Science and Elementary Technology

Pupil's Book

Primary 4

Kigali, 2022

Copyright © 2022 Rwanda Basic Education Board

All rights reserved.

This book is the property of the Government of Rwanda.
Credit should be given to REB when the source of this book is quoted.

FOREWORD

Dear Pupil,

Rwanda Basic Education Board is honoured to present to you this Science and Elementary Technology book for Primary Four which serves as a guide to competence-based teaching and learning to ensure consistency and coherence in the learning of Science and Elementary Technology subject. The Rwandan educational philosophy is to ensure that you achieve full potential at every level of education which will prepare you to be well integrated in society and exploit employment opportunities.

The government of Rwanda emphasises the importance of supporting teaching and learning materials with the syllabus to facilitate your learning process. Many factors influence what you learn, how well you learn and the competences you acquire. Those factors include the instructional materials available among others. Special attention was paid to the activities that facilitate the learning process in which you can develop your ideas and make new discoveries during concrete activities carried out individually or with peers.

In competence-based curriculum, learning is considered as a process of active building and developing knowledge and meanings by the learner where concepts are mainly introduced by an activity, a situation or a scenario that helps the learner to construct knowledge, develop skills and acquire positive attitudes and values. For effective use of this textbook, your role is to:

- Work on given activities which lead to the development of skills;
- Share relevant information with other learners through presentations, discussions, group work and other active learning techniques such as role play, case studies, investigation and research in the library, from the internet or from your community;
- Participate and take responsibility for your own learning;
- Draw conclusions based on the findings from the learning activities.

I wish to sincerely extend my appreciation to the people who contributed towards the development and editing of this textbook, particularly REB staff who organized the whole process from its beginning. Special gratitude goes to teachers, illustrators and designers who carefully worked to successful completion of this textbook. Any comment or contribution would be welcome for the improvement of this textbook for the next edition.

Dr. MBARUSHIMANA Nelson
Director General, REB

ACKNOWLEDGEMENT

I wish to sincerely extend my special appreciation to people who played a major role in development and editing of this Science and Elementary Technology book for Primary Four book. It would not have been successful without the participation of different partners that I would like to express my deep gratitude.

My thanks go to the Rwanda Basic Education Board leadership who supervised the whole activity and staff who were involved in the process of development and editing this book. I also wish to extend my appreciation to primary school teachers, lecturers and different education experts for their valuable support.

Joan MURUNGI
Head of CTLR Department

CONTENTS

PREFACE

The book strictly follows the **competence-based curriculum** issued by the Rwanda Education Board (REB).

Salient features of the book are:

- The book adopts pupil-centred approach.
- Each topic in the book starts with an **Activity** from real-life situations which helps the pupils discover the scientific concepts.
- **Keywords** and **Summary** complement the learning.
- Each unit concludes with a **Unit Review Exercise** for self assessment.
- **ICT** based units make the learning more fun.

Any suggestions for the improvement of the book would be gratefully acknowledged.

—Authors

Unit 1 Agricultural Tools

People do different types of jobs for their living. Many jobs can be done using hands. But some jobs are not easy to do with hands alone. To make such jobs easier, we use tools.

1.1 Identification of Agricultural Tools

Activity - 1 Identifying and Naming Agricultural Tools

 (*i*)	 (*ii*)	 (*iii*) .....
 (*iv*)	 (*v*)	 (*vi*) .....
 (*vii*)	 (*viii*)	 (*ix*) .....
 (*x*)	 (*xi*)	 (*xii*) .....

1. What are these?
2. Who use these tools and what for?
3. Identify these tools and write their names in your science notebook.

These are some **agricultural tools**. Farmers use these tools in farming.

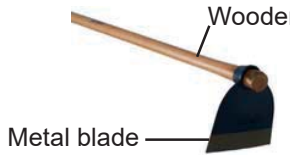
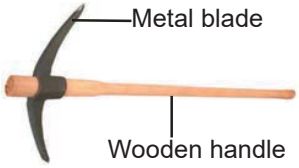
1.2 Uses of Agricultural Tools

Activity - 2 Grouping Agricultural Tools Based on their Uses

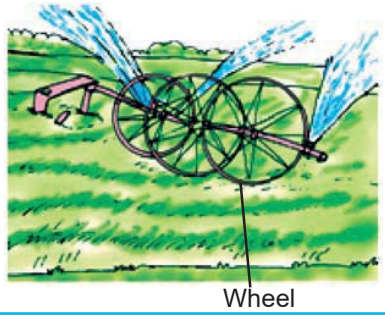
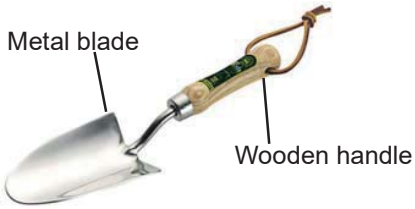
1. Identify the tools the farm workers use.
2. Group these tools according to their uses. Fill in the table below.

Digging Tools	Watering Tools	Transplanting Tools	Sharpening Tools	Cutting Tools	Transporting Tools	Spraying Tools	Cleaning Tools

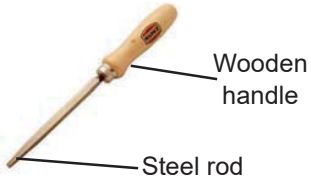
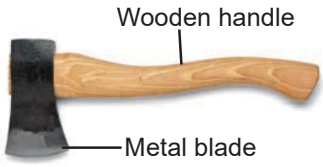
Table 1.1: Grouping Agricultural Tools Based on their Uses

S.No.	Tools	Uses
(a) Clearing Tools		
1.	**Machete** is a big knife-like tool. It is made up of a flat long metal blade and a wooden handle. Its one edge is sharp while the other is blunt. 	(*i*) Clearing bushes (*ii*) Harvesting crops like maize, sugarcane, cassava and yam
2.	**Slasher** is also a big knife-like tool. It is made up of a flat long metal blade and a long wooden handle. 	(*i*) Clearing bushes
(b) Digging Tools		
1.	**Hoe** is made up of a metal blade and a wooden handle. 	(*i*) Digging the soil (*ii*) Harvesting crops like cassava and cocoyam (*iii*) Removing weeds (*iv*) Making drains
2.	**Pickaxe** is made up of a double headed thick metal blade and a wooden handle. 	(*i*) Digging up of roots and tree stumps (*ii*) Breaking up of hard soil

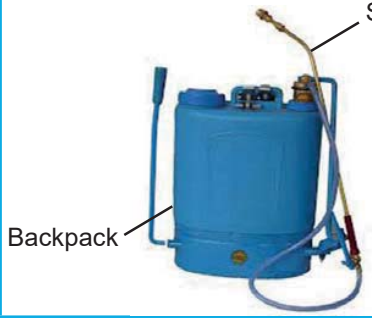
(Continued...)

(c) Watering Tools		
1.	**Watering can** is a metal or plastic can with a spout.  	(*i*) Watering crops (*ii*) Applying liquid fertilisers to crops
2.	**Watering wheel** is a long pipe attached to a rotating wheel.  	(*i*) Watering crops (*ii*) Applying pesticides, weedicides, herbicides and liquid fertilisers
(d) Transplanting Tools		
1.	**Trowel** is a boat-shaped tool. It has a curved sloop metal blade and a wooden handle.  	(*i*) Transplanting of seedlings (*ii*) Application of fertilisers and manure to the soil (*iii*) Digging holes for planting seeds
2.	**Spade** is made up of a flat metal blade and a long handle. The handle is wide at the end.  	(*i*) Transplanting of seedlings (*ii*) Digging up the earth (*iii*) Levelling the ground (*iv*) Making seedbeds

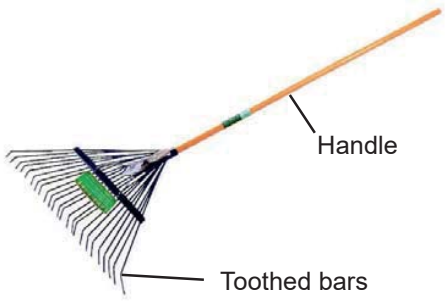
(Continued...)

(e) Sharpening Tool		
1.	**File** is a piece of hardened steel rod with cutting ridges. It has a wooden handle.  	(*i*) Sharpening edges of agricultural tools
(f) Cutting Tools		
1.	**Axe** is made up of a metal blade and a wooden handle.  	(*i*) Cutting and splitting woods (*ii*) Cutting trees
2.	**Sickle** is also a big knife-like tool. It is made up of a curved metal blade and a wooden handle.  	(*i*) Cutting millet and rice (*ii*) Cutting grass in a compound
(g) Transporting Tools		
1.	**Wheelbarrow** is a single wheel, small hand pushed cart. It has two handles at the back.  	(*i*) Transporting crops, seeds, and manures (*ii*) Carrying other tools for agricultural work

(Continued...)

2.	**Tractor** consists of heavy engine and a trolly. 	(*i*) Carrying crops (*ii*) Transporting seed bags, manure and equipments
(h) Milking Tool		
1.	**Milking can** is a metal container with a handle. 	(*i*) Storing and transporting milk
(i) Spraying Tool		
1.	**Spraying pump** is a plastic container with backpacks and spray gun. 	(*i*) Spraying pesticides, herbicides and weedicides (*ii*) Spraying liquid fertilisers

(Continued...)

(j) Cleaning Tool		
1.	**Rake** has toothed bars, fixed diagonally to a handle. 	(*i*) Collecting fallen leaves, hay and grass (*ii*) Levelling the soil (*iii*) Making seedbeds

Can you name some other agricultural tools?

1.3 Maintenance of Agricultural Tools

Activity - 3 **Practicing the Maintenance of Agricultural Tools**

1. Visit a nearby agricultural farm.
2. Observe and practice the ways people maintain all agricultural tools.
3. Make a report on it and present to the class.

The following are useful methods to maintain agricultural tools in good condition:

1. Tools must be cleaned properly after use.
2. After cleaning, tools must be stored in a safe, dry and termite-free place.
3. Digging and cutting tools should be kept sharp.
4. Plastic sprayers must be kept away from fire. Pipes and nozzles must be cleaned regularly to prevent blockages.
5. Damaged tools must be repaired properly.
6. Metallic tools like wheelbarrows must be painted regularly to avoid rusting.
7. On transporting tools and their parts, oiling and greasing have to be done regularly.
8. Tools must be handled with care.
9. Tools must be used for the purpose they are designed for.
10. Records of the movement of tools must be kept.

1.4 Storage of Agricultural Tools

Activity - 4 **Storing Agricultural Tools**

1. Visit a nearby agricultural farm.
2. Observe the techniques the farm workers use to store their agricultural tools.
3. Make a report on it and present to the class.

After using the tools, they must be stored in a safe place. The following points should be kept in mind while storing tools:

1. Store all tools in a damp-proof or a dry room.
2. The store room should be well lit.
3. Tools should be kept dry.
4. Tools may be hung on hooks on the wall or from the ceiling.
5. Tools must be stored in the fixed places.
6. Damaged tools must be repaired and greased before storing.
7. Tools we use often should be kept near the door.
8. Store room should be locked to protect the tools from theft.

Fig. 1. *Storage of agricultural tools*

1.5 Dangers of Misuse of Agricultural Tools

Activity - 5 **Discussion on Dangers of Misuse of Agricultural Tools**

1. Discuss the prevention against possible dangers of misusing agricultural tools.
2. Make a report on it and present to your science teacher.

Misuse of agricultural tools could lead to injuries to people and their co-workers. Incorrect storage of tools could also lead to injuries. We may get cut with the sharp edges of the tools. Therefore, tools must be handled with care.

If an agrochemical is inhaled as a mist, it may cause headache, nausea and diseases of lungs. So it is necessary to wear a mask while spraying pesticides. Ensure that nobody is around there while spraying.

1.6 Precaution while Using Agricultural Tools

Activity - 6 | **Discussion on Precautions while Using Agricultural Tools**

1. Go to a nearby agricultural farm.
2. Observe the ways the farm workers handle the tools.
3. Also list the precautions to be taken while using the tools.

The following precautions should be taken while using agricultural tools:

1. Debris should be removed so that the fields become safer places to work.
2. Worn out tools in poor condition can lead to accidents. Therefore, these must not be used.
3. If we get cut with any tools, first aid should be applied properly.
4. Agrochemicals are poisonous. These should be used by wearing gloves and mask.
5. Agrochemicals must not be checked by inhaling.
6. Handgloves, boots and a mask should be worn while sprinkling pesticides.
7. After working with pesticides, wash your hands with soap properly.

Fig. 2. *Precaution while spraying pesticides*

Boots

Gloves

Mask

Fig. 3. *Things that must be worn while using agricultural tools*

1.7 Keywords

- **Agricultural tools:** Tools we use in farm work.
- **Agrochemicals:** Chemicals used in agriculture.
- **Container:** Anything that can hold some other material.
- **Fertiliser:** Chemicals that add nutrients to the soil.
- **Herbicides:** Chemicals that can kill herbs.
- **Insecticides:** Chemicals that can kill insects.
- **Pesticides:** Chemicals that can kill pests.
- **Tool:** A hand-held instrument.
- **Weedicides:** Chemicals that can kill weeds.

1.8 Summary

- The tools we use in farming are called agricultural tools. Examples: hoe, spade, rake, axe, wheelbarrow, machete, trowel, milking can, sprayer and file.
- Tools like hoe, spade, and trowels are used for digging the soil.
- Tools like watering cans, pipes and watering wheels are the common watering tools.
- Transplanting of seedling can be done with the help of spades and trowels.

- Sharpening of tools can be done with the help of a file.
- Axes and machetes are the common cutting tools.
- Wheelbarrows and tractors are common transporting tools.
- Maintenance of tools increases the life of the tools.
- After using the tools, they must be stored in a safe, dry and termite-free place.
- Misuse of agricultural tools could lead to injuries to people and their co-workers.
- If agrochemicals are inhaled as a mist, it may cause headache, nausea and diseases of lungs.
- Handgloves, boots and a mask should be worn while using agricultural tools.

1.9 Unit Review Exercises

Do these review exercises in your exercise book.

I. Fill in the blanks with the correct options:

1. Axes and machetes are ..... tools.
   (a) cutting (b) clearing
   (c) watering (d) transporting
2. …… has toothed bars fixed diagonally to a handle.
   (a) Rake (b) File
   (c) Trowel (d) Spade
3. Trowel is a ..... tool.
   (a) sharpening (b) transplanting
   (c) cutting (d) none of these
4. Wheelbarrow is a ..... tool.
   (a) transplanting (b) transporting
   (c) digging (d) sharpening

5. ..... is a sharpening tool.

(a) Spade (b) Trowel

(c) File (d) Machete

II. State whether the following statements are true or false:

1. Tools make our job easier.
2. Digging and cutting tools should be kept sharp regularly.
3. Tools must be handled with care.
4. Agricultural tools must be stored in a damped room.
5. One must wear a mask while spraying insecticides.

III. Match the following:

Column A	**Column B**
1. Hoe	(a) Watering tool
2. Rake	(b) Transporting tool
3. Axe	(c) Digging tool
4. Tractor	(d) Levelling soil
5. Watering can	(e) Cutting tool

IV. Answer the following questions briefly:

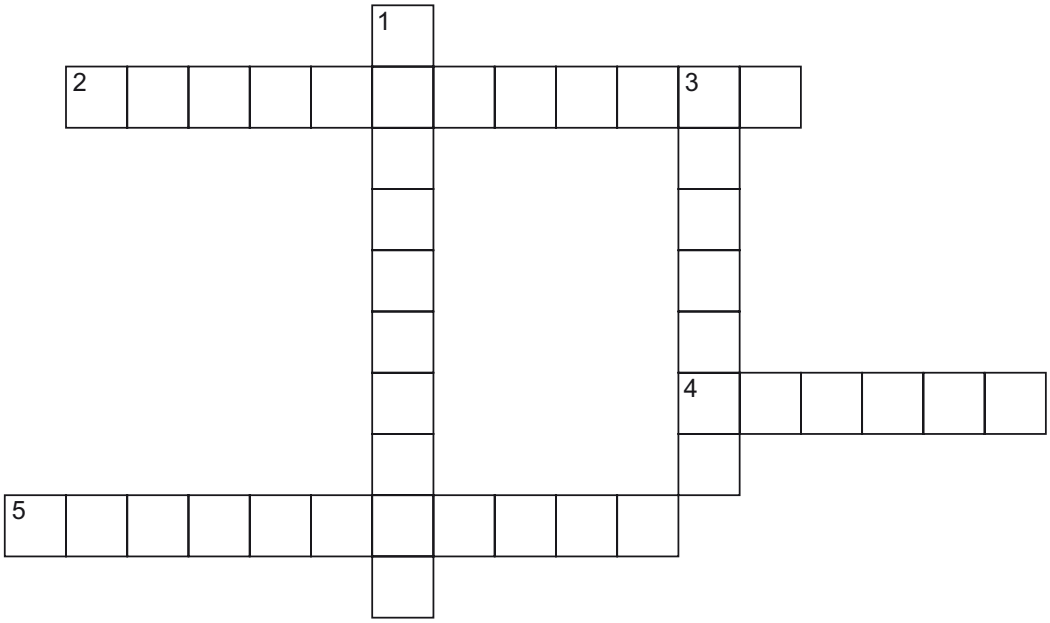
1. What are agricultural tools?
2. List some common agricultural tools.
3. Write the uses of the following tools:

(a) Hoe (b) Rake (c) Spraying pumps

(d) Trowel (e) Machete

4. Write some methods of maintenance of agricultural tools.
5. Explain the dangers of the misuse of agricultural tools.

V. Complete the crossword puzzle using the clues below:



Clues:

Across

2. It is a plastic container with backpacks and spray guns.
4. The boat-shaped tool which is used for transplanting of seedlings.
5. It is a single wheel, small hand pushed cart.

Down

1. We use this tool for storing and transporting milk.
3. It is a big knife-like tool used for clearing bushes.

Unit 2 Objects Production

We can make many things for playing with from things found in our environment. We can make toys from clay, wires, leaves, stick, etc. We can also make different utility objects using sticks and plant fibres. Similarly we can make different learning materials using papers.

2.1 Making Toys in Clay and Wires

We can make toys using clay and wires.

Activity - 1 Making a Toy Bicycle from Wire

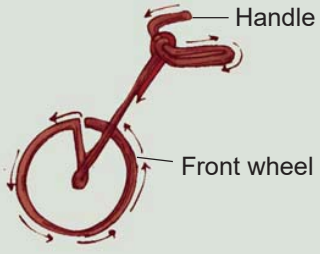
You will need

A soft aluminium wire and a wire cutter.

Note: Do this activity under the guidance of your teacher or an elder.

Procedure

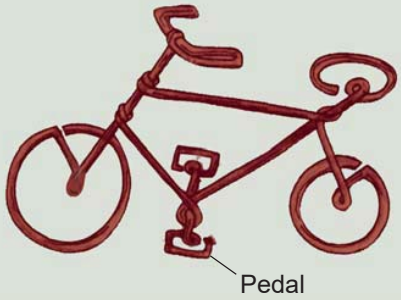
Step 1: Fold the wire as shown.



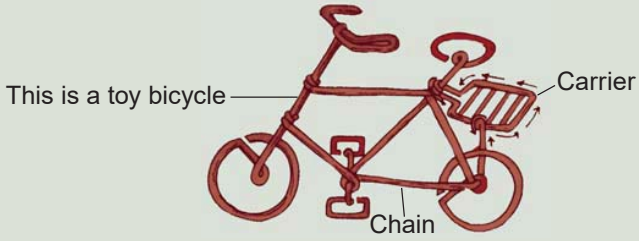
Step 2: Add a seat.

Step 3: Make the total frame and the back wheel.

Step 4: Make pedals.



Step 5: Fix a chain and a carrier.



Now your toy bicycle is ready.

Activity - 2 Making a Clay Doll

You will need

- Natural clay
- Water
- Stones

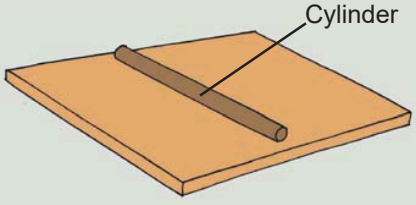
Procedure

Step 1: Take some clay. Pour water on it. Knead it until it stops sticking on to your fingers.

Kneading clay

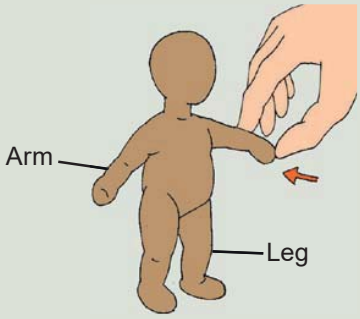
Step 2: Remove stones and sticks from the clay.

Step 3: Roll some of the kneaded clay into a cylinder. Cut it into four equal parts. These will be used as legs and arms.

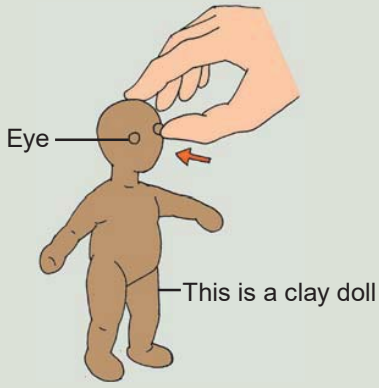


Step 4: Model your baby doll with no legs and hands.

Step 5: Model the legs and arms. Fix them on the shape you have made.



Step 6: Put stones as eyes.



Step 7: Dry your clay doll under the shade.

Step 8: Display your clay doll in the classroom.

Activity - 3 | Making a Wire Doll

You will need

A soft aluminium wire (about 30 cm), a wire cutter and a pair of pliers.

Note: Do this activity under the guidance of your teacher or an elder.

Procedure

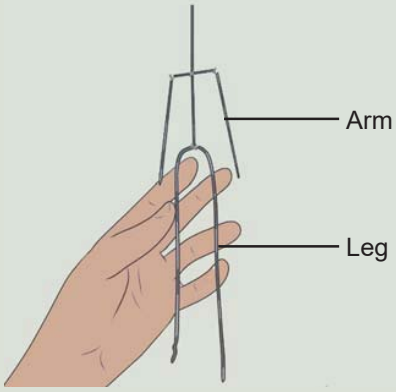
Step 1: Cut the wire into three pieces. The first one is about 6 cm, the second one is about 10 cm and the third one is about 14 cm.

Step 2: Now fold the two larger wires into 'U' to make the legs and arms of the doll.

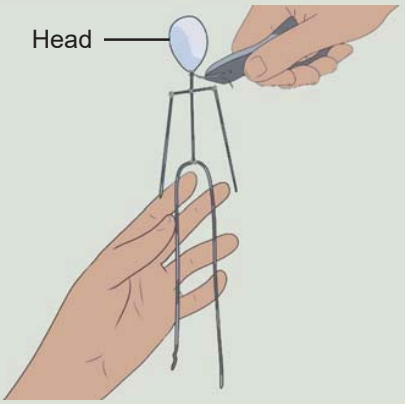
10 cm wire folded to form the arms

14 cm wire folded to form the legs

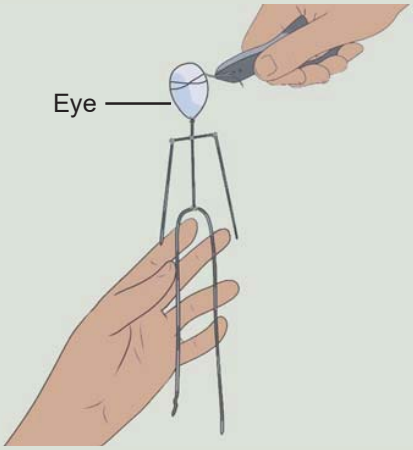
Step 3: Join the three wires to make the body of the doll as shown.



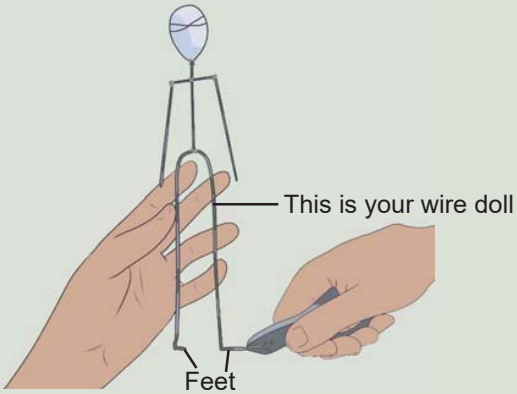
Step 4: Using a pair of pliers fold the small wire to make the head.



Step 5: Take another small wire and criss-cross it to make the eyes.



Step 6: Using the pliers fold the legs from the bottom to make feet.



Display your wire doll in the class.

Activity - 4 | Making a Cat from Clay

You will need

- Natural clay
- Water
- Stones

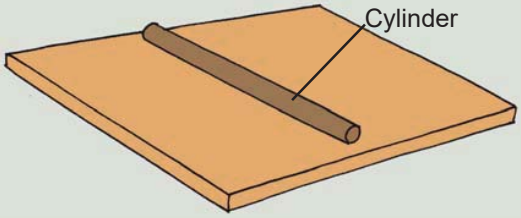
Procedure

Step 1: Take some clay. Pour water on it. Knead it until it stops sticking onto your fingers.

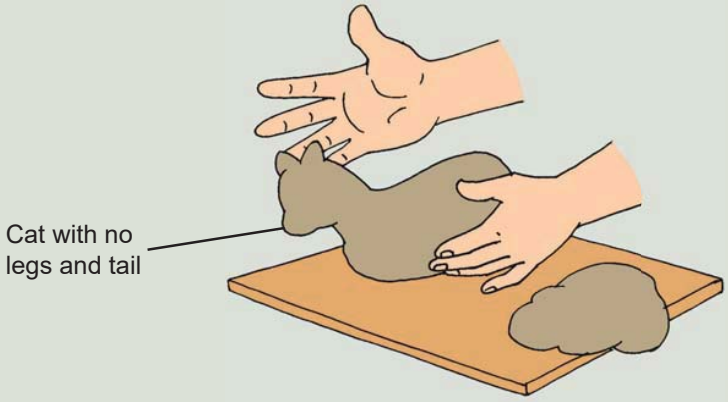
Kneading clay

Step 2: Remove stones and sticks from the clay.

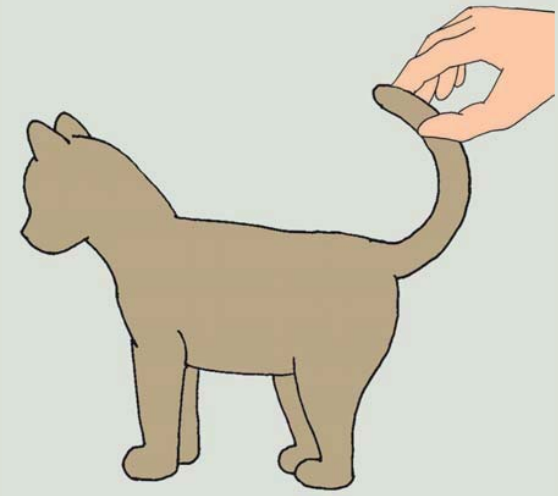
Step 3: Roll some of the kneaded clay into a cylinder. Cut it into five equal parts. These will be used as legs and tail.



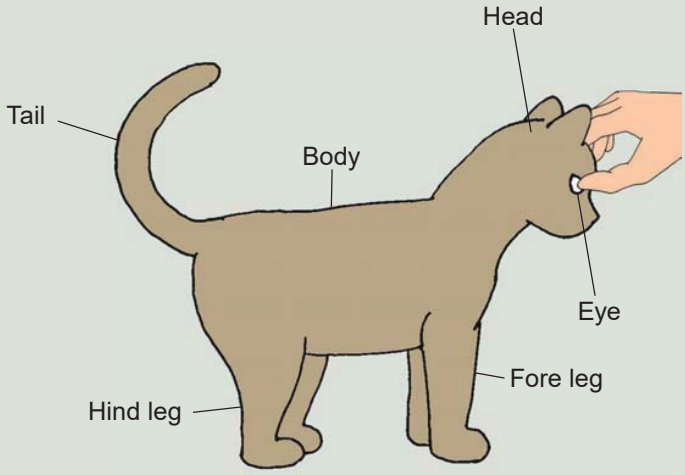
Step 4: Model the cat with no legs and tail.



Step 5: Model the legs and tail and fix them on the shape you have made.



Step 6: Put two small stones as eyes.



Step 7: Dry your toy cat in a safe place under the shade.

Step 8: Display your toy cat in the classroom.

Similarly, you can make many other animals.

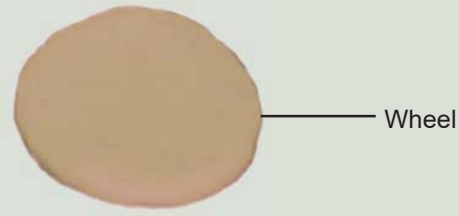
Activity - 5 | Making a Motorcycle from Clay

You will need

- Natural clay
- Knife

Procedure

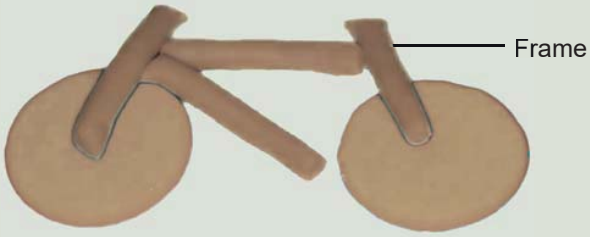
Step 1: Take some clay and roll into a ball. Flatten it with your palm. It will be used as a wheel.



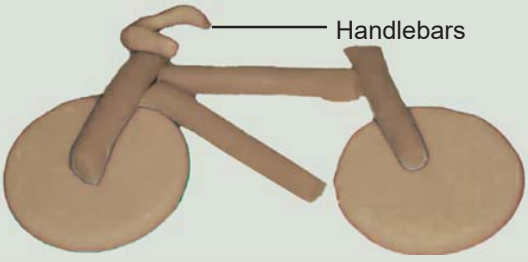
Step 2: Do the same for another wheel.

Step 3: Roll some clay into a cylinder. It will be used as a frame and handles.

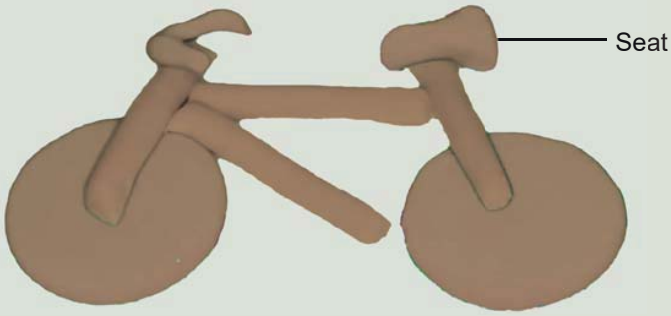
Step 4: Cut four cylinders from it. Make frame as shown below.



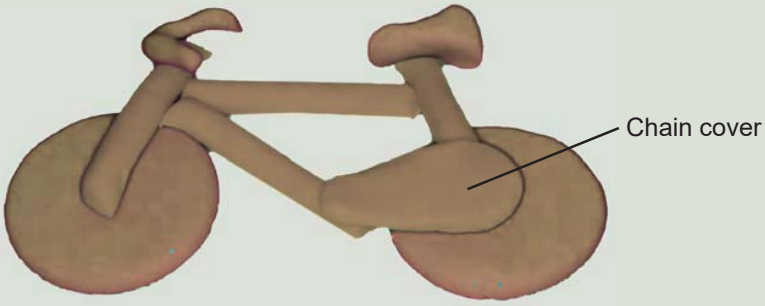
Step 5: Roll some clay into a cylinder. Use it to make the handles as shown.



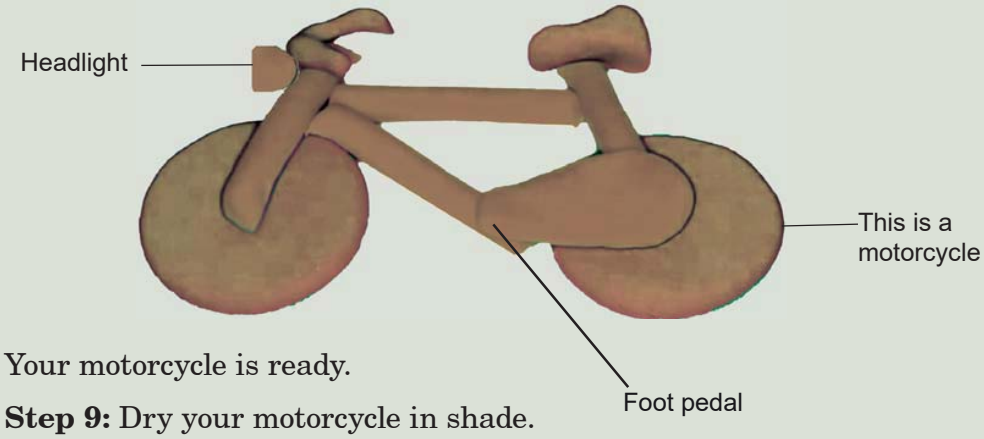
Step 6: Roll some clay to make a ball. Make it a triangular shape. Now insert it to the seat post.



Step 7: Cut a small cylinder. Flatten it as the shape of a chain cover. Fix it with the frame and the back wheel.



Step 8: Roll some clay into a small ball. Mould it as the shape of a headlight. Then fix it with the frame.



Your motorcycle is ready.

Step 9: Dry your motorcycle in shade.

Step 10: Colour it and display in your classroom.

2.2 Making Utility Objects in the Sticks

Children are fond of playing with the sticks. It will be a fun for them if they learn how to make some utility objects like basket with the sticks.

Activity - 6 | Making a Basket from Sticks

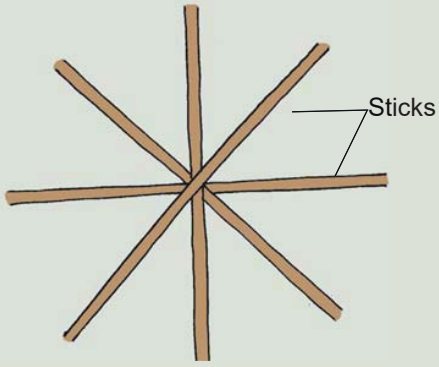
You will need

- Soft sticks which can be bent
- String

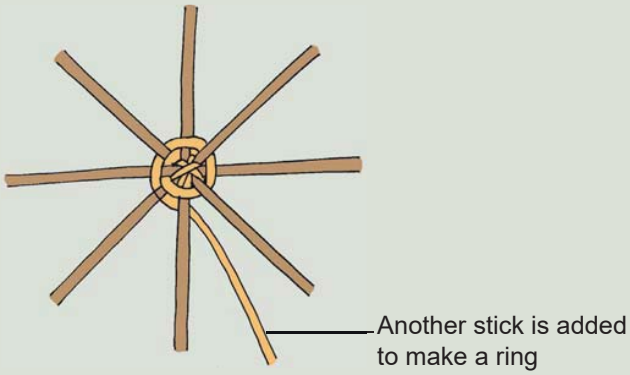
Procedure

Step 1: Take some soft sticks which can be bent. You can choose mid-ribs of palm leaves.

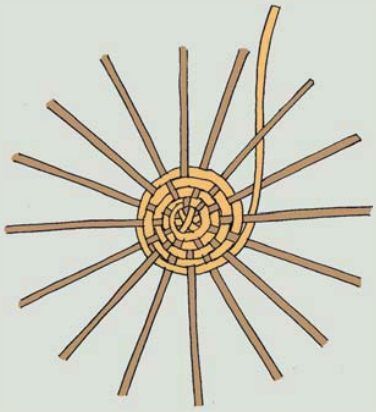
Step 2: Put the sticks as shown.



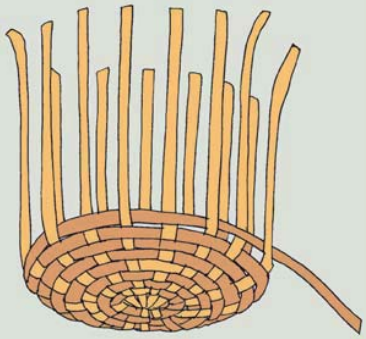
Step 3: Take another stick. Make a ring round the sticks using string.



Step 4: Continue this process till you get the size of the base.



Step 5: When you get the size of the base, bend the sticks upwards and continue making rings.



Step 6: At the top, bend the end on one another.

Step 7: Fix a string to make handle.

Step 8: Display your basket in the classroom.

2.3 Making Utility Objects with Banana Fibres

Banana fibres are obtained from banana plant. It is eco-friendly. We can use it to make objects like ropes, mats, bags and dustbins.

Fig. 1. *Typical African banana plantations and their fibres*

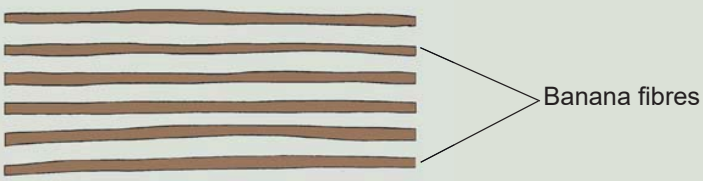
Activity - 7 Making a Mat from Banana Fibre

You will need

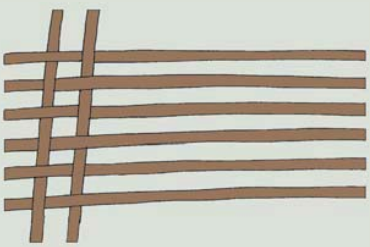
- Straight banana fibre
- A pair of scissors
- String

Procedure

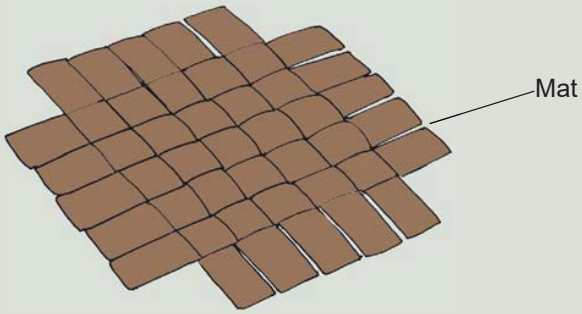
Step 1: Arrange about 6–8 banana fibres as shown.



Step 2: Weave other fibres across the fibres above.



Step 3: When it becomes the size of a mat, stitch all its borders with a string.



Step 4: Cut the extra length of the fibres with the help of a pair of scissors. Your doormat is ready to use.

Step 5: Display your mat in the classroom.

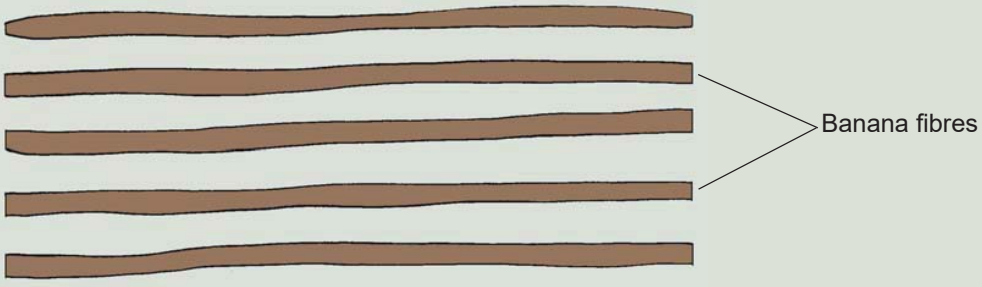
Activity - 8 Making a Dustbin from Banana Fibre

You will need

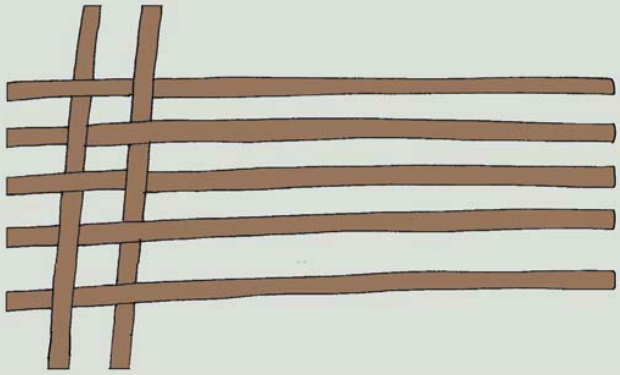
- Straight banana fibre
- A pair of scissors
- String

Procedure

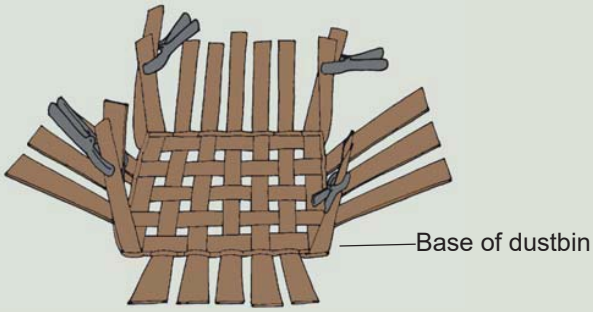
Step 1: Arrange about 4 to 6 banana fibres as shown.



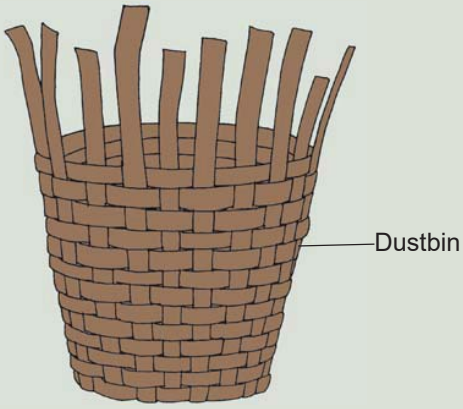
Step 2: Weave other fibres across the fibres above.



Step 3: When it becomes the size of a dustbin's base, bend the fibres upward and continue weaving.



Step 4: At the top, cut the extra length of the fibres with the help of a pair of scissors. Bind the edge with a string.



Your dustbin is ready.

Step 5: Display your dustbin in the classroom.

2.4 Making Learning Materials in Paper

Making shapes from a sheet of paper is an art. Children can make different shapes like triangle, rectangle and square with paper.

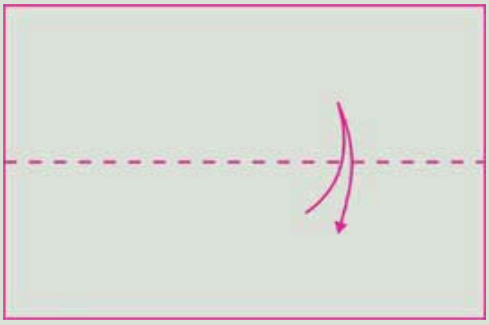
Activity - 9 Making a Triangle from a Sheet of Paper

You will need

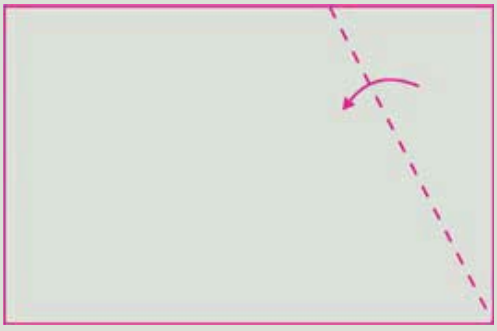
- A rectangular sheet of paper
- A pair of scissors

Procedure

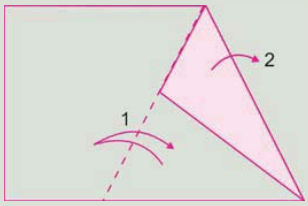
Step 1: Fold and unfold the rectangular sheet of paper in half lengthwise.



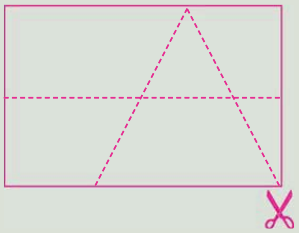
Step 2: Fold the top-right corner of the paper down. So that the corner meets the crease made in step 1 (join the dots). The crease made should intersect with the bottom-right corner.



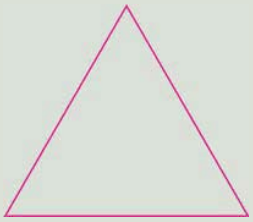
Step 3: Fold left side of the paper over the flap made in step 2. Use the raw edge of the flap as a guide to position this fold.



Step 4: Unfold and cut along the creases to get an equilateral triangle.



You will get an equilateral triangle as a result.



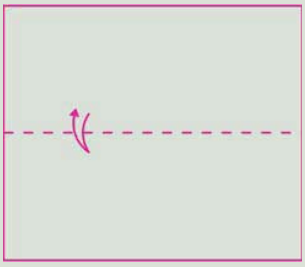
Activity - 10 Making a Rectangle from a Sheet of Paper

You will need

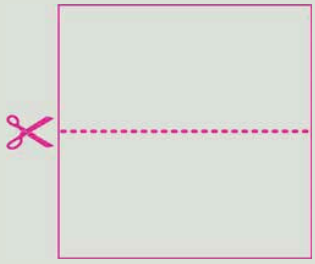
- A square shaped sheet of paper
- A pair of scissors

Procedure

Step 1: Fold and unfold the square shaped paper in half lengthwise.



Step 2: Unfold and cut along the creases to get a rectangle.



Step 3: The rectangle made is as shown below.

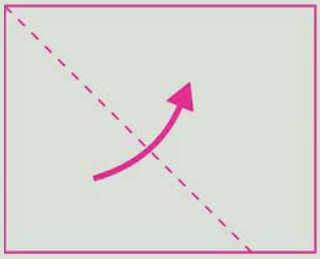
Activity - 11 Making a Square from a Sheet of Paper

You will need

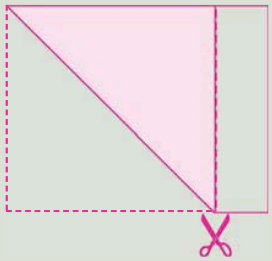
- A rectangular sheet of paper
- A pair of scissors

Procedure

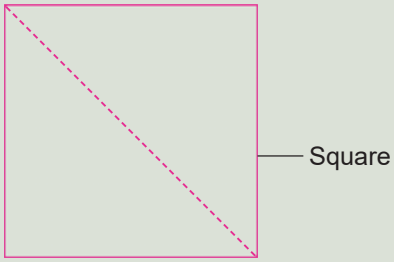
Step 1: Take the rectangular sheet of paper. Hold its bottom left corner and fold it towards the upper right side. It makes a triangle.



Step 2: Cut the excess paper using a pair of scissors.



Step 3: Unfold the triangle. You will get the square.



2.5 Maintenance of Utilities and Learning Objects

The prepared utilities and learning tools are soft. We must take extra care to keep them safe. They should be:

- kept at dry and clean place.
- handled with care.
- cleaned with dry soft brush.

PRACTICAL ACTIVITY

1. Collect the following things:
   - Clay and wires to make toys.
   - Fibres, knife/razor-blade, needle or lancelet, wood, sisal, sticks to make utility objects.
   - Paper, manila paper and a pair of scissors to make learning objects.
2. Prepare toys, utilities and learning objects individually.
3. Discuss the maintenance of objects produced.

2.6 Keywords

- **Cylinder:** A solid object with two circular bases and a curved surface.
- **Equilateral triangle:** A triangle in which all three sides are equal.
- **Fibre:** A plant material from which a textile is formed.
- **Flap:** A flat piece of paper that is hinged on one side only.
- **Knead:** Work (moisten flour or clay) into dough or paste with hands.
- **Object:** A material that can be seen or touched.
- **Rectangle:** A plane figure with four straight sides and four right angles.
- **Square:** A plane figure with four equal straight sides and four right angles.
- **Triangle:** A plane figure with three straight sides and three angles.

2.7 Summary

- Banana fibre is eco-friendly. We can use it to make items like ropes, mats, bags, dustbins, and some other materials.
- Making shapes from a sheet of paper is an art. Children can make different shapes like triangle, rectangle and square with paper.
- The prepared utilities and learning tools are soft. These should be kept at dry and clean place. These should be handled with care.

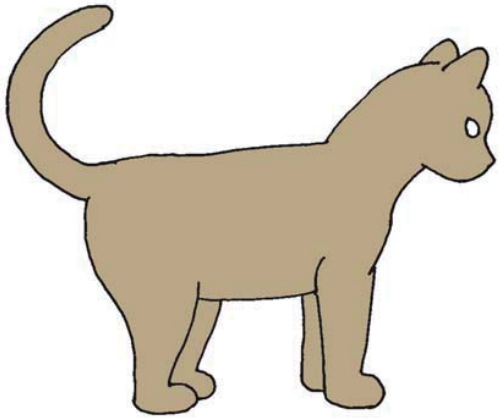
2.8 Unit Review Exercises

Do these review exercises in your exercise book.

I. Answer the following questions briefly:

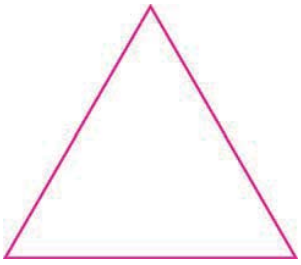
1. What type of soil is used for modelling?
2. Name at least three objects made of clay.

3. Which material is used to make the toy below?



(*a*) Cement (*b*) Clay (*c*) Plaster of Paris

4. List at least three objects made up of fibres.
5. Name the following shapes.

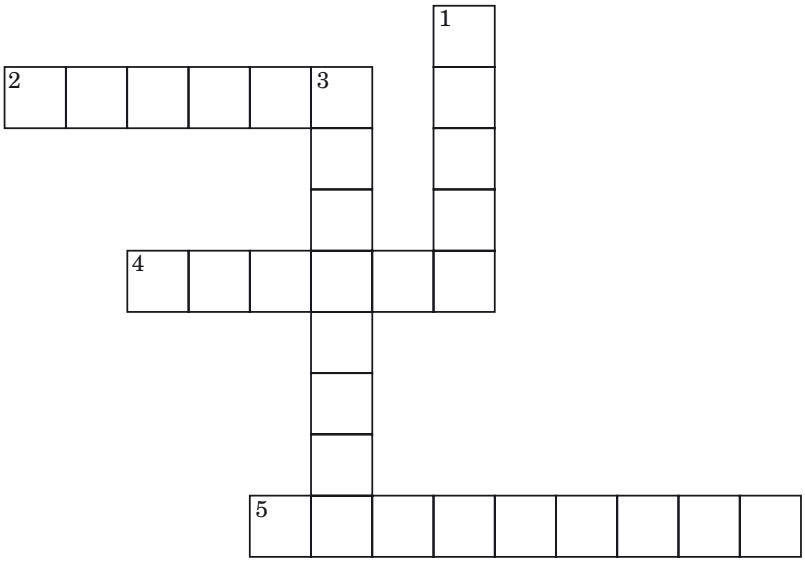


(*i*) .....

(*ii*) .....

(*iii*) .....

II. Complete the crossword puzzle using the clues below:



Clues:

Across

2. A material that can be seen or touched.
4. A plane figure with four equal straight sides and four right angles.
5. A plane figure with four straight sides and four right angles.

Down

1. A plant material from which a textile is formed.
3. A plane figure with three straight sides and three angles.

Project Work

1. Choose:
   - a play object like a clay doll or a clay motorcycle.
   - a utility object like a mat or a dustbin.
   - a learning object like a triangle or a square or a rectangle.
2. Using the techniques you have learnt; make it over a week or two.
3. Bring it to display in the class.

Unit 3 Computer My Friend

Computer is a basic need in every field. Life becomes easier with the introduction of different Information and Communication Technology (ICT) tools.

3.1 Common ICT Terms Used in ICT Field

Activity - 1 **Observing and Listing Different ICT Tools**

1. Visit the school computer lab. Observe the equipments and make a brief description of all ICT tools found.
2. List the other ICT tools which are not found in the school computer lab.
3. Share the information on ICT tools with your classmates and discuss the role of each tool.
4. Write the role of ICT tools in your notebook.

Computers, mobile phones, calculators, radios, scanner and fax machines are common ICT tools. These tools help us to use information and share it digitally.

(a) Computer

Computer is a machine. It accepts data and processes it. Finally it produces output results. It is used to do difficult calculations.

Fig. 1. *An XO Laptop*

Role of a Computer

A computer plays various roles in our daily life.

1. It can be used for personal computing.
2. It can be used for educational references.
3. It can be used in the field of health and medicine.
4. It can be used for scientific research.
5. It can be used for communication and entertainment.

(b) Data and Information

- **Data:** Whatever you type from the keyboard is data. It may be numbers, alphabets and symbols.
- Information: Computer processes data. The processed data is called information. In a computer, we can get information through output devices, for example, monitor and printer.

Fig. 2. *Data and information*

(c) Communication

Activity - 2 **Discussion on the Role of Tools of Communication**

1. Discuss with parents or guardians the role of tools of communication (telephone, computer, radio, television) and how the communication was done before the invention of these tools.
2. Take note about the responses received in your notebook.
3. Share the information with your classmates.

Communication is the process of sending or receiving information. We can communicate by speaking, writing, through art and music, and books.

With a mobile phone, we can communicate to any part of the world. We can make calls, send and receive text messages.

Fig. 3. *Communicating with mobile phones*

Fig. 4. *Sending or receiving text messages*

Activity - 3 Calling and Sending Messages Using Mobile Phones

Calling Using Mobile Phone

1. Write the receiver's telephone number.

2. Push on the call key.

Sending Message Using Mobile Phones

1. Open writing option on the mobile phone.

2. Write a greetings message.

3. Write the receiver's telephone number.

4. Push on send key.

Activity - 4 Typing and Sending Text Messages Using Mobile Phone

1. Type a text message from a mobile phone keypad.
2. Send this message to one of your friends and a family member.

Role of Communication

Communication plays an important role in our day-to-day life.

1. It is a source of information.
2. We know what is happening around the world.
3. Without communication we cannot convey our thoughts and feelings.

(d) Technology

Technology is the collection of techniques, skills, methods and processes used to complete a work. Communication technology helps us to send and receive information. With the help of communication technology, messages can be sent within a moment around the world.

Examples of technology used for communication are Internet, emails, fax, phones, chat groups and social networking sites.

Internet, Website and WWW

Internet: It is a large group of computers connected to each other. It is used to send information quickly. It is widely used at hospitals, railway stations, airports, schools and offices.

Website: It is a collection of web pages. A website gives information about any subject. Each website has its own web address. It can be reached through an Internet connection by typing domain name in the address bar. The first opening page of a website is called homepage.

