii. A sponge has minute holes, in which air is trapped, when we press it, the air is expelled out and we are able to compress it.

In a liquid, the particles are more loosely packed than in a solid and are able to flow around each other, giving the liquid an indefinite shape. Therefore, the liquid will conform to the shape of its container.

Much like solids, liquids (most of which have a lower density than solids) are incredibly difficult to compress.

Liquids have the following characteristics:

- No definite shape (takes the shape of its container).
- Has definite volume.
- Particles are free to move over each other, but are still attracted to each other.

Activities 6.3

The Liquid State

i. Collect the following:
   a. water, cooking oil, milk, juice, a cold drink.
   b. containers of different shapes. Put a 50 mL mark on these containers using a measuring cylinder from the laboratory.

ii. What will happen if these liquids are spilt on the floor?

iii. Measure 50 mL of any one liquid and transfer it into different containers one by one. Does the volume remain the same?

iv. Does the shape of the liquid remain the same ?

v. When you pour the liquid from one container into another, does it flow easily?

We observe that liquids have no fixed shape but have a fixed volume. They take up the shape of the container in which they are kept. Liquids flow and change shape, so they are not rigid but can be called fluid.

In above two activities, we saw that solids and liquids can diffuse into liquids. The gases from the atmosphere diffuse and dissolve in water. These gases, especially oxygen and carbon dioxide, are essential for the survival of aquatic animals and plants. All living creatures need to breathe for survival. The aquatic animals can breathe under water due to the presence of dissolved oxygen in water. Thus, we may conclude that solids, liquids and gases can diffuse into liquids. The rate of diffusion of liquids is higher than that of solids. This is due to the fact that in the liquid state, particles move freely and have greater space between each other as compared to particles in the solid state.

In a gas, the particles have a great deal of space between them and have high kinetic energy. A gas has no definite shape or volume. If unconfined, the particles of a gas will spread out indefinitely; if confined, the gas will expand to fill its container. When a gas is put under pressure by reducing the volume of the container, the space between particles is reduced and the gas is compressed.

Gases have the following characteristics:

- No definite shape (takes the shape of its container)
- No definite volume
- Particles move in random motion with little or no attraction to each other
- Highly compressible

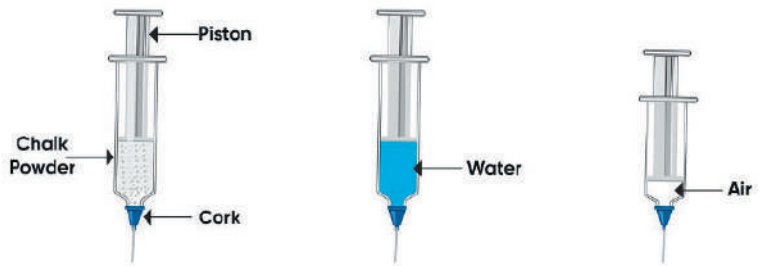
Activities 6.4

The Gaseous State

i. Take three syrings A, B, and C.
ii. Fill them with Salt, Water and Air respectively.
iii. Close the nozzle of allsyringes by inserting them in cork (This is to prevent leakage from them).
iv. Now press syringe.

We see that Syringe A containing salt and Syringe B containing water cannot be compressed. But Syringe C containing air can be compressed.

This shows that- gases can be compressed but solids and liquids cannot be compressed.



Have you ever observed a balloon seller filling a large number of balloons from a single cylinder of gas? Enquire from him how many balloons is he able to fill from one cylinder. Ask him which gas does he have in the cylinder.

We have observed that gases are highly compressible as compared to solids and liquids. The liquefied petroleum gas (LPG) cylinder that we get in our home for cooking or the oxygen supplied to hospitals in cylinders is compressed gas. Compressed natural gas (CNG) is used as fuel these days in vehicles. Due to its high compressibility, large volumes of a gas can be compressed into a small cylinder and transported easily. We come to know of what is being cooked in the kitchen without even entering there, by the smell that reaches our nostrils. How does this smell reach us? The particles of the aroma of food mix with the particles of air spread from the kitchen, reach us and even farther away. The smell of hot cooked food reaches us in seconds; compare this with the rate of diffusion of solids and liquids. Due to high speed of particles and large space between them, gases show the property of diffusing very fast into other gases. In the gaseous state, the particles move about randomly at high speed. Due to this random movement, the particles hit each other and also the walls of the container. The pressure exerted by the gas is because of this force exerted by gas particles per unit area on the walls of the container

The particles in a gas are widely spaced and move around freely. This means they will move to fit into any space but in liquids and gases the particles are more closely packed so cannot be compressed.

Activities 6.5

i. What is matter? Match the information to learn more afoul mailer.

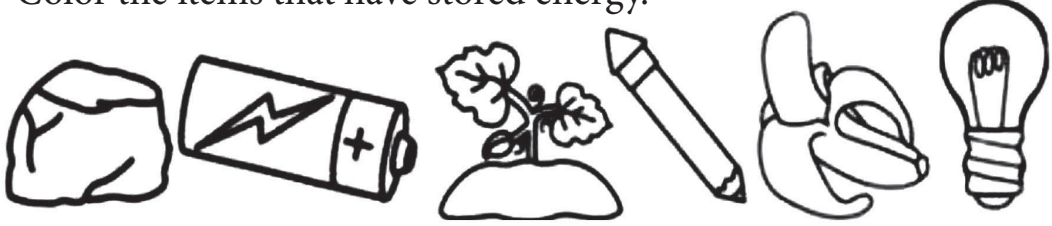
What is Matter?	•	•	weight
How are mass and volume alike?	•	•	the measure of how light or heavy something is for its size
Name a unit used to measure mass	•	•	density
Which property of matter changes depending on the gravitational pull?	•	•	the mass and volume of an object never change
What determines an object's ability to float?	•	•	grams, ounces pounds, tons
What is density?	•	•	anything that has both mass and volume

Activities 6.6

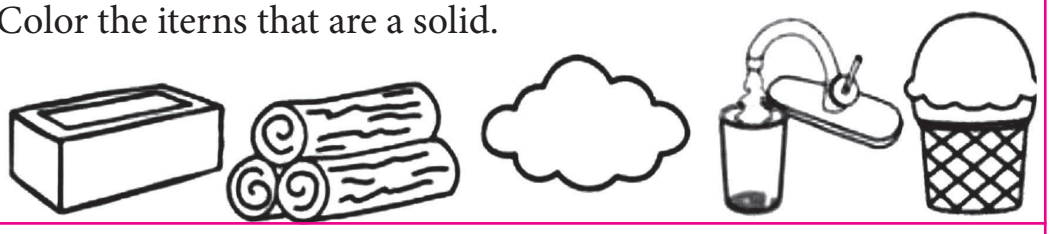
ii. Describe the properties of matter of an object in your classroom.

Color the items that show the process of a liquid to a gas.

Color the items that have stored energy.



Color the iterns that are a solid.

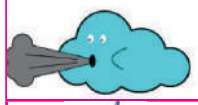


Color the iterns that ore a natural light source

Color the items that ore a gas.

Activities 6.7

iii. Fill in the table below by ticking the correct box. The first one has been done for you.

	Liquid			Solid		Gas		
	can be stirred	can be pourad	keeps its volume	keeps its shape	keeps its vlume	can be squashed eassy	changes its volume	fills any container its in
						✓	✓	✓
								

Why Heat, Light and Sound Aren't Matter ?

The universe consists of both matter and energy. The Conservation Laws state that the total amount of matter plus energy are constant in a reaction, but matter and energy may change forms. Matter includes anything that has mass. Energy describes the ability to do work. While matter may contain energy, the two are different from one another.

One easy way to tell matter and energy apart is to ask yourself whether what you observe has mass. If it doesn't, it's energy. Examples of energy include any part of the electromagnetic spectrum, which includes visible light, infrared, ultraviolet, X-ray, microwaves, radio, and gamma rays. Other forms of energy are heat (which may be considered infrared radiation), sound, potential energy, and kinetic energy.

Another way to distinguish between matter and energy is to ask whether something takes up space. Matter takes up space. You can put it in a container. While gases, liquids, and solids take up space, light, sound and heat do not.

Usually, matter and energy are found together, so it can be tricky to distinguish between them. For example, a flame consists of matter in the form of ionized gases and particulates and energy in the form of light and heat. You can observe light and heat, but you can't weigh them on any scale. Sound is also not considered a matter as it does not occupy space .

6.1.2 Physical Properties of matters

All matter has physical and chemical properties. Physical properties are characteristics that scientists can measure without changing the composition of the sample under study, such as mass, color, and volume (the amount of space occupied by a sample). Chemical properties describe the characteristic ability of a substance to react to form new substances; they include its flammability and susceptibility to corrosion. All samples of a pure substance have the same chemical and physical

properties. For example, pure copper is always a reddish-brown solid (a physical property) and always dissolves in dilute nitric acid to produce a blue solution and a brown gas (a chemical property).

A physical property is a characteristic of a substance that can be observed or measured without changing the identity of the substance. Silver is a shiny metal that conducts electricity very well. It can be molded into thin sheets, a property called malleability. Salt is dull and brittle and conducts electricity when it has been dissolved into water, which it does quite easily. Physical properties of matter include color, hardness, malleability, solubility, electrical conductivity, density, melting point, and boiling point.

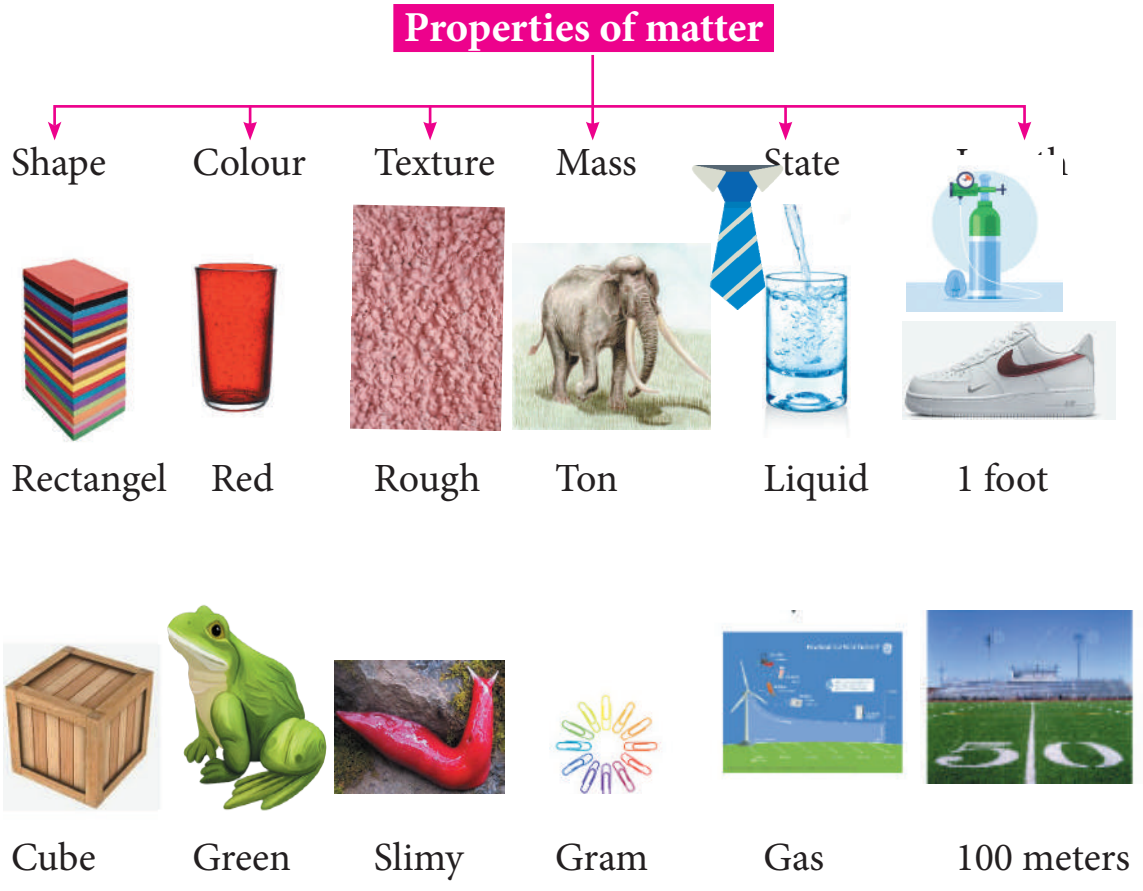


Fig.6.2

Activities 6.8

Which of these materials are solids (S), which are gases (G), and which are liquids (L)? Circle the ones that exist in all three phases on Earth. Write S, G, or L in each box.

Cotton	Plastic	Wood	Jell-O
Air	Water vapor	Wool	Water
Milk	Metal	Silk	Oxygen

Physical Properties of Solids, Liquids and Gases

Water can take many forms. At low temperatures (below 0°C), it is a solid. When at "normal" temperatures (between 0°C and 100°C), it is a liquid. While at temperatures above 100°C, water is a gas (steam). The state that water is in depends upon the temperature. Each state has its own unique set of physical properties. Matter typically exists in one of three states: solid, liquid, or gas.

The state that a given substance exhibits is also a physical property. Some substances exist as gases at room temperature (oxygen and carbon dioxide), while others, like water and mercury metal, exist as liquids.

Most metals exist as solids at room temperature. All substances can exist in any of these three states. A solid has definite volume and shape, a liquid has a definite volume but no definite shape, and a gas has neither a definite volume nor shape.

Sold

- Rigid
- Fixed Shape
- Fixed Volume
- Cannot be squashed

Liquid

- Not Rigid
- No Fixed Shape
- Fixed Volume
- Cannot be squashed

Gas

- Not Rigid
- No Fixed Shape
- No Fixed Volume
- Can be squashed

Activities 6.9

Complete the table below to show the properties of solid, liquid and gas

Property	Solid	Liquid	Gas
Particle movement		Vibrante and move in a restricted space	
Particle arrangement	Closely packed and well arrange		
Shape			No fixed shape, fills the entire container
Volume		Fixed volume	
Density			Least dense

Comparison of solids liquids and gases

Solids	Liquids	Gases
Highly Strong intermolecular forces between the mclecules, leads to a definite valume in Solids.	The intermolecular forces are stronger than gases but weaker than solids.	The intermolecular forces are practically non-existent. Thus, there is no definite volume.
Solids have a definite shape to them.	Liquids de not have a definite shape.	Gases do not have a definite shape.
The intermolecular space between sclids is absent.	Theintermolecular space is moderate but present.	The intermolecular space is free-flowing and plenty.
The force cf attraction between the molecules is incredibly high.	The force of attraction between molecules is pretty moderate.	There is no intermclecular force of attraction between the molecules.
They are incompressible.	Liquids cannot be compressed.	Gases can be compressed quite easily.
Solids have a definite shape and volume.	Liquids have a definite volume.	Gases have no definite volume.

Project Work

i. Prepare a model to demonstrate movement of particles in solids, liquids and gases.

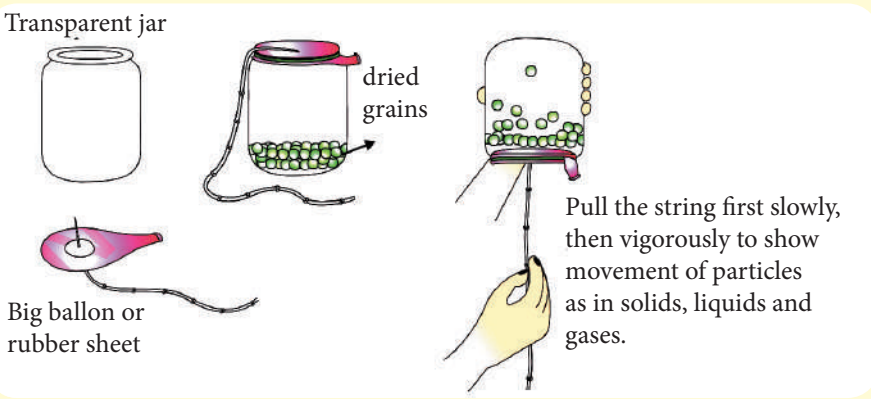
For making this model you will need

- A transparent jar
- A big rubber balloon or piece of stretchable rubber sheet
- A string
- Few chick-peas or black gram or dry green peas.

Project Work

How to make?

- Put the seeds in the jar.
- Sew the string to the centre of the rubber sheet and put some tape to keep it tied securely.
- Stretch and tie the rubber sheet on the mouth of the jar.
- Your model is ready. Now run your fingers up and down the string by first tugging at it slowly and then rapidly.



A model for converting of solid to liquid and liquid to gas.

ii. Collect at least ten objects from your home and school. Sort them into solids, liquids, and gases. Also, write the reason why the objects you have collected are solid, liquid, or gaseous. Demonstrate it in the classroom.

iii. Collect solids of similar shape and size and weigh them. Prepare a report.

iv. Take equal amounts of ghee, water, glycerol, and honey. Write scientific facts about how the amount of matter varies between objects of the same volume. Present it in the classroom.

v. Prepare a report based on the fact that alcohol and water are miscible liquids and water and oil are not miscible liquids.

