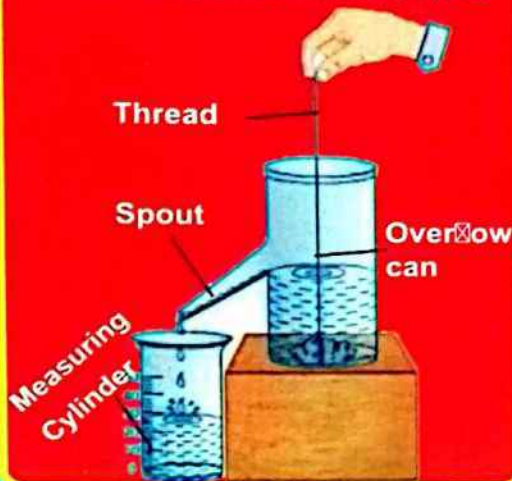


THE SUREKEY INTEGRATED SCIENCE

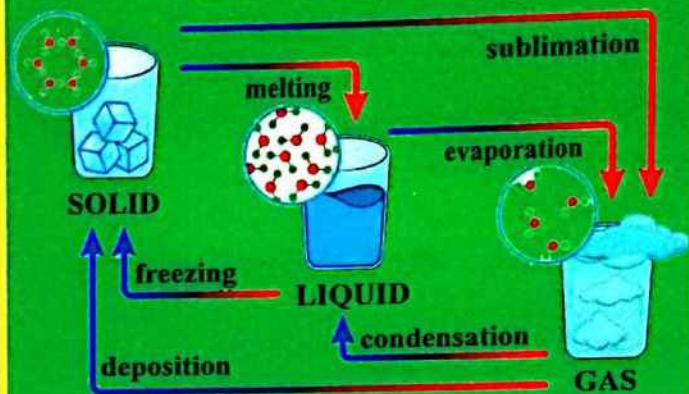
PUPIL'S BOOK

5

DISPLACEMENT METHOD



CHANGES OF STATE OF MATTER



TUBER CROPS

Irish Potatoes (Stem tubers)



Carrots (Root tubers)

BREASTFEEDING



For Predominance in Integrated Science

AUTHOR: JAMIE HUMPHREY

Based on the Current Standard Curriculum

THE SUREKEY INTEGRATED SCIENCE

Pupil's Book 5

First Edition



"Don't speak for quality, let quality speak for itself"

MESSAGE FROM THE AUTHOR



Dear Learner, it is with great pleasure that I present to you The Surekey Integrated Science Pupil's Book Five. This book has been carefully crafted to meet the demands of the Competence Based Curriculum (CBC), ensuring it provides you with the knowledge, skills and attitudes necessary for lifelong learning and success in the modern world.

The content in this book is presented in a clear, organized and engaging manner to simplify even the most complex scientific concepts. The notes are written with clarity and precision, making it easier to understand and apply the ideas in your day-to-day life. Special attention has been given to ensure that the explanations are not only accurate but also learner-friendly, helping you develop a solid foundation in Integrated Science.

The approach used in this book is content based with simple and clear language that a learner can read and understand on his/her own. The content given on each topic is sufficient as per learner's level.

To make learning more interactive and enjoyable, the book is enriched with detailed and clearly drawn and labelled diagrams. These visual aids are designed to help you grasp scientific concepts more effectively, bridging the gap between theory and practice. Science comes alive through illustrations, giving you a clearer understanding of how the natural world works.

Moreover, this book provides a variety of well-structured exercises at the end of each lesson. These exercises are designed to test your knowledge, sharpen your critical thinking and build your confidence in solving real-life problems. The questions range from simple to complex, ensuring that all learners, regardless of their pace, are fully catered for.

As you begin this exciting journey through this Book Five Integrated Science, I encourage you to embrace a spirit of curiosity and exploration. Let this book be your trusted companion, guiding you to discover the wonders of science and empowering you to excel academically. Wishing you all the best in your studies. May this book inspire you to achieve great things!

Note: In case of any questions, corrections, concerns and inquiries about the book, please contact me using the telephone numbers or e-mail address on the back cover.

With humble regards,

Jamie Humphrey
AUTHOR

ACKNOWLEDGEMENT



I take this golden opportunity to cast a vote of thanks to the following people for their great contribution towards the compilation and production of this reference book. Your guidance and consultations have played a fundamental role during the course of writing this academic material.

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Mr. Kimuli Derrick	Lady Irene Primary School
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Mr. Kusasira Ronald	Namilyango Junior Boys' School

"Your support in crafting this reference material in the world of science is truly commendable"

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IRRELEVANT CONCEPTS IN PRIMARY FIVE INTEGRATED SCIENCE

TOPIC	IRRELEVANT CONCEPTS
Keeping poultry and bees	• Digestive system of a domestic bird. • Reproductive system of a bird. • Classifying feathers and their descriptions. • Teaching absconding in bees. Note well. Do not put much emphasis on parts of an egg.
Immunisation	• Classifying vaccines as killed, attenuated, conjugate and toxoid vaccines. Note well. Pupils are not supposed to know how vaccines are made at primary level.
The digestive system	• The structure of the villus. • Adaptations of the villi to their functions. • Details on specific enzymes in food digestion.
Heat energy	• Concepts on; surface tension, inertia, friction, work done, dilution, diffusion and forces. • Parts/regions of a candle flame i.e., blue zone, yellow zone Note well. Do not teach rusting under heat energy
Crop growing	• Teaching groups of crops (annual crops and perennial) and types of annual crops. • Details on the garden tools. • Details on crop growing practices. Note well. (These are concepts for crop growing in P4)
Bacteria and fungi	• Detailed structure of a bacterium. • People who made great discoveries in science and health. • Examples of specific bacteria e.g., bacilli, vibrio, cocci Note well. Put less emphasis on parts of the mushroom
Keeping goats, sheep and pigs	The digestive system of a pig.

Food and nutrition

Details on the classes of food and a balanced diet.

Deficiency diseases

Food preservation

Note well. These are concepts for P4 under "Our Food"

Points to note about this Book Five

- ☒ All the concepts in this book are curriculum based.
- ☒ All the exercises in this book are in the line with the Competence Based Curriculum
- ☒ 96.5% of the exercises given have diagrams.
- ☒ The book is learner centered.

THEME: SCIENCE IN HUMAN ACTIVITIES AND OCCUPATIONS

TOPIC : 1 KEEPING POULTRY AND BEES

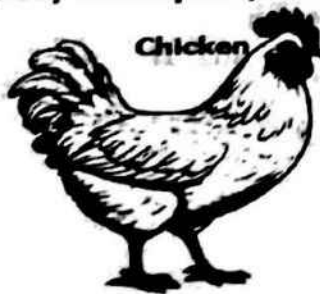
KEEPING POULTRY

Keeping poultry is the rearing of domestic birds.

Poultry are domestic birds.

Poultry can also be called **fowls**.

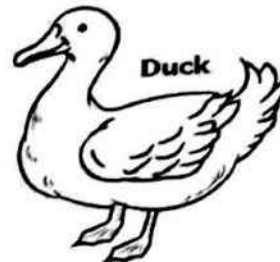
Types/examples/forms of poultry.



Chicken



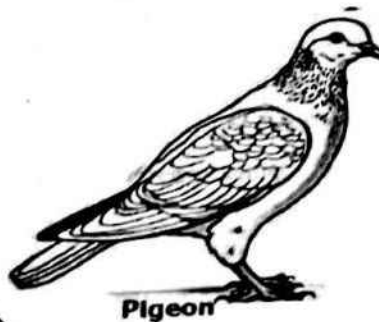
Turkey



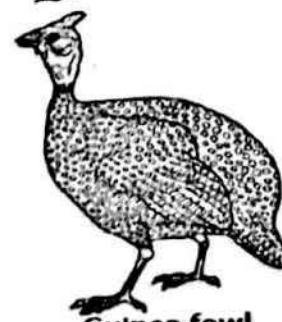
Duck



Parrot



Pigeon



Guinea fowl

Reasons why people keep poultry.

- ✓ To get eggs.
- ✓ To sell and get money.
- ✓ To get meat.

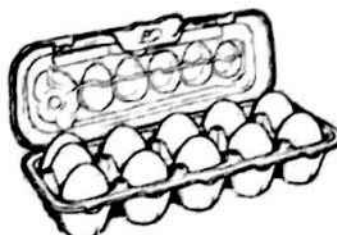
Ways in which keeping poultry is important to people.

- ✓ They are source of eggs.
- ✓ They are source of income to people.
- ✓ Their droppings are used as manure in the garden.
- ✓ They are source of meat.
- ✓ They provide feathers to people.

Products got from poultry



Chicken



Eggs

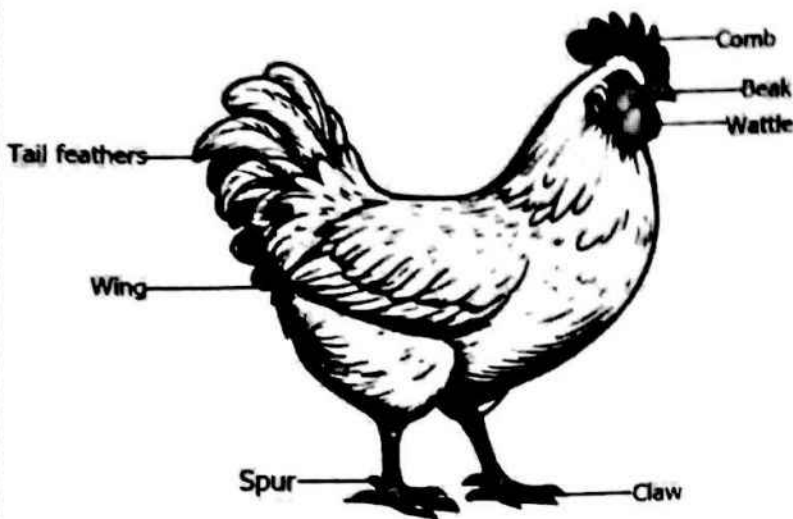


Feathers



Don't speak for Quality, let Quality speak for itself

External features of a domestic fowl.



Functions of some parts of a domestic fowl

Beak

- For picking food.
- For protection.
- For turning eggs during incubation.

Nostril. For smelling.

Wings. For flying.

Claws.

- For scratching the ground to get food.
- For protection.

Spur. For protection.

Comb and wattle. They are used to regulate body temperature.

Functions of feathers to a bird

- They protect the body of a bird from physical injuries.
- They keep the bird warm.
- They help the bird to fly.
- They are used for brooding chicks.
- They are used for incubating eggs.

Feathers prevent heat loss from the bird's body.

Uses of feathers to people.

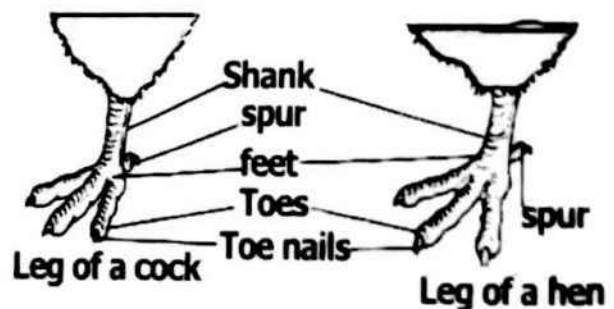
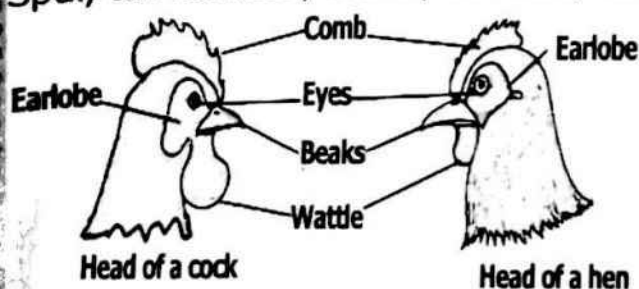
- They are used to make dancing costumes.
- They are used to make pillows, mattresses and cushions.
- They are used for decoration.
- They are used to make craft materials.

Physical differences between a cock and a hen.

- A cock has a long spur while a hen has a short spur.
- The tail feathers of a cock are longer than those of a hen.
- The wattle of a cock is bigger than that of a hen.
- A cock has bright feathers while a hen has dull feathers.
- The comb of the cock is bigger than that of a hen.
- A cock is larger than a hen of the same age.
- The earlobes of a cock are bigger than those of a hen.

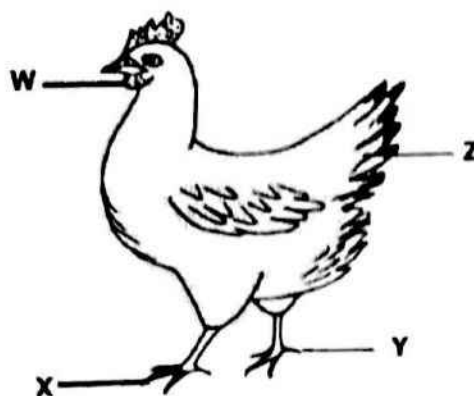
Features used to distinguish a cock from a hen.

Spur, tail feathers, wattle, feathers, comb and earlobe



Evaluation activity 1.1

1. Give the meaning of the following terms:
 - i) Poultry
 - ii) Poultry keeping
2. Write down any **two** types of poultry kept by people in your community.
3. Mention any **two** ways in which poultry farming is important to people.
4. State any **two** differences between the external parts of a hen and that of a cock.
5. Write down any **two** products got from birds.
6. The diagram below shows external features of a hen. Study and use it to answer the questions that follow.



- a) Name the external features marked **X** and **Z**.
 - b) How is part marked **Y** useful to a hen?
 - c) Identify the part that enables a hen to cool its body on hot days.
7. Give any **two** uses of feathers to a domestic fowl.
 8. State any **two** ways in which feathers are useful to people.
 9. Give any **one** way in which poultry help in the prevention of kwashiorkor in children.
 10. State **one** way in which feathers keep the body of a bird warm on a cold day.

TYPES OF CHICKEN

A type of chicken is a class of birds kept for a specific purpose.

Types of chicken are; layers, broilers and dual purpose

Layers

These are chickens kept purposely for egg production.

They are also called light breeds.

Breeds of chicken kept for eggs.

White leghorn, Brown egg, Minorca, Ancona and Sykes

Note: *Offlayers are chickens whose egg production has lowered or reduced laying eggs*

Don't speak for Quality, let Quality speak for itself

Factors that can lead to reduced production of eggs in layers.

- Poor feeding of birds.
- Stress
- Moulting
- Poor housing.
- Old age of the hens.
- Breeding cycle.
- Outbreak of poultry diseases.

Practices that a poultry farmer can do to layers to increase egg production.

- Proper feeding.
- Proper housing.
- Regular vaccination.
- Early treatment of diseases.
- Early control of parasites and diseases.

Broilers

These are chickens kept purposely for meat production.

They are also called **table birds** or **heavy breeds**.

They are called heavy breeds because they put on weight very fast and become heavy.

Breeds of chicken kept for meat.

- Light Sussex
- Cobb 500
- Cornish White
- Plymouth Rock
- Jersey Giant

Dual purpose

These are chickens kept for both meat and egg production.

Exotic breeds of chicken kept for both meat and eggs.

- New Hampshire
- Rhode Island Red
- Black Australorp



New Hampshire



Rhode Island Red



Black Australorp

BREEDS OF CHICKEN

A breed of chicken is a class of birds that has similar features/ characteristics

- local breeds
- exotic breeds
- cross breeds

Features used to distinguish breeds of chicken.

- Size of chickens.
- Colour of feathers.
- Place of origin.
- Colour of the skin.
- Number of toes.

Local breeds

These are chickens which originate from Uganda.

They are also called **indigenous/native breeds**.

They are commonly kept in rural areas by most people.

Reason. They are easy to look after.

Characteristics of local breeds of chicken.

- They are resistant to harsh weather.
- They have slow growth rate.
- They are usually small in size.
- They are dual purpose in nature.

- They have multiple colour shades.
- They lay fewer eggs.
- They give less meat.

Examples of local breeds of chicken.

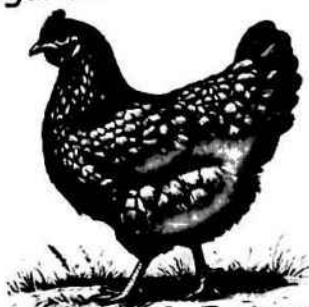
- Naked Neck chickens
- Ugandan Black chickens
- Ugandan Red chickens.
- Ugandan Brown chickens.



Ugandan Red



Ugandan Black



Ugandan Brown



The Naked neck

Advantages of keeping local breeds of chicken over exotic ones.

- Local breeds can survive harsh weather conditions unlike exotic breeds.
- Local breeds are resistant to tropical diseases while exotic breeds cannot.
- Local breeds are resistant to parasites unlike exotic breeds.

Disadvantages of keeping local breeds of chicken.

- ✓ They grow slowly.
- ✓ They produce less meat.
- ✓ They lay fewer eggs.

⚠ *Note: Local breeds of chicken can be improved by crossbreeding.*

Exotic breeds

These are chickens which are imported from overseas.

They are also called pure breeds.

Examples of exotic breeds of chicken.

- New Hampshire
- White leghorn
- Light Sussex
- Ancona
- Plymouth Rock

Characteristics of exotic breeds of chicken.

- They lay many eggs.
- They grow and mature faster.
- They produce plenty of meat.
- They have the same colour.

Advantages of exotic breeds over local breeds.

- Exotic breeds grow and mature faster than local breeds.
- Exotic breeds produce more meat than local breeds.
- Exotic breeds lay more eggs than local breeds.

Disadvantages of keeping exotic breeds of chicken.

- They are prone to tropical diseases and parasites.
- They need a lot of care.
- They are easily affected by harsh climate.
- They feed on special food.
- They are expensive to maintain.

Hybrids/crossbreeds

- A hybrid is got by mating a local breed and an exotic breed. This is called crossbreeding.
- Crossbreeding improves the quality of chickens.
- Crossbreeds are more resistant to parasites than exotic breeds.

Evaluation activity 1.2

1. Mention any **two** types of chicken commonly kept by people in your community.
2. Apart from Light Sussex, name any **two** other exotic breeds of chicken kept for meat.
3. Cereal wants to supply eggs to different shops. What type of chicken would you advise him to keep?
4. How does a poultry farmer benefit from keeping a Black Australorp?
5. State any **two** advantages of keeping local breeds of chicken over exotic breeds.
6. Which type of chickens are kept to obtain **two** main products?
7. How best can a poultry farmer improve the quality of local breeds of chicken?
8. Name any **two** exotic breeds of chicken commonly kept in your community.

SYSTEMS OF KEEPING POULTRY.

Factors to consider when choosing a system of keeping poultry.

- ✓ Expenses involved in running the system.
- ✓ Safety of the birds in a particular system.
- ✓ Skills used in controlling poultry diseases.
- ✓ Knowledge about the use of the system.
- ✓ The number of birds to keep.

The systems of keeping poultry are;

free range system, deep litter system, battery system and fold system

Free range system

In this system, birds are left free to move on their own and look for food. Free range system is also called **open range system**.



This system is commonly used in villages or rural areas.

Reason. The system is cheap to use



Advantages of free-range system of keeping poultry.

- Birds need less attention.
- It is cheaper in terms of feeding.
- Birds get enough physical exercises.
- Birds feed on a variety of food
- Poultry vices are reduced.

Disadvantages of free-range system of keeping poultry.

- Birds can easily destroy crops.
- Birds can easily be stolen.
- It is difficult to control parasites and diseases.
- A lot of land is needed.

Reason. It is difficult to monitor poultry.

Deep litter system

In deep litter system, birds are kept in the house all the time.

Deep litter system is suitable for farmers living in towns/urban areas.

Reason. There is limited piece of land to accommodate many birds.



In this system, birds are kept indoors on a hard floor covered with dry plant materials.

These dry materials are called **litter**.

Examples of materials used as litter.

- wood shavings
- coffee husks
- sawdust
- crushed maize cobs
- rice husks

Ways in which litter is important in a poultry house.

- ❖ Litter keeps the poultry house dry. This is done by absorbing moisture from the droppings.
- ❖ Litter reduces on the breakage of the eggs.

This is done by providing the soft landing of eggs when a hen lays.

Note: The litter should be turned regularly.

Reasons.

- To enable it get mixed with the birds' droppings.
- To prevent the litter from hardening.

Characteristics of litter suitable to be put in a deep litter house.

- ✓ It should be loose.
- ✓ It should be less dirty.
- ✓ It should be durable.
- ✓ It should not be poisonous.
- ✓ It should be able to absorb moisture from droppings.

Items found in a deep litter house.

Litter: It prevents dampness on the floor.

Laying nests: They hold and keep eggs when laid.

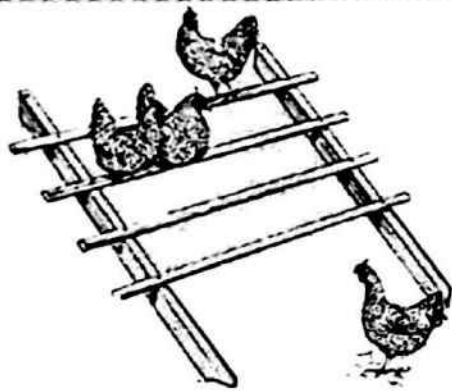
Water trough: It holds water for birds to drink.

Feed trough: For holding mash.

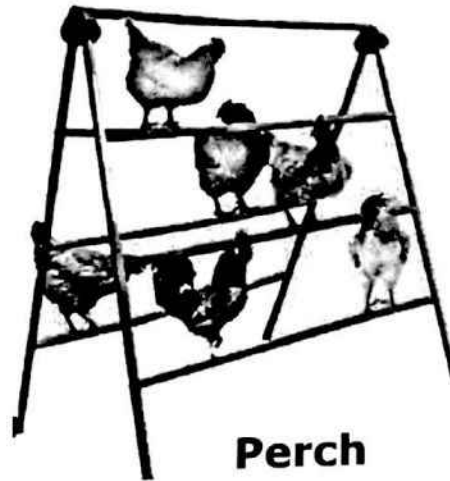
Perches:

They enable birds to do physical exercises.