Activity - 5 | **Typing Domain Name in the Address Bar of the Browse Activity**

Type a domain name of Rwanda Education Board (REB) in the address bar in the browse activity.

World Wide Web (WWW): It is a collection of millions of electronic pages. These pages are interlinked just like a spider's web. These pages display a variety of information.

(e) Activity

Sugar is a collection of Activities. Activities are Applications that involve active engagement from the learner. They automatically save results to a journal, where reflections are recorded. Activities can be shared between learners.

(f) Projects

A project is a planned set of interrelated tasks. It should be completed over a fixed period within certain cost and other limitations.

On websites, we get necessary information regarding a project. Online projects can be done with the help of related websites.

(g) Digital and Analogue Data

- Any signal or data which is expressed in digits (0–9) is called **digital**. For example, digital watch displays the time by means of displayed digits.

Fig. 5. *Digital clock*

- A system that represents changing values as continuously variable physical quantities is called **analogue**.

Fig. 6. *Analogue clock*

(h) Hardware and Software

Computer Hardware refers to computer physical parts that can be touched. For example, system unit, monitor, printer, keyboard and mouse.

System unit

Mouse

Printer

Keyboard

Monitor

XO laptop

Power button

Fig. 7. *Hardware components of a computer*

Software is a set of instructions for a computer to perform specific operations that cannot be touched. For example, Windows Media Player for music and word processing.

Windows Media Player Word Processing

Fig. 8. *Computer software*

(i) Switch ON a Computer

Activity - 6 Switching on a Computer

Desktop Computer

To switch ON a desktop computer, follow the steps:

1. Switch ON the main power supply.

2. Switch ON the Uninterruptible Power Supply (UPS) .

3. Switch ON the power button of the System unit.

4. Switch ON the monitor.

XO Laptop

1. Push the power button to turn on the laptop.

(j) Switch OFF a Computer

Activity - 7 | **Switching OFF a Computer**

Desktop and Laptop Computer

To switch a computer OFF, follow these steps:

1. Click on the Start button. A menu appears on the screen.
2. In the right pane of the **Start** menu, click on the **Shut down** button. Wait till the computer shuts up.

3. Switch OFF the UPS.

4. Switch OFF the main power supply.

XO Laptop

1. Hover over the XO icon in the centre of the Home view.
2. A menu appears.
3. Choose the Shutdown option.

3.2 Sugar Interface

Activity - 8 | Switching ON an XO Laptop

Switch ON an XO laptop and describe how the icons are arranged on Home screen.

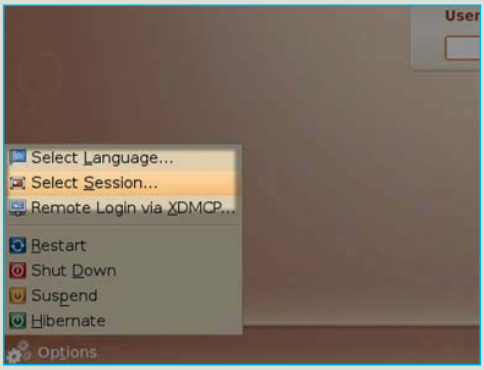
Sugar interface is both a desktop and a collection of activities. Activities automatically save results to a Journal, where reflections are recorded.

You can write documents, share books and pictures or make music together with ease. Power-on XO laptop or any computer with sugar installed, you should see the Sugar **Home view**.

Activity - 9 | Starting up Sugar Interface

Any Computer with Sugar Installed

1. Switch on your computer with Sugar installed.
2. At the log-in screen, click the "Options" button:



3. Choose Select Session as shown. Then the pop-up menu appears:

4. Choose Sugar and click Change Session and log-in normally.

XO Laptop

1. Switch on an XO laptop. The first screen you see is a Sugar **Home View**.

Elements of Sugar Interface

Different elements of Sugar Interface are given in the following figure.

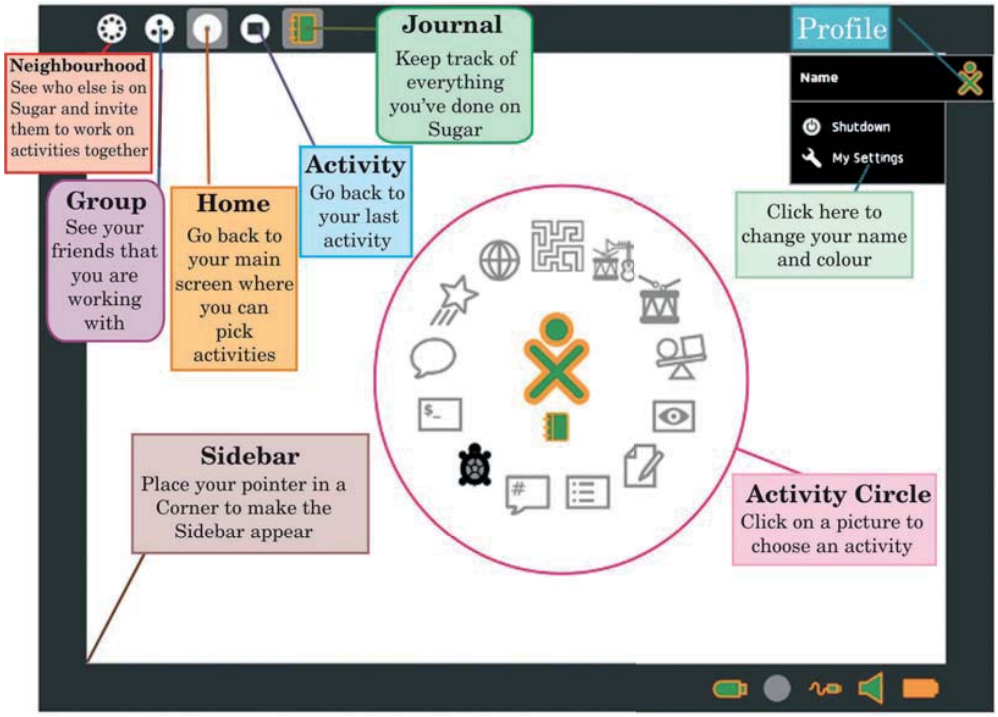
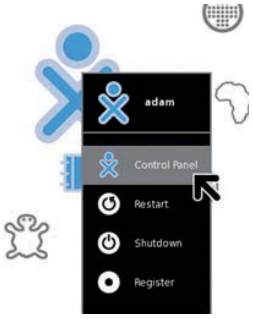


Fig. 9. *Elements of Sugar Interface*

Opening the Sugar Control Panel

1. Hover over the XO icon in the centre of the **Home View**.
2. A menu appears.
3. Select the **Control Panel**.



(a) Home View

To get to the Home view, click the Home icon on the frame or press F3 key.

Fig. 10. *Home view*

Modes of Home View

- Ring view
- List view
- Free form view

Ring mode: The favorite activities are placed in a ring.

Fig. 11. *Ring mode of Home view*

List view: The installed activities are arranged in a list.

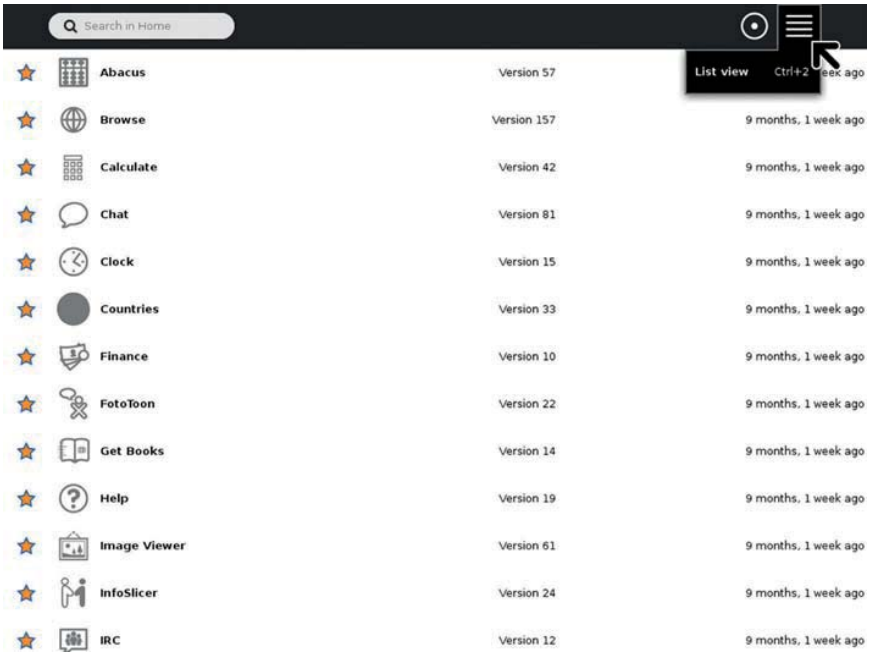


Fig. 12. *List view of Home view*

Free form mode: All the icons are not arranged in a ring or a list, you can arrange icons in a way that makes sense to you.

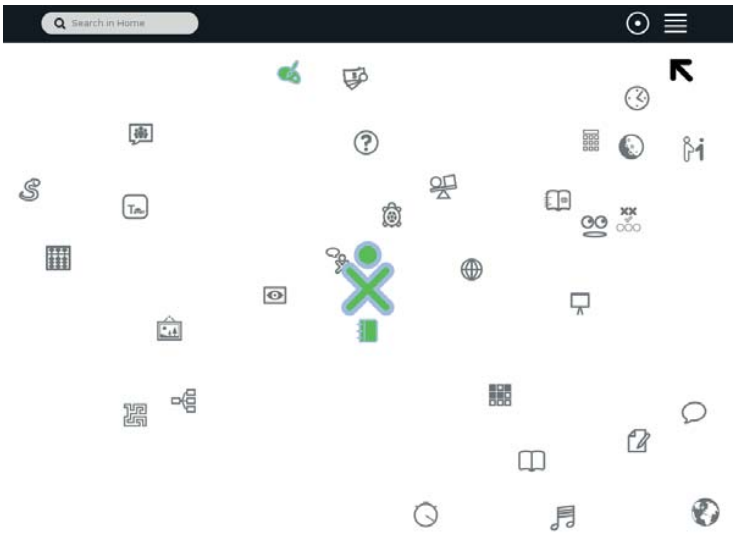


Fig. 13. *Free form mode of Home view*

(b) Neighbourhood View

This view helps to see your friends or classmates' activities, and you can join them in order to collaborate.

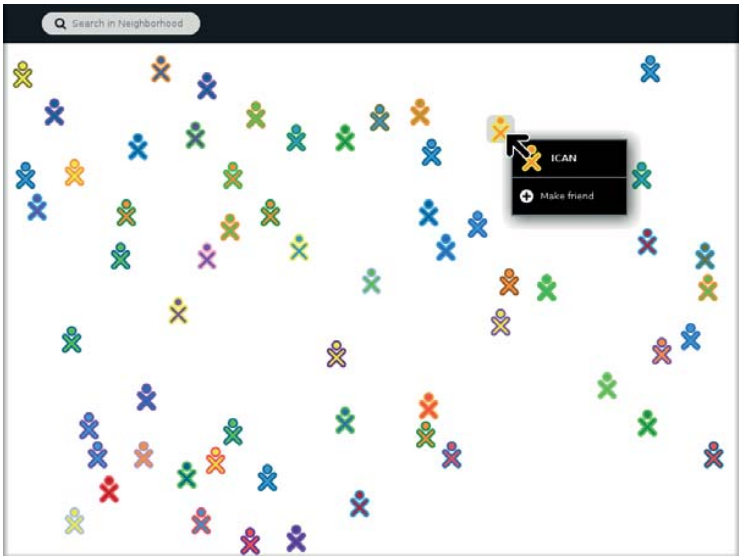


Fig. 14. *Neighbourhood view*

XO Menu

Activity - 10 | Observing Different XO Menu

1. Switch on your XO laptop.
2. Hover over the XO icon in the middle of the ring of activities.
3. Write in your notebook the options which appear on the menu.

The XO menu appears when you point on the XO icon.

Fig. 15. *Different XO menu*

3.3 Gnome Interface

The XO laptop allows switching from sugar interface to GNOME interface.

Activity - 11 | Switching to GNOME Interface from Sugar Interface

To switch to GNOME interface from Sugar Interface:

1. Hover over XO icon in the middle of ring of activities.

2. Choose the option “My Settings”.

3. Select the **Switch Desktop** option under My Settings and follow steps until you click on switch to GNOME.

GNOME is a graphical user interface.

3.4 Major Components of GNOME Desktop

Figure 16 shows some major components of the GNOME desktop.

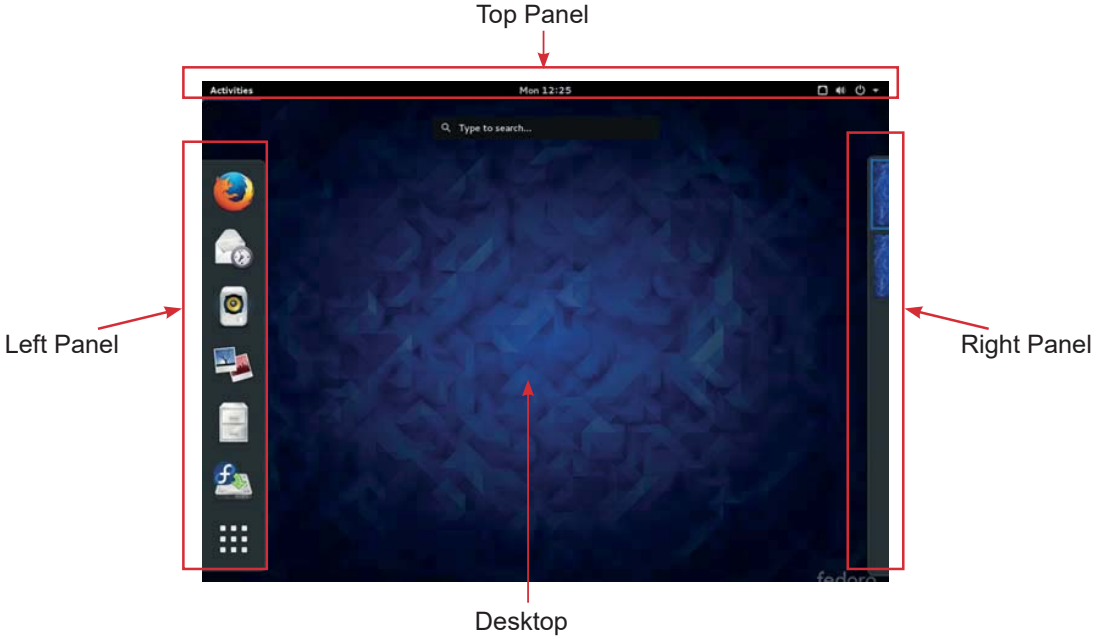


Fig. 16. *Major components of the GNOME desktop*

1. Desktop Basics

The desktop lies behind all other components on your screen. You can place files and folders on the desktop that you want to have easy access to.

The desktop also has several special objects on it:

- The **Computer icon** gives you access to Compact Discs, removable media such as pen drive, and also the entire files system.
- All of your personal files are kept in your **Home Folder**, labelled *username's* Home. You can also open this folder from the **Places** menu.
- The **Trash** is a special folder where you can place files and folders you no longer need.

2. Desktop Panels

The bars across the top and bottom of the desktop are called panels.

By default the **top panel** appears as follows:

Fig. 17. *Top panel of the GNOME desktop*

The **Application menu** provides access to the applications installed in the system.

The **Places menu** provides a list of locations. On selection these are opened in file browser windows.

The **System menu** provides options for:

- configuring the system, and
- desktop environment such as desktop theme and screen resolution.

In the above picture of the desktop the icons next to the system menu provide quick access to common applications and tools.

The right hand side of the panel includes the current time, a volume control and a network status indicator.

The **left desktop panel** contains three items appearing as follows:

Fig. 18. *Left panel of the GNOME desktop*

The area containing squares controls the currently displayed **virtual workspace**.

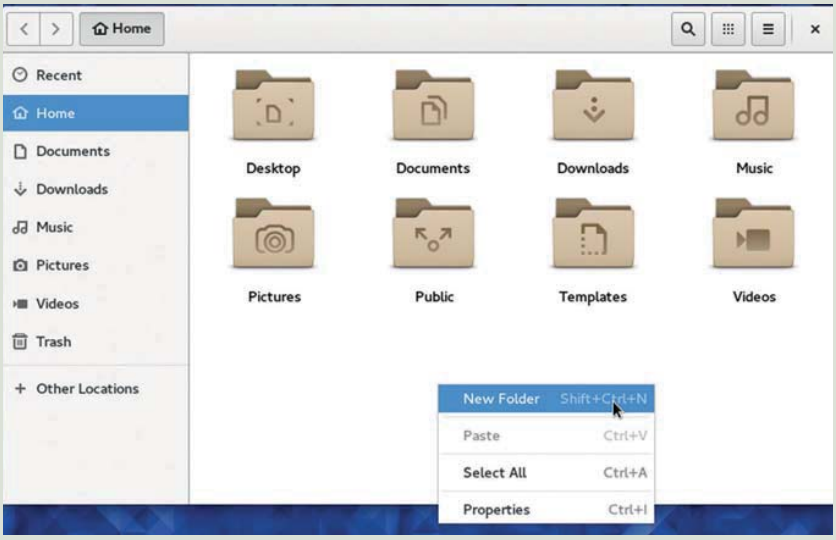
The GNOME desktop allows multiple workspaces to be active at any one time. We can move from one application to another by clicking on one of the squares in the bottom toolbar.

Creating a Folder

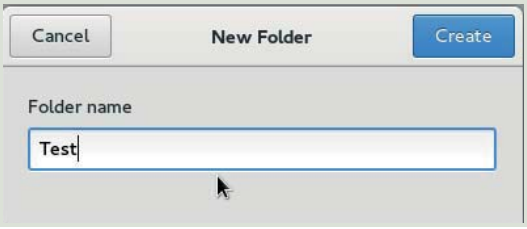
Create a Folder in GNOME

Activity - 12 **Creating and Renaming a Folder in GNOME**

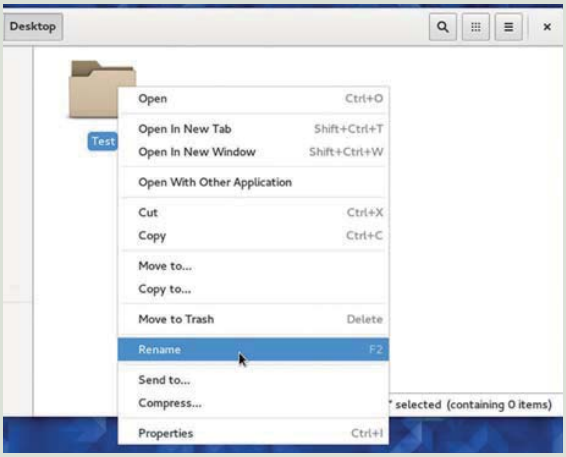
1. Switch to GNOME from Sugar.
2. Right click on blank area of Desktop and the menu appears.



3. Click on option “New Folder” and the folder will be created on the Desktop.



4. Rename the new folder appeared on desktop as your choice.



3. Windows

Windows is a rectangular area of an opened application.

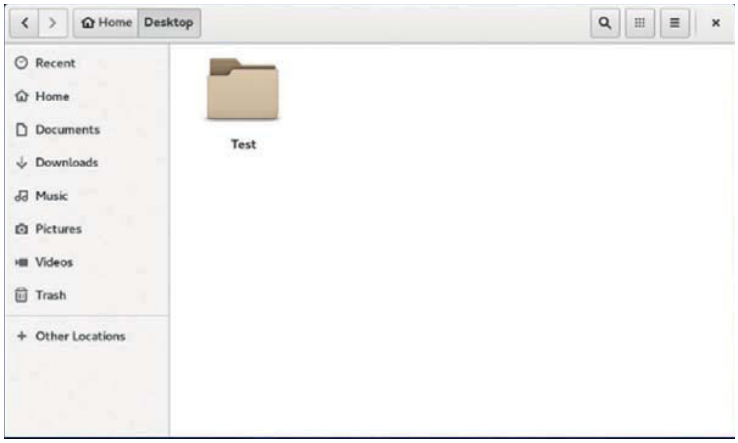


Fig. 19. *Windows*

Workspaces allow managing windows on screen. By default four workspaces are available.

Fig. 20. *Workspaces*

A window is a rectangular area of the screen. It has a border all around and a title bar at the top. Each window displays an application. It allows you to have more than one application visible, and work on more than one task at a time.

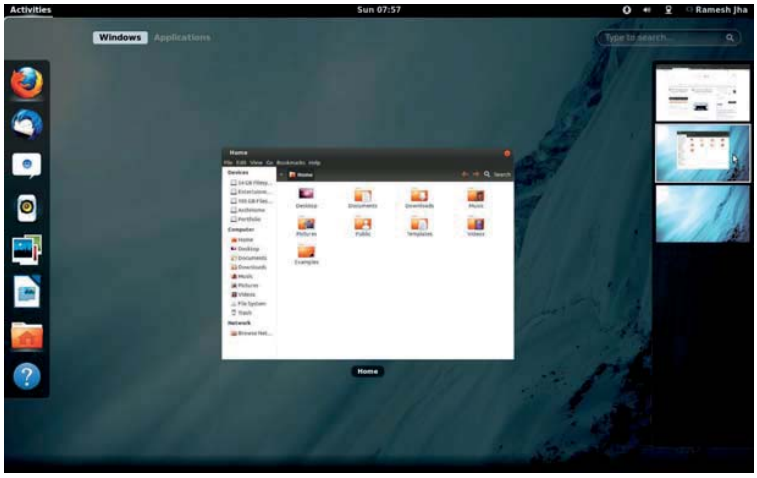


Fig. 21. *Windows and workspaces*

Buttons on title bar allow you to minimize, maximize, and close the windows.

You can control a window's position of the screen, as well as its size. You can control those windows which overlap other windows, so the one you want to work with is completely visible.

Giving Focus to a Window

To work with an application, you need to give the focus to its window. Only one window can have focus at a time. The window that has focus will appear on top of other windows, so nothing covers any part of it.

4. Workspaces

Workspaces allow you to manage which windows are on your screen. Every workspace contains the same desktop, the same panels, and the same menus.

By default, four workspaces are available. You can switch between them with the Workspace Switcher applet at the right of the bottom edge panel. This shows a representation of your workspaces, by default a row of four rectangles.

Fig. 22. *Workspaces displayed in workspace switcher*

Switching between Workspaces

To switch between workspaces, follow these steps:

Using the mouse:

1. Open the **Launcher** and click the **workspace switcher** button near the bottom.
2. Double-click on any window or workspace to switch to it, or press the workspace switcher button again to return to your previous workspace.

Using the keyboard:

1. Press **Ctrl+Alt+→** to move to a workspace which is to the right of the current workspace.
2. Press **Ctrl+Alt+←** to move to a workspace which is to the left of the current workspace.
3. Press **Ctrl+Alt+↓** to move to a workspace which is below the current workspace.
4. Press **Ctrl+Alt+↑** to move to a workspace which is above the current workspace.

5. Applications

An application is a type of computer program that allows you to perform a particular task. You might use applications:

- to create text documents such as letters or reports;
- to work with spreadsheets;
- to listen to your favourite music;
- to navigate the Internet;
- to create, edit, or view images and videos.

For each of these tasks, you would use a different application.

To launch an application, open the Applications menu and choose the application you want from the submenus.

The applications that are part of GNOME include the following:

- GEDIT is an application of GNOME that can be used to create, edit, format and save a document.

Fig. 23. *Various applications of GNOME*

- There are other applications in GNOME like, Dictionary, Image viewer and calculator.

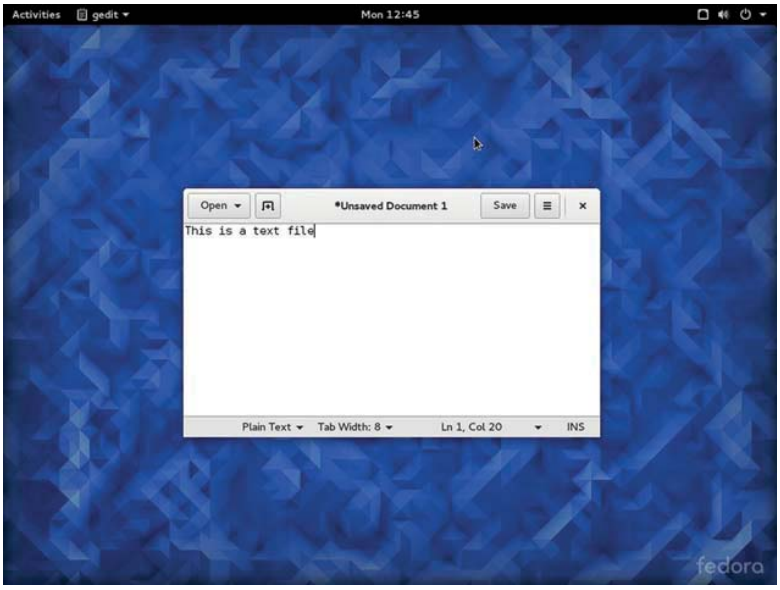


Fig. 24. *The GNOME gedit text editor*

3.5 Switching to Sugar from GNOME

Switching back to Sugar from GNOME can be done by clicking on icon "Switch to Sugar" of GNOME desktop.

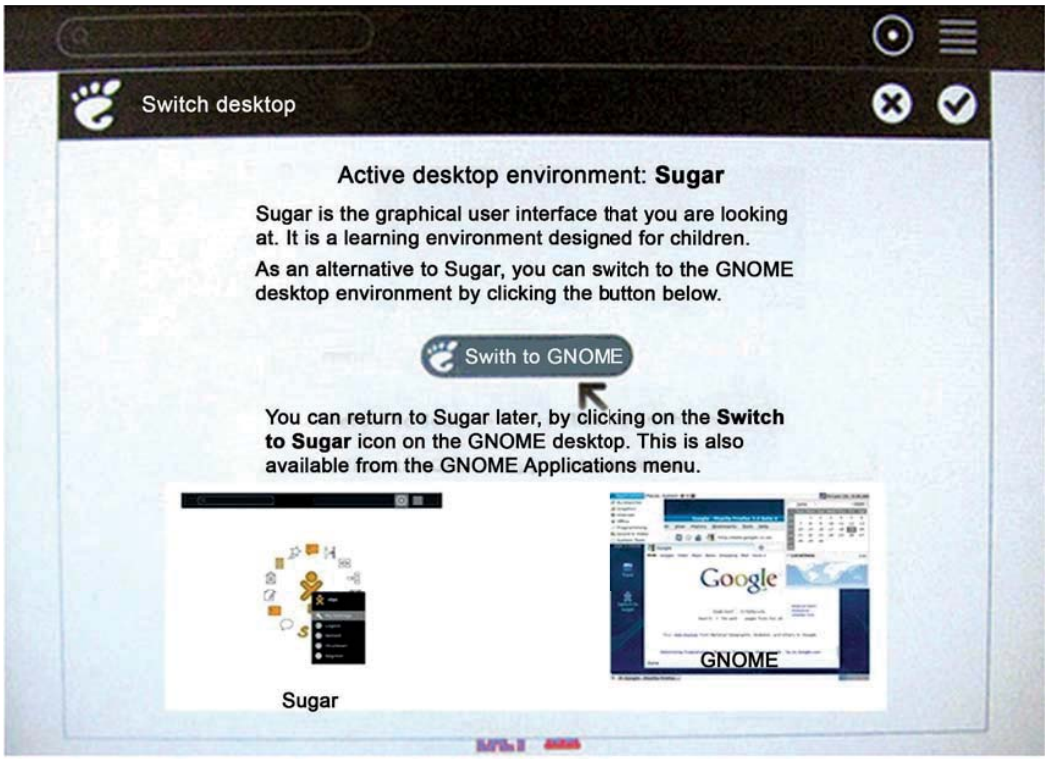


Fig. 25. *Switching from Sugar to GNOME desktop*

3.6 The Journal

The Sugar Journal records everything you do using Sugar interface.

You can use a Journal as a place:

- to revisit old work,
- to resume incomplete work,
- to organize completed work, and
- to reflect upon your progress as a learner.

Opening the Journal

To show the Journal, click the **Journal** icon on the Frame.

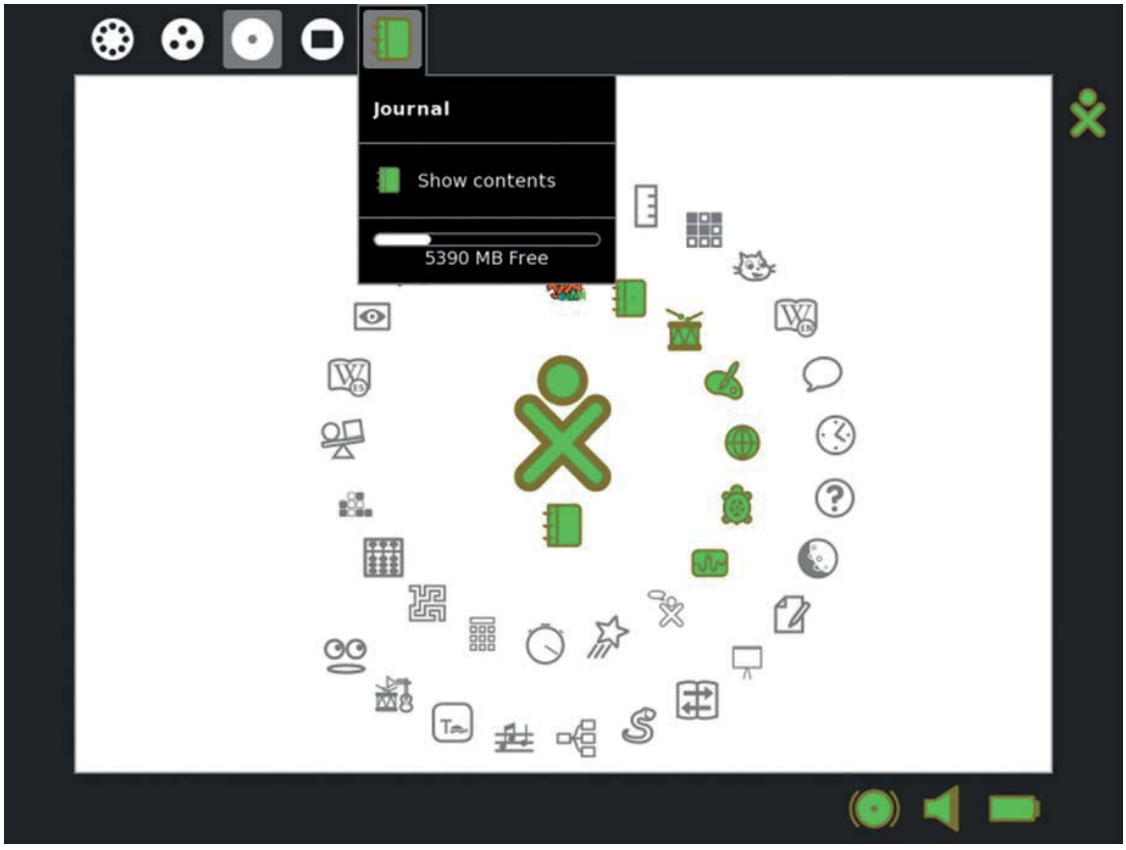


Fig. 26. *Opening the Journal*

On an XO laptop, you can press the magnifying glass key in the top row of the keyboard to immediately open the Journal and search.

Journal Features

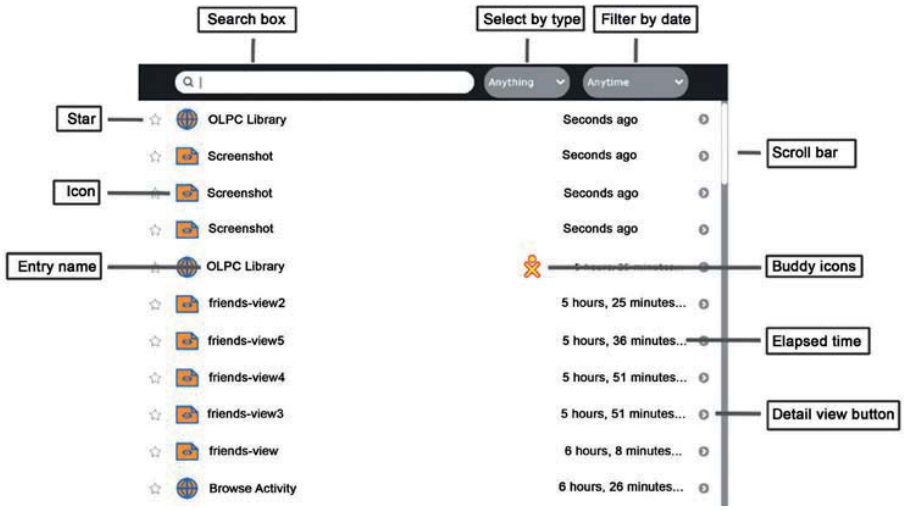


Fig. 27. *Components of Journal view*

The Journal view contains a menu and a list of journal entries:

1. **Star:** You can mark important entries to help them stand out in the list by clicking the star icon for that entry. When you click the star icon, the star is coloured in.
2. **Icon:** Each Journal entry has an icon. The colour of the icon shows who created the entry. For example, if you copy a photo from a friend, the photo's icon has your friend's colours.

You can launch the Activity for the entry by clicking the icon.

A hover menu may reveal additional options. In particular, "Erase" deletes that entry from your Journal.

Caution

"Erase" deletes any data associated with the entry shown. For example, if you delete an entry that shows that you installed an Activity, you delete the Activity as well.

3. **Entry name:** Each entry has a name. You can edit the name by clicking it.
4. **Buddy icons:** If other participants join you in this Activity, icons in their colours will appear here.
5. **Elapsed time:** The Journal displays the time since the most recent change to the entry.

6. **Detail view button:** Click this button to see detailed information about the entry. See "Journal detail view", on next page.
7. **Scroll bar:** When there are more entries in the Journal than can fit on the screen, you can use the scroll bar to scroll through them.
8. **Search box:** Type words in the box to search for entries that match those words. Entries are displayed when they contain all of the typed words. Comparison will be against all of:
   - the entry name field
   - the description field (see "Journal detail view")
   - the tag field (see "Journal detail view")
9. **Select by type (Anything):** Choose an entry type to display only entries of that type. Types include the Activity that created an entry, or the object type, such as, picture, sound, text, and so on.
10. **Filter by date (Anytime):** You can limit the Journal View to entries made within the past day, week, or month.

NOTE: You can search and retrieve a saved document in journal by using features such as search box ,by selecting items, using options like Anything ,Anytime and Sort View. You can also search by entering the item name in the search box.

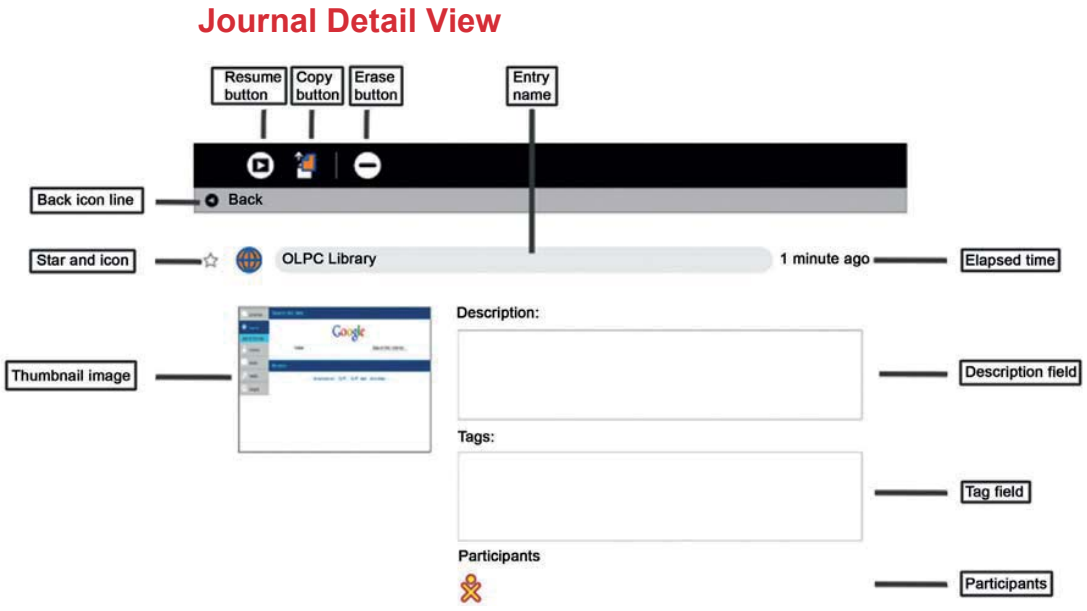


Fig. 28. *Components of Journal Detail view*

The Detail view appears when you click the **Detail view** button for an entry. This view lets you examine and annotate the entry. The detail view has the following components.

1. **Back icon line:** You can click anywhere in this line to return to the main Journal View.
2. **Star and icon:** These items duplicate their functions on the main Journal view—a star represents a special, never-deleted Journal entry and the icon colour indicates who created it originally.
3. **Thumbnail image:** Each entry has a thumbnail image that is created automatically. The image shows the Activity screen when the last change to the Journal entry was saved.
4. **Entry name:** You can change the name of the entry by clicking it and typing in a new name.
5. **Elapsed time:** Displays the time since the most recent change to the entry.
6. **Description field:** You can type a description of the entry in this field. Use a description to remind you of what you did.
7. **Tag field:** You can enter search tags. Use keywords to describe a journal entry so that you can find it later using the Search box in the main Journal view.
8. **Participants:** Displays the XO icons of each person who participated in a shared Activity.
9. **Resume button:** You can click the Resume button to resume an Activity. A hover menu may show additional options. For example, you can resume working with an image using either the Browser or the Paint Activity.
10. **Copy button:** You can copy a Journal entry to the clipboard (or to one of the removable storage devices shown on the bottom edge of the Journal screen) by clicking the Copy button.
11. **Erase button:** You can erase an entry by clicking the Erase button.

Using Removable Media

Activity - 13 | Using Removable Media

1. Plug a flash dish into the XO laptop.
2. Push on magnifying glass key to open Journal.
3. Write on the notebook two icons found on the button of Journal.
4. Open the Universal Serial Bus (USB) device by clicking on the icon representing flash disk on the bottom of the Journal.
5. Click on Journal icon besides the USB device icon to see the activities saved in Journal.

The Journal also supports external storage media such as USB device or Secure Digital (SD) card.

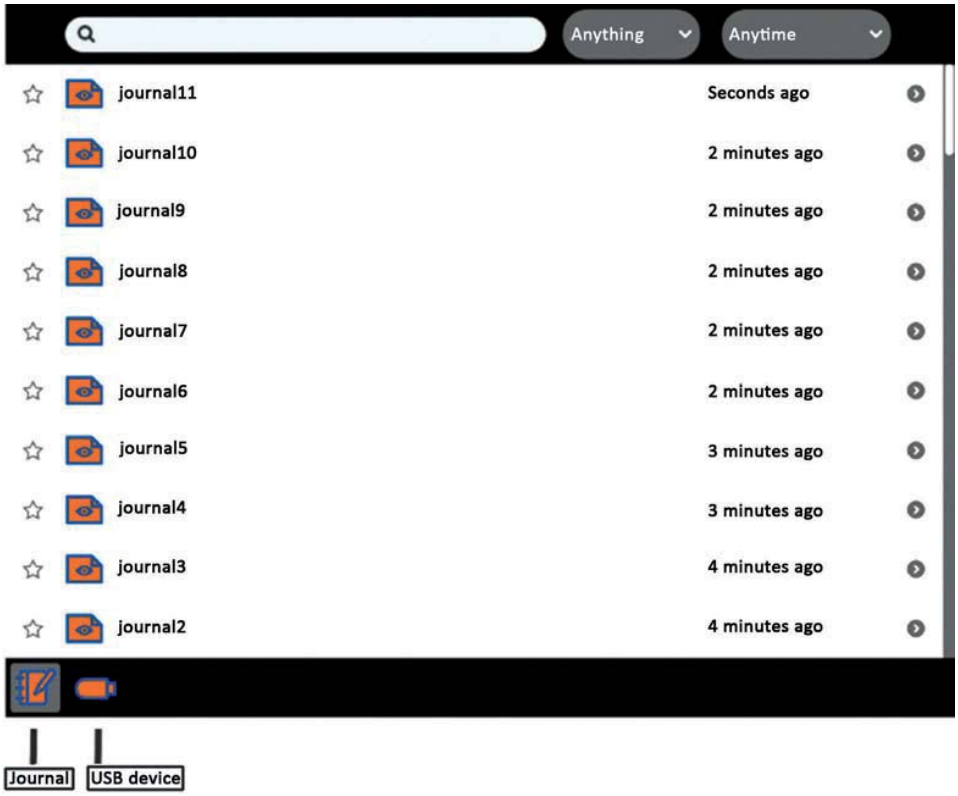
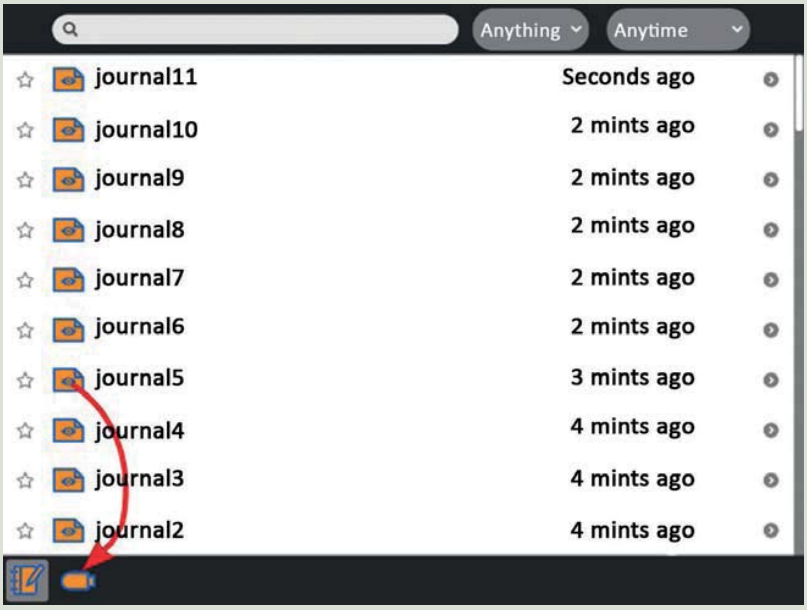


Fig. 29. *Use of removable media in Journal*

Activity - 14 Saving Entries from Journal to USB Device

1. Plug USB device into XO laptop.
2. Open Journal.
3. Point on the entry you want to move and hold the touchpad key.
4. Drag down to the USB device icon.



Activity - 15 Saving Entries from USB Device to Journal

1. Plug USB device into XO laptop.
2. Open Journal.
3. Click on USB icon to view its content.
4. Point on the entry you want to move and hold the touchpad key.
5. Drag down to the Journal icon.

To Remove USB Device

Hover over the icon of USB device and on the appeared menu, click Unmount or Remove option.

Fig. 30. *Removing USB device*

Activity - 16 | Sending Documents to Each Other

Find your friend's XO Friend in the **Neighbourhood** view. In your friend's pop-up palette menu select **Make friend**.

Use the search text box in the **Neighbourhood** view tool bar to find a known XO Friend name.

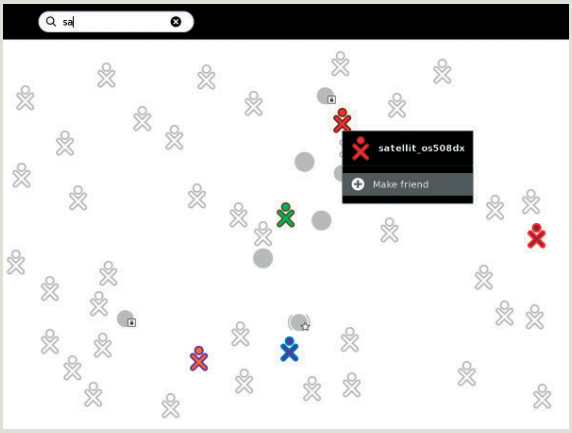
(+) Make friend

Click on the Journal icon in the Sugar **Frame**.

Right Click on the item you want to send:

ReadMeFirst.txt

Wait for the pop-up palette menu; click on send to, and select the friend you established in the previous step.



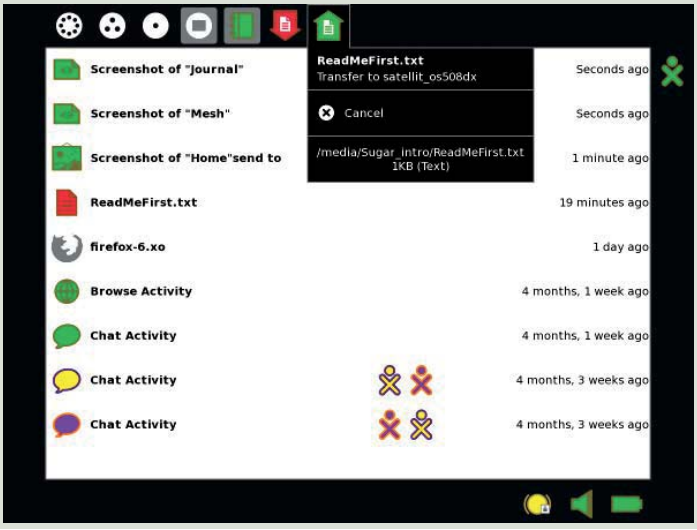
(The drop down does not take a screen shot while it is activated - so it is not shown here.)

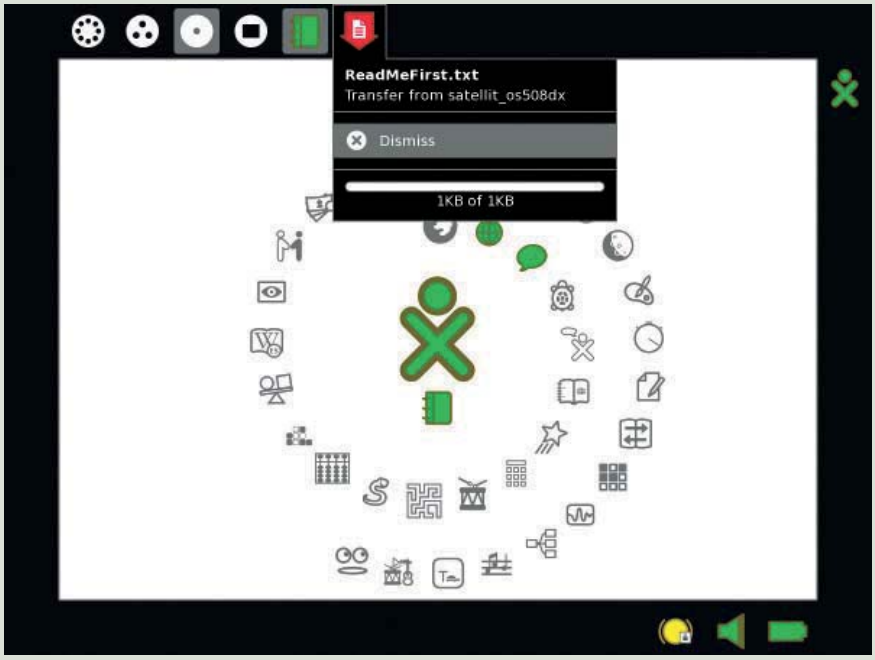
Note: A Red Arrow will appear on the left side of the receiving system's Sugar Frame. Then it appears in the upper Sugar Frame when the Activity is running. Here the user has to accept the transfer, before it is transmitted into the Journal in Sugar.

Point the mouse at a corner of the screen/window and wait for the **Frame** to extend.

The Red arrow icon drop-down palette indicates a file was received also.

Here in the **Home** view, the Red Arrow icon drop-down palette shows that a file was **received** into the Journal.





3.7 Keywords

- **Computer:** Computer is an electronic device that accepts data, processes, organizes and produces results.
- **Data:** Whatever you have typed from the keyboard is the data.
- **GNOME Interface:** A graphical user interface which has many applications designed to help you in your daily work.
- **Information:** The processed data.
- **Internet:** A large group of computers connected to each other.
- **Journal:** An automated diary of everything you do within Sugar.
- **Website:** A collection of web pages related to each other by a certain topic.

3.8 Summary

- Communication is the process of sending or receiving information. We can communicate by speaking, writing, through art and music and books.
- Technology is the collection of techniques, skills, methods and processes used to complete a work. Communication technology helps us to send and receive information.
- Project is a planned set of interrelated tasks. It should be completed over a fixed period within certain cost and other limitations.
- Computer hardware refers to physical parts that can be touched. For example, system unit, monitor, printer, keyboard and mouse.
- Software is a set of instructions for a computer to perform specific operations that cannot be touched. For example, Windows Media Player and Word Processing.

3.9 Unit Review Exercises

Do these review exercises in your exercise book.

I. Fill in the blanks with the correct options:

1. ..... tools help us use information and share it digitally.
   (a) ICT (b) UPS
   (c) DATA (d) Website
2. ..... is a collection of web pages.
   (a) Data (b) Website
   (c) Digital (d) Analogue
3. The ..... lies behind all other components on your screen.
   (a) mouse (b) keyboard
   (c) desktop (d) none of these
4. The ..... is a special folder where you can place files and folders you no longer need.
   (a) window (b) home
   (c) icon (d) trash

5. ..... is a type of computer program that allows you to perform a particular task.
   (a) Application (b) Text Editor
   (c) Calculator (d) Character map

II. State whether the following statements are true or false:

1. Computer hardware refers to physical parts that can be touched.
2. Gedit Text Editor can read, create, or modify any kind of simple text without any formatting.
3. Buttons on status bar allow you to minimize, maximize, and close the windows.
4. Sugar is a graphic user interface.
5. The Sugar Journal records everything we do using Sugar Interface.

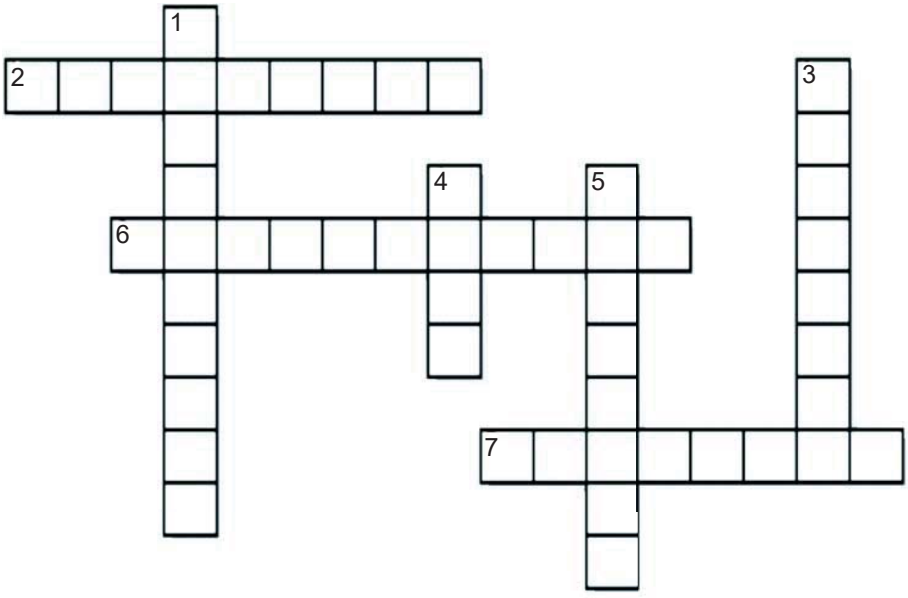
III. Match the following:

Column A	Column B
1. Project	(a) processed data
2. Communication	(b) an electronic device
3. Information	(c) collection of electronic pages
4. www	(d) exchanging information
5. Computer	(e) a planned set of interrelated tasks

IV. Answer the following questions briefly:

1. What are the roles of a computer?
2. Differentiate between data and information.
3. Explain the features of website.
4. List some uses of the following:
   (a) Scroll bar (b) Gedit Text Editor (c) GNOME interface
   (d) System menu (e) Workspaces
5. Write the steps to switch on and switch off a computer.
6. What is Journal Activity?

V. Complete the following crossword puzzle using the clues below:



Clues:

Across

2. A device or program that enables a user to communicate with a computer.
6. This is the processed data.
7. It is a large group of computers connected to each other.

Down

1. The collection of techniques, skills, methods and processes used to complete a work.
3. This is a set of instructions for a computer to perform specific operations.
4. Something on which operations are performed by a computer.
5. An electronic device that accepts data, processes, organizes and produces results.

Group Activity

Students in group practise switching from Sugar to Gnome interface and vice versa.

Project Work

Send a document to your classmates through sugar interface.

Discuss it with each other.

Unit 4 Writing Skills

We like to write and decorate words and sentences in our notebooks. In the same way, word processing applications help us to write, edit, and format a document in a computer.

Word processing programs like Microsoft Word, Word Perfect, WordPad, and WordPro give us options for text formatting.

Observe the various tools of MS Word in the following picture. These tools help us in writing, editing, and formatting a document.