Exercise

A. Choose the correct one and put the tick mark (√) .

i. Matter is referred to as a substance that has a certain _____ and takes up a certain volume in space.

a. density b. mass
c. area d. weight

ii. The _____ states of matter are solid, liquid and gas.

a. classical b. plasma
c. Bose-Einstein condensate d. none of above

iii. A _____ particles are packed closely together.

a. liquid's b. solid's
c. gas's d. plasma's

iv. The state has a definite volume, but no definite shape-

a. liquid b. gas
c. solid d. plasma

v. This state has no definite volume-

a. liquid b. gas
c. solid d. plasma

vi. This state allows the individual particles to move about while remaining in contact.

a. liquid b. gas
c. solid d. plasma

vii. Which are not the properties of solids?

a. It has a fixed shape and a fixed volume.
b. It's particles are closely bound.
c. It's particles cannot be compressed easily.
d. It has a fixed volume but not a fixed shape.

vii. Which are not the properties of liquids?

a. It has a fixed volume but not a fixed shape.
b. It does not completely fill the container like gases.
c. It should completely fill the container.
d. It's particles are far from each other.

viii. Which of the following statements is correct for gases?

a. It has a fixed shape and a fixed volume.
b. It can be compressed easily because of its low density.
c. It's particles cannot be compressed easily.
d. It has a fixed volume but not a fixed shape.

B. Use the following words to fill in the blanks .

shape, diffuse, gas, physical, substance, solids,

i. Solids can only change _____ under force, as when broken or cut.
ii. The particles in a _____ are widely spaced and move around freely.
iii. Solids, liquids and gases can _____ into liquids.
iv. The rate of diffusion of liquids is higher than that of _____.
v. All matter has _____ and chemical properties.
vi. A physical property is a characteristic of a _____ that can be observed or measured without changing the identity of the substance.

C. Explain the following:

i. Heat, light and sound aren't matter.
ii. The particles of solid cannot move freely, they can only vibrate.
iii. Solid have a definite shape .
iv. Liquids have a definite volume.
v. Gases can be compressed quite easily.

D. Answer the following questions :

i. What is matter, and give some examples?

ii. What are the physical properties of matter?

iii. Classify the following substances into solids, liquids, and gases based on their physical properties.

Bricks, water, oxygen, concrete, air, wood, milk, glass, dry ice, frozen carbon dioxide, rock, nitrogen,blood, potato, hydrogen, gold, oil, water vapor, salt, sand, honey, butter, ozone urine, coffee, carbon dioxide.

Solids	Liquids	Gases

iv. Write down comparative physical properties of solids, liquids, s and gases.

v. Draw one example of each state of matter.

Solid	Liquid	Gase

E. Diagrammatic Questions :

i. classify the following substances:

Gold

Milk

Helium

Wood

Blood

Xenon

Brick

Coffee

Neon

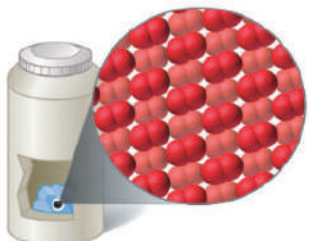
ii. Label each picture solid, qliduid or gas.

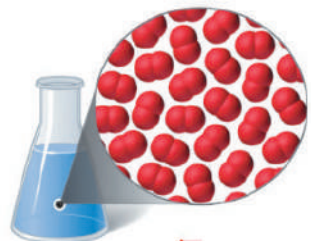
_____

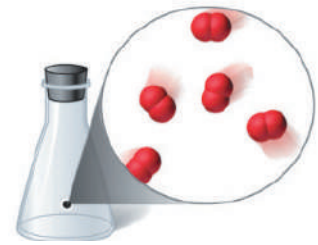
_____

_____

ii. What are the pictures below related to? Molecules of A, B, and C appear in which state of matter? Explain each with an example.


A


B


C

6.1.3 Heat

Heat is a form of energy of motion of molecules constituting the body. The unit of heat is the same as that of energy. The S.I. unit of heat is Joule.

Think about what your life would be like without heat. No more hot showers, hot food, or for that matter, no more warm sunlight to heat you up on a cold day. Imagine waking up in the morning and taking a cold shower, then eating a cold breakfast while sitting in your cold kitchen. Then getting in your cold school bus on a cold day, and heading to a cold school to sit in your cold classroom. What a crazy life that would be. Most of us take heat, a form of energy, for granted.

Heat energy, also called thermal energy, is the energy an object has because of the movement of its molecules, and heat can be transferred from one object to another object. Heat energy on Earth comes from the sun.

Everything on Earth is made up of molecules. Molecules are so small, you would need a very powerful microscope to see them. Molecules are always moving, and just like us, the more excited they get, the more they move. Do you know what gets molecules excited? Heat! When molecules get excited, they touch other molecules, heating them up, and getting them excited, too. This sharing of heat keeps spreading until all the molecules are the same temperature. Only then do they settle down.

For example, think about putting butter on a warm, flaky biscuit. The molecules in the biscuit are warm and vibrating all around. When the butter is placed on the biscuits, the molecules in the biscuit begin to heat up and excite the molecules in the butter, and the butter starts to melt. Heat energy is being transferred from the biscuit to the butter.

Do you like popcorn? How do you like to pop it? Do you fix it in the microwave? Maybe you heat the popcorn up on the stove in a pan or use an air popper. Let's think about popcorn popping to help us understand how heat is transferred. We will look at three ways that this transfer,

or spreading of heat energy, can happen: **radiation**, **conduction**, and **convection**.

All liquids expand more than all solids. The volume of the liquid gets greater as it is heated. The greater the rise in temperature the more it expands. The actual change in shape of the liquid depends on the shape of the container that it is in.

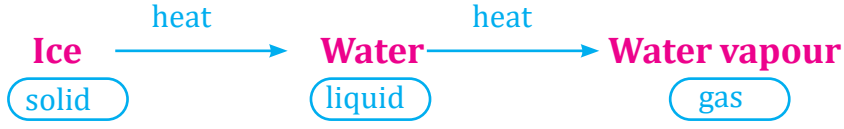
When a substance is heated its volume increases and so the density decreases. In solids, increase in volume is negligible and hence decrease in density too. In liquids and gases, as the temperature increases, volume increases and therefore density decreases considerably.

Effects of Heat

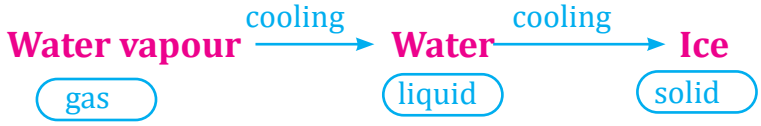
Some effects of heat are listed below.

i. 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.



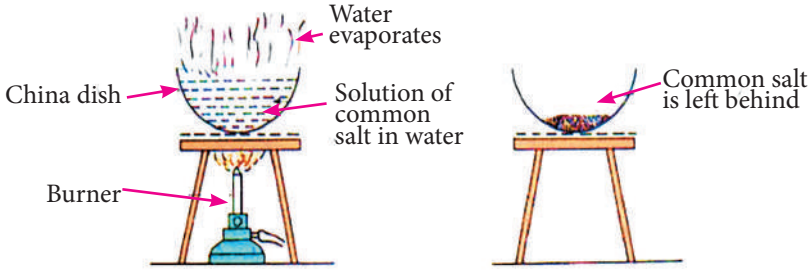
Water vapour can be changed into ice by cooling as in the following process.



Activities 6.10

i. 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.

ii. Take solution of common salt and water . Keep the solution in a porcelain dish and heated gently by using a burner. The water present in salt solution will form water vapours and escape into atmosphere. When all the water present in the solution of common salt and water gets evaporated, then common salt is left behind in porcelain dish as a white solid.



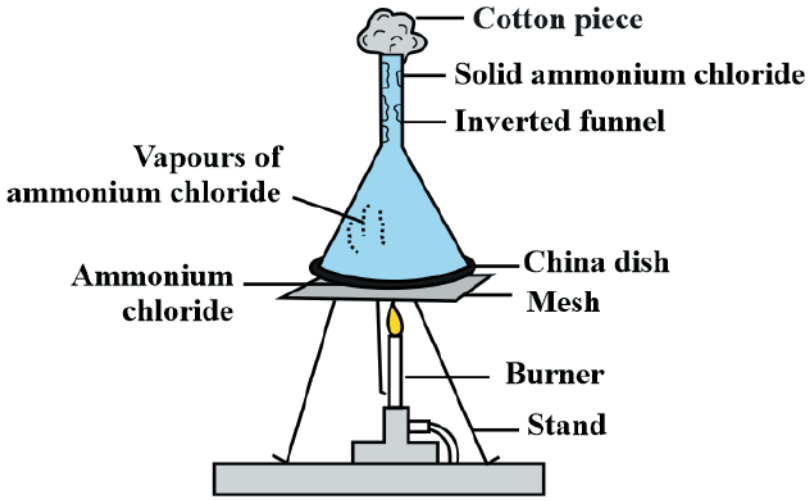
iii. Take Ice cubes of the same size and containers for the ice cubes. Place each ice cube in a container.

Put the ice cubes in different places, we put ours outside, inside and in the fridge.Time how long it takes each to melt. First we discussed what makes ice melt and predicted where the cubes would melt the fastest.

Melting is when a substance changes from a solid to a liquid. Water freezes to form ice when it is cooled to below 0 degrees celsius, when ice is warmed to above 0 degrees celsius it turns back into water.

Activities 6.11

iv. Take some Ammonium chloride powder in a china dish. Cover the china dish with inverted funnel and put a cotton plug in end of funnel so that vapours do not escape. Set up the apparatus as shown. Heat the dish with burner. Solid ammonium chloride changes into vapours which when come in contact of walls of funnel get cooled and change to solid and get deposited there.



v. Observe the changes in the state of camphor, wax, water, ghee, etc. when heated and cooled and prepare a report with pictures.

ii. Expansion of matter

In the experiment with the coloured water in a glass flask if you watch very carefully you will see the level of the water go down when you first start heating. This is because the glass gets hot first and so expands and the volume of the beaker therefore increases. This means that the water level will drop. Then the water starts getting hotter, it expands more than the glass and so the water level rises.

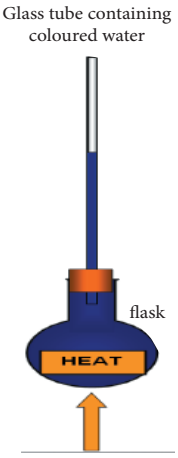


Fig.6.3

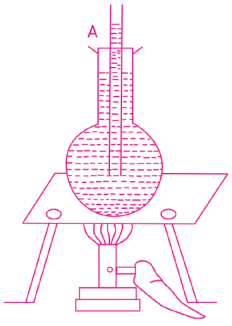
One important use of this is in the liquid in glass thermometer. Mercury is often used in thermometers, but for low temperatures alcohol is preferred because it freezes at a lower temperature. In a thermometer the expansion of the liquid is 'magnified' by allowing it to expand up a very narrow tube. A small increase in volume will change the level in the tube a lot.

(N.B a very narrow tube is called a capillary tube)

Activities 6.12

A. Expansion of liquid

Experiment - Take a round bottom flask and fil
Close its mouth with a cork having a delivery tube and mark the level of water as A.



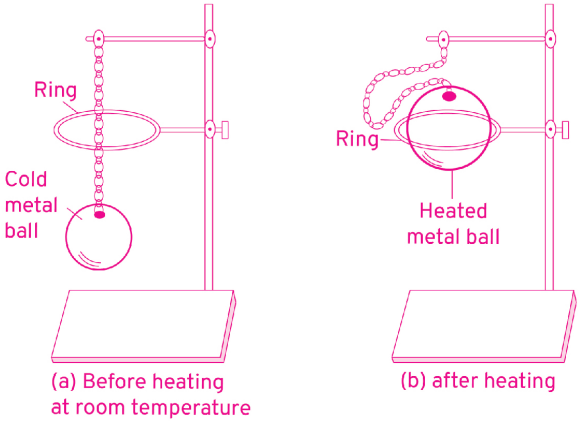
Now heat the flask, we see that the level of water in the tube rises from A to a higher mark B.

B. Expansion of solid

Take a metallic ball and ring such that the ball can pass through the ring easily. The ball is heated, and the ball cannot pass through the ring.

This is because the solid ball expands in size. On cooling, it can pass through the ring.

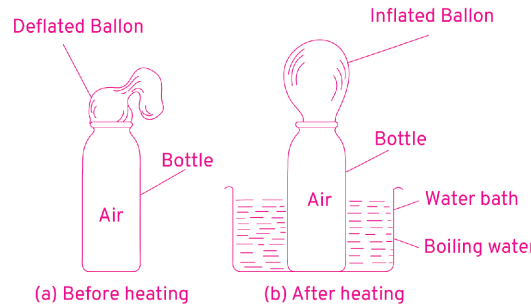
Observation - Solids expand on heating and contract on cooling.



Activities 6.12

C. Expansion of gases

Take an empty bottle, attach a rubber balloon to its neck. Initially, the balloon is deflated. Place the bottle in a container filled with boiling water. After some time you will notice that the balloon gets inflated.this happens because of the air inside the bottle expands on heating and it fills the balloon. Take out the bottle out of the container and allow it to cool itself. We will notice that the balloon gets deflated and it collapses.



Thermal expansion of air

Putting the bottle in hot water causes the air molecules inside to heat up and begin taking up more space (thermal expansion), causing air to enter the balloon and inflate it. When you move the bottle into the cold water, the air molecules cool back down and take up less space (thermal contraction).

Advantages of Heat effects

i. **Melting and giving a new shape:** Heat is used to melt metals like iron and gold and give them a new shape.

ii. **To open the tight bottle:** Heat helps to open the tight bottle.

iii. **Tightening Nuts and Bolts:** Using heat helps tighten nuts and bolts.

iv. **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.

v. **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.

vi. **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.

vii. **To run factories:** Heat is the most essential element to run factories. Heat energy for running factories is obtained by burning wood, coal, etc.

viii. **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.

ix. **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.

x. **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.

Disadvantages of Heat effects

The disadvantages of Heat are as follows:

i. In the summer, the pipes get overheated and burst.

ii. When you keep hot water on the glass, it breaks.

iii. A portion of the electric current that travels through the conductor has been transformed into heat energy. This seems to be an inefficient use of energy.

iv. To counteract the heating impact, an extra cooling system must be added to the circuit. This raises the price.

v. The heat generated can harm the insulation and other electrical components, as well as catch on fire.

vi. Reduces the endurance of various circuit elements.

vii. The main disadvantage seems to be that it requires refrigerants to function. These are "fluids that absorb heat at low temperatures and reject heat at high temperatures" and are made of some pretty dangerous chemicals, such as chlorine. These would affect the environment around geothermal heaters.

viii. Heat gain in the human body can be caused by a combination of external heat from the environment and internal body heat generated from metabolic processes. Rapid rises in heat gain due to exposure to hotter than average conditions compromises the body's ability to regulate temperature and can result in a cascade of illnesses, including heat cramps, heat exhaustion, heatstroke, and hyperthermia.

ix. Constant greenhouse gas emissions seriously pollute it.

x. Steam and heat emissions from thermal power plants. And, it can negatively affect the climate of thermal power plants.

xi. The water used for this is ultimately contaminated.

xii. It releases carbon dioxide pollutants.

Project Work

i. Write an essay on the positive and negative effects of heat on matter by asking a senior person and presenting it in the classroom.

ii. Heat the camphor ball and ice cubes in a small pot. After heating in this way, observe the changes in the state of those substances and write down the results.

Exercise

A. Choose the correct one and put the tick mark (√) .

i. Heat is a form of _____ of motion of molecules constituting the body.

a. power b. energy
c. work d. kinetic

ii. The S.I. unit of heat is -

a. watt b. calorie
c. joule d. kelvin

iii. Heat energy is also called _____ energy.

a. biomass b. biogas
c. solar d. thermal

iv. Heat energy on Earth comes from the _____ .

a. coal b. sun
c. oil d. wind

v. Everything on Earth is made up of _____ .

a. elements b. atoms
c. compound d. molecules

vi. Heat is produced inside our body by the _____ of food.

a. combustion b. condensation
c. evaporation d. distillation

B. Use the following words to fill in the blanks .

Heat, volume, liquids, density, tight, tighten, overheated, temperature

i. All _____ expand more than all solids.

ii. The _____ the liquid gets greater as it is heated.

iii. The greater the rise in _____ the more it expands.

iv. When a substance is heated its volume increases and so the _____ decreases.

v. _____ is used to melt metals like iron and gold and give them a new shape.

vi. Heat helps to open the _____ bottle.

vii. Using heat helps _____ nuts and bolts.

viii. In the summer, the pipes get _____ and burst.

C. Answer the following questions :

i. What is heat ? Write down its S.I unit.

ii. Explain the effects of heat on matter.

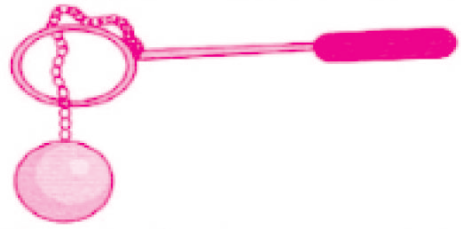
iii. Explore the advantages of heat effects in daily life.

iv. Explore the disadvantages of heat effects in daily life.

v. How can you explain what happened to a balloon when a bottle and balloon system was placed in hot water?

F. Diagrammatic Questions :

i. The figure below shows a metal ball and ring. At room temperature, the ball is able to pass through the ring. What would happen if the ball is heated?