They provide resting places for birds.



Perch



Perch

Advantages of deep litter system of keeping poultry.

- It can be used for commercial purposes.
- Many birds can be kept in a small room.
- Birds are protected from wild animals and thieves.
- It is easy to collect eggs.
- Birds are easy to handle.

Disadvantages of deep litter system of keeping poultry.

- Easy spread of poultry diseases.
- Poultry vices are common.
- It needs a lot of capital to manage
- A lot of labour is required.
- Birds lack enough physical exercises.

Evaluation activity 1.3

1. State any **two** factors that a poultry farmer should consider when choosing a system he/she should use to keep poultry.
2. Why do most poultry farmers in rural areas use free range system of keeping poultry?
3. Apart from free range system, name any **two** other systems used by poultry farmers in your community.
4. Give any **two** disadvantages of keeping poultry in free range system.
5. Name the system of keeping poultry commonly practiced by poultry farmers in town.

The diagram below shows a poultry house under a system of keeping poultry. Study and use it to answer the questions that follow.



- a) Name the system of keeping poultry shown above.
- b) State any **one** reason the structure marked **K** is used when constructing the poultry house above.
- c) Give any **two** advantages of using the above system of keeping poultry.
6. Give any **one** way in which litter is important in a poultry house.
7. State the use of the following items in a poultry house.
 - i) Water trough
 - ii) Feed trough

Fold system/pen system

In this system, birds are kept in a small movable structure.

Advantages of fold system of keeping poultry.

- Manure is easily collected.
- Disease control is easy.
- Chances of parasites are reduced.
- Easy to supervise birds.

Disadvantages of fold system of keeping poultry.

- It is expensive to manage.
- Few birds are kept in the folds.
- Birds lack enough physical exercises.
- It is tiring to keep moving the fold around.

Battery system/cage system.

In this system, birds are kept in separate cages in the house.

It is an intensive way of keeping poultry.



Advantages of battery system.

- Sick birds can be easily identified.
- Birds are very easy to manage.
- Birds are protected from wild animals and thieves.
- It is easy to collect eggs.
- It can be used for commercial purposes.

Disadvantages of battery system.

- It is very expensive to manage.
- Birds do not get enough exercises.
- Birds need much attention.
- Birds may not get a balanced diet.

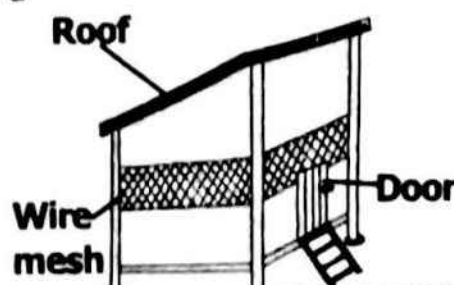
MANAGEMENT OF POULTRY.

This refers to the routine activities carried out on a poultry farm by farmers.

- | | | | |
|------------------|------------------|------------------|-----------|
| ▪ Proper feeding | ▪ Proper housing | ▪ Debeaking | ▪ Culling |
| ▪ Deworming | ▪ Dusting | ▪ Record keeping | |

HOUSING POULTRY

A poultry house is called a **coop**



Don't speak for Quality, let Quality speak for itself

Advantages of proper housing of poultry.

- ✓ It protects poultry from predators.
- ✓ It protects poultry from harsh weather.
- ✓ It helps to control the spread of diseases and parasites.

Qualities of a good poultry house (coop)

- It should be big enough to accommodate birds.
- The upper part should be built with a wire mesh.

The wire mesh allows proper circulation of air in the coop.

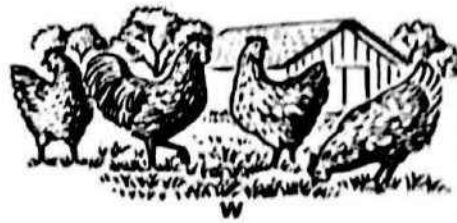
The wire mesh allows enough light into the coop.

- It should be strong enough to protect birds from thieves and wild animals.
- The floor should be made of concrete to allow easy cleaning.

The concrete floor also keeps away parasites.

Evaluation activity 1.4

1. In which system of keeping poultry are birds kept in a movable structure?
2. State any **two** advantages of using fold unit system of keeping poultry.
3. State any **one** reason why the upper part of the poultry house should be built using wire mesh.
4. Write down any **two** qualities of a good poultry house.
5. Why should the floor of the poultry house be made of concrete?
6. Name **two** systems of keeping poultry that enable a farmer to keep a large number of birds.
7. Give any **two** reasons why cage system is used by few poultry farmers in Uganda.
8. Why is battery system suitable for commercial purpose?
9. State **one** way of promoting physical exercises in a poultry house.
10. The diagrams below show systems of keeping poultry. Study and use them to answer the questions that follow.



- (a) Name the systems of keeping poultry marked **X** and **W**.
 - (b) Give any **one** reason why most farmers in Uganda use the system marked **W** when keeping poultry.
 - (c) State any **one** way in which the system of keeping poultry marked **X** is harmful to birds.
- 11.(a) Name the system of keeping poultry where;
 - (i) Birds are left to look for their own food.
 - (ii) Litter is put on the floor of the coop.
 - (b) Give any **one** way in which litter is important in a poultry house.
 - (c) Apart from the systems named in (a) above, mention any **one** other system of keeping poultry.

FEEDING POULTRY

Reasons why poultry should be fed properly.

- ✓ To enable birds grow healthy.
- ✓ To increase egg production.
- ✓ To increase meat production in broilers.
- ✓ To enable birds grow well

Note: The manufactured feeds for poultry are called **mash**.

Composition of poultry feeds (sources of calcium)

Mukene/ silver cyprinid, sea shells, crushed eggshells, crushed snail shells, crushed animal bones, lime and crushed oyster shells.

Importance of calcium in the diet of poultry.

- Calcium enables layers to lay eggs with hard eggshells.
- Calcium makes the bones of birds to grow hard and strong.

 **Points to note:**

- Birds that lack calcium in their diet lay eggs with soft eggshells.
- Hens sometimes eat their eggs because they lack calcium in their diet.
- Small stones or sand grains should be included in the diet of birds to help in crushing food in the gizzard.
- Birds have grit in their gizzard that crush food.

 **Note:** Farmers usually hang vegetables in a poultry house.

Reasons. - They are source of vitamins to birds.

- They help in proper functioning of the digestive system.
- They enable birds to do physical exercises as they jump to eat the leaves.

Type of birds	Age	Type of mash	Reasons for feeding
Chicks	1 day-8 weeks	Chick mash	To promote faster growth of chicks. It is rich in proteins
Growers/ Layers	8-16 weeks	Growers' mash	To promote faster growth of layers.
Layers	8 weeks onwards	Layers' mash Rich in calcium to harden egg shells	To prepare layers for laying eggs. To promote egg production. To maintain the quality of eggshell
Broilers	16 weeks on-wards	Broilers' mash Rich in Proteins	To promote rapid growth. To optimise weight gain

Composition of Poultry mash

Type of Mash	Composition
Layers' Mash	Silver cyprinid, oyster shells, snail shells, animal bones
Broilers' Mash	Silver cyprinid, fat soya beans, oat meal, rice cake flour, whole grains, green vegetables

Type of Mash	Composition
Chick mash	Crushed Grains, green vegetables, crushed ground nuts, silver cyprinid
Growers' Mash	Whole grains, rice seeds, cotton seed cake, soya meal, sunflower cake, snail shells, oyster shells.

Equipment used when feeding poultry.

Feed trough

It holds poultry feeds.

It is made of a swivel bar/spinning handle.

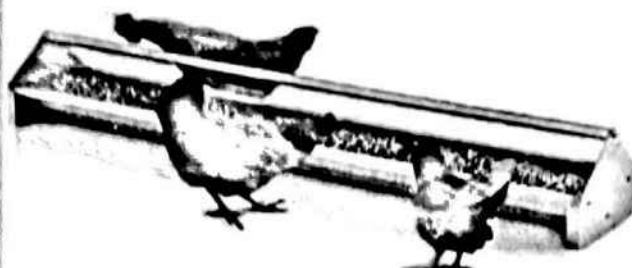
It rolls to prevent birds from stepping on and spoil the feeds.



Feed trough

Water trough.

It holds water for birds to drink.



Water trough

Ways of caring for poultry feeding equipment.

- ✓ Regular washing of the water trough.
- ✓ Removing waste mash from the feed trough.
- ✓ Keeping the feeding equipment in clean places.
- ✓ Repairing damaged parts of the feeding trough.



Note: Feeding equipment should be kept clean to prevent the outbreak of poultry diseases.

Evaluation activity 1.5

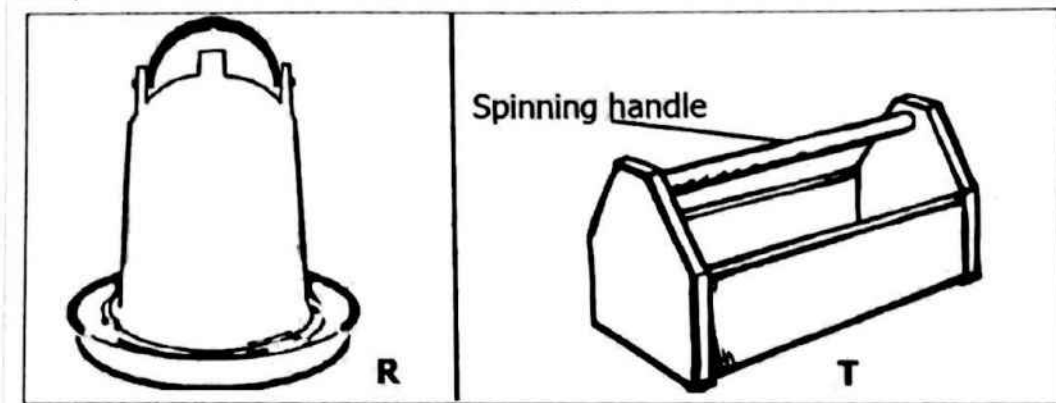
1. Give any **two** reasons why it is important to feed birds.
2. Write down any **two** things that can be added to chicken to increase the amount of calcium.
3. Mention any **two** types of chicken mash.
4. What is the importance of adding sand grains in poultry feeds?
5. Why do layers sometimes lay eggs with soft eggshells?
6. Give any **one** reason why birds should be fed on feeds rich in calcium.
7. Which type of chicken is given grower mash?
8. Apart from being a source of food, give the reason why farmers hang green vegetables in poultry houses.

Evaluation activity 1.5 Continued

9. The table below shows chickens, age and the type of feeds given to them. Study and complete it correctly.

Chicken	Types of feeds	Age
Chicks	Chick mash	.....
Broilers	.....	8 weeks onwards
.....	Growers' mash	8-16 weeks
Layers	Layer mash	.....

10. The diagrams below show the equipment used in the feeding of poultry. Study and use them to answer the questions that follow.



- Name the feeding equipment marked **R** and **T**.
- How is the equipment marked **R** helpful when feeding poultry?
- Why is the feeding equipment marked **T** made of spinning handle?

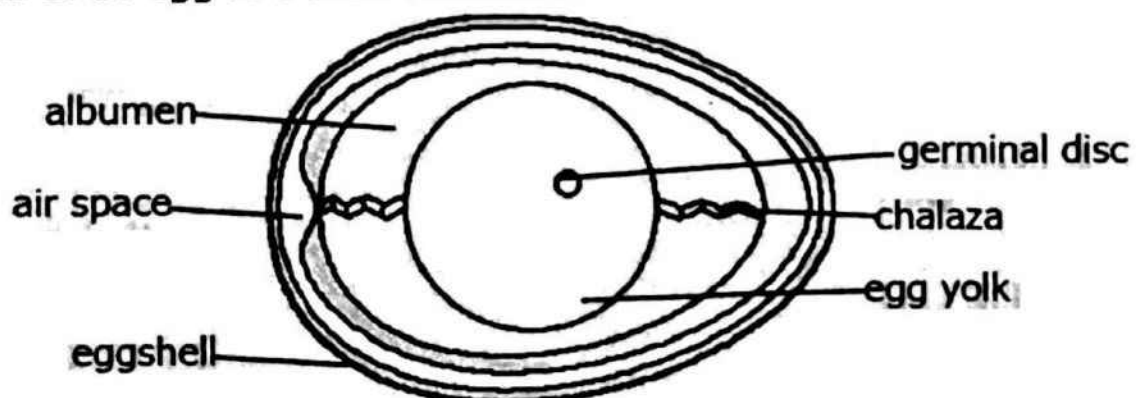
REPRODUCTION IN POULTRY

Like other birds, poultry reproduce by laying eggs.

The eggs are fertilised internally.

Chicks develop from fertilised eggs.

Parts of an egg and their functions.



Part	Function(s)
Eggshell	It protects the inner parts of an egg. It allows the exchange of gases in an egg.

Part	Function(s)
	It is porous to allow the exchange of gases to take place. It is made up of calcium.
Germinal disc	It develops into an embryo during incubation. The embryo will later develop into the chick.
Air space	It provides oxygen to the embryo.
Albumen	It is a source of proteins to the embryo. Proteins promote proper growth of the embryo Albumen is also called egg white
Chalaza	It holds the embryo and yolk in the center of an egg. It is a passage for food to the embryo
Egg yolk	It provides food for the embryo. It is the yellow part of an egg.

INCUBATION IN POULTRY.

Incubation is the provision of necessary conditions for the fertilised eggs to hatch.

Conditions necessary for poultry eggs to hatch.

- ✧ Presence of warmth.
- ✧ Good ventilation.
- ✧ Presence of moisture.

Note. The eggshell is porous to allow the exchange of gases to take place.

Stages in the growth of a domestic fowl



Egg



hatching



chick



adult

Methods / types of incubation.

➤ Natural incubation

➤ Artificial incubation

Natural incubation

This is where a broody hen sits on her eggs and provides the necessary conditions until they hatch.

The hen provides warmth by covering its eggs.

The hen turns the eggs using its beak from time to time.

Reason. To enable all eggs to receive warmth evenly.

How to prepare a mother hen for natural incubation.

- Provide a suitable nestling area secluded from disturbances.

Note. The laying boxes should be put in dark corners to prevent egg eating by the hen.

- Ensure the nestling material is clean and comfortable.

- Make sure the area is warm and well-ventilated.
- Regularly check on the hen, provide fresh food and water nearby and allow her sit on the eggs to begin incubation process.



Advantages of natural incubation.

- ✓ It is cheap in terms of money.
- ✓ Less labour is required.
- ✓ It is easy to manage by the farmer.
- ✓ All the conditions are provided by the hen.

Disadvantages of natural incubation.

- Few eggs are incubated and hatched at a time.
- The hen can easily be attacked by predators.
- It is not good for commercial purpose.
- It encourages egg-eating.
- Some hens are not good at incubating eggs.

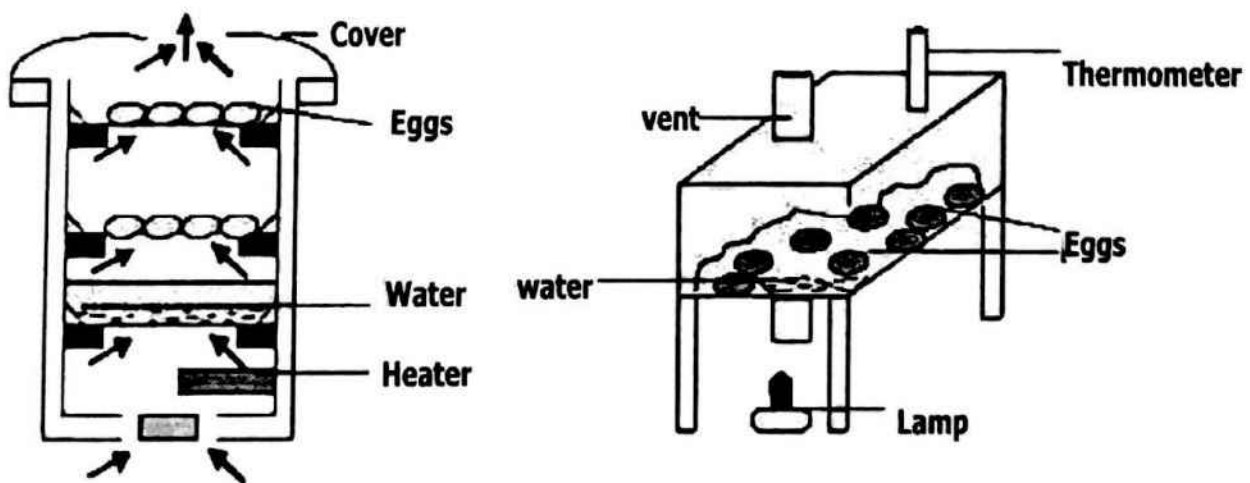
Incubation period.

Incubation period is the time taken by an egg to hatch.

hen	21 days	turkey	28 days	duck	28 days
goose	30 days	pigeon	16 days	guinea fowl	30 days

Artificial incubation.

This is where a machine called an incubator is used to incubate and hatch eggs. This type of incubation is mainly practiced by large scale farmers.



Functions of some items in an incubator.

Thermometer. To measure the temperature in the incubator.

Heater. Provides warmth to the eggs.

Vent. Allows free air circulation in the incubator.

Water. Provides moisture to the eggs.

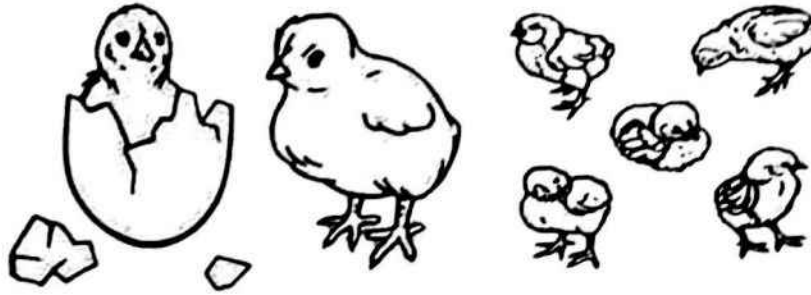
Advantages of artificial incubation.

- Many eggs can be hatched at once.
- Diseases can easily be controlled.
- It is the best for commercial purpose.
- Eggs are free from vermins.

Disadvantages of artificial incubation.

- It is expensive to use.
- It is tiring to use.
- It needs skilled labour to manage.
- It can lead to losses in case electricity goes off.

Newly hatched chicks

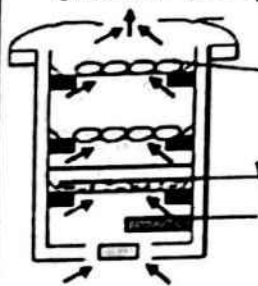


Factors/ conditions that can make eggs fail to hatch.

- Cracked eggshell.
- Soft eggshells.
- Unfertilized eggs.
- Eggs with double yolks.
- Dirty eggs.

Evaluation activity 1.6

1. How do poultry reproduce?
2. Give any **two** conditions necessary for the eggs of a hen to develop into chicks.
3. In which **one** way is incubation in poultry similar to germination in plants?
4. Legume was found by Hypogeal eating an eggshell. What food nutrient did Legume get from an eggshell?
5. How is an eggshell able to carry out gaseous exchange in an egg efficiently?
6. Which type of incubation is suitable for commercial purpose?
7. State any **two** reasons why most farmers use natural method of incubation.
9. What is the incubation period of a hen?
11. The diagrams below show the methods of incubation. Study and use them to answer the questions that follow.



E



(a) Name the methods of incubation marked **E** and **F**.

(b) Give any **one** reason why commercial farmers prefer using the method of incubation **E** over method **F**.

(c) State the importance of water in the method of incubation marked **E**.

BROODING IN POULTRY

Brooding is the providing of special care to the newly hatched chicks.

Conditions provided during brooding.

Warmth, food and protection

Types/ methods/forms of brooding.

Natural brooding

Natural brooding is the provision of warmth to the newly hatched

This method is suitable for poultry farmers who keep poultry on a small scale



Advantages of natural brooding.

- There is not cost involved.
- Constant temperature is provided.
- The hen looks for food for its chicks.
- It requires less attention.

Disadvantages of natural brooding.

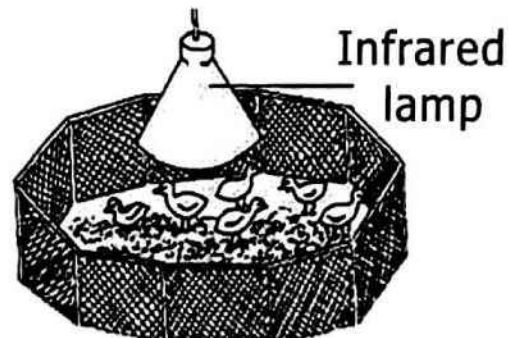
- It caters for only few newly hatched chicks.
- Chicks are exposed to predators.
- Some hens fail to take care of their chicks.

- There is less profit since few chicks are kept.
- The hen can easily be stolen.

Artificial brooding.

Artificial brooding is the method of brooding where chicks are kept in a special structure called a brooder.

This method is suitable for poultry farmers who keep poultry on a large scale/ for commercial purpose.



Types of brooders

infrared lamp brooders, kerosene brooders and charcoal brooders

Advantages of artificial brooding.

- ✓ Chicks are protected from predators.
- ✓ Feeding chicks in one place is easy.
- ✓ Many chicks are catered for.
- ✓ It allows easy monitoring of chicks.

Disadvantages of artificial brooding.

- ✓ Chicks require constant supervision.
- ✓ It encourages toe pecking among chicks.
- ✓ It is expensive to use.
- ✓ It requires special skills to use.

POULTRY VICES

Poultry vices are bad habits found in domestic birds.

Examples of poultry vices.

egg eating, feather pecking, cannibalism and egg hiding

Mnemonic used: **FECE**

Egg eating

This is where a hen breaks the eggshell with its beak and eats its contents.