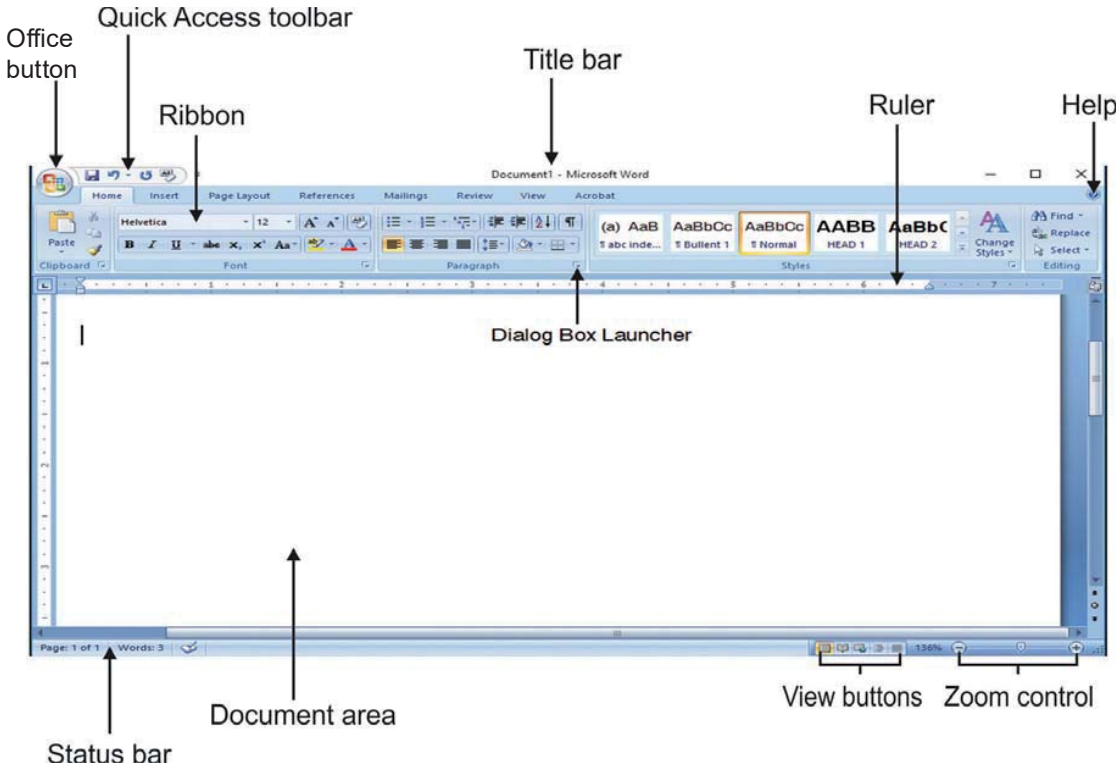


Fig. 1. *Different elements of an MS Word window*

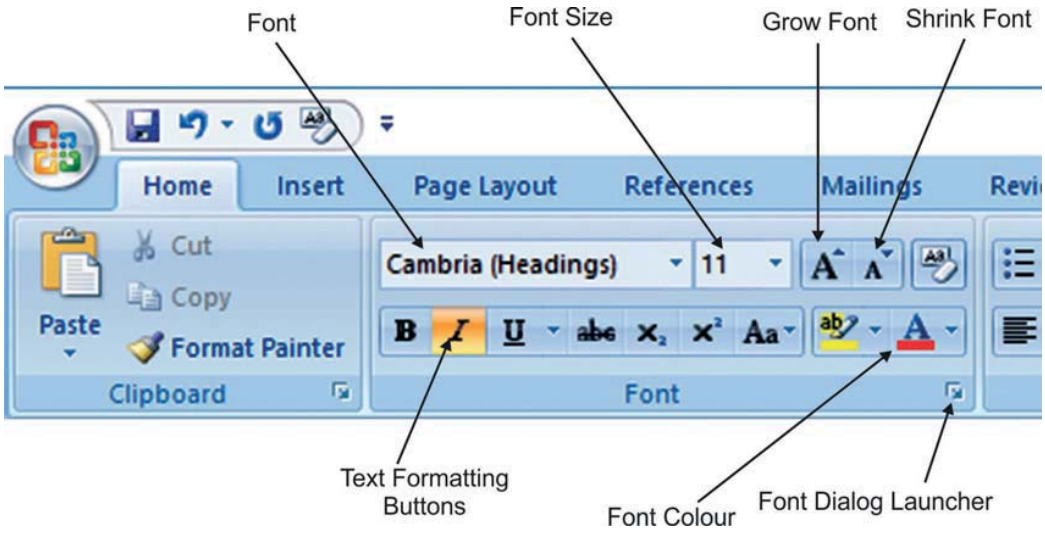


Fig. 2. *Different elements of an MS word ribbon*

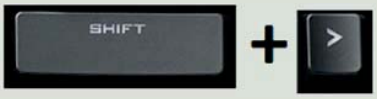
4.1 Text Selection

Selection of text highlights the text. After selecting the text, we use formatting or editing tools to make changes in the text. You can select text either using the keyboard or using the mouse.

Selecting Text Using Keyboard

Activity - 1 **Opening Microsoft Word, Writing and Selecting Text Using Keyboard**

1. Click on the **Start Icon**, slide the mouse up so the cursor is on **All Programs**.
2. Click on **Microsoft Office** option and choose **Microsoft Word**.
3. On a new document page, write your name.
4. Select the first character of your name by placing cursor at the start of your name, press **SHIFT** key, hold it and then press **RIGHT ARROW** key at the same time.



5. Select the last character of your name by placing cursor at the end of your name, press **SHIFT** key, hold it and then press **LEFT ARROW** key at the same time.

6. Select your second name from its beginning to its end by placing cursor at the beginning of your second name, press and hold **CTRL+ SHIFT + RIGHT ARROW** keys at the same time.

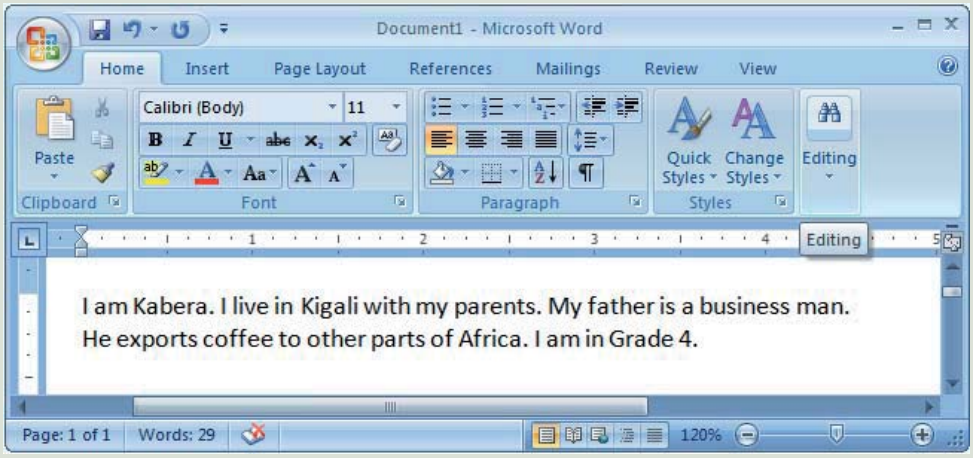
7. Select your second name from its end to its beginning by placing cursor at the end of your second name, press and hold **CTRL+ SHIFT + LEFT ARROW** keys at the same time.

8. Select your full name from its beginning to its end by placing cursor at the beginning of your full name, press and hold **HOME** key and then **SHIFT + END** keys.

9. Select your full name from its end to its beginning by placing cursor at the end of your full name, press and hold **END** key and then **SHIFT + HOME** keys.

Activity - 2 Selecting Sentence, Paragraph and Document Using Keyboard

1. Open a new document and write a home life story.



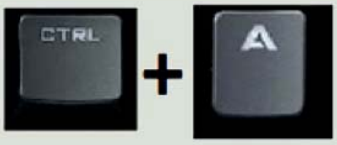
2. Select a sentence down by placing a cursor at the beginning of the sentence, press and hold **END** key and then **SHIFT + DOWN ARROW** keys.

3. Select a sentence up by placing a cursor at the end of the sentence, press and hold **HOME** key and then **SHIFT + UP ARROW** keys.

4. Select a paragraph from its end to its beginning by placing the cursor at the end of the paragraph, press and hold **CTRL** key and then press **SHIFT + DOWN ARROW** keys.

5. Select a paragraph from its beginning to its end by placing the cursor at the beginning of the paragraph, press and hold **CTRL** key and then press **SHIFT + UP ARROW** keys.

6. Select a whole document by pressing **CTRL + A** keys at the same time.



7. Select a whole document from its beginning by placing the cursor at the beginning of the document, press and hold **CTRL** key and then press **SHIFT + END** keys.

8. Select a whole document from its end by placing the cursor at the end of the document, press and hold **CTRL** key and then press **SHIFT + HOME** keys

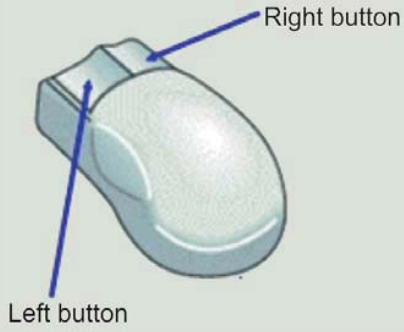
Selection can be done using keyboard or using mouse, before formatting a text you need to select it.

Selecting Text with Mouse

We can use mouse to select characters, words, sentences, paragraphs, or a whole document.

Activity - 3 | Selecting Word, Sentence, Paragraph and Document Using Mouse

1. Open the existing document that you have typed in the previous activity.
2. To select a word, double click on it.
3. To select a sentence:
   (i) Place the cursor anywhere on the sentence.
   (ii) Holding the **CTRL** key, click anywhere on the sentence.



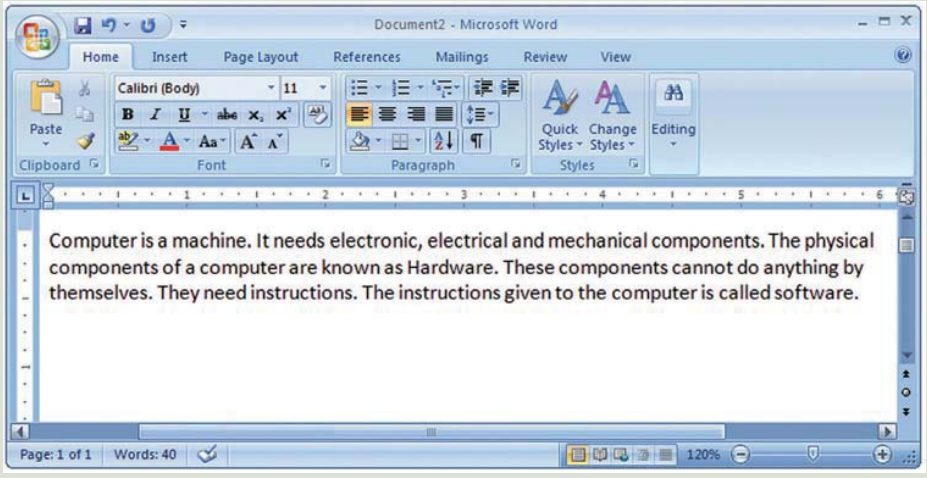
4. To select a paragraph, triple click anywhere on the paragraph.
5. To select entire document:
   (i) Place the cursor at the beginning of the document.
   (ii) Holding the **SHIFT** key, click at the end of the document.

Note: Click means clicking the left mouse button.

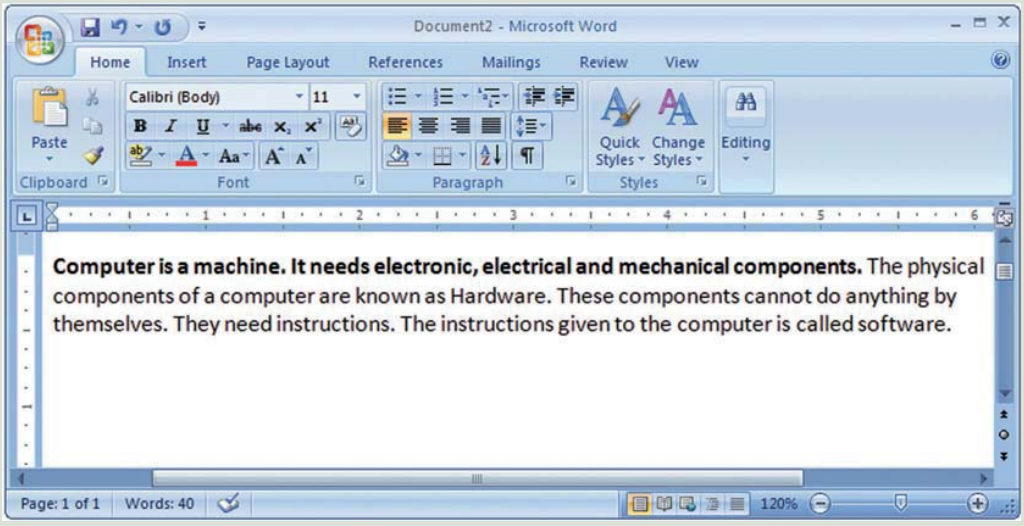
4.2 Formatting Text

Activity - 4 | Formatting Text

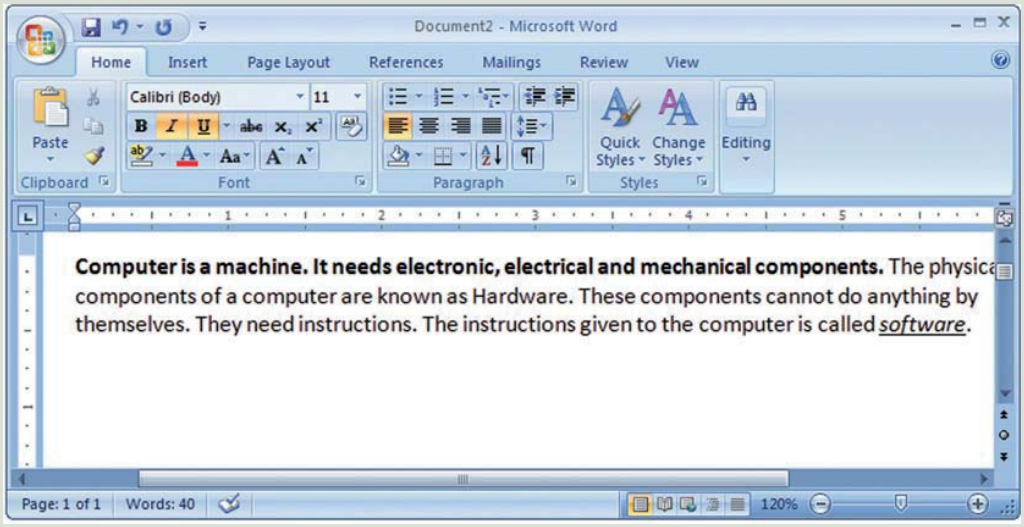
1. Formatting a text by making it **Bold**, *Italic*, Underlined, Changing colour and size.
2. Type the text as shown below.



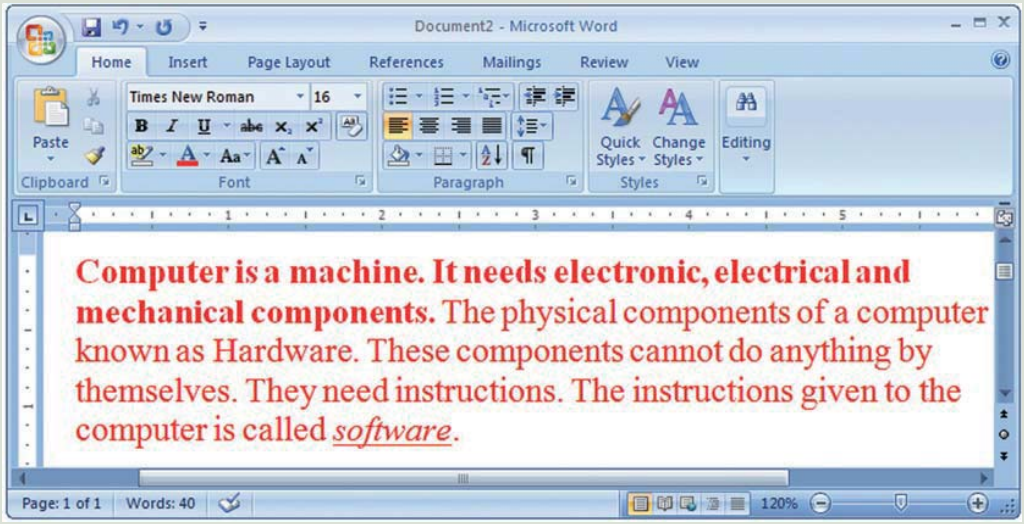
3. Observe the **font** options on the word document **Ribbon**.
4. Select the first two sentences and make them bold by clicking on **B** or by pressing the **Ctrl + B** keys.



5. Select the word "software", make it Italic and Underline it by clicking on *I* and U or by pressing **Ctrl + I** for italic and **Ctrl + U** for underlining.



6. Change the size of whole text from 11 to 16, change the style from **Arial** to **Times New Roman** and put the first sentence in red color.



Formatting a text means changing the style, color, and size of the desired text. Font size indicates the size (both height and width) of the text. Using the font size tool, you can increase or decrease the text size.

Changing the Character Case of the Text

Character Case indicates the case of the text. It is used to change the text from lower case to upper case or vice-versa.

To change the character case of the text:

1. Select the text whose character case is to be changed using the keyboard or mouse.
2. Click on change case box Aa on the Home tab of the Ribbon.
3. Select the desired case style from the drop down list.

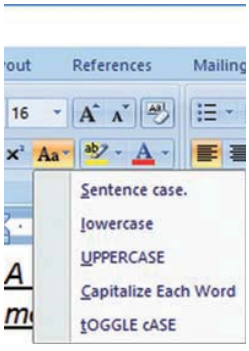
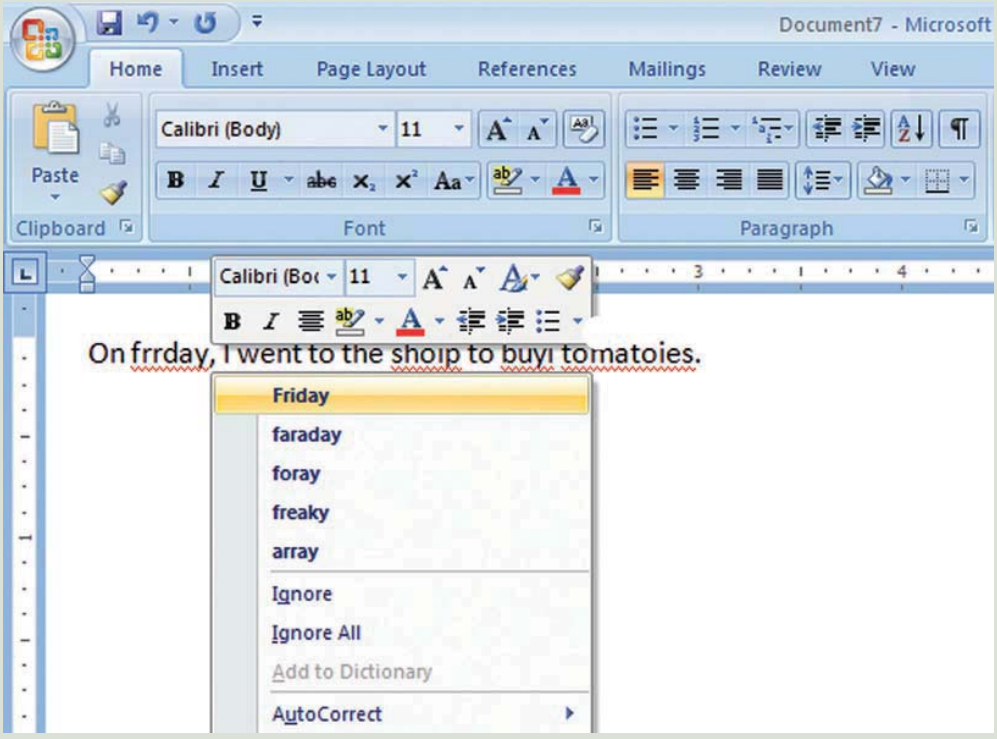


Fig. 3. *Change case options on the change case box*

Spelling and Grammar Checking

Activity - 5 Checking Spelling and Grammar

1. Type the following sentence exactly as shown. Include all the errors.
   On frrday, I went to the shoip to buyi tomatoies.
2. Using the right button of your mouse, click on the first word that has the red wavy line under it.
3. Several choices will appear. Click on the correct one.



4. Do the same thing with each of the words with wavy lines under them.
   Spelling errors are displayed with a red wavy line under the text. A red wavy line means the word is wrongly spelt or it is not an English word.

Saving a Word Document

When your work is finished, you need to save it for further use. You should save the document at proper place with a suitable name.

To save a word document:

1. Press **Ctrl + S** or Click on the button on the Home tab of the Ribbon. The **Save As** window will appear.
2. Select the location in the computer where you wish to save the document.
3. Write a file name in the **File name** box. For example, "Computer".
4. Click on the **Save** button. The file will be saved by the name "Computer".

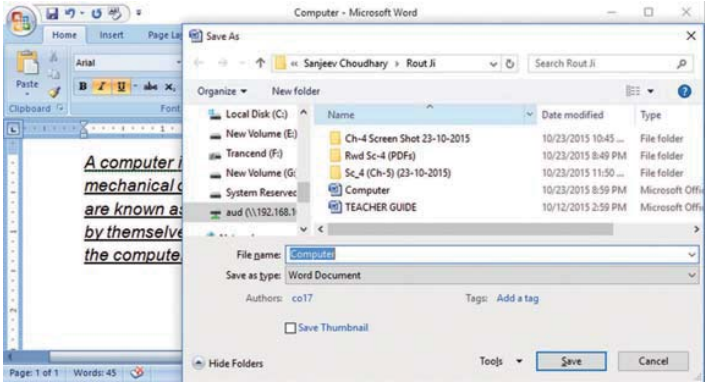


Fig. 4. *Save As dialog box*

Opening a Word Document

You can open the same file, if you have to see or work again on the same document.

To open a word document:

1. Press **Ctrl + O** or Click on **Office** button and select Open option. The **Open** dialog box appears.

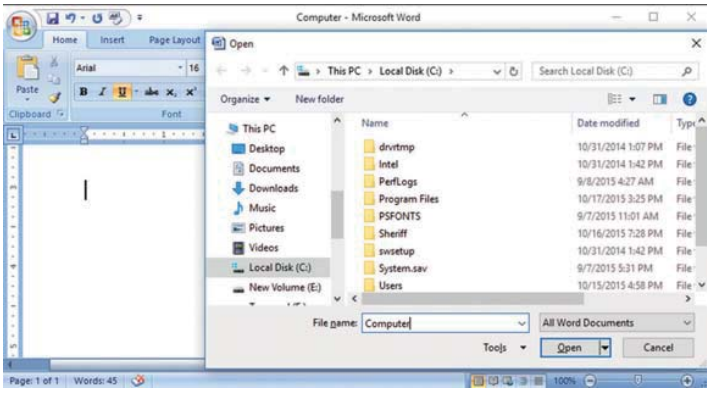


Fig. 5. *Open dialog box*

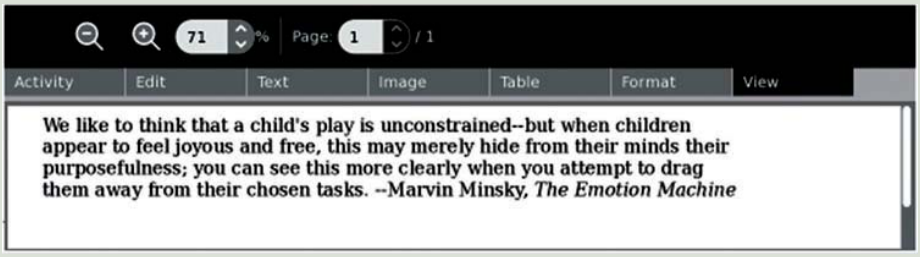
2. Select the location where you saved the document.
3. Choose the document to be opened and click on **Open** button. The document you selected appears on the screen.

Sharing and Collaboration

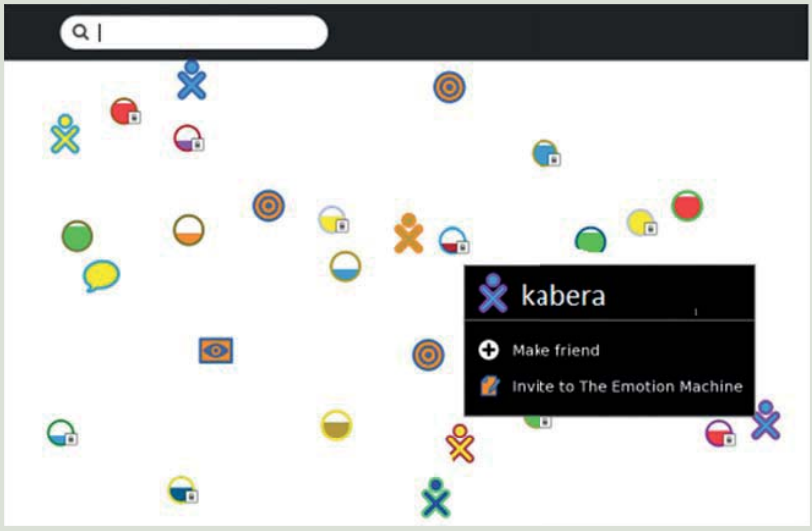
The Write Activity in Sugar Interface helps multiple users to work together or **collaborate** on a single document. You can show edits made to a document so that others can review the edits. You can also merge edits from multiple users. To do this, **sharing** is required.

Activity - 6 | Sharing a Document

1. Open the Activity on which the document is prepared.

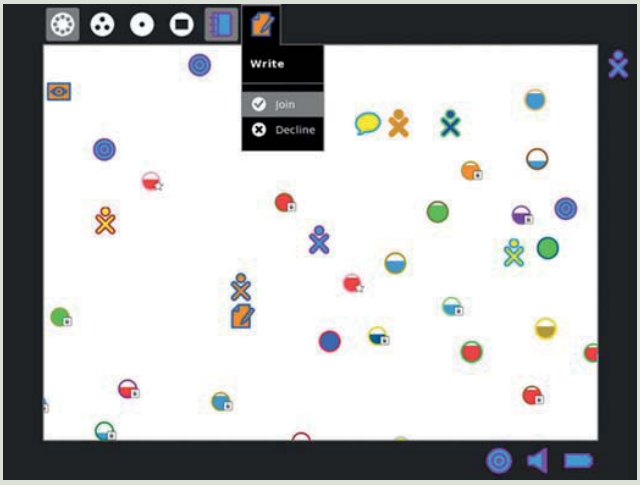


2. To send an invitation:
   - Go to the **Neighbourhood view**.
   - Click a friend's XO icon to send an Invite request.



3. Receive/Accept an invitation:

   After you have invited your friend, he/she has to click the **Write** icon in the Frame and choose **Join**.



4. Once you and your friends have shared the Write Activity, everyone sees the same document. Then both of you can type on the same document.

Group Work

1. Go to you Computer Lab.
2. Search or connect to friends in the **Neighbourhood view**.

Activity - 7 | Identifying Different Formatting Buttons

Identify the following buttons. Write their names in your notebook.

(*i*) 	(*ii*) 	(*iii*)  .....
(*iv*) 	(*v*) 	(*vi*)  .....
(*vii*) 	(*viii*) 	(*ix*)  .....

Activity - 8 | Typing and Formatting a Document

Go to your computer laboratory. Type the following document. Then format this document as instructed below.

Information and Communication Technology (ICT)

ICT stands for Information and Communication Technology. Computer is the basic need in every field. Life becomes easier with the introduction of different ICT tools.

Computers, mobile phones, calculators, radios, thermometers and fax machines are the common ICT tools. These tools help us use information and share it digitally.

1. Select the heading "Information and Communication Technology (ICT)".
2. Make it bold.
3. Change its colour into red.
4. Make it underlined.
5. Change its style into Arial.
6. Select the first paragraph and change its case to uppercase.
7. Select the second paragraph and make it italic.
8. Save this document with the name 'ICT'.

4.3 The Keyboard and Touchpad

Keyboard is an input device of a computer system. Data are entered into the computer with the help of keyboard. It plays a very crucial role while working on a computer.

Fig. 6. *Keyboard*

Touchpad is a pointing device on laptops and some keyboards. It is operated using fingers. It allows the user to touch an area on the screen in order to enter data. Like computer mouse, it also has two buttons. These two buttons allow the user to left-click or right-click.

Fig. 7. *Touchpad*

Frame Keys

Frame keys are the keys which are available on the multimedia keyboard. These keys are used for special functions or as short-cut keys.

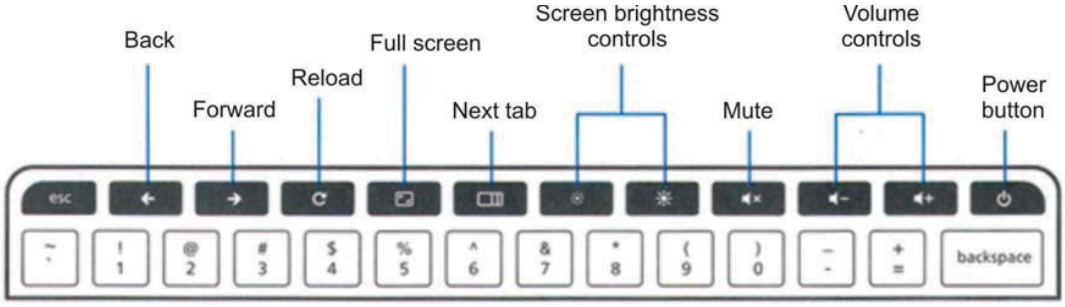


Fig. 8. *Frame keys on multimedia keyboard*

Volume Control

The following keys of multimedia keyboard are used for Volume control.

	Volume up
	Volume down
	Mute toggle

Brightness Control

The following keys of multimedia keyboard are used for brightness control.

	Reduces display brightness
	Increases display brightness
	Reduces keyboard brightness
	Increases keyboard brightness

Special Keys on the Keyboard

The keys which are marked with red are special keys. All special keys have some special functions.

Keyboard

XO keyboard

Fig. 9. *Special keys on the keyboard*

Application of Special Keys in the MS Word Document

Special keys	Pictures	Applications
Backspace		It erases the characters from left side of the cursor.
Delete		It erases the characters from right side of the cursor.

(Continued...)

Special keys	Pictures	Applications
Right Arrow		It moves the cursor in right direction.
Left Arrow		It moves the cursor in left direction.
Up Arrow		It moves the cursor in upward direction.
Down Arrow		It moves the cursor in downward direction.
Caps Lock		It capitalises the letters.
End		It moves the cursor to the end of the line.
Home		It moves the cursor to the beginning of the line.
Enter		It starts a new paragraph in a document.
Escape		It cancels any command or exits the program.

(Continued...)

Special keys	Pictures	Applications
Spacebar		It provides a space between letters and words.
Control key		This key is used with other keys to alter the other key's command. For example, **Ctrl + O** to open an existing file; **Ctrl + F** to search any word or phrase.
Alt key		This key is used with other keys to alter the other key's command. For example, **Alt + F4** to close a saved file or exit.

Table 1: Special Keys and their Functions

4.4 Keywords

- **Collaboration:** The action of working with someone to produce something.
- **Font size:** The size (both height and width) of the text.
- **Formatting text:** Changing the style, colour, and size of the text.
- **Frame keys:** The keys available on the multimedia keyboard.
- **Keyboard:** An input device of a computer system.
- **Touchpad:** A device for controlling the pointer on a display screen by sliding the finger along a touch-sensitive surface.

4.5 Summary

- Word processing applications help us to write, edit, and format a document in an effective manner.
- Text formatting buttons are used to make the text bold, italic, and underlined.
- When our work is finished, we need to save a document for further use.
- Selection of text highlights the text. After selecting the text, we use a formatting or editing tool to make changes in the text.

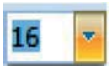
4.6 Unit Review Exercises

Do these review exercises in your exercise book.

I. Fill in the blanks with the correct options:

1. The buttons which are used for formatting are called ..... buttons.
   (a) formatting (b) editing
   (c) calculating (d) none of these
2. Ctrl + I command is used to make the text…….. .
   (a) bold (b) italic
   (c) underlined (d) none of these
3. A word can be selected with mouse by …….. clicking on it.
   (a) single (b) double
   (c) triple (d) none of these
4. …….. keys are used to select a sentence from its beginning to its end.
   (a) Home + Shift + End (b) End + Shift + Home
   (c) Home + Shift + Up Arrow (d) Home + Shift + Down Arrow
5. ..... key erases the characters from left side of the cursor.
   (a) Esc (b) End
   (c) Delete (d) Backspace

II. State whether the following statements are true or false:

1. Right arrow key moves the cursor in right direction.
2. To select a sentence with mouse, hold down the Ctrl key then click the sentence.
3. Font size box  on the formatting toolbar is used to change the font style of the character.
4.  button is used to change the text from lower case to upper case.
5. Sharing and collaboration feature helps multiple users to work together on a single document.

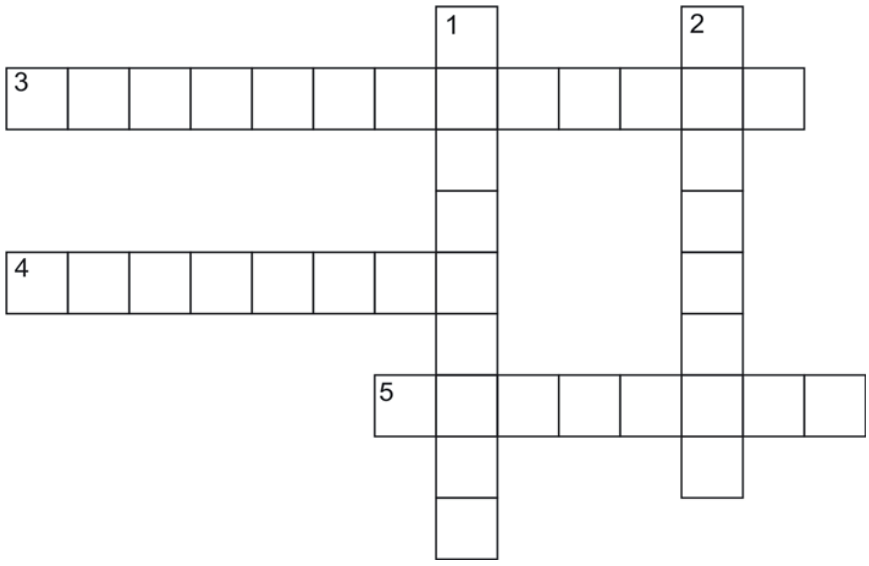
III. Match the following shortcut keys with their functions:

Shortcut keys	Function
1. **Ctrl + Z**	(a) Pastes the most recent addition
2. **Ctrl + A**	(b) Applies or removes underline
3. **Ctrl + V**	(c) Selects the whole document
4. **Ctrl + U**	(d) Applies or removes italic formatting
5. **Ctrl + I**	(e) Used to undo an action.

IV. Answer the following questions briefly:

1. Define formatting.
2. State the steps to select a paragraph with mouse.
3. How will you select whole document with keyboard?
4. Differentiate between Keyboard and Touchpad.
5. Give uses of the following special keys:
   (a) Enter key (b) Esc key (c) End key
   (d) Home key (e) Delete key
6. Write steps to:
   (a) change the colour of text
   (b) change the style of text
   (c) save a word document

V. Complete the crossword puzzle using the clues below:



Clues:

Across

3. The action of working with someone to produce something.
4. An online backup and data storage software.
5. An input device of a computer system which has 104 keys.

Down

1. The keys available on the multimedia keyboard.
2. A device for controlling the pointer on a display screen by sliding the finger along a touch-sensitive surface.

Unit 5 Graphics and Multimedia

Computer graphics is one of the most effective way to communicate the processed information to the user. It displays the information in the form of graphics objects such as pictures, graphs and diagrams. Let us learn about Paint Application.

5.1 Paint Application

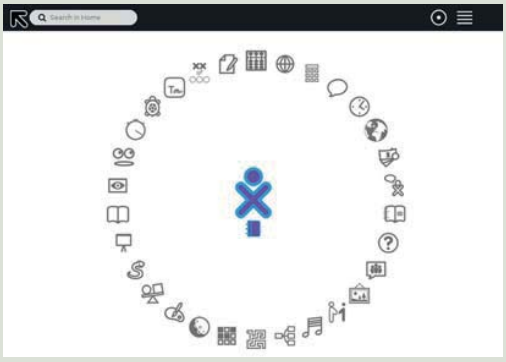
Definition and Role

Paint is an activity in **Sugar Interface**. It is used to draw, colour and edit pictures. The program mainly saves file as Joint Photograpy Expert Group(JPEG).

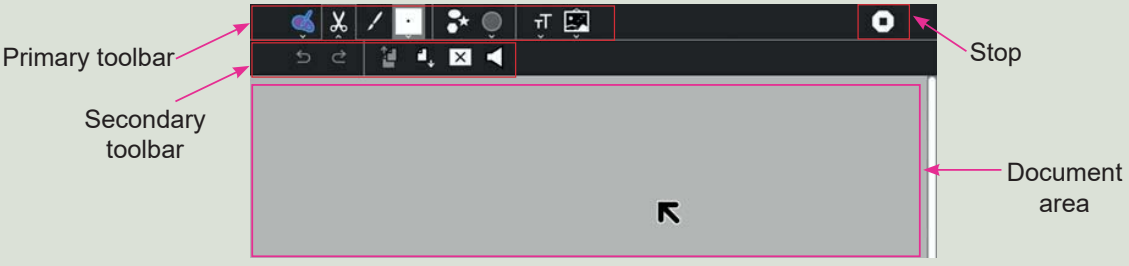
Paint Activity

Activity - 1 **Starting the Paint Activity**

1. Go to **Home view**.
2. Click on **Paint icon** .



3. Paint window will appear.



5.2 Toolbar

Primary Toolbar

The **Primary toolbar** is located at the top of the screen.

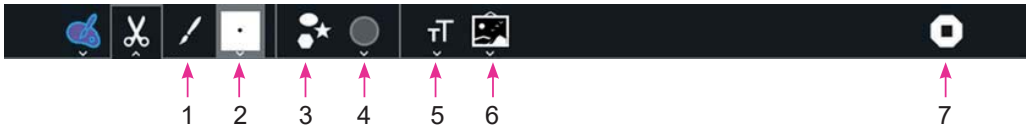


Fig. 1. *Primary toolbar*

1. **Brush tool:** It is used to paint.
2. **Brush properties tool:** It shows the properties of brush tool.
3. **Shape tool:** Draw different types of shape.
4. **Shape properties tool:** It is used to edit shape size and colour.
5. **Text tool:** It is used to type text in your activity and change the format of text, *i.e.*, bold, italic and font face.
6. **Image tool:** It is used to insert image, colour formatting (Grayscale and colour), and editing.
7. **Stop:** It quits the Activity and exits the program.

Activity - 2 **Practising Editing and Cropping an Image**

1. Take an image of market place from the Internet.
2. Reduce its size with the help of crop tool.
3. Delete some of unwanted parts from its images.
4. Change colour of image.

Secondary Toolbar

Each tool bar contains a logically grouped set of buttons and controls, as the name on its corresponding tab suggests. Each of these sets represents a distinct editing or control context, called **Secondary toolbar**.

1. Display or change the name of the image that is saved in the Journal.

Fig. 2. *Secondary toolbar*

2. **Edit tool:**

Fig. 3. *Edit tools*

(a)	**Undo**		Undo is an important command. It erases the last change done to the document reverting it to an older state.
(b)	**Redo**		To reverse your last action, press Ctrl+Z. To reverse your last Undo, press Ctrl+Y. You can reverse more than one action that has been undone. You can use Redo command only after Undo command.
(c)	**Copy**		Copy command creates a duplicate of selected clip.
(d)	**Paste**		Paste command allows you to insert data from the clipboard into an application. In order to use the Paste command, you must first use either the Copy or Cut command to save data to the clipboard. Once the clipboard contains data, you can paste the saved data into any supporting program.
(e)	**Clear**		Clear the selected area or document.
(f)	**Enable Sound**		Insert sound in clipboard.

Table 1: Edit Tools and their Functions

3. **Brush tool:** Brush tool is used for painting and editing image colour. It works like traditional drawing tools for applying colour.

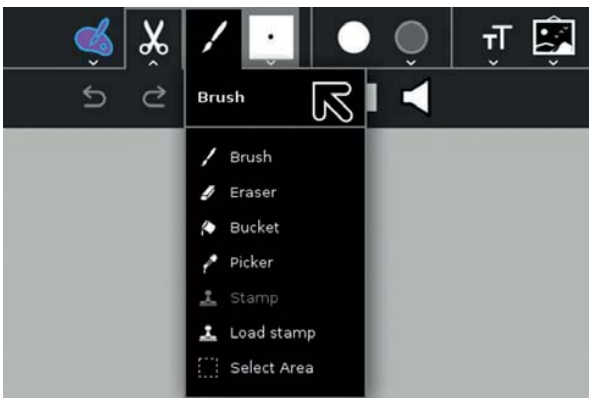


Fig. 4. *Brush tools*

(a)	**Brush**		We use this tool to draw lines that have a different appearance and texture. Using different brushes, you can draw free-form and curving lines that have different effects.
(b)	**Eraser**		The Eraser tool is used to erase areas of your picture or clip art.
(c)	**Bucket**		The Bucket tool is used to fill the entire picture or an enclosed shape with colour.
(d)	**Picker**		Colour picker tool is used to pick colour from other objects.
(e)	**Stamp**		Select an area with the select tool, then copy it with the stamp tool.
(f)	**Load stamp**		It loads saved stamp.
(g)	**Select area**		It selects an area from clipart.

Table 2: Brush Tools and their Functions

4. **Brush properties:** Changes the properties of the brush tool or the stamp tool. When the brush tool is selected, it changes the colour, size and shape of the brush tool. It also affects the shape and text tools.

Fig. 5. *Properties of brush tools*

5. **Shapes:** Draw different types shapes in your clip art.

(a)	**Ellipse**		Draws an Ellipse in clip art.
(b)	**Rectangle**		Draws a Rectangle in clip art.
(c)	**Line**		Draws a Line in clip art.
(d)	**Free form**		Draws a Free form in clip art.
(e)	**Polygon**		Draws a Polygon in clip art.
(f)	**Heart**		Draws a Heart in clip art.
(g)	**Parallelogram**		Draws a Parallelogram in clip art.
(h)	**Arrow**		Draws an Arrow in clip art.
(i)	**Star**		Draws a Star in clip art.
(j)	**Trapezoid**		Draws a Trapezoid in clip art.
(k)	**Triangle**		Draws a Triangle in clip art.

Table 3: Shape Tools and their Functions

6. **Shapes properties:** This tool changes the properties of the shape tool. When the shape tool is selected, it changes the colour, size and shape of the brush tool.

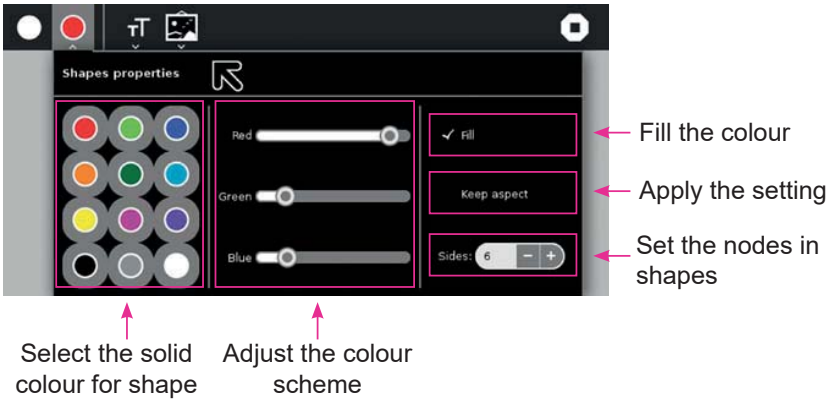


Fig. 6. *Properties of shape tools*

7. **Text tool:** This tool is used to change the font, the size of the font and formatting.

Fig. 7. *Text tools*

(a)	**Type**		Types text in your document
(b)	**Bold**		Changes the text format in **Bold** face
(c)	**Italic**		Changes the text format in *Italic* face
(d)	**Font size**		Increases and decreases font size
(e)	**Font face**		Changes the font face.

Table 4: Text Tools and their Functions

8. **Image Editing:** Image Editing tool is used to edit image colour, rotation and importing image in a document.

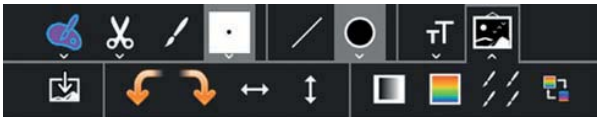


Fig. 8. *Image editing tools*

(a)	**Insert image**		Inserts image in your document
(b)	**Rotate left**		Rotates the image left
(c)	**Rotate right**		Rotates the image right
(d)	**Horizontal mirror**		Rotates an image horizontally
(e)	**Vertical mirror**		Rotates an image vertically
(f)	**Grayscale**		Converts an image into grayscale mode
(g)	**Rainbow**		Draws a line with rainbow colour
(h)	**Kaleidoscope**		Uses four brushes at a time
(i)	**Invert colour**		Inverts document colour.

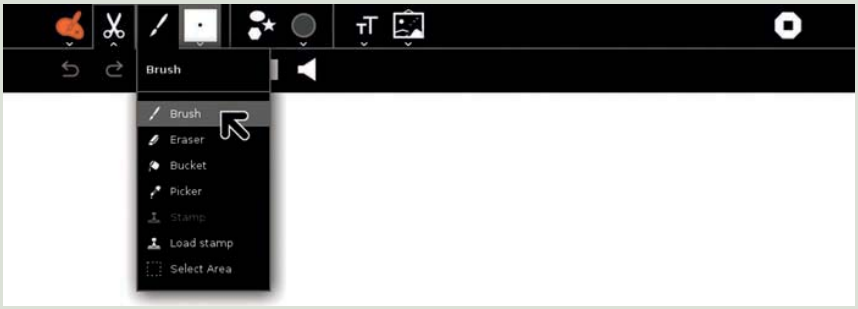
Table 5: Image Editing Tools and their Functions

5.3 Drawing with Free Hands

Activity - 3 | Drawing a House with Free Hands

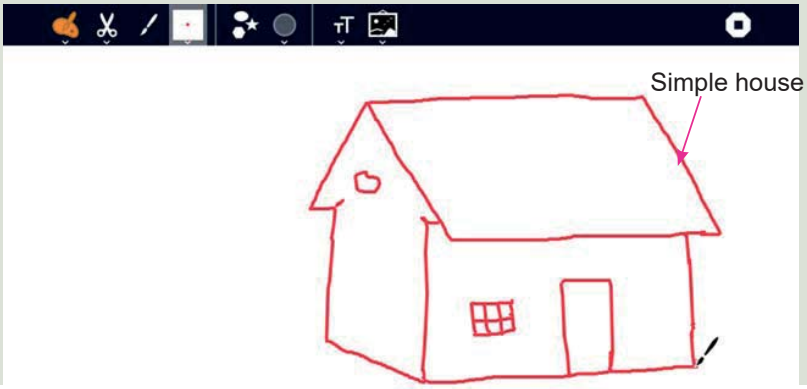
Using Paint Application:

1. Open the **Paint** Activity.
2. Select the **Brush** tool .



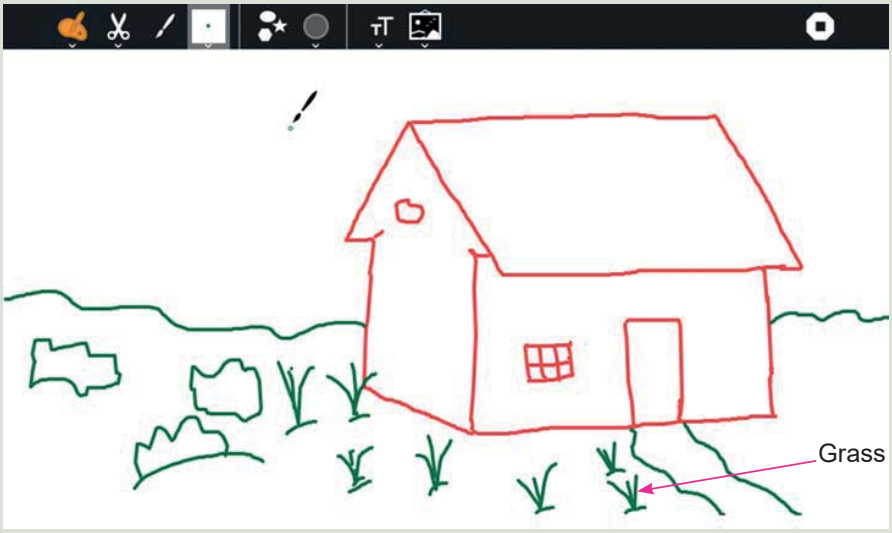
3. Click on the **Brush properties** tool and select the brush size and colour according to your drawing theme.

4. Hold the left mouse button down and drag it to draw a simple house.

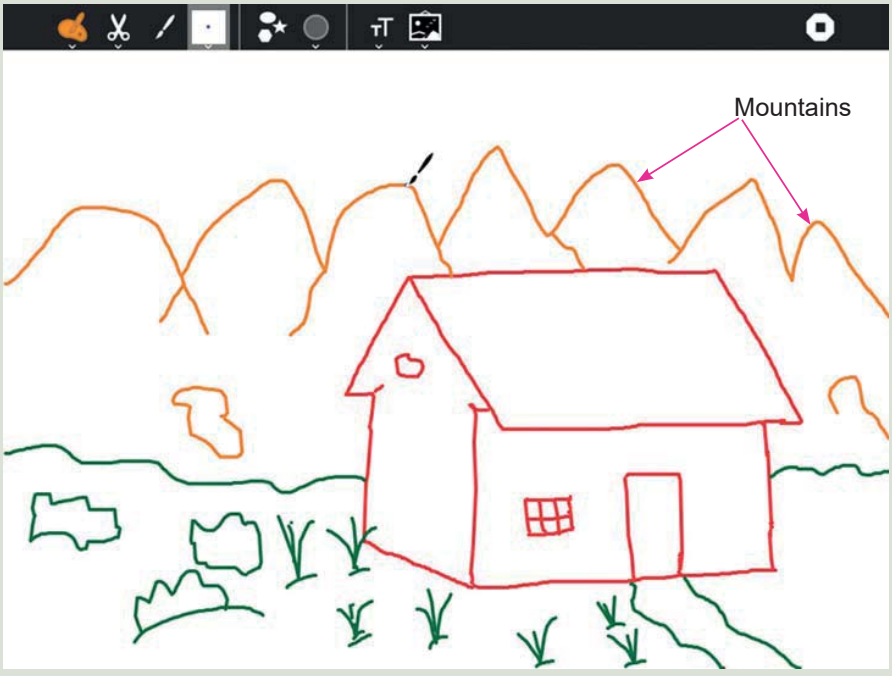


Note: If you draw wrong line by mistake, press Ctrl+Z to undo your previous action.

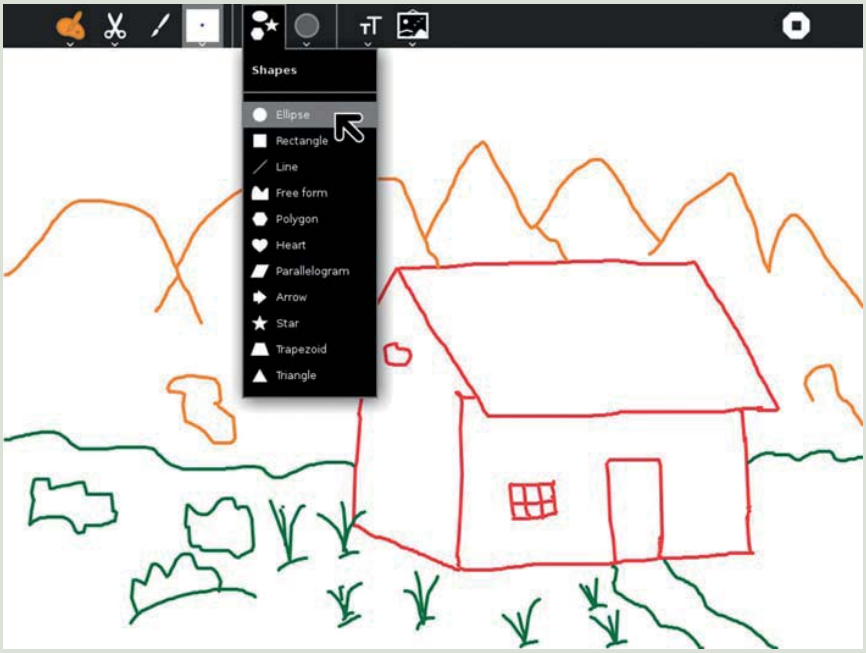
5. Then, draw grasses with green colour. Select the **Brush** tool and choose the green colour.



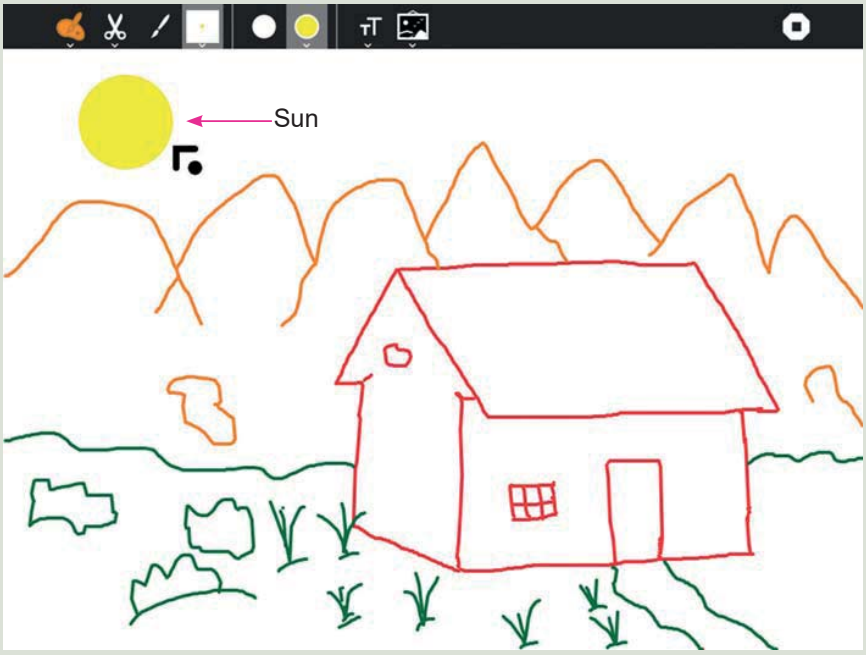
6. Draw the mountains with same tool.