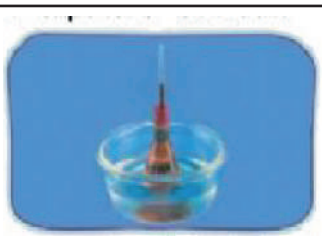


a. The metal ball passes throught the ring.
b. The metal ball gets stuck in the ring
c. The metal ball shrinks.
d. The metal ball melts.

ii. Which effect of thermal energy is shown in each photo? Press and drag.

Melting Evaporation Expansion

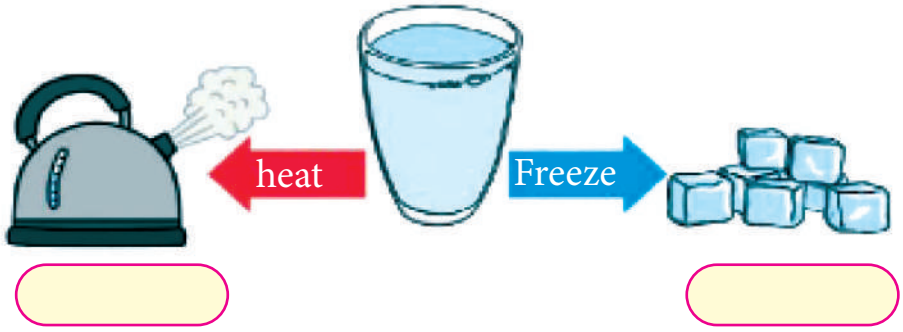
iii. Tick (√) the correct word on the condition of materials. State the effect of heat on material whether it 'expand' or 'contract'.

		
Light the bunsen burner and heat the metal ball for three minutes.	Put the conical flask into the glass container filled with hot water.	Immerse the plastic bottle into the glass container filled with ice.
gain heat ○ lose heat ○	gain heat ○ lose heat ○	gain heat ○ lose heat ○
Effect : _____	Effect : _____	Effect : _____
Put the metal ball into the glass container filled with water.	Put the conical flask into the glass container filled with ice.	Immerse the plastic bottle into the glass container fillde with hot water.
gain heat ○ lose heat ○	gain heat ○ lose heat ○	gain heat ○ lose heat ○
Effect : _____	Effect : _____	Effect : _____

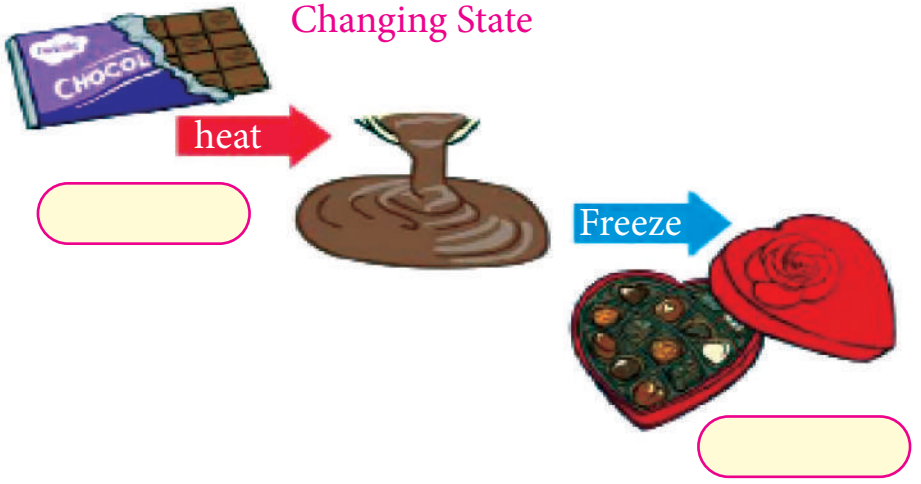
iv. Choose an option to relate to each box.

Solid, Liquid, Gas

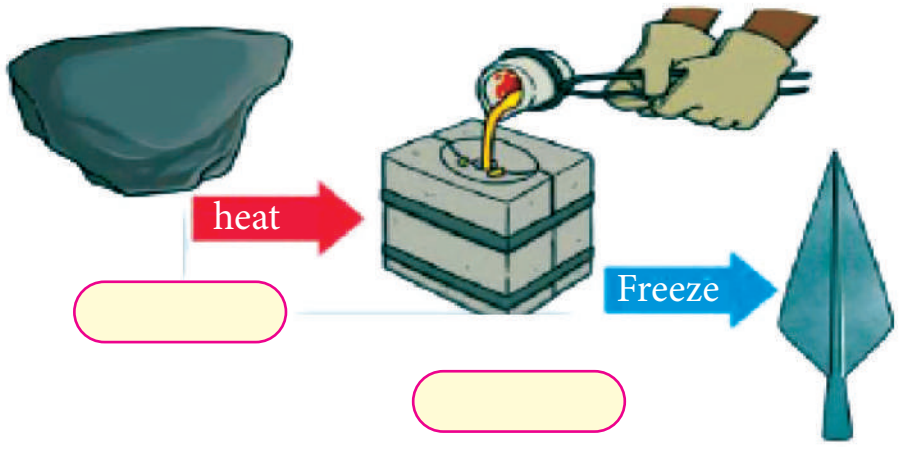
Changing State

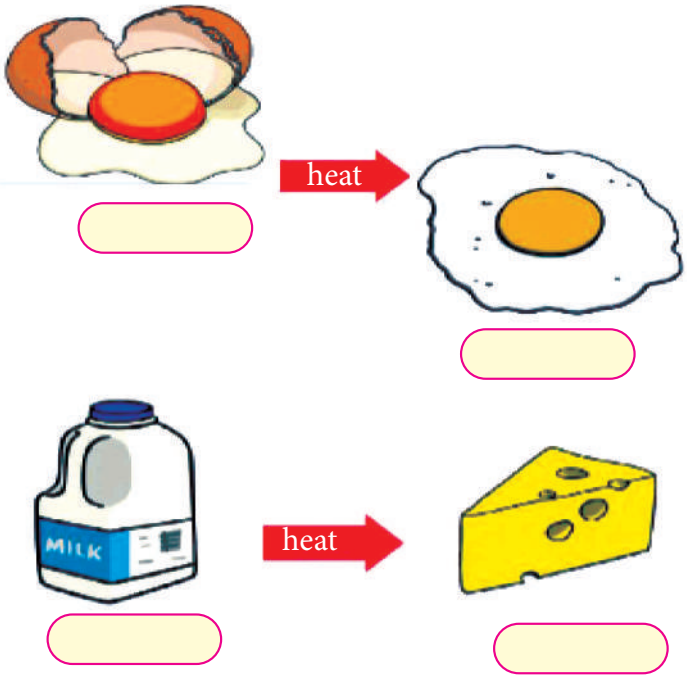


Changing State



Changing State





v. Fill the blacks with correct answer.

Situation X Situation Y

a. Which situation shows that the water is gaining heat?

_____

b. Which situation shows that the water is losing heat?

_____

c. State the effect on a substance when

i. it gains heat: ubstances become _____

ii. it loses heat : Substances become _____

d. State the temperature of a substance when :

i. it gains heat : Temperature of a substance _____

ii. it loses heat Temperature of a substance _____

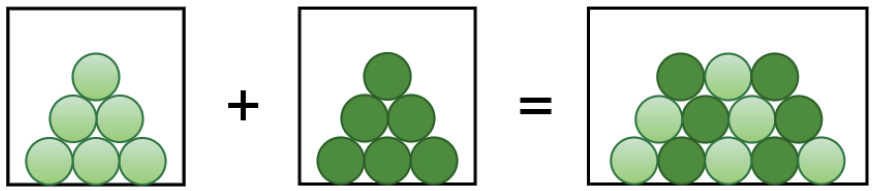
6.2 Mixtures

Mixtures are everywhere you look. Most things in nature are mixtures. If you look around you will notice the rocks, lakes, and even the air we breathe are mixtures. There are an infinite number of mixtures. Anything you can combine together is then called a mixture once combined. Think of all of the different foods you eat. Think of how many different types of cake there are, an infinite amount. Each cake has a different mixture of ingredients that were combined together to form a cake.

Cale Ingredients Final product, cake

Fig.6.4

A mixture is a substance in which two or more substances are mixed without a chemical reaction between them. The substances retain their original properties and can be separated from the mixture if need be. Some other examples of mixtures are – a bowl of cereals mix, cookie dough, salt mixed in water, carbon dioxide in coke, a tossed salad, gunpowder (a mixture of sulfur, potassium nitrate and carbon), crude oil (A mixture of organic compounds), seawater(a mixture of various salt and water) etc. Air is the most common mixture around us. Air a mixture of various gases like oxygen, carbon dioxide, nitrogen, argon, neon, etc.



Pure Substances Mixture

6.2.1 Introduction to Mixture

Mixtures involve the physical properties of substances, not the chemical ones. What this means is that the individual substances are near each other, as they are mixed together, but the properties of each substance does not change.

Trail mix is a popular mixtures of different ingredients.

Trail mix is a mixture of differnt substances.

When the ingredients are separated, their physical properties have not changed.

Mixtures are the one product of a mechanical blending or mixing of chemical substances such as elements and compounds. The components of a mixture each keep their original properties.The separation of components can be easily done. The proportion of the components is variable.

6.2.2 Forms of mixture

i. Homogeneous Mixture

a. Solid + liquid

i. Evaporation : Salt from salt solution.
ii. Centrifuging : Cream from milk.
iii. Crystallization : Salt from salt solution
iv. Evaporation : Water from sugar solution

b. Liquid + liquid

i. Steam distillation : salt water
ii. Fractional distillation : components of petroleum

iii. Distillation : alcohol and water

ii. Heterogeneous Mixture

a. Solid + solid

i. Sublimation : sand + camphor
ii. Winnowing : sand + Rice
iii. Sieving : Wheat grain from its floor + Rice
iv. Magnetic separation : Iron dust + rice

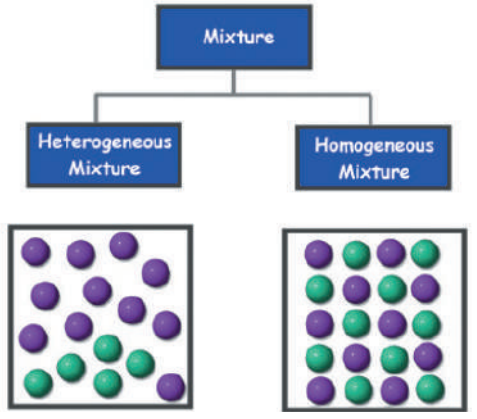
b. Solid + liquid

i. Sedimentation : sand + water
ii. Filtration : Sand + mud + water

c. Liquid + liquid

i. Using separating funnel : water + kerosene

6.2.3 Homogeneous and heterogeneous mixtures



A. Homogeneous Mixture

A homogenous mixture is a mixture that has the same proportion of the component substances throughout. The constituents are distributed uniformly in a homogeneous mixture. It has visibly indistinguishable parts. It can be a solid, liquid or a gaseous mixture.

Some examples –

- Air is a homogeneous mixture of gaseous substances like nitrogen, oxygen and other substances.
- Saline solution is a homogeneous mixture of water and salt.
- Most alloys are homogenous mixtures of elements, that has a characteristic of a metal and at least one of the components is a metal. For e.g. steel is an alloy of iron and carbon.

B. Heterogeneous Mixture –

A heterogeneous mixture is not blended together and do not have the same consistency throughout. They are non-uniform in their composition and we can see multiple distinguishable parts in it.

In a heterogeneous mixture the substances are not evenly distributed (ex. chocolate chip cookies, pizza, and rocks).

Example: Let's consider a pizza:

- You can separate the parts (ex. take the tomatoes off if you don't like tomatoes). Therefore, you know that the pizza is a mixture.
- Since the tomatoes (or olives or onions or....) are not evenly distributed, we know that it's a heterogeneous mixture.

Some other examples –

- A mixture of sand and water.
- A mixture of oil and water.
- A mixture of salt and pepper.
- A chocolate chip cookie – one bite may have more chocolate than the next.

Activities 6.13

A. Prove heterogeneous mixture:

Step 1: Take some water and oil in a vessel. Stir it well.
Step 2: Get some sand and mix it in the water.
You can see that the sand in the water and the oil in the water are not so mixed well. So, these kinds of mixtures with uneven compounds are known as heterogeneous mixtures.

B. To prove homogeneous mixture:

Step 1: Take some water in a bowl.
Step 2: Add any compound in that water, such as sugar or salt.
Step 3: Mix the water with sugar or salt uniformly.

Now, the obtained solution is the homogenous mixture. Homogenous mixtures are made by mixing any two or more compounds in the same proportions.

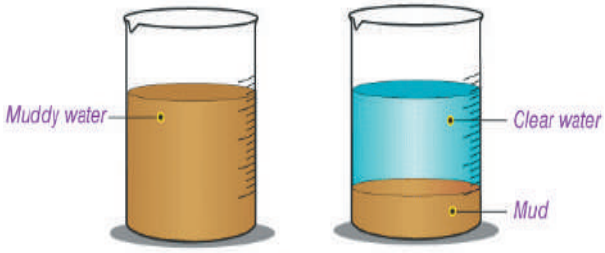
6.2.4 Methods of separating mixtures

A mixture is composed of two or more types of matter that can be present in varying amounts and can be physically separated by using methods that use physical properties to separate the components of the mixture, such as handpicking, sedimentation and decantation, sieving, winnowing, and filtration.

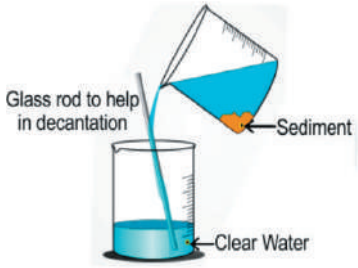
Handpicking

This method involves simply picking out all the unwanted substances by hand and separating them from useful ones. The separated substances may be an impurity that has to be thrown away or maybe that both the separated substances are useful. For example – if you separate black grapes from green ones from a mixture of the two.

Sedimentation and decantation



Sedimentation process



Decantation

Sedimentation is a process by which heavier impurities present in liquid normally water settle down at the bottom of the container containing the mixture. The process takes some amount of time. Decantation is the process of pouring out the liquid without disturbing the sediment.

Winnowing

When the grains are collected from the process of threshing, it needs to be cleared out of husks and chaffs before it is turned into flour. Normally the separation of the mixture is carried out with the help of wind or blowing air. The husk and chaff are blown away by the strong wind when the farmers drop the mixture from a certain height to

Winnowing process

the ground. The heavier grains are collected at one place.

Winnowing is a separation process used to separate husks from grains. By throwing the mixture in the air, the wind blows away the lighter parts leaving the heavier grains behind.

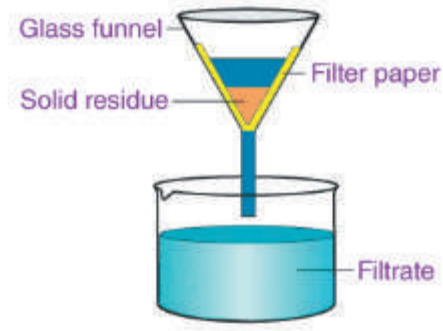
Sieving

It is done to separate mixtures that contain substances mostly of different sizes. The mixture is passed through the pores of the sieve. All the smaller substances pass through easily while the bigger components of the mixture are retained.

Sieving process

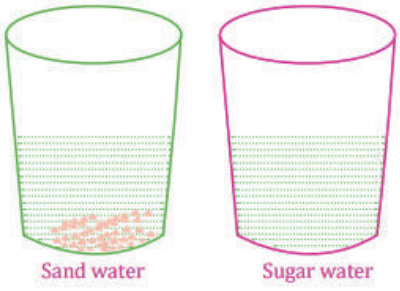
Filtration

The most common method of separating a liquid from an insoluble solid is the filtration. Take, for example, the mixture of sand and water. Filtration is used here to remove solid particles from the liquid. Various filtering agents are normally used like filtering paper or other materials.



Activities 6.14

i. 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.



ii. Take some chalk powder in a beaker and mix it with water. Pour the mixture into a plastic bottle that has a tight letting 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.

Exercise

A. Choose the correct one and put the tick mark (√) .

i. A _____ is a substance in which two or more substances are mixed without a chemical reaction between them.

a. atom
b. element
c. mixture
d. solution

ii. A mixture of various salt and water-

a. crude oil b. Air
c. seawaterd. gunpowder

iii. Which is example of Solid + liquid mixture

a. Salt and sugar b. Salt and water
c. Sand and camphor d. alcohol and water

iv. Which is example of liquid + liquid mixture-

a. components of petroleum b. sand and camphor
c. sand and rice d. sand and water

v. Which is not correct for heterogeneous mixture

a. A mixture of sand and water.
b. A mixture of oil and water.
c. A mixture of salt and pepper.
d. mixture of water and salt.

B. Use the following words to fill in the blanks .

heterogeneous , argon, original, homogenous, cookie dough,

i. The substances retain their _____ properties and can be separated from the mixture if need be.

ii. Some examples of mixtures are – a bowl of cereals mix, _____ , salt mixed in water, carbon dioxide in coke, and a tossed salad.

iii. Air a mixture of various gases like oxygen, carbon dioxide, nitrogen, _____, neon, etc.

iv. A _____ mixture is a mixture that has the same proportion of the component substances throughout.

v. A _____ mixture is not blended together and do not have the same consistency throughout.