Causes of egg eating

- ❖ Lack of calcium in the diet.
- ❖ Boredom among the birds.
- ❖ Failure to collect eggs in time.
- ❖ Hunger due to irregular feeding.
- ❖ Too much light in the nestling area.
- ❖ Presence of broken eggs in the coop.

Signs of egg-eating in poultry

- Presence of broken eggs in the coop.
- Eggshells with holes.
- Yellow stains on the bird's beak.
- Sticky feathers near the beak.

Control of egg eating in poultry

- ❖ Debeaking the birds.

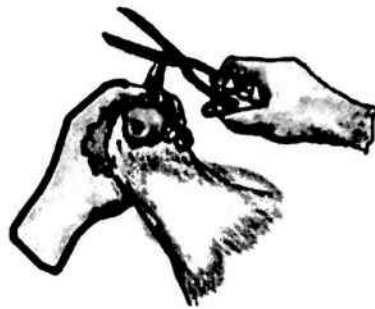
This is the cutting of the bird's upper beak short.

Debeaking is mainly done to prevent egg-eating.

It can be done using a knife or a pair of scissors.

Debeaking makes the bird's beak blunt making it unable to break the eggshell.

 **Note well:** During debeaking, the lower beak is left to enable the bird pick food easily from the ground.



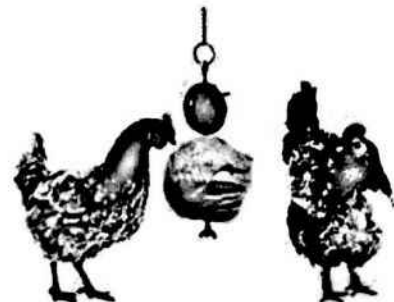
- ❖ Hanging green vegetables on raised bars.

It enables birds to do physical exercises as they jump to eat vegetables.

- ❖ Putting laying nests in dark corners of the poultry house.

It prevents eggs from being seen clearly by a hen to eat them.

- ❖ Providing feeds rich in calcium.



These include; crushed eggshells, oyster shells, or bonemeal Calcium hardens the eggshell.

- ❖ Regular collection of eggs.

Feather pecking

This is when a bird plucks off feathers from other birds using its beak.

Causes of feather pecking

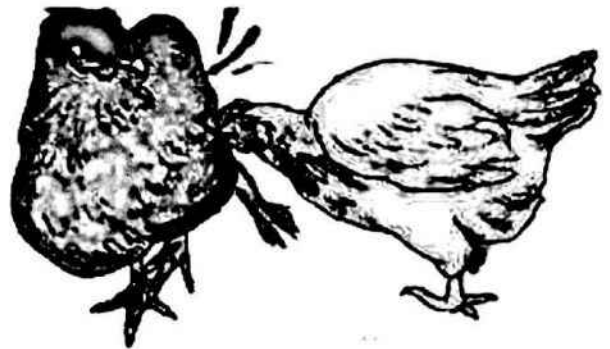
- Overcrowding of poultry.
- Boredom among birds.
- Lack of enough space in the coop.
- Bright light in the poultry house.
- Lack of vitamins in mashes given to birds.

Signs of feather pecking

- Few feathers on the bird's body.
- Presence of feathers in the poultry house.

Prevention of feather pecking

- Provide enough space to poultry.
- Provide enough feeds to birds.
- Provide perching materials in the coop.
- Give mash containing vitamin nutrients.
- Hang green vegetables in the coop
- Add wood ash to litter.
- Isolate pecked birds.



Feather pecking

Cannibalism

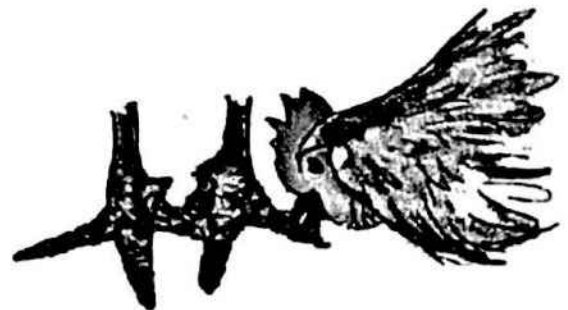
This is an act in which a bird pecks, tears and eats the flesh of another bird it is kept with.

Forms of cannibalism.

- Toe pecking
- Vent pecking
- Skin pecking



Cannibalism



toe pecking

Causes of cannibalism

- Overcrowding of birds.
- Shortage of food.
- Starving birds.
- Bright lighting.
- Lack of proteins in the diet.
- Poor ventilation of the poultry house.

Signs of cannibalism in poultry

- ❖ Blood stains on the bird's beak.
- ❖ Fighting among birds.
- ❖ Dead or injured birds in the flock.
- ❖ Chicken bleeding at the vent.
- ❖ Wounds on the skin of birds.

Control of cannibalism

Don't speak for Quality, let Quality speak for itself

↑ Hanging green vegetables in the coop.

↑ Regular feeding of birds.

↑ Providing enough space for birds.

↑ Proper stocking.

Egg hiding in Poultry

This is a behaviour where laying birds hide their eggs instead of using designated nests.



Causes

- Inadequate or poorly placed nesting boxes.
- Overcrowding in laying area.
- Stress due to disturbance.
- Preference for darker or more private laying spots.

Signs and symptoms

- ◆ Missing eggs despite active laying.
- ◆ Finding eggs in unusual or hidden places.
- ◆ Hens showing secretive behavior when laying.
- ◆ Increased egg breakage and loss

Control and prevention

- Provide enough nesting boxes
- Place nests in quiet dark areas
- Collect eggs regularly
- Do not disturb or stress layers

Culling birds.

Culling is the removal of less productive or sick birds from the flock.

Advantages of culling birds.

- It maintains high level of egg production in birds.
- It reduces the spread of diseases on the poultry farm.
- It saves the costs of feeding unproductive birds.
- It creates more space for healthy birds.

Effects of poultry vices.

- ✓ They lead to reduced egg production.
- ✓ They can lead to death of birds.
- ✓ They reduce profits to the poultry farmer.
- ✓ They cause injuries on birds
- ✓ They reduce body insulation of the birds.
- ✓ They lead to the outbreak of fowl pox.

Evaluation activity 1.7

1. Name the method of brooding commonly used by commercial farmers.
2. State any **two** advantages of natural brooding.
3. Why should a source of heat be provided in a brooder?
4. Apart from egg eating, give any **two** other examples of poultry vices.
5. State any **two** causes of egg eating in poultry farming.
6. Why are laying boxes put in dark corners of a poultry house?
7. State any **two** ways of controlling poultry vices.
8. What is meant by the term debeaking in poultry management?
9. Give any **two** ways of promoting physical exercises in poultry.
10. Why is not advisable to cut the lower beak of the hen during debeaking?
11. The diagrams below show vices commonly found in domestic birds. Study and use them to answer the questions that follow.



M



N

- a) Name the vices in domestic birds marked **M** and **N**.
- b) Give any **one** cause of the form of vice marked **M** in domestic birds.
- c) Mention any **one** piece of advice you would give a poultry farmer to control the vices marked **M** and **N**.

POULTRY DISEASES, CAUSES, THEIR CONTROL AND TREATMENT.

Conditions that can lead to the outbreak of poultry diseases.

- ❖ Invasion of poultry parasites.
- ❖ Poor housing of birds.
- ❖ Poor feeding of birds.
- ❖ Poor hygiene in the poultry house.
- ❖ Overcrowding of birds.
- ❖ Contaminated feeds and water.

Examples of poultry diseases.

Coccidiosis

It is caused by **protozoa**.

It attacks the liver and intestines.

It attacks both poultry and rabbits.

Signs and symptoms.

- Diarrhoea
- Ruffled feathers.
- Blood-stained droppings.
- Dullness and drooping wings

Prevention/control

- Putting coccidiostat in poultry feeds.
- Providing clean feeds and water
- Keeping the poultry house clean.
- Treating infected birds.
- Culling the infected birds.
- Keeping the feeding troughs clean.
- Removing litter regularly.

Fowl pox It is caused by **virus**.

It is spread through vices like feather pecking.

Signs and symptoms

- Discharge of fluids from eyes and nostrils.
- Tiny wounds on the comb, wattle, wings and mouth.
- Eyes become sleepy and stuck.
- Difficulty in breathing.

Prevention/control

- ✓ Ensure proper hygiene in the poultry house.
- ✓ Cull all sick birds.
- ✓ Add antibiotics and vitamins to the drinking water for birds.
- ✓ Routine vaccination.

Newcastle disease

It is a deadly disease in poultry caused by **virus**.

Signs and symptoms.

- ❖ Greenish or yellowish watery droppings.
- ❖ Mucus from the mouth and nostrils.
- ❖ Twisted neck.
- ❖ Sudden death of birds in large numbers.
- ❖ Poor eggshell formation.
- ❖ Lameness and staggering.
- ❖ Drop in egg production.
- ❖ Coughing and sneezing.
- ❖ Loss of appetite
- ❖ Drooping wings.

Prevention/control.

- Vaccinate the birds regularly.
- Bury the carcasses of chickens that have died.
- Cull or isolate sick birds.
- Keep the poultry house clean daily.

Fowl typhoid

It is caused by bacteria.

Signs and symptoms

- Rough feathers.
- Sleepy eyes.
- Loss of appetite.
- Whitish-green yellowish watery droppings.
- Dullness of the bird.

Prevention/control

- ✓ Keep the poultry house clean regularly.
- ✓ Separate infected birds from healthy ones.
- ✓ Vaccinate birds at 5 weeks and 4 months.
- ✓ Burn or bury dead birds.

Pneumonia

It is caused by either **virus** or **bacteria**.

It attacks poultry, rabbits and human beings.

Signs and symptoms.

- Coughing
- Dullness
- Loss of appetite.
- Mucus comes out of the nostrils.
- Difficulty in breathing.
- Slight increase in body temperature.

Prevention/control.

- ❖ Make the poultry house well ventilated.
- ❖ Separate infected birds from healthy ones.
- ❖ Keep the poultry house clean.
- ❖ Treat early with antibiotics.

Other diseases that attack poultry are;

gumboro disease (**virus**)// blackhead (**protozoa**) and bird flu/avian leucosis (**virus**)

Evaluation activity 1.8

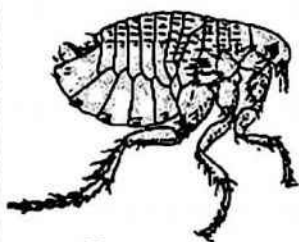
1. Write down any **two** conditions that can lead to the outbreak of diseases in chickens.
2. Give any **two** viral diseases that can break out in chickens.
3. State any **two** signs of Newcastle disease in chickens.
4. Name any **one** infectious disease that attacks both chickens and rabbits.
5. Apart from using medicines, state any **one** other way of preventing the spread of coccidiosis in poultry.
6. A poultry farmer has his chicken passing out blood-stained droppings and have drooping wings.
 - a) What disease is likely to have attacked the farmer's birds?
 - b) Why should the farmer separate the birds with the above condition from the rest?
 - c) Apart from separating the birds with the above condition, state any **two** ways in which the neighbours to the farmer can prevent their birds from contracting the above disease.
7. Which infectious disease attacks both poultry and humans?
8. Give any **two** practices that poultry farmers can use to protect their birds from being attacked by diseases.

POULTRY PARASITES AND THEIR CONTROL.

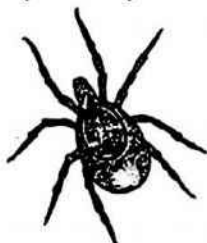
A parasite is an organism that depends on another organism for survival. Poultry parasites are divided into ectoparasites and endoparasites.

Ectoparasites are parasites that attack the skin of the birds and suck blood. They are also called **external parasites**.

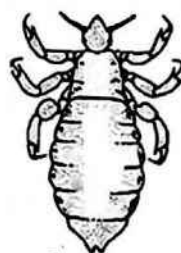
Examples are; fleas, lice, mites, and darkling beetles.



flea



Tick



louse



darkling beetle

Endoparasites are parasites that attack the alimentary canal of the birds. They are also called internal parasites.

Examples are; tapeworms, roundworms and hookworms.

Effects of parasites to poultry.

- They suck blood causing anaemia.
- They spread diseases to poultry.
- They cause emaciation of birds.

Ways in which parasites can be controlled in poultry.

- ✓ Regular deworming of birds.
- ✓ Keep the poultry house clean regularly.
- ✓ Disinfect the poultry house regularly.
- ✓ Regular cleaning of feeding troughs.
- ✓ Dipping the birds' feet in kerosene to kill fleas.

RECORD KEEPING IN POULTRY MANAGEMENT

Don't speak for Quality, let Quality speak for itself

Record keeping is the gathering and storing of information about various activities and transactions carried out on a farm.

Farm records are pieces of written information about different activities and transactions carried out on a farm.

A sample of farm record.

Date	Day	Batch No.	Bird Age (Weeks)	Type of Mash	Feed Qty (kg)	Comments
20/11/2024	Wednesday	001	20	Layer mash	25	Normal feeding
21/11/2024	Thursday	001	20	Grower mash	26	Transition to layer mash
22/11/2024	Friday	001	20	Layer mash	24	Feed intake slightly to lower
23/11/2024	Saturday	001	21	Starter mash	23	Starter mash given to new chicks.
24/11/2024	Sunday	001	21	Layer mash	26	Increased food consumption.

Explanation:

Type of mash. It specifies the feeds given to birds e.g., layer mash for egg-laying birds.

Feed quantity. It records the total quantity fed to the birds on a given day.

Comments. They are notes on feeding performance or changes in diet.

Examples of information on farm records.

- ✓ Size of the farm
- ✓ Date of planning
- ✓ Size of the flock.
- ✓ Health of the birds.
- ✓ Feeding and health costs.

Examples of farm records.

Production records:

Provide information about egg production and meat production. It helps in planning schedules and related activities.

Feeding records:

Feeding records show the amount of feeds given to poultry in a specific period of time.

Health records:

These show cases of diseases, their diagnosis and treatment. It also shows dates for vaccination and health conditions of poultry.

Importance of keeping health records in poultry management.

- It allows farmers to carry out culling of poultry easily.
- It helps to identify sick birds on the farm.
- It helps to know the expenditure for treating birds.
- It helps the farmer to plan for the health of birds.
- It helps to know common diseases and ways of preventing them.

Sales records:

These show the income, daily expenditure and total sales.

Inventory records:

These show detailed list of all the items used on the farm.

Breeding records.

These show the breeds of birds kept.

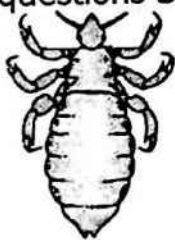
Ways in which keeping farm records is important to a farmer.

- ✓ It helps a farmer to plan for the farm.
- ✓ It helps a farmer to know the income and expenditure on the farm.
- ✓ It helps a farmer to know the profits and losses made on a farm.
- ✓ It helps in decision making regarding the future of the project.
- ✓ Records can be used as reference when a farmer wants to get loans.
- ✓ It helps a farmer to be taxed fairly by the government.
- ✓ It helps a farm to identify areas of development and investment.

Evaluation activity 1.9

1. What is meant by the term parasite?
2. Write down any **two** ectoparasites that attack poultry.
3. State any **one** way in which parasites affect poultry.
4. Give any **two** ways in which poultry farmers can control parasites in poultry.

The diagram below shows a type of parasite in poultry. Use it to answer questions 5 and 6.



5. Name the poultry parasite shown above.
6. How does the poultry shown above affect poultry?
7. Write down any **two** examples of farm records that can be kept by poultry farmers.
8. Give any **two** ways in which farm records are important to poultry farmers.
9. State any **one** way in which each of the following farm records are important to a poultry farmer.
a) Health records b) Feeding records.
10. Write down any **two** pieces of information recorded in a poultry farm record.
11. The table below shows the pieces of information carried out by a poultry farmer. Study and use it to answer the questions that follow.

Month	September	Breeds of chicken	exotic
Age of the flock	4 months	Number of chicken	100 birds

Number of eggs					
Day	Morning	Afternoon	Broken	Good	Total
Monday	50	40	10	80	90
Tuesday	55	46	none	111	111

Evaluation activity 1.9 Continued

- Identify the pieces of information shown in the table above.
- State any **one** reason why the above pieces of information is important to a poultry farmer.
- Give any **one** factor that might have caused the drop in the number of eggs collected on Monday.
- What type of chicken is kept by the poultry farmer according to the above information?

BEE KEEPING

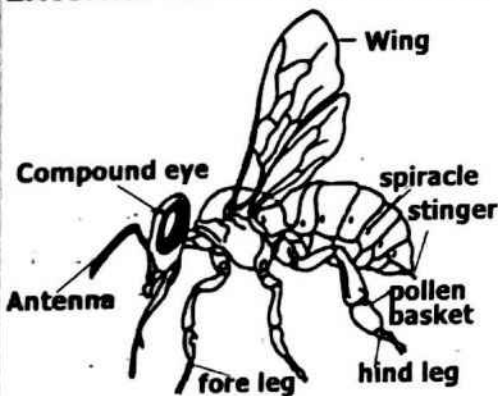
- The practice of keeping bees for honey is called **apiculture**.
- A person who keeps honey bees is called an **apiarist**.
- A farm of honey bees is called an **apiary**.
- Honey bees are social insects because they live and work together.

Social insects are insects that live and work together

Examples of social insects are; honey bees, wasps, termites, bumble bees, ants.

- Some bees like mason bees, carpenter bees, mining bees and leafcutter bees are **solitary bees**. **Reason.** They do not live and work together.

External features of a honey bee



Functions of parts of a honey bee.

Antennae/feelers: For feeling, smelling, hearing and sensing danger.

Proboscis: For feeding.

Stinger: For protection against enemies.

Pollen basket/corbicula: For carrying pollen from flowers.

Wings: For flying.

Halteres: For body balance in air during flight.

Thorax: For attachment of wings and legs.

Head: For attachment of eyes, feelers and proboscis.

Abdomen: For attachment of spiracles for breathing.

On a queen bee and worker bees, the abdomen holds the stingers.

On the queen bee, the abdomen also holds the ovipositor used for laying eggs.

Types/groups/casts of honey bees

- queen bees
- worker bees
- drone bees

Queen bee



Characteristics of the queen bee.

- It has long legs.
- It has a smooth and slippery body.
- It has a larger thorax.
- It is the largest bee in the hive.
- It is the female fertile bee in the hive.
- It feeds on royal jelly.
- It mates once in its lifetime.

Worker bees

They are also called forage bees because they wander around the environment looking for nectar, water, propolis and pollen.

These are the busiest bees in the hive.

They are very many in number,

They are commonly seen around the flowers to look for food (nectar and pollen)

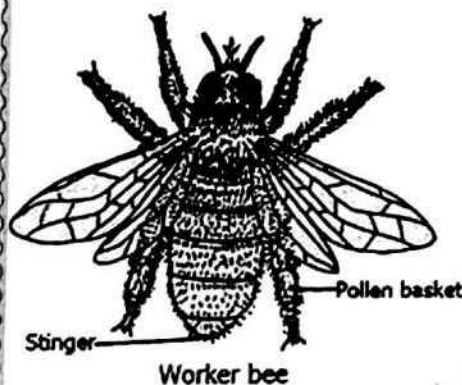
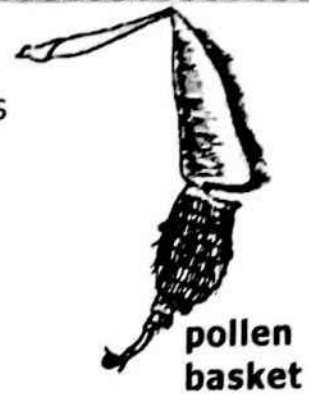
They regulate temperature in the hive by flapping their wings in the hive.

Worker bees are called other names based on their roles within the colony i.e;

Nurse bees: worker bees that take care of the grub and queen.

Forager/foraging bees: worker bees that collect nectar, pollen, and propolis

Guard bees: worker bees that protect the hive from enemies



Characteristics of worker bees.

- They are the smallest bees in the hive.
- They have a pollen basket on the hind leg.
The pollen basket is used to carry pollen from flowers.
- They are female sterile bees in the hive.
- **Reason.** They lack an ovipositor to lay eggs.
- They are the nurse bees in the hive.

Duties/roles of worker bees.

- ✓ They clean the hive.
- ✓ They collect food.
- ✓ They protect the hive by stinging the enemies.
- ✓ They repair the hive.
- ✓ They make honey.

 **Note:** a worker bee dies soon after stinging.

Reason. A worker bee loses its stinger which leads to dehydration to death.

- ✓ They build honey combs.
 - ✓ They feed the grubs and the queen bee.
- They prepare bee bread from pollen and honey for feeding the grubs.

Substances collected by worker bees in the environment.

Propolis:

- For repairing damaged parts of the hive.
- For smoothing the interior of the hive.
- For waterproofing the hive.
- For waterproofing the brood cells

Nectar and water

- For making honey.

pollen

- For making bee bread.
- For food by worker bees.

Drone bees

Drone bees are the male bees in the hive. A drone bee mates with the queen bee. The period when the drone bee mates with the queen bee is called

nuptial flight.



 **Note:** A drone bee dies after mating with the queen bee.

Reason. The mating process causes rupture of its reproductive organ.

Drone bees are not normally found in the hive.

Reason. They live in their congregational areas.

Drone bees have a limited role in the hive

Characteristics of drone bees.

- They have not stinger.
- They develop from unfertilized eggs.
- They make buzzing sound when flying.
- They have a broad abdomen.
- They are stout in shape.



Drone bee

Evaluation activity 1.10

1. Give the meaning of the following terms:
 - a) Apiculture
 - b) Apiary
2. Why are honey bees called social insects?
3. Apart from honey bees, list down any **two** other examples of social insects.
4. State any **two** characteristics of worker bees.
5. Name the type of bees that develop from unfertilized eggs.
6. Give any **two** duties of worker bees in the hive.
7. Why does a drone bee die soon after mating with a queen bee?
8. The diagram below shows the leg of a bee. Study and use it to answer the questions that follow.