7. Click on the **Shape** tool and select the **Ellipse** tool .

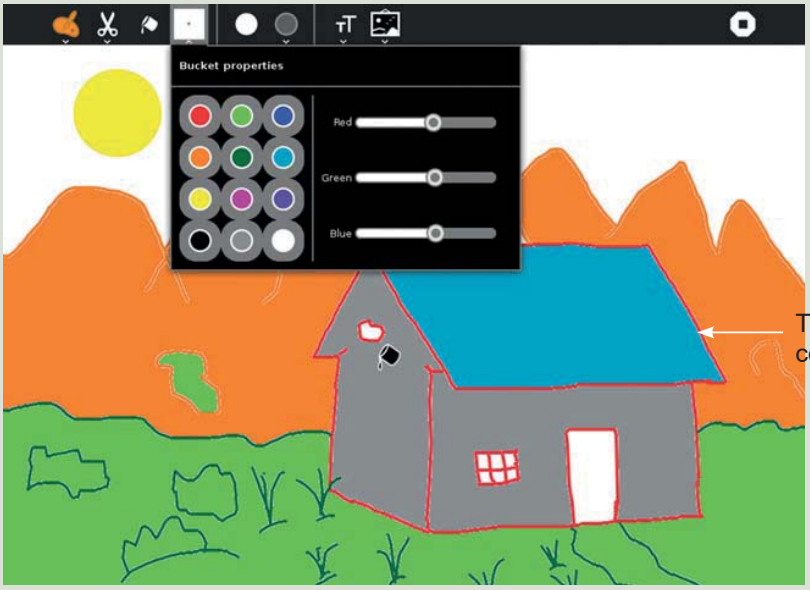


8. Using the **Ellipse** tool, draw the sun.



9. Select the **Bucket** tool .

10. Then, select the **Bucket properties** and choose the colour which you want to fill in grass, house and sun.

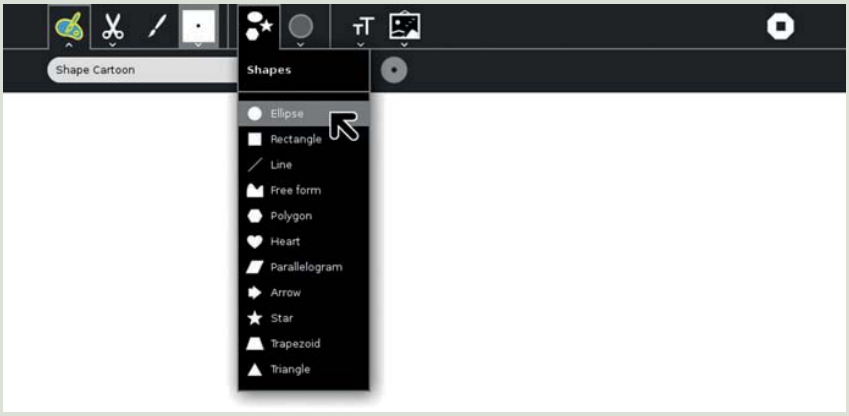


11. Now, your drawing is ready.

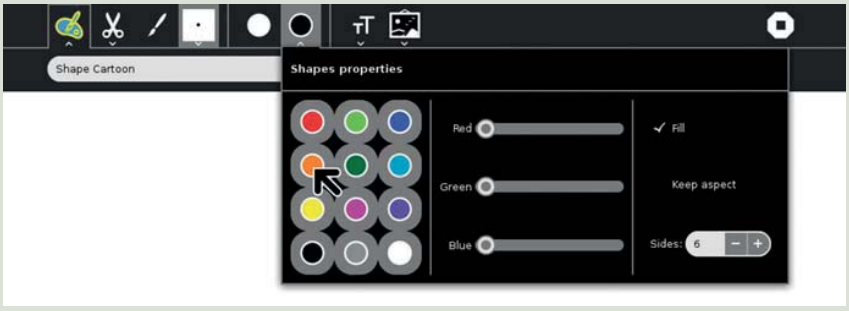
5.4 Drawing Using Shapes

Activity - 4 Drawing a Cartoon Using Shapes Tool

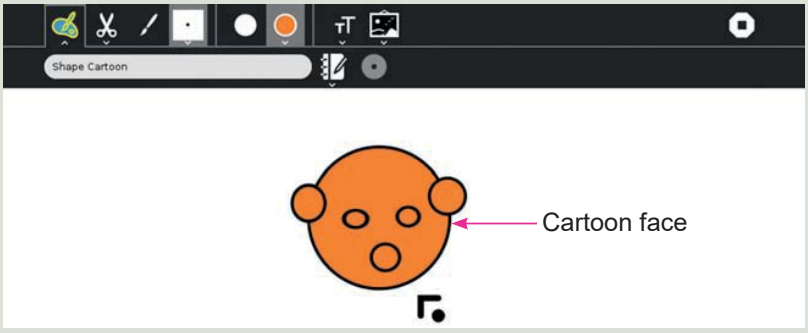
1. Open the **Paint** Activity.
2. Select **Shapes** tool.



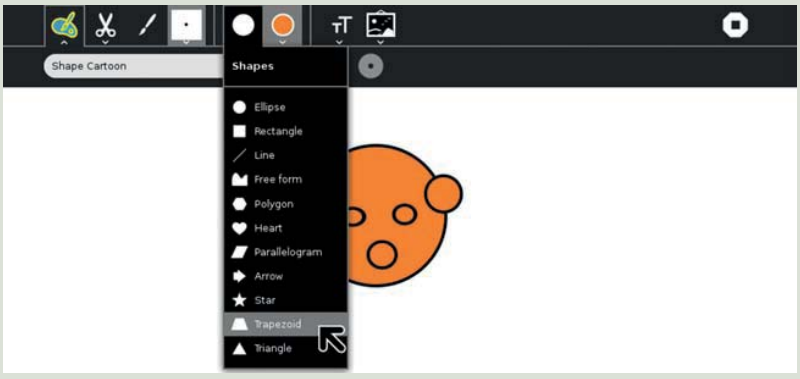
3. Choose **Shapes properties** to set fill colour.

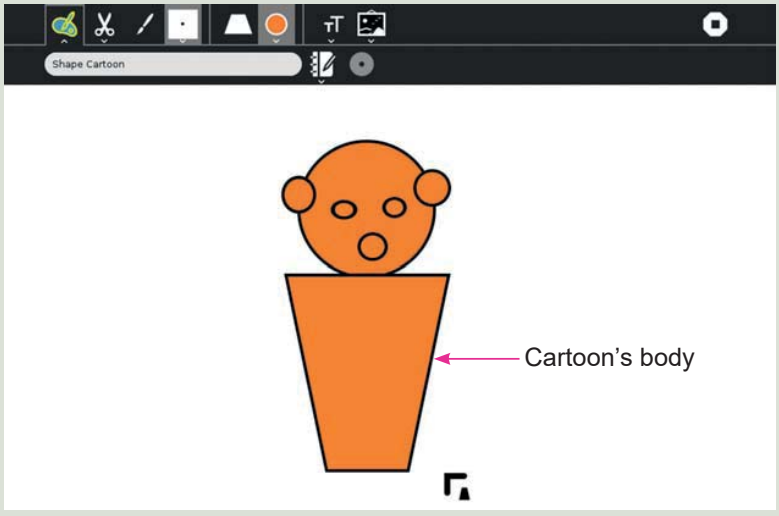


4. Draw ellipses of different sizes and arrange them to make a cartoon face.

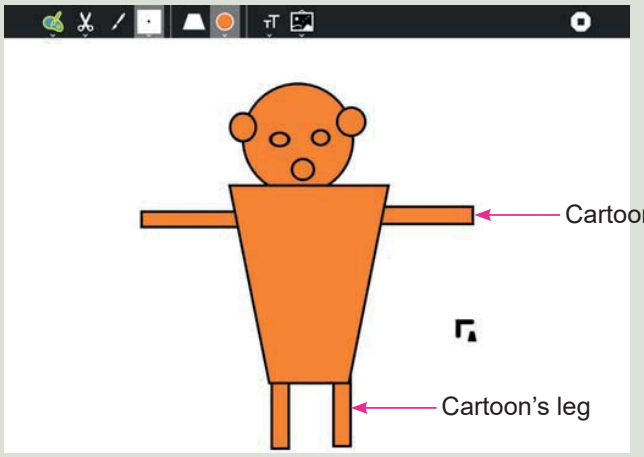


5. Then, select the **Trapezoid** tool for drawing cartoon body.

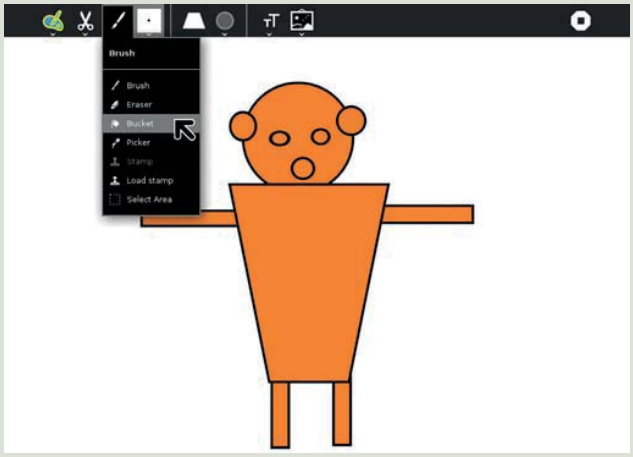


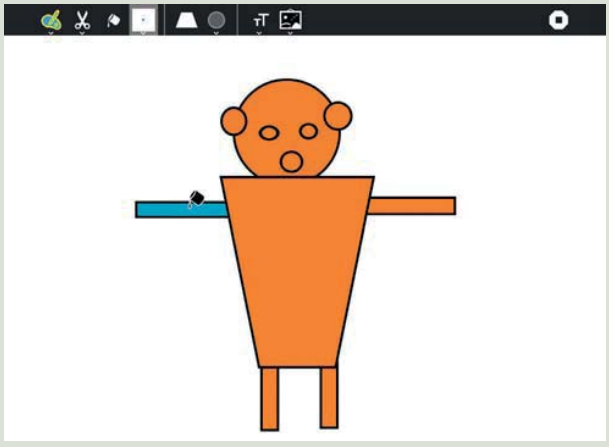


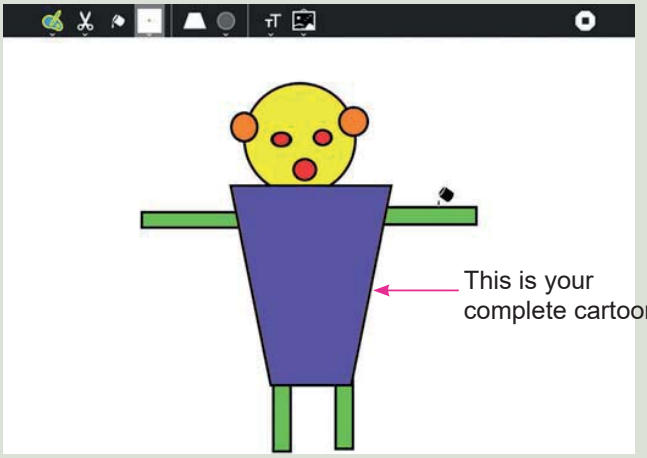
6. Select the **Rectangle** tool for drawing cartoon's hands and legs.



7. Select **Bucket** tool to fill colour in your cartoon.







8. Now your cartoon is ready.

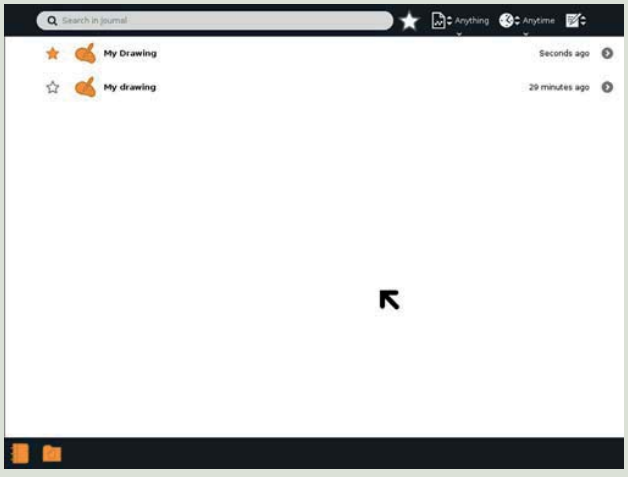
Activity - 5 Drawing Images Using Geometric Shapes

1. Draw an image of a school bus with the help of geometric shapes only.
2. Fill colour in it with bucket tool.

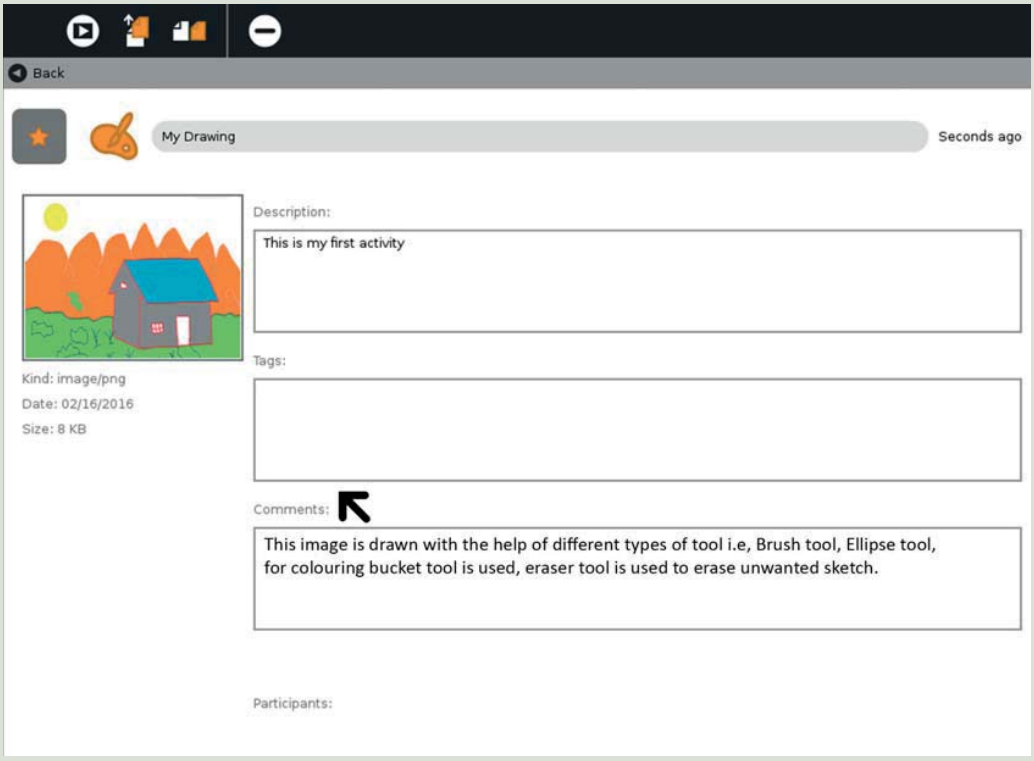
5.5 Comments on a Picture

Activity - 6 Commenting on a Picture

1. Go to **Home view** and press **F5**.
2. Select the Activity on which you want to comment.



3. Type your comment about your Activity.



4. It will be automatically saved.

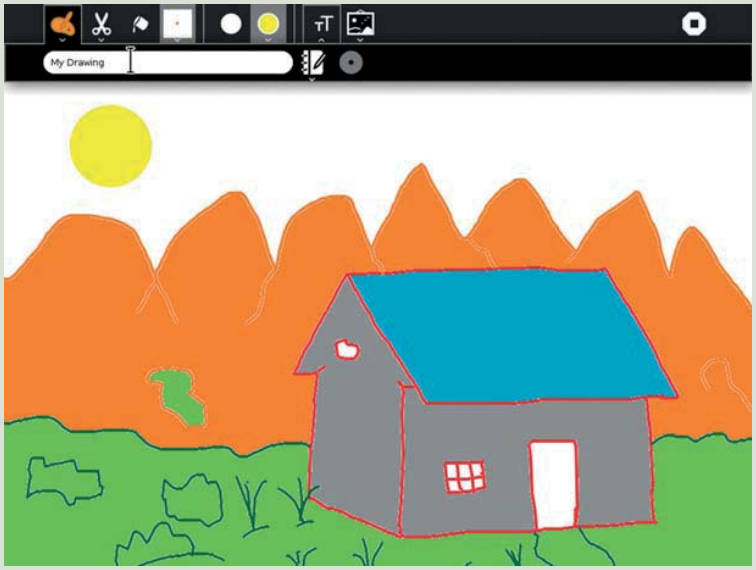
Activity - 7 Commenting on Images

1. Draw an image of hut in the forest with the help of geometric tools and free hand.
2. Fill suitable colour in it.
3. Write meaningful comment for the image.

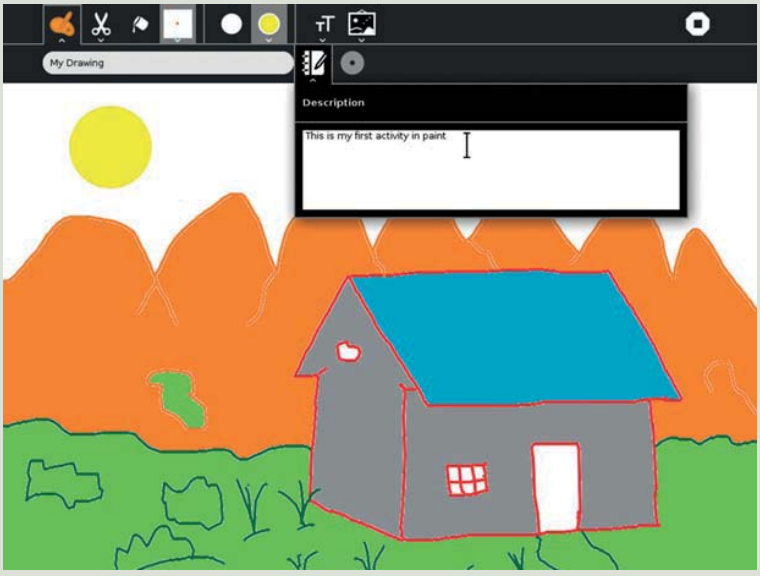
5.6 Saving and Closing an Activity

Activity - 8 | Saving and Closing an Activity

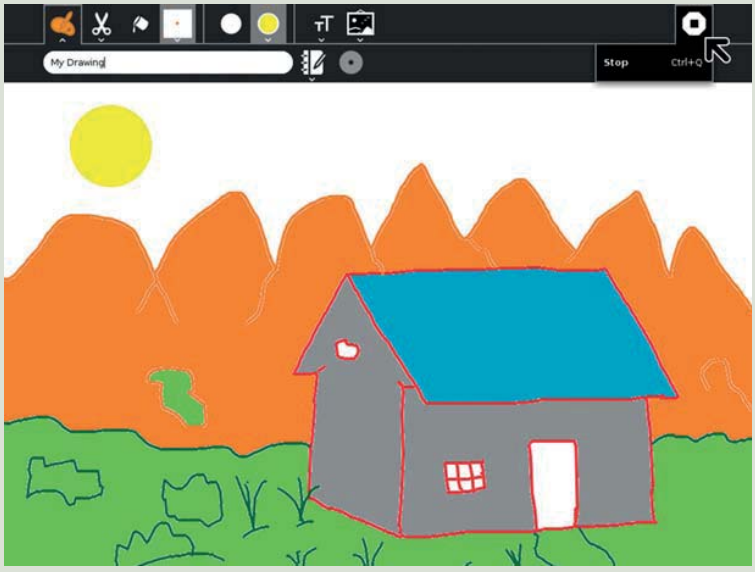
1. Click on  . Type your activity name by which you want to save.



2. Click on **Description** icon  , and type about your Activity.



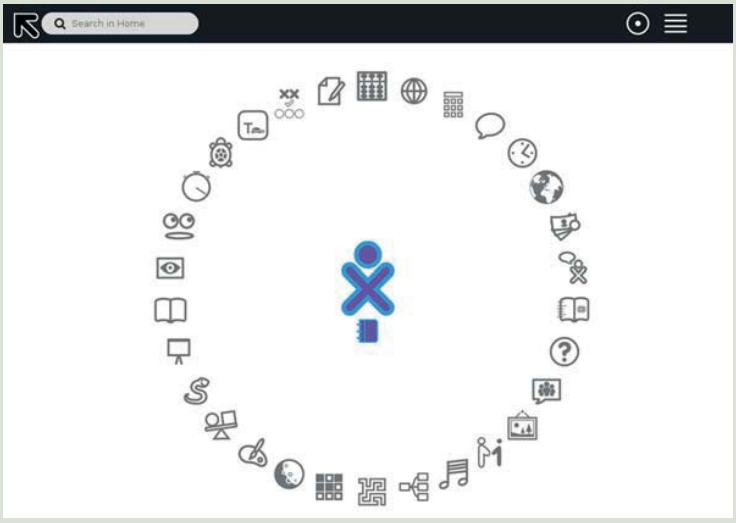
3. Click on **Quit** icon , or press Ctrl+Q to close the Activity.



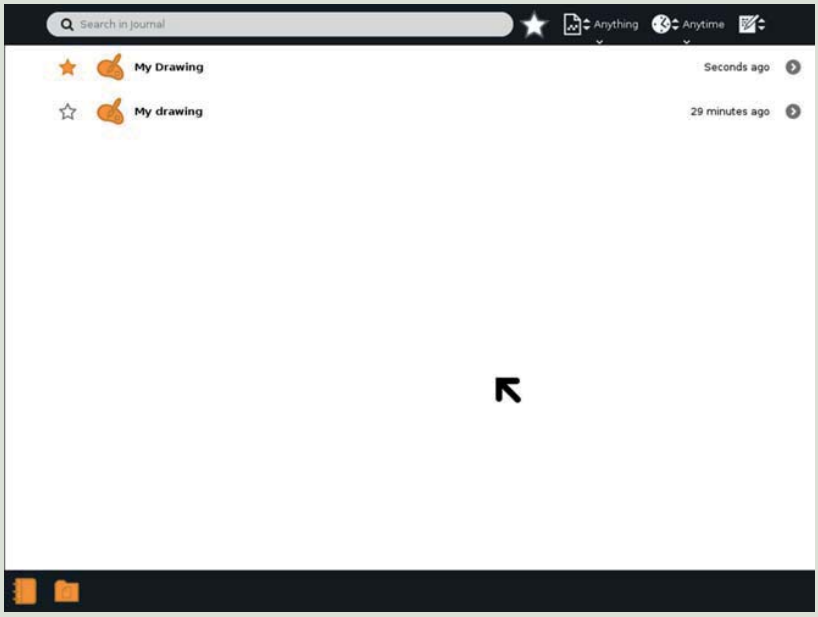
5.7 Opening a Saved Activity

Activity - 9 | Opening a Saved Activity

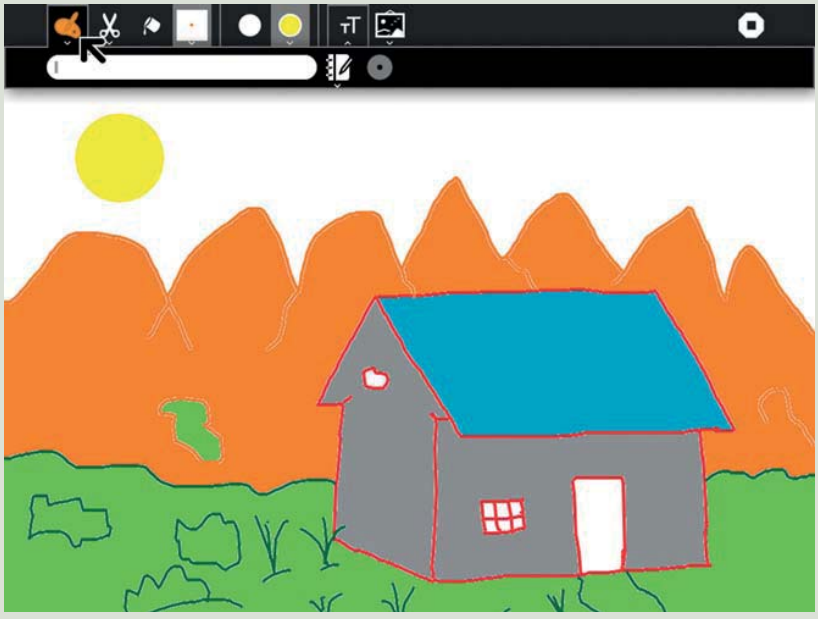
1. Go to **Home Window**.
2. Click on **Paint** icon



3. Press **F4**, a window will appear. Then, select the Activity which you want to open.



4. Your saved Activity will be opened.



5.8 Keywords

- **Bucket tool:** It is used to fill colour in an enclosed shape.
- **Font face tool:** It is used to change the face of the font.
- **Paint:** It is an Activity on Sugar Interface.
- **Undo command:** This command is used to revert last step.

5.9 Summary

- Primary tool bar is used to follow initial steps for drawing in paint activity.
- Secondary tool bar consists of logically grouped set of buttons and controls. Each set represents distinct editing tools.
- Picker tool picks colour from other objects.
- Shape properties tool changes the properties of the shape tool.
- Comment is used to inform about the topic or theme of the subject or image.

5.10 Unit Review Exercises

Do these review exercises in your exercise book.

I. Fill in the blanks with the correct options:

1. ..... is a simple graphics program.
   (a) Clip Art (b) Paint (c) Font Face (d) None of these
2. To undo command you have to press ..... keys together.
   (a) Ctrl + Z (b) Ctrl + Y (c) Ctrl + S (d) Ctrl + X
3. To increase or decrease font size of a text, ... tool is used.
   (a) Font Size (b) Font Face (c) Bucket (d) None of these
4. ..... key is used to close a Paint Activity.
   (a) Ctrl + Z (b) Ctrl + Q (c) Ctrl + C (d) Ctrl + Y

II. State whether the following statements are true or false:

1. In an XO laptop paint icon is found at Home view.
2. The paint program saves file as .JPEG.
3. Image tool is used to format colour.

4. Invert colour is used to rotate image left.
5. To go for the Home view, we have to press F4.

III. Match the following:

Column A	Column B
1. 	(a) Inserts sound in clipboard
2. 	(b) Used to draw image Free Hand
3. 	(c) Used to open Paint Activity
4. 	(d) Rotates image horizontally
5. 	(e) Reverses your last undo

IV. Answer the following questions briefly:

1. What is the use of Paint Activity?
2. Differentiate between primary and secondary tool bar.
3. Write the use of following tools.
   (a) Brush (b) Eraser (c) Bucket (d) Picker
4. Write the command for following actions.
   (a) Undo (b) Redo
   (c) To go for the Home view (d) To close a Paint Activity

Unit 6 Programming for Children

Computer program is a set of instructions. A computer requires programs to function. A program is usually written in a programming language. Scratch and Turtle Art are two popular programming languages for kids.

6.1 Turtle Art

Turtle Art is a programming language which allows children to draw colourful and complex images. In Turtle Art, a turtle needs commands to draw pictures and designs.

Activity - 1 Starting up Turtle Art

Click on the Turtle  icon in the Home View.

The Start up screen of Turtle Art that pops up looks like this.

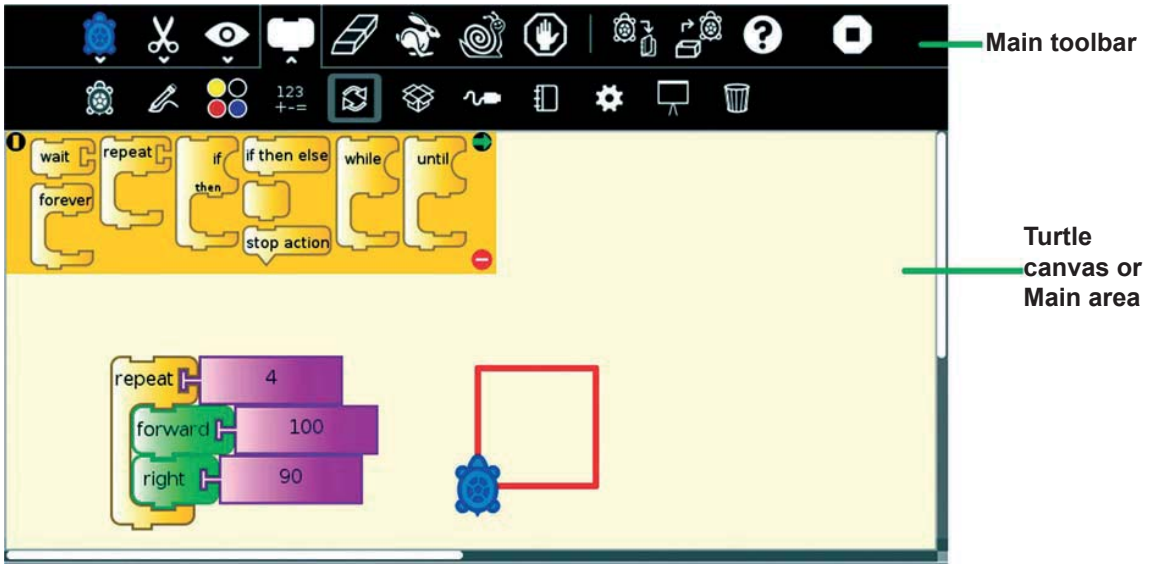


Fig. 1. *Start up screen of Turtle Art*

6.2 Elements of Turtle Art Window

The Turtle Art window has the following elements.

Main Toolbar

The Main toolbar consists of the following tools:

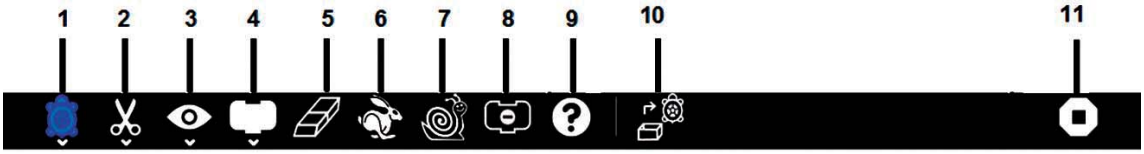


Fig. 2. *Main toolbar and its components*

1. Activity toolbar (includes sharing; saving/loading options);
2. Edit toolbar (includes copy and paste);
3. View toolbar (includes full-screen, coordinate overlays and turtle status);
4. Palette toolbar (includes all programming blocks);
5. Erase canvas;
6. Run project fast (rabbit);
7. Run project slow (snail);
8. Hide blocks (This button is replaced by the stop button when the project is running);
9. Help;
10. Load examples;
11. Stop activity.

Palettes Toolbar

To get the Palettes toolbar, click on the Block icon on the Main toolbar.

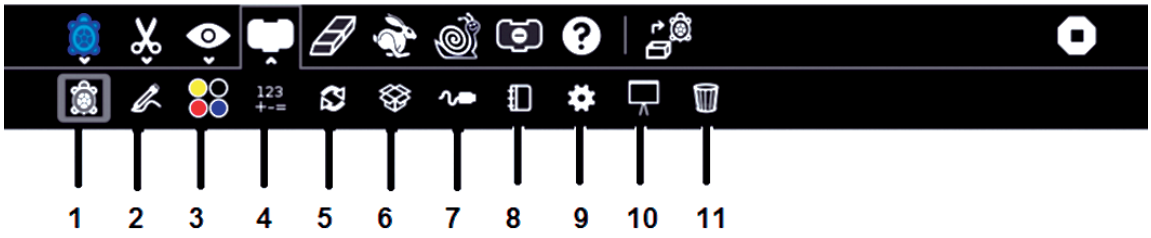


Fig. 3. *Palettes toolbar and its components*

The palettes toolbar consists of the following palettes:

1.	Turtle Palette	5.	Flow Palette	9.	Extras Palette
2.	Pen Palette	6.	Blocks Palette	10.	Portfolio Palette
3.	Colour Palette	7.	Sensors Palette	11.	Trash Palette
4.	Numbers Palette	8.	Media Palette		

Each palette consists of blocks. A **block** is a command for the turtle. For example there is a block to tell the turtle to go forward.

Activity - 2 Adding and Deleting Blocks

1. Practise how to add a block by dragging it from the palette to the main area.
2. Practise how to delete a block by dragging it back onto the palette.

You can **add blocks** to your program by clicking on or dragging them from the palette to the main area. You can also **delete a block** by dragging it back onto the palette.

Some of the palettes are discussed below.

(a) Turtle Palette

Blocks available in Turtle palette are used to control the movements of the turtle.

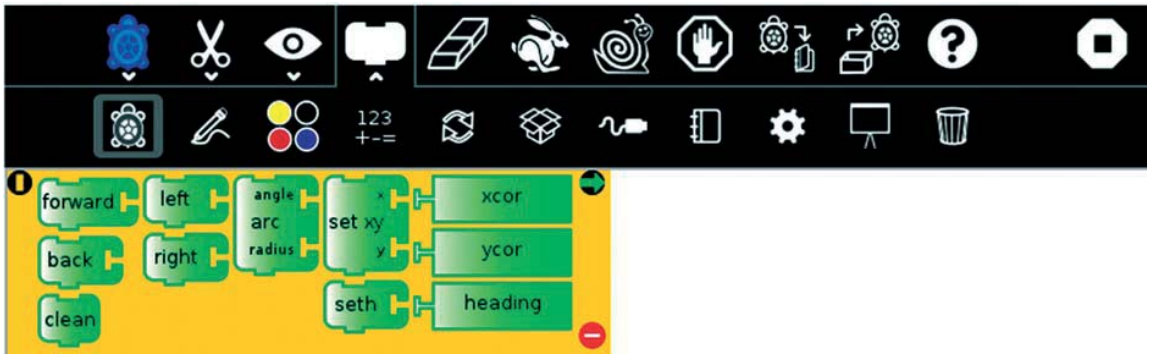


Fig. 4. *Turtle palette*

(b) Pen Palette

Blocks available in Pen palette are used to control the attributes of the Turtle's pen.

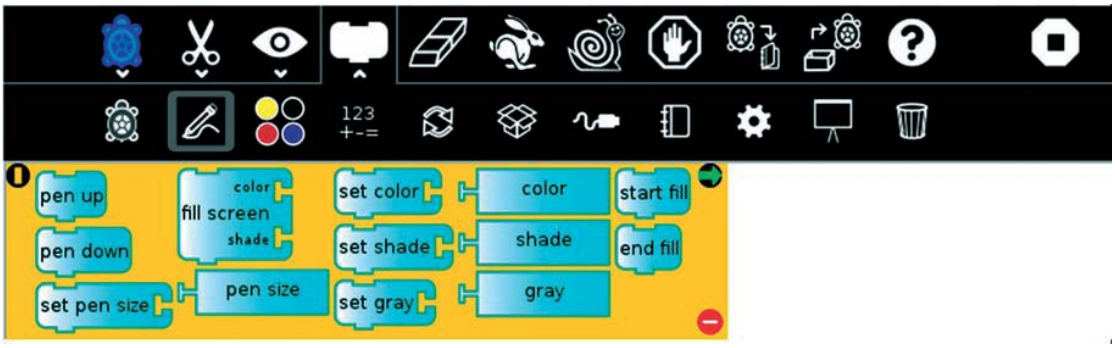


Fig. 5. *Pen palette*

(c) Colour Palette

Blocks available in Colour palette can be used with the set-pen-colour block in place of a number block.

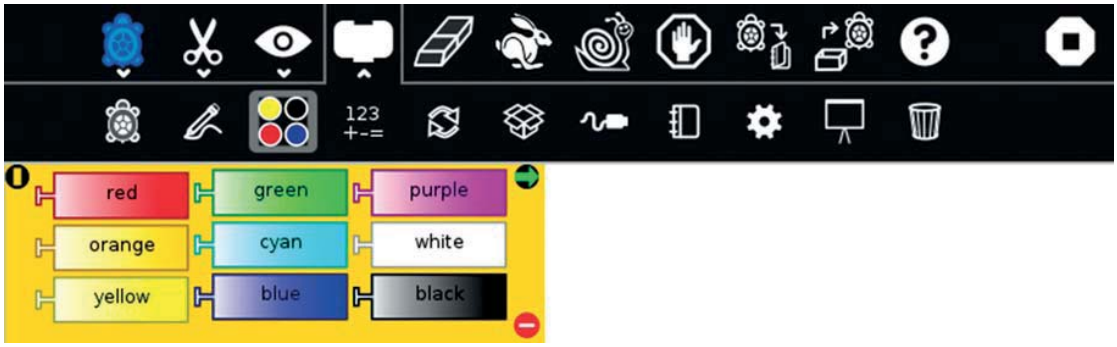


Fig. 6. *Colour palette*

(d) Numbers Palette

The blocks available in Numbers palette are used to perform arithmetic operations. For example: Addition, subtraction, multiplication, division, identity, modulo, square root, random number, etc.

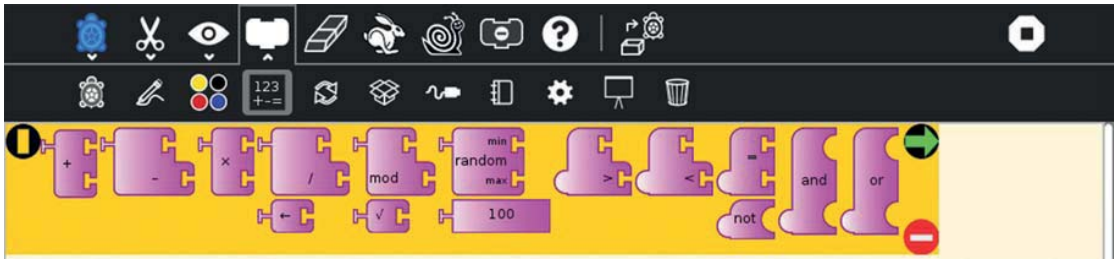


Fig. 7. *Numbers palette*

(e) Flow Palette

Blocks available in Flow palette control the program flow.

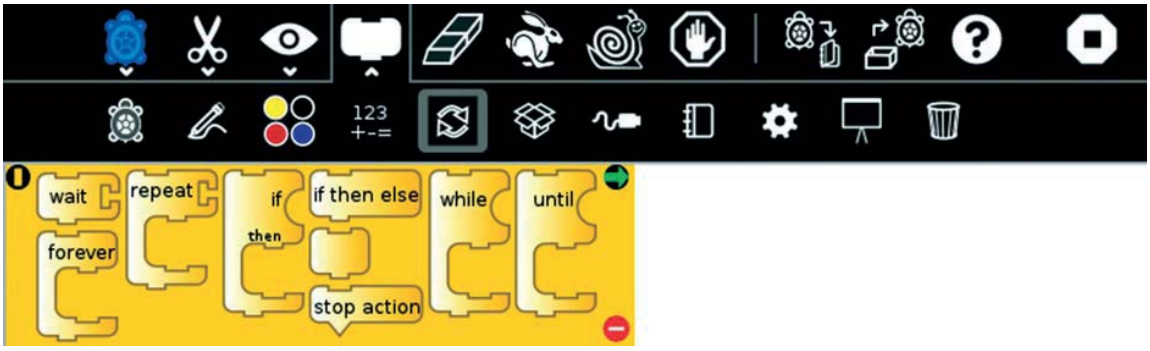


Fig. 8. *Flow palette*

(f) Blocks Palette

The blocks available in Blocks palette can be used to define variables and subroutines, store a number, string or media object in a named box.

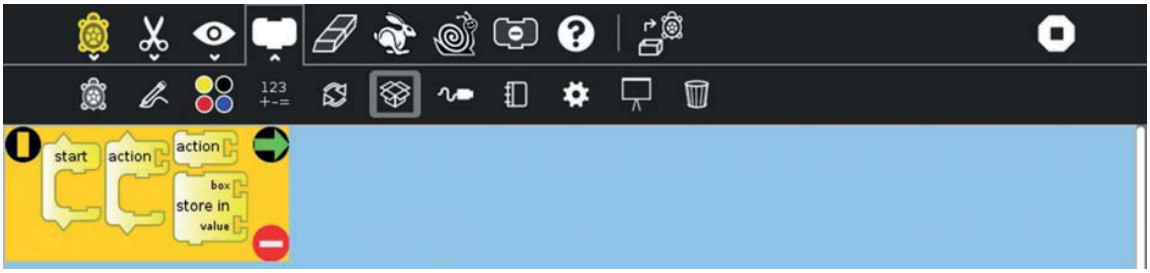


Fig. 9. *Blocks palette*

(g) Sensors Palette

Blocks available in Sensors palette are used to check keyboard input, current value of keyboard input, check picture value and pixels, set volume loudness and pitch.

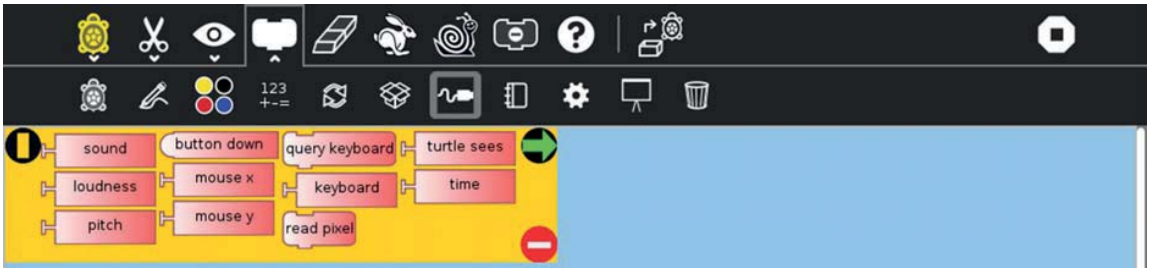


Fig. 10. *Sensors palette*

(h) Media Palette

Blocks available in Media palette can be used to control your media like scaling, fonts, play, stop and duration.

Fig. 11. *Media palette*

(i) Extras Palette

Using the blocks in extras palette we can access advanced features. For example, push value onto FILO (first-in last-out) heap, show FILO in status block, empty the FILO, print value in status block, program comment (displayed in "walk" mode).

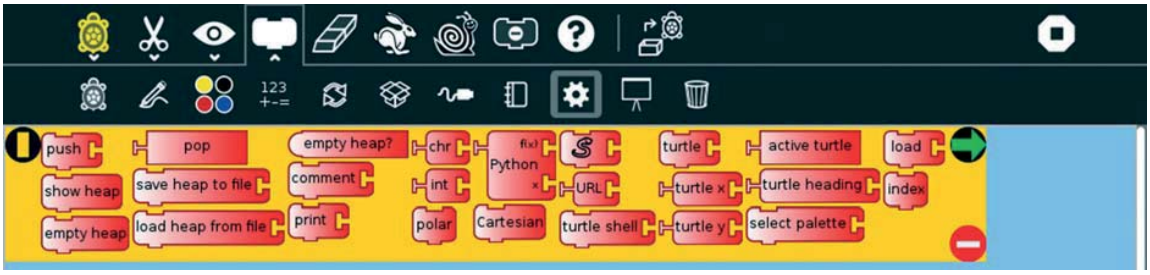


Fig. 12. *Extras palette*

(j) Portfolio Palette or Presentation Palette

Using the blocks, we can see and run our activity in full screen. We can also adjust our presentation position, for example, left, right, top and bottom.

Fig. 13. *Portfolio palette or presentation palette*

(k) Trash Palette

Using the blocks, we can easily delete or restore all holds block. We can also clear our trash.

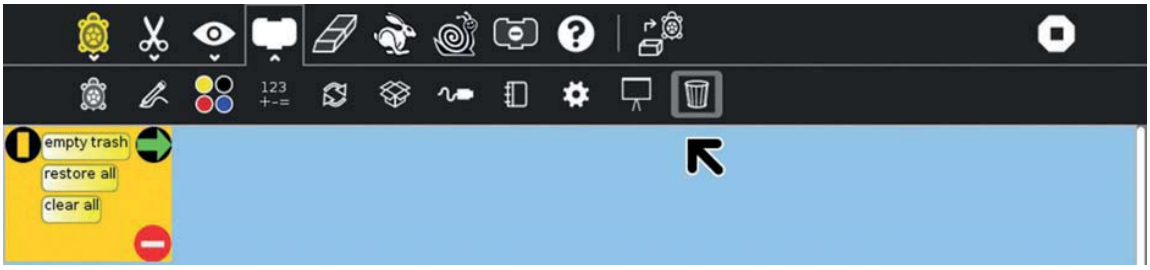


Fig. 14. *Trash palette*

6.3 Using Turtle Art Instructions/Commands

Here are some instructions you can use in Turtle Art.

(a) **Forward:** Using this command, you can move the turtle forward with the number of pixels entered.

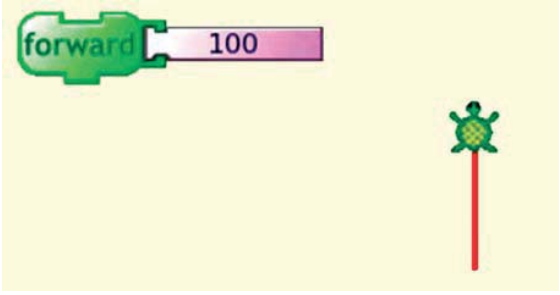


Fig. 15. *Forward command*

(b) **Back:** Using this command, you can move the turtle backward with the number of pixels entered.

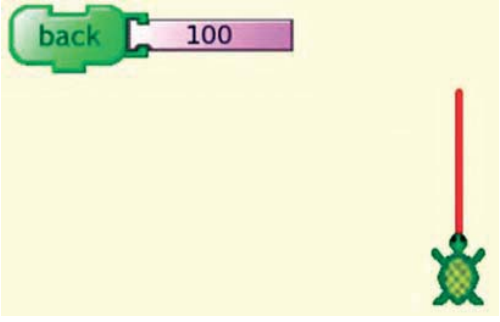


Fig. 16. *Back command*

(c) **Left:** Using this command, you can change the turtle's direction to the left by a specified angle.

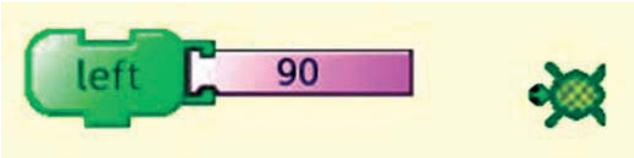


Fig. 17. *Left command*

(d) **Right:** Using this command, you can change the turtle's direction to the right by a specified angle.

Fig. 18. *Right command*

(e) **Arc:** Using this command, you can draw a part of the circle. The angle is the part of the circle that the turtle draws.

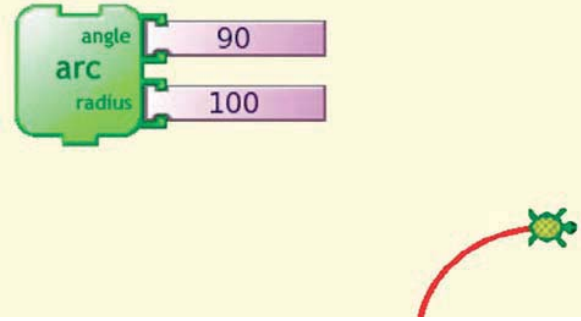


Fig. 19. *Arc command*

(f) **Clean:** Using this command, you can clean or clear the screen of all drawings.

Fig. 20. *Clean command*

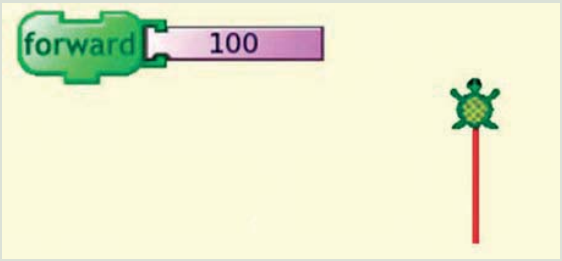
6.4 Drawing

Using multiple blocks from the Turtle palette, we can draw lines (horizontal and vertical), square, rectangle and circle.

Activity - 3 Drawing Geometrical Shapes Using Turtle Art

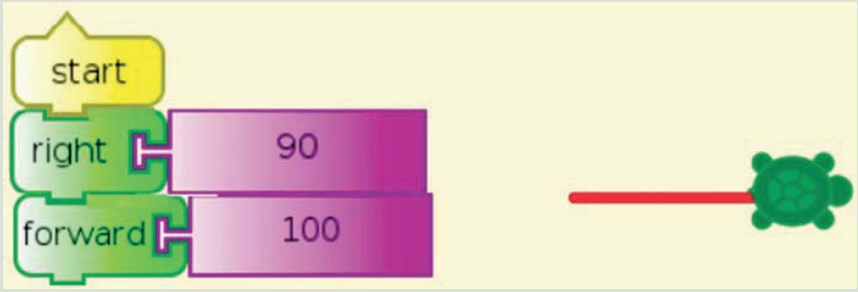
To draw a vertical line:

1. Move the turtle forward 100 spaces
2. To make the line longer, repeat this step.



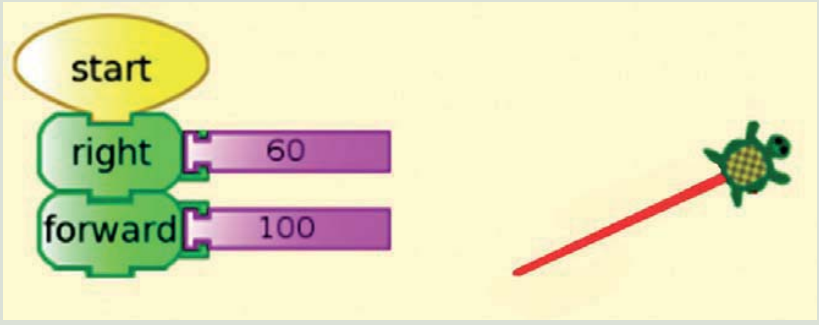
To draw a horizontal line:

1. Turn the turtle right 90 degrees.
2. Then move the turtle forward 100 spaces.



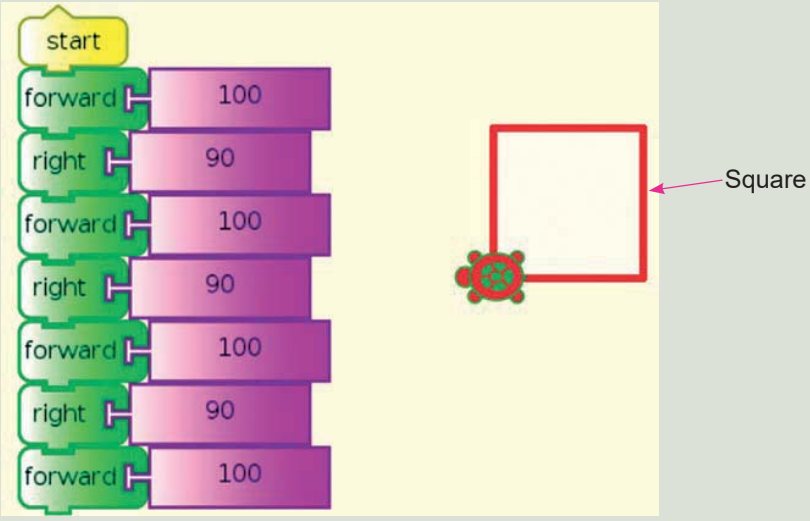
To draw a oblique line:

1. Turn the turtle right 60 degrees.
2. Then move the turtle forward 100 spaces.



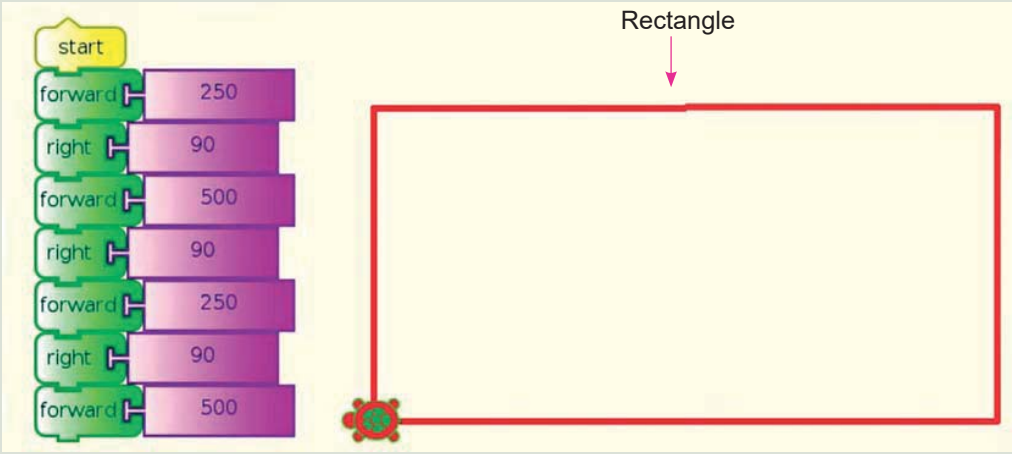
To draw a square:

1. Move the turtle forward 100 spaces.
2. Then turn the turtle right 90 degrees.
3. Move the turtle forward 100 spaces.
4. Then turn the turtle right 90 degrees.
5. Move the turtle forward 100 spaces.
6. Then turn the turtle right 90 degrees.
7. Move the turtle forward 100 spaces.
8. Now the turtle comes to its original position and forms a square.



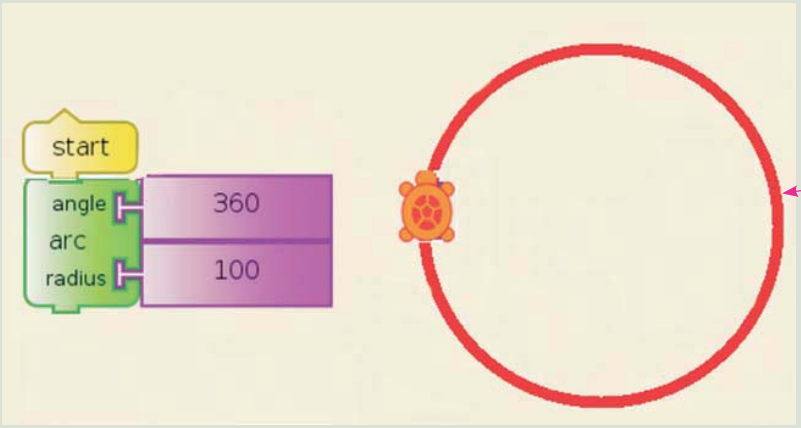
To draw a rectangle:

1. Move the turtle forward 250 spaces.
2. Then turn the turtle right 90 degrees.
3. Move the turtle forward 500 spaces.
4. Then turn the turtle right 90 degrees.
5. Move the turtle forward 250 spaces.
6. Then turn the turtle right 90 degrees.
7. Move the turtle forward 500 spaces.
8. Now the turtle comes to its original position and forms a rectangle.



To draw a circle:

- Arc the turtle right 360 degrees with radius 100 spaces.



6.5 Saving a Document, Closing and Opening Turtle Art Activity

To save a document:

Once you have completed your work, it is time to save the document, using the following steps:

1. Click on **Project** toolbar.
2. Click on **Save** menu. It will offer four options.
3. Right Click on option in which you wish to save. The **Save As** dialogue box appears.
4. Choose the location where you want to save your document.
5. Click on **Save**.