C. Differentiate between these pairs.

i. Heterogeneous mixture and a Homogeneous mixture

ii. Sedimentation and Decantation

iii. Sieving and Winnowing
iv. Sedimentation and Filtration

D. Answer the following questions :

i. What is a Mixture?
ii. Write down any three form of mixtures with examples
iii. What are the differences between a heterogeneous mixture and a homogeneous mixture?
iv. List five examples of heterogeneous mixtures in your home.
v. Write down examples of different types of mixtures :solid and solid, solid and liquid, liquid and liquid, liquid and gas, gas and gas.
vi. Write down any six method of seperation of mixtures.
vii. Write a short note :
   a. Hand picking
   b. Sedimentation
   c. Decantation
   d. Sieving
   e. Winnowing
   f. Filtration
vii. What method of separation would be most effective on the following mixtures:
   a. sand + rice
   b. Loose tea leaves in tea.
   c. Sand + mud + water
   d. sand + water
   e. water + kerosene
ix. By which method can the following mixtures be separated?
   a. A mixture of corn and small stones
   b. A mixture of soil and water
   c. A mixture of rice and bran
   d. A mixture of coarse and fine sand
   e. remove the tea leaves from the tea

F. Diagrammatic Questions :

i. Distinguish between homologous and heterogeneous mixtures in the figure given below.

ii. Which is homologous and which is heterogeneous? Write in the given box.

iii. Classify mixtures as homologous and heterogeneous-

Substance	Mixture	Answer
	lentils	
	smoothie	
	fruit salad	
	cake	

Unit 7

Energy in Daily Life

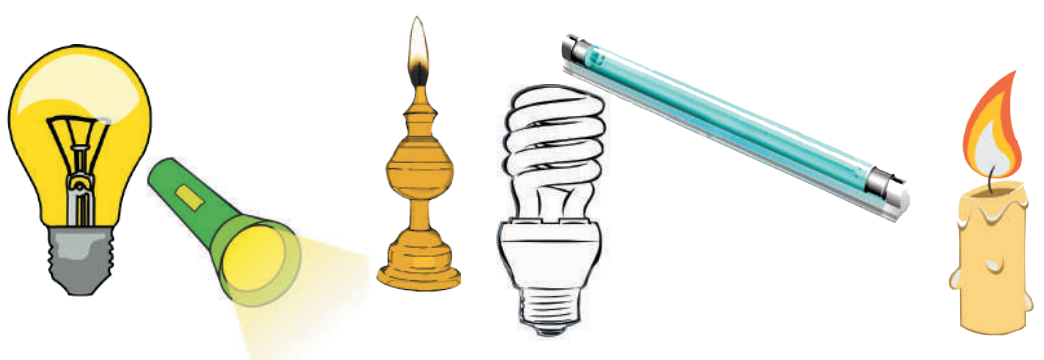
Total Estimated pariods (Th. 20+ Pr. 5 =25)

Student's Learning Outcomes

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

- identify different sources of light
- define Luminous objects and Non-luminous objects dim objects and identify such objects
- identify transparent, semi-transparent, and opaque objects and state their utility
- demonstrate the fact that light has seven colors
- define sound as the force produced by the vibration of an object with examples
- identify different sources of sound
- classify sounds into small and loud, soft and sharp sounds
- experiment to confirm sharp and sharp sounds and to identify the conditions that cause these sounds.
- explain the negative effects of noise
- adopt good sound practice
- using dry cells, switches, conductive wires, and torch bulbs or LEDs to light a lamp and describe closed and open circuits based on it
- explain the function of wires, cells bulbs, and switches in a circuit

Identify the picture below. What are these used for? It can be taken as a source of what?



7.1 Light

Light is an electromagnetic radiation that can be detected by the human eye. Electromagnetic radiation occurs over an extremely wide range of wavelengths, from gamma rays with wavelengths less than about 1×10^{-11} metre to radio waves measured in metres. Within that broad spectrum the wavelengths visible to humans occupy a very narrow band, from about 700 nanometres (nm; billionths of a metre) for red light down to about 400 nm for violet light. The spectral regions adjacent to the visible band are often referred to as light also, infrared at the one end and ultraviolet at the other. The speed of light in a vacuum is a fundamental physical constant, the currently accepted value of which is exactly 299,792,458 metres per second, or about 186,282 miles per second.

7.1.1 Sources of light

When we look at a leaf we know that it is green because light bounces off the leaf to our eyes to tell us that it is green. But what is light? Which are the sources of light from which light originated? Light is electromagnetic radiation. A particular frequency of this radiation (around 390-700 nm) is visible to the human eye. Everything that we see around us is because of light. Light is a form of energy and like all energies, it is produced from a source. In Physics, these are called light sources.

Types of Light Sources

There are countless sources of light, but they can all be categorized under either of the two following categories-

- Natural sources
- Artificial sources

Natural Light Sources:

The universe is filled with objects that emit light. Some light from these sources reaches the earth. The following things in nature have the ability to emit light:

- The Sun is the major source of light for the earth. The sun is a massive ball of fire, at the centre of which nuclear fusion produces massive energy. This energy comes out as heat and light. The light from the sun is one of the major factors behind the sustainability of life on earth.
- Every other star produces light too, but only a small or no amount of it reaches the earth because of the huge distance.
- The moon provides light as well but it cannot produce light on its own. The light that we get from the moon is the light reflected by it from the sun.
- Some living organisms have the ability to produce light too. It is called bioluminescence. It is the effect of certain chemical reactions within the organism. Fireflies, jellyfish, glow-worm, certain deep-sea plants, and microorganisms can be cited as examples.
- Certain other natural phenomena such as lightning and volcanic eruptions also emit light.

Artificial Light Sources:

Apart from natural sources, light can be produced artificially too. The different light sources produced artificially can be put under three broad categories-

- **Incandescent Sources:**

  When certain objects are heated to a high temperature, they begin to emit light. Both infrared and visible light is produced in the process.

  Example- Candle, incandescent lamp.

- **Luminescent Sources:**

  Light can be produced by accelerating charges in a luminescent material. One common way of doing it is by passing current through the material.

  Example- Fluorescent tube light, electric bulb

- **Gas Discharge Sources:**

  Passing electricity through certain gases at very low pressure can produce light too.

  Example – Neon lamp, Sodium lamp.

A few examples of natural light sources include the Sun, stars and candles. A few examples of artificial light sources include light bulbs, lamp posts and televisions. Without light sources we could not see the world around us, however, not every object we see is a light source.

7.1.2 Luminous objects and Non-luminous objects

Luminous objects:- The objects that can emit light energy by themselves are known as luminous objects. Objects like the sun that give out or emit light of their own are luminous objects. Other examples of luminous bodies are Electric bulb, torch etc.

Non-luminous objects:- The objects that can not emit light energy by themselves are known as Non- luminous objects. Objects like the moon that do not give out or emit light of their own are Non- luminous objects. Moon is an example of a non-luminous object as we can see the moon because it reflects light from the sun. Other examples of Non luminous bodies are pen, pencil, chair, wood etc.

Luminosity:- It is defined as the luminous intensity in a particular direction; or we can say it is the apparent brightness of an image.

7.1.3 Transparent, Translucent and opaque objects

Transparent Objects

Light rays can pass through these substances. The refractive index of transparent substances is nearly uniform. Most of the light, incident on a transparent object, transmits through it. Light rays follow Snell's law of refraction. While passing through a transparent object, the amount of scattering is very less. Therefore, a clear image is seen on the other side

of the substance. Window glasses are transparent in nature. Transparent materials (e.g. glass) are used for lenses, spherical mirrors, spectacles, and many more.

Translucent Objects

A substance is called translucent if it allows partial transmission. The light rays get scattered in the interior of such objects. Consequently, the light rays emerge in random directions. If any object is seen through a translucent material, the image appears fuzzy or blurred. Translucency can occur due to the following properties:

- **Non-uniform Density:** If a material has a non-uniform distribution of matter, its density is different at different parts. Such density distribution can result in irregular refraction and transmission. Density fluctuations may cause scattering centers. At the points of fluctuations, the light rays get scattered.
- **CrystallographicDefects:** Defects (e.g. fluctuation in composition) in a crystal structure can give rise to a scattering of light.
- **Boundaries:** Grain boundaries (in a polycrystalline structure) and cell boundaries (in an organism) can behave as scattering centers.

Some examples of translucent objects are frosted glass, butter paper, tissue, various plastics, and so on.

Opaque Objects

Opaque substances do not allow the transmission of light. Any incident light gets reflected, absorbed, or scattered. Light rays can penetrate the substances to some depth. The causes behind opacity are:

- **Absorption:** The light rays can be absorbed inside the medium. This process highly reduces the intensity of the incident light.
- **Scattering:** The molecules of the medium can absorb and scatter light in random directions. Due to cumulative scattering, the energy of the wave can be completely dissipated before the emergence of light from the other side.

- **Reflection:** The incident light rays may get reflected at the surface of an opaque object. The objects appear colored because of the reflection of a particular wavelength. The rest of the wavelengths get absorbed or scattered.

  Common examples of opaque objects are wood, stone, metals, concrete, etc.

7.1.4 Colour of Light

The gorgeous red hues of sunrise at dawn, the golden white shimmering towards noon, or the brilliant tangerine winter sunset over a snowy field, the sun never ceases to awe us with its display of colors! But have you ever given a thought to the range of colors that you witness every day? When asked about the color of sunlight, a reflexive response would be, 'yellow' or 'white'! You might also answer 'red' or 'orange' if 'dawn and dusk' pop up in your mind's eye. Nevertheless, what really is the color of sunlight?

Demonstrating the color of sunlight through an experiment

Let us demonstrate the color of sunlight through a small activity.

Requirements: A prism and a white sheet of paper

- Take a glass prism in a dark room
- Place it in a position such that the direct sunlight falls on it through a hole in the window shutter of the room.
- Fix the white paper on the opposite wall where the sunlight is reflected through the prism.

We observe on the paper that the sunlight is split into a spectrum of colors. Pretty much like the rainbow, every color in VIBGYOR, that is Violet, Indigo, Blue, Green, Yellow, Orange and Red can be seen. The conclusion drawn here is that sunlight is nothing but a mixture of seven colors. And these seven colors combine to form the white light.

Why Don't We See Sunlight as Seven Colors?

When the sun rays enter the earth, they get distorted by the earth's atmosphere, air molecules, dust, smoke and pollution. We know that different colors of the spectrum have different wavelengths. The short-wavelength blue and violet are scattered more than colors at the lower end of the spectrum which are less easily scattered.

- **Noon:**

  If the sun is high overhead in the sky, the rays suffer the least amount of interference because the distance covered by them is the least at that point in time. Consequently, the blue light is scattered and the sky appears blue whereas the color of sunlight appears yellow.

- **Morning and Evening:**

  During the sunrise and sunset, the sun is near the horizon due to which the light rays have to travel a longer distance through the atmosphere. As a result, there is more interference which causes more scattering. Consequently, most of the colors, including the blue as well as the yellow are scattered leaving the red light. Hence, the color of sunlight appears in the tinges of orange and red during dawn and dusk.

A. Choose the correct one and put the tick mark (√).

i. Which of the following is a non- luminous object?

a. fireflies
b. electric bulb
c. moon
d. star

ii. Which of the following 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. There are countless sources of light, but they can all be categorized under either of the _____ categories-

a. two b. three
c. four d. five

vi. Objects that allow all light to shine through are called _____.

a. opaque b. transparent
c. translucent d. mirrors

vii. A _____is used to separate white light into all its colors.

a. polarized filter b. lens
c. prism d. magnifying glass

viii. Mahesh is pushing the door closed. Hecannot see through the door because it is _____.

a. opaque b. translucent
c. transparent d. none of these

B. Use the following words to fill in the blanks .

light, wood, electromagnetic, luminescent, seven, bioluminescence, transparent , lenses, emit, universe, living, translucent,

i. Light is an _____ radiation that can be detected by the human eye.

ii. When we look at a leaf we know that it is green because _____ bounces off the leaf to our eyes to tell us that it is green.

iii. The _____ is filled with objects that emit light.
iv. Some _____ organisms have the ability to produce light too and it is called _____.
vi. When certain objects are heated to a high temperature, they begin to _____ light.
vii. Light can be produced by accelerating charges in a _____ material.
viii. Light rays can pass through _____ substances.
ix. Transparent materials are used for _____ , spherical mirrors, spectacles, and many more.
x. A substance is called _____ if it allows partial transmission.
xi. Common examples of opaque objects are _____ stone, metals, concrete, etc.
xii. Sunlight is nothing but a mixture of _____ colors.

C. Differentiate between these pairs.

i. Light and Sources of light
ii. Luminous and non- luminous bodies
iii. Natural and Artificial sources of light
iv. Transparent Objects and Translucent Objects
v. Transparent Objects and Opaque Objects

D. Answer the following questions :

i. What do you mean by the sources of light? Name any three sources of light.
ii. Write down the differences between a non-luminous body and a luminous body.
iii. Define transparent, translucent, and opaque objects with examples.
iv. Why can't a transparent object cast a shadow?
v. Define transparent, semi-transparent, and opaque objects and state their utility.
vi. Write down the fact that light has seven colors.

F. Diagrammatic Questions :

i. Match the name of the objects with the pictures. Darg the word and drop it below the correct object.

lamp	cat's eye	mirror	fire	sun	tourch
candle	telvision	light bulb	moon	match	stars

a

b

c

d

e

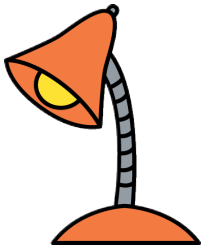
f

g

h

i

j

k 

l

ii. Decide if the foloowing are Natural or Artificial sourse of light.

a

b

c

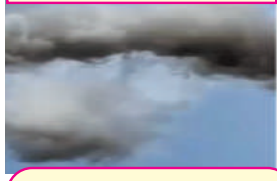
d

iii. Which is non-luminous body and which is luminous body? Write in the given box.

Grass

Fire

Smoke



Lamp

Shooting star

Planet

Paper

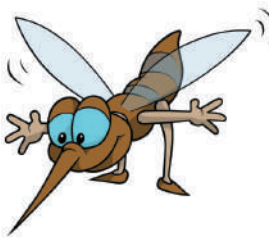
Fie fly

iv. Complete the following table.

trasparent	translucent	opaque

7.2 Sound

Look at the picture and answer the questions below.



i. How does a bird produce sound?
ii. How do mosquitoes, bees, flies, crickets, etc. make sound?
iii. Which part of our body vibrates when we breathe?
iv. How does clapping sound?

Sound is a type of energy made by vibrations. When any object vibrates, it causes movement in the air particles. This movement, called sound waves, keeps going until the particles run out of energy.

7.2.1 Introduction to Sound

Sound is defined as vibrations that travel through the air or another medium as an audible mechanical wave. It is produced by a vibrating body. The vibrating body causes the medium (water, air, etc.) around it to vibrate, thus producing sound. The sound is produced when something vibrates. Sound waves consist of areas of high and low pressure, called compressions and rarefactions, respectively. Vibrations that travel through the air or another medium can be heard when they reach a person's or animal's ear.

A sound wave can be defined as a vibration that propagates as an audible wave of pressure, through a medium such as a gas, liquid, or solid. Sound waves are longitudinal waves. It needs a medium to travel.

The direction of particle vibrational propagation in sound waves is parallel to the direction of energy wave propagation.The speed of sound is the rate at which sound waves move through a medium.

A sound is a vibration that travels as a mechanical wave across a medium.

Activities 7.1

i. 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.

ii. 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.

7.2.2 Sources of Sound

fig.7.1

Sound sources can be divided into two types, natural and man-made. Examples of natural sources are: animals, wind, flowing streams, avalanches, and volcanoes. Examples of man-made sources are: airplanes, helicopters, road vehicles, trains, explosions, factories, madal, guitar , and home appliances such as vacuum cleaners and fans.

fig.7.2 guitar

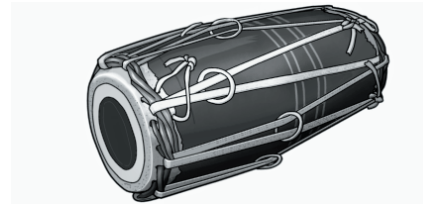


fig.7.3 madal

Some other sources of sound are-Acoustic instruments, Electrical instruments, Living beings like animals and birds using their vocal cords, Man-made sources like machines, any vibration caused by wind.

7.2.3 Low and loud sounds

We say high sounds are high pitch sounds, while low sounds are low pitch sounds. Blowing a whistle produces a high pitch sound while hitting a drum produces a low pitch sound. You will realize that a violin produces a high pitch sound, while human heartbeat has a low pitch sound. In a similar way, chirping of birds is a high pitch sound, while a lion's roar is a low pitch sound.

Sounds can be loud or quiet, depending on how much energy or force is used; bigger vibrations make louder sounds and smaller vibrations make quieter sounds. The scientific word for loudness is amplitude. But there are other ways in which sounds can be different. Think about the following: Can you make a high sound with your voice? How about a low sound with your voice? Can you describe how to make a high or low sound with a musical instrument? Think extra carefully - can you use an everyday object from your desk to make a high sound and then a low sound? High and low are the words that we use to describe the pitch of a sound. Remember - the pitch of a sound is different to the amplitude (volume). Amplitude is a measure of how loud or quiet a sound is, whereas pitch is a measure of how high or low a sound is. High sounds can be quiet or loud, and low sounds can be quiet or loud too.