- (a) Identify the type of bee whose leg is shown above.
- (b) Name the structure marked **J**.
- (c) How is the structure marked **J** useful to the bee with the leg shown above?
- (d) In which way is the bee whose leg is shown above beneficial to flowering plants?
8. How is a worker bee able to carry pollen from flowers?
9. Apart from pollen, write down any **two** other substances collected by worker bees in the environment.
10. State any **one** use of propolis to honey bees.

Evaluation activity 1.10 Continued

11. Why does a worker bee die soon after stinging a person?
12. State any **one** physical feature that differentiates a worker bee from a queen bee.
13. Which health condition leads to the death of a worker bee after stinging an enemy?

The lifecycle of a honey bee.

- Bees undergo complete metamorphosis.

Reason. The larva stage is completely different from the adult in structure and function.

- The eggs are laid by the queen bee.
- The eggs are laid in wax cells for proper development of larvae and for safety.
- The eggs are fertilized by the queen bee using sperms it stores in the sperm sac during the nuptial flight/mating flight with the drone bee.

- The fertilized eggs develop into the queen bee and worker bees while the unfertilized eggs develop into drone bees.
- The larva stage of bees is called **grub**.

- The grubs are fed on bee bread.

Importance of bees in the environment.

To plants.

They help in cross pollination.

To crop farmers.

They pollinate farmer's crops.

Other ways in which bees are important to people.

- ✓ They provide honey to people.
- ✓ Bees provide pollen and bees-wax.
- ✓ Bees are sold for money.
- ✓ Bee keeping provides jobs to people.
- ✓ Honey from bees is sold for money.

Products got from bees.

Honey

- For making tea sweet.

 **Note:** Honey is a source of carbohydrates.

- It is used to make alcohol.

Uses of honey in industries.

- It is used to make cough syrup.
- It is used to make sweets and chocolates.
- It is used to make dye.

 **Note:** Honey does not go bad easily.

Reasons: - Honey has very low water content which cannot allow germs to survive.
- Honey is acidic in nature which prohibits the survival of germs.

Bees-wax

- It is used to make shoe and wood polish.
- It is used to make candles.
- It is used to make cosmetics.

- It is eaten by people.

- It is sold for money

- It is used as local medicine.

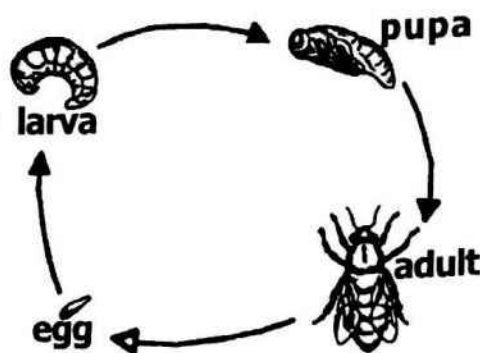
- It is used as a preservative.

- It is used to make lip shiners.

- It used to make soap.

- It is used to make glue.

- It is used to make crayons.



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- It is used to make book binding threads.

- It is used to make varnish.



A person making candles



Evaluation activity 1.11

1. How are worker bees useful to a crop farmer?
2. State any **two** ways in which honey is useful in industries.
3. Apart from honey, mention any **two** other products got from bees.
4. How does bee keeping help in the prevention of malnutrition in children?
5. Give any **one** reason why honey does not easily go bad.
6. Which stage of a bee is harmful to human health?
7. Name the kind of food used to feed the queen bee in the hive.
8. What food value do we get from eating honey?
9. How is bee keeping important to a candle manufacturer?
10. Apart making candles, mention any **one** other way in which bees-wax is useful to people.

SWARMING IN BEES

Swarming is the movement of bees from one place to another looking for a new hive.

A **swarm** is a large group of bees.

Reasons why bees swarm/causes of swarming in bees.

Cause	How it contributes to swarming
Overcrowdedness of bees in the hive	When many bees live in one hive, some leave to find a new home
Development of a new queen bee	When a new queen bee is born, some bees follow her to start a new hive
Lack of flowers	If there are few flowers, bees leave to find food in a better place.
Lack of water	Bees need water, if there is none, they move to a place with water.

Cause	How it contributes to swarming
Direct sunshine into the hive	Too much sunshine in the hive makes it too hot, so bees leave for a cooler place.
Direct smoke into the hive	smoke makes the bees uncomfortable, so they fly away to stay safe.
Too much noise around the hive.	Loud sound disturbs bees, so they leave to find a quiet place.
Dampness in the hive	Wet hives are not good for bees, so they move to a dry place.
Bad smell around the hive	Bees do not like bad smells, so they fly away to fresh place.
Leakage in the hive	If the hive has holes, rainwater and wind enter, making bees live.
Attack by pests	If pests like ants or waxmoths enter the hive, bees run away to be safe

Ways in which a bee keeper can prevent swarming.

- ✓ Ensuring the presence of flowers near the hive.
- ✓ Ensuring the presence of water near the hive.
- ✓ Protecting bees from pest attacks.
- ✓ Providing quiet and cool environment.
- ✓ Keeping the brood undisturbed.

Beehives

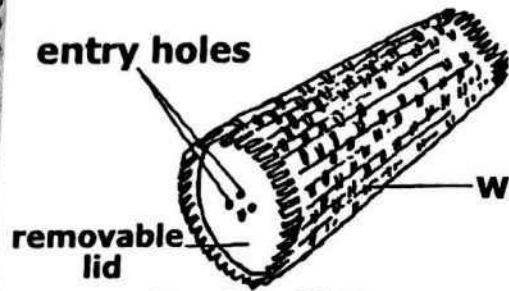
A hive is a home of bees.



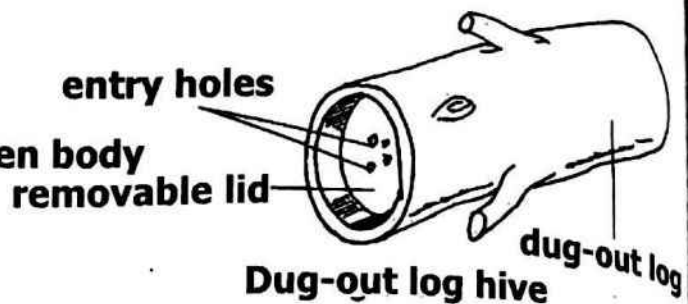
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Types of beehives

Traditional beehives



Kigezi beehive



Dug-out log hive

Advantages of traditional beehives.

- They are cheap to make.
- The colony is not constantly disturbed by an apiarist.

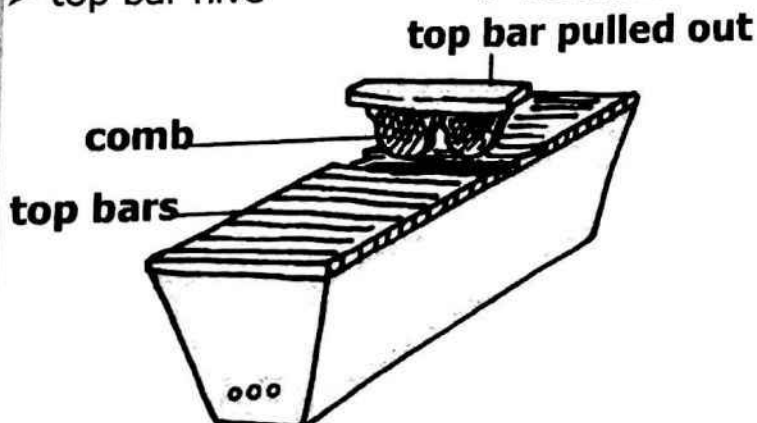
Disadvantages of traditional beehives.

- They are difficult to inspect.
- They last for a short time.
- The hive is damaged in process of harvesting honey.
- It is difficult to control swarming.
- Harvested honey contains brood

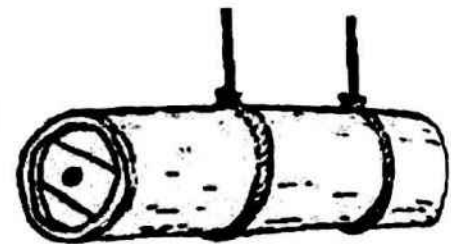
Modern beehives

➤ top bar hive

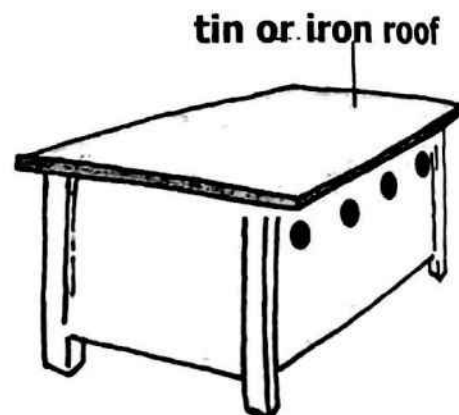
➤ box hive



Top bar beehive



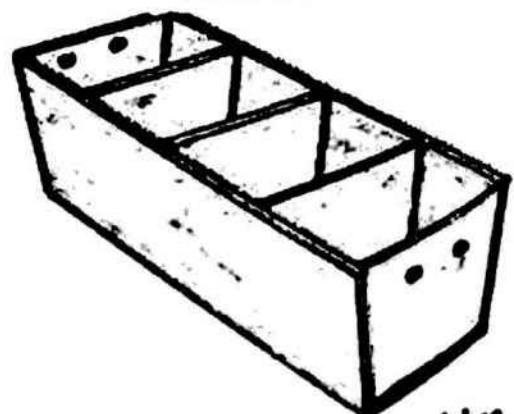
Dug out log hive



Box beehive

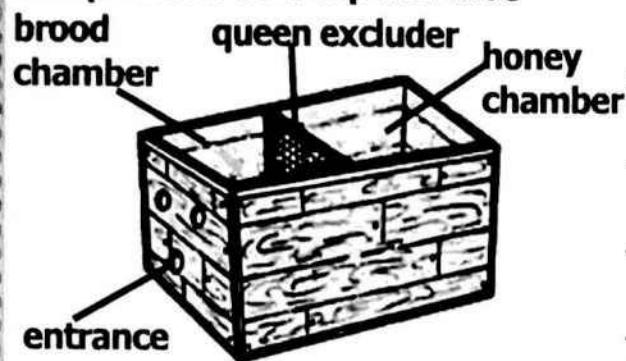


Top bar hive



Box beehive

Components of a top bar hive



Brood chamber

- It is where the queen bee lays eggs.
- It is where the grubs grow from.

Honey chamber

- It is where honey is stored.

Queen excluder

- It prevents the queen bee from laying eggs in the honey chamber.
- It prevents the queen bee from eating honey kept in the honey chamber.



Points to note:

The queen excluder is made with small holes

Reason. To prevent the queen bee from entering the honey chamber.

Engine oil and metal guard should be put on the poles when hanging a modern beehive

Reason. To keep away ants and lizard which attack and kill bees.

Iron sheets are placed on top of the hive to protect it from rain.

Honey bees can also live in tree trunks, anthills, holes under the ground and rocks.

Advantages of modern beehives.

- The colony develops undisturbed.
- It is easy to inspect the colony.
- Bees build their colony on each bar.
- Clean honey is harvested.
- They protect honey from dirt, pests and environmental pollutants.
- The honey is stored in a controlled hygienic space within the hive.
- They are long lasting.
- High quality honey is collected.
- They cannot be damaged by rain.

Disadvantages of modern beehives.

- They are expensive to construct.
- They need a skilled apiarist.

Siting the hive

Siting the hive is the selecting of a suitable place for keeping honey bees.

Factors to be considered when siting the hive.

Factor	Reason(s)
Nearness to water source	To enable honey bees get water for making honey. To enable honey bees get water for cooling the hive.
Presence of flowering plants	To enable worker bees get nectar for making honey. To enable worker bees get pollen for food.
Quiet place	To protect bees from noise which can lead to swarming.
Cool place	To enable worker bees regulate hive temperature in hot weather.
Smoke-free place	Smoke can drive away bees affecting their productivity.
Bee pest free place	To prevent pests from attacking and destroying bees.
Distance from schools or main roads.	To prevent bees from stinging people. To protect bees from too much noise.

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Sheltered place

To protect bees from direct sunlight, rain, wind and coldness.

Evaluation activity 1.12

1. (a) Give any **two** advantages of a modern beehive.
(b) State any **two** factors that should be considered when selecting a site for keeping honey bees.
2. What happens when a new queen is born in the hive?
3. Give any **one** reason why a beehive should be set up far from the school.
4. Give the function of each of the following parts of a modern beehive.
i) Honey chamber ii) Brood chamber
5. Apart from being a source of food, state any **two** other ways in which honey is useful to people.
6. Why is the queen excluder in a top bar hive made of small holes?
7. State any **one** function of the queen excluder in a top bar hive.
8. What is meant by the term swarming in bees?

STOCKING THE HIVE

Stocking the hive is the process of introducing honey bees into an empty hive.

Methods of stocking the hive.

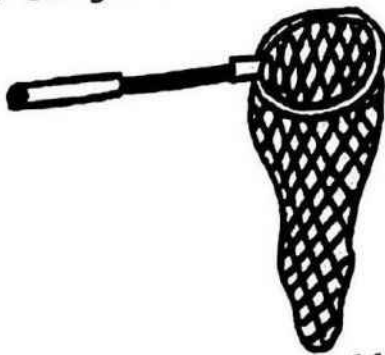
❖ Using bee baits.

Bee baits are materials that attract bees into the hive during stocking.

Examples of bee baits.

sugar solution, bees-wax, ripe bananas, cow dung, fruit juice honey

❖ Using a swarm catching net.



swarm catching net



swarm catching net

It is used to trap a swarm.

❖ Using a catcher box.



A catcher box



An apiarist stocking the hive using a catcher box

Handling honey bees

Occasions when an apiarist can handle bees.

- Harvesting honey. ✓ Inspecting the colony. ✓ Feeding bees.
- Stocking the hive

HARVESTING HONEY

Harvesting honey is the removal of ready honey from the beehive. Harvesting of honey should be done during day time.

Reasons why harvesting of honey is best during day time

- It is easy to detect ready combs with honey.
- Most worker bees are out of the hive looking for food.
- It reduces the death of worker bees.
- There is less disruption from bees.
- It reduces on damage of honeycombs.

 Note well. Harvesting of honey should not be done in the evening/night.

Reason. It leads to the destruction of both the broods and bees.

Methods of harvesting honey.

traditional method and modern method

Steps taken when harvesting honey.

- i) Blow smoke into the hive.
- ii) Lower the hive to the ground to prevent damage of honeycombs.
- iii) Remove the roof and quilt.
- iv) Cut and remove light coloured combs with honey in them.
- v) Place the honey combs in the bucket for honey extraction.

 Note: Ensure that some combs with honey remain in the hive for bees to feed on before they build new combs.

Dangers of harvesting honey using fire.

- Fire kills bees reducing their population.
- It leads to the destruction of the hive, honeycombs, grubs and bee colonies.
- Smoke or ash from fire contaminates honey.
- It reduces honey harvest by killing worker bees.

Equipment used when harvesting honey.

Bee veil: To protect the face and head from beestings.

Apiarist's gloves: To protect the hands from beestings.

Apiarist's overall: To protect the whole body from beestings.

Bucket: For putting in harvested honey combs.

Apiarist's gumboots: To protect the feet from beestings and sharp objects.

Smoker: It is used to produce smoke in



Smoker

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order to scare and paralyse bees.

Fuel that can be used in the smoker

- old sacks
- dry grass
- wood shaving
- sawdust

Knife: For cutting combs with honey from the hive.

Bee brush: For brushing off bees from honey combs.

Hive tool: It is used to scrap away propolis holding the top bars together so as to separate them.



bee brush



hive tool

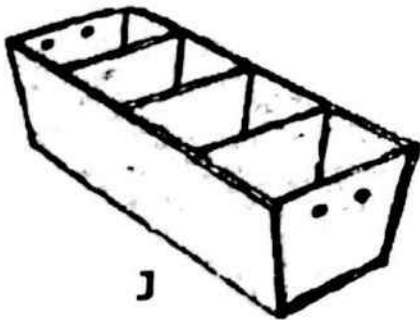


People Harvesting Honey in Different Ways.



Evaluation activity 1.13

1. What is meant by the term stocking the hive?
2. Mention any **two** examples of baits that an apiarist can use when stocking the hive.
3. Apart from using baits, state any **two** other methods of stocking the hive.
4. Mention any **one** reason why harvesting of honey should be done during day time.
5. Name any **one** method of harvesting honey.
6. Give any **one** reason why the bee hive should not be set up near a school.
7. How are the following equipment useful when harvesting honey?
i) Bucket ii) Bee veil
8. The diagrams below show types of beehives. Study and use them to answer the questions that follow



J



K

- (a) Name the bee hives marked J and K.
 - (b) State any **one** advantage of using the type of bee hive marked J.
 - (c) Identify the type of bee hives to which the hive marked K belongs.
- The diagram below shows a device used when harvesting honey. Study and use it to answer questions 9 and 10.



9. Name the device shown in the diagram above.
10. State **one** way in which the device above is useful to a bee keeper when harvesting honey.

Evaluation activity 1.13 Continued

The diagram below shows items commonly used by nursery school children. Use it to answer questions 11 and 12.



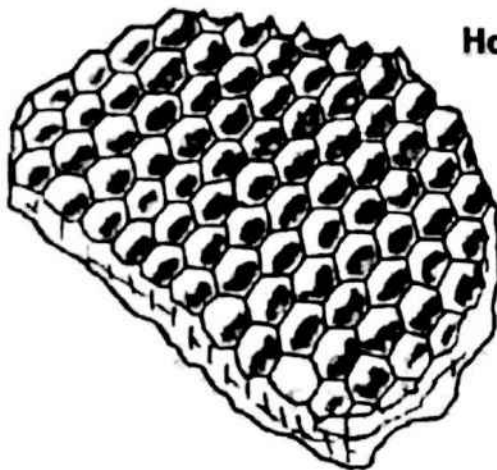
11. Name the product from bees used to make the items above.
12. Give the importance of the above items to nursery school children.

EXTRACTION OF HONEY

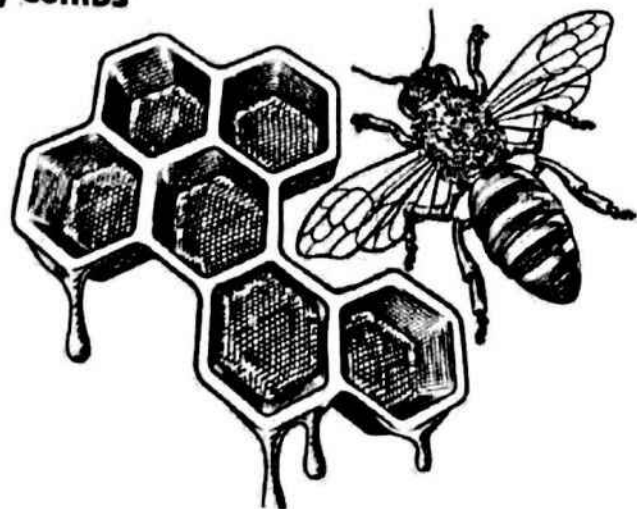
Extraction of honey is the removal of ready honey from the combs. Honeycombs are hexagonal cells built by worker bees in the hive to store honey. They are built from wax. Honeycombs are also used to raise grubs.

Why honeycombs are hexagonal

- To provide strong and compact storage space for honey.
- To create enough room for easy storage of honey.



Honey combs



Factors to consider when extracting honey.

When extracting honey, key factors to consider include; maturity of the honey (capped cells), weather conditions, hive health, cleanliness of the equipment, proper beekeeping practices, the method of extraction (uncapping technique), and the storage conditions of the harvested honey, ensuring the honey is fully capped and not contaminated with debris or foreign substances is crucial for

quality extraction

Methods Of Extracting Honey.

Floating the wax method.

In this method, honey is separated by melting combs in warm water.

Steps taken

- (i) Cut the honeycombs into small pieces.
- (ii) Place the pieces in warm water to melt the wax.
- (iii) Allow honey to settle at the bottom of the container.
- (iv) The floating wax is removed from the top surface to remain with only honey in the container.

Observation.

The wax floats on top of the honey. It is carefully removed using a sieve or a piece of cloth.

The fine honey is placed in containers like bottles or jerry cans for storage.

Pressing honey method

In this method, honey is extracted by crushing and pressing the honeycombs. They are wrapped and the honey is squeezed into clean containers.

Steps taken:

- (i) Crush the honeycombs using clean press or hands.
- (ii) Place the crushed combs in a strainer or fine cloth.
- (iii) Squeeze or press to allow honey to come out.
- (iv) Collect the honey in a clean container.

Centrifuging method/spinning method

In this method, honey is removed from the combs using a **centrifugal honey extractor**.

The machine spins the honeycombs at a very high speed and forces honey out.

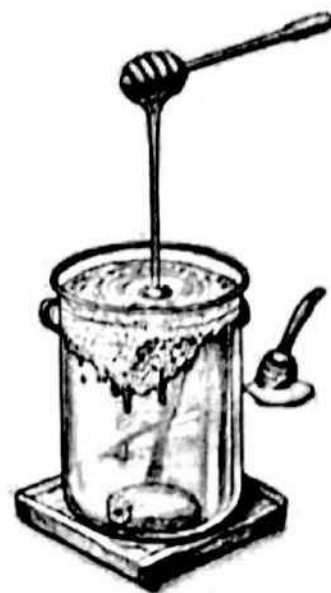
The honey is then separated from the wax and stored in clean containers.

Steps taken:

- (i) Place honeycombs in a centrifuge.
- (ii) Spin the centrifuge to separate honey from the combs.
- (iii) The honey settles at the bottom of the machine.
- (iv) The honey is then boiled and stored in clean containers.

Ways in which bee keeping is an important business to people.