To close a document:

When your document is saved, it is time to close it. To close:

1. Click on **Stop Activity** on Main toolbar.
2. Turtle Art Window will be closed.

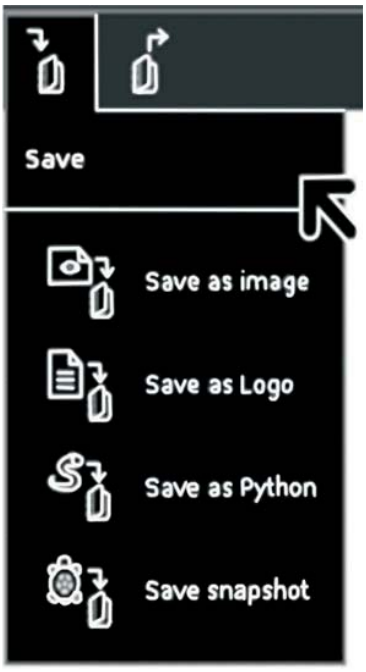


Fig. 21. *Save menu*

Fig. 22. *Stop Activity on Main toolbar*

6.6 Scratch Window

Scratch is a fun programming language. It provides a learning environment for kids. It allows us to create games, stories and animation. It can be used to write and run a program. Scratch is developed by the Lifelong Kindergarten Research group at the MIT Media Lab, USA.

Activity - 4 | Getting Started Scratch Window

1. Go to the folder where you copied the Scratch.
2. Double click the Scratch icon.

You will see the Scratch window as shown.

Fig. 23. *Scratch window*

The Scratch window has the following components:

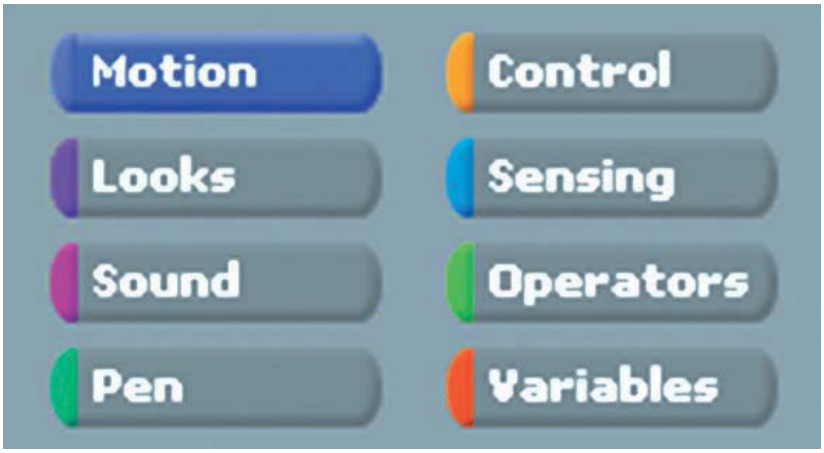


Fig. 24. *Components of Scratch window*

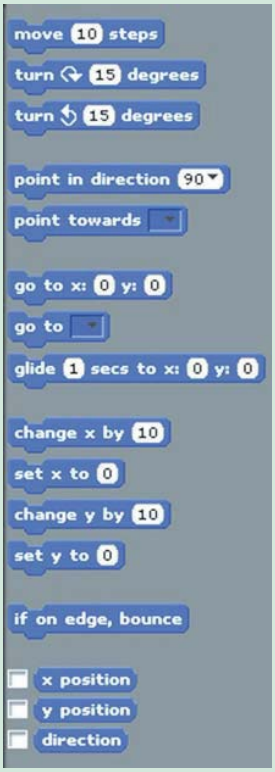
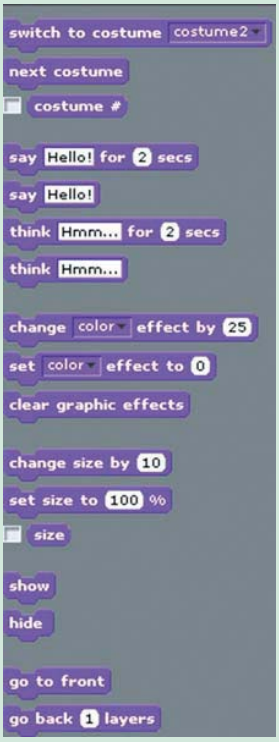
(a) Command Palette

Command Palette is an area in the top-right corner of the Scratch window. These blocks consist of the following categories:

- **Motion:** Moves sprites and changes angles.
- **Looks:** Controls the visuals of the sprite; attaches speech or thought bubble, changes background, makes the sprite bigger or smaller.

- **Sound:** Plays audio files and programmable sequenced audio.
- **Pen:** To draw on portrait by controlling pen width, color, and shade.
- **Control:** Conditional if-else statement, "forever", "repeat", and "stop".
- **Sensing:** Sprites can interact with the surroundings the user has created.
- **Operators:** Mathematical operators, random number generator and statement that compare sprite positions.
- **Variables:** Defines variable and makes list for sprites.

Toolbar contains all the eight commands of Command Palette as shown below.

Motion	Looks	Sound	Pen
			

(Continued...)

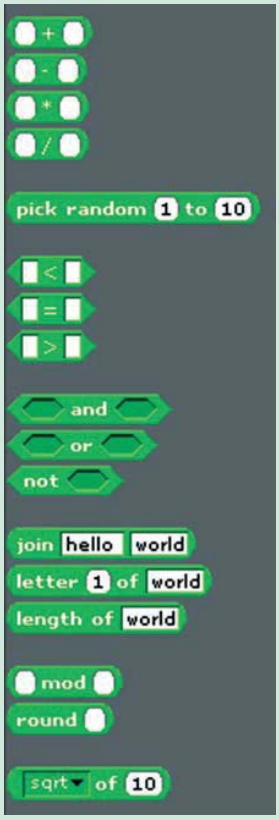
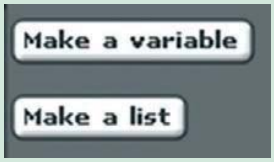
Control	Sensing	Operators	Variables
			

Table 1: Commands of a Command Palette

(b) Script Pane

The middle pane of scratch is called the **Scripting pane**. Here all program codes are constructed and stored. You can create and view the scripts pertaining to the current sprite.

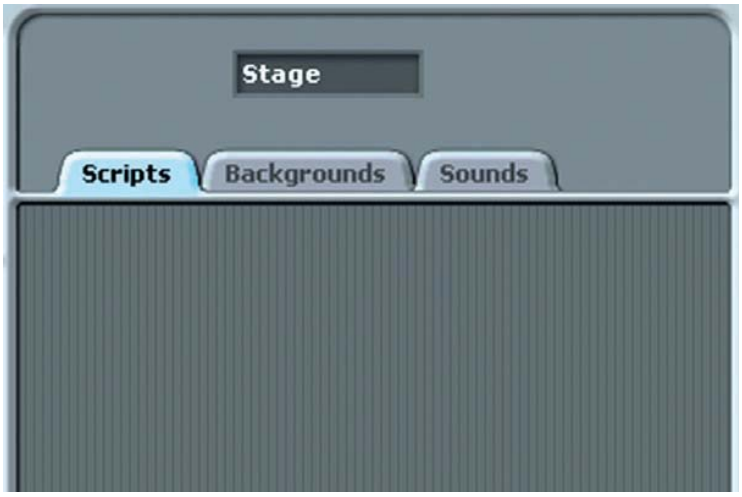


Fig. 25. *Script pane of Scratch*

(c) Stage Pane

The stage is where all the actions take place. The stage is 480 steps wide by 360 steps tall.

Fig. 26. *Stage pane of Scratch*

(d) Thumbnails Pane

On the left, you can see a thumbnail for the stage. Clicking on **Thumbnails Pane**, it changes 'Current Sprite Information' area to reflect properties of the stage. To change the appearance of the stage, you would select a different 'Background' as opposed to 'Costume'.

On the right, you can see thumbnails of all of the sprites used in the project together with sprite's name. You can easily change current sprite by clicking on a different one.

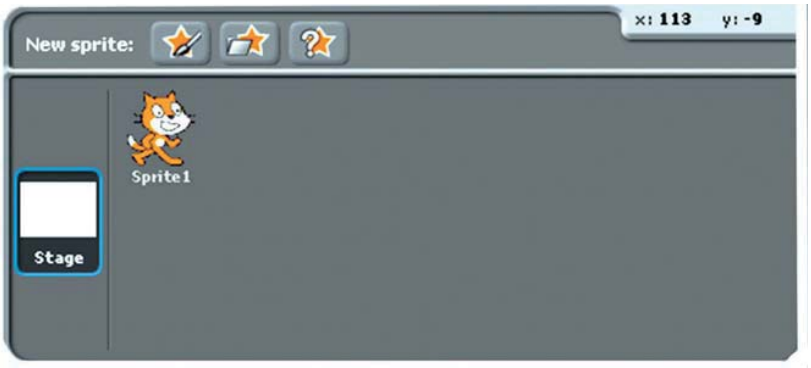


Fig. 27. *Thumbnail pane of Scratch*

6.7 Object Animations (Animate an Object)

You can change costumes or position of an object by animation. Animation involves sprites to talk and interact. The following are different steps to animate an object.

(a) Choosing New Sprite from File

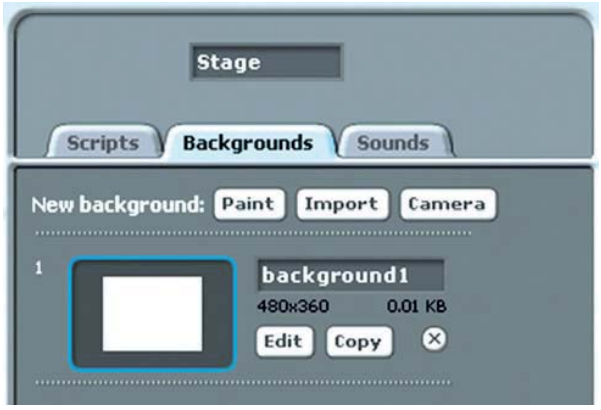
1. Choose **File** menu from menu bar.
2. Click on **New** option from drop-down list box. You will get sprite to work on new project.

(b) Changing the Background

To change the background of an object:

1. Select the **Stage** thumbnail from the Sprite List.
2. Now choose **Backgrounds** from the Tabs area. You can Paint a background yourself. Import a background from a file.

   You can also Edit an existing background or Copy a background (useful to do before editing).
3. Select **Import** and find a background you like in one of existing files (such as 'Outdoors' > 'brick-wall1'). Click 'OK' when ready.
4. Since you no longer need 'background1' you can delete it. You should now have an interesting background!

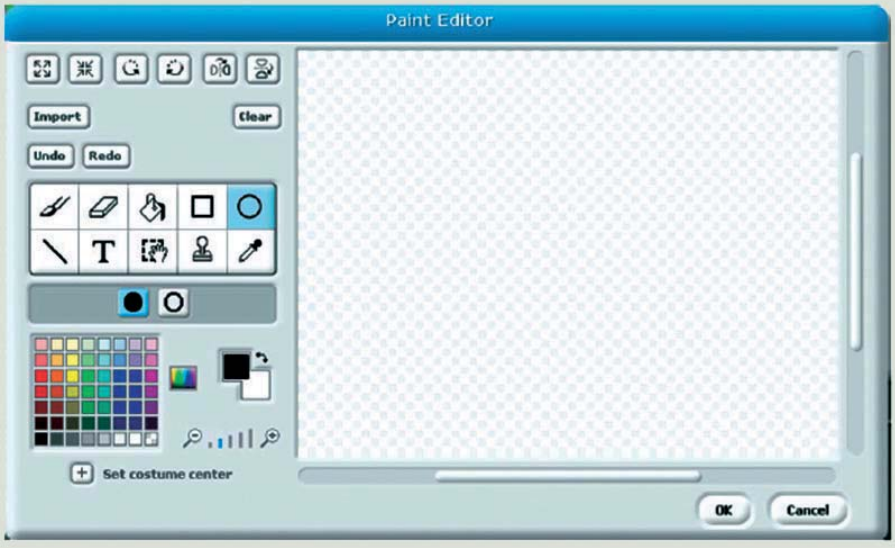


(c) Adding Blocks to Scripts

Activity - 5 | Creating a Project by Adding Blocks to the Script

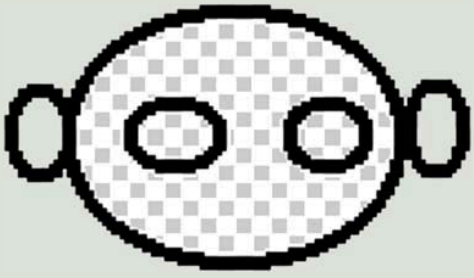
1. Go to the folder where you copied the Scratch. Then double click the Scratch icon to open the Scratch window.
2. Delete the Cat sprite named 'Sprite1'. To delete the sprite, right click on 'Sprite1' and select **Delete**.

3. Click ( ) to open Paint Editor. The **Paint Editor** window appears.



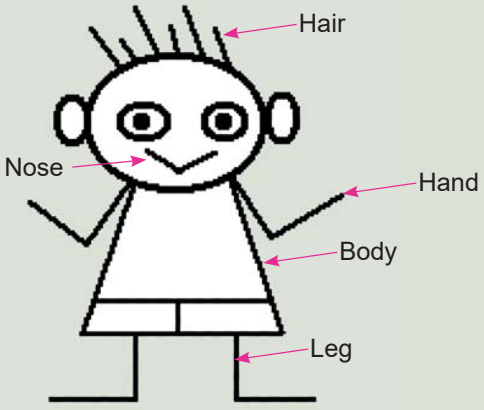
Paint Editor window

4. Click Ellipse Tool ( ) and click hollow mode ( ). Draw five circles.



5. Click Ellipse Tool ( ) and click solid mode ( ). Draw two dark solid circles inside the eyes.

6. Click the Line Tool ( ) and draw its nose, body, legs, hands and hair.



7. Click Fill Tool ( ) and fill its body and dress with colours.

8. To save the sprite, click **OK**. By default the new sprite is named as **Sprite1**.

9. Rename the new sprite as **Dancer1**.
10. Click the **Script** tab.

11. Sprite **dancer1** doesn't have any script blocks. Click **Control**.

12. Then drag out **forever** script block and drop it in the script editor.

13. Click **Looks**. Drag out **next costume** block and drop it inside **forever** block to form a combo block.

14. Now double click this combo block to see dancer1 spin like crazy!

15. If you need to slow him down, click **Control** again. Drag **wait 1 secs** and drop it under **next costume**. Now double click the combo block again.

Now your animation is ready.

(d) Playing/ Executing Scripts

We are almost done with creating our first animation. To wrap it up, drag **when clicked** and drop it above **forever** block. Now click the button to start the animation.

View in **full-screen** mode or **presentation** mode by clicking .

(e) Project

A project is a creation made in the Scratch program. It can be about anything from music to animation, art and games.

Saving a Project

When you are satisfied completely with the execution of your script:

1. Click on **File** menu. A Drop-down **List Box** appears.

Fig. 28. *File menu*

2. Choose **Save** option. The **Save Project** dialog box appears.

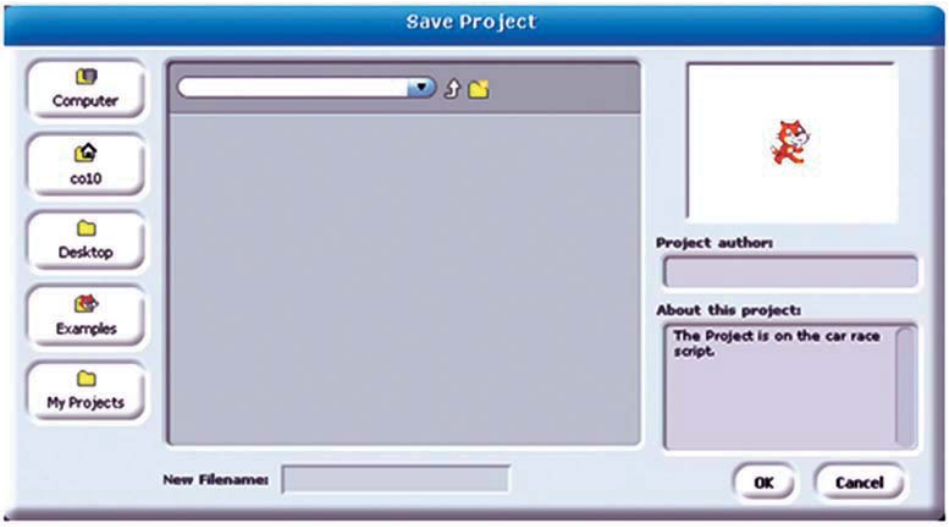


Fig. 29. *The Save Project dialog box*

3. Choose the location where you want to save the project. Type your file name in the **New Filename** box. Write the name of the **Project Author**. Write **About this project**.
4. Click on **OK** button.

Closing Scratch Activity

To close your scratch activity:

1. Click on **File** menu. A Drop-down **List Box** will appear.
2. Choose **Quit** option. Your scratch activity will be closed.

Opening a Project

If you want to show your saved project to your friends:

1. Open the **Scratch** window.
2. Click on **File** menu. A Drop-down **List Box** appears.
3. Choose **Open** option. The **Open Project** dialog box appears.
4. Select the location. Double click on the saved project. Your project will be opened.

Activity - 6 | Creating and Animating a Sprite

1. In Scratch window, create a sprite.
2. Animate it by arranging the instructions required.

6.8 Keywords

- **Program:** A collection of instructions.
- **Scratch:** Scratch can be used to write and run programs.
- **Scripting pane:** All program code is constructed and stored in this pane.
- **Thumbnails Pane:** It changes 'Current Sprite Information' area to reflect properties of the stage.
- **Turtle Art:** It is a programming language.

6.9 Summary

- A computer program is usually written by a computer programmer in a programming language.
- Blocks can be added to program by clicking on or dragging them from the palette to canvas.
- You can add blocks to your program by clicking on or dragging them from the palette to canvas. You can also delete a block by dragging it back onto the palette.
- Using arc command you can draw a part of the circle. The angle is the part of the circle the turtle draws.
- With Scratch, you can program your own interactive stories, games, and animations. You can share your creations with others in the online community.

6.10 Unit Review Exercises

Do these review exercises in your exercise book.

I. Fill in the blanks with the correct options:

1. Turtle Art is an example of ..... .
   (a) Programming lunguange (b)PASCAL (c)BASIC (d) ASCII
2. Using …… command you can move the turtle forward with the number of pixels entered.
   (a) Back (b) Forward (c) Left (d) Right
3. Using …….. command you can move the turtle backward with the number of pixels entered.
   (a) Back (b) Forward (c) Left (d) Right
4. Scratch can be used to write and run …….. .
   (a) application (b) hardware (c) software (d) programs
5. All program codes are constructed and stored in …….. .
   (a) Command Palette (b) Script Pane
   (c) Stage Pane (d) Thumbnails Pane

II. State whether the following statements are true or false:

1. A computer requires programs to function.
2. Scratch and Turtle Art are two popular programming languages for kids.
3. Using clean command you can clear the screen of all drawings.
4. Using left command you can change the turtle's direction to right by the angle specified.
5. Pen Palettes are used to control the movements of the turtle.

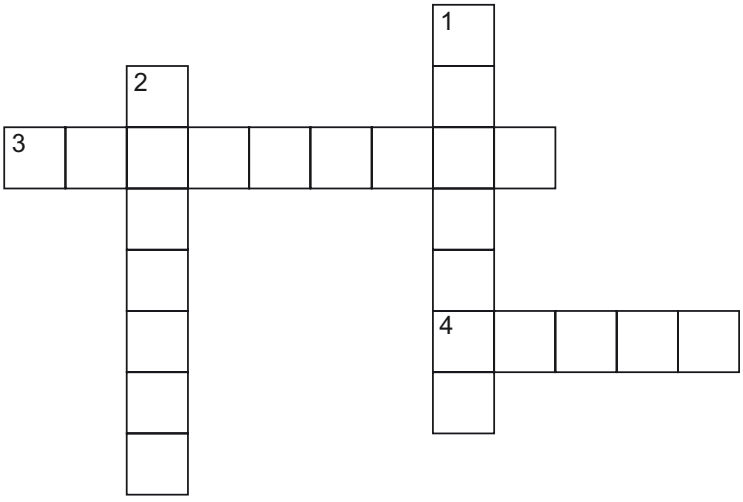
III. Match the following:

	Palette		**Function**
1.	Flow Palette	(a)	controls the attributes of the Turtle's pen
2.	Colour Palette	(b)	controls the movements of the turtle
3.	Pen Palette	(c)	all the actions take place
4.	Turtle Palette	(d)	is used with the set-pen-colour block
5.	Stage Pane	(e)	controls program flow

IV. Answer the following questions briefly:

1. List any two popular programming languages for kids.
2. What is the use of Arc command?
3. List categories of Command Palette.
4. List uses of the following commands:
   (a) Forward (b) Back (c) Left (d) Right
5. Write commands to draw a:
   (a) horizontal line (b) rectangle
6. Write the steps to open a scratch activity.

V. Complete the following crossword puzzle using the clues below:



Clues:

Across

3. It is a part of programming language .
4. This command is used to clear the screen of all drawings.

Down

1. This is a fun programming language for kids.
2. It is a collection of instructions.

Unit 7 Air, Wind and Sound

Air is what everybody breathes. It is a mixture of gases. A moving air is called wind. Air is the gaseous medium through which sound propagates.

Activity - 1 Feeling the Presence of Air

Wave your notebook across your face.

What do you feel?

You will feel **air**. Air is everywhere. We cannot see it. We can only feel it.

7.1 Main Properties of Air

Activity - 2(a) Exploring Properties of Air

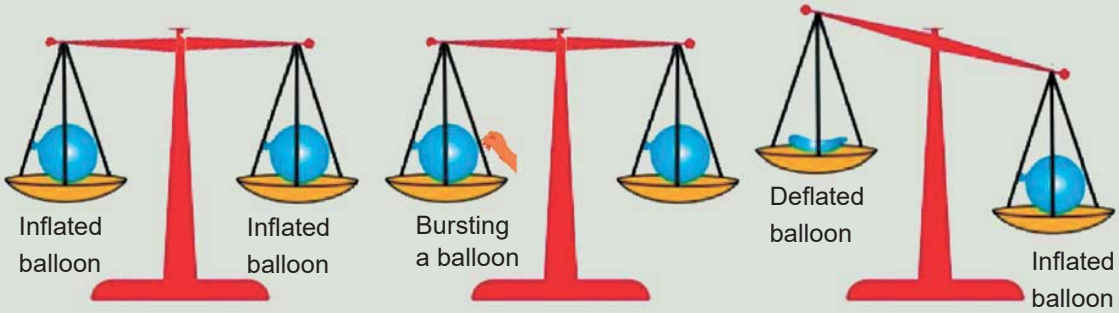
1. Take a deflated balloon.
2. Blow it until it increases in size.

   What makes the balloon inflate? Explain why?

Air makes the balloon inflate. This is because the air blown into the balloon occupies space. In the same way, air causes football and bicycle tubes to inflate. This shows that **air occupies space**.

Activity - 2(b) Exploring Properties of Air

1. Take two balloons of the same size.
2. Blow them up to the same size.
3. Tie their ends with string.
4. Now place these on the two pans of a beam balance.
   What do you observe?
5. Now burst one balloon and observe what happens.

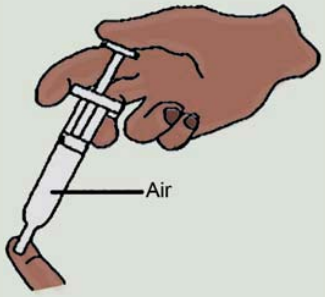


Why does the pan that holds deflated balloon go up and the other end come down?

The inflated balloon goes down as it is heavy. The inflated balloon is heavy because it has air in it. This shows that the **air has weight**.

Activity - 2(c) Exploring Properties of Air

1. Take a syringe.
2. Pull its plunger and draw in 10 mL of air.
3. Then cover its nozzle with your finger.
4. Try to push the plunger down.
   What do you observe?
   Why can you push the plunger into a certain extent? Discuss.



Air inside the syringe gets compressed to a certain extent. This shows that **air can be compressed**.

Thus, the air has the following properties:

(a) Air occupies space

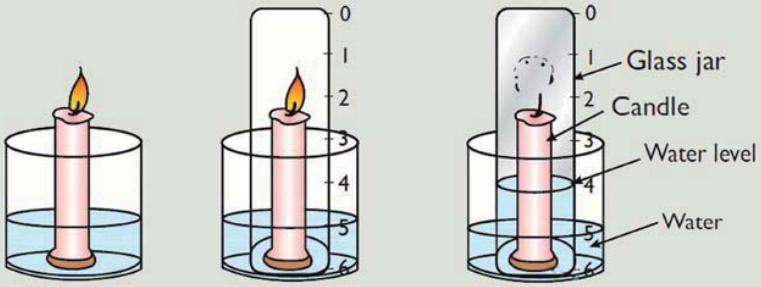
(b) Air has weight

(c) Air can be compressed

7.2 Composition of Air

Activity - 3 | Experiment on Composition of Air

1. Take a beaker and fix a candle on it.
2. Pour water into it.
3. Mark the initial level of water.
4. Light the candle.
5. Cover the candle with a glass jar.
6. Record your observation.



The candle stops burning when it is covered by the jar. It is because the burning candle has used up the oxygen present inside the jar. Water rises up to fill this space. The level of water rises to one-fifth of the glass jar. This is because one-fifth of air is used up in the jar. This shows that **oxygen is one-fifth of air**.

Air is a mixture of various gases. It consists of the following gases:

- Nitrogen 78%,
- Oxygen 21% (one-fifth of air),
- Rare gases like Argon 0.97%, and
- Carbon dioxide 0.03%.

Besides these gases, dust particles, water vapour and smoke are also present in the air.

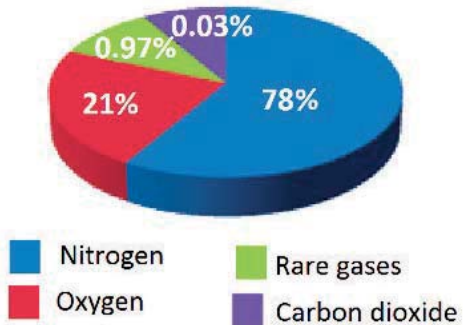


Fig. 1. *Components of air*

7.3 Utility of Air Components in Daily Life

Air has different components. Each component has some specific use. Some of them are:

(a) Nitrogen

Activity - 4 | **Discussing the Use of Nitrogen**

1. Discuss the following questions in groups:
   - What would happen if there was no nitrogen in the air?
   - Write some other uses of nitrogen.
2. Make a report on it and present to the class.

If there was no nitrogen in air, everything would burn rapidly on the earth surface. Nitrogen prevents this rapid burning. Nitrogen is also used in the preparation of fertilisers.

(b) Oxygen

Activity - 5(a) | **Exploring the Use of Oxygen**

1. Take two cockroaches.
2. Keep one in the first jar and other in the second jar.
3. Place a burning candle in the second jar.
4. Now cover the second jar with its lid.

   What difference do you observe? Explain why?

Carry out this activity under your teacher's supervision.

You will see that the cockroach in the second jar dies. This is because the burning candle has used the oxygen present inside the jar. Due to the lack of oxygen, the cockroach could not respire. This shows that **oxygen is used in respiration**.

Activity - 5(b) Exploring the Use of Oxygen

1. Take two potted plants.
2. Keep them in the open.
3. Cover one of the plants with a bell jar.

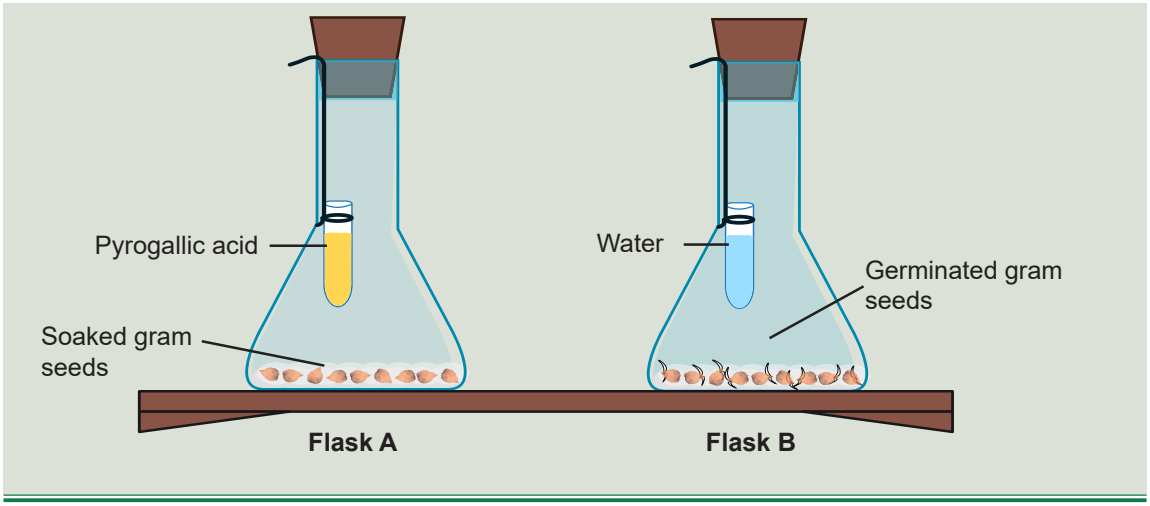
   What do you observe after 2-3 hours?

The plant covered with bell jar wilted. This is because it got no oxygen for respiration. The plant which was kept open did not wilt. This is because it got oxygen for respiration.

This shows that **oxygen is necessary for respiration**.

Activity - 5(c) Exploring the Use of Oxygen

1. Take two flasks and label them A and B.
2. Put wet cotton cloths in both flasks.
3. Place equal number of soaked gram seeds on the wet cotton wool in both the flasks.
4. Take two test tubes and tie them with threads.
5. In the first test tube, fill Pyrogallic acid which absorbs oxygen. Hang this test tube in flask A. Ensure that no acid falls on the cotton wool.
6. In the second test tube, fill water and hang this test tube in flask B.
7. Seal both the flasks with the corks and keep them in the room at ordinary temperature.
8. Observe them after two days.

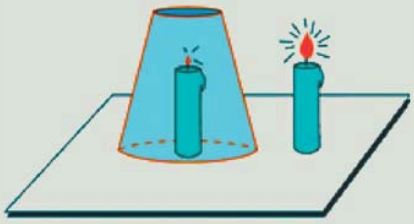


You will find that seeds in flask B grow while seeds in flask A do not. In flask A, oxygen was absorbed by the pyrogallic acid and no germination took place. In flask A, there was oxygen and germination took place. This shows that **oxygen is necessary for seed germination**.

Activity - 5(d) Exploring the Use of Oxygen

1. Light two candles.
2. Fix them on a flat surface.
3. Cover the first one with a transparent cup.

What do you observe?



Carry out this activity under your teacher's supervision.

The candle covered with the cup goes off after some time. This is because the supply of oxygen is interrupted. This shows that **oxygen supports combustion**.

Thus, oxygen is used for the following purposes:

(a) Respiration

(b) Plant germination

(c) Combustion

(c) Argon

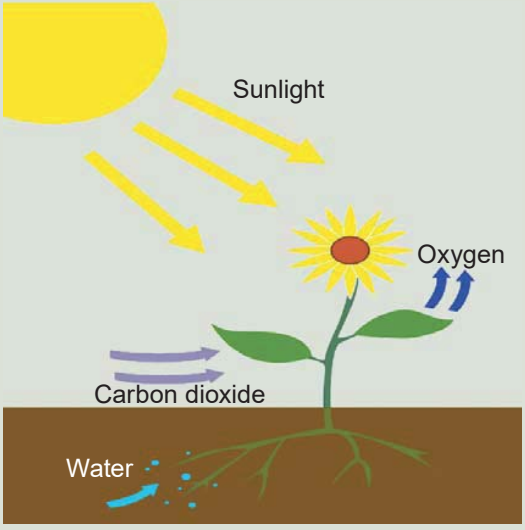
Activity - 6 Exploring the Use of Argon

1. What does the picture show?
2. Which gas is used in it?

Argon is used in the light bulb.

(d) Carbon Dioxide

Activity - 7(a) Exploring the Use of Carbon Dioxide



1. What does the picture show?
2. What is the process called?
3. Which gas is used in this process?

This is the process of **photosynthesis**. In this process, green plants use carbon dioxide to prepare food.

Activity - 7(b) Exploring the Use of Carbon Dioxide

1. Go to your school garden.
2. Cover some grass in the garden with a brick.
3. After two days, remove the brick and observe colour of the covered grass.
4. Similarly, observe the colour of covered grass on every second day.
5. Continue this process for about 10 days.
6. Write your observation in your notebook.
7. Discuss your findings in the class.

(*a*) *Before* (*b*) *After*

The grass covered with the brick cannot receive atmospheric carbon dioxide and light. So it is unable to prepare its food and becomes pale yellow.

This shows that **carbon dioxide is essential for green plants**.

Activity - 7(c) Exploring the Use of Carbon Dioxide

1. What does this picture show?
2. Why does the drink fizz up?
3. Which gas is used in its preparation?

In factory, **carbon dioxide is pressurized into the soft drink bottle**. Carbon dioxide is poorly soluble in water. When we open the bottle, carbon dioxide is quickly released. Therefore, releasing the pressure it produces fizz.

Activity - 7(d) Exploring the Use of Carbon Dioxide

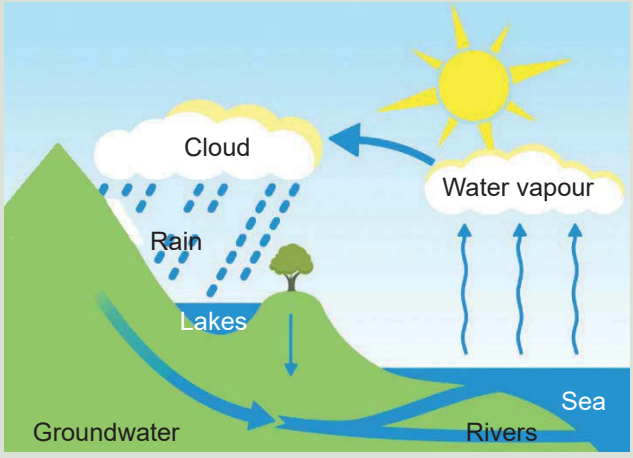
1. What does the picture show?
2. Which gas is used in the fire extinguisher?

Carbon dioxide is used in the fire extinguisher to put the fire off.
Thus, carbon dioxide has the following uses:

(a) Green plants use carbon dioxide to make their food.
(b) Carbon dioxide is used for **making industrial beverages** like soda water.
(c) Carbon dioxide is used in **fire extinguishers** to put the fire off.

(e) Water Vapour

Activity - 8 Exploring the Use of Water Vapour



1. What does the picture show?
2. What is the role of water vapour in this process?

The picture above shows the cycle of water.

Water vapour forms clouds and then falls as rain on earth. So it is essential for life processes on earth.

7.4 Dangers of Components of Air

(a) Carbon Dioxide and Water Vapour

The atmospheric air contains a little amount of carbon dioxide and water vapour. These are the most powerful greenhouse gases.

Charcoal stoves, brick kilns, factories and motor vehicles release carbon dioxide into the atmosphere. Bushfire also increases the amount of carbon dioxide in the atmosphere. This gas traps the heat released by the earth. As a result, the atmospheric temperature increases.

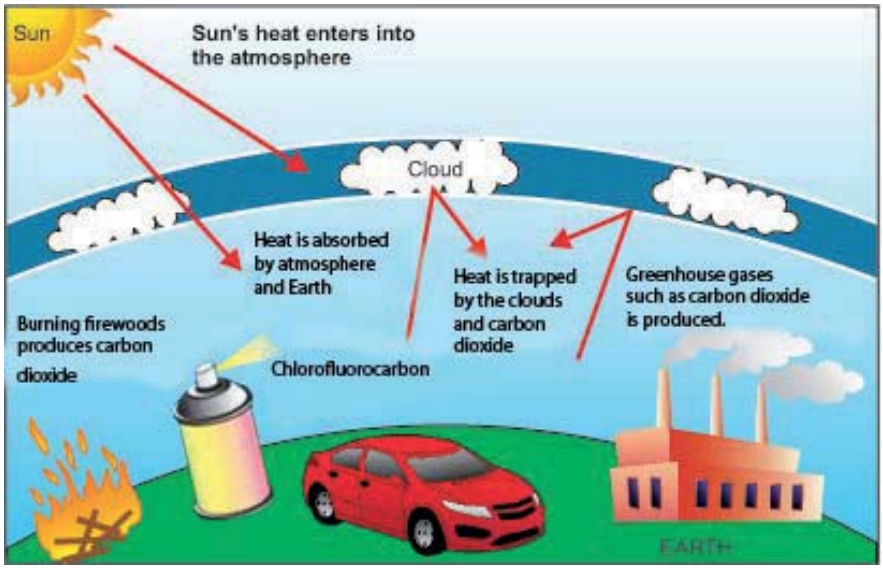


Fig. 2. *Global warming*

Water vapour is produced during boiling of water. These vapours are suspended in the atmosphere as clouds. These clouds trap the heat released by the earth. As a result, the atmospheric temperature increases.

The process of rising atmospheric temperature is called **global warming**.

(b) Carbon Monoxide

Carbon monoxide is a poisonous gas.

Activity - 9 | Exploring the Dangers of Carbon Monoxide

1. Take a small rat and keep it in the first jar.
2. Take another rat and keep it in the second jar.
3. Place a burning candle in the second jar.
4. Now cover both the jars with their lids.

What difference do you observe? Explain why?

Caution Carry out this activity under your teacher's supervision.

You will see that the rat in the second jar gets unconscious. This is because the burning candle fills the jar with carbon monoxide. It shows that carbon monoxide is dangerous.

Breathing carbon monoxide can cause headache, vomiting, nausea and loss of consciousness. It is invisible, tasteless and non-irritating. It is released from charcoal stoves, brick kilns, factories and motor vehicles when fuel burns. It is also released from bushfires.

People in rural areas use wood/ charcoal stoves to cook their food. Charcoal stoves are a source of carbon monoxide. So never cook food inside a closed room.

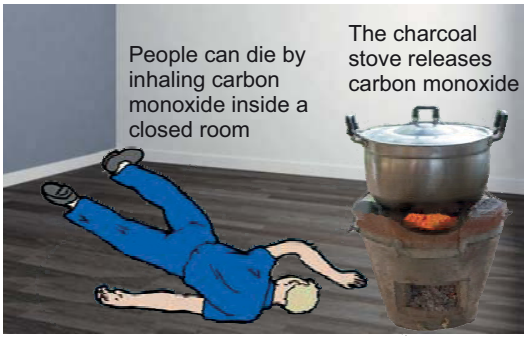


Fig. 3. *Dangers of carbon monoxide*

7.5 Prevention from Global Warming

To prevent atmosphere from global warming:

1. Reduce fuel consumption.
2. Walk, use bicycle or take public transport.
3. Encourage people to plant trees to preserve the rainforests.
4. Use solar and wind energy.
5. Maintain your vehicle properly.
6. Turn off your vehicles at the traffic lights.
7. Buy energy-efficient appliances.

7.6 Wind and its Types

Activity - 10 **Discovering the Existence of Wind**

Place a burning candle in your school verandah.

What do you observe?

What makes the candle flame disturbed?

Moving air disturbs the flame. This moving air is called **wind**. It blows from a particular direction.

Activity - 11 **Discussion on Nature and Speed of Wind Movement**

1. Discuss what type of wind is blowing by looking out of the window. Explain its nature also.
2. Each pupil lists the differences between the types of wind.

Movement of air depends on the change in pressure and temperature of the atmosphere. Winds may be light, breezy or stormy.

(a) Light Wind

The soft and pleasant movement of air is called **light wind**. Light wind can be noticed by smoke **rising vertically** from a mosquito coil.

Fig. 4. *Smoke rising from a mosquito coil*

(b) Breeze Wind

Wind with soothing feeling on a warm day is called **breeze wind**. It blows at a certain speed.

(c) Storm Wind

When wind blows very fast, it is called **storm**. A storm can uproot trees and blow away temporary houses. It can also damage bird's nests, sheds, and crops. We must not go out of our homes during a storm.

Fig. 5. *Storm wind*

7.7 Uses of Air and Wind

Air and wind help animals and human in many ways.

Activity - 12 Flying Birds

1. What does the picture show?
2. What helps the bird to fly?

Air helps the bird to fly in the sky.

Activity - 13 Discussing Breathing Factors

Hold your breath for some time.

How do you feel? Discuss why?

You will feel uneasy. This is because air is necessary for breathing.

Activity - 14 Separating Components of Heterogeneous Mixtures

1. Collect millet, sorghum and a winnower.
2. Go to an open area.
3. Stand on a high platform.
4. Allow the grain to fall down from a height.

   What is this process called?

This process is called **winnowing**. Wind helps in winnowing. In this process, farmers separate lighter husk particles from heavier grains like corn, millet and sorghum.

Activity - 15 Drying Clothes

1. Take two wet clothes.
2. Hang them in the open.
3. Observe these clothes just after two hours.

   What do you observe?

After two hours, you will find the clothes become dry. What make the clothes dry?

The moving air helps the clothes to dry.

Activity - 16 Discussion on Factors of Rain Distribution

1. What does the picture show?
2. What helps the clouds to move for rain distribution?

The picture shows clouds formation, moving air helps the clouds to move for rain distribution.

Activity - 17 Discussing the Sail Boat

1. What does the picture show?
2. What helps the boat to sail on water?

Moving air helps the boat to sail on water.

Activity - 18 Discussing the Windmill

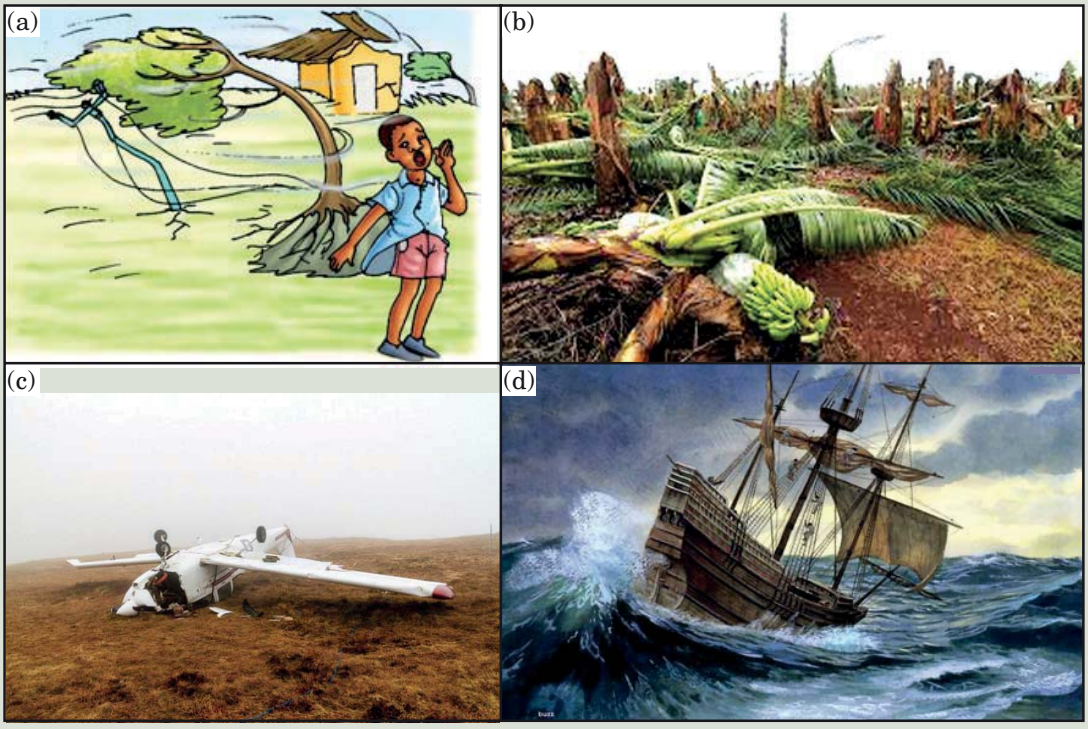
1. What does the picture show?
2. What helps the wheel of the windmill to rotate?

The moving air rotates the wheel of the windmill to generate electricity.

7.8 Dangers of Wind

Air helps us in many ways. But sometimes it is very dangerous.

Activity - 19 | Discussing the Dangers of Wind



1. Observe the pictures above and state what is happening?
2. What do strong winds do to trees and electric poles?
3. How can strong wind damage houses and properties?
4. Why is it unsafe to fly an airplane on a stormy day?
5. Why is it unsafe to sail a boat on a stormy day?

The following are some dangers of wind:

1. Strong winds can uproot the plants and electric poles.
2. It can damage our houses and other properties.
3. It can damage our crops.
4. On a stormy day, an airplane can lose its control and may crash.
5. Strong wind can make a boat sink.

Can you add some more dangers to this list?

Field Trip

Organise a visit to an area spoiled by the wind. Observe and list the effects of wind on environment.

7.9 Prevention of Dangers of Wind

Activity - 20 **Preventing Dangers of Wind**

1. What does the picture show?
2. Why does the boy plant trees around his house?

The boy plants trees around his house. Trees can block the wind speed and protect the house from damage.

We can prevent dangers of wind in the following ways:

1. Trim the branches of trees. It allows the wind to pass through. It lowers the chance of trees tumbling over.
2. Ask the fishermen not to go for fishing on a stormy day.
3. Check the roof for loose tiles. They can get displaced by strong wind and hurt some one.
4. Never go on a stormy day. You can get hurt.
5. Make people aware about the dangers of wind.

Project Work

1. Collect various samples of seedlings.
2. Plant these and do the follow up.
3. Continue this process for many years.

7.10 Sound

Activity - 21 Differentiating Sources of Sound

1. Go outside your classroom.
2. Try to hear different sounds produced in your surroundings.
3. List the sources of each sound, you have heard.
4. Imitate these sounds.
5. Ask your friend to tell what sound you are making.

Sound is a form of energy. It comes from all around us. It comes from:

- people when they talk.
- radios when they play.
- airplanes when they fly.

Even breathing makes a low sound.

(a) Sound Production

Sounds may be soft or loud, high or low, and pleasant or unpleasant. Still, all kinds of sounds are made in the same way.

Activity - 22 Exploring the Causes of Sound

1. Take a drum and hit its membrane.
2. Put some tiny pieces of paper on it.

   What do you observe?

   Do the tiny pieces of paper move?

   What makes these pieces of paper move?

When we hit the drum, its membrane moves back and forth very quickly. This fast movement is called **vibration**. It makes the sound. The vibrations cause paper pieces to jump on the membrane.

(b) Nature of Sound

Activity - 23 Exploring the Nature of Sound

Take an empty glass tumbler. Place a cell phone in it. Ask your friend to give a ring on this cell phone from another cell phone. Listen to the ring carefully.

Now, surround the rim of the tumbler with your hands. Put your mouth on the opening between your hands. Indicate to your friend to give a ring again. Listen to the ring while sucking air from the tumbler.

Does the sound become fainter as you suck the air?

Remove the tumbler from your mouth.

Does the sound become loud again?

The sound becomes fainter as you suck the air. This is because the air has been removed from the glass. It shows that **sound needs a medium to travel**. It cannot travel in vacuum.

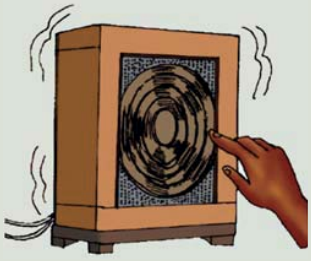
Some other nature of sound are:

1. Sound is a form of energy, just like electricity and light.
2. It is always produced by a source.
3. Sound waves cannot be transmitted through vacuum.
4. Speed of sound varies in all three media.

(c) Sound Propagation and Transmission

Activity - 24 Exploring the Propagation of Sound

1. Play a music system.
2. Put your hand on its speaker.
   What do you feel?



You will feel vibration of the speaker. Its back and forth movements make the sound propagate towards your ears.

Propagation means the transmission of sound in different states of matter. When any object vibrates, it causes movement of the air particles. These particles push the particles close to them. It makes them vibrate too. This movement creates sound waves. If your ear is within range of the vibrations, you hear the sound.

Fig. 6. *Propagation of sound*

Activity - 25(a) Exploring the Medium of Sound Transmission

1. Take two paper cups.
2. Make a hole at the bottom of each cup.
3. Insert a string in both the holes and tie a knot.
4. Give one cup to your friend. Ask him/her to hold it to his/her ear.
5. Walk away until the string is stretched taut.
6. Speak into your cup. Can your friend hear you? Your friend can hear you. Try it the way round.

This activity shows that **sound transmits through solids**.

Activity - 25(b) Exploring the Medium of Sound Transmission

1. Go to your school playground.
2. Let each of you try to talk to each other.

   Do you hear each other?

You hear one another. Here the **sound transmits through air**.

Activity - 25(c) Exploring the Medium of Sound Transmission

1. Take a bucket and fill it with water.
2. Take a small bell in one hand.
3. Shake this bell inside the water to produce sound.

   Make sure that the bell does not touch the body of the bucket.

4. Place your ear gently on the water surface. Be careful: water should not enter in your ear. Can you hear the sound of the bell?

You can hear the sound of the bell. This shows that **sound transmits through liquid**.

Thus, sound can transmit through the following:

(a) Solids

(b) Air

(c) Liquids

(d) Production of Echo: Reflection of Sound

Activity - 26 | Producing Echo

1. Move towards a hilly area.
2. Shout loudly.
   What do you hear after a while?

A faint sound similar to original sound is heard after some time. This can also be experienced in big and empty rooms or halls. Sound hits the solid surface and reflects back. This reflection of sound waves is called **echo**.

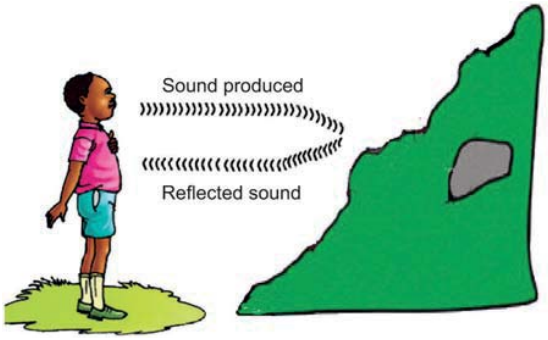
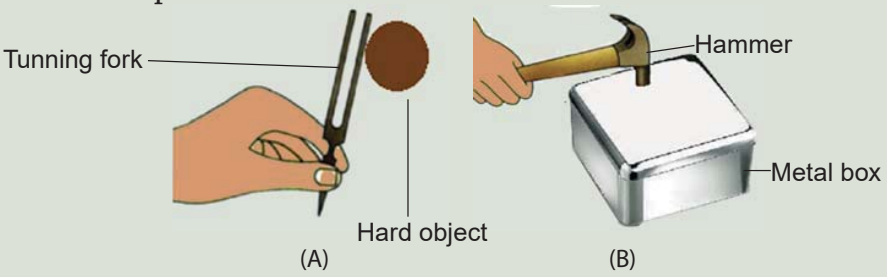


Fig. 7. *Echo or reflection of sound*

(e) Sound and Noise

Activity - 27 | Discussing the Nature of Sound

1. Take a tuning fork and strike it with a hard object (Figure A). Hear the sound it produces.
2. Now take a hammer and strike it on a metal box (Figure B). Hear the sound it produces.



What difference do you observe between them?
Discuss them in your class.

We hear different types of sound in our daily life. Some of them are pleasant to hear. Others are unpleasant to hear.

The sounds which are pleasant to hear are **pure** or **musical sounds**. Musical sounds are produced by the regular vibrations. All musical instruments produce regular vibrations, for example, strings of guitar and violin.

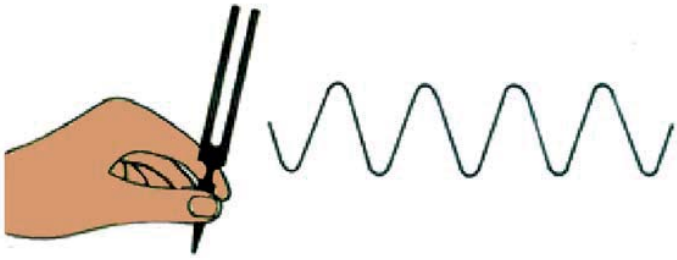


Fig. 8. *Music (pleasant sound) consists of regular, gently curving sound waves*

The sounds which are unpleasant to hear are called **noise**. Irregular vibrations produce noise. Grinding machine, hammer, motor vehicles and crackers produce irregular vibrations.

Fig. 9. *Noise (unpleasant sound) consists of irregular and spiky sound waves*

(f) Damaging Effects of Noise

Activity - 28 | **Effects of Noise on Health and Environment**

1. Visit a nearby factory or a stone crusher.
   What type of sound does it produce?
2. List some effects of such sounds on our health and environment.

We hear sound or noise through our ears. If we hear loud noise, we get irritated. Prolonged exposure to noise has various harmful effects.

1. Loud noise can damage our ears.
2. Loud noise can also cause **tinnitus**. Tinnitus is like a ringing or buzzing in the ears or head.
3. Noise leads to emotional and behavioural stress.
4. Noise increases chances of diseases like headache, blood pressure and heart failure.
5. Noise leads to noise pollution.

(g) Protection of Ears from Noise

Activity - 29 | Protection of Ears from Noise

1. What does this picture show?
2. Why is the factory worker wearing earmuffs?

The factory worker is wearing earmuffs to protect his ear from noise.

The Way of Protecting Ears from Noise

1. Stay away from noisy places.
2. Turn the volume down and get used to listening to quieter sounds.
3. Wear earmuffs.
4. Protect the ears of children those who are too young to protect their own.
5. Make people aware about the hazards of noise.

Fig. 10. *Protecting ears from noise*

7.11 Keywords

- **Air:** A mixture of gases.
- **Combustion:** The process of burning a substance, such as charcoal and wood, in the presence of oxygen.
- **Echo:** The reflection of sound waves.
- **Germination:** The process by which a plant grows from a seed.
- **Global warming:** The process of rising atmospheric temperature.
- **Greenhouse:** A glass housing in which temperature can be regulated to grow plants.
- **Photosynthesis:** The process through which green plants produce their food.
- **Respiration:** The process by which energy is obtained from food.
- **Sound:** A form of energy, just like electricity and light.
- **Sound propagation:** The transmission of sound.
- **Syringe:** A tube with a nozzle for sucking in and ejecting liquid in a thin stream.
- **Tinnitus:** Ringing or buzzing in the ear.
- **Vibration:** To and fro movement of something.
- **Wind:** The moving air.