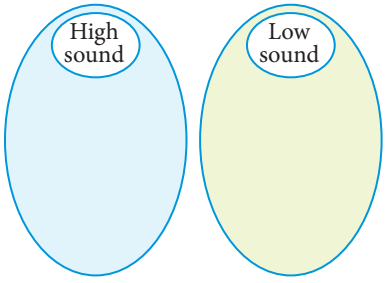
Activities 7.2

i. Group the following sounds as high sounds and low sounds.

Frog's crooking - Bird's chirping - Sound of the Violin - Singing of a Lady - Singing of a Man - Pig's Oink - A Dog's Bark - A Puppy's bark - Whistle of a kettle - Sound of an Ambulance.

Hig Sounds	Low Sounds

ii. Let's listen to the environment and find examples for the following-



Sharp sounds (A shrill or sharp sound)

A sound of low pitch is called a flat or a hoarse sound but a sound of high pitch is called a sharp or a shrill sound. Thus, we can say that the pitch of a sound is it's characteristic due to which we are able to distinguish between a shrill (high-pitched) sound and a hoarse (low-pitched) sound.

7.2.4 Low and high sounding conditions

As you know, there are many different sounds. Fire alarms are loud, whispers are soft, sopranos sing high, tubas play low, every one of your friends has a different voice. The differences between sounds are caused by intensity, pitch, and tone.

Sound is a wave and waves have amplitude, or height. Amplitude is a measure of energy. The more energy a wave has, the higher its amplitude. As amplitude increases, intensity also increases. Intensity

is the amount of energy a sound has over an area. The same sound is more intense if you hear it in a smaller area. In general, we call sounds with a higher intensity louder.We are used to measuring the sounds we hear in loudness. The sound of your friend yelling is loud, while the sound of your own breathing is very soft. Loudness cannot be assigned a specific number, but intensity can. Intensity is measured in decibels.

The human ear is more sensitive to high sounds, so they may seem louder than a low noise of the same intensity. Decibels and intensity, however, do not depend on the ear. They can be measured with instruments. A whisper is about 10 decibels while thunder is 100 decibels. Listening to loud sounds, sounds with intensities above 85 decibels, may damage your ears. If a noise is loud enough, over 120 decibels, it can be painful to listen to. One hundred and twenty decibels is the threshold of pain.

Pitch helps us distinguish between low and high sounds. Imagine that a

singer sings the same note twice, one an octave above the other. You can hear a difference between these two sounds. That is because their pitch is different. Pitch depends on the frequency of a sound wave. Frequency is the number of wavelengths that fit into one unit of time. Remember that a wavelength is equal to one compression and one rarefaction. Even though the singer sang the same note, because the sounds had different frequencies, we heard them as different. Frequencies are measured in hertz. Hertz - One cycle per second. One hertz is equal to one cycle of compression and rarefaction per second. High sounds have high frequencies and low sounds have low frequencies. Thunder has a frequency of only 50 hertz, while a whistle can have a frequency of 1,000 hertz.

The human ear is able to hear frequencies of 20 to 20,000 hertz. Some animals can hear sounds at even higher frequencies. The reason we cannot hear dog whistles, while they can, is because the frequency of the whistle is too high be processed by our ears. Sounds that are too high for us to hear are called ultrasonic.

Ultrasonic waves have many uses. In nature, bats emit ultrasonic waves and listen to the echoes to help them know where walls are or to find prey. Captains of submarines and other boats use special machines that send out and receive ultrasonic waves. These waves help them guide their boats through the water and warn them when another boat is near.

Sound waves travel at the same speed but vibrate in different ways. Some vibrate quickly and have a high frequency or pitch, while others vibrate slowly and give a lower pitch.

Condition that produces a shrill or sharp sound

A string vibrates with a particular fundamental frequency. It is possible, however, to produce pitches with different frequencies from the same

string. The four properties of the string that affect its frequency are length, diameter (thickness), size, and tension. These properties are described below:

i. **Length :** When the length of a string is changed, it will vibrate with a different frequency. Shorter strings have higher frequency and therefore higher pitch. When a musician presses her finger on a string, she shortens its length. The more fingers she adds to the string, the shorter she makes it, and the higher the pitch will be.

ii. **Diameter :** It is the thickness of the string. Thick strings with large diameters vibrate slower and have lower frequencies than thin ones. A thin string with a 10 millimeter diameter will have a frequency twice as high as one with a larger, 20 millimeter diameter. This means that the thin string will sound one octave above the thicker one.

iii. **Size :** A long object has a low pitch and vibrates slowly. A short object has a high pitch and vibrates quickly. Sound by itself can be a reliable source of information about an object's size. For instance, we are able to estimate the size of objects merely on the basis of the sound they make when falling on the floor. Moreover, loudness and pitch are crossmodally linked to size.

iv. **Tension :** A string stretched between two points, such as on a stringed instrument, will have tension. Tension refers to how tightly the string is stretched. Tightening the string gives it a higher frequency while loosening it lowers the frequency. When string players tighten or loosen their strings, they are altering the pitches to make them in tune.

Activities 7.3

Write a, b, c, or d in the boxes to answer each question.

1. Which property of sound defines the loudness and softness of a sound?

   a. pitch b. volume c. base d. scale

2. Which of the following will produce the highest sound pitch?

a. thunder b. guitar c. car engine d. drums

3. How do you hear a sound?

   a. The ear converts sound vibrations to code. Code travels from the ear to the brain and sound is heard.

   b. The ear converts sound vibrations to signals. Signals travel from the ear to the brain and sound is heard.

   c The ear sends vibrations to the brain directly and sound is heard.

   d. The ear sends vibrations to the spinal cord directly and sound is heard.

Constructed Response

Tell how each instrument produces sound.

In the boxes to write your answer

Wind

String

Percussion

7.2.5 Negative effects of loud noise

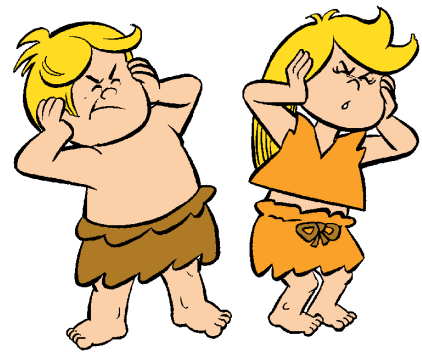


fig.7.4

Why do we close our ears when there is a very loud sound? What if there is a lot of noise? Which places are always loud, and can you work and sleep in such places or not? What is the reason for this? How does loud noise affect our health? If we look for answers to these questions, we can learn about the harm that loud noise is causing us. Loud noise affects our health badly. So we should be able to avoid loud noises.

A person who is exposed to a loud sound continuously may get temporary or even permanent impairment of hearing. Excessive noise in the surrounding can also cause health related problems like lack of sleep, hypertension (high blood pressure), higher stress , anxiety & many more. It may affect sleep cycles. Moreover, loud noise is also associated with the decline of cognitive capacity.

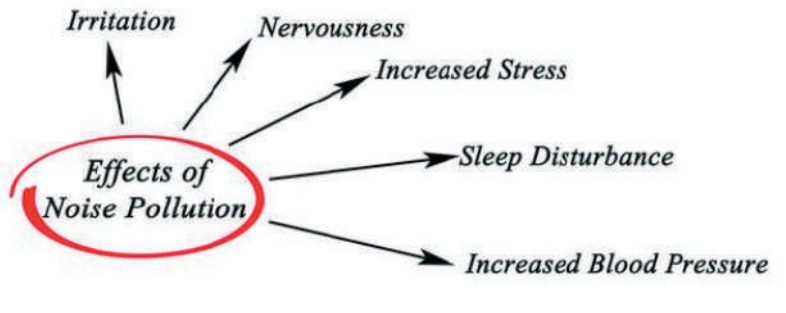


fig.7.5

A. In humans, the effects of loud noise are:

- High blood pressure
- Hearing loss
- May affect the circadian rhythm (sleep cycles)
- Impair cognitive functions
- Irritability, high stress

B. In animals, the effects of loud noise are:

- Noise pollution increases the risk of death by altering prey-predator behaviour (avoidance or detection)
- May interfere with navigation
- Also affects the reproductive behaviour
- Risk of hearing loss
- Unusual animal behaviour – some studies indicate that certain species of whales beached themselves after exposure to sonar.

7.2.5.1 Adoption of affective behaviors related to sound use

The following good behaviors regarding the use of sound should be adopted:

i. We don't talk loudly.

ii. Don't make loud songs,

iii. Don't shout loudly near other people's ears,

iv. Don't use earphones excessively.

v. Don't honk unnecessarily while driving.

Project Work

i. Write down your experience of an incident that caused you distress due to an excessively loud noise and present it to the class.

ii. Write an essay on noise pollution and present it to the class.

iii. Write an essay on the negative effects of loud noise and present it in the classroom.

Exercise

A. Choose the correct one and put the tick mark (√).

i. Sound is a type of energy made by _____.

a. collision b. vibrations
c. friction d. none of these

ii. A sound is a vibration that travels as a _____ wave across a medium.

a. mechanical b. transverse
c. longitudinal d. electromagnetic

iii. A sound of low pitch is called a flat or a _____ sound

a. sharp sound b. shrill sound.
c. loud sound d. hoarse sound

iv. The differences between sounds are caused by _____ pitch, and tone.

a. intensity b. power
c. energy d. tension

v. The human ear is able to hear frequencies of _____.

a. 20 to 20,000 hertz b. 20 to 2000 hertz
c. 20 to 200 hertz d. none of these

vi. When the _____ of a string is changed, it will vibrate with a different frequency.

a. thickness b. length
c. size d. tension

vii. What is required to produce sound from objects?

a. vibration b. solid object
c. medium d. gas

viii. What is the shrillness or flatness of sound called?

a. pitch b. wave
c. frequency d. amplitude

B. Use the following words to fill in the blanks .

Sound , amplitude , medium, longitudinal, high , Intensity , low, frequency , cognitive, Pitch, wave,

i. Sound is defined as vibrations that travel through the air or another medium as an audible mechanical _____.

ii. _____ waves consist of areas of high and low pressure, called compressions and rarefactions, respectively.

iii. Vibrations that travel through the air or another _____ can be heard when they reach a person's or animal's ear.

iv. Sound waves are _____ waves. It needs a medium to travel.

v. Blowing a whistle produces a _____ pitch sound while hitting a drum produces a _____ pitch sound.

vi. The scientific word for loudness is _____.

vii. _____ is the amount of energy a sound has over an area.

viii. _____ helps us distinguish between low and high sounds.

ix. Tightening the string gives it a higher _____ while loosening it lowers the frequency.

x. Loud noise is also associated with the decline of _____ capacity.

C. Differentiate between these pairs.

i. Sound and Sources of sound

ii. Wave and Vibration

iii. Low sound and High sound

iv. Soft sound and Sharp sound

v. Good sound and Bad sound

D. Explain the following:

i. Sound produced by different bodies differ.
ii. Sound is not heard in the moon.
iii. Tuning fork is a source of sound

E. Answer the following questions :

i. What is sound? Write any four sources of sound.
ii. What should we do to increase the pitch of sound of the guitar? Give two reasons.
iii. How sound is produced?
iv. Define low sound and loud sound , soft and sharp sounds.
v. Choose the appropriate word and complete the following table:

sharp sound, shrill sound, loud sound, hoarse sound

Name of the object that produces sound	Types of Sound
While playing the instrument	
Hitting the table	
When the whistle blows	
While playing the flute	
When playing a guitar	
While crying loudly	
As the glass falls to the ground	

vi. Explain the negative effects of noise.
vii. Write down any five good sound practice.

F. Diagrammatic Questions :

i. Match the picture with the corresponding sound.

Artificial sound
natural sound

Artificial sound
natural sound

Artificial sound
natural sound

Artificial sound
natural sound

Artificial sound
natural sound

ii. Who makes a high sound and who makes a low sound? Write HIGH or LOW in front of the animal.

Bird's tweet

Cow's moo

Cat's Meow

Frog's croaking

Lion's Roar

Dolphin's cry

iii. Look at the picture and choose if LOUD SOUND and SOFT SOUND.

7.3 Electricity

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

7.3.1 Introduction and construction of electric circuits

A simple electric circuit can consist of a battery (or other energy source), a light bulb (or other device that uses energy), and conducting wires that connect the two terminals of the battery to the two ends of the light bulb.

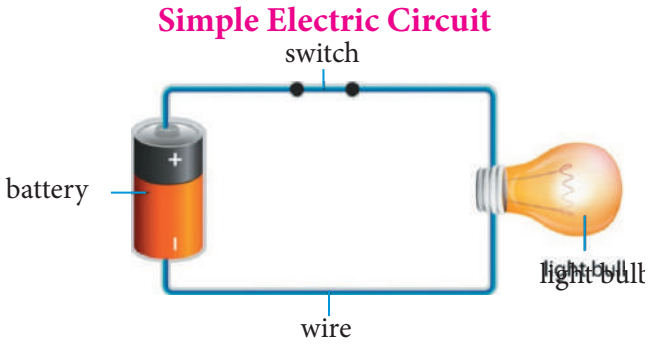


fig.7.6

The electric circuits are closed-loop or paths, forming a network of electrical components where electrons can flow.

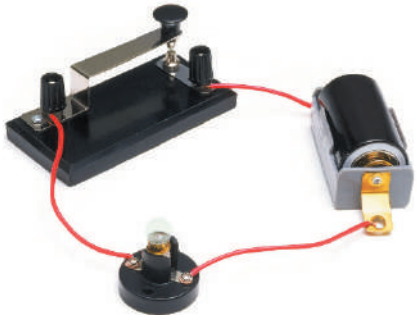


fig.7.7

Connect the wires to the bulb and connect one end of the wire to the battery. Notice what happens, there won't be any change in the bulb, but when you connect the free wire to the battery and complete the circuit, you will notice that

the bulb starts glowing. Therefore the circuit must be completed for the current to flow.

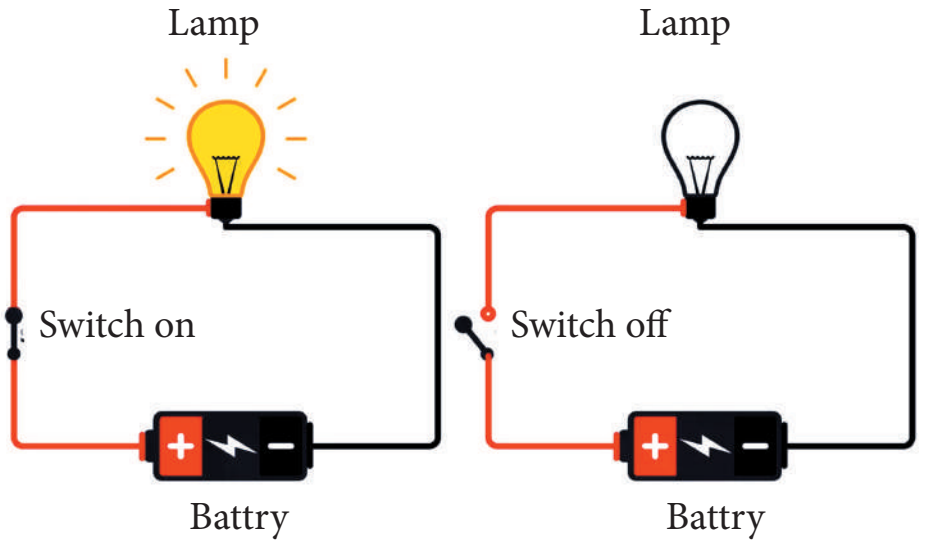


fig.7.8

Connect the wires to the bulb and connect one end of the wire to the battery. Notice what happens, there won't be any change in the bulb, but when you connect the free wire to the battery and complete the circuit, you will notice that the bulb starts glowing. Therefore the circuit must be completed for the current to flow.

You might have seen these danger signs on electric poles, transformers, and sometimes even on some electrical equipment at home. It is to warn you about the dangers of electricity, and electricity, if not handled properly, could be lethal and can even cause death. Electric wires sockets and live wire should be adequately insulated and kept away from the reach of children, the voltage in a small battery does not exceed more than 12 volts, but the voltage in a transformer may reach up to 11000 volts.

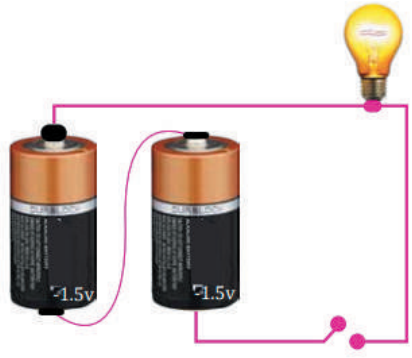
Faulty electrical circuits because fire, for fires caused due to electrical failure use of water to extinguish must be avoided, there are special extinguishers for the same.

We have come to a conclusion that electric current flows only when there is a complete uninterrupted connection from a battery through different components back to the battery. Any interruption will stop the flow of current

Electric batteries should also be handled carefully; never connect two terminals of the battery without a bulb or a load because the chemicals inside the battery react so quickly that they generate an immense amount of energy, which can even cause them to burst.

Activities 7.4

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.

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 doesnot glow. Thus, this circuit is an open circuit.

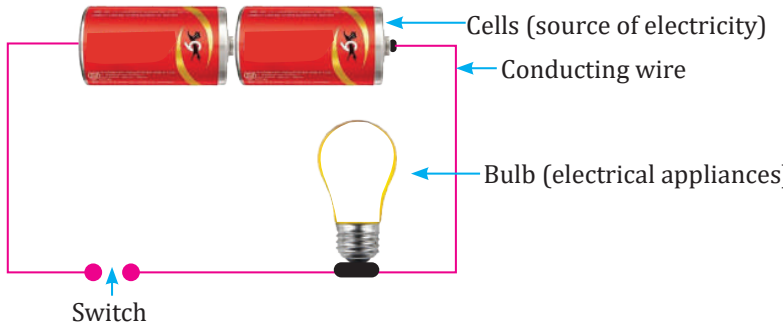


fig. 7.8 open circuit

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.