- Bee keeping creates jobs to people.
- Wax candles from beeswax are sold for money.
- Bee propolis is used for making plastics.



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- Bees provide honey for sale.

Pests that attack honey bees.

- wood ants
- wax moths
- safari ants
- bee lice
- hive beetles
- hawks
- monitor lizards
- honey badgers
- wasps

Effects of bee pests.

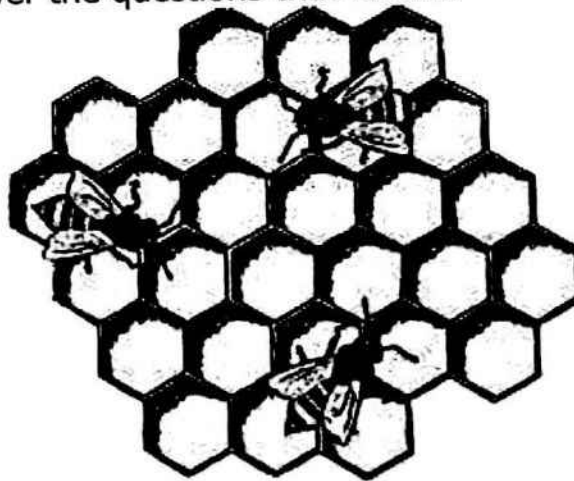
- ✓ They damage the hive.
- ✓ They eat honey.
- ✓ They lay eggs in the combs.
- ✓ They kill bees.
- ✓ They eat the grubs.
- ✓ They carry away broods.

Ways in which bee pests can be prevented.

- Put oil or grease at the bases of poles. - Keep the grass around the hive short.
- Suspend the hive with wires between poles.
- Spray insecticides at the base of poles.

Evaluation activity 1.14

1. Name the method of extracting honey where honey is separated from the combs using a spinning extractor.
2. Apart from using a spinning extractor, mention **two** other methods of extracting honey from combs.
3. State any **one** factor to consider when extracting honey.
4. Write down any **two** examples of pests that attack honey bees.
5. Mention any **one** way in which pests affect honey bees in the hive.
6. Give any **one** way in which a bee keeper can control pests from attacking his/her honey bees.
7. The diagram below shows hexagonal structures built by honey bees. Study and use it to answer the questions that follow.



- a) Name the structures shown above.
- b) How are the above structures useful to honey bees?
- c) What type of bees build the structures shown above?
- d) Identify any **one** substance bees use to build the structures shown above.

MEANING OF KEY TERMS IN KEEPING POULTRY AND BEES

Poultry: Birds kept at home.

Apiary: The rearing of honey bees.

Royal jelly: Food on which the queen bee feeds on.

Swarm: A large group of honey bees in the hive.

Colony: A group of honey bees flying together.

Poultry fanning: The rearing of domestic birds.

Poultry vices: Bad habits in domestic birds.

Swarming: The massive movement of bees looking for a new hive.

Incubation: Providing necessary conditions for eggs to hatch.

Brooding: Providing special care to chicks.

Stocking the hive: Encouraging honey bees to occupy an empty hive.

Debeaking: Shortening the upper beak of a hen.

Hiving: The act of attracting bees to the hive using baits.

Siting the hive: Selecting a suitable site for keeping honey bees.

Propolis: Sticky substance worker bees get from tree sap for smoothing the hive.

Honey extraction: The removal of ready honey from the combs.

Farm records: Written information on various activities carried out on a farm

THEME: MATTER AND ENERGY

TOPIC : 2 MEASUREMENT

MASS AND WEIGHT

Mass is the quantity of matter contained in an object or body.

Mass is measured in grammes or kilogrammes.

$$1 \text{ kg} = 1000 \text{ g}$$

Units used to measure mass

Basic units: grammes (g)

Standard units: kilogrammes (kg)

Points to note: Basic units are the smallest units we use to measure things.

Examples: meter (m) for length, grammes (g) for mass, and second(s) for time

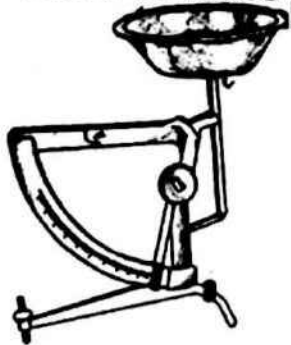
Standard units are fixed units that do not change. they are agreed upon by everyone.

Examples: kilometer (km) for distances, kilogramme (Kg) for heavier things, and litre (L) for liquids.

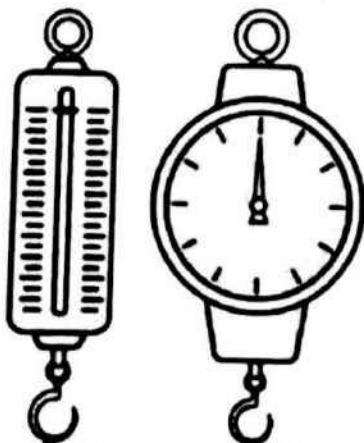
The accurate mass of different objects is measured using weighing balances.

Examples of weighing balances.

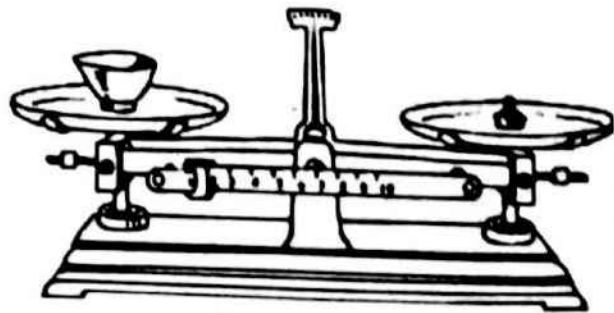
Lever balance



Beam balance



Spring balance



Scale balance

Weight

Weight is the force of gravity acting upon an object.

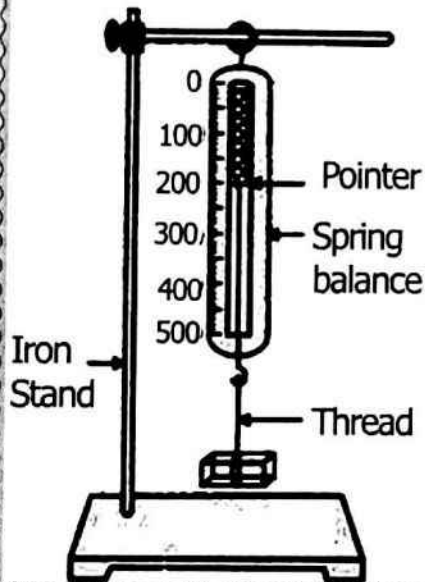
The standard unit for measuring weight is Newton.

Gravity is the force of attraction that pulls objects towards the centre of the earth. It is also called gravitational force

 **Note:** the weight of an object increases when in air because more gravity is experienced on an object.

When a piece of paper and a rubber are dropped from the same height, a rubber reaches the ground first.

Reason. A rubber has less air resistance than a piece of paper.



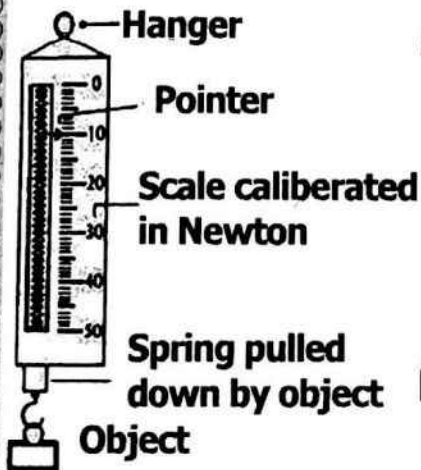
Measurement of weight of iron cuboid in air

Ways in which gravity is applied in our daily life.

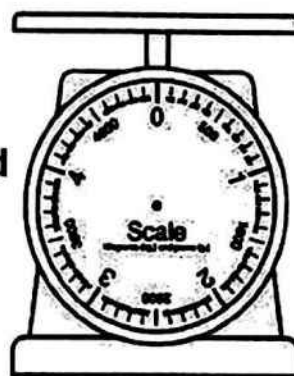
- ✓ It keeps objects on the ground.
- ✓ It enables fruits to fall from trees.
- ✓ It enables people to draw water from water pumps and taps.
- ✓ It enables people to receive rain from nimbus clouds.
- ✓ It allows pouring of liquids in containers.

Machines used to measure weight of objects

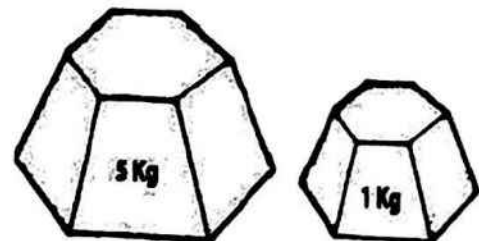
Scale balance, lever balance, spring balance, clock balance and hydraulic balance (This uses a liquid called hydraulic fluid)



Spring balance



Clock balance



Weighing stones

Factors On Which Weight Depends.

Factor	Its effect on weight.
Force of gravity	Stronger gravity increases the weight of an object.
Upthrust force	It reduces the effective weight of an object in fluids.
Mass of an object	Greater mass directly increases weight due to gravity

Factor	Its effect on weight.
Nature of an object	Density and compactness affect how heavy the object feels.
Material from which an object is made	Denser materials increase the object's weight.

Points to note: Objects weigh less on the moon than on the earth.

Reason. There is less gravity on the moon than on the earth.

A cubic unit of wool weighs less than a cubic unit of a stone.

Reason. Wool is less dense than a stone. // Wool has less mass than a stone.

1 kg of iron nails has less volume than 1 kg of wool.

Reason. Iron nails have more density than cotton wool.

Iron nails have more mass per unit volume than feathers.

Explanation.

In stones, particles are more closely packed together and therefore, there are more particles within a small space hence the higher density.

It is easier to transport 1kg of iron nails than 1kg of feathers.

Reason. Stones are more compact and take up less space than feathers.

It is difficult to push a wheelbarrow uphill than downhill.

Reason. There is less gravity to support the movement of a wheelbarrow uphill than downhill.

It is easier to pull the wheelbarrow downhill than uphill.

Reason. There is more gravity to support the movement of a wheelbarrow downhill than uphill.

Simple Calculations on Weight.

$$1\text{kg} = 10\text{N}$$

Examples

1. Change 78kg to Newtons

$$1\text{kg} = 10\text{N}$$

$$1\text{kg} = (78 \times 10) \text{ N}$$

$$= 780\text{N}$$

2. Express 200g to Newtons.

$$100\text{g} = 1\text{N}$$

$$200\text{g} = \frac{200}{100} \text{ N}$$

$$200\text{g} = 2\text{N}$$

Evaluation activity 2.1

1. Give the meaning of the following terms:
(i) Mass (ii) Weight
2. State the difference in units used to measure mass and weight.
3. Why does the weight of an object increase when in air?
4. Name the force that makes objects thrown in air to fall back on the ground.
5. Give any **two** factors that affect the weight of an object.
6. Why does 1kg of iron nails have less volume than 1kg of cotton wool?
7. Convert 65kg to Newtons.
8. State the reason why a cubic unit of wool weighs less than a cubic unit of a stone.

Evaluation activity 2.1

The diagram below shows a material commonly used by shop attendants. Use it to answer questions 8 and 9.



9. Name the material shown in the diagram above.

10 Give any **one** way in which the above material is useful to shop attendants in your community.

Upthrust Force

Upthrust force is the upward force acting on an object immersed in a fluid/liquid. It can also be called buoyancy force.

Upthrust force makes objects to weigh less in water.

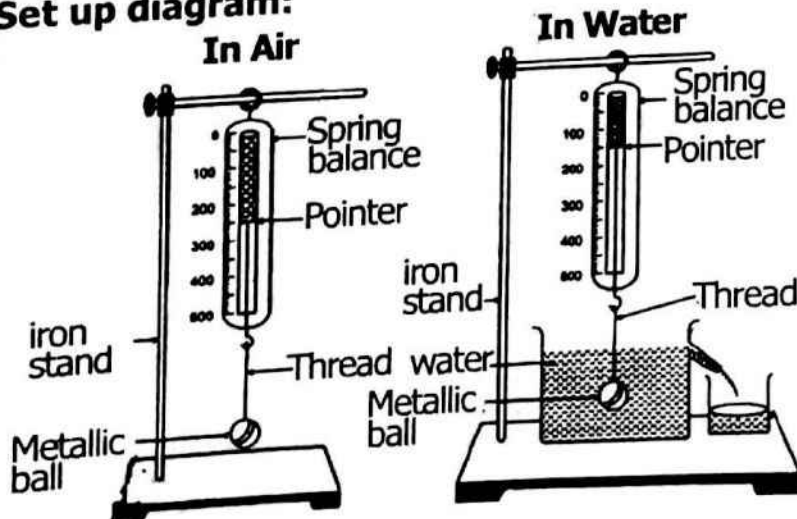
Experiment to demonstrate the weight of objects when in water and in air.

Materials needed: spring balance, water, an overflow can, metallic ball and thread

What to do:

- Tie the metallic ball to the spring balance using the thread and measure its weight in air.
- Fill the overflow can with water to the brim and let excess water overflow.
- Immerse the metallic ball into water using the thread and measure its weight in water using a spring balance.
- Compare the weights in air and in water to observe the loss of weight in water due to upthrust.

Set up diagram:



Observation:

The weight of metallic ball in air initially was 350N but when immersed in water, it dropped to 250N.

Conclusion:

Objects weigh less in water than in air.

Reason. There is more upthrust force in water than in air.

Roles of the materials in the experiment:

Spring balance: It measures the weight of the metallic ball in air and in water.

Water in overflow can. It provides the medium for observing the effect of upthrust on the metallic ball.

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Metallic ball. It serves as the object whose weight is being measured.
Thread. It suspends the metallic ball from the spring balance for accurate measurement.

Relationship between mass and weight

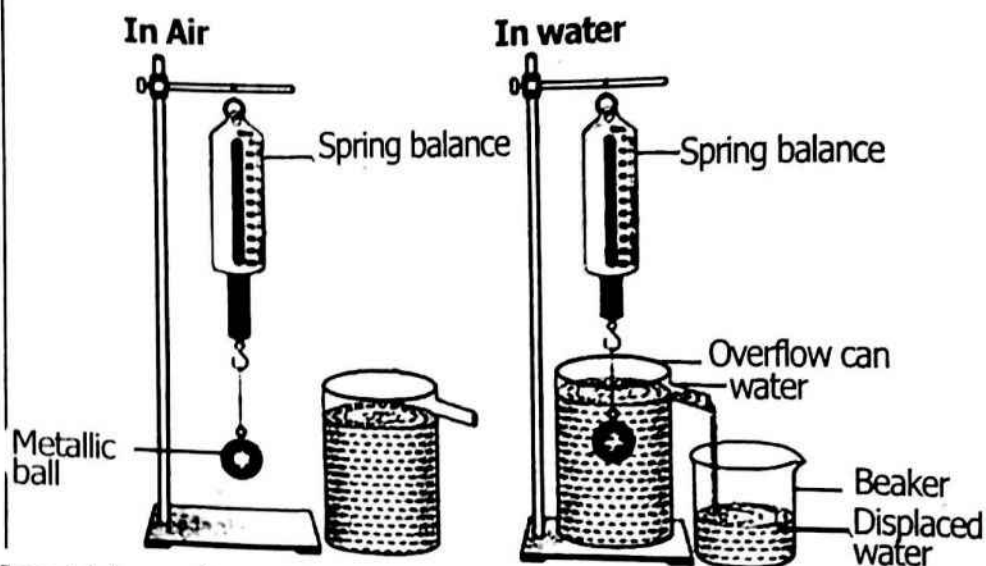
- Weight is directly proportional to mass.
- Objects with higher mass weigh more.

Differences between mass and weight.

- Mass is measured in grammes or kilogrammes while weight is measured in Newtons.
- Mass is constant while weight changes.
- Mass is the amount of matter in an object while weight is the force of gravity exerted on an object.

Evaluation activity 2.2

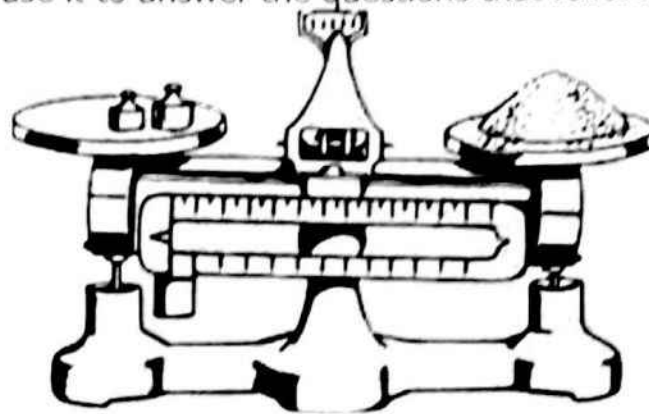
1. In the diagram below, a solid was measured in air and in water. Study and use it to answer the questions that follow.



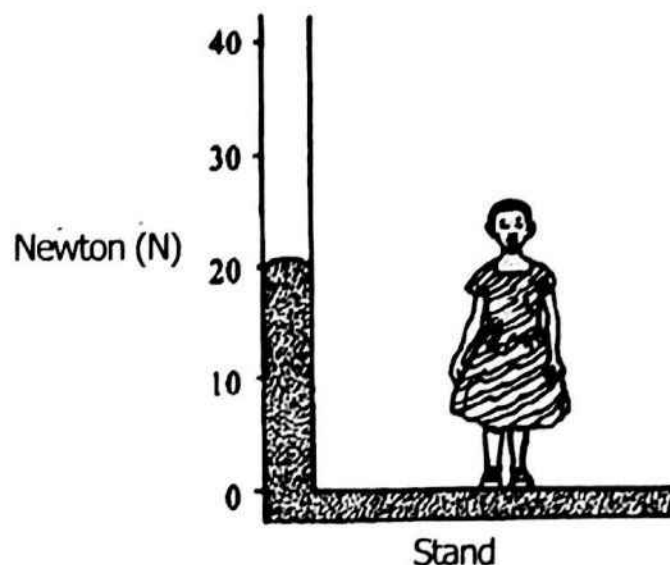
- a) In which medium did the solid weigh less?
 - b) Give a reason for your answer in a) above.
 - c) Name the force that acted on the solid in air.
 - d) What was the purpose of carrying out the above experiment?
2. Why do objects weigh less when immersed in water than in air?
 3. State the relationship between mass and weight.
 4. What is the basic unit for measuring mass?
 5. State the effect of upthrust force on objects.
 6. Why is it difficult to push a wheelbarrow uphill than downhill?
 7. When a piece of paper and rubber are dropped from the same height which one reaches the ground first?
 8. Give a reason for your answer in 7 above.
 9. Why does a stone thrown in air come back to the ground?

Evaluation activity 2.2 continued

10. The diagram below shows an instrument used in measurement. Study and use it to answer the questions that follow.



- a) Name the instrument shown above.
b) State the use of the above instrument to shop attendants.
c) Give any **two** other instruments that can be used for the same purpose as the one shown above.
11. The diagram below is of a weighing machine which uses a liquid. Study and use it to answer the questions that follow.



- a) Name the machine shown above.
b) What is the weight of the girl?
c) Where will the level of the liquid be when the girl gets off the machine?
d) State what happens if a teacher whose weight is 75 Newtons stands on the machine above.

VOLUME AND CAPACITY

Volume is the amount of space occupied by an object.

Volume is measured in cubic units e.g.

- cubic centimetres (cc/cm³)
- cubic metres (m³)
- cubic millimetres (mm³)

The S.I unit for volume is **cubic metre**.

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Types of shaped objects.

Regular objects

Regular objects are materials which have well-defined shapes.

Examples of regular objects.

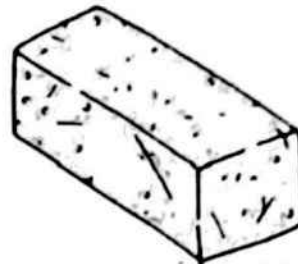
rim, bricks, boxes, tables, blocks, kites, water tanks and tins



rim



table



glass block

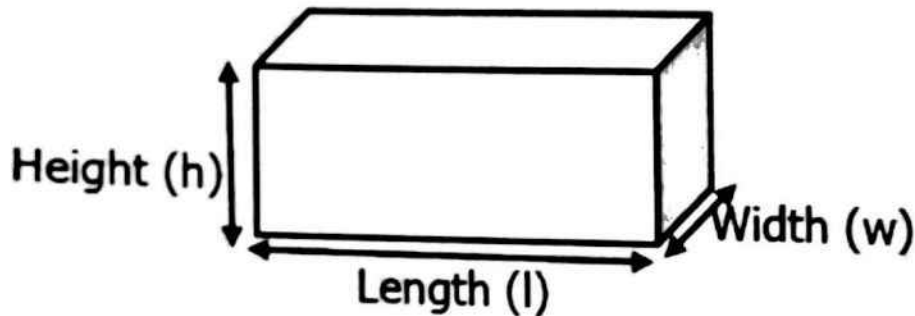


tin

Finding the volume of regular objects

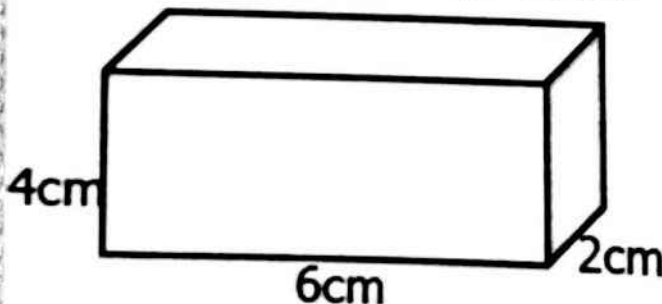
Volume = length x width x height

Volume = $l \times w \times h$



Examples:

1. Find the volume of the figure below.



Volume = length x width x height

Volume = $6\text{cm} \times 2\text{cm} \times 4\text{cm}$

Volume = 48cm^3

2. The volume of the figure below is 120cm^3 , what is its length?



Volume = Length x Width x Height

$120\text{cm}^3 = \text{Length} \times 4\text{cm} \times 6\text{cm}$

$120\text{cm}^3 = \text{Length} \times 24\text{cm}$

$120\text{cm}^3 = \text{Length} \times 24\text{cm}$

$24\text{cm} \quad 24\text{cm}$

$5\text{cm} = \text{Length}$

Irregular objects

Irregular objects are materials which have undefined shapes.