7.12 Summary

- Air is a mixture of various gases. It has the following properties:
  (i) It occupies space.
  (ii) It has weight.
  (iii) It can be compressed.
- Oxygen is used by all living things. It is essential for germination, respiration and combustion.
- Carbon dioxide is an essential component of photosynthesis.
- Green plants use carbon dioxide to make their food.
- Carbon dioxide and water vapour are the most powerful greenhouse gases.
- The moving air is called wind. Winds may be light, breeze and stormy.

- Sound is a form of energy.
- Propagation means transmission of sound in different states of matter.
- The reflection of sound is called echo.
- The sounds which are pleasant to hear are pure or musical sounds. Musical sounds are produced by the regular vibrations.
- The sounds which are unpleasant to hear are called noise. Irregular vibrations produce noise.

7.13 Unit Review Exercises

Do these review exercises in your exercise book.

I. Fill in the blanks with the correct options:

1. The percentage of nitrogen present in air is ..... .
   (a) 78% (b) 21%
   (c) 0.17% (d) none of these
2. ..... supports combustion.
   (a) Oxygen (b) Argon
   (c) Nitrogen (d) Water vapour
3. ..... is a greenhouse gas.
   (a) Oxygen (b) Carbon dioxide
   (c) Argon (d) None of these
4. ..... is used in light bulbs.
   (a) Oxygen (b) Argon
   (c) Nitrogen (d) Water vapour
5. ..... is produced when something vibrates.
   (a) Sound (b) Light
   (c) Air (d) Oxygen

II. State whether the following statements are true or false:

1. The vibrating body causes the medium around it to vibrate.
2. Nitrogen is essential for respiration.

3. Reflection of sound waves is called echo.
4. Regular vibrations produce noise.
5. Noise increases chances of diseases like blood pressure and heart failure.

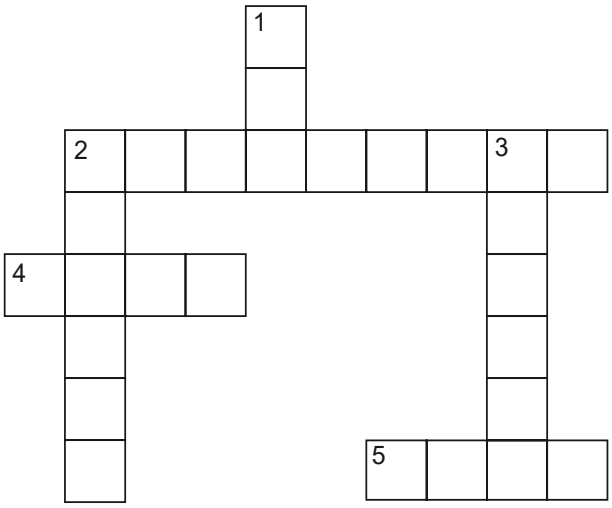
III. Match the following:

Column A	Column B
1. Oxygen	(a) Greenhouse gas
2. Carbon dioxide	(b) Produces sound
3. Reflection of sound	(c) Helps in winnowing
4. Vibration	(d) Echo
5. Wind	(e) Used for respiration

IV. Answer the following questions briefly:

1. List different properties of air.
2. Explain the composition of air.
3. List at least two uses of the following:
   (a) Oxygen (b) Carbon dioxide
4. List the main types of wind.
5. State some uses of air and wind.
6. Define echo.
7. What is the nature of sound wave?
8. How can we protect our ears from noise?
9. Differentiate between:
   (a) Breeze and storm
   (b) Music and noise

V. Complete the crossword puzzle using the clues below:



Clues:

Across

2. Sound is produced due to this.
4. It is the reflection of sound.
5. It is the moving air.

Down

1. It is a mixture of different gases.
2. Sound waves cannot be transmitted through it.
3. This gas supports burning.

Unit 8 Soil

Soil is one of the non-living things. It is useful to plants, people and other animals. Plants grow in soil. People and other animals depend on plants for food.

Activity - 1 Preparing a Recipe for Soil

Mix together tiny chips of rocks, dry leaves and water.

Add bits of dried up caterpillars' skin, birds' feathers and air.

What do you think? What is this a recipe for?

It is the recipe for soil.

8.1 Definition of Soil

The topmost layer of the earth's surface is called **soil**.

Fig. 1. *Land is covered with soil*

8.2 Types of Soil

Activity - 2 | Exploring the Types of Soil

Collect samples of soil from different places like lake side, farm and a construction site. Observe these samples thoroughly. Rub them with your fingers. Record your observations in the following table:

Soil samples	Colour	Size	Feel	Types of soil
Soil from farm				
Soil from lake side				
Soil from a construction site				

Table 1: Different Types of Soil and their Characteristics

There are three main kinds of soil:

1. **Loam.** Loam is chiefly a mixture of sand and clay. It can hold enough water and air for plants. It feels smooth.
2. **Clay.** Clay is made up of very fine particles. It can hold a lot of water but very little air. It feels sticky when wet and forms clumps when dry.
3. **Sand.** Sandy soil is made up of very small rock particles. They are bigger than clay particles. Sand is found in desert areas. Sand cannot hold much water but it can hold much air. It feels gritty.

8.3 Composition of Soil

Activity - 3 | How to Identify Components of Soil

You will need: some garden soil (dry), two jars, water and a stick.

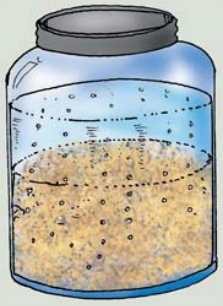
Procedures:

Step (a)

1. Take a jar and half-fill it with dry soil.
2. Pour water into the soil.

   What do you observe?

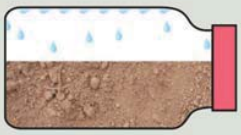
   Do you observe it bubbling out?



Step (b)

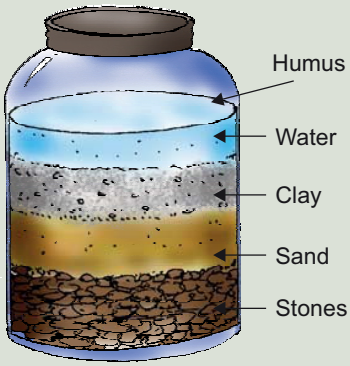
1. Take another jar and half-fill it with soil.
2. Close its lid and keep it under the sun.
3. Observe the inside of the jar after about half an hour.

   What do you find?



Step (c)

1. Take a handful of garden soil.
2. Pour it into a wide mouthed transparent bottle.
3. Add water to it.
4. Stir the soil and water vigorously with a stick.
5. Allow it to settle for a few hours.
6. Observe the different layers of soil.



In step (a), when soil is watered, water fills up the spaces between the grains of soil. The air is then pushed up as bubbles. This shows that **air is trapped in the spaces between the grains of the soil**.

In step (b), you will see droplets of water on the sides of the jar. This shows that **soil contains water or moisture**.

In step (c), you will see that the soil settles in different layers. The largest particles (stones) go down to the bottom. Above this layer, bigger grains of sands settle. Over the sand, you will find a layer of clay. On the top of water floats the humus. This shows that **soil contains stone, sand, clay and humus**.

Thus, soil has the following components:

1. Air
2. Moisture or water
3. Clay, sand, stones and humus.

8.4 Uses of Soil

Activity - 4 | **Uses of Soil**

1. Collect samples of clayey, sandy and loamy soils.
2. Take a fistful of soil from one of the samples.
3. Remove any pebbles and rocks from it.
4. Now add water drop by drop and knead the soil.
5. Try to make a ball from the soil.
6. On a flat surface roll the ball into a cylinder.
7. Repeat this activity with other samples.

   Which soil is suitable for making different shapes? Why?

The clayey soil is sticky when wet. So it is best for making shapes.

Different kinds of soil have many uses.

1. **Loam** contains good amount of humus. It is the best type of soil for plant growth.
2. **Clay** is used for making bricks, toys, tiles, pottery and many other articles. Vegetables such as tomato and pepper grow well in this soil.
3. Crops like coconut, cashewnut, dates and groundnut grow well in **sandy** soil. Sand is also used to make glass. Sand mixed with cement is used for construction of houses.
4. A large number of living organisms make their home in the soil. These include insects, worms, snakes, rats and rabbits.
5. Soil supports plant growth. There are minerals and water in the soil. Plants use these to make their food and to grow.

Fig. 2. *Clay for making toys*

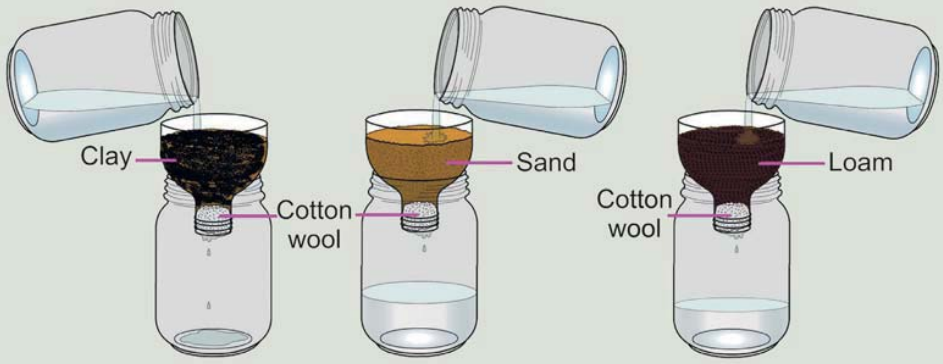
Fig. 3. *Sandy soil*

Fig. 4. *Soil supports plant growth*

8.5 Characteristics of Suitable Soil for Cultivation

Activity - 5 **Exploring the Characteristics of Different Types of Soil**

1. Collect three same sized jam jars, three funnels, some clay, sand, loam and water.
2. Put some cotton wool at the neck of the funnels.
3. Put each type of soil in different funnels.
4. Set up the jars as shown in the picture.
5. Slowly pour the water onto each funnel. Wait for five minutes.



Which soil does not allow water to pass through it easily? Discuss why?

The clayey soil does not allow water to pass through it easily. This is because its particles are closely packed. It has high water-holding capacity. It is suitable for cultivation.

Soil that is used for cultivation should be fertile. Fertile soil should have the following characteristics:

1. It should have adequate amount of humus.
2. It should have high water-holding capacity.
3. It should be well aerated.
4. It should be deep because deep soil enables plants to grow well.
5. It should be easy to dig.

8.6 Soil Erosion

Activity - 6 | **Showing Process of Soil Erosion**

1. Take some garden soil and place it on a flat surface.
2. Take a watering can filled with water.
3. Pour water on the soil from above.
   What do you observe?

When water is poured on the soil, it washes away some soil. The process of carrying away of soil by wind, water or other agents is called **soil erosion**.

Soil erosion reduces the fertility of soil. Farmers do not get good crops.

Fig. 5. *Soil erosion*

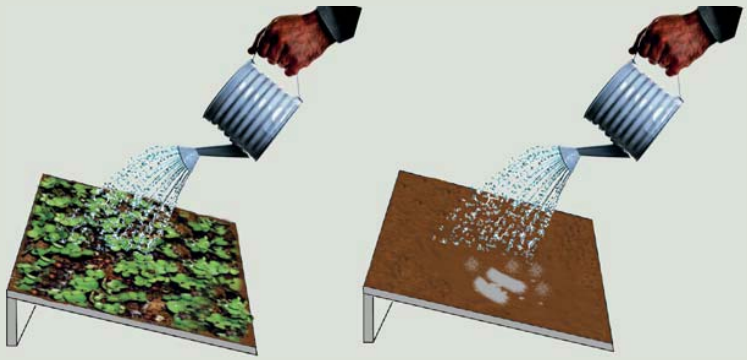
8.7 Agents of Soil Erosion

There are many factors that are responsible for soil erosion. These are called **agents of soil erosion**.

(a) Water

Activity - 7 | Showing the Effect of Water on Soil Erosion

1. Take two trays and fill them with soil.
2. Sow some mustard or gram seeds in the first tray. Water the tray for a few days, till it is covered with plants.
3. Tilt both the trays at equal angles. Now fix them onto a wall.
4. Pour water gently on both the trays.



What do you observe?

You will see that the amount of soil carried out in tray without plants will be more.

When water runs over the soil, it carries away the topsoil with it. On the hill slopes this is even more severe.

Fig. 6. *Soil erosion by water*

(b) Wind

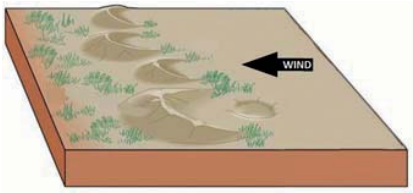


Fig. 7. *Soil erosion by wind*

Strong wind carries away loose and dry soil particles easily. When the wind blows, it carries away these particles to distant places.

8.8 Causes of Soil Erosion

Activity - 8 | **Discussing the Causes of Soil Erosion**

1. Discuss various causes of soil erosion.
2. Makes a list of these.
3. Compare your list with others.

Soil erosion is caused by any activity that make the soil bare. The following are different causes of soil erosion.

(a) Deforestation: Deforestation is the cutting down of trees. When the trees are cut down the soil is left uncovered. This causes it to be carried away easily.

Fig. 8. *Deforestation*

Fig. 9. *Overgrazing*

(b) Overgrazing: Animals graze the plant cover on land and expose the soil for erosion.

(c) Burning of bushes or bushfires: Bushfires make the soil bare and expose it for erosion.

Fig. 10. *Bushfires*

8.9 Types of Soil Erosion

Activity - 9 | **Exploring the Types of Soil Erosion**

1. After a heavy rainfall, visit an area where vegetation has been removed.
2. Observe various types of soil erosion on a steep slope.
3. Make a list of them.

There are four types of soil erosion. These include:

(a) Splash erosion: It occurs when heavy raindrops hit the bare soil. These raindrops splash or displace away the soil particles.

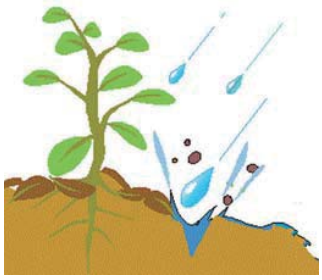


Fig. 11. *Splash erosion*

Fig. 12. *Sheet erosion*

(b) Sheet erosion: Some times surface water flows as a sheet over large areas down a slope. It takes away the soil uniformly. This type of erosion is called **sheet erosion**.

(c) Rill erosion: When light rains wash away the top soil, some narrow wavy channels are produced on the land. These channels are called **rills**.

Fig. 13. *Rill erosion*

Fig. 14. *Gully erosion*

(d) Gully erosion: It occurs in steep slopes. After the sheet erosion stage, channels appear. These channels are widened and deepened by running water to form gullies.

8.10 Prevention of Soil Erosion

Activity - 10 | **Preventing Soil Erosion**


(A)


(B)


(C)


(D)

- What do you observe in each picture?

These are various methods to prevent soil erosion.

(A) Afforestation

Afforestation means planting of trees. The roots of plants and trees hold the soil and reduce erosion by water and wind.

(B) Soil Cover

After harvesting of crops, the land should be covered with grass. The roots of the grass bind the soil and protect it from being blown away.

(C) Shelter Belts

You might have seen tall trees grown on all sides of a field. These are grown to reduce the speed of blowing winds. They act as wind breakers.

(D) Terrace or Step Farming

Soil erosion is maximum on hill slopes due to the speed of water being high. Here the hills are cut into steps by farmers. It reduces the speed of flowing water and prevents soil erosion.

8.11 Keywords

- **Clay:** Soft soil when it is wet and hard when it is dry.
- **Humus:** A component of soil, made up of dead plant and animal remains.
- **Loam:** A kind of soil which is a mixture of sand and clay with some humus.
- **Sand:** Finely crushed stones found on beaches.
- **Soil:** The topmost layer of the earth's surface.
- **Weathering:** Breaking of rocks into tiny pieces to form soil.

8.12 Summary

- Soil is the topmost layer of earth's surface.
- Soil contains air, water, clay, sand, stones and humus.
- There are three types of soil, namely loam, clay and sand.
- Fertile soil should have high water-holding capacity and adequate amount of humus.
- The process of carrying away soil by wind, water or other agents is called soil erosion.
- Water and wind are two main agents of soil erosion.
- Deforestation, overgrazing and bushfires are main causes of soil erosion.

8.13 Unit Review Exercises

Do these review exercises in your exercise book.

I. Fill in the blanks with the correct options:

1. The topmost layer of the earth's surface is called ..... .
   (a) rock (b) soil
   (c) stone (d) none of these
2. ..... is trapped in the spaces between the grains of soil.
   (a) Water (b) Air
   (c) Roots (d) All of these
3. ..... soil is best for plant growth.
   (a) Sandy (b) Loamy
   (c) Clayey (d) None of these
4. ..... is a cause of soil erosion.
   (a) Step farming (b) Afforestation
   (c) Deforestation (d) Soil covering

II. State whether the following statements are true or false:

1. Soil contains water or moisture.
2. Sandy soil has high water-holding capacity.
3. Sheet erosion is caused by the direct impact of falling rain drops on soil particles.
4. Tall trees or hedges grown on all sides of a field act as wind breakers.
5. Fertile soil should have little amount of humus.

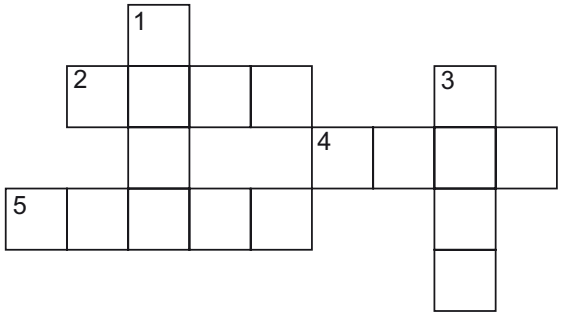
III. Match the following:

Soil type	**Uses**
1. Loam	(a) Making bricks, toys and pottery items
2. Sandy	(b) Best for plant growth
3. Clay	(c) Good for crops like groundnut

IV. Answer the following questions briefly:

1. Define soil.
2. What are the different types of soil?
3. What is the composition of soil?
4. Write three uses of soil.
5. Soil is home to many animals. Can you name any three animals?
6. Write any three characteristics of fertile soil.
7. Mention one agent of soil erosion.
8. List different types of soil erosion.
9. List three methods of preventing soil erosion.

V. Complete the crossword puzzle using the clues below:



Clues:

Across

2. It is the topmost layer of the soil.
4. Soft when it is wet and hard when it is dry.
5. Component of the soil, made up of dead plants and animal remains.

Down

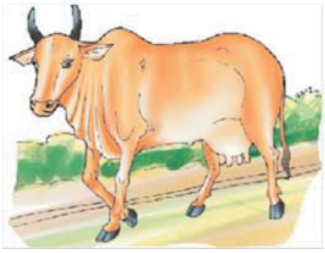
1. A kind of soil which is a mixture of sand and clay with some humus.
3. Finely crushed stones found on beaches.

Unit 9 Animals

There are different types of animals in the world we live in. Many animals are quite similar to each other. Others are quite different. Animals can be classified based on their similarities.

9.1 Classification of Animals According to the Backbone

Activity - 1 Classifying Animals According to Backbone

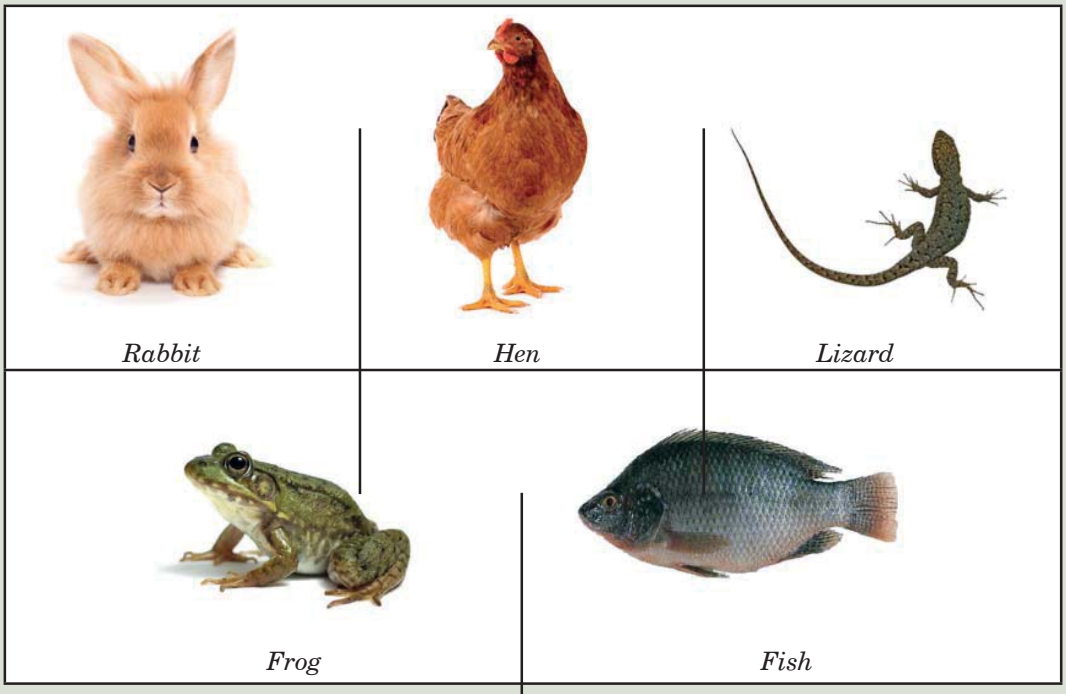
 *Cow*	 *Earthworm*	 *Human*
 *Grasshopper*	 *Cat*	 *Housefly*
 *Frog*	 *Butterfly*	 *Pigeon*

1. Which of these animals have a backbone?
2. Which of these animals do not have a backbone?

Animals such as cows, cats, frogs, pigeons and humans have a backbone. They are **vertebrates**. Other animals such as earthworms, grasshoppers, houseflies and butterflies do not have a backbone. They are **invertebrates**.

A. Vertebrates and their Classes

Activity - 2 Classifying the Vertebrates According to their Major Characteristics



1. Are these animals vertebrates?
2. What are their major characteristics?
3. Group these animals according to their major characteristics.

These animals are all vertebrates. The following are some major characteristics of vertebrates:

1. Vertebrates have a backbone.
2. They have an internal skeleton which protects their internal organs.
3. They have two pairs of limbs or fins for movement.

4. They have lungs or gills for breathing.
5. They have closed circulatory system.

There are different classes of vertebrates. The five most well-known classes of vertebrates are **mammals, birds, reptiles, amphibians** and **fish**.

(a) Mammals

Activity - 3 **Identifying Major Characteristics of Mammals**

Cow

Dog

Human

1. How do these animals feed their young ones?
2. How is their skin?
3. What are they called?

They are mammals. They have the following characteristics:

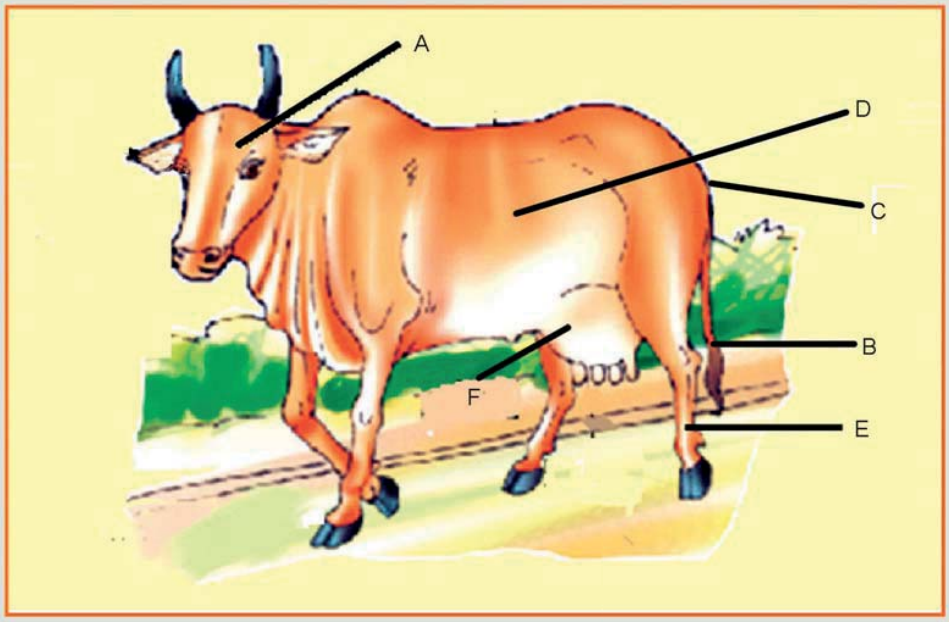
1. Mammals have hairs on their body.
2. They (females) give birth to their young ones.
3. They (mothers) feed milk to their young ones.

Cow

Cow is the best example of a mammal. It possesses a backbone, hair and mammary glands. It gives birth to its young ones.

Activity - 4 | Identifying External Body Parts of a Cow

Identify the external body parts of a cow and label them in your notebook.



The main external body parts of a cow are:

A. **Head:** It contains the eyes, ears, mouth, horns and muzzle. This allows it to pick up sounds from more than one direction at a time.

B. **Tail:** Tail is the section at the rear end of an animal's body. It helps swat away biting insects that may carry diseases.

C. **Anus:** Anus is the opening through which the waste is removed.

D. **Abdomen:** It helps in digestion of food.

E. **Legs:** Legs are used for locomotion.

F. **Udder:** It is the mammary gland hanging near the back legs. There are four teats in the cow's udder.

Internal Features of a Cow

Activity - 5 **Discussing the Functions of Internal Organs of a Cow**

1. Observe various internal organs of a cow on a wall chart.
2. Discuss the functions of each organ.
3. Make a report on it and present to your class teacher.

Some of the internal organs of a cow are: lungs, livers, heart and alimentary canal. All these organs are shown in Fig. 1.

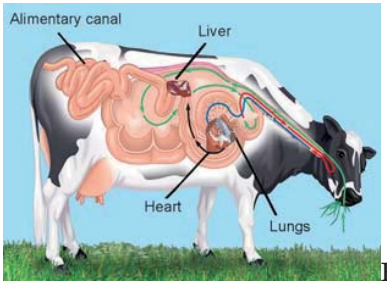


Fig. 1. *Internal features of a cow*

Heart: It pumps blood throughout the body.

Alimentary canal: It is a tube running from mouth to anus. It helps in digestion of food.

Lungs: They help in breathing.

Liver: It produces bile. Bile helps in digestion of fats.

(b) Birds

Activity - 6 **Discussing the Major Characteristics of Birds**


Hen


Duck


Vulture

1. How do these animals make their young ones?
2. What is their body made up?
3. What are these animals called?

These animals are called birds. They have the following characteristics:

1. They have a backbone.
2. They have streamlined body.
3. They have a beak, wings and feathers.
4. Their feet are covered with scale.
5. They lay eggs.

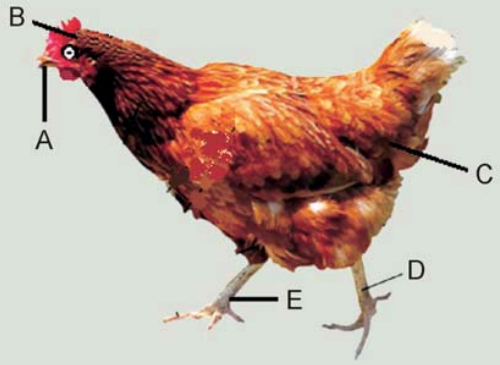
Hen

Hen is the best example of a bird. It possesses a backbone, beak, wing and feathers. It lays eggs.

External Features of a Hen

Activity - 7 **Identifying External Features of a Hen**

Identify the external body parts of a hen and label them in your notebook.



The main external body parts of a hen are:

A. Beak: Beak helps a hen to protect it from enemies. It is also used as teeth.
B. Head: It bears eyes, ears, beak and wallet.
C. Feathers: Feathers keep a hen's body warm.
D. Legs: Legs help the hen to walk. It also scratches the soil with its legs.
E. Scales: Scales are hard plates that cover a chicken's toe.

Internal Features of a Hen

Activity - 8 **Discussing the Functions of Internal Organs of a Hen**

1. Observe various internal organs of a hen on a wall chart.
2. Discuss the functions of each organ.
3. Make a report on it and present it to your class.

The main internal body part of a hen is the **alimentary canal**. It is shown in Fig. 2.

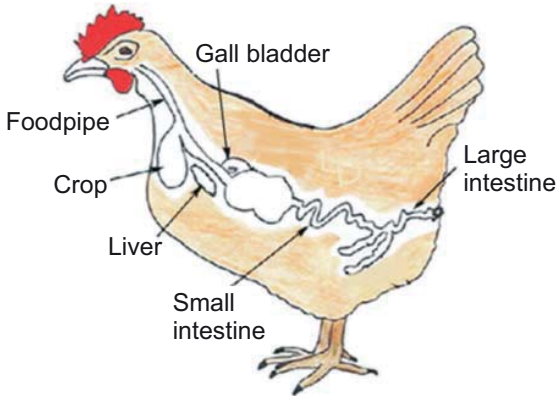


Fig. 2. *Internal features of a hen*

Alimentary canal is a long tube-like organ. It starts at the beak and ends with the vent or cloaca in the abdominal region. It consists of foodpipe, crop, liver, gall bladder and intestines.

- The **foodpipe** carries the food from the mouth to the crop.
- The **crop** is a small sac-like structure where the food is stored for some time.
- **Liver** secretes bile which digests fats.
- The **gall bladder** stores the bile produced by the liver.
- The **small intestine** absorbs nutrients from the digested food.
- The **large intestine** absorbs water from the remaining undigested food.

(c) Fish

Activity - 9 **Identifying Major Characteristics of a Fish**

1. What does the picture show?
2. Where do fish live?
3. Write some characteristics of a fish.

The following are some characteristics of fish:

1. Fishes live in water.
2. They have a backbone.
3. They have a streamlined body.
4. They have scales on their skin.
5. They breathe through gills.

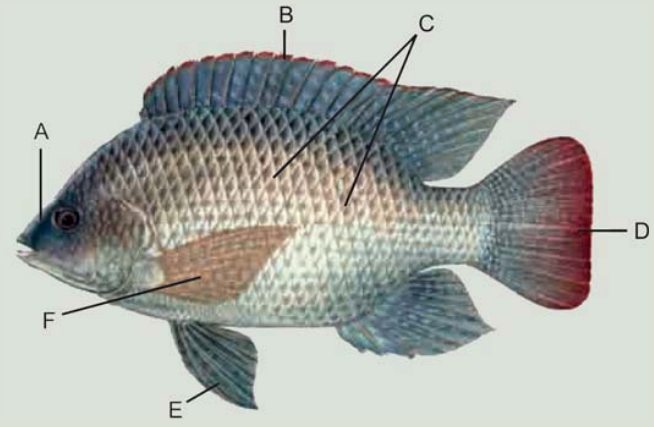
Examples: Tilapia and tuna

Tilapia is the best example of a fish. It possesses backbone. It lives in water. It has scales on its body. It breathes through gills.

External Features of Tilapia

Activity - 10 | Identifying External Features of Tilapia Fish

1. Identify external body parts of a Tilapia fish.
2. Label them in your science notebook.



The main external body parts of a Tilapia fish are:

A. Nostrils: A fish uses it to detect food.

B. Dorsal Fin: The fish uses it for balancing and protection.

C. Scales: Scales are the protective cover on a fish. It is similar to skin.

D. Caudal or Tail Fin: The fish uses it for steering.

E. Pelvic Fin: The fish uses it for steering.

F. Pectoral Fin: The fish uses it for turning.

Internal Features of Tilapia

The main internal body parts of a tilapia are gills. Fishes breathe through their gills.

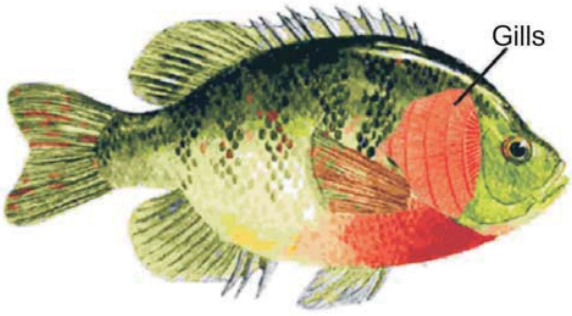


Fig. 3. *Internal features of tilapia*

(d) Reptiles

Activity - 11 | **Identifying Major Characteristics of Reptiles**

Snake

Crocodile

Tortoise

1. How do these animals move?
2. What is their body made up?
3. What are these animals called?

These animals are called **reptiles**. They have the following characteristics:

1. They have a backbone.
2. They move by crawling.
3. They have scales on their body.
4. They lay eggs on land.

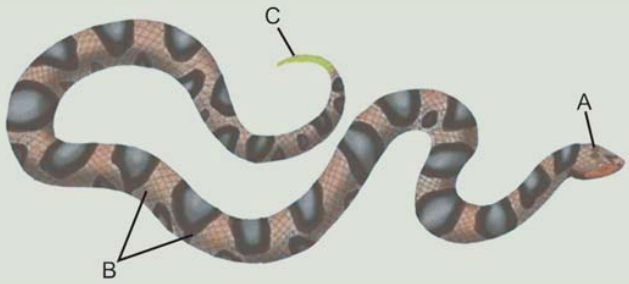
Snake

Snake is the best example of a reptile. It possesses a backbone and scales on its body. It moves by crawling. It also lays eggs.

External Features of a Snake

Activity - 12 **Identifying External Features of a Snake**

Identify the external body parts of a snake and label them in your science notebook.



The main external body parts of a snake are:

A. **Head:** It contains eyes, nostrils, mouth and brain.

B. **Scales:** Scales protect them from wearing away. Scales also help them move.

C. **Tail:** It is the end part of the body.

Internal Features of a Snake

Activity - 13 **Discussing the Functions of Internal Organs of a Snake**

1. Observe various internal organs of a snake.
2. Discuss the functions of each organ.
3. Make a report on it and present it your class.

The main internal body parts of a snake are the **intestines**. Water snakes also have **gills**.

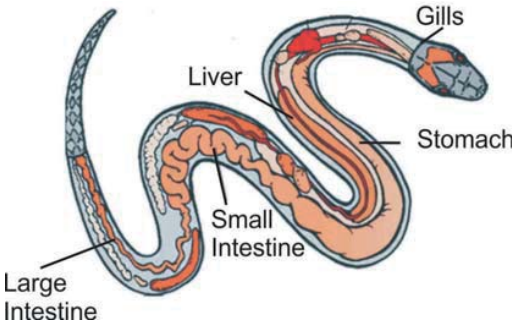


Fig. 4. *Internal features of a snake*

Gills: These help the snake to breathe in water.

Liver: It secretes bile which helps in the digestion of fats.

Stomach: It is the main internal organ in which digestion of food occurs.

Small intestine: It is a long narrow coiled tube. It absorbs nutrient from the food.

Large intestine: It absorbs water from wastes.

(e) Amphibians

Activity - 14 | **Identifying Major Characteristics of Amphibians**

Frog

Toad

Salamander

1. Where do these animals live?
2. What is their body made up?
3. What are these animals called?

These animals are called **amphibians**. They have the following characteristics:

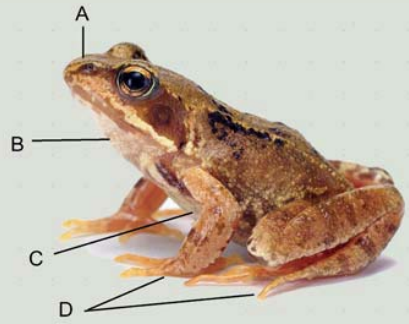
1. Amphibians have a backbone.
2. They can live on both land and water.
3. They have a smooth slimy skin.Some of the amphibians have a hard skin.

Frog is the best example of an amphibian. It possesses a backbone. It lives on both land and in water. It has no scales on its body.

External Features of Frog

Activity - 15 | Identifying the External Body Parts of a Frog

1. Identify the external body parts of a frog.
2. Label them in your science notebook.



The main external body parts of a frog are:

A. Head: It contains the mouth, eyes, ears and nose. It protects internal organs like brain.

B. Thorax: It is the part of the body between neck and abdomen. It protects internal body parts such as lungs and the heart.

C. Abdomen: It protects the internal organs like stomach and intestines.

D. Legs: The legs help a frog to jump.

Internal Features of Frog

The main internal body parts of a frog are: heart, stomach and intestines. These are shown in Fig. 5.

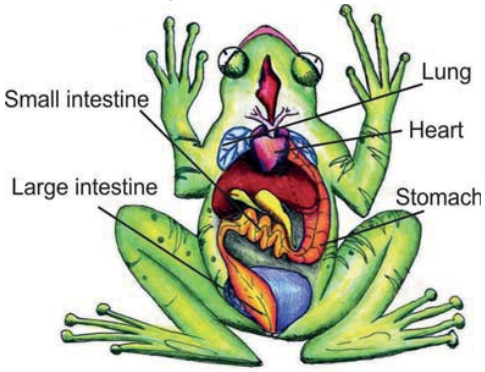


Fig. 5. *Internal features of a frog*

Heart: It pumps out blood throughout the body.

Stomach: Its main function is to break down and digest food.

Intestines: The small intestine absorbs nutrients from the food. The large intestine absorbs water from wastes.

B. Invertebrates

Activity - 16 **Classifying the Invertebrates According to their Major Characteristics**

Earthworm

Caterpillar

Butterfly

1. Do these animals have backbones?
2. What are they called?
3. Write their common characteristics.

These animals do not have backbones. These are all invertebrates. About 97% of all animals on our planet are invertebrates.

The following are some major characteristics of invertebrates:

1. They **do not** have a backbone.
2. They cannot make their own food.
3. Some of them have hard body covering.
4. They make their young ones.

Some organisms like earthworms and insects like grasshoppers, houseflies and butterflies are invertebrates.

Activity - 17 Identifying the Characteristics of Insects

Locust

Butterfly

Housefly

1. How many legs do these animals have?
2. How do they feed?
3. What are these animals called?

These animals are called **insects**. Some examples of insects are locust, butterfly, housefly, spider and bee.

The following are some characteristics of insects:

1. Insects have six legs.

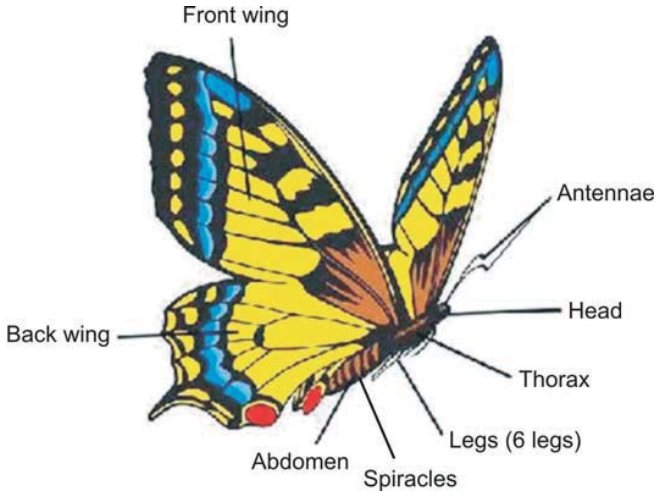


Fig. 6. *External features of an insect* (*e.g., Butterfly*)

2. Each insect has a pair of antennae or feelers.
3. Insects like butterfly have a proboscis to suck nectar from flowers.
4. Body of an insect is made up of head, thorax and abdomen.
5. Most insects have wings and can fly.
6. Insects breathe through their spiracles (or air holes).

9.2 Classification of Animals According to the Respiration Mode

Different animals have different breathing organs. On the basis of their breathing organs, animals are classified into various categories.

(a) Animals Breathing through Lungs

Activity - 18 | **Discussion on the Animals Breathing through Lungs**

Bird

Cat

Human

1. How do these animals breathe?
2. Can you name some other animals that breathe through lungs?

Animals such as Dog, Cow, Goat ,etc , breathe through lungs

Fig. 7. *Fish breathe through gills*

(b) Animals Breathing through Gills

Aquatic animals such as fish breathe through gills. Tadpoles (young ones of a frog) also breathe through gills.

(c) Animals Breathing through Skin

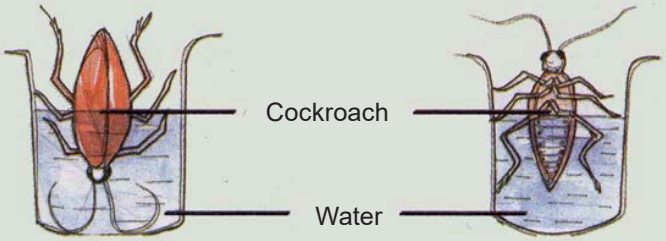
Some animals like earthworms and frogs breathe through their moist skin.

Fig. 8. *Earthworm breathe through moist skin*

(d) Animals Breathing through Spiracles

Activity - 19 | Locating the Spiracles in Insects

1. Take two insects (e.g., cockroach and locust) and two glasses of water.
2. Dip one insect in water by its abdomen and the other one by the head.
3. Keep them in water for about 5 minutes.



4. Remove these insects from water after 5 minutes.
   Which of these two insects died? Explain why?

An insect breathes through spiracles. When the insect is dipped in water by the abdomen, it could not breathe. As a result of which it died. This shows that **spiracles of insects are located near the abdomen**. Spiracles are tiny pores located on the sides of the insect's body (abdomen).

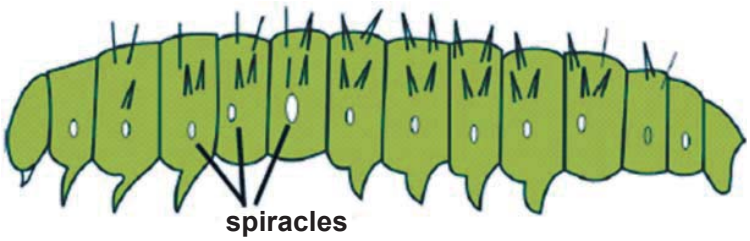


Fig. 9. *Spiracles in caterpillar*

Examples of such animals include caterpillar, grasshopper, housefly and butterfly.

Grasshopper

Housefly

Butterfly

Fig. 10. *Animals that breathe through spiracles*

(e) Animals Breathing through Both Lungs and Skin

Activity - 20 | **Discussion on Animals Breathing through Both Lungs and Skin**

Frog (adult)

Toad (adult)

Turtle

1. How do these animals breathe?
2. Can you name some other animals that breathe through lungs and skin?

These animals breathe through both lungs and skin. When on land, an adult frog breathes through lungs. But it breathes through its moist skin, when it is under water.

9.3 Classification of Animals According to the Locomotion Mode

Activity - 21 | **Exploring Locomotion Mode of Different Animals**

1. Visit a nearby zoo.
2. Observe the movement of different animals like birds, lizards, rabbits elephants and crocodiles.
3. Make a report on it and present to the class.

Animals move from one place to another. This movement of animals is called **locomotion**. Animals move in different ways.

On the basis of locomotion, animals are classified into various groups.

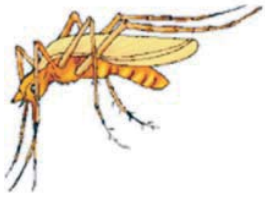
(a) Flying

Animals such as birds fly with the help of wings. The following features help a bird to fly:

1. It has a streamlined body.
2. Its bones are filled with air.
3. It has flight muscles.

Fig. 11. *Bird*

Besides birds, insects also fly. They can fly because they have wings.



Mosquito

Dragonfly

Bee

Fig. 12. *Insects that can fly*

(b) Crawling

Some animals such as crocodiles and tortoise use their legs to crawl. Their legs are short. So when they crawl, their bodies remain close to the ground.

Insects also crawl on the ground. They use their six legs to crawl.

Fig. 13. *Lizard*

Beetle

Cockroach

Bee

Fig. 14. *Insects that can crawl*

(c) Jumping or Hopping

Some animals such as rabbits, grasshoppers and frogs are good hoppers. They have strong back legs. These are longer than the front legs. The back legs provide power for these animals to hop.

Rabbit

Grasshopper

Frog

Fig. 15. *Animals that can hop*

(d) Walking

Activity - 22 | **Practising Animal's Walking**

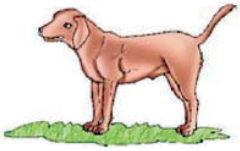
1. Stand up and get more space.
2. Put one foot forward keeping the other on the ground.
3. Then move the second foot forward keeping the first one on the ground.

This is how most animals move.

Can you say which other animals move like this?

Animals like goat, dog and human can walk and run. They walk by putting one foot in front of the other on the ground.

Goat



Dog

Human

Fig. 16. *Animals that can walk*

Can you name some other animals which move by walking?

(e) Swimming

Animals such as fish, ducks and crocodiles can swim in the water. They go through the water by moving their body and tail from side to side.

The streamlined body of the fish helps in swimming.

Different fins help the fish in different stages of swimming.

Fish

Duck

Crocodile

Fig. 17. *Animals that can swim*

Activity - 23 Role Playing Locomotion Mode of Different Animals

Split your class into groups of 8-10 pupils each.

Choose one member in each group as the judge. The other members of the group will imitate the locomotion mode of animals, e.g., walking, running, crawling and hopping. Finally, the judge will choose the best performer in the group.

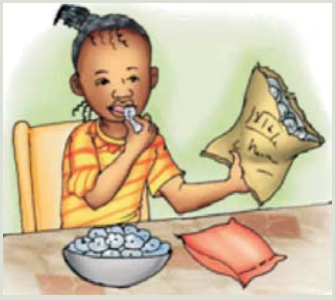
9.4 Classification of Animals According to the Feeding Mode

Activity - 24 Grouping Animals According to the Feeding Mode

Rabbit

Lizard

Wolf



Human being

Sparrow

Frog

Buffalo

Bear

Squirrel

Tiger

Snake

Crow

1. What do these animals eat?
2. Group them according to their feeding habits. Fill in the following table:

Herbivores	Insectivores	Carnivores	Omnivores	Granivores
Rabbit				

Table 1: Classification of Animals According to the Feeding Mode

Some animals like buffaloes and rabbits eat grass and leaves. They are **herbivores**.
Can you name some more herbivores?
Some animals like lizards and frogs eat insects. They are **insectivores**.
Can you name some more insectivores?
Some animals like tiger and wolf eat flesh of other animals. They are **carnivores**.
Can you name some more carnivores?
Some animals like human and bear eat both plants and animals. They are **omnivores**.

Some animals like sparrows and squirrels eat grains. They are **granivores**.

Can you name some more granivores?

Some granivores like rats and squirrels have sharp front teeth. These teeth help them cut and bite nuts and seeds. They gnaw (constantly bite and chew) their food. They are **rodents**.

Rat

Squirrel

Fig. 18. *Examples of some rodents*

9.5 Classification of Animals According to their Reproductive Mode

Activity - 25 Grouping Animals According to their Reproductive Mode

Tiger

Frog

Human

Hen

Dog

Snake

1. Which animals lay eggs? _____ _____ _____
2. Which animals give birth to their young ones? _____ _____ _____
3. How do these animals reproduce?

All animals give birth to their young ones to continue their own kind on earth. This process is known as **reproduction**.

Some animals like tigers, humans and dogs reproduce by giving birth to their young ones.

Some other animals like hens, frogs and snakes reproduce by laying eggs.

9.6 Keywords

- **Amphibians:** Animals that live both on land and in water.
- **Carnivores:** Animals that feed on other animals.
- **Crawling:** Dragging the body close to the ground.
- **Granivores:** Animals that eat grains.
- **Heart:** Multi-chambered, muscular organ that pumps blood through the body.
- **Herbivores:** Animals that eat grass.
- **Insect:** A small arthropod animal that has six legs.
- **Invertebrates:** Animals lacking a backbone.
- **Reptiles:** Egg-laying vertebrates having dry scaly skin, for example, snakes, lizards, crocodiles, turtles, and tortoises.
- **Udder:** Mammary gland hanging near the back legs of a cow.
- **Vertebrate:** Animal having a backbone.

9.7 Summary

- The five most well-known classes of vertebrates are mammals, birds, reptiles, amphibians and fish.
- Insects are animals with jointed legs and segmented body.
- All animals take oxygen from the air and give out carbon dioxide.
- Aquatic animals such as fish breathe through gills. Gills are found on both sides of the head.
- Animals move from one place to another. This movement of animals is called locomotion.

- Herbivores eat grass, leaves, fruits, vegetables and nuts.
- Carnivores eat flesh of other animals.
- All animals give birth to their young ones to continue their own kind on earth. This process is known as reproduction.

9.8 Unit Review Exercises

Do these review exercises in your exercise book.

I. Fill in the blanks with the correct options:

1. Animals having backbones are called ..... .
   (a) vertebrates (b) invertebrates
   (c) both (d) none of these
2. Animals lacking backbones are called ..... .
   (a) vertebrates (b) invertebrates
   (c) both (d) none of these
3. ..... is a mammal.
   (a) Frog (b) Dog
   (c) Snake (d) Fish
4. ..... is an amphibian.
   (a) Snake (b) Lizard
   (c) Newt (d) Crocodile
5. ..... is an egg-laying animal.
   (a) Bat (b) Hen
   (c) Whale (d) Cat
6. ..... is a rodent.
   (a) Sparrow (b) Squirrel
   (c) Crow (d) Snake

II. State whether the following statements are true or false:

1. Mammals have hairs on their body.
2. Reptiles move by crawling.

3. An adult frog breathes though gills.
4. Insects have four legs.
5. Vulture is a granivore.

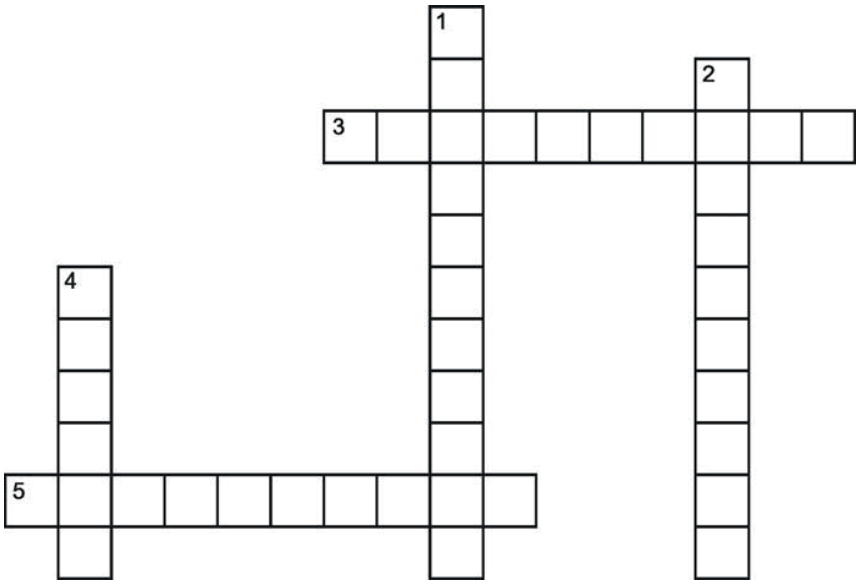
III. Match the following:

Column A	Column B
1. Cow	(a) Amphibian
2. Frog	(b) Mammal
3. Hen	(c) Reptiles
4. Locust	(d) Bird
5. Lizard	(e) Insect

IV. Answer the following questions briefly:

1. Define vertebrates.
2. List all five major classes of vertebrates.
3. Name two reptiles that lay eggs on land.
4. What do fish use for breathing?
5. Name two animals that breathe through skin.
6. Name two animals that breathe through gills.
7. Name two animals that breathe through spiracles.
8. Write the name of two amphibians.
9. Define invertebrates.
10. List any two properties of invertebrates.
11. Write any two characteristics of an insect.
12. Which group do rabbits and squirrels belong to?

V. Complete the crossword puzzle using the clues below:



Clues:

Across

3. Animals that eat grass, leaves, fruits, vegetables and nuts.
5. Animals that feed on other animals.

Down

1. Animals having backbone.
2. Animals that eat grains.
4. Vertebrates having hairs or furs on their bodies.

Unit 10 Animals Management

Rabbits are small mammals. They are used for meat, fur and as pets. Rabbits can be found in woods, forests and grasslands. They live in the underground burrows. Pet rabbits live in the hutches.

Fig. 1. *Triangular rabbit hutch*

Fig. 2. *Modern rabbit hutch*

10.1 Conditions of a Good Rabbit Hutch

Activity - 1 **Exploring the Conditions of a Good Rabbit Hutch**

1. Visit a local rabbit farm.
2. Observe different conditions of a good rabbit hutch.
3. Ask the farm owner different questions regarding a rabbit hutch.
4. Make a report and discuss it in your class.

A good rabbit hutch should provide enough exercise space for the rabbit. It should protect the rabbit from the predators. The following points should be considered while making the hutches.

1. Hutches should be airy.
2. Rabbits should have enough material to play with. For example, small toys, pipes and ramps.
3. Hutches should be dry.
4. Hutches should be clean.

5. Litter areas should be lined with hay.
6. The space required for an adult rabbit is about 0.18 sq.m.

Activity - 2 Building a Model Rabbit Hutch

1. Take paper cartons, sticks, and dry grass to build a model rabbit hutch.
2. Place things that you think will be good for the rabbits.

DID YOU KNOW

Cedar and pine shavings in the rabbit hutch can cause respiratory and liver damage in the rabbits due to chemicals that contain aroma.

10.2 Characteristics of Good Rabbits

Activity - 3 Exploring the Characteristics of Good Rabbits

1. Visit a local rabbit farm.
2. Observe different characteristics of a good male and female rabbit.
3. Compare their characteristics and make a report on it.

Both female and male rabbits have some special characteristics. These are discussed below:

Female Rabbit

A female rabbit is commonly known as a **Doe**. It is usually larger than the male of the same breed. A good female rabbit has the following characteristics:

1. Should be a good milk producer.
2. Can grow comfortably in your environment.
3. Can have a large **litter**.
4. Will give a large **pelt** per animal.
5. Should be healthy and disease free.

Fig. 3. *A doe suckling its young ones*

Male Rabbit

A male rabbit is known as a **Buck**. It is usually smaller than a female of the same breed. A good male rabbit has the following characteristics:

1. Should grow very fast.
2. Should have strong and large muscles.
3. Can grow comfortably in your environment.
4. Should be healthy and disease free.
5. Breeds with ease.
6. Has high fertility and can have several offspring.