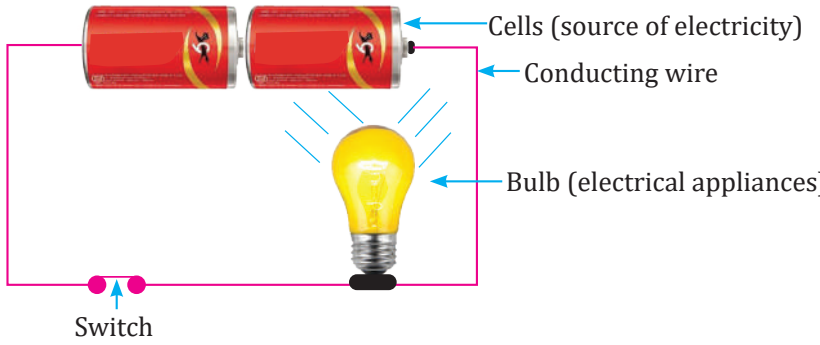


fig. 7.9 closed circuit

An electric circuit is most essential because we use an electric circuit while using electric appliances. Electric appliances are used to 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 opened 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.

Activities 7.5

Fill in the missing words.

loop	complete	energy	path
negative	positive	electricity	

A corcot os a _____ that allows _____ to pass throught it

Electricity always travels from the _____ to the _____

A circuit will only work if it is _____ . This means it must make a complete _____ otherwise the electrical _____ cannot flow.

7.3.2 Function of wire, cell, bulb, and switch in an electric circuit

Wire (Conductors):

An electrical wire is the electro technical component used to transport electricity to transmit energy and information. It is made of a conductive material, single or multiple strands, often surrounded by an insulating envelope. The inside of the electrical wire is called the "core" of the wire. These are usually copper wires with no insulation. They make the path through which the electricity flows. One piece of the wire connects the current from the power source (cell) to the load.

The other piece connects the load back to the power source.

Switch:

An electrical switch is any device used to interrupt the flow of electrons in a circuit. Switches are essentially binary devices: they are either completely on ("closed") or completely off ("open").The switch is simply a small gap in the conductor where you can close or open the circuit. When the switch is closed the circuit is closed, and electricity flows.

The Load:

An electrical load is simply any component of a circuit that consumes power or energy. The load is a small light bulb or buzzer that lights when the circuit is turned on. The load is also known as a resistor. In a household setting, the most obvious examples of electrical loads include light bulbs and appliances. The load is also known as resister.

Cell:

An electric cell is a device, which converts chemical energy into electrical energy. It has two terminals, which are made up of metal: one terminal is positive (+), while the other one is negative (-). When the two terminals are connected to an electrical device, electric current flows through it. The power source is a cell. More than one cell put together is known as a battery. A battery can be defined as an electrochemical device (consisting of one or more electrochemical cells) which can be charged with an electric current and discharged whenever required.

Batteries are usually devices that are made up of multiple electrochemical cells that are connected to external inputs and outputs.

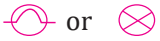
Activities 7.6

Match the elements to the definitions.

Resitor ●	● It generates the energy.
Conductor ●	● It opens or closes the circit.
Power Source ●	● It converts electricity in another tyep of energy.
Switch ●	● Electricity flows through this element.

Symbols in Electric-circuit

While drawing a 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	

7.3.3 Safety measures have to be taken while using electricity.

Precautions that should be taken during the use of electricity are as follows:

- Always use insulated tools while working.
- Never use equipment with frayed cords, damaged insulation, or broken plugs.
- Know the wire code of your country.
- When working on any receptacle at a height in your home, never use an aluminum or steel ladder.An electrical surge will ground you, and the whole electric current will pass through your body. Use a bamboo, wooden, or a fibreglass ladder instead.
- Avoid water at all times when working with electricity. Never touch or try to repair any electrical equipment or circuits with wet hands. It increases the conductivity of electric current.
- Never use equipment with frayed cords, damaged insulation, or broken plugs.

A. Choose the correct one and put the tick mark (√).

i. _____ can be defined as the flow of electric charge.

a. Electron
b. Electricity
c. Electric load
d. Electric wire

ii. A simple electric circuit can consist of a _____ , a light bulb, and conducting wires that connect the two terminals of the battery to the two ends of the light bulb.

a. insulator
b. resistor
c. battery
d. none of these

iii. A circuit which is not complete and electric current cannot flow is called an _____.

a. open circuit
b. close circuit
b. open- close circuit
d. none of these

iv. The circuit which is complete and through which electric current flows and the bulb glows is called a closed circuit.

a. open circuit
b. close circuit
b. open- close circuit
d. none of these

v. These are usually copper _____ with no insulation.

a. cells
b. wires
d. switches
e. load

vi. The load is a small light _____ or buzzer that lights when the circuit is turned on. The load is also known as a resistor.

a. bulb
b. cell
c. switch
d. wire

vii. The power source is a _____.

a. bulb
b. cell
c. switch
d. wire

viii. Precautions that should not be taken during the use of electricity -

a. Always use insulated tools while working.
b. Never use equipment with frayed cords, damaged insulation, or broken plugs.
c. Avoid water at all times when working with electricity.
d. Touch or try to repair any electrical equipment or circuits with wet hands.

ix. Which one is conductor?

a. Stone
b. Lead
c. Copper
d. Rubber

B. Use the following words to fill in the blanks .

appliances,	electric circuits,	conductor,
turned off,	switch,	battery, energy,

i. Electricity is a form of _____ that can be easily changed to other form using electrical appliances.

ii. Electric _____ convert electric energy into different forms of energy as sound energy, heat energy, light energy, etc

iii. The _____ are closed-loop or paths, forming a network of electrical components where electrons can flow.

iv. When the switch is _____, the electric current cannot flow in the electric circuit and the bulb doesnot glow.

v. In the "off" position of the _____, the wire is not connected and the circuit becomes open in which the electric load does not work.

vi. The switch is simply a small gap in the _____ where you can close or open the circuit.

vii. More than one cell put together is known as a _____.

C. Differentiate between these pairs.

i. Circuits and electricity
ii. Open and closed circuits
iii. Electric wire and electric load
iv. The Cell and the Battery
v. The Switch and the Wire

D. Explain the following:

i. Always use insulated tools while working.
ii. Never use equipment with frayed cords, damaged insulation, or broken plugs.
iii. Avoid water at all times when working with electricity.
iv. Never use equipment with frayed cords, damaged insulation, or broken plugs.

v. A layer of plastic coated around copper wire.
vi. A bulb does not glow when circuit is opened.

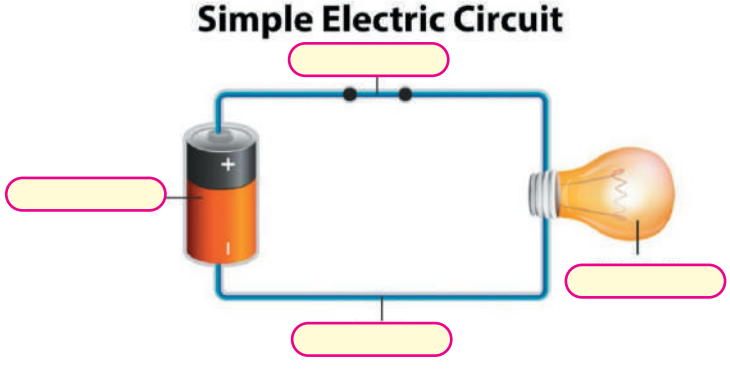
E. Answer the following questions :

i. What is electricity? Write various uses of electricity in our daily life.
ii. Define electric circuit. Mention the types of circuit.
iii. Draw an electrical circuit containing cell, wire and 'on' and 'off ' switch.
iv. What is a closed circuit? Sketch a diagram.
v. What is a open circuit? Sketch a diagram.
vi. By using dry cells, switches, conductive wires, and torch bulbs or LEDs to light a lamp and describe closed and open circuits based on it.
vii. Explain the function of wires, cells, bulbs, and switches in a circuit.
viii. Write down safety measures have to be taken while using electricity.

F. Diagrammatic Questions :

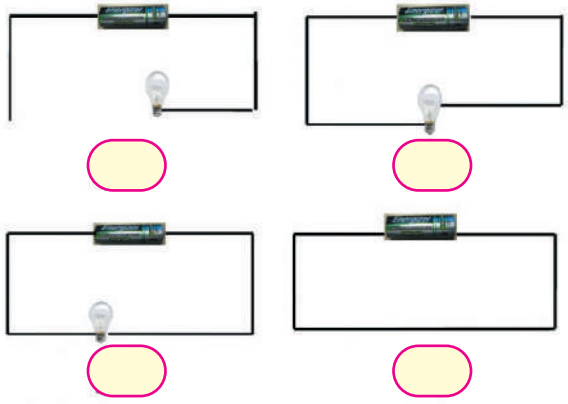
i. Drag and label the elemets of the electrical circit.

Resistor	Power Source	Switch	Conductor



ii. Look at the diagram below

Give tick (√) in the box for the bulb that can be light.



iii. Fill in the blanks by using the helping words

wires	hurt	force	hair	sockets	work
careful	batteries	flow	lightning	phones	

Electricity is an invisible _____ . You cannot see electricity, but you can see what it does! It makes _____ streak across the sky. It can make your _____ stand on end. Electricity can _____ through wires and make things work. We can plug into things into _____ in the wall. Electricity flows through lightbulbs, computers, and refrigerators to make them_____Some things have _____ in them to create electricity.

Flashlights and cell _____ use batteries.

or even kill you. Never touch electric _____ or sockets.

iv. Fill in the blanks by using the helping words.

damage	circuit	positive	switch	wet
move	light	open	flows	put
socket	cells	gap	negative	alarm clock

1. When the switch in a circuit is _____ there is a gap in the circuit.
2. Nina can turns the table lamp on or off by using a _____

3. A _____ provides a path for electricity to flow.
4. The sound from the _____ buzzer is so loud.

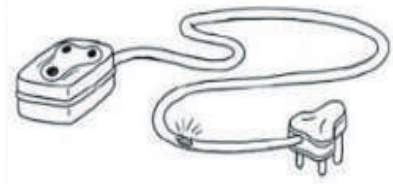
5. The electric iron uses electricity from the mains when we plug it into _____
6. Mobile phone uses electricity from batteries or _____
7. Fires caused by electricity can _____ the things.
8. The electric fan and for car use electricity to _____
9. Flashlight uses electricity fro batteries to give off _____
10. There are two poles in battery, they are _____ and _____

11. When the switch is closed, there is no in the circuit.
12. Electricity _____ through the circuit, so the bulb lights up.
13. Electricity is dangerous for us when we touch it using _____ hands.
14. Do not _____ your finger into the socket.

v. Match thethings to what they do in a circuit.

1	Holds the battery
2	Uses electricity to make sounds
3	Pushes electricity around a circuit
4	Connect the parts of a circuit
5	Uses electricity to give off light

vi. Tick (√) what you should not to do when using electricity.



Unit 8

Earth and Space

Total Estimated pariods (Th. 15+ Pr. 5 =20)

Student's Learning Outcomes

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

- state that the sun, earth, moon, and other celestial bodies can be found in the sky
- explain the reason for day and night by demonstrating the process by which the earth continuously rotates on its axis
- demonstrate with a suitable model the process by which the Earth revolves around the Sun and the Moon revolves around the Earth.
- describe the lunar art pictorially by observing the changes in the shape of the moon

Look at the pictures below and answer the question:

i. What are these pictures related to?

ii. List the celestial bodies.

iii. Briefly present to the class what you know about the sun, earth, moon, meteors, and meteorites.

8.1 Sun, Earth, moon and celestial bodies

Everything that exists as a matter is called universe. It includes galaxies, stars, planets, satelites, small (or baby) planets, meteors, comets and other heavenly bodies. Actually, the universe is unlimited region that contains everything.

The Sun

The Sun is a medium sized star. It looks bigger and brighter than the other stars because it is closer to the earth. It is situated at the centre of the solar system.

fig. 8.1

The Sun is about 15 crores kilometers away from our earth. The sun appears bigger and brighter than other stars as it is closer to the earth. The Sun is ultimate source of energy. Sunlight help in conduction of water cycle and preparation food by green plants during photosynthesis process.

The sun gives us heat and light. Without heat and light from the sun, our solar system would be dark and cold. There would be no life on the earth. Can you imagine life on the earth without the Sun? The sun is the main source of energy on the earth.

The Sun is a 4.5 billion-year-old yellow dwarf star – a hot glowing ball of hydrogen and helium – at the center of our solar system.

The Earth

The earth is about 150 million kilometers away from the Sun. It is not perfectly round but it is slightly flattened at the poles. It is revolving around the sun in an oval path called the Orbit. It has a good environment with air to breathe, water and suitable temperature for the survival

fig. 8.2

of the living organisms. The earth is the only planet which supports life. It has only one natural satellite, the moon.

The Moon

The moon is our nearest neighbour in space. It is a natural satellite of the earth. The moon does not have its own light. Light from the sun falls on the moon which it reflects and shines brightly at night. Life is not possible on the moon. Its because it lacks life supporting conditions. The surface of moon is rough and uneven. It has a dusty surface. It has plains and mountains.

fig. 8.3

Some other celestial bodies

Our solar system consists of heavenly objects that travel around the Sun. The sun is nearly at the centre of the solar system. The solar system consists of eight planets including the earth, satellites (moon) of each planet, minor planets called asteriods. Bright stars having head and tail called comets.

The whole group of planets, their satellites, asteriods and comets which move around the sun is called the solar system.

Stars

fig. 8.4

Stars are the huge glowing balls of gases. They are luminous bodies. They emit their own light.

There are billions and billions of stars in the universe. All the space, matter as well as energy that exists everywhere is called the universe. The size, mass, temperature and colour of stars are not same. They twinkle at night. Some stars form constellations. Constellations have a fixed shape. There are 88 constellations discovered till now. The Sun is also a star. It is the closest star to the earth.

Planets

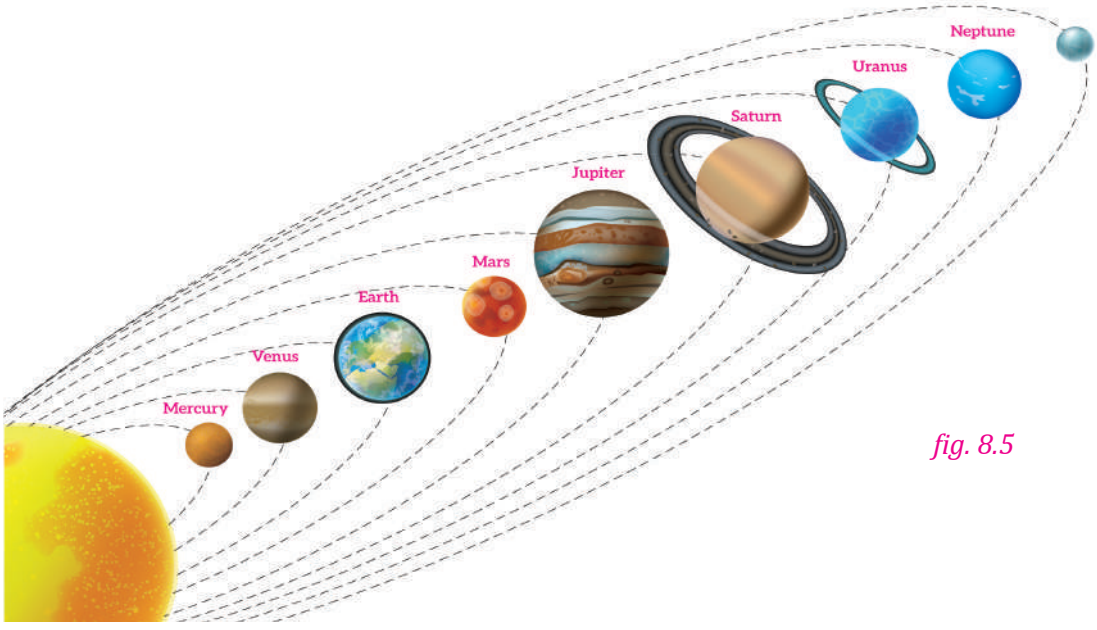


fig. 8.5

Planets are heavenly bodies that revolve around the Sun. There are eight planets in the solar system. They are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. These planets revolve around the sun in an elliptical path which is known as orbit. The planets do not have their own light. They shine when the light of the Sun falls on them. The planets do not twinkle.

Mecury is the nearest planet to the Sun and Neptune is the farthest. Jupiter is the largest planet where as mercury is the smallest. Venus is

the brightest planet and it is brighter than any star seen from the earth. It is the closest planet to the earth.

The earth is the third nearest planet from the Sun. It has plenty of water, oxygen and suitable temperature for animals and planet. The Saturn is the second largest in the solar system.

Satellites

The heavenly bodies that revolve around a planet are called satellites. Satellites do not have their own light. It shines due to the reflection of the sun light.

The number of natural satellites discovered so far in different planet are given in following table.