Examples of irregular objects.

Stones, mangoes, keys, needles and tubers



stone



Potato tuber



keys



mango

Finding the volume of irregular objects.

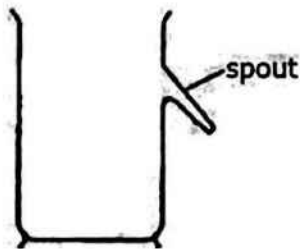
The volume of an irregular object is found by displacement method.

Reason. An irregular object displaces the amount of water equal to its volume.

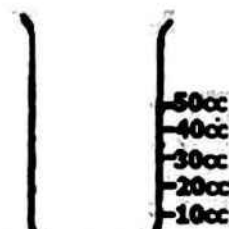
The volume of water in a container rises when a stone is lowered into it.

Reason. The stone displaces water equal to its volume.

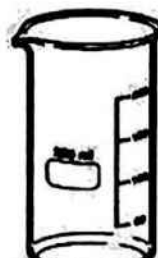
Equipment used when finding the volume of an irregular object.



Overflow can



Measuring cylinder



Beaker



Thread/string

Role/use of each equipment when measuring volume.

String/thread. It is used to hold an irregular object and lower it gently in water.

Measuring cylinder/beaker. It is used to accurately measure the volume of water displaced by an irregular object.

Adaptation. It has graduated markings for accurate measurement of the displaced water.

The beaker has a wide opening and is marked to estimate the volume of displaced water.

Irregular object. It displaces water in the overflow can or measuring cylinder.

Water. It helps to determine the volume of an irregular object.

The overflow can/Eureka can. It holds water used in the experiment.

Adaptation. It has a spout that directs displaced water into the measuring cylinder.

Finding the volume of an irregular object using a measuring cylinder

Materials needed: An irregular object, water, string and measuring cylinder

What to do:

- Pour some water in a measuring cylinder.
- Mark the reading of the original water level.
- Tie the irregular object with a string and lower it carefully in a measuring cylinder and mark the final water level.
- Subtract the original level of water from the final level of water to get the volume of the irregular object. i.e.

Volume = final water level - original water level

For example;

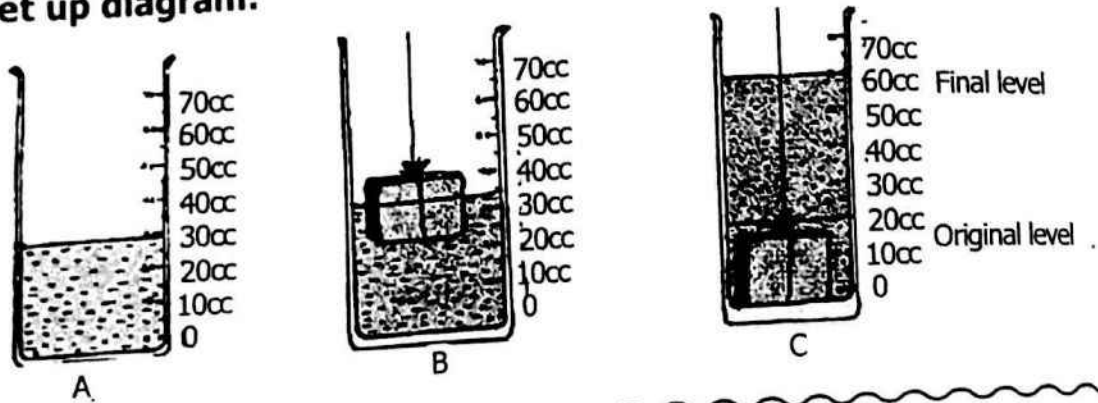
$$\text{Volume} = 60\text{cc} - 20\text{cc}$$

$$\text{Volume} = 40\text{cc}$$

The volume of an irregular object is 40cc.

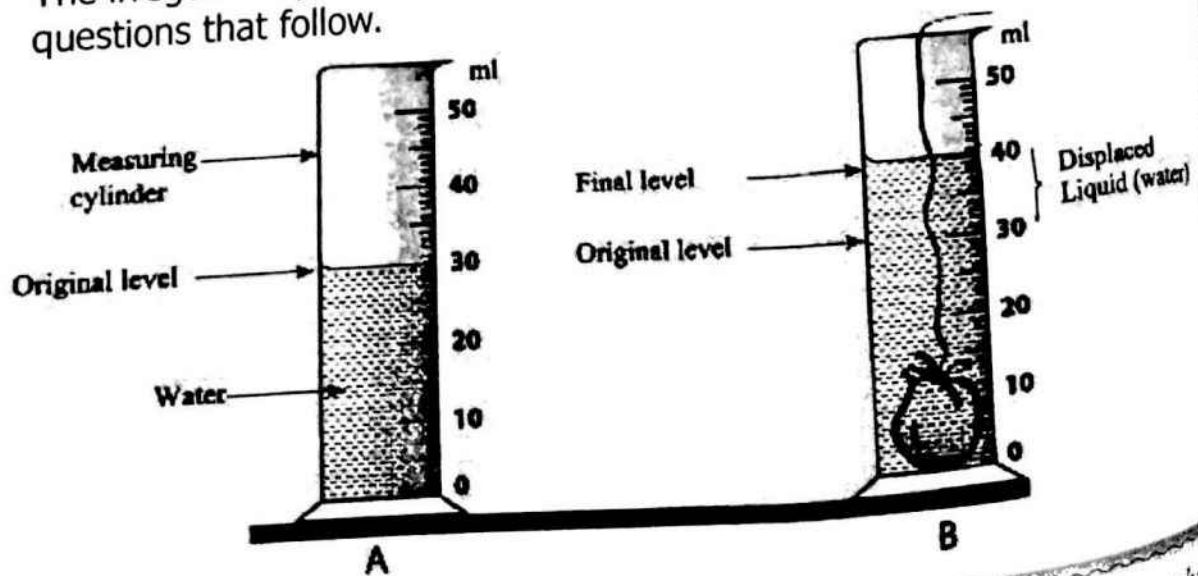
Reason. It displaces the amount of water equal to its volume when lowered in water.

Set up diagram:



Worked Example.

An irregular object was immersed in water as shown in the diagram below. The irregular object displaced some water. Study and use it to answer the questions that follow.



a) Name the method of finding volume shown above.

Displacement method

b) Calculate the volume of the stone. (2marks)

Volume = final level – original level

Volume = 40cc – 30cc

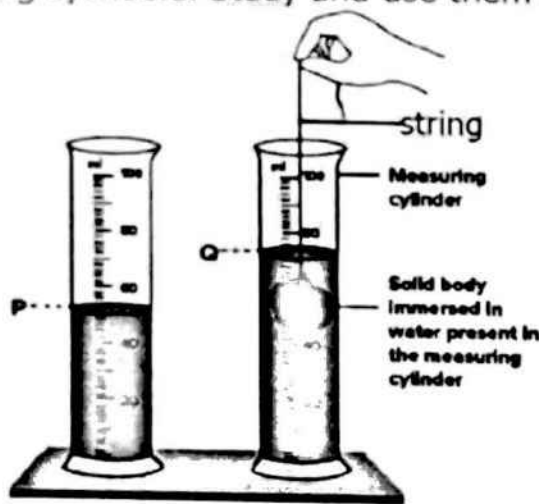
Volume = 10 cc

c) Give a reason for your answer in a) above.

The stone displaces the amount of water equal to its volume.

Evaluation activity 2.3

2. The diagrams below show an irregular object dropped in water in measuring cylinders. Study and use them to answer the questions that follow.

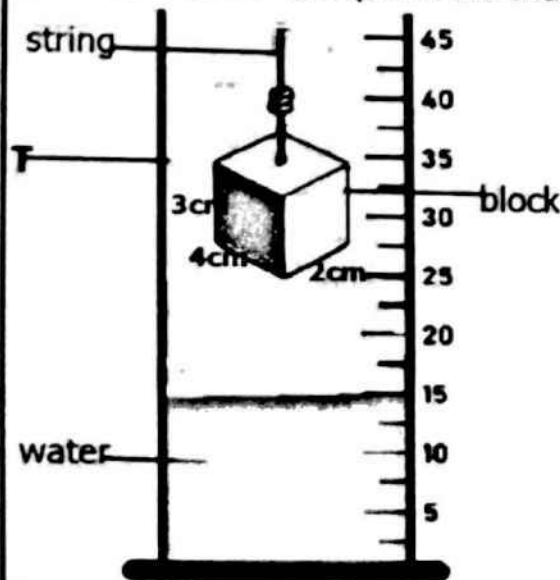


(a) Name the method used to find the volume of the irregular shown above.

(b) State the role of the string in the diagram above.

(c) Express the volume of the irregular objects as shown in the diagram above. (2 marks)

3. The diagram below shows a block swinging in container T. Study and use it to answer the questions that follow.



(a) What type of object is the block in the diagram above?

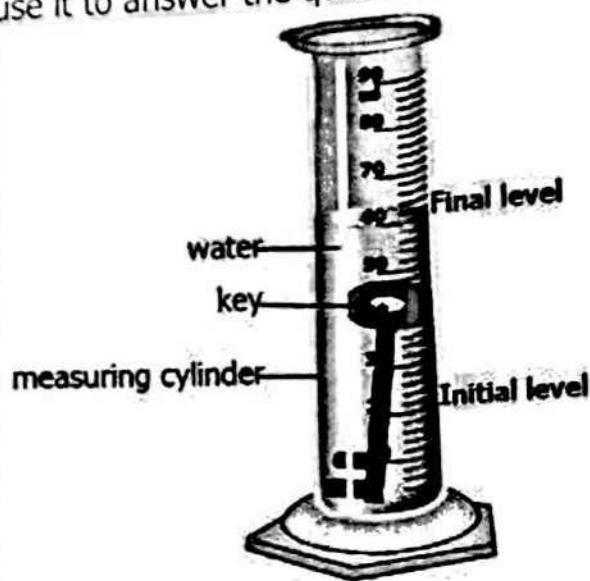
(b) Give the reason for your answer in (a) above.

(c) Name the container marked T.

(d) Calculate the volume of the block in the diagram above.

Evaluation activity 2.3 continued

4. In the diagram below, a key was dipped in water as shown. The volume of water rose in the measuring cylinder as shown. Study and use it to answer the questions that follow



- Give the reason why the volume of water rose in the measuring cylinder as shown in the diagram above.
- State the method used to find the volume of the key shown above.
- Find the volume of the key using the diagram above. (2marks)

Using Both Measuring Cylinder And Overflow Can

Finding the volume of an irregular object using both a measuring cylinder and an overflow can.

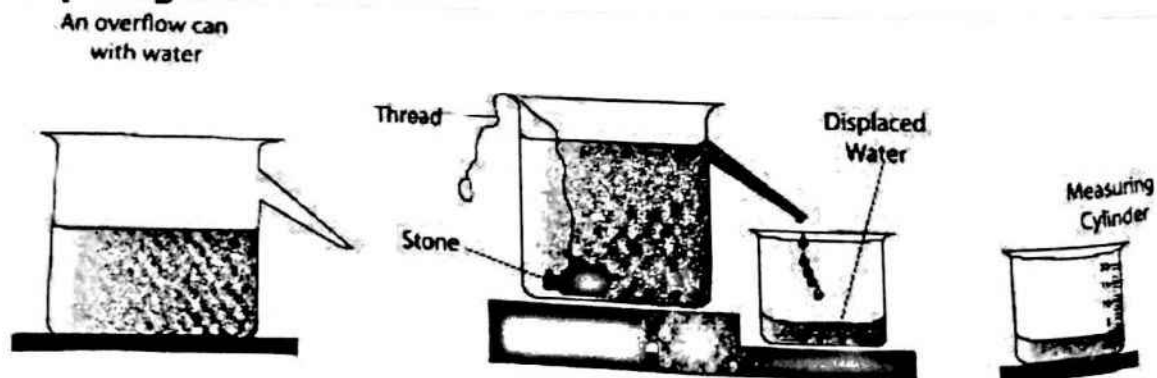
Materials needed: An irregular object, water, thread and measuring cylinder

What to do:

- Pour water into an overflow can up to the level of the spout.
- Place the measuring cylinder at the outlet of an overflow can.
- Lower the irregular object into the water in an overflow can.
- Take the reading of the displaced water in the measuring cylinder.

Note: The amount of displaced water collected in the measuring cylinder is equal to the volume of the irregular object.

Set up diagram:

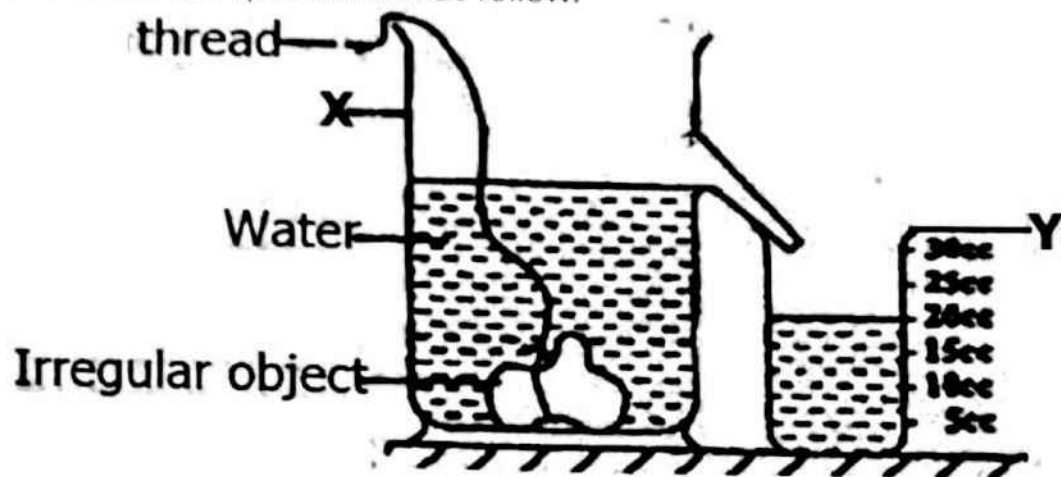


A drawing of an overflow can method

The spout directs water into the measuring cylinder.

Worked Example

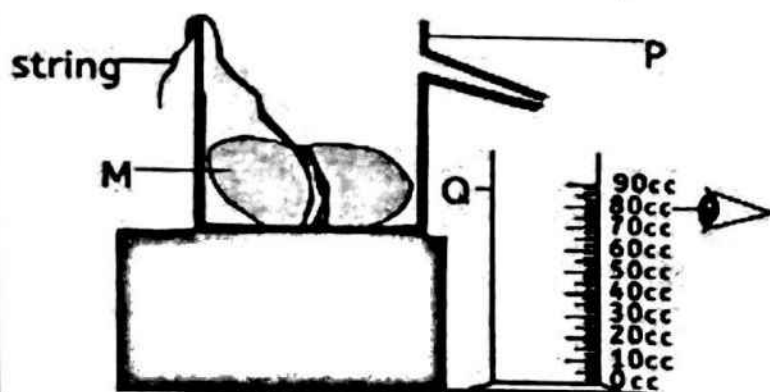
An irregular object was lowered in an overflow can as shown below. Study and use it to answer the questions that follow.



1. Identify the method of finding volume shown above.
displacement method
2. What is the volume of the irregular object?
20 cc
3. Give a reason for your answer.
The stone displaces the amount of water equal to its volume.
4. Name the containers marked X and Y.
X- overflow can Y-measuring cylinder
5. What is water in container Y equal to?
The volume of the irregular object.
6. When is the above method of finding volume used?
Finding the volume of an irregular object.
7. Write cc in full.
cubic centimetres

Evaluation activity 2.4

1. The diagram below shows an object marked M immersed in water. Study and use it to answer the following questions.

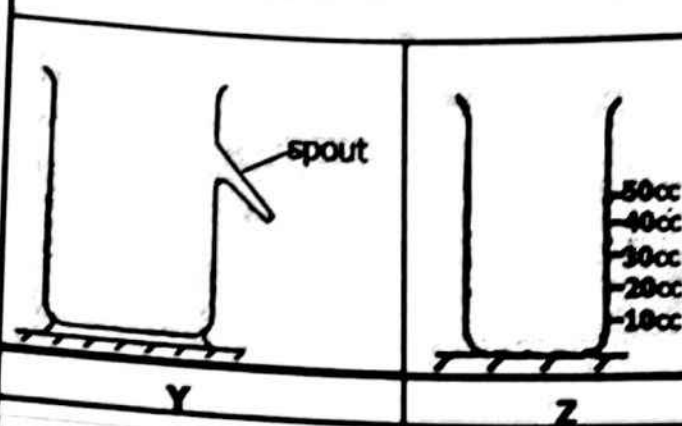


- (a) Name the method of measuring volume of irregular objects shown above.
- (b) Give the name of the containers marked P and Q.
- (c) Find the volume of the object marked M.
- (d) State the importance of a string in the above method.

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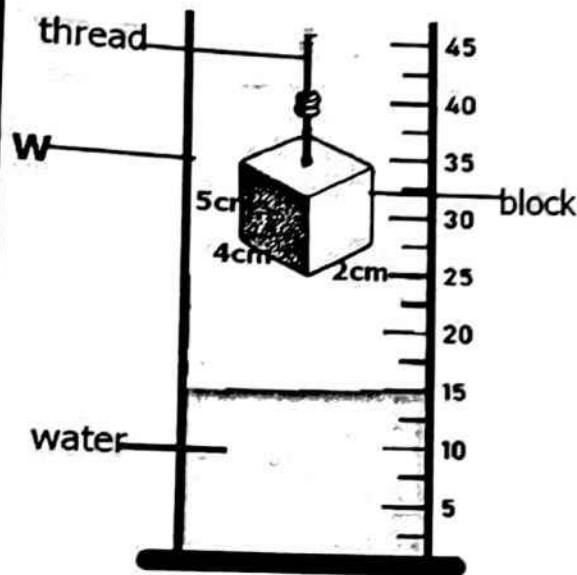
Evaluation activity 2.4 continued

2. The diagrams below show equipment used in measuring the volume of irregular objects.



- Name the containers marked **Y** and **Z**.
- How is the spout useful on the container marked **Y**?
- Mention **one** other instrument that has the same function as the equipment marked **Z** when measuring volume of irregular objects.

3. The diagram below shows a regular block swinging in a container marked **W**. Study and use it to answer the questions that follow.



- Name the container marked **W**.
- State what would happen to the volume of water if the block was immersed in container **W**.
- Calculate the volume of the block swinging in container **W** above when immersed in water.

Capacity

Capacity is the amount of liquid a container can hold.

The basic unit of capacity is **litre**.

1 litre = 1000 cc

Liquids like paraffin, water, petrol, cooking oil are measured in litres.

Factors that determine the capacity of an object.

Factor	Its effect on capacity
Surface area	More surface area provides greater storage or holding space.
Size of an object	Larger objects typically have a higher capacity to hold more liquids than smaller ones.

Factor	Its effect on capacity
Length of an object	Greater length can increase capacity if an object can hold more liquids along its length.
Height of an object	Taller objects can hold more liquids than shorter ones.
Volume of an object	A larger volume of an object holds more liquids than an object with smaller volume.
Nature of the material	Some objects expand or compress which can change the available capacity.
Shape of an object	Cylindrical or rectangular can optimise space and affect capacity.

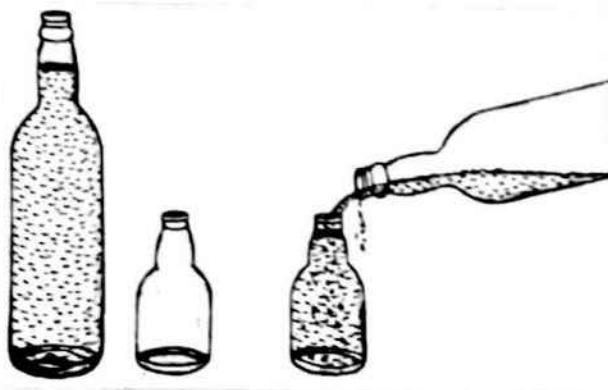
Finding the capacity of different objects

Materials needed: 1 big bottle, 1 small bottle and water

Procedure:

- i) Get a small bottle and a big bottle.
- ii) Fill the big bottle with water.
- iii) Pour the water in the big bottle into the small bottle.
- iv) Some water remains in the big bottle because it has a larger capacity than a small bottle

Set up diagram:

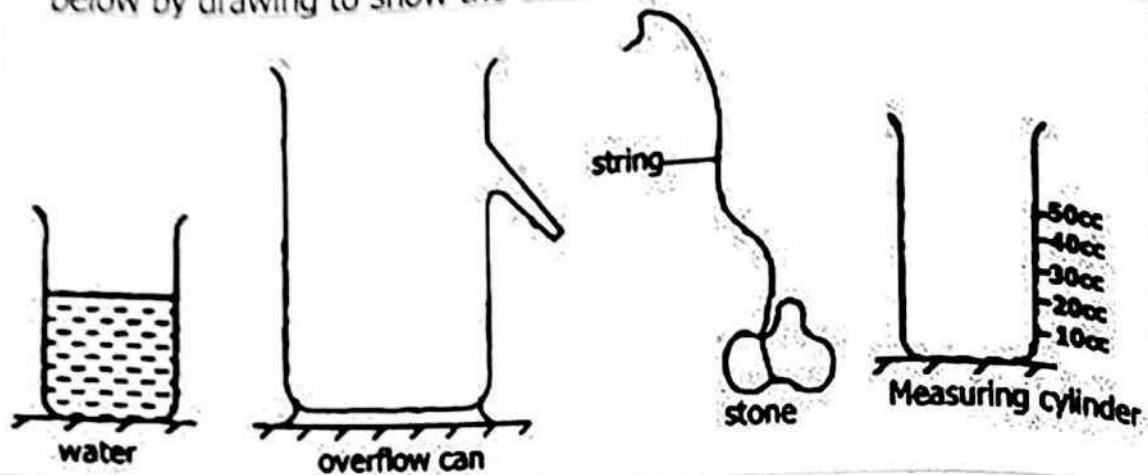


Evaluation activity 2.5

1. Name the method used to find the volume of an Irish potato.
2. State the reason why the volume of water in a container rises when a stone is lowered into it.
3. Why is it not possible to find the volume of a feather using displacement method?
4. Name any **one** equipment that can be used to find the volume of an irregular object.
5. Give a reason why displacement method is used when finding the volume of irregular objects.