Fig. 4. *A buck with strong muscles*

10.3 Distinguishing Male from Female Rabbits

Activity - 4 **Distinguishing a Male Rabbit from a Female Rabbit**

1. Visit a local rabbit farm.
2. Observe rabbits of opposite sexes.
3. Compare their characteristics and make a report on it.

A male rabbit is different from a female rabbit in the following ways:

1. The size of a female rabbit is comparatively large than a male rabbit of the same age in the same breed.
2. The round face in females is unlike the block-like face in males.
3. Old females have **dewlaps** but males haven't.
4. Males are more defensive than females.
5. Males produce more urine than females during the mating period.

10.4 Criteria for Choosing a Rabbit to Rear (Rabbit Breeding Guide)

Activity - 5 **Discussing the Criteria for Choosing a Rabbit to Rear**

1. Visit a local rabbit farm.
2. Discuss with the farm owner about some criteria for choosing a rabbit to rear.
3. Make a report on it and present to the class.

The following are different criteria to choose a rabbit to rear:

(a) Breeds

There are too many rabbit breeds. They are divided into three categories—Commercial, fancy and woolly.

1. **Commercial rabbit breeds** should have excellent meat producing qualities. Examples: Californian, New Zealand and Satin.
2. **Fancy type rabbit breeds** include Dutch, English Spot and Rex.
3. **Wool type rabbit breeds** should have a wool coat. Examples: Jersey Woolly and Angoras.

(b) Colour and Coat

Colour and coat types are definitely a matter of personal preference. Some rabbits cannot tolerate bright light and some require constant grooming.

(c) Age

One thing to consider while choosing a rabbit is whether it is old enough to adopt. Eight weeks is a healthy age for an adoptable rabbit.

(d) Health

Rabbits are susceptible to diseases. A diseased rabbit can affect a healthy rabbit. So health is an important aspect of choosing a rabbit.

(e) Environment

Rabbits living in a clean environment are disease free. So choose a rabbit from a clean and healthy environment.

10.5 Proper Feeding of Rabbits

Activity - 6 | **Proper Feeding of Rabbits**

1. Visit a local rabbit farm.
2. Look at the feeding and watering troughs.
3. Identify which one needs cleaning.
4. Ask the farm owner to clean the troughs properly.

Rabbits feed on green leafy vegetables, carrots, beetroots, turnips and pellets. Pellets are manufactured animal feed. They provide complete nutrition to the rabbits.

Rabbits should have a supply of water at all times. Water should be changed twice a day.

Fig. 5. *Proper feeding of rabbits*

10.6 Rabbit Health

Rabbits are susceptible to health problems. So it is important to adopt sanitary measures.

Activity - 7 **Exploring the Measures that the Farm Worker Adopts to Keep the Rabbit Healthy**

1. Visit a local rabbit farm.
2. Observe various measures that the farm worker adopts to keep the rabbits healthy.
3. Make a report on it and present to the class.

The following are some sanitary measures to be taken:

1. Clean the hutches or cages once in a week.
2. Clean the feeding and watering troughs daily to avoid contamination.
3. Feed the rabbits at least twice a day in proper time.
4. Give them scope for enough physical exercise and mental stimulation by providing toys to play.
5. Isolate sick rabbits for treatment.
6. De-worm the rabbits at regular intervals.
7. Keep the surroundings of the rabbit cage weed-free.

10.7 Common Diseases in Rabbits

Like other living animals, rabbits suffer from diseases.

Activity - 8 **Discussing the Common Rabbit Diseases**

1. Visit a local rabbit farm.
2. Discuss with the farm owner about some common rabbit diseases, their symptoms and prevention.
3. Make a report on it and present to the class.

The following are common diseases of rabbits.

(a) Coccidiosis

A rabbit with coccidiosis has:

(*i*) Loose motion along with blood
(*ii*) Loss of appetite
(*iii*) Loss of weight
(*iv*) Rough hair
(*v*) Death in severe cases

Fig. 6. *A rabbit with coccidiosis*

Prevention/Treatment

(*i*) Isolate the affected rabbit.
(*ii*) Start treatment under the supervision of a vet.(veterinarian)

(b) Ear Scabies

Fig. 7. *A rabbit with ear scabies*

A rabbit with ear scabies has:
(*i*) Brown scab inside the ear canal.
(*ii*) Swelling and painful ear.
(*iii*) Shaking of the head.

Prevention/Treatment

(*i*) Isolate the affected rabbit.
(*ii*) Keep the hutch clean.
(*iii*) Invite a vet for treatment.

(c) Tapeworm

Fig. 8. *Worms seen in rabbit droppings*

A rabbit with tapeworm has:
(*i*) Slow growth.
(*ii*) Sometimes worms are seen in droppings.
(*iii*) Inability to pass faeces.
(*iv*) Death in severe cases.

Prevention/Treatment

(*i*) Keep the hutch clean.
(*ii*) Before feeding, wash all food items.
(*iii*) Invite a vet for treatment.

(d) Pneumonia

Fig. 9. *A rabbit with pneumonia*

A rabbit with pneumonia has:
(*i*) Fever.
(*ii*) Sneezing.
(*iii*) Bluish colour of lips, tongue and ears.
(*iv*) Difficulty in breathing.

Prevention/Treatment

(*i*) Invite a vet for treatment.
(*ii*) Use of antibiotics is effective.

10.8 Importance of Rabbit Farming

Commercial rabbit farming in Rwanda can be a great source of income and employment. One can use his/her family labour for rabbit farming.

Activity - 9 | **Discussing the Importance of Rabbit Farming**

1. Discuss the importance of rabbit farming.
2. Make a report on it and present to your class.

Rabbits are sold in the market for the following purposes:

(*i*) The **meat** of rabbits is sold for food.

(*ii*) The **fur** of rabbit is made into wool and then woven into cloth.

(*iii*) Many people keep rabbits as **pets**.

(*iv*) Rabbit **skin** is used to make bags, gloves, shoes and ear muffs.

(*v*) Rabbit **droppings** are used as manure.

(*vi*) Rabbits are reared for **study** in biology classes

Fig. 10. *Importance of rabbit farming*

10.9 Keywords

- **Buck:** A male rabbit.
- **Coccidiosis:** A series of specific infectious diseases caused by parasites.
- **Dewlap:** A loose skin hanging from the neck or throat of an animal or bird, especially in cattle.
- **Doe:** A female rabbit.
- **Exotic:** Originating in or characteristics of a foreign country.
- **Hutch:** A box or cage, typically with a wire mesh front for keeping rabbit.
- **Litter:** A number of young animals born to an animal at one time.
- **Pelt:** The skin of an animal with fur.
- **Scabies:** A relatively contagious infection caused by a tiny mite.
- **Stimulation:** Something that makes you active.
- **Susceptible:** Prone to something.

10.10 Summary

- The optimum temperature of rabbit hutch should be between fifteen degrees celsius and twenty degrees celsius.
- The size of a female rabbit is comparatively large than a male rabbit of same age and same breed.
- A female rabbit is known as Doe.
- A male rabbit is known as Buck.
- According to the breed of rabbits, they are divided into three categories, *viz*., commercial, fancy and woolly.
- Rabbits feed on green leaves ,vegetables, carrots, beetroots, turnips and pellets. Pellets are manufactured animal feed.

10.11 Unit Review Exercises

Do these review exercises in your exercise book.

I. Fill in the blanks with the correct options:

1. A good rabbit hutch should be …….. .
   (a) stuffy (b) airy
   (c) oppressive (d) none of these
2. The space required for an adult rabbit is …….. .
   (a) 1.18 sq.m (b) 0.18 sq.m
   (c) 0.17 sq.m (d) all of these
3. A female rabbit is …….. than a male rabbit of the same breed.
   (a) smaller (b) larger
   (c) lighter (d) none of these

II. State whether the following statements are true or false:

1. Pet rabbits live in burrows.
2. A male rabbit is smaller than a female rabbit of the same breed.
3. Rabbits should not have a supply of water at all times.
4. To avoid ear scabies among the rabbits, hutches should be kept very clean.
5. Sneezing is not a symptom of pneumonia of the rabbits.

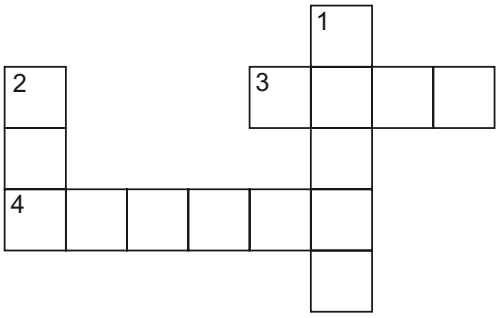
III. Match the following:

Diseases	Symptoms
1. Coccidiosis	(a) Difficulty in breathing
2. Ear scabies	(b) Worms might be seen in droppings
3. Tapeworms	(c) Shaking of the head
4. Pneumonia	(d) Loose motion along with blood

IV. Answer the following questions briefly:

1. List two conditions of a good rabbit hutch.
2. Distinguish a male rabbit from a female rabbit.
3. List two criteria for choosing a rabbit to rear.
4. What does a rabbit feed on?
5. List two points to keep a rabbit healthy.
6. List four common diseases of a rabbit.
7. Write two symptoms and prevention of the disease 'ear scabies'.
8. List any two importances of rabbit farming.
9. How can we use the skin of a rabbit?

V. Complete the crossword puzzle using the clues below:



Clues:

Across

3. The male of the rabbit.
4. Originating in or characteristics of a distant foreign country.

Down

1. It is the house of a pet rabbit.
2. The female of the rabbit.

Unit 11 Plants

Plants are living things. They grow from seeds. Most plants bear seeds. Seeds germinate and grow into new plants.

11.1 Definition of Germination

Activity - 1 Germination of Seeds

1. Take some gram seeds.
2. Sow them in your school garden.
3. Sprinkle water to keep the soil moist.
4. Observe them daily for 3–4 days.

When seeds get enough air, water and light, they grow into new plants or seedlings. The growing of seeds into seedlings is called **germination**.

11.2 Conditions Necessary for Seed Germination

Every seed needs certain favourable conditions to germinate.

Activity - 2 Experiment on Conditions Necessary for Germination

You will need

Four containers, cotton wool, some viable and non-viable cowpea seeds and a cupboard.

Procedure

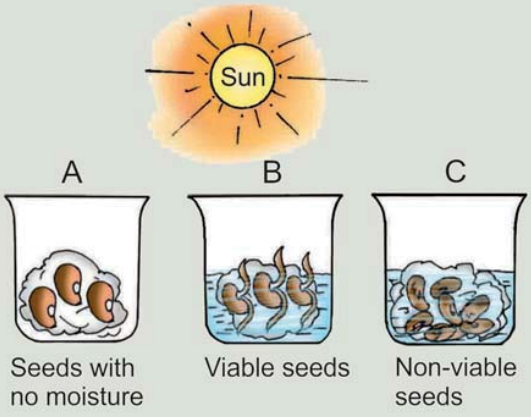
1. Take four containers marked A, B, C and D as follows:
   A with dry cotton wool.
   B, C and D with moist cotton wool.
2. Place 3–4 viable (healthy) cowpea seeds at the top of the cotton wool in containers A, B and D and non-viable (unhealthy) seeds in container C.
3. Place containers A, B and C in sufficient light and air.

4. Place container D in the cupboard.
5. Observe them daily for 3–4 days.
6. Discuss your findings in the class.

Observation

After 3–4 days, you may observe that seeds in containers A, C and D remain unchanged. The seeds in container B have germinated.

Find out why.



Discussion

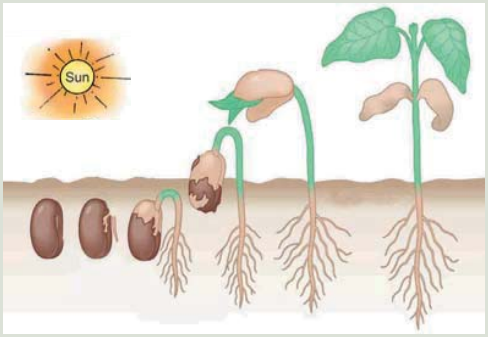
- Container A received suitable temperature and oxygen but no moisture.
- Container C received **suitable temperature, oxygen** and moisture **(water)** but the seeds were not viable.
- Container D did not receive suitable temperature though it had oxygen and moisture (water).
- Only container B received suitable temperature, oxygen and moisture (water) with viable seeds. These conditions helped the seeds in container B to germinate.

Conclusion

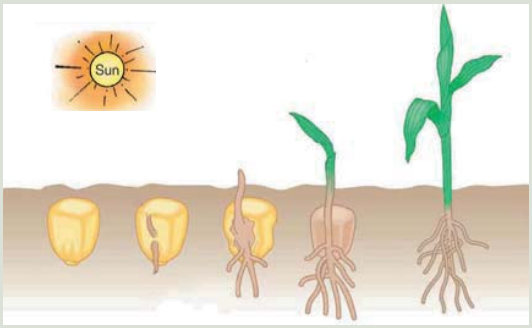
Thus, **oxygen, water** and **suitable temperature** are the necessary conditions for **viable seeds** to germinate.

11.3 Types of Germination

Activity - 3 | Identifying the Types of Germinations



(A)



(B)

1. What do these pictures represent?
2. What difference do you observe?

These two pictures represent germination of seeds.

In picture (A), the seed leaves or cotyledons come out of the soil. This type of germination is called **epigeal germination**. This type of germination occurs in bean and gram seeds.

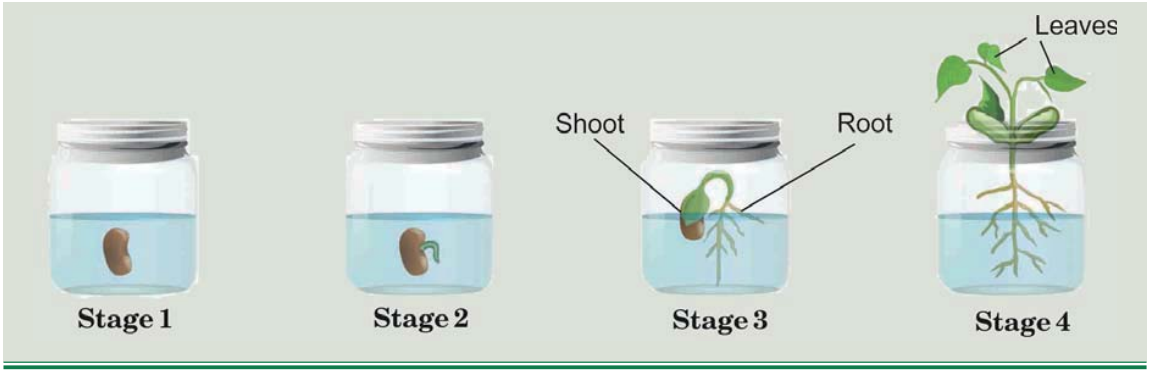
In picture (B), the seed leaves or cotyledons remain under the surface of soil. This type of germination is called **hypogeal germination**. This type of germination occurs in maize, rice and corn seeds.

11.4 Stages of Germination

Activity - 4 | Identifying Main Stages of Germination

1. Take a small plastic jar and fill it with soil.
2. Take a viable bean or a maize seed and place it in the soil of the jar.
3. Keep the jar in a bright airy place.
4. Sprinkle water everyday and observe.

   Note: Make sure that soil is always damp. The seed needs water to grow.
5. Record your observation in your science notebook.



The process of germination occurs in the following four stages:

- **Stage 1:** The seed takes in water and becomes swollen. The seed coat splits.
- **Stage 2:** Baby root begins to grow. It grows downwards.
- **Stage 3:** Baby shoot begins to grow.
- **Stage 4:** The first leaves grow. The seed leaves shrivel. The food has been used up by the baby plant.

11.5 Types of Plants

Activity - 5 | **Sorting Plants into Trees, Herbs and Shrubs**

1. Go on a nature walk.
2. Observe various plants around you.
3. Collect information on them.
4. Sort them into trees, herbs and shrubs.

There are different types of plants. Some of them are discussed below.

(A) Trees

Some plants are very tall. They have hard, strong, and thick stems called **trunk**. These plants are called **trees**. Trees live many years. Examples: mango tree, acacia tree, eucalyptus tree and avocado tree.

Mango tree | Acacia tree | Eucalyptus tree | Avocado tree

Fig. 1. *Examples of some trees*

(B) Shrubs

Some plants are smaller than trees. They have hard stems with many branches. Such plants are called **shrubs**. They live for a few years. Examples: Hibiscus, cotton, rose and tea plant.


Hibiscus


Cotton


Rose


Tea plant

Fig. 2. *Examples of some shrubs*

(C) Herbs

Some plants are very small. They have thin and soft stems. They live for one season or for a few months. Such plants are called **herbs**. Examples: grass, mint, spinach, coriander and garden eggplant.


Grass


Mint


Spinach


Garden eggplant

Fig. 3. *Examples of some herbs*

11.6 Parts of a Plant and their Functions

Like other organisms, plants also have different parts. Each part has a specific function to perform. Let us know about them.

Activity - 6 | **Identifying the Parts of Flowering Plant and Discussing Function for Each Part**

1. Visit your school surroundings.
2. Uproot a small flowering plant and observe its various parts.
3. Name these parts.
4. Also discuss their functions in the class.

A flowering plant has many parts. These are roots, stems, leaves, flowers and fruits.

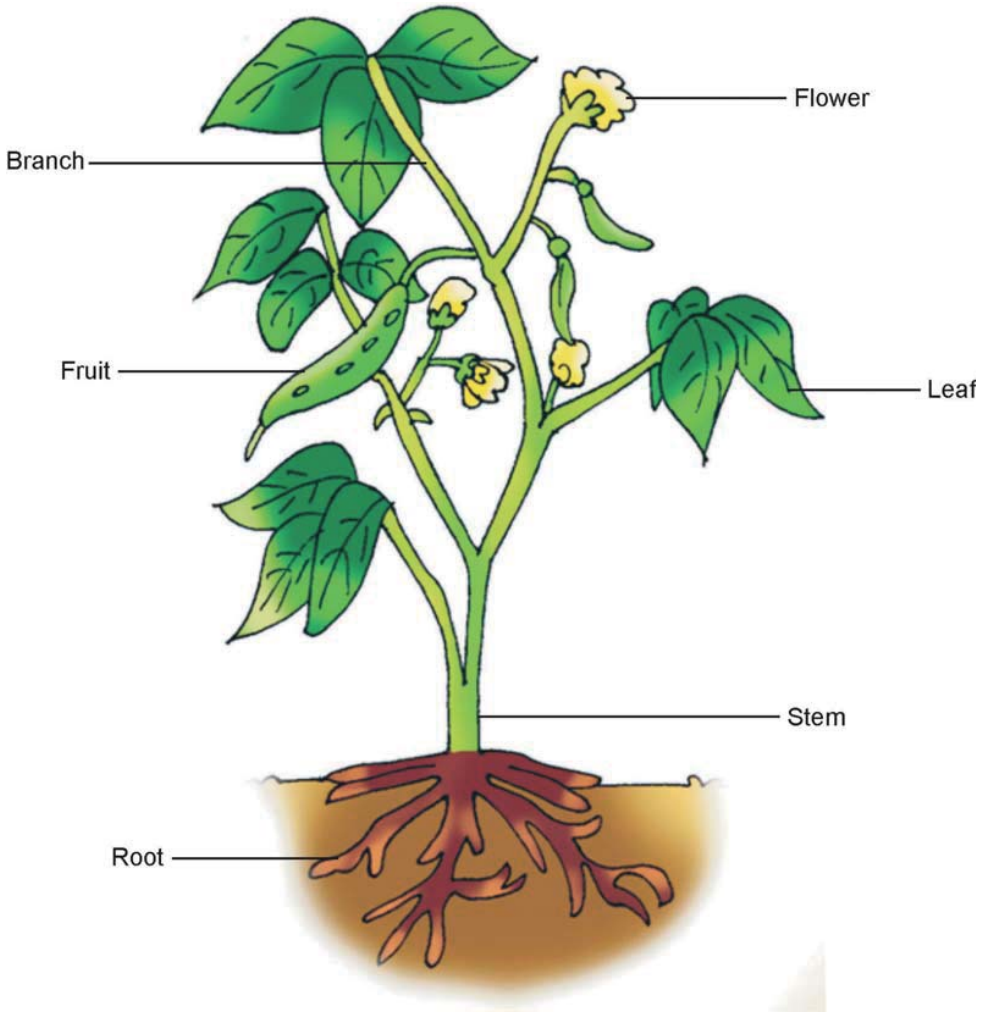


Fig. 4. *Different parts of a plant*

Functions of Parts of the Plant

(a) Root

It is the underground part of the plant. It has the following functions:

1. Roots fix the plant into the soil.
2. They absorb water and minerals from the soil. Water and minerals are important for plants to grow healthy.
3. In some plants, roots store extra food. For example, carrot, radish and beetroot.

(b) Stem

It is the aerial part of a plant. It has the following functions:

1. The stem supports branches which bear leaves, buds, flowers and fruits.
2. It transports water and minerals from the roots to the leaves and fruits.
3. In some plants, stems store extra food. We eat these stems. For example, Irish potato, ginger and sugarcane.

Irish Potato

Ginger

Sugarcane

Fig. 5. *Stems that store extra food*

(c) Leaf

It is the most important part of a plant. Most plants have green leaves. Some functions of a green leaf are:

1. A green leaf makes food for the plant.
2. Air and water vapour go in and out of the leaf. Thus it helps the plant to breathe.
3. In some plants, leaves store extra food. We eat these leaves. For example, spinach, cabbage and coriander.

Spinach

Cabbage

Coriander

Fig. 6. *Leaves that store extra food*

(d) Flower

Flowers are colourful and pretty. They are the reproductive parts of a plant. Some functions of the flower are:

1. Flowers turn into fruits.
2. They give off a sweet smell. So they are used to decorate houses and gardens.
3. Flowers like pyrethrum are natural insecticides.
4. We eat some flowers, for example, cauliflower and broccoli.

Cauliflower

Broccoli

Fig. 7. *Flowers that we eat*

(e) Fruits

Fruits are produced from flowers. Fruits like mango and coconut are one seeded. Other fruits like pawpaw and guava are many seeded. Some functions of fruits are:

1. Fruits protect the seeds.
2. Fruits are a part of our diet.
3. Fruits are rich in minerals and vitamins. They keeps us healthy.
4. Fruits bear seeds which help in reproduction.
5. Seeds of some fruits like black pepper are used as medicines and spices.

Fig. 8. *Black pepper*

Project **Maintaining Plants to Protect Our Environment**

1. Plant a variety of seeds in your school garden.
2. Maintain the new plants to protect your environment.

11.7 Keywords

- **Epigeal germination:** The type of germination in which cotyledons come out of the ground.
- **Germination:** The process by which a seed grows into a seedling.
- **Herb:** A flowering plant whose stem above the ground does not become woody.
- **Hypogeal germination:** The type of germination in which cotyledons remain below the ground.
- **Seed:** A small hard part of a plant from which a new plant grows.
- **Shrub:** A small to medium-sized woody plant.
- **Stem:** The stem is the main part of the shoot.
- **Tree:** A tall plant with a trunk and branches made of wood.

11.8 Summary

- When seeds get enough air, water and light, they grow into new plants or seedlings. The growing of seeds into seedlings is called germination.
- During germination, cotyledons of some seeds come out of the ground. Such type of germination is called epigeal germination.
- During germination, cotyledons of some seeds remain under the surface of the soil. Such type of germination is called hypogeal germination.
- There are different types of plant such as trees, herbs and shrubs.
- Branch, fruit, flower, leaf, stem and root are the main parts of a plant.
- The stem is the main part of the shoot. Branches, leaves, buds, flowers and fruits grow on it.
- A green leaf makes food for the plant.
- Flowers are the reproductive parts of a plant.

11.9 Unit Review Exercises

Do these review exercises in your exercise book.

I. Fill in the blanks with the correct options:

1. When a seed gets enough air, water and sunlight, it grows into a seedling. This process is known as ..... .
   (a) germination (b) pollination
   (c) dispersion (d) none of these
2. The tall plants are called ..... .
   (a) shrubs (b) herbs
   (c) trees (d) none of these
3. ..... live for one season or for a few months.
   (a) Shrubs (b) Trees
   (c) Herbs (d) All of these
4. Fruits are produced from ..... .
   (a) roots (b) stems
   (c) leaves (d) flowers
5. ..... transports water and minerals from the roots to the leaves and fruits.
   (a) Root (b) Leaf
   (c) Stem (d) Flower

II. Match the following:

Column A	Column B
1. Seeds	(a)Germinate and grow into new plants
2. Hibiscus	(b) Shrubs
3. Spinach	(c) Herbs

III. State whether the following statements are true or false:

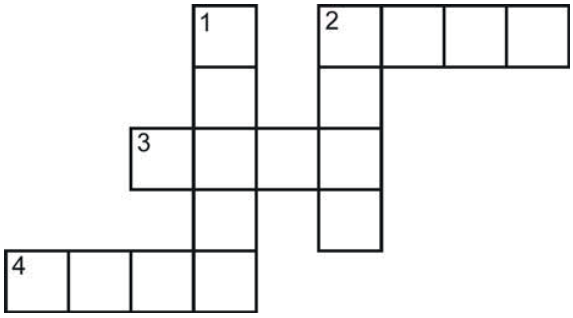
1. Seeds germinate and grow into new plants.
2. Epigeal germination occurs in maize seeds.

3. Hypogeal germination occurs in bean seeds.
4. Roots absorb water and minerals from the soil.
5. Flowers are the reproductive parts of a plant.

IV. Answer the following questions briefly:

1. Define germination.
2. List two types of germination.
3. Define trunk of a tree.
4. Write the names of two shrubs.
5. Write any two functions of roots.
6. We eat some flowers. Can you name any two flowers that we eat?
7. Write any two functions of flower and fruit.

V. Complete the crossword puzzle using the clues below:



Clues:

Across

2. The part of the shoot which bears branches, leaves, flowers and fruits.
3. A tall plant with a trunk and branches made of wood.
4. A flowering plant whose stem is not woody.

Down

1. A small to medium-sized woody plant.
2. A small hard part of a plant from which a new plant grows.

Unit 12 Human Sensory Organs

Organs which help us to see, hear, smell, taste and feel are called **sensory organs**. The organs which help us to know the world around us are eyes, ears, nose, tongue and skin. These are our sensory organs.

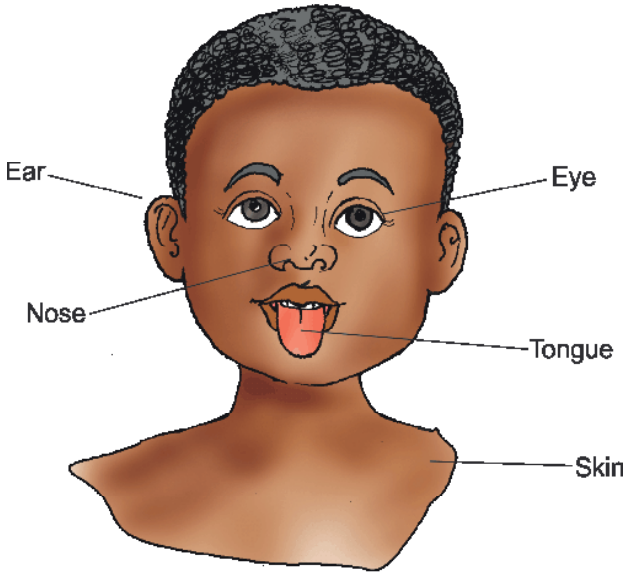


Fig. 1. *Human sensory organs*

12.1 Functional Mechanism of All Sensory Organs

Activity - 1 **Research on Functional Mechanism of Sensory Organs**

1. Research on the functional mechanism of all sensory organs from library or search engines like Google or Yahoo.
2. Make a report on it and present to the class.

Sensory organs are connected to the brain through nerves. They work as follows:

- Each sensory organ receives stimuli such as touch, heat, cold and pressure from the environment.

- The sensory organ transmits this information to the brain through sensory nerves.
- The brain interprets this information and gives feedback to the sensory organ through motor nerves.

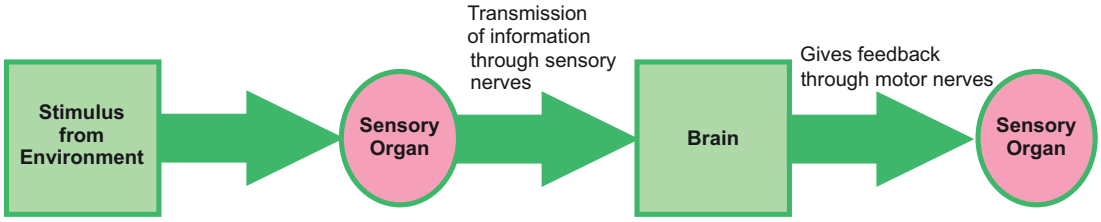
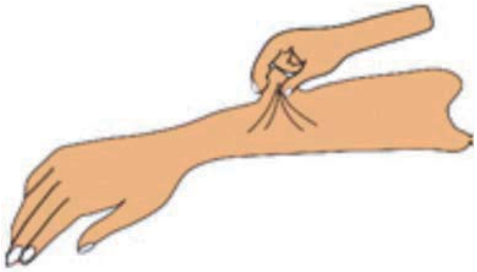


Fig. 2. *Functional mechanism of all sensory organs*

12.2 Structure, Function and Maintenance of Sensory Organs

(a) Skin

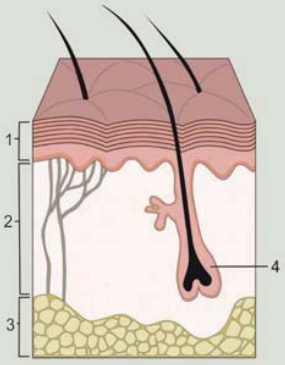
Skin is the outermost covering of our body. It is the sensory organ for touch and feel.



Parts of Skin

Activity - 2 **Identifying the Parts/Layers of Human Skin**

1. Using a hand lens to observe different types of skin:
   - on the head
   - in the palm of the hand
   - on the arm.
2. Compare your findings with the other.
3. Using Internet, find out the following:
   (i) How many layers are there in the skin?
   (ii) What are the functions of each layer?



Skin has three layers: **epidermis, dermis** and **hypodermis**.

1. The **epidermis** is the outermost layer of the skin. It provides a waterproof barrier.
2. The **dermis** is beneath the epidermis. It contains hair follicles, and sweat glands.
3. The **hypodermis** is the very bottom layer of the skin. It is made of fat and tissues.

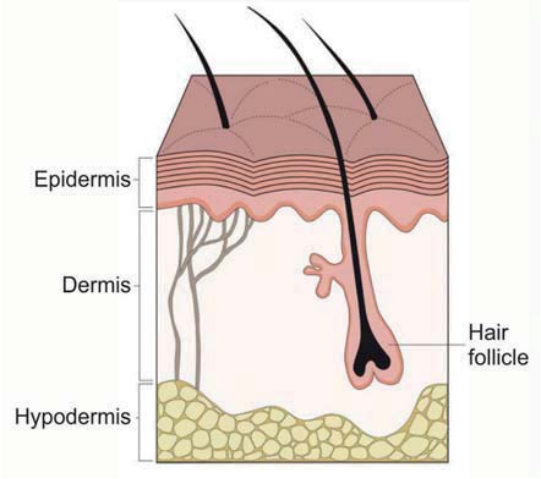


Fig. 4. *Different parts of skin*

Functions of Skin

Activity - 3 | Exploring the Function of Skin

1. Run around your school playground twice.
2. Now observe your skin.
   What is formed on your body?

The substance you see on your body is sweat. Others can say you are sweating.

The main functions of the skin include:

1. It allows us to have a sense of touch.
2. It protects our body from harmful germs.
3. It regulates our body temperature.
4. It helps us to release waste products as sweat.

Properties of Skin

Skin has the following properties:

1. Different people have different skin colours. Some people have light skins. and Others have dark skins.
2. Skin may be oily and dry.

Hygiene of Skin

A clean skin cannot be attacked by diseases. So it is important to keep our skin clean.

To keep the skin clean:

1. Take a bath every day.
2. Use good soap while bathing.
3. Rub and wash every part of the body.

Fig. 5. *Bathing*

4. After taking bath, wipe your body with a clean towel.
5. Wear clean and ironed clothes.
6. Always eat healthy food and drink plenty of water.
7. Always protect your skin from injuries.

Skin Diseases

Activity - 4 | Exploring the Common Skin Diseases

(A)

(B)

(C)

(D)

1. What do these pictures show?
2. What are signs of each disease?
3. List some other skin diseases.
4. What should we do when we suffer from skin diseases?
5. Search information on some common skin diseases from library books/search engines like Google and Yahoo.
6. Make a report and discuss it.

The following are some common skin diseases:

(A) Ringworm

Ringworm usually causes itching. It begins as a small red area. This grows larger. It appears as red, scaly ring. There may be one or several patches.

Ringworm can be easily cured with medicine. The affected person should use his/her own comb, soap and towel.

(B) Eczema

Eczema is characterised by itching and inflammation. The inflamed skin may be dry, swollen and crusty. It may even ooze fluids.

Eczema can be prevented if we wash our skin carefully with good soap. Doctors prescribe ointments and creams for early relief.

(C) Scabies

Scabies causes intense itching. It may affect any part of the body from neck down. It frequently involves the skin between the fingers, under the arms, and on the wrists. It is caused by mites.

Scabies spreads through skin contact. Doctors treat the disease with creams and lotions that kill the mites. Scabies can easily spread from one family member to another.

(D) Leprosy

Leprosy is an infectious disease. Its main symptoms include white or reddish patches on skin, loss of feeling in skin and thickened nerves. The fingers and toes may curl inward.
Early detection and treatment can control leprosy.

Skin Accidents and First Aid

Activity - 5 | **Exploring the Skin Accidents**

(A)

(B)

(C)

1. What do these pictures show?
2. What are the causes and signs of each skin accident?

Sometimes the skin gets injured in accidents. Injuries can happen at work or play, or walking across the street. Some common skin injuries are:

(A) Wounds

Wounds are injuries that break the skin. They include cuts, scrapes and scratches.
First aid for the wound:

1. Clean the wound with a cotton soaked with antiseptic lotion. It removes dirt.
2. Put another ball of cotton soaked with antiseptic lotion. Tie a bandage around it. It will help to stop the blood flow.

(B) Bruises

A bruise is a black or blue mark on the skin. It is caused by blood trapped under the skin. Bruises are often painful and swollen.

First aid for the bruises:

1. Put an ice pack over the bruise. You can put a cloth soaked with cold water on the affected area.
2. Rest the affected area.

(C) Burns and Scalds

A **burn** is a damage to your body's skin caused by heat. Heat from chemicals, hot metal and burning are the most common causes of burns.

Scald is a skin injury caused by wet heat. Hot liquids cause scalds.

Both burns and scalds can cause swelling, blistering and scarring.

First aid for the burns and scalds:

1. Wash the affected area with cold running water.
2. Put an ice pack over the affected area for about 5 to 10 minutes.
3. Apply an antiseptic cream over the affected area.

Activity - 6 | Role Playing a Skin Accident

Situation:

One of your friends has a skin accident. He/She has severe wounds on his/her skin. What would you do?

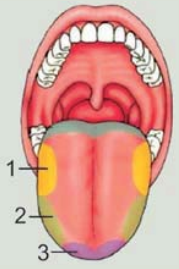
Role play:

1. Form a team of two students each.
2. One member will act as a victim.
3. The other member will provide him/her necessary first aid.

(b) Tongue

Activity - 7 | Identifying the Parts of the Tongue

1. Look into a mirror.
2. Observe your tongue thoroughly.
   What do you see on your tongue?
3. Discuss your findings in the class.



Tongue is the sensory organ for taste. It is found inside the mouth. It is pink in colour.

Parts of Tongue

The surface of the tongue has small buds called **taste buds**. They are present in different areas of the tongue. These buds help us to taste salt, sugar and lemon.

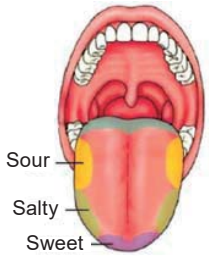


Fig. 6. Different parts of the tongue

Activity - 8 | Tasting Food Samples

1. Bring different food samples that are sweet, salty and sour.

Sugar

Common salt

Lemon

2. Using a toothpick, place each of the samples on different parts on the tongue at once.
3. Find out which part of the tongue can detect which taste.
   Hint: Every part of the tongue detects a different taste.

12.3 Functions of Tongue

Activity - 9 | Exploring the Function of a Tongue

1. Put your tongue out of the mouth.
2. Hold it with your fingers.
3. Now, try to talk to your neighbours.

Are you able to speak properly? Why or why not?

You have seen that **the tongue helps us to speak**. As we speak, it moves up and down.

The following are some other functions of the tongue:

1. It enables us to detect various tastes.
2. It helps in chewing food and rolls it into food pipe.
3. It helps to clean food particles stuck between gums and teeth.

12.4 Hygiene of Tongue

Activity - 10 | Discussing the Hygiene of Tongue

1. Discuss the following questions in groups:
   - How often should we clean our tongue?
   - Why should we clean our tongue?
   - List the things you use to clean your tongue.
2. Make a report on it and present to the class.

A clean tongue cannot be attacked by diseases. So it is important to keep our tongue clean.

To keep your tongue clean:

1. Wash your mouth before and after taking food.
2. Clean your tongue with a soft tongue cleaner.
3. Clean your tongue twice daily—in the morning and at night.

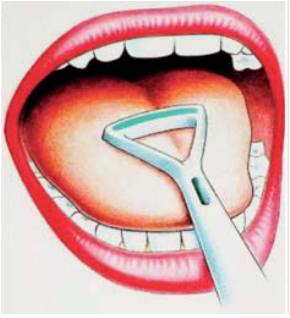


Fig. 7. *Scrapping the tongue*

Proper Method of Cleaning Tongue

1. Choose a cleaning tool (e.g., a tongue cleaner).
2. Scrap the tongue first.
3. Rinse the mouth with clean water.

12.5 Tongue Disorders or Problems

Activity - 11 | Identifying Common Tongue Disorders

(A)

(B)

(C)

1. What do these pictures show?
2. What are signs of each tongue disorder?
3. List some other tongue disorders.
4. What should we do when we suffer from tongue disorders?

The following are some tongue disorders:

(A) **Sore:** In case of sore, there are white or red patches seen on the tongue. Sores are often painful. A person with sore on the tongue finds eating spicy foods difficult. Sores may be caused by viruses.

If you have sore:

(a) Avoid hot and spicy foods.

(b) Take soft foods and cold beverages until the sore heals.

(B) **Swelling of tongue:** Sometimes tongue may suddenly swell up in size. It is a symptom of disease like tongue cancer. If you have such a problem, immediately consult a doctor.

(C) **Black hairy tongue:** In this case, the tongue appears to be hairy. It is caused by a course of antibiotics.

If you have black hairy tongue:

(a) Scrap your tongue with a special tongue scrapper regularly.

(b) Avoid smoking.

(D) **Loss of sense of taste:** Sometimes people lose the ability to taste sour, salty, bitter, or sweet flavours partially or completely. Poor oral hygiene and dental problems are the causes of this.

If you have a taste disorder, consult a doctor.

Tongue Accident

Activity - 12 | Identifying Tongue Accidents

(A)

(B)

1. What do these pictures show?
2. What are causes and signs of each tongue accident?

Sometimes your tongue gets injured due to some accidents or hot food items. Some of the tongue accidents include:

(A) Tongue bite: People often bite their tongue while eating, talking or playing games. They may also bite their tongue in road accidents. Most tongue bites get completely healed easily.

If you have a tongue bite:

(a) Apply ice pack on the affected area.

(b) Avoid eating spicy food.

(c) Rinse your mouth with warm salt water.

(B) Burn of tongue: A burn of the tongue is a common ailment. It occurs when you eat or drink something that is too hot. It injures the outermost layer of the tongue. It is often painful. Redness, swelling, and blistering are signs of a burn of the tongue.

If you have a burn of the tongue:

(a) Rinse the area well with cool water for a few minutes.

(b) Wet a clean cloth with cool water and hold it on top of the burn.

(c) Avoid warm or hot liquids, which could irritate the burn.

(d) If the burn does not improve, consult a doctor.

(c) Nose

The nose is the sensory organ for smell.

Smells flow in air. Our nose picks up the air when we breathe in. Brain instantly tells whether the smell is good or bad. In the above activity, it was the nose which helped to smell the perfume.

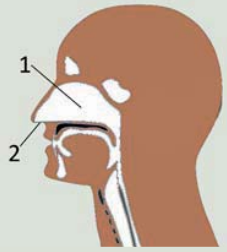
Activity - 13 | Exploring the Uses of Nose

1. Spray some perfume into a cotton wool and leave it in one corner of the room.
2. After a few minutes, call your friend in. Does the friend smell something?
3. Name the organ which helped to smell the perfume.

Parts of Nose

Activity - 14 Identifying the Parts of a Human Nose

1. Identify all parts of the nose and label them.
2. Draw this picture in your science notebook.



The nose consists of the following parts:

1. The nose has two holes called **nostrils**. Air enters the nose through the nostrils.
2. **Nasal cavity** is the large air-filled space above and behind the nose. It is the continuation of nostrils.

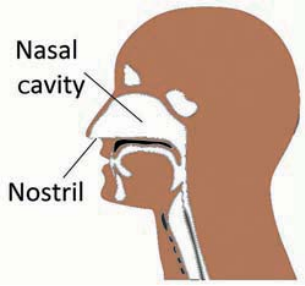


Fig. 8. *Different parts of the nose*

Functions of Nose

Activity - 15 Discovering the Function of Nose

1. Hold your nose tight.
2. What do you feel? Explain why.

You will feel uneasy. This is because the nose helps us to breathe. Nose also helps us to smell.

Hygiene of Nose

Activity - 16 | Discussing the Hygiene of Nose

1. Discuss the following questions in group.
   - How often do you clean your nose?
   - Why is it essential to keep the nose clean?
2. Make a report on it and present to the class.

Proper nasal hygiene is essential to the good function of a nose. It is important to maintain proper nose care.

You can take care of your nose in the following ways:

1.  *Gently blow your nose.*	**2.**  *Cover your nose when you are in a dusty place.*	**3.**  *Clean your nose with a soft cotton cloth.*

Activity - 17 | Identifying Common Nose Diseases

(A) 

(B) 

1. What do these pictures show?
2. What are signs of each disease?
3. What should we do when we suffer from these diseases?

The following are some common nose diseases:

(A) Common Cold

The common cold is a viral infectious disease. A person with common cold feels a runny nose. He/She sneezes from time to time. It causes headache and weakness.

Causes of Common Cold

The causes of common cold include:

1. Transmission of cold viruses through air-borne droplets
2. Cold weather condition such as rain or winter
3. Poor immune functions
4. Insufficient sleep and malnutrition.

(B) Sinusitis

It is an infection of the sinuses near the nose. When a person suffers from sinusitis, his/her nose is blocked. He/She does not breathe well. He/She has headache and facial discomfort.

Causes of Sinusitis

The causes of sinusitis include:

1. Microorganisms such as virus, bacterium or fungus
2. Abnormalities in the structure of the nose
3. It can be caused by allergy and irritation of sinuses.

Prevention of Nose Diseases

The following measures should be taken to prevent nose diseases:

1. Avoid close contact with the people who are sick.
2. Wear face mask when you are in crowds.
3. Cover your mouth and nose while others are sneezing or coughing.
4. Wash your hands with a soap. It reduces the spread of viruses.

Accidents of Nose

Nose injuries often occur during play, sports and accidents. Some of the nose injuries include:

Broken Nose

A broken nose is a fracture in a bone in the nose. It commonly occurs with face injuries. Some causes of broken nose include: falling down and motor vehicle accidents.

A person suffering from broken nose has the following *symptoms*:

1. Nose pain.
2. Swelling of the nose.
3. Bruising around the nose or eyes.
4. A runny nose or a nosebleed.
5. Blocked nasal passages.

In case of broken nose:

1. If you have nose bleeding, sit upright and breathe through the mouth.
2. To reduce swelling, apply an icepack on the nose.
3. In severe cases, consult a doctor.

Nosebleed

Nosebleed is the flow of blood from one or both nostrils. It is caused due to minor injury to the nose.

If you have nosebleed:

1. Sit upright and breathe through the mouth
2. Keep an icepack on the nose to stop bleeding
3. In case of severe bleeding, consult a doctor.

(d) Ear

Activity - 18 | **Exploring the Importance of Ears**

1. Ask your friend to clap his/her hands.
2. Cover your ears. Can you hear your friend's clapping?
3. Ask your friend to blow a whistle. Can you hear the sound of the whistle?

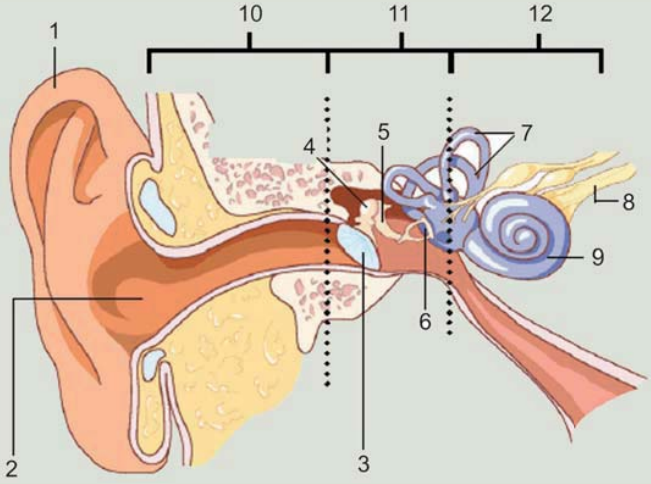
Ears are our sensory organs of hearing. We have a pair of ears on either side of our head.

We hear sounds with our ears. When our ears are covered, we will not be able to hear sounds.

Parts of Ear

Activity - 19 | Identifying the Parts of a Human Ear

1. Identify all parts of the ear and label them.
2. Draw this picture in your exercise book.



There are three major parts of a ear. These are the **outer ear**, the **middle ear** and the **inner ear.**

1. **The outer ear:** It is the part of the ear which can be seen. It helps us to receive sound waves from the environment. Then it sends them towards the other parts of the ears. It has the following parts:
   - **The pinna:** It is made up of a cartilage and skin. This is the entrance for the sound waves.
   - **The ear canal:** It is a canal that guides the sound towards the inner ear. The glands which release ear wax are positioned in the ear canal.
2. **The middle ear:** It is located in between outer and inner ears. It is a cavity filled with air. It converts sound waves into pressure waves with the help of these parts:
   - **Eardrum:** It is a delicate membrane. It separates the outer ear from

the middle ear. When sound reaches it, it turns into mechanical energy.

- **Hammer:** It is one of the three bones located next to the eardrum. It vibrates when sound reaches it.
- **Anvil:** It is another tiny bone which vibrates in response to the previous vibration.
- **Stirrup:** It is the last bone of the ear. It receives the vibration from the other two bones and sends it into the inner ear.

3. **The inner ear:** It is the last part of the ear. It is filled with a watery substance. It is made up of three parts which help in hearing.
   - **Cochlea:** It is a spiral shaped tube. It is covered with small hairs which contain nervous cells. Sound messages are picked from cochlea and sent to the brain.
   - **Semi-circular canals:** They are connected with the cochlea and are filled with fluid. They maintain the body balance and posture.
   - **The auditory nerve:** It picks up sound messages from cochlea and sends them to the brain.

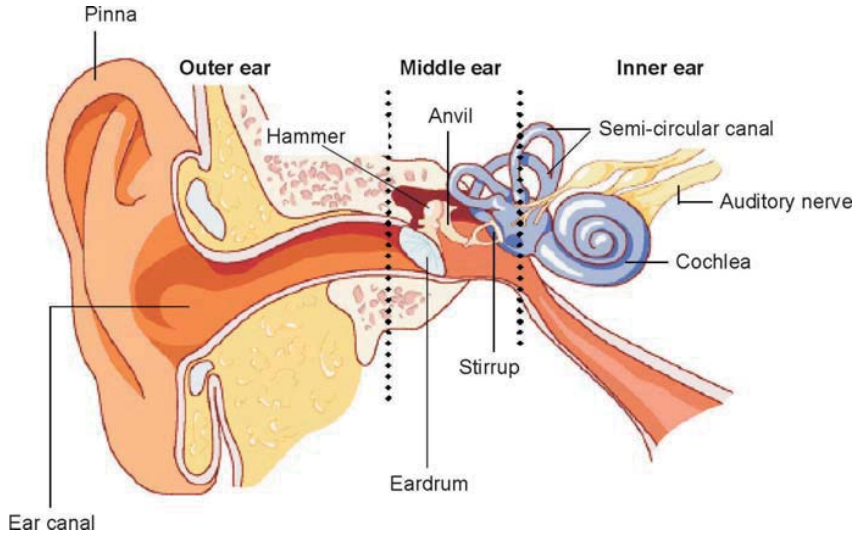


Fig. 9. *Different parts of a ear*

Functions of Ears

The following are some specific functions of the ears:

1. They help in hearing sound.
2. They help in balancing our body.

Hygiene of Ears

Activity - 20 Discussing the Hygiene of Ears

1. Discuss the following questions with your parents.
   - Why do we clean our ears regularly?
   - What materials are suitable for cleaning ears?
   - Why is it unsafe to clean ears with sharp or hard objects?
2. Make a report on it and present to the class.

Regular cleaning of ears prevents some ear problems. Therefore, these should be cleaned properly.

1. Do not clean your ears with toothpicks, matchsticks or any sharp objects. It can injure the delicate part of the ears.
2. Use cotton buds to clean your ears.
3. Keep you away from loud sound. Loud sound can damage the ears.
4. Do not push things like beads and small stones into your ears.

Diseases of Ears and their Causes

Activity - 21 Identifying Diseases of Ears

1. Is this person able to hear clearly?
2. What disease he is suffering from?
3. List some possible causes of this disease.

He is suffering from ear disease. Some common ear diseases are: hearing loss and deafness.

Hearing Loss

Hearing loss is the reduced ability to hear sound. It occurs when sound waves do not reach the brain. Basically, there are two types of hearing loss.

Conductive Hearing Loss

Activity - 22 **Identifying Causes of Conductive Hearing Loss**

1. What is the child doing?
2. Is it safe to enter such foreign materials into the ears? Explain why.

The child is cleaning his ears using a matchstick. It is unsafe to enter such foreign materials into the ears. It may cause problems with ear canal, ear drums and middle ear. It may lead to conductive hearing loss.

Some other **causes** of conductive hearing loss are:

1. Infection in the ear canal.
2. Tumour in the ear canal.
3. Much ear wax in the ear canal.

This disease is temporary. It can be cured by removing ear wax and other foreign materials from the ears.

Activity - 23 | Identifying Causes of Sensory Hearing Loss

1. What difference do you observe between these two pictures?
2. What happens if the child hears loud noises every day?

In the first picture, the child is hearing loud noise coming from vehicles and loud speakers. If he hears such loud noise for a long time, he will suffer from sensory hearing loss.

Sensory hearing loss is due to the problem in the inner ear. A person with such disease cannot understand what he/she is hearing. This disease is nerve-related.

Some other **causes** of sensory hearing loss are:

1. Old age
2. Injury to the ear canal
3. Ear infection.

This disease can be cured by:

1. Treatment of ear infection
2. Avoiding travel in the vehicles which produce loud sound
3. Treatment of infection in the ear canal.

Deafness

Deafness is the complete inability to hear sound. It is caused by damage to the inner ear. Basically, there are three types of hearing loss. These are:

Partial Deafness

It is the condition in which a person is unable to hear properly.

It can be **caused** by the following factors:

1. Intrusion of foreign materials in the ear
2. Much ear wax in the ear canal
3. Holes in the ear drum.

This disease is temporary. It can be cured by removing ear wax and other foreign materials from the ears.

Permanent Deafness

It is the condition in which a person is completely unable to hear. In some cases, deafness is inherited from parents to their child. This type of deafness is permanent and cannot be cured.

Sensory Deafness

It is due to the problem in the nervous system. A person with such a disease cannot understand what he/she is hearing.

It can be **caused** by the following factors:

1. Disease of the blood vessels
2. Loud noises or sounds
3. Tumour in the ear canal
4. Use of certain medicines (drugs) that are harmful to hearing.

This disease can be cured by:

1. Treating the diseases of the blood vessels.
2. Avoiding working around loud noises every day.
3. Removing tumour from the ear canal by surgery.

(e) Eye

The eyes are organs of sight. We have a pair of eyes. The eyes are located in the bony cavities of the skull. They are protected by the eyelids and eye lashes.

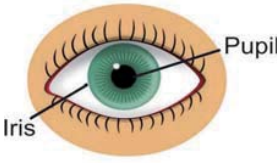


Fig. 10. *Front part of an eye*

Activity - 24 | Observing the Structure of Eyes

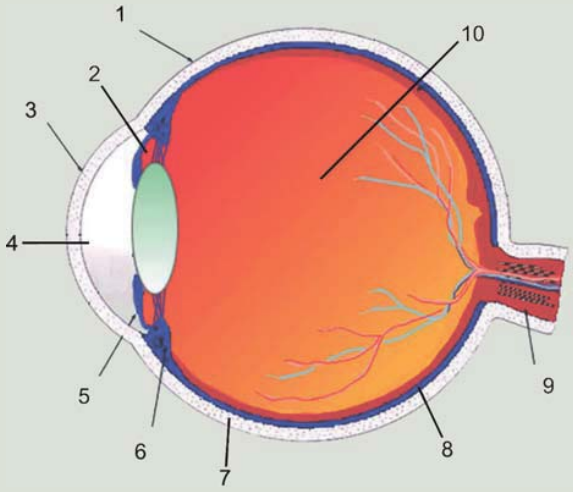
1. Choose a partner and face each other.
2. Look into the eyes of your partner closely.
3. Observe and describe the parts you see.

You can see a dark round part in the eye. There is a darker spot at the middle of it. It is the hole through which light enters into the eye.

Parts of an Eye

Activity - 25 | Identifying Different Parts of a Human Eye

1. Identify all its parts of an eye and label them.
2. Draw this picture in your exercise book.



Layers of an Eye

An eye is composed of three concentric layers:

1. **Outer layer:** This layer contains the sclera and the cornea.
   - **Sclera:** This is the white part of an eye. It protects the eye from injury.
   - **Cornea:** It is a curved, transparent circular coat in front of the eyeball. It controls and focuses the entry of light into the eye.
2. **Middle layer (Vascular layer):** This layer contains the iris, ciliary body and choroid.