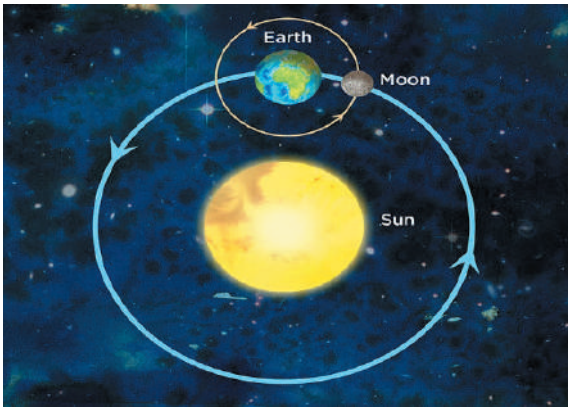


fig. 8.6

Planet	Natural Satellites	Number
1.Mercury	-	-
2.Venus	-	-
3.Earth	Moon	1
4.Mars	Phobos,Deimos	2
5.Jupiter	Europa,Ganymede etc.	67
6.Saturn	Titan,Rhea etc.	62
7.Uranus	Miranda,Ariel etc.	27
8.Neptune	Triton,Neried	17

[Note:- The number might vary depending upon new discoveries by NASA, USA. National Aeronautics and Space Administration]

Beside natural satellites, man made satellites (artificial satellites) are launched for human benefits. Artificial satellites are computerized spacecraft which are designed to move around the earth in their fixed orbit. Artificial satellites are launched for following purposes.

- They are used in communication such as telephone, internet, etc.
- They are useful in weather forecasting.
- They are helpful for scientific experiments.
- They are used to gather information regarding the heavenly body and outer space.
- They are helpful for the transmission of radio and television programmer.

Comets

Small objects that appear occasionally in the sky with head and tail are known as comets. The head of a comet is made up of ice, rock and dust. The tail is made up of gas. Halley's comet is the famous comet. Other example are : Euke comet, Donati comet, Temple tuttle etc.

fig. 8.7

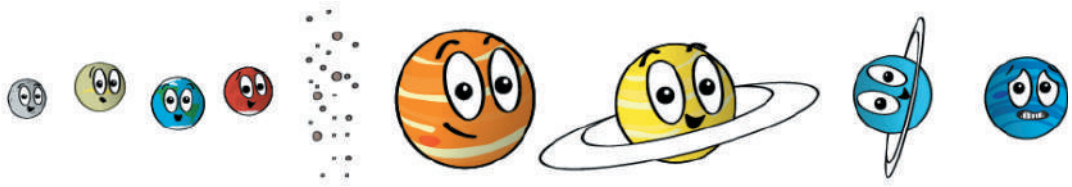
Asteroids

Mathilde *Gaspra* *Ida*

fig. 8.8

Large number of small bodies which are made up of rocks and metals are known as asteroids. They revolve around the sun. They are also called

minor planets. (or planetoids or baby planets). They are also sometimes considered as remanants of former planets. There are lots of asteroids in our solar system. Most of them live in the main asteroid belt—a region between the orbits of Mars and Jupiter.



Most asteroids in our solar system can be found in the asteroid belt, between Mars and Jupiter.

fig. 8.9

Asteroids hang out in other places, too. For example, some asteroids are found in the orbital path of planets. This means that the asteroid and the planet follow the same path around the sun. Earth and a few other planets have asteroids like this. Asteroids are left over from the formation of our solar system. Our solar system began about 4.6 billion years ago when a big cloud of gas and dust collapsed.When this happened, most of the material fell to the center of the cloud and formed the sun.

Some of the condensing dust in the cloud became planets. The objects in the asteroid belt never had the chance to be incorporated into planets. They are leftovers from that time long ago when planets formed.
Examples : Mathilde, Gaspra, Pallas, Juno, Eros, Vesta, etc.

Meteor

A meteor is a space rock—or meteoroid—that enters Earth's atmosphere, as it – burns up upon entering Earth's atmosphere, it creating a streak of light in the sky (often called "shooting stars"). When Earth encounters many meteoroids at once, we

fig. 8.10

call it a meteor shower. If a meteoroid survives its trip through Earth's atmosphere and lands on the Earth's surface, it is called a meteorite.

8.2 Earth's rotation

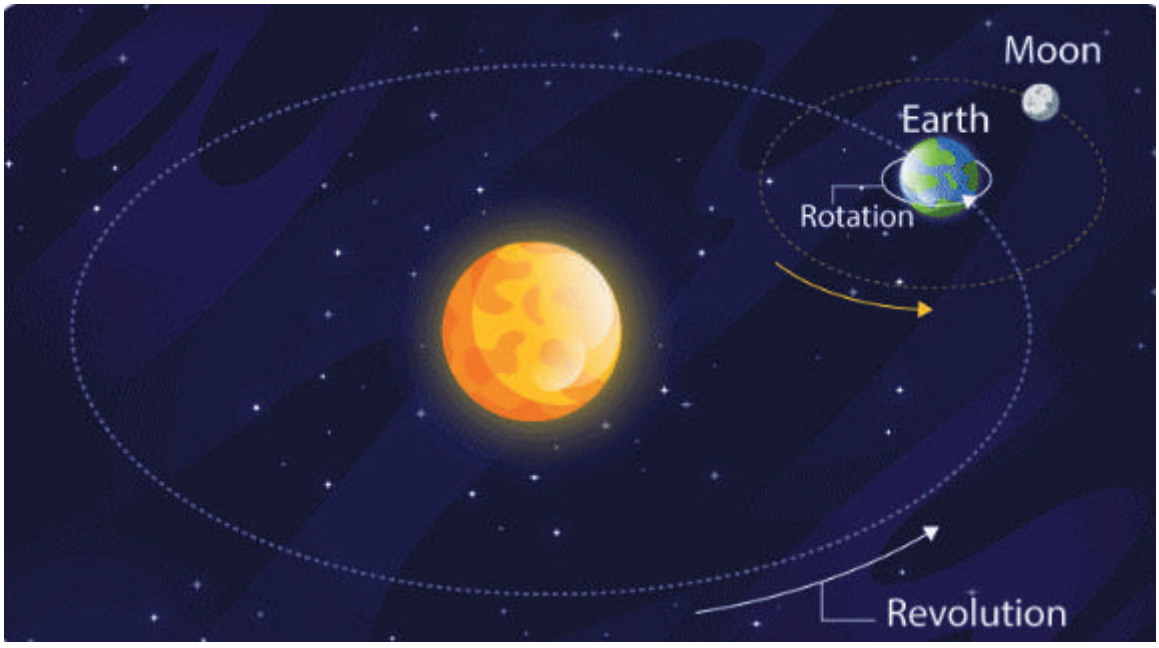


fig. 8.11

A rotation is a circular movement of an object around a centre of rotation. If three-dimensional objects like the earth, moon and other planets always rotate around an imaginary line, it is called a rotation axis. If the axis passes through the body's centre of mass, the body is said to rotate upon itself or spin.

Earth rotates on its axis from west to east, and the Sun and the Moon appear to move from east to west across the sky. The spinning of the Earth around its axis is called 'rotation'. The axis has an angle of 23 1/2° and is perpendicular to the plane of Earth's orbit. This means the Earth is tilted on its axis, and because of this tilt, the northern and southern hemispheres lean in a direction away from the Sun. The rotation of the Earth divides it into a lit-up half and a dark half, which gives rise to day and night. The direction of the Earth's rotation depends on the direction

of viewing. When viewed looking down from the North Pole, Earth spins counterclockwise. On the contrary, when viewed looking down from the south pole, the earth spins in the clockwise direction.

- The earth rotates around its axis from west to east.
- The circumference of the earth along its equator is 40,067 km.
- The earth takes 24 hours to complete one rotation.
- Therefore its rotational speed is about 1670 km/h at the equator.

Earth's rotation effects

i. **The rotation causes day and night :** Day and night are caused due to the rotation of the earth. During rotation, while the earth moves around its axis, only half the portion of it receives sun's rays and therefore, it appears bright, the other half remains in darkness. In other words that half portion of the earth which is lit by sun rays experiences day and the other half experiences night.

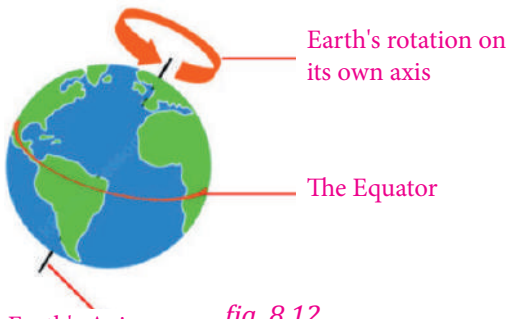


fig. 8.12

In the process of rotation the portion lit by sun rays gradually goes into light. This is the reason at day and night occurs alternately. Earth takes about 24 hours to complete one rotation.

ii. **Rotation causes Sunrise and sunset :** The Sun rises in the east and sets in the west. Similarly, moon and stars also rise in the east and set in the west. All these happen due to the rotation of the earth from west to east. For example, while travelling in a train we observed that the trees appear to move in the direction opposite to our own direction of travel. Whereas the train in which we travel appear to be stationary. Similarly the Sun rises in the east and sets in the west because the earth rotates from west to east. It appears to us that the earth is stationary. But actually it is quite opposite (i.e. Earth and train are not stationary)

iii. **Diurnal cycle :** The Earth's rotation creates the diurnal cycle of lightness and darkness, temperature and humidity changes. Half the earth is illuminated while half is dark. Rotation causes the day-night cycle which also creates a corresponding cycle of temperature and humidity creates a corresponding cycle of temperature and humidity.

iv. **Tide :** Rotation causes the tides- the twice daily rise and fall of sea level. Tides are complicated complicated because because they are the result of both the gravity gravity of the moon and the gravity of the sun. Sometimes the sun and the moon are lined up with the earth, but most of the time they are not. Tides are highest when the earth, sun and moon are in a straight line.

8.3 Earth's revolution

Revolution is often used as a synonym for rotation. However, in many fields like astronomy and its related subjects, revolution is referred to as an orbital revolution. It is used when one body moves around another, while rotation means moving around the axis. For example, the Moon revolves around the Earth, and the Earth revolves around the Sun. The movement of the earth around the sun is called revolution.

- The fixed regular path through which earth revolves round the sun is called orbit.
- This orbit is elliptical in shape.
- The length of the Earth's orbit is 965 million kilometers.
- Earth takes one year or strictly speaking 365 ¼ days to complete one revolution.
- A normal year has 365 days only with 28 days in February.
- The remaining one-fourth of the day is added once in every four years. And this year is known as leap year. So leap year has 366 days with 29 days in February.

Earth's revolution effect

The Seasons

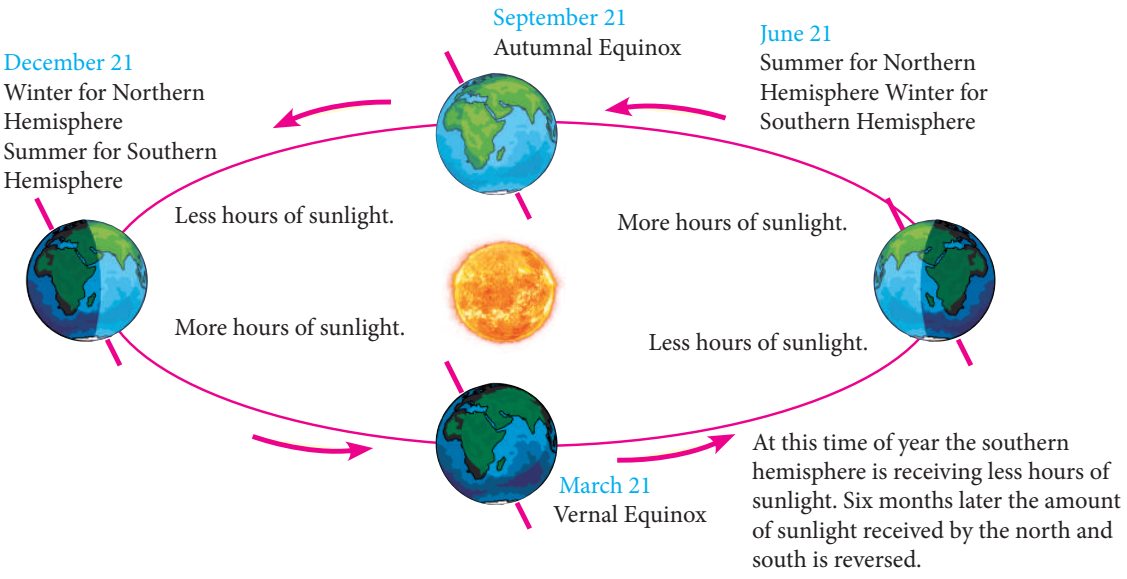


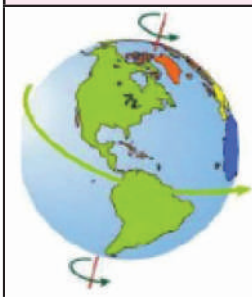
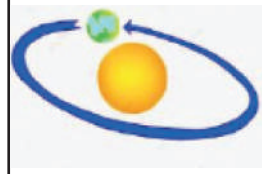
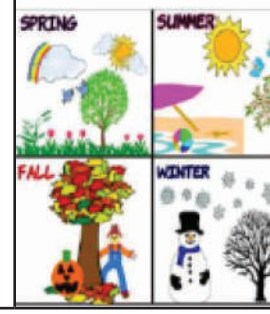
fig. 8.13

i. **Revolution causes seasons :** The seasons are created by the Earth's revolution around the Sun, which changes the amount of sunlight that each part of the Earth receives throughout the year. The northern hemisphere gets summer when it is tilted toward the sun, winter when it is tilted away from the sun, and spring and fall in between. Likewise for the southern hemisphere, though the southern hemisphere's seasons are a half-year out of phase with the northern hemisphere's one. When it's summer in one hemisphere, it's winter in the other.

ii. **Recolution causes aphelion and Perihelion:** Distance between the Earth and the sun is not constant as the earth's orbital path is elliptical in shape. Sometimes the earth occupies farthest position from the sun and at other times closest to the sun. The farthest position of the earth from the sun is known as aphelion and the closest position is known as perihelion.

iii. **Different day and night lengths:** It results in different day and night lengths. During the revolution, the lengths of days and nights are equal at the equator. The equator faces the Sun directly on March 21 and September 23.During these two days the day and night are equal throughout the earth.These two days are called Equinoxes. On June 21, the Tropic of Cancer faces the sun. This is known as the summer solstice. It is the longest day in the Northern Hemisphere and longest night in the Southern hemisphere. On December 22, the Tropic of Capricorn faces the sun. This is known as the winter solstice. It is the longest day in the Southern Hemisphere and longest night in the Northern hemisphere

The difference between Earth's Rotation and Revolution:

Rotation		Revolution	
	When the Earth spins or turns on its axis.		When the Earth travels around the Sun.
	Rotation takes 24 hours or 1 day		Revolution takes 365 1/4 days or 1 year
	It causes Day and Night		It causes the 4 seasons

Activities 8.1

Seasons Model

Science Idea: rotation and revolution

Materials:

- 5 Ping-Pong balls (one yellow, four white)
- darning needle
- 5 round toothpicks
- 3 markers (blue, green, and black)
- foam plate

Steps:

1. Use the needle to poke holes through the top and out the bottom of each white ball. Insert a toothpick through the holes in each ball to represent Earth's axis. Repeat with the yellow ball (sun), but make only one hole so the toothpick protrudes from one end only.
2. Use the markers to make each white ball look like Earth.
3. Turn the plate upside down and insert the balls, tilting the ball at summer toward the sun and the ball at winter away from the sun as shown
4. Draw arrows to show the direction of Earth's revolution around the sun.
5. Slowly turn each miniature
6. globe on its axis to show how Earth rotates in each position to create day and night as it revolves around the sun.

8.4 Moon's revolution

You've probably looked up at our planet's moon and noticed how beautiful it is. You've probably also noticed that sometimes it is full and bright, and sometimes you can only see part of it. And have you ever noticed that sometimes you can't see it at night, but you can during the day? Our view of the Moon changes because it's constantly moving through space, just like Earth is. The moon has two main movements: its revolution and its rotation.

The Moon moves around the Earth in a movement called revolution. This is very similar to Earth's revolution around the Sun. The path the

Moon takes to go all the way around the Earth is called its orbit.

The Moon takes about one month to orbit Earth (27.3 days to complete a revolution, but 29.5 days to change from New Moon to New Moon). The revolution of the Moon around Earth is not its only movement, though .It's also spinning in space.

Phases of moon

The moon revolves around the earth. It takes 29.5 days to complete one revolving around the earth. The change in the shape of the moon which is seen from the earth are called **phases of the moon**.