Evaluation activity 2.5 continued

7. Given that the volume of the stone is 30cc. Arrange the equipment below by drawing to show the amount of water displaced by the stone.



8. Why is a stone called an irregular object?
9. Photosynthesis wanted to find the volume of an irregular object. He had the following materials for the experiment; an irregular object, thread, overflow can and water.
- Name **one** material Photosynthesis forgot to include on his list of items.
 - What is the use of the thread in the experiment?
 - Describe how Photosynthesis will get the volume of an irregular object in this experiment (2 marks)

BEHAVIOUR OF OBJECTS WITH WATER.

Density determines whether the object will sink or float when put in water or any other liquid.

Objects whose density is less than that of water float on water.

Objects whose density is more than that of water sink in water.

Floating objects.

These are materials which when put in water remain on its top.

Floating is when an object remains on top of the liquid on which it is put.

The ability of an object to remain on top of the liquid on which it is put is called **flotation**.

Conditions under which an object can float.

- When the density is less than that of the liquid.
- When the upthrust acting on it is equal to its weight.

Some objects float on water because;

- They are less dense than water.
- Their density is less than that of water.

Examples of floating objects.

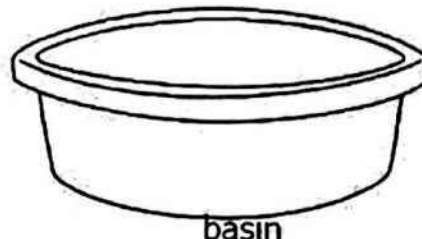
- | | | | | | |
|------------|-----------|---------|------------|------------|------------|
| • leaves | • cork | • balls | • papers | • balloons | • feathers |
| • plastics | • boats | • ships | • paraffin | • petrol | • rubber |
| • dry wood | • sponges | • basin | | | |



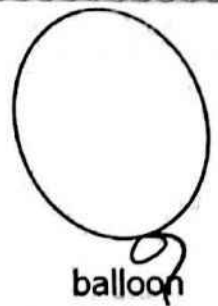
ball



cork



basin



balloon

Note well. A ship or a boat floats on water when sailing in water bodies.

Reason. A ship or boat displaces the amount of water equal to its weight.

A floating object displaces water equal to its weight.

Behaviour of Cooking Oil with Water

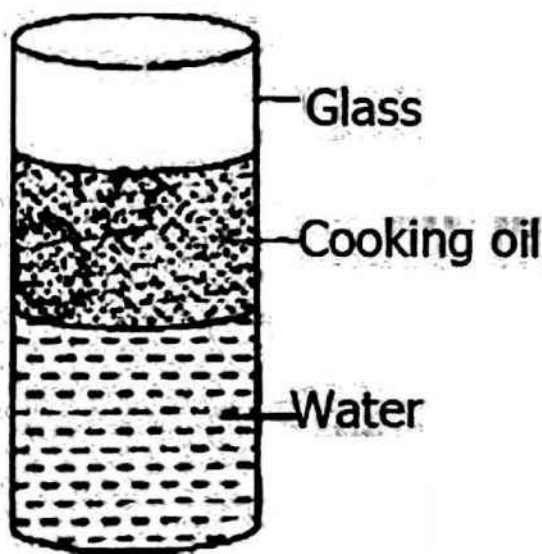
Experiment to show how oil behaves when mixed with water.

Materials needed: • cooking oil • water • container

Procedure:

- (i) Get a container and pour water in it.
- (ii) Then also pour cooking oil in the container having water and observe.
- (iii) Cooking oil floats on water because it is less dense than water.

Set up diagram:



Note the following:

- Water and cooking oil cannot mix together.

Reason. They have different densities.

- They are called immiscible liquids because they cannot mix together completely and form different layers.

- The mixture of water and oil can be separated by;

- Using a separating funnel.
- Decantation.

Sinking objects

These are materials which when put in water, they go to the bottom.

Sinking is when an object thrown in water goes to the bottom of water.

Some objects sink in water because;

- They are denser than water.
- Their density is greater than that of water.

Conditions under which an object can sink in water.

- When it is denser than water.
 - When the upthrust force is less than its weight.
- A sinking object displaces water equal to its volume.

Examples of sinking objects

- stones
- sand
- coins
- keys
- chalk
- glass
- nails
- bricks
- padlocks
- sugar
- blocks
- mercury



coin



padlock



key



nails



stone

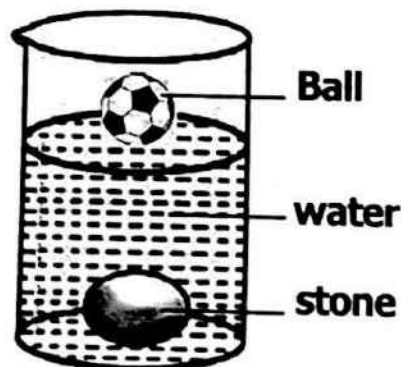
Experiment to find out how different objects behave in water.

Materials needed: 1 big bottle, 1 small bottle and water

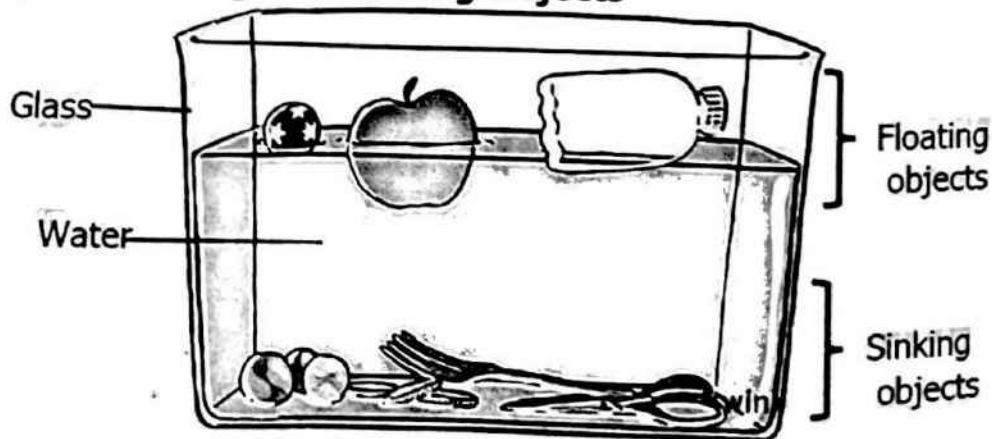
Procedure:

- Fill the plastic glass with water.
- Put the ball and the stone in the plastic glass of water.
- Observe the behaviour of the two objects above in water.
- The ball floats on water while the stone sinks in water.

Set up diagram:

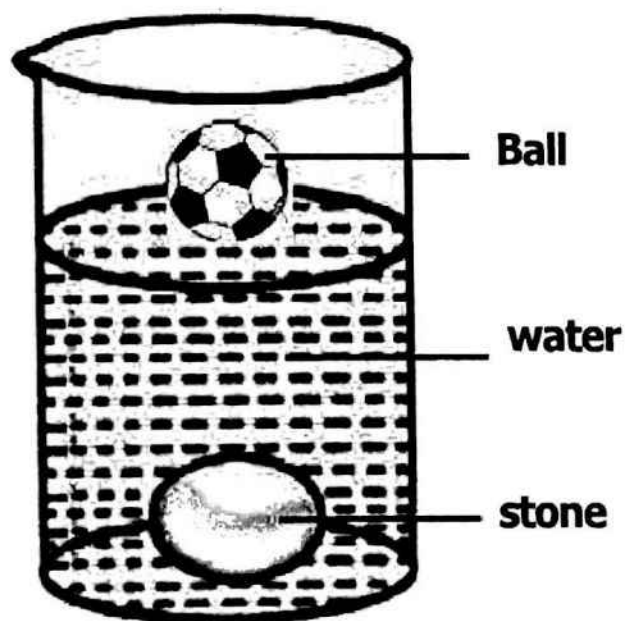


Summary of Floating and Sinking Objects



Evaluation activity 2.6

1. What determines the sinking or floating of an object?
2. Why does paraffin settle on top when mixed with water?
3. How does an object that is less dense than water behave when put in water?
4. Why does a leaf float on water?
5. Apart from the leaf, mention any **two** other objects that float on water.
6. Why does a ship float on water yet it is made up of heavy metals?
7. State any **one** condition under which a body can sink in water.
8. Why does a nail sink in water?
9. Pecking wanted to find how different objects behave when put in water. She had the following materials for the experiment; a feather, fork, sponge, chalk and basin.
 - a) Name **one** material Pecking forgot to include on the list of her materials.
 - b) How did the fork behave in this experiment?
 - c) Which behaviour of objects in water did Pecking want to find out?
 - d) Identify any **one** object from the list above that behaves like a boat when put in water.
10. The diagram below shows two objects immersed in water. Their behaviour was seen as shown below. Study and use it to answer the questions that follow.



- a) What term is used to describe the ball above?
- b) Why does the stone behave as shown above?
- c) What factor determines the behaviour of the ball and the stone as shown above?
- d) Name any one other object that behaves like the stone above when immersed in water.

Finding Density of Different Objects In Relation To Mass And Volume.

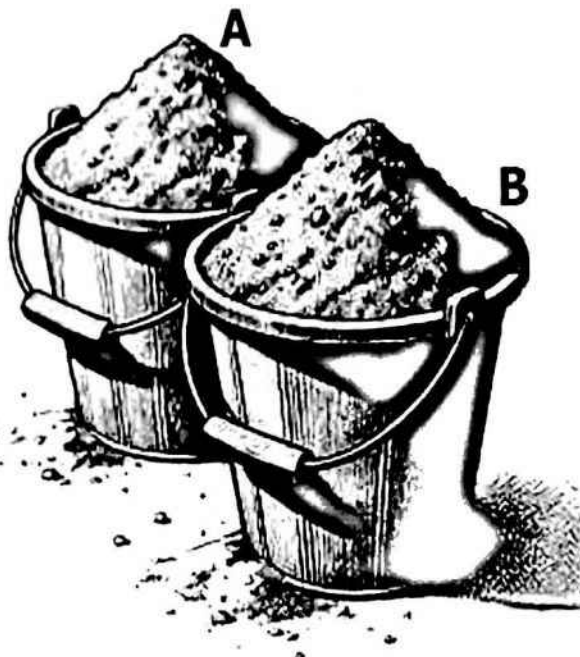
An experiment to determine Density of a substance

Materials needed: bucket and sand

Steps taken:

- (i) Get two buckets of the same size. Label one **A** and the other **B**.
- (ii) Fill both buckets with sand from the same place.
- (iii) Press the sand in bucket A. add more sand and press until the bucket cannot hold anymore sand.
- (iv) Find the mass of each bucket of sand.

Set up diagram:



Observation:

The bucket **A** has more mass than the bucket **B**.

Reason. Bucket **A** has compressed sand.

This shows that mass of a material depends on how tightly the material is packed within a given volume.

The amount of material in a given volume of a substance is called **density**

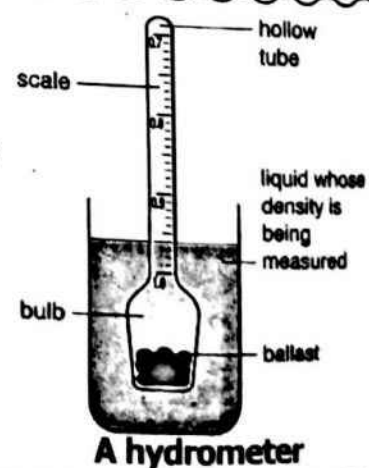
Density is the mass per unit volume of a material.

The density of water is 1.0g/cc and ice is 0.9g/cc .

Therefore, ice floats on water because its density is less than that of water.

The S.I unit for density is kilogrammes per cubic metre (kg/m^3)

The density of liquids is measured using a **hydrometer**.

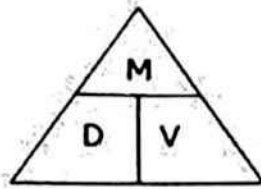


Finding density

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

Density is measured in grams per cubic units
e.g.

- grammes per cubic centimetres (g/cc or g/cm³)
- grammes per cubic millilitres (g/ml)
- grammes per cubic metres (glm³)



Volume

Density

Mass

$$\begin{aligned} \text{Volume} &= \frac{\text{Mass (g)}}{\text{Density (g/cm}^3\text{)}} \\ \text{Density} &= \frac{\text{Mass (g)}}{\text{Volume (cm}^3\text{)}} \\ \text{Mass} &= \text{Density} \times \text{Volume} \end{aligned}$$

How to calculate density of a substance.

Examples:

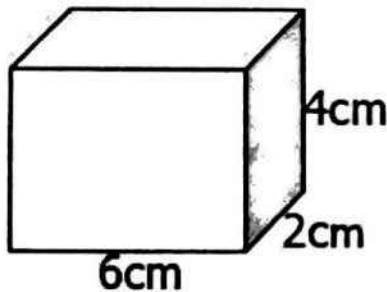
1. Find the density of an object of mass 1500g and volume 30cc

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

$$\text{density} = \frac{1500\text{g}}{30\text{cc}}$$

$$\text{density} = 5\text{g/cc}$$

2. If the mass of the cube below is 480g, find its density.



First find the volume of the cube.

$$\text{volume} = \text{length} \times \text{width} \times \text{height}$$

$$\text{volume} = 6\text{cm} \times 2\text{cm} \times 4\text{cm}$$

$$\text{volume} = 48\text{cm}^3$$

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

$$\text{density} = \frac{480\text{g}}{48\text{cc}}$$

$$\text{density} = 10\text{g/cc}$$

3. What is the density of an object whose mass is 14g and volume 7cc?

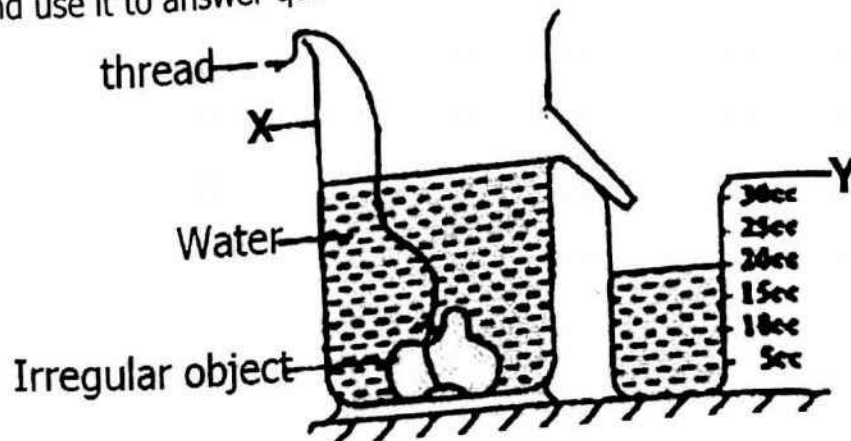
$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

$$\text{density} = \frac{14\text{g}}{7\text{cc}}$$

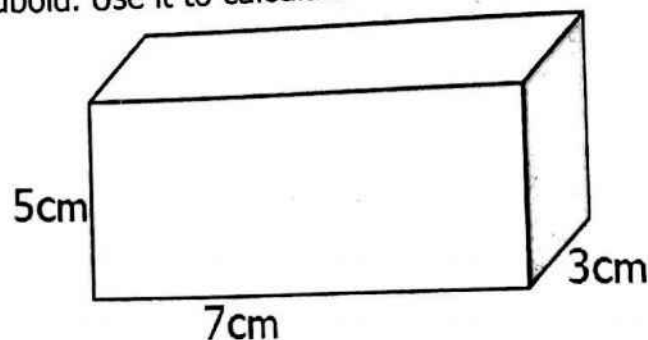
$$\text{density} = 2\text{g/cc}$$

Evaluation activity 2.7

1. Calculate the density of a substance of mass 12g and volume 4cc.
 2. A substance has volume 7cc and mass 63g. what is its density?
 3. An irregular object has mass of 60g and volume 30cc. work out its density.
 4. A block of mass 30 g was completely immersed in water and it displaced 5ml of water. Calculate its density.
- An irregular object was lowered into an overflow can as shown below.
Study and use it to answer questions 5 and 6.



5. What is the volume of the irregular object?
6. Calculate the density of the irregular object if mass is 60g.
7. Below is a cuboid. Use it to calculate its density given its mass is 600g.



Finding Mass of a Substance.

mass = density x volume

Examples:

1. A substance has density of 4g/cc with volume 15cc. Find its mass.

Mass = density x volume

$$= 4\text{g/cc} \times 15\text{cc}$$

$$= (4 \times 15) \text{ g}$$

$$\text{Mass} = 60\text{g}$$

2. What is the mass of an object whose volume is 5cc and density 10g/cc?

Mass = density x volume

$$= 10\text{g/cc} \times 5\text{cc}$$

$$= (10 \times 5) \text{ g}$$

$$\text{Mass} = 150\text{g}$$

Evaluation activity 2.8

1. Calculate the mass of an object whose density is 6g/cc and volume 16cc.
2. An object has volume 30cc and its density is 3g/cc. what is its mass?
3. Calculate the mass of an object whose density is 5g/cc with volume 8cc.
4. Find the mass of a stone whose density is 20g/cc and volume of 5cc.
5. Work out the mass of an object whose volume is 3cc and density of 10g/cc.

Finding The Volume of a Substance.

$$\text{volume} = \frac{\text{mass}}{\text{density}}$$

Example:

Calculate the volume of an object whose mass is 60g with density 5g/cc.

$$\text{volume} = \frac{\text{mass}}{\text{density}} \quad \text{volume} = \frac{60\text{g}}{5\text{g/cc}} \quad \text{volume} = 12\text{cc}$$

 **Note well.** Do not write those formulae in abbreviations i.e., $M = D \times V$, $D = M/V$, $V = M/D$

Round Up Activity

1. Find the volume of an object whose density is 2g/cc and mass 10g.
2. Complete the table below about measures and their basic units.

Measure	Units
density	-----
-----	grams
weight	-----
-----	Cubic units

3. A stone weighing 21g with mass per unit volume of 7g/cc is immersed in water. How much water will it displace?
4. A block of mass 2g and density 6g/ml was completely immersed in water. How much water did it displace?
5. The diagrams below show objects grouped in measurement. Study and use them to answer the questions that follow.



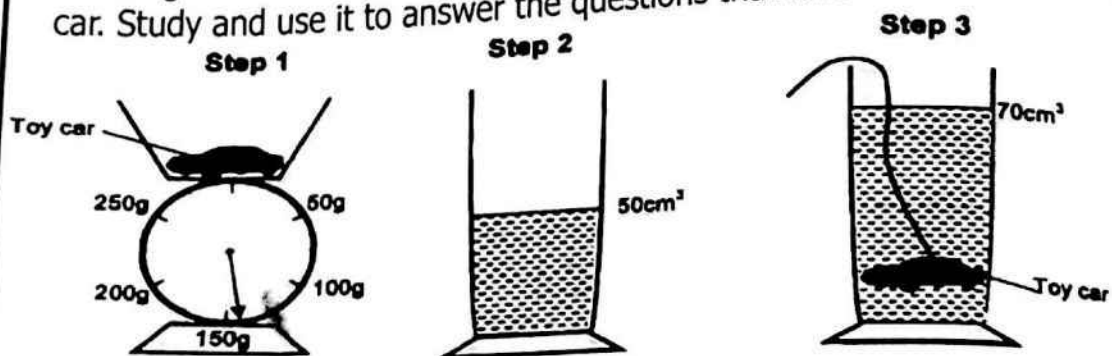
- (a) Identify the type of object marked **F** and **G**.
- (b) Give the reason why the object marked **F** floats on water when in use.
- (c) State the difference in density between objects marked **F** and **G**.

Round Up Activity

6. The diagrams below show two objects X and Y with water. A primary five pupil wanted to show how they behave when dropped in water. Use them to answer the questions that follow.



- State the difference between object X and object Y in terms of their density.
 - Show the behaviour of objects marked X and Y by drawing in container of water in the space provided below. (3 marks)
7. The diagram below shows steps used to determine the density of a toy car. Study and use it to answer the questions that follow.



- Calculate the volume of the toy car
- State the factor that makes the toy car to sink in water as shown in step 3.
- Work out the density of the toy car. (2marks)

MEANING OF KEY TERMS IN MEASUREMENT

Weight: The gravitational force exerted on an object.

Volume: The amount of space an object can occupy.

Density: The mass per unit volume of a material.

Upthrust: The upward force on an object which is immersed in a fluid.

Floatation: The ability of an object to remain on top of a liquid.

Gravity: The force of attraction that objects have on one another because of their masses.

Capacity: The maximum amount a container can hold.

Displacement: A method of measuring the volume of an irregular object.

Hydrometer: An instrument for measuring density of a liquid.

Mass: The amount of matter in an object.

Matter: Anything that has mass and volume.

THEME: HUMAN HEALTH

TOPIC : 3 IMMUNISATION

Immunisation is the introduction of vaccines into the body to make its immunity strong.

Vaccines are preventive drugs introduced into the body to boost immunity. Immunisation can be done in hospitals, clinics and health centres.

Reasons why the government encourages immunisation of children.

- To boost the immunity of the child.
- To reduce infant mortality rate.
- To prevent lameness due to polio in children.