- **Iris:** It is a coloured, thin circular ball present in the centre of the eye. It determines eye colour.
- **Ciliary body:** It is a structure that releases a transparent liquid in the eye. It controls the shape of the lens. Lens is a solid body lying just behind the iris. It provides focus of light on the retina.
- **Choroid:** It is a vascular layer of the eye. It lies between retina and the sclera. It nourishes the outer layer of the retina.

3. **Inner layer:** This layer is also called retina. It is the sensory part of an eye.
   - **Retina:** It is a very delicate coat at the back of the eyes. Images are formed on the retina. The retina sends the images to the brain through nerves called **optic nerves**.

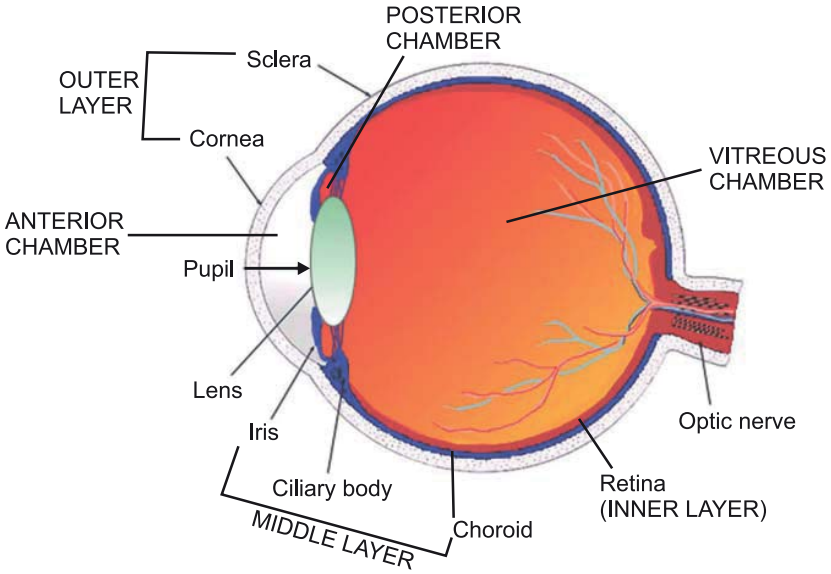


Fig. 11. *Different parts of an eye*

Chambers of an Eye

There are three chambers in the eye. They are:

1. **Anterior chamber:** It is the space between cornea, iris and the lens. It is filled with a fluid called aqueous humour.
2. **Posterior chamber:** It is the space between iris and ciliary body. It is also filled with aqueous humour.

3. **Vitreous chamber (or Internal chamber):** It is the space behind lens and between iris and retina. It is filled with a clear jelly-like substance called vitreous humour.

Functions of Eyes

Activity - 26 | Exploring the Functions of Eyes

1. Blindfold one of your friends.
2. Put different objects in front of him/her.
3. Is he/she able to see these objects? Explain why.

The blindfolded pupil cannot see the things. It is because the **eyes help us to see**.

Defects of Eyes and their Correction

Activity - 27 | Identifying the Types of Eye Defects

1. Search information from various sources (parents, peers, nearest health facilities, printed materials and XO laptops about eye defects and their prevention.
2. Then share the information with your classmates.
3. 

(A)

(B)

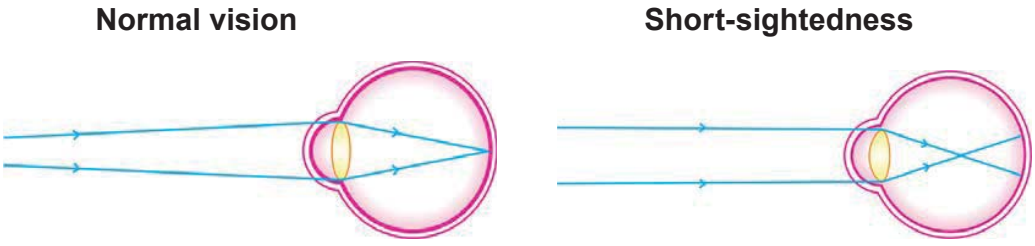
- What do the pictures show?
- Which disease is the girl suffering from?
- Which disease is the lady suffering from?

There are many types of eye defects. These are:

(A) The girl is suffering from **short-sightedness** or **myopia**. She can see nearby objects very well, but cannot see objects well that are far.

The following are some **causes** of short-sightedness:

1. Increased size of the eyeball
2. Weakness of eye muscles
3. Insufficient supply of blood to the eyes.



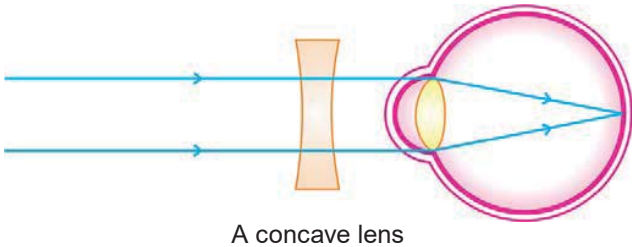
(i) Light rays are focused on the retina and the image is clear

(ii) Light rays from a distant object are focused before the retina and the image is not clear

Fig. 12. *Causes of short-sightedness*

Correction

This defect can be corrected using a *concave* (*diverging*) lens.



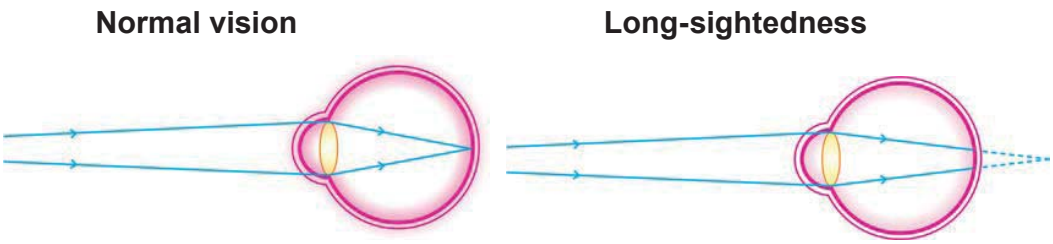
A concave lens

Fig. 13. *Correction of short-sightedness*

(B) The lady is suffering from **long-sightedness** or **hypermetropia**. She can see distant objects clearly, but near objects with blurred vision.

The following are some **causes** of long-sightedness:

1. When the cornea is less curved
2. Decreased size of the eyeball
3. Lack of enough elasticity by the ciliary muscles
4. Insufficient supply of blood to the eyes.



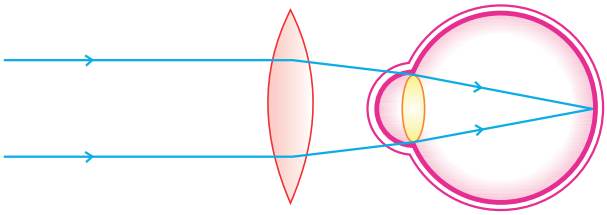
(i) Light rays from a nearby object are focused onto the retina and the image is clear

(ii) Light rays from a nearby object are focused behind the retina and the image is not clear

Fig. 14. *Causes of long-sightedness*

Correction

This defect can be corrected by using a *convex* (*converging*) lens.



A convex lens

Fig. 15. *Correction of long-sightedness*

(C) Presbyopia

Presbyopia is a progressive form of long-sightedness. It affects most people by their early 60s. Most people find that the near point gradually diminishes.

Cause and Cure

It arises due to the gradual weakening of the eye muscles. Simple reading eyeglasses with convex lenses correct most cases of presbyopia. Sometimes, a person may suffer from both *myopia* and *hypermetropia*. Such people often require *bi-focal lenses*. In the bi-focal lens, the upper portion of the bi-focal lens is a concave lens, used for distant vision. The lower part of the bi-focal lens is a convex lens, used for reading purposes.

(D) Astigmatism

In *astigmatism*, a person cannot simultaneously focus on both horizontal and vertical objects.

Causes

This defect is usually due to the cornea that is not perfectly spherical.

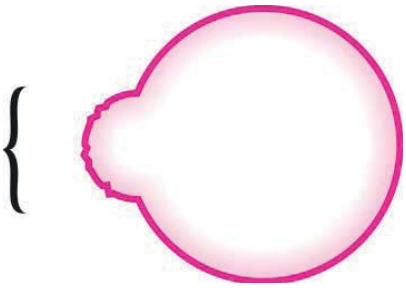


Fig. 16. *Causes of astigmatism*

Correction

This defect can be corrected using eyeglasses with *cylindrical lenses*.

Prevention of Eye Defect

Activity - 28 **Collecting Information on Prevention and Treatment of Eye Defects**

1. Go to your school library.
2. Collect information on prevention and treatment of possible eye defects from textbooks in the library.
3. Make a report on it and present to the class.

To prevent eye defects, respect the following advice:

1. Eat a healthy diet that includes fruit and green leafy vegetables.
2. Avoid smoking.
3. When you are outdoors, wear sunglasses that block sun's harmful UV rays.
4. Keep at least a distance of 25 cm when you are reading and watching TV.
5. Have a regular checkup of your eyes by an eye doctor.

12.6 Keywords

- **Auditory:** Related to the sense of hearing.
- **Dermis:** The middle layer of the skin.
- **Epidermis:** The outermost layer of the skin.

- **Hygiene:** Practice that you do to keep things healthy.
- **Hypodermis:** The bottom layer of the skin.
- **Lens:** A piece of glass with curved sides for concentrating or dispersing light rays.
- **Motor nerve:** A nerve that carries feedback from brain to the sensory organs.
- **Scald:** A skin injury caused by wet heat.
- **Sense:** To become aware of something.
- **Sensory organs:** are organs which help us to see, hear, smell, taste and feel
- **Sinuses:** Air-filled cavities inside face and skull.
- **Tumour:** A swelling of a part of the body.
- **Wounds:** Injuries that break the skin.

12.7 Summary

- Organs which help us to see, hear, smell, taste and feel are called sensory organs. The eyes, ears, nose, tongue and skin are our sensory organs.
- Skin is the outermost covering of our body. It is the sensory organ for touch and feel.
- If we do not clean our skin properly, diseases like ringworms and eczema will attack our skin. Some common skin diseases include: ringworm, scabies, leprosy and eczema.
- Tongue is the sensory organ of taste.
- Nose is the sensory organ for smell.
- Common cold and sinusitis are some common nose diseases.
- Ears are our sensory organs of hearing.
- Some common ear diseases include: hearing loss and deafness.
- Deafness is the complete inability to hear sound.
- The eyes are organs of sight.

- In short-sightedness, a person can see nearby objects very well, but cannot see objects well that are far.
- In long-sightedness, a person can see distant objects clearly, but near objects with blurred vision.

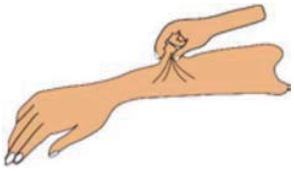
12.8 Unit Review Exercises

Do these review exercises in your exercise book.

I. Fill in the blanks with the correct options:

1. Organs which help us to see, hear, smell, taste and feel are called ..... .
   (a) breathing organs (b) sensory organs
   (c) reproductive organs (d) none of these
2. ..... is the sensory organ for touch and feel.
   (a) Ear (b) Eye
   (c) Skin (d) Nose
3. ..... is the sensory organ of sight.
   (a) Ear (b) Eye
   (c) Skin (d) Nose
4. ..... is the sensory organ of taste.
   (a) Ear (b) Eye
   (c) Skin (d) Tongue
5. ..... is the sensory organ of hearing.
   (a) Ear (b) Eye
   (c) Skin (d) Nose
6. ..... is the sensory organ for smell.
   (a) Ear (b) Eye
   (c) Skin (d) Nose

II. Match the organs with their functions:

Sensory Organs	Functions
1. 	(a) It helps us to see
2. 	(b) It helps us to taste
3. 	(c) It helps us to smell
4. 	(d) It helps us to feel
5. 	(e) It helps us to hear

III. State whether the following statements are true or false:

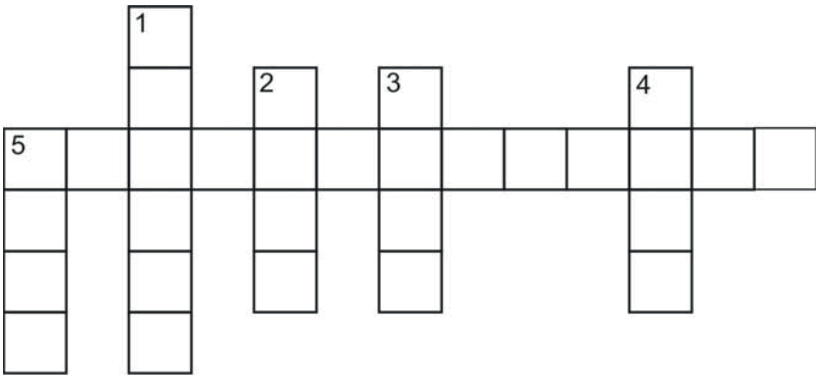
1. Sensory organs are connected to brain through nerves.
2. Tongue enables us to balance our body.
3. The inner ear has three tiny bones.
4. Retina is the outer layer of the eye.
5. Short-sightedness can be corrected using a convex lens.

IV. Answer the following questions briefly:

1. Explain the mechanism of sensory organs.
2. What are the specific functions of skin?

3. List any two properties of skin.
4. Name any three skin diseases.
5. What are bruises?
6. What are the specific functions of tongue?
7. How can you take care of your tongue?
8. List some tongue disorders and their causes.
9. What are the specific functions of nose?
10. Explain how to maintain the hygiene of tongue.
11. List two nose diseases, their causes and preventions.
12. State the functions of ears.
13. Mention some ear diseases and their causes.
14. List some eye defects and their corrections.
15. How can you prevent eye defects?

V. Complete the crossword puzzle using the clues below:



Clues:

Across

5. Organs which help us to see, hear, smell, taste and feel.

Down

1. It is the sensory organ for taste.
2. It is the sensory organ for smell.
3. These are the sensory organs for sight.
4. These are the sensory organs for hearing.
5. It is the outermost covering of our body.

Unit 13 Human Skeleton

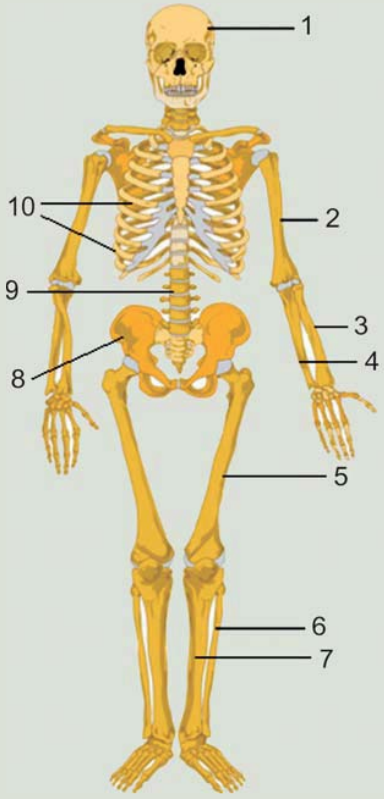
Skeleton supports our body. It is made up of bones. Without skeleton, we would not be able to stand up.

13.1 Main Parts and Major Bones of the Skeleton

Activity - 1 Identifying Main Parts of Human Skeleton

Identify different parts of the skeleton from the following and write in your notebook. Take help of the Internet or books from the library.

- What would you look like if you had no skeleton?
- Would you be able to stand up?
- Would you be able to walk?
- What supports your body?



Skeleton gives shape and support to our body. A skeleton comprises skull, arms and legs. Each of the major parts consists of some small bones.

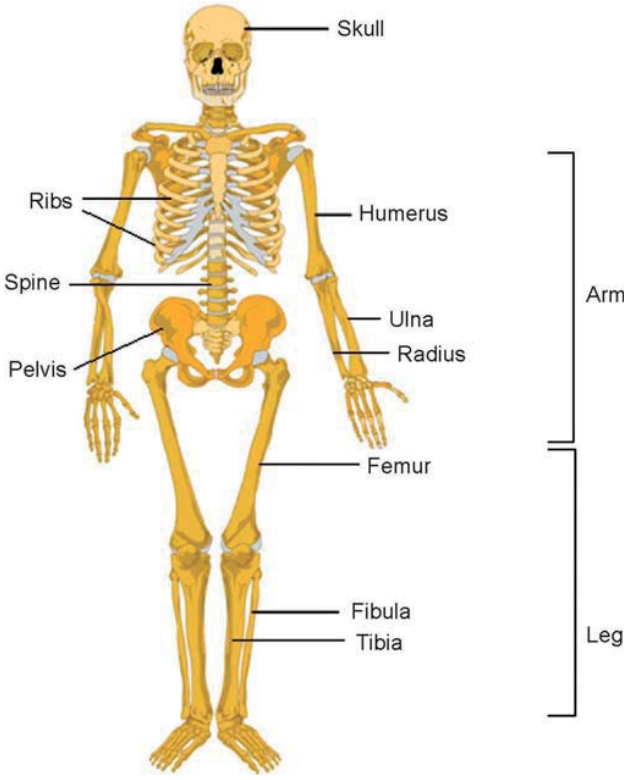


Fig. 1. *Main parts of human skeleton*

(a) Major Bones of Skull

Activity - 2 | Exploring Bones in the Forehead

1. Press the top of your forehead.
2. Do you feel hard or soft?
3. What do you think makes your forehead harder?

Inside our head, there is a bony framework that encloses the brain. It is called **skull**. It is the hardest of all bones in the body. All the bones in the skull are fixed. The major bones of the skull are:

1. **Cranium:** It is the covering that protects and supports the brain. It consists of 8 bones.
2. **Facial bones:** There are 14 facial bones in the face and the jaws. The only movable bone in the jaw is the lower jaw.

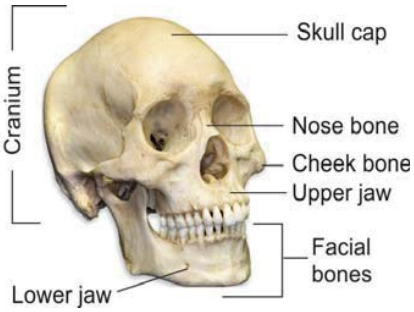
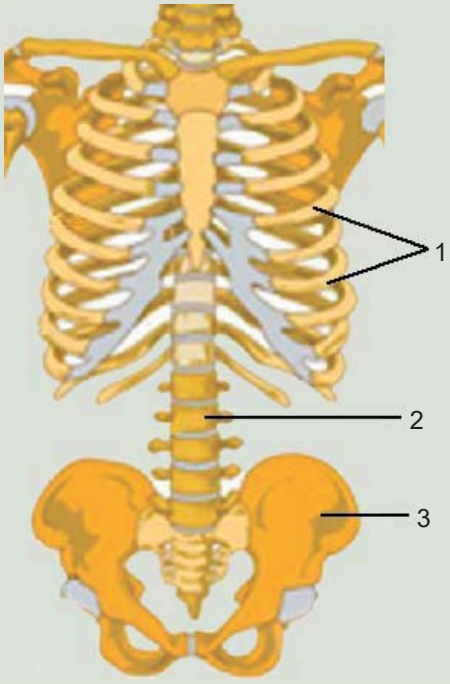


Fig. 2. *Skull*

(b) Major Bones of Trunk

Activity - 3 | **Identifying Major Bones of Trunk**

Look at the picture. Identify the major bones of trunk from the given options and write in your notebook. (RIBS, SPINE, PELVIS)



The part of the body to which head and limbs are attached is called **trunk**. The major bones of the trunk are:

The Backbone or Spine

The backbone is made up of 33 ring-like bones called **vertebrae**. These 33 bones form a column called **spine**.

Spine encloses and protects the spinal cord. It also supports the head, neck and body for upright posture.

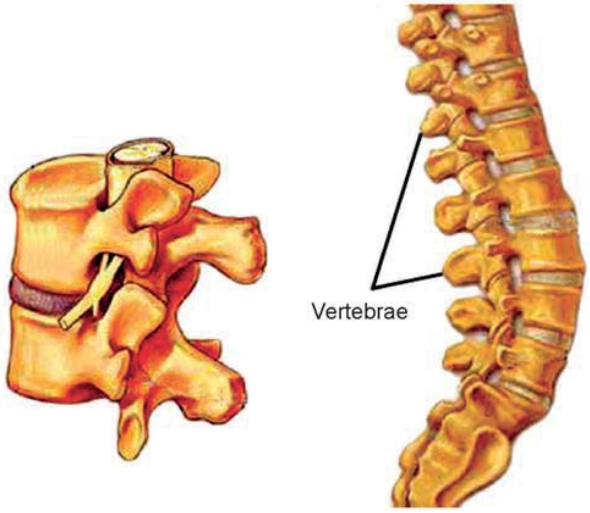


Fig. 3. *Spine*

Ribs

Ribs are curved bones. These are attached to the backbone at the back and breastbone at the front. All these ribs together form a cage-like structure called **rib cage**. Rib cage protects our heart and lungs. There are 12 pairs of ribs in this rib cage.

Fig. 4. *Ribs*

Pelvis

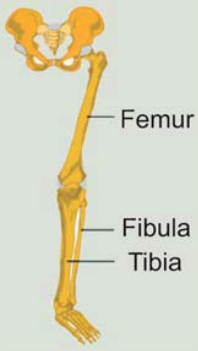
It is the lower part of the trunk. It supports the abdomen. It also protects the digestive organs. Legs and backbone are attached to the pelvis.

Fig. 5. *Pelvis*

(c) Major Bones of Legs and Arms

Legs

Activity - 4 | **Identifying Major Bones of Legs**



1. What does the picture show?
2. How many long bones are there in leg?
3. Write their names in your science notebook.

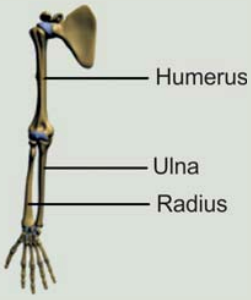
The legs are called the **hind-limbs**. Each leg has three long bones and several short bones. These bones make up the foot. Major bones of the leg are femur, tibia and fibula.

The upper part of a leg has a long bone. It is called **femur**.

The lower part of a leg is made up of two bones—**tibia** and **fibula**. Tibia is larger than fibula.

Arms

Activity - 5 | **Identifying Major Bones of Arms**



1. What does the picture show?
2. How many long bones are there in an arm?
3. Write their names in your science notebook.

The arms are called **fore-limbs**. Each arm has three long bones and several short bones. These bones form the fingers and the hands. Major bones of an arm are humerus, ulna and radius.

The upper part of an arm has a long bone. It is called **humerus**.

The lower part of an arm is made up of two bones—**radius** and **ulna**.

13.2 Functions of the Skeletal System

Activity - 6 **Discussing the Functions of Skeletal System**

Discuss the following question in groups:

- What would happen if we didn't have skeleton?

Without skeletal system we would be just a puddle of skin. The **skeleton gives shape and support to our body**. It has some other functions also. They are:

1. Together with muscles it helps us to move.
2. It protects all the delicate organs like brain and heart.
3. Some bones produce blood cells in the **bone marrow**. Marrow is a soft tissue present inside the bone.
4. Bone tissues store minerals like calcium and phosphorus.
5. Bone regulates the release of hormones.
6. The facial bones form jaws which help us in speaking and eating.
7. The vertebral column or spine protects the spinal cord.

13.3 Accidents of Bones

When damages occur to the bones, it is called **bone accidents**. Fracture is one type of accident to the bone.

Activity - 7 | Discussing the Types of Accidents of Bones

Look at the picture.

What is the person suffering from?

The person is suffering from fracture. A break or crack in the bone is called a **fracture**. Fractures can occur to the bones of legs, arms, head and backbones. A sudden fall or an accident can cause fracture.

The following are the **signs** and **symptoms** of fractures:

1. Swelling or bruising over a bone.
2. The injured limb appears shorter.
3. Pain in the injured area.
4. Loss of function in the injured area.

(a) Types of Fractures

There are two types of fractures. These are—**open fracture** and **closed fracture**.

1. **Open fracture:** When a fracture punctures the skin, it is called an open fracture.
2. **Closed fracture:** When a fracture does not puncture the skin, it is called a closed fracture.

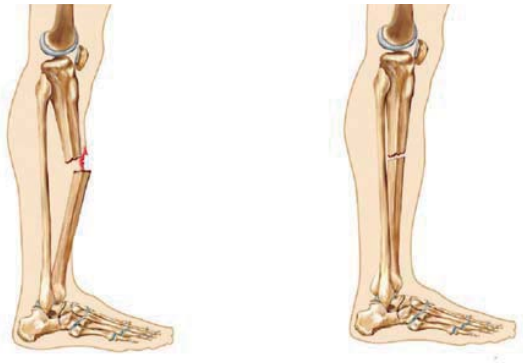


Fig. 6. *Types of fractures*

(b) First Aid for Fracture

In case of fracture:

1. Do not move the fractured part.
2. Apply a **splint** (rigid material) to the injury. Tie a cardboard with a piece of cloth around the fractured part.

> **Note:** Do not secure the splint too tight. The circulation of blood will be stopped.

3. In case of hand fracture, use a **sling** to restrict the movement of the hand. A sling is a triangular piece of cloth.

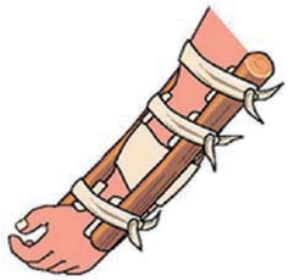


Fig. 7. *Splint*

Fig. 8. *Sling*

4. Rush the victim to a nearby health centre.

(c) Prevention of Accidents of Bones

To prevent bone accidents:

1. Never play dangerous games.
2. Never fight with your friends.
3. Take a well-balanced diet to keep your bones healthy. Especially, eat food rich in calcium.
4. Exercise regularly. It will make your bones strong.

13.4 Bone Diseases

Activity - 8 | **Identifying the Bone Diseases**

1. Search information from different sources on different bone diseases from library, wallcharts and search engines like Google or Yahoo.
2. Then share the information with your friends in the classroom.

Diseases that affect our bones are called **bone diseases**. There are many kinds of bone diseases. Some of the common bone diseases are:

(a) Rickets

Rickets is the softening or weakening of bones. It is common in children of 6–24 months of age.

Fig. 9. *Rickets*

Cause of Rickets

1. Deficiency of Vitamin D
2. In some cases it is genetic.

Symptoms of Rickets

Signs and symptoms of rickets include:

1. Pain in bone
2. Bending of legs and backbones
3. Swelling at the wrists, knees and ankles
4. Dental deformities.

Prevention of Rickets

1. Have daily sunlight exposure.
2. Eat foods that include adequate amount of calcium and vitamin D.

(b) Bone Cancer

Bone cancer occurs when abnormal cells grow in the bones.

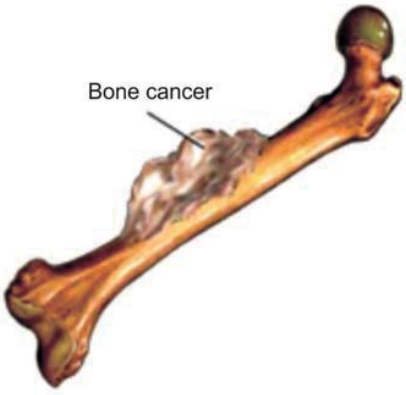


Fig. 10. *Bone cancer*

Symptoms of Bone Cancer

The main symptoms of bone cancer are:

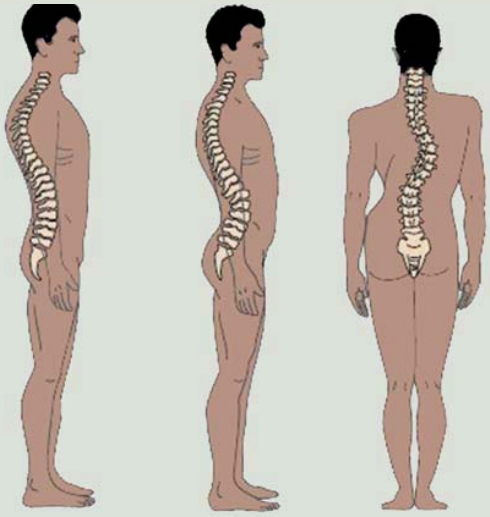
1. Painful bones and joints
2. Joint swelling and stiffness
3. Fever
4. Unexplained weight loss
5. Tiredness.

Treatment of Bone Cancer

1. Surgery is the primary treatment of bone cancer
2. Use medicines to destroy the cancer cells
3. Radiation therapy.

(c) Deformities of Vertebral Column or Spine

Activity - 9 | **Identifying the Deformities of Spine**



1. What do these pictures show?
2. What are the people suffering from?

They have deformities of their spines.

Deformity of spine is the abnormality of the shape of the vertebral column. The natural curvatures of spine are misaligned in some areas. There are three main types of deformities. These are summarised in Table 1.

Deformities of vertebral columns	Causes	Symptoms	Treatment
 Fig. 11. *Scoliosis*	(*i*) From an injury or illness (ii) From previous back injury (iii) Thinning of the bones	(i) Head is not centred directly above the pelvis. (ii) Uneven shoulder blade with one being higher than the other. (iii) An uneven waist or hip. (iv) Leaning towards one side.	(i) Check your back every 4 to 6 months. (ii) Surgery can sometimes decrease the curve. (iii) Exercise regularly.
 Fig. 12. *Lordosis*	(i) Bad posture (ii) Fatness (iii) Weakening of the bones	(i) Pain and discomfort in the lower back. (ii) Problems in moving in certain ways.	(i) Medication to reduce pain and swelling. (ii) Physical therapy to help build strong muscles. (iii) Practising yoga to increase body awareness. (iv) Weight loss. (v) Surgery can sometimes decrease the curve.

(Continued.....)

Deformities of vertebral columns	Causes	Symptoms	Treatment
 Fig. 13. *Kyphosis*	(i) Bad posture (ii) Abnormal development of the spine in the womb.	(i) Difficulty in breathing (in severe cases) (ii) Fatigue (iii) Mild back pain. (iv) Round back appearance. (v) Tenderness and stiffness in the spine.	(i) Medication to reduce pain. (ii) Physical therapy to help build strong muscles. (iii) Practising yoga to increase body awareness. (iv) Weight loss. (v) Surgery in severe cases.

Table 1: Different Types of Deformities of Vertebral Column

13.5 Hygiene of the Skeleton

Activity - 10 **Discussing the Maintenance of Skeleton**

1. Have a discussion to find out good practices of maintaining the skeleton and avoiding accidents.
2. Make a report on it and present to the class.

The following steps can help us improve our bones' health:

1. **Eat diet rich in calcium and Vitamin D.** For example, egg, fish, milk and liver.
2. **Do physical exercise.** Like muscles, bones become stronger with exercise.
3. **Drink plenty of water** to maintain joint health.
4. **Prevent falls** as it can cause bones to break.

13.6 Prevention of Bone Diseases and Deformation of the Vertebral Columns

Activity - 11 | Preventing Deformities of Vertebral Columns

1. Is this person sitting in right posture?
2. What happens if he sits in this posture daily?
3. How can he prevent such type of problems.

His spine will be deformed and he will have some bone diseases.

To prevent bone diseases and deformation of vertebral columns:

1. Sit correctly.
2. Avoid carrying heavy schoolbags.
3. Take regular exercise.
4. Take calcium-rich food such as milk, cheese, yogurt, orange and lemon.
5. Take Vitamin D rich food such as liver, fish and egg yolks.

Fig. 14. *Proper sitting posture*

13.7 Keywords

- **Breastbone:** A thin, flat bone running down the centre of the chest.
- **Deformity:** Abnormality of shape or form.
- **Fracture:** A break or crack in the bone.
- **Hygiene:** Practice that you do to keep things healthy.
- **Pelvis:** The lower part of the trunk that supports the abdomen.
- **Radiation:** Energy that comes from a source and travels through some material or through space.
- **Ribs:** Curved bones that are attached to the backbone at the front and the breastbone at the front.
- **Skeleton:** The framework of bones that supports our body.
- **Skull:** The bony framework that encloses the brain.
- **Sling:** A bandage or device used to support an injured part of the body.
- **Splint:** A device used for support or immobilization of a limb.
- **Swayback:** An abnormally hollowed back.
- **Trunk:** The part of the body to which the head and limbs are attached.

13.8 Summary

- Skeleton gives shape and support to our body.
- The bony framework that encloses the brain is called skull. It consists of cranium and facial bones.
- The part of the body to which head and limbs are attached is called trunk. The major bones of the trunk are—the backbone, ribs and pelvis.
- When damages occur to the bones, it is called bone accidents.
- The backbone is made up of 33 ring-like bones called vertebrae.
- The major bones of a leg are—femur, tibia and fibula.
- Some bones produce blood cells in the bone marrow. Marrow is a soft tissue present inside the bone.
- A break or crack in the bone is called a fracture. Fractures can occur to the bones of legs, arms, head and backbones.
- There are two types of fractures. These are—open fracture and closed fracture.

- Diseases that affect our bones are called bone diseases. There are many kinds of bone diseases. Some of common bone diseases are—rickets, bone cancers.
- There are three main types of deformities. These include: scoliosis, lordosis and kyphosis.

13.9 Unit Review Exercises

Do these review exercises in your exercise book.

I. Fill in the blanks with the correct options:

1. Our body is supported by a framework of bones called ..... .
   (a) skeleton (b) tissue
   (c) muscle (d) none of these
2. ..... encloses the brain.
   (a) Pelvis (b) Skull
   (c) Rib (d) None of these
3. ..... is the lower part of the trunk.
   (a) Rib (b) Spine
   (c) Pelvis (d) None of these
4. A break or crack in the bone is called ..... .
   (a) disease (b) fracture
   (c) deformity (d) none of these
5. When the fracture punctures the skin, it is called ..... .
   (a) open fracture (b) closed fracture
   (c) deformity (d) none of these
6. ..... is the bone disease caused due to lack of Vitamin D.
   (a) Scoliosis (b) Bone cancers
   (c) Rickets (d) None of these

II. State whether the following statements are true or false:

1. Skeleton gives shape and support to our body.
2. Pelvis is the hardest bone in our body.
3. The legs are called forelimbs.
4. Fracture is the break or crack in the bone.
5. Kyphosis is characterised by an abnormally rounded upper back.

III. Match the bones with their functions:

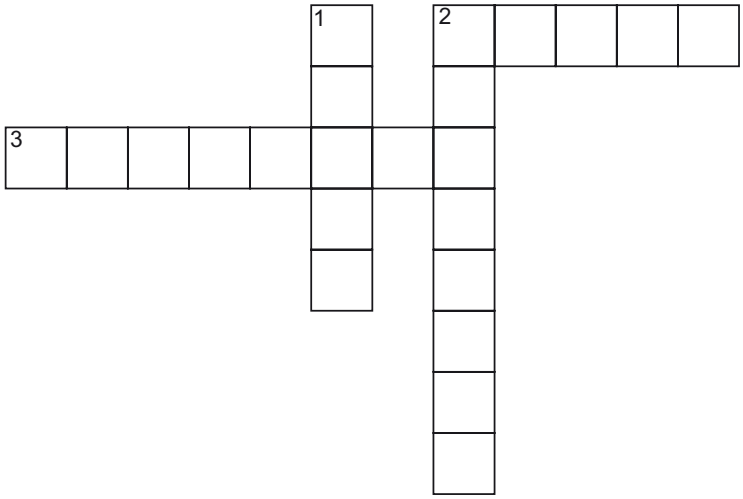
Bones	Function
1. 	(a) Protects the heart and lungs
2. 	(b) Supports the abdomen
3. 	(c) Supports the head, neck and body for upright posture
4. 	(d) Protects the brain

IV. Answer the following questions briefly:

1. What is skeleton?
2. Which part of the skeleton protects the brain?
3. List major bones of the skull.
4. List major bones of the trunk.
5. List major bones of the legs.

6. Name the bone found in the upper part of the leg.
7. List major bones of the arms.
8. Name the bone found in the upper arm.
9. List at least three functions of the skeletal system.
10. What is fracture?
11. What are the two main types of bone fractures?
12. Name some common bone diseases and deformation of vertebral column.

V. Complete the crossword puzzle using the clues below:



Clues:

Across

2. This is the bony framework that encloses our brain.
3. This is a break or crack in the bone.

Down

1. This is the part of the body to which the head and limbs are attached.
2. This is the framework of bones that supports our body.

Unit 14 Muscles

What are Muscles?

Activity - 1 Muscles of Arms

1. Make a fist.
2. Bend your arm at the elbows and tighten your fist.
   You will see your arm bulging out.
3. Do you know why this happened?

It is because muscles contracted to help you fold your arm.

Muscles are soft tissues found in our body. They cover our bones and help to move them. Bones and muscles work together to move our body.

Need of Keeping Healthier Muscles

Healthy muscles let us move freely. They also keep our body strong. They help us enjoy playing, dancing, walking and other activities. Strong muscles also help to keep our joints in good shape.

Importance of Muscles

Muscles are very important for human body.

1. They help in the movement of human body.
2. They support our body.
3. They help maintain posture.

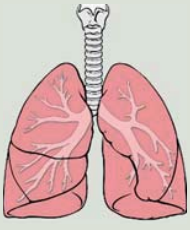
14.1 Main Groups of Muscles

Activity - 2 Grouping Muscles

Arm

Heart

Legs



Lungs

1. Which of these muscles work at our will?
2. Which of these muscles do not work at our will?

The muscles of arms and legs work at our will. These are **voluntary muscles**. These muscles get tired and need rest. Can you name some other voluntary muscles?

The muscles of heart and lungs do not work at our will. These are **involuntary muscles**. These muscles do not get tired and work continuously. Can you name some other involuntary muscles?

Differences between Voluntary and Involuntary Muscles

Voluntary muscles	Involuntary muscles
1. Work at our will. 2. Get tired and need rest. **Examples:** Muscles attached to arms and legs.	1. Do not work at our will. 2. Do not get tired and work continuously. **Examples:** Muscles of stomach, heart and intestine.

14.2 Major Voluntary Muscles of the Human Body

Activity - 3 **Identifying the Major Voluntary Muscles of the Human Body**

1. Touch the body.
2. Contract your muscles.
3. Move organs like head, the trunk, legs and arms to discover the main muscles.

We use voluntary muscles to perform different activities. Some of the major voluntary muscles are:

(a) Major Muscles of the Head

The muscles in our head help us move different parts of the face. They also move our jaw and scalp. There are various muscles in our head. Based on their functions, they are classified as:

1. **Eye muscles:**
   Orbicularis oculi: These muscles are present around our eyes. They help us to open and close our eyes.
2. **Facial muscles:** These muscles are associated with facial expressions. Some of the facial muscles include:
   Frontalis: This muscle covers the parts of the skull.
   Zygomaticus major: This muscle controls facial expression, drawing the mouth's angle upward and outward.
   Orbicularis oris: This muscle encircles our mouth and enables our lips to move.
3. **Chewing muscles:** These muscles help us to chew foods. Some of the chewing muscles include:
   Temporalis: This muscle is used for chewing.
   Buccinator: This muscle holds the cheek to the teeth and assists in chewing.
   Masseter: This muscle closes the mouth by raising our jawbones.
4. **Neck muscles:**
   Sternocleidomastoid: This muscle helps rotate the head upward and side to side.

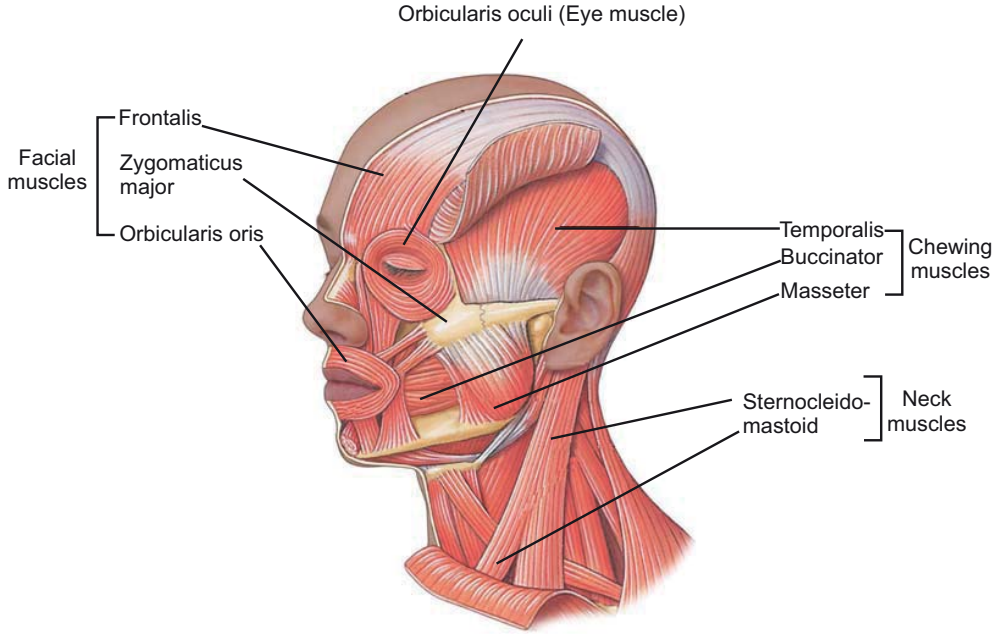


Fig. 1. *Major muscles of the head*

(b) Major Muscles of the Trunk

Our trunk has a large number of muscles. Some of these muscles are:

1. **Pectoralis major (or Chest muscles):** These muscles keep the arms attached to the body.
2. **Rectus abdominis (or Abdominal muscles):** These muscles help in breathing process.
3. **Deltoid (or Shoulder muscles):** These muscles prevent joint dislocation.
4. **Serratus muscle:** This muscle allows the forward movement of arm.

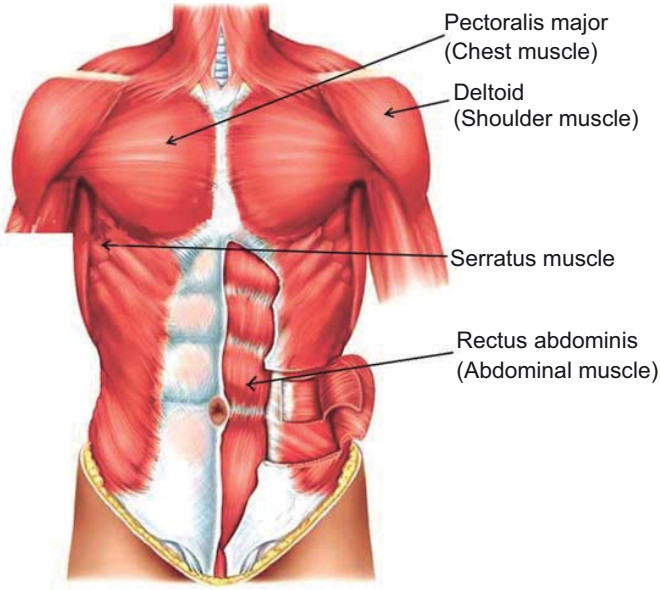


Fig. 2. *Major muscles of the trunk*

(c) Major Muscles of the Legs

Legs are used for standing, walking, jumping and other work. Major muscles of legs are:

1. **Gluteus medius (or Hip muscles):** These muscles provide movement, strength, and stability to the hip joint.
2. **Popliteus (or Knee muscles):** These muscles allow the body to walk, run and jump.
3. **Vastus lateralis (or Thigh muscles):** These muscles allow the thigh to move.

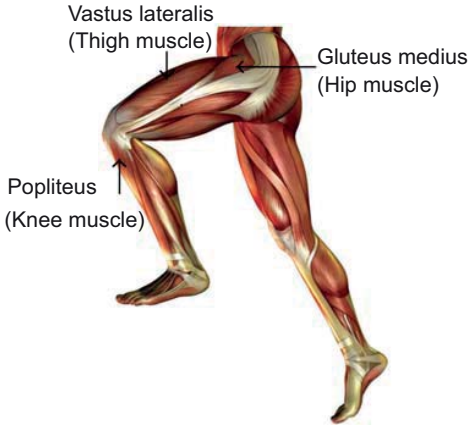


Fig. 3. *Major muscles of the legs*

(d) Major Muscles of the Arms

The arm's curved shape comes from its major exterior muscles. These muscles also give the arm its strength.

The major muscles of an arm are:

1. **Biceps:** This muscle is on the front of the upper arm.
2. **Triceps:** This muscle is on the back of the upper arm.

Both biceps and triceps have opposite functions. When biceps muscle contracts, the arm bends and triceps muscle stretches. When triceps muscle contracts, the arm is stretched.

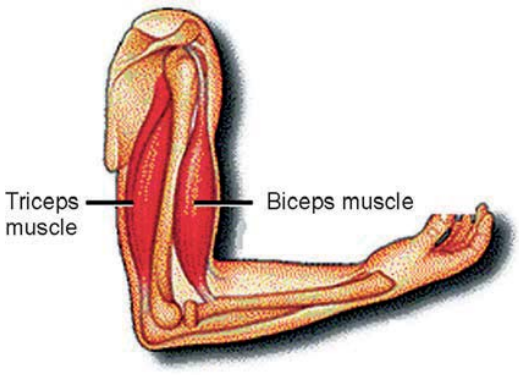


Fig. 4. *Major muscles of an arm*

14.3 Functions of Voluntary Muscles

Activity - 4 **Discussing the Functions of Voluntary Muscles**

1. Have a discussion on the functions of voluntary muscles.
2. Make a report on it and present to the class.

Major functions of voluntary muscles are:

1. **Produce skeletal movement:** Contraction and relaxation of muscles allow the bones to move.
2. **Maintain posture and body position:** Good posture depends on the strength of muscles. A person with strong muscle can maintain upright posture.

3. **Stabilise the joints:** The muscles around the knee keep the joints in a good shape. These also protect the knee from injury.

14.4 Accidents of Muscles (Cramp) and First Aid

Activity - 5 | Discussing the Cramps

1. What is the footballer suffering from?
2. What is muscle cramp?
3. What are the causes of muscle cramps?

Muscle cramps are sudden contractions of muscles. These contractions are often painful. Commonly affected muscles include the back of lower leg, the back of thigh, and the front of thigh. It is caused due to dehydration and muscle fatigue.

Fig. 5. *Muscle cramp*

First Aid for Muscles (Cramp)

Activity - 6 **Role Play a Muscle Accident**

Situation:

One of your friends has muscle cramp. What would you do?

Role play:

Form a group of two pupils each. One member will act as a victim. The other member will provide him/her necessary first aids.

If you have a muscle cramp:

1. Stretch the cramped muscle to increase flexibility.
2. Gently massage the cramped muscle.
3. Drink plenty of water.
4. Take a hot water bath.

14.5 Hygiene of Muscles

Activity - 7 **Discussing the Good Practices of Maintaining Muscles**

1. Have a discussion to discover good practices of maintaining muscles and avoiding their accidents.
2. Make a report on it and present to the class.

For healthy muscles, the following care should be taken:

1. Take good food and pure air.
2. Avoid dangerous games.
3. Sit, walk and stand in a correct posture.
4. Do physical exercise regularly.

Fig. 6. *Physical exercise*

Maintaining Tone of a Muscle

Muscle tone is an unconscious low level contraction of muscles at rest. The main purpose of muscle tone is to keep the muscles ready for action.

The following things can be done to maintain tone of a muscle:

1. Eat foods such as whole grains, fruit and vegetables to reduce body fat.
2. Drink plenty of water.
3. Do strength training exercises to reduce fats.

14.6 Prevention of Accidents

During physical exercises, follow these tips to prevent accidents:

1. Take five to ten minutes to warm up and cool down properly.
2. Plan to start slowly and boost your activity level gradually.
3. Do not exercise when you are sick.
4. Choose clothes and shoes designed for your type of exercise.
5. Avoid exercise in humidity and overheating condition.

14.7 Keywords

- **Cramps:** Painful involuntary contraction of a muscle or muscles.
- **Involuntary:** Does not work at one's own will.
- **Joint:** The point at which bones are joined.
- **Muscles:** Soft tissues found in our body.
- **Strength training:** A type of physical exercise specialised for minimising muscular contraction.
- **Tissue:** A type of material of which plants and animals are made.
- **Voluntary:** Works at one's own will.

14.8 Summary

- Muscles are soft tissues found in our body.
- There are two types of muscles in our body. They are: voluntary and involuntary muscles.
- The muscles that work at our will are called voluntary muscles. Examples: Muscles attached to arms and legs.
- The muscles that do not work at our will are called involuntary muscles. Examples: Muscles of our stomach and intestines.
- Abdominal muscles help in breathing.
- Biceps and triceps are two major muscles of arms.
- Major functions of voluntary muscles are:
  - Produce skeletal movement
  - Maintain posture and body position
  - Stabilise the joints
- Muscle cramps are sudden contractions that occur in various muscles. These contractions are often painful.
- Muscle tone is an unconscious low level contraction of muscles at rest. The main purpose of muscle tone is to keep the muscles ready for action.

14.9 Unit Review Exercises

Do these review exercises in your exercise book.

I. Fill in the blanks with the correct options:

1. Muscles are the ..... found in the body.
   (a) tissues (b) cells
   (c) organs (d) none of these
2. Muscles that work at our will are called ..... muscles.
   (a) voluntary (b) involuntary
   (c) cardiac (d) none of these
3. Muscles that do not work at our will are called ..... muscles.
   (a) voluntary (b) involuntary
   (c) cardiac (d) none of these

4. ..... muscle is on the front of the upper arm.
   (a) Biceps (b) Triceps
   (c) Involuntary (d) None of these
5. ..... are the sudden contraction of muscles.
   (a) Cramps (b) Bruise
   (c) Cuts (d) None of these

II. State whether the following statements are true or false:

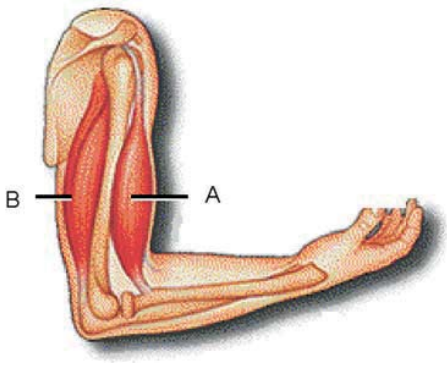
1. Muscles together with bones help in the movement of body.
2. Muscles of the arms and legs are involuntary muscles.
3. Shoulder muscles prevent joint dislocations.
4. Muscles keep the joints in good shape.
5. In case of muscle cramp, we should take a cold water bath.

III. Match the muscles to their functions:

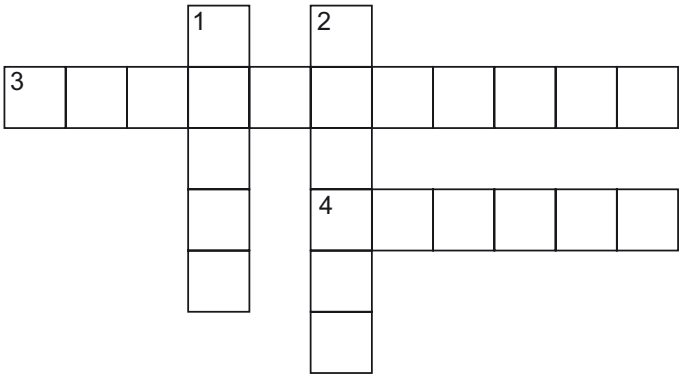
Muscles	Functions
1. Facial muscles	(a) Allow the body to run, jump and play
2. Eye muscles	(b) Prevent joint dislocation
3. Shoulder muscles	(c) Enable us to open or close our eyes
4. Knee muscles	(d) Keep the arms attached to the body
5. Chest muscles	(e) Facial expression

IV. Answer the following questions briefly:

1. What are muscles?
2. List the major groups of muscles of the human body.
3. List any two major muscles of the head.
4. What are the functions of voluntary muscles?
5. Name the muscles labelled A and B.
6. What are the causes of muscle cramps?
7. What type of first aid should be given in case of muscle cramps?
8. List some ways in which we can keep our muscles strong.



V. Complete the crossword puzzle using the clues below:



Clues:

Across

3. This type of muscle is present in heart and intestines.
4. This is a painful contraction of muscle.

Down

1. This is the point at which bones are joined.
2. Together with bones they help in the movement of our body.

References

Books

1. Cecilia Dawson & Johnson Odei, *Excel with Integrated Science Primary 4-6*, Afram Publications, Accra, Ghana.
2. Paul K. Adu Asirifi & Nana Kuuku Ampah, *Science and Beyond Integrated Science Primary 4-6*, Aabok Publications, Accra, Ghana
3. Bob Sayles, *Science in Action Pupil's Book 4-6*, Macmillan, Cameroon
4. W. Alice & M. Jerome, *Elementary Science and Technology Pupil's Book 4-6*, MK Publishers, Kampla, Uganda
5. A. Ntungwa, B. Yesigye & John S. Wotsuna, *Science and Elementary Technology for Rwandan Primary Schools Book-4*, Fountain Publishers, Kigali, Rwanda
6. Teddy Borth, *Tools on the Farm*, ABDO KIDS, Minnesota, USA
7. Jerry Lee Ford Jr, *Scratch Programming*, Course Technology PTR, Boston, USA
8. Sdenka Z. Salas Pilco, *The XO Laptop in the Classroom*, Puno, Peru
9. *NCERT Science Textbooks for Classes VI-VIII*, NCERT, New Delhi, India
10. Jhara Roy, *Interactive Science Primary 4-8*, Laxmi Publications Pvt. Ltd, New Delhi, India
11. S. Johari, P. Tyagi & P. Chopra, *I Explore a Science Textbook Grades 4-8*, Cambridge University Press, New Delhi, India
12. V.K. Sally, S.K. Aggarwal, *Learning Elementary Science Grades 4-8*, Goyal Brothers, New Delhi, India

Websites

1. http://www.fao.org/docrep/x5672e/x5672e0a.htm
2. http://www.wikihow.com/Make-Clay-Dolls
3. https://www.sugarlabs.org/
4. https://www.cs.swarthmore.edu/help/vim/selection.html
5. http://www.bcairquality.ca/101/what-is-air.html
6. https://en.wikipedia.org/wiki/Soil
7. http://kids.sandiegozoo.org/animals/mammals
8. http://athomepets.weebly.com/the-rabbit-and-its-uses.html
9. http://theseedsite.co.uk/germinating.html
10. http://www.ivyroses.com/HumanBody/
11. http://www.innerbody.com/image/skel06.html
12. http://boneandspine.com/types-of-muscles-and-their-functions/