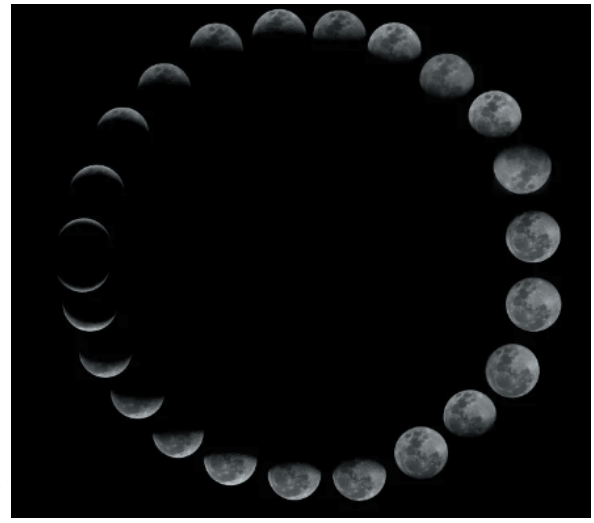


fig. 8.14

When the earth is in between the sun and the moon, bright part of the moon faces the earth, this phase is known as full moon. We can see fully lighted moon. When the moon is in between the earth and the sun, the dark half of the moon faces the earth is known as new moon. We cannot see the moon from the earth. When the moon reaches the position at 'Q' then the half portion of the earth's surface will be visible is known as first quarter. When the moon reaches the position at 'S', only the half of it is visible as in position at 'Q', which is known as third quarter. The period in between the new moon and the full moon, the bright part of the moon goes on

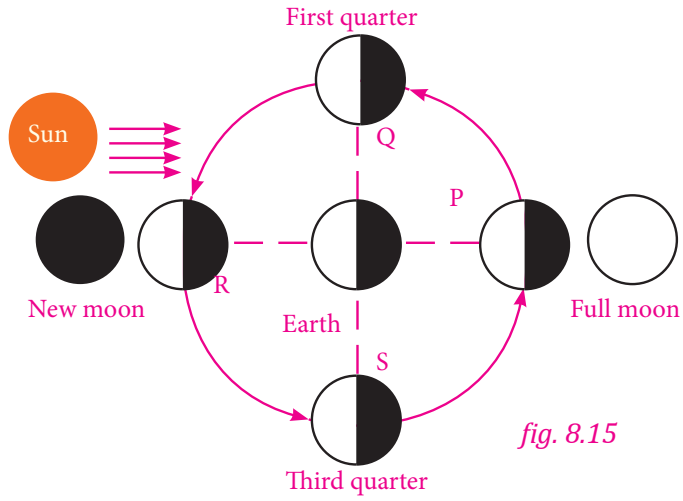


fig. 8.15

increasing which is known as bright half of the moon. The period from the full moon to the new moon, the bright part of the moon goes on decreasing which is known as dark half of the moon. The period of a new moon to another full moon is called a lunar month.

Just for Your Knowlege

Describing the phases of the moon. Match.

1.	new moon	a.	At the end of the second week, all of the lit half of the moon is visible.
2.	first quarter	b.	At the end of the third week, the moon looks ke a half circle again.
3.	third quarter	c.	At the end of the first week, the moon looks like a half circle.
4.	full moon	d.	Early in week one, all of the moon appears dark.

Activities 8.2

i. Make a drawing to show the inclination of the earth.

ii. Record the timings of sunrise and sunset at your place taking help from your local newspaper on the 21st of each month and answer the following :
   a. In which month are the days the shortest?
   b. In which months are the days and nights nearly equal?

iii. Look at the sky in clear night and identify stars and planets. Can you spot some planets? Prepare a report .

iv. Demonstrate in the classroom the fact that the earth rotates on its axis using a globe.

v. Prepare a report comparing the rotation of the earth with a fan, a mane, and a jaanto.

Exercise

A. Choose the correct one and put the tick mark (√).

i. Everything that exists as a matter is called _____ .

a. planet b. Sun
c. Comet d. universe

ii. The Sun is a _____ sized star.

a. small b. large
c. medium d. big

iii. The Sun is about _____ kilometers away from our earth.

a. 12 crores b. 14 crores
c. 15 crores d. 20 crores

iv. The Sun is a _____ year-old yellow dwarf star – a hot glowing ball of hydrogen and helium – at the center of our solar system.

a. 3.5 billion b. 4 billion
c. 4.5 billion d. 5 billion

v. The earth is the only _____ which supports life.

a. comet b. planet
c. asteroid d. satellites

vi. Comet is-

a. Gaspra b. Pallas
c. Temple tuttle d. Juno

vii. Asteroid is-

a. Euke comet b. Donati comet
c. Temple tuttle d. Vesta

vii. The earth rotates around its axis from _____ .

a. west to east b. east to west
c. south to west d. west to south

viii. The earth takes _____ hours to complete one rotation.

a. 29 b. 30
c. 24 d. 27

ix. Which is not the Earth's rotation effects -

a. day and night b. tide
c. season d. sunrise and sunset

ix. Which is not the Earth's revolution effects -

a. different day and night lengths
b. Sunrise and sunset
c. aphelion and Perihelion
d. season

x. The _____ moves around the Earth in a movement called revolution.

a. moon b. earth
c. sun d. asteroid

xi. The Moon takes about _____ to orbit Earth .

a. 27.3 days b. 29.5 days
c. 30 days
d. 365 days

xii. The movement of the earth around the sun is known as

a. Rotation b. Revolution
c. Inclination d. None of these

xiii. Direct rays of the sun fall on the equator on

a. 21 March b. 21 June
c. 22 December d. 21 september

xiv. Cycle of the seasons is caused due to

a. Rotation b. Revolution
c. Gravitation d. Inclination

xv. The movement of the Moon around the Earth is called.

a. Translation. b. Oscillation.
c. Rotation. d. Revolution.

B. Use the following words to fill in the blanks .

comets , solar, satellites, mars , seasons, meteoroids , rotation, east, revolution , phases of the moon , brighter

i. The sun appears bigger and _____ than other stars as it is closer to the earth.
ii. Without heat and light from the sun, our _____ system would be dark and cold.
iii. The heavenly bodies that revolve around a planet are called _____.
iv. Small objects that appear occasionally in the sky with head and tail are known as _____.
v. Most of asteroids live in the main asteroid belt—a region between the orbits of _____ and Jupiter.
vi. When Earth encounters many _____ at once, we call it a meteor shower.
vii. Day and night are caused due to the _____ of the earth.
viii. The moon and stars rise in the _____ and set in the west.
ix. The movement of the earth around the sun is called _____.
x. The _____ are created by the Earth's revolution around the Sun, which changes the amount of sunlight that each part of the Earth receives throughout the year.
xi. The change in the shape of the moon which is seen from the earth are called _____.

C. Differentiate between these pairs.

i. The sun and planet
ii. Rotation and revolution
iii. Earth's rotation effect and Earth's revolution effect

iv. Earth's revolution effect and Moon's revolution effect
v. Star and planet
vi. The Earth and the moon
vii. Asteroid and comet

D. Explain the following:

i. The sun is a medium sized star.
ii. The earth is called a living planet. Bright stars with a head and tail are called comets.
iii. The rotation of the earth causes day and night.
iv. The revolution of the earth causes seasons.
v. The period from a new moon to another full moon is called a lunar month.

E. Answer the following questions :

i. State the sun, earth, moon, and other celestial bodies can be found in the sky.
ii. What is the Earth's rotation? Write down its effect.
iii. What is the Earth's revolution? Write down its effect.
iv. What is the Moon's revolution? Write down its effect.
v. What are the phases of moon ?
vi. What do you understand by full moon and new moon?
vii. Define the followings.
    a. Universe
    b. Asteroid
    c. Planet
    d. Rotation
    e. Revolution
    f. Comets
    g. Orbit
    h. Earth's rotation effect
    i. Earth's revolution effect
    j. Moon's revolution effect
    k. Phases of the moon

viii. Write a short note:

a. The Sun
b. The Earth
c. The moon
d. Comets
e. Asteroid

ix. Click what rotation makes on the Earth.

causes day and night

the spinning of Earth on its axis

takes 24 hours to complete

occurs in day

the Sun is in the East in the morning, but in the West in the evening

works in a similar way to o spinning top

when the Earth is Facing toward the Sun, it is daytime

takes approximo tel 365 days

takes 1 year to complete

takes 1 year to complete

causes the seasons

follows a path called or orbit

the movement of the Earth around the Sun

the hemisphere facing toward the Sun experiences summer

F. Diagrammatic Questions :

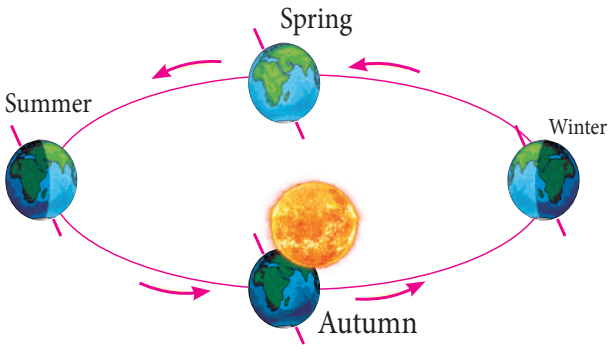
i. The sun. Look and match.

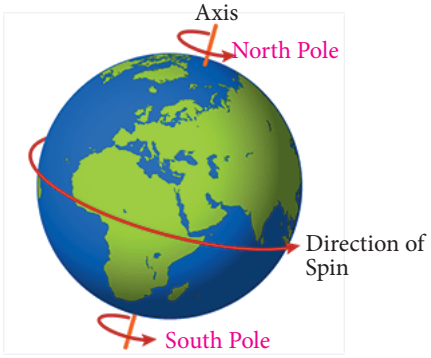
a. Living things need heat from the sun.
b. A star is a big ball of hot gas.
c. The sun lights Earth.
d. The sun warms the lard, the water, and the air.

ii. Match the words to the pictures (Drag and drop)

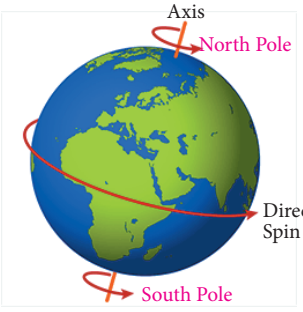
Revolution

Rotation





iii. Complete the followings-

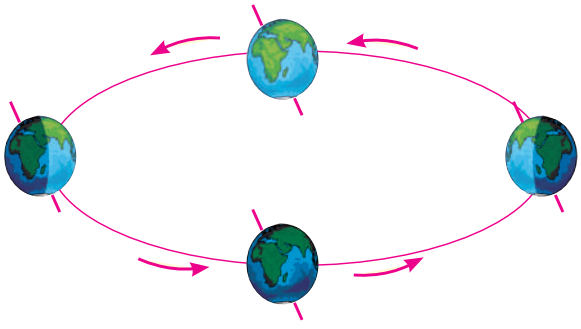


_____ The Earth moves arount its own axis.

It takes _____

It produces _____

iv. Complete the followings-

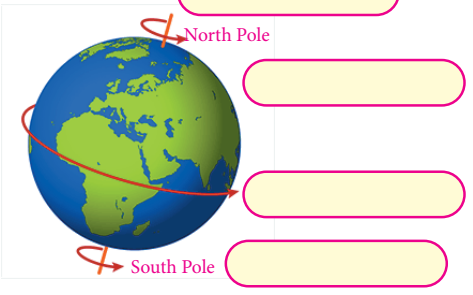


_____ The Earth orbits the sun.

It takes _____

It produces _____

v. Look at the below picture and drag the correction options in the boxes:



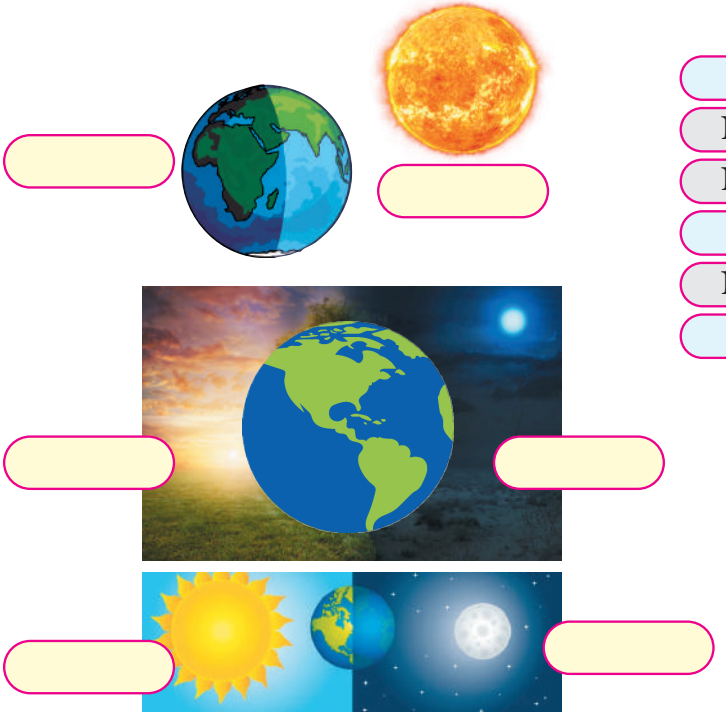
Axis of Earth

Equator

Northern Hemisphere

Southern Hemisphere

vi. Identify which part will have day and which part will have night?



Day

Night

Night

Day

Night

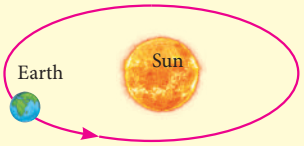
Day

vii. Each of the pictures and labels below show a time or the passing of time.

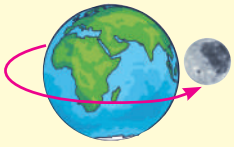
Instructions: Match each phrase in the word box to the correct picture.

Twelve hours | one week | one day | one moth | one year

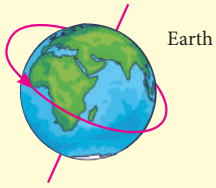
Earth goes once round the sun.



Moon goes once round the earth.

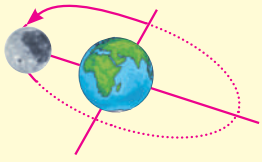


Earth spins round once.

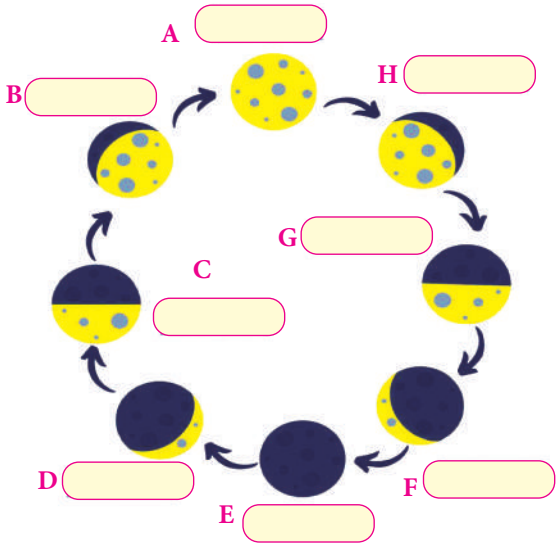


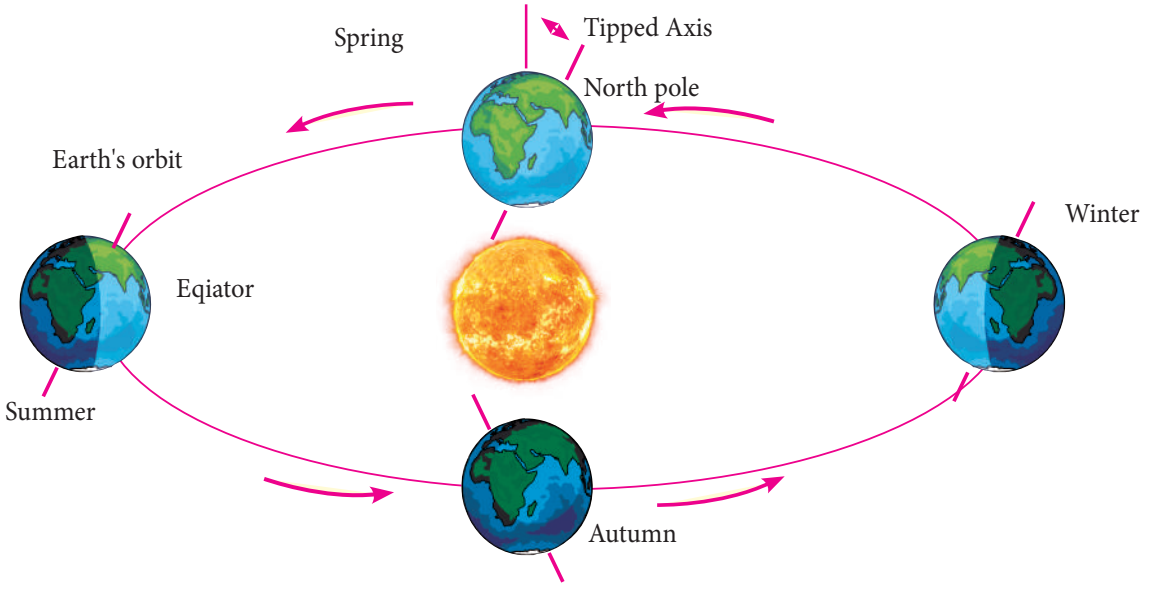
Earth spins half way round.

Moon goes a quarter of the way round the Earth.



viii. Drag and drop the different phases of the moon.



A.	New/Full/First quarter/Last quarter .
B.	Waxing crescent/Waxing gibbous/Waning crescent/Waning gibbous
C.	New/Full/First quarter/Last quarter .
D.	Waxing crescent/Waxing gibbous/Waning crescent/Waning gibbous
E.	New/Full/First quarter/Last quarter .
F.	Waxing crescent/Waxing gibbous/Waning crescent/Waning gibbous
G.	New/Full/First quarter/Last quarter .
H.	Waxing crescent/Waxing gibbous/Waning crescent/Waning gibbous

ix. Identify following figure. Write down short note about season.