Immunisation in Uganda is free of charge.

Reason. To enable the poor parents access immunisation services.

IMMUNITY

- Immunity is the ability of the body to resist diseases.
- Immunity depends on the presence of antibodies in blood.

Antibodies are substances produced by the white blood cells to defend the body against disease germs.

- They are biological in nature because they are produced by organisms.
- Antibodies are also protein in nature because they are produced by white blood cells.
- Antibodies boost the immunity of the body.

Ways of improving antibodies in the human body.

- Feeding on a balanced diet.
- Breastfeeding children.
- Through immunization.
- Doing regular physical exercises.

Types of immunity

Natural immunity

This is where the body acquires antibodies using natural means. It is acquired without using vaccines.

Ways of acquiring natural immunity.

- ✓ Through taking breastmilk.
- ✓ Recovering from an illness.
- ✓ From a pregnant woman to her unborn baby through the placenta.

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Artificial immunity

This is where the body acquires antibodies when vaccines are introduced into it. Artificial immunity is acquired through immunisation.

Importance of immunity.

- ❖ It enables the body to resist against diseases.
- ❖ It keeps the body healthy and productive.
- ❖ It reduces death rate in the community.

Ways in which immunity can be boosted/improved.

- ✓ Feeding on a balanced diet.
- ✓ Taking breastmilk.
- ✓ Through immunisation.
- ✓ Staying hydrated
- ✓ Limiting added sugar in tea or juice.
- ✓ Engaging in moderate exercises.

Evaluation activity 3.1

1. What is meant by the term immunity?
2. What type of immunity is acquired through taking breastmilk?
3. State any **two** ways of boosting the immunity of a baby.
4. Mention **two** types of immunity.
5. Name the type of immunity acquired through:
i) Recovery from an illness ii) immunisation
6. State any **one** way in which immunity is important to the human health.
7. State any **one** way of acquiring natural immunity.
8. 9. In which way is breast milk important to the health of the baby?
10. How is the presence of antibodies important in the health of an individual?

IMMUNISABLE CHILDHOOD DISEASES

These are diseases that attack mostly children below the age of six years. They attack children below six years because their immunity is still weak.

Examples of immunisable childhood diseases.

Viral immunisable childhood diseases

Polio

- It is caused by virus.
- It affects the bones and causes lameness to a child.
- It is a waterborne disease but can also be spread by cockroaches.
- It can spread due to poor sanitation.

How polio can spread.

- Through drinking contaminated water.
- Through eating contaminated food.
- Through poor disposal of human wastes.

Signs and symptoms of polio.

- Paralysis of the limbs.
- Weak bones and muscles.
- Fever
- Lameness



Measles

- It is caused by virus.
- It affects the skin.
- It an example of airborne disease.

How measles spreads.

- Through air.
- Through body contact.

Signs and symptoms of measles.

- Skin rash
- Sore mouth
- Red eyes
- Runny nose.
- High fever
- Itchy skin.

Hepatitis B

- It is caused by virus.
- It affects the liver.

How hepatitis B spreads.

- Through eating contaminated food.
- Through blood contaminated syringes.
- Through blood during sexual intercourse.
- Through the placenta of an infected mother to unborn baby.
- Through exchange of saliva with an infected person.

Signs and symptoms of hepatitis B.

- Dark urine.
- Yellow eyes.
- Greyish stool
- Joint pain.

Effects of hepatitis B

- It causes scars on the liver.
- It can lead to kidney diseases.
- It causes inflammation of blood vessels.



Evaluation activity 3.2

1. Name the viral waterborne immunisable childhood disease.
2. Write down any **two** signs of polio.
3. The diagram below shows a person suffering from an immunisable disease. Use it to answer questions 4 and 5.



4. Name the immunisable disease the above child is suffering from.
5. How does the immunisable disease above affect the child above?
6. Which immunisable disease attacks the liver?
7. Write down any **two** viral immunisable childhood diseases.
8. Which body organ is attacked by measles?
9. State any **two** signs of measles in children.
10. Name any **one** airborne immunisable childhood disease.
11. Name the immunisable viral disease which is spread due to poor sanitation.

Bacterial immunisable childhood diseases.

Tuberculosis

- It is caused by bacteria.
- It affects the lungs.
- It is sometimes mistaken to be AIDS because of having similar signs and symptoms.
- Tuberculosis is an example of airborne disease.

How tuberculosis is spread.

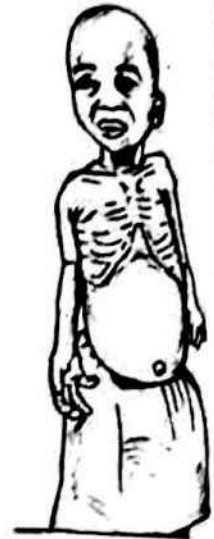
- Through inhaling contaminated air.
- Through droplet infection.
- Through drinking unboiled milk from an infected cow.

Signs and symptoms of tuberculosis.

- Production of blood-stained sputum.
- Chronic cough.
- Sweating at night.
- Mild fever.
- Pain in the chest.
- Weight loss.

Effects of tuberculosis

- It damages the lungs and bones .
- It leads to death of the patient.
- It causes pain at the spine.
- It causes joint drainage.
- It damages body organs like lungs, liver, kidney and the heart.



Tetanus

- It is caused by bacteria.
- it affects the muscles
- Tetanus in newly born babies is called lockjaw.
- Tetanus is spread through open cuts and wounds.

In newly born babies, tetanus can catch babies at birth when the umbilical cord is cut with a contaminated object e.g. razorblade, pair of scissors or surgical knife.

Signs and symptoms of tetanus.

- Stiff muscles
- Spasm when touched.
- Convulsions
- Headache
- Fever
- Baby stops suckling



Diphtheria

- ✓ It is caused by bacteria.
- ✓ It affects the throat.
- ✓ It is spread through air by droplet infection.

Signs and symptoms.

- Swollen neck
- Sore throat.
- Fever
- Headache
- Difficulty in breathing

Effects of diphtheria

- It causes breathing problems.
- It causes damage of the heart.



Diphtheria

Whooping cough

- It is also called pertussis.
- It is caused by bacteria.
- It affects the lungs.
- It is spread through air by droplet infection.

Signs and symptoms of whooping cough.

Runny nose, Severe coughing, Wheezing sound while coughing and Difficulty in breathing

Effects of whooping cough.

- It causes cracked ribs.
- It causes abdominal hernia.
- It causes broken blood vessels in the skin.

Haemophilus influenza type B.

It is caused by bacteria.

It affects the lungs.

It is spread through air.

Signs and symptoms

Congested nose, Cough, Fever, Stiff neck, Muscle pain.

Ways in which immunisable childhood diseases can be controlled/prevented.

- Taking children for immunisation.
- Giving children boiled water for drinking.
- Sterilising sharp medical objects to prevent tetanus.
- Isolating infected children.



Evaluation activity 3.3

1. Name the immunisable childhood disease that can be mistaken to be AIDS.
2. Which germ causes haemophilus influenza type B in children?
3. State any **one** way in which the spread of tuberculosis can be controlled.
4. Give any **two** examples of bacterial immunisable childhood diseases.
5. Write down any **two** signs of tuberculosis.
6. Mention any **two** immunisable diseases that attack the lungs.
7. How does tetanus spread?
8. Which body organ is attacked by whooping cough?
9. Which communicable disease shows signs and symptoms similar to that of tuberculosis?
10. Name the cattle product through which tuberculosis can spread to human beings.
11. Identify the immunisable childhood disease characterised by;
 - i) Swollen neck
 - ii) Stiff muscles
 - iii) Chronic cough
 - iv) Stiff neck

VACCINES

Vaccines are medical drugs introduced into the body to boost immunity. Vaccines stimulate the production of antibodies in the body against disease germs.

Examples of vaccines.

- BCG vaccine
- Polio vaccine
- Measles vaccine
- DPT vaccine
- PCV
- Hep B vaccine
- Hib vaccine

Methods of administering vaccines in the body.

- injection method
- oral method

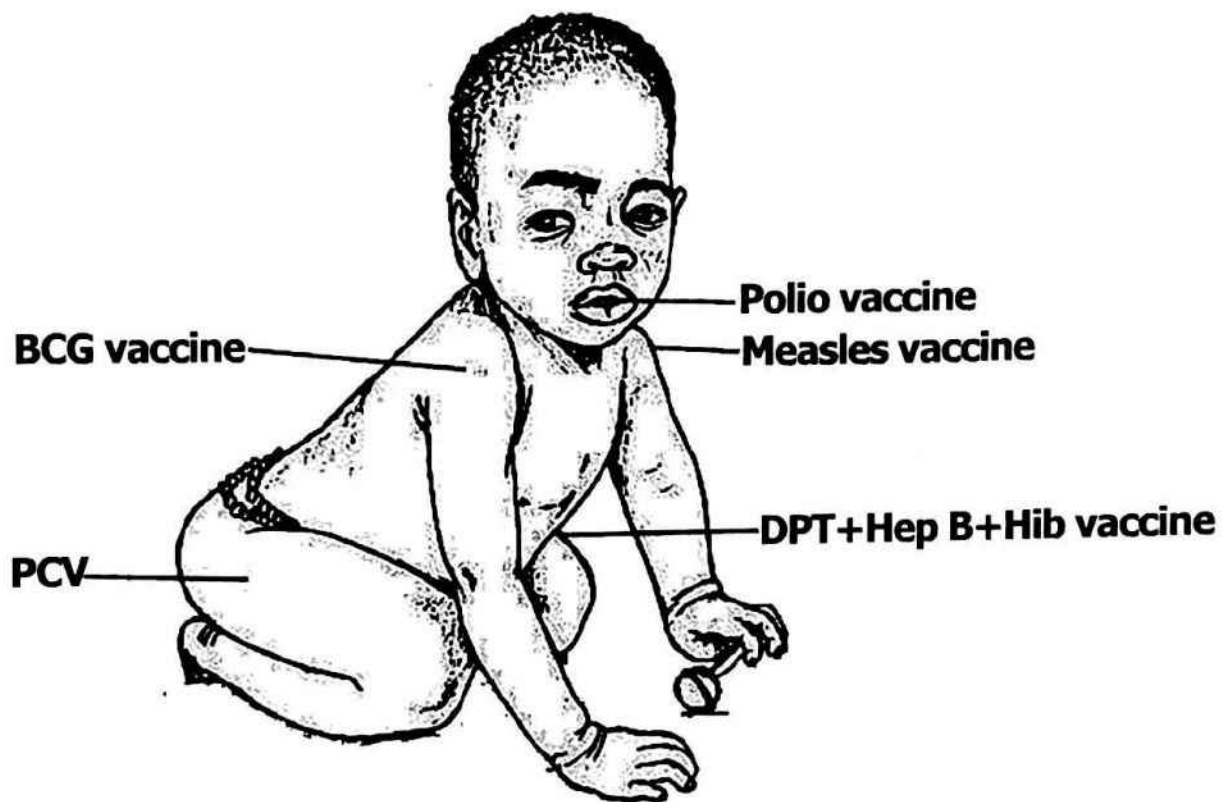


Administration of vaccines in the human body

Vaccine	Age	Disease(s)	Admin. Method	Body Site
BCG Vaccine	at birth (1 dose)	tuberculosis	injection	right upper arm
polio vaccine	at birth, 6 weeks, 10 weeks, and 14 weeks (4 doses)	polio	oral method (drops in the mouth)	mouth
DPT Vaccine	6,10 and 14 weeks. (3 doses)	diphtheria/ tetanus/ whooping cough	injection	left upper thigh
Hep B vaccine	6,10 and 14 weeks. (3 doses)	hepatitis B	injection	left upper thigh
Hib vaccine	6,10 and 14 weeks. (3 doses)	Haemophilus influenza B	injection	left upper thigh
PCV	6,10 and 14 weeks. (3 doses)	pneumonia	injection	right upper thigh

Vaccine	Age	Disease(s)	Admin. Method	Body Site
measles vaccine	9 months/ 36 weeks (1 dose)	measles	injection	left upper arm

A baby showing the administration of vaccines in the body.



Important points to note:

❖ *Vaccines are administered on different body parts/sites.*

Reasons.

- ✓ To prevent side effects to the person.
- ✓ To prevent multiple injections at one site.
- ✓ To easily identify the given vaccines.
- ✓ To prevent mixing of vaccines.
- ✓ To allow effective absorption of vaccines into the body.

❖ *Vaccines are given to babies at different ages.*

Reason. To make vaccines more effective in the body.

❖ *DPT vaccine is called a triple vaccine.*

Reason. It is given to prevent three immunisable childhood diseases.

❖ *Measles vaccine is given at the age of nine months.*

Reason. The baby is born with strong natural immunity against measles that weakens at around nine months.

❖ *Polio and BCG vaccines are given to babies at birth.*

Reason. Babies are born with low natural immunity against polio and tuberculosis.

❖ *Babies are given polio vaccine more than once.*

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Reason. To boost their body immunity against polio./To ensure full protection against polio.

- ❖ BCG vaccine is given once in the baby's lifetime.

Reason. BCG vaccine provides long-lasting immunity to the baby.

- ❖ Polio vaccine is given to babies orally to produce antibodies in the gut.
- ❖ Polio vaccine, rotavirus vaccine and cholera vaccine are vaccines given orally to people.
- ❖ Adolescent girls are given T.T Vaccine to protect them against tetanus during menses.
- ❖ Pregnant women are also given T.T vaccine to protect the unborn baby from contracting tetanus during childbirth.
- ❖ One can identify a child who was immunised against tuberculosis by checking for the immunisation scar on the right upper arm.
- ❖ DPT-Hep B-Hib vaccine is called a penta-valent vaccine.
- Reason. It is given to protect the baby against five immunisable childhood diseases.
- ❖ A health worker weighs the baby before giving any vaccine.
- Reason. To ensure that the baby is healthy enough for immunization..

Storage of vaccines

Vaccines should be kept under cool conditions.

Reasons.

- To prevent vaccines from getting spoilt.
- To maintain the medical value of the vaccines.
- To maintain their effectiveness.

Vaccines should be kept in a clean place

Reason. To protect the vaccines from contamination.

Materials used to keep vaccines include; vaccine carrier, ice cubes, refrigerators and thermos flasks.

Vaccines are handled in a cold chain.

Reasons.

- To maintain their strength.
- To prevent them from getting spoilt.
- Cold chain is the cold environment that is maintained for the vaccines.



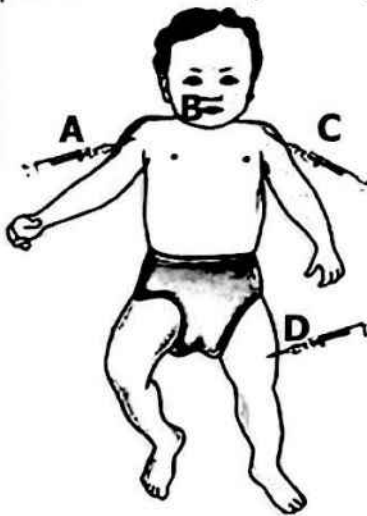
Vaccine carrier/cold chain box

Evaluation activity 3.4

1. Name any **one** vaccine given to babies once in their lifetime.
2. Give any **one** reason why vaccines are given to babies at different body sites.
3. How can the school health committee identify whether the child was immunized against tuberculosis or not without referring to the child health card?
4. Why is measles vaccine given to babies at the age of nine months?
5. State **one** condition suitable for the storage of vaccines.

Evaluation activity 3.4 continued

6. The diagram below shows how vaccines are administered on the different parts of the baby's body. Study and use it to answer the questions that follow.



- Name the vaccines administered at **A** and **C**.
 - Mention any **one** disease that is immunised against using the vaccine administered at the site marked **D**.
 - How is the vaccine administered at site **B** different from the one administered at site **C**?
- Name **two** groups of people who are given Tetanus Toxoid vaccine.
 - Why is DPT vaccine called a triple vaccine?
 - Why are babies given BCG vaccine at birth?
 - State the meaning of the term vaccine.
 - Mention the way in which polio vaccine is administered.

(c) State the reason why vaccines should be stored in a cool place.

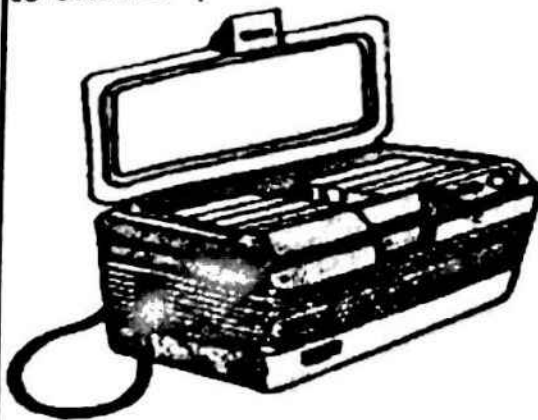
11. Why is polio vaccine given to children more than once?

12. How is BCG vaccine different from polio vaccine in the way they are given to children?

13. The table below shows immunisable diseases, vaccines and body sites. Study and complete it correctly

Immunisable disease	Vaccine given	Body site
tuberculosis	BCG vaccine	.....
.....	DPT vaccine	Left upper thigh
Polio	.....	mouth
Measles	Measles vaccine	.....

The diagram below shows a medical device used by health workers. Use it to answer questions **14** and **15**.



- Name the medical device shown in the diagram above.
- Give the importance of the medical device above to the health worker.

OTHER IMMUNISABLE DISEASES

Disease, cause and Organ affected	How it spreads	Signs/ Symptoms	Prevention/ Control
Cholera (bacteria) Organ. intestines	• Drinking contaminated water. • Eating contaminated food. • Eating food with dirty hands.	• Excessive diarrhoea. • Excessive vomiting • General body weakness • Abdominal pain • Dehydration.	• Immunisation • Proper disposal of human wastes • Proper covering of food. • Spraying insecticides to kill adult house flies. • Drinking contaminated water.
Meningitis (bacteria/virus) Organ. Brain	❖ By houseflies carrying germs from faeces to food. ❖ Through contaminated food.	❖ Stiff neck ❖ Vomiting ❖ Severe headache ❖ Pain in the neck ❖ Loss of consciousness ❖ Pale blotchy skin ❖ Severe muscle pain	❖ Washing hands before eating food. ❖ Treating using antibiotics. ❖ Immunisation ❖ Avoid direct strong sunshine.
Yellow fever (virus) Organ. Liver	▪ Through bites of aedes mosquito	▪ Yellow eyes and fingernails. ▪ Dark urine ▪ Whitish stool ▪ Fever ▪ Loss of appetite ▪ Abdominal pain. ▪ Yellowing of the skin. ▪ Yellow urine ▪ Swelling of the body ▪ Jaundice	▪ Sleep under a treated mosquito net. ▪ Avoid alcoholic drinks. ▪ Immunisation ▪ Drain stagnant water ▪ Immunizing using yellow fever vaccine.

Disease, cause and Organ affected	How it spreads	Signs/ Symptoms	Prevention/ Control
Rabies (virus) Organ. Brain	✓ Bites of a rabid dog, fox, cat, jackal or bats.	✓ Irregular breathing ✓ Thick and sticky saliva. ✓ Uncontrolled barking like a dog. ✓ Fits and paralysis. ✓ Pain in the area of the bite. ✓ Difficulty in swallowing. ✓ Paralysis ✓ Flu-like illness	✓ Kill and bury animals suspected of rabies. ✓ Vaccinating dogs and cats.
Pneumonia (bacteria/virus) Organ. lungs	• Breathing infected droplets of saliva or mucus.	• Difficulty in breathing • Tiredness • Productive cough • Fever	Immunisation
Typhoid Organ. Intestine	➤ Drinking contaminated water. ➤ Eating contaminated water	➤ High fever ➤ Loss of appetite ➤ Stomach pain ➤ Headache ➤ diarrhoea	➤ Drink boiled water ➤ Wash hands before touching food. ➤ Wash raw foods before eating them.
COVID 19 (corona virus) Organ. Lungs	❖ Through droplet infection ❖ Through body contact	❖ Fever ❖ Cough ❖ Shortness of breath ❖ Fatigue ❖ Headache ❖ Runny nose ❖ Vomiting ❖ Loss of taste ❖ Blurred vision	❖ Wearing face mask. ❖ Washing hands with soap regularly. ❖ Social distancing. ❖ Sanitising hands. ❖ Avoid handshake.

Disease, cause and Organ affected	How it spreads	Signs/ Symptoms	Prevention/ Control
Diarrhoea Organ. Intestines	❖ Through drinking contaminated water. ❖ Through eating contaminated food.	❖ Passing out watery stool. ❖ Lack of energy. ❖ Passing out less urine than the normal. ❖ Dehydration ❖ Dizziness	❖ Give plenty of fluids. ❖ Drink boiled water. ❖ Immunize using rotavirus vaccine.

 **Points to note:** ❖ Rubella, influenza, diarrhoea and cervical cancer are other immunisable diseases.

❖ Yellow fever is immunized at the age of 9 months on the left upper arm.

❖ The vaccine for cervical cancer is HPV vaccine.

THE CHILD HEALTH CARD

A child health card is a medical document showing the baby's health status.

Pieces of information found on a child health card.

Kind of information	Importance of the information
Growth trend of the baby	To monitor the child's physical development over time.
Child's birth weight.	To assess the baby's health status at birth.
The vaccines given	To track which immunisations the child has received.
The next date of immunisation	To remind the parent of the next immunization appointment.
Immunization schedule	To ensure timely administration of all required vaccines.
Child's date of birth	To give the right vaccines at the right age.
Child feeding	To monitor the nutrition status of the baby.
Education and counselling information	To teach the mother about proper child care and family planning.

REPUBLIC OF UGANDA
MINISTRY OF HEALTH

CHILD HEALTH CARD

Parent's Name: _____ Child's No.: _____

Child's Name: _____

Sex: _____ Date of Birth: _____ Birth Order: _____

Mother's Name: _____ Mother's Occupation: _____

Father's Name: _____ Father's Occupation: _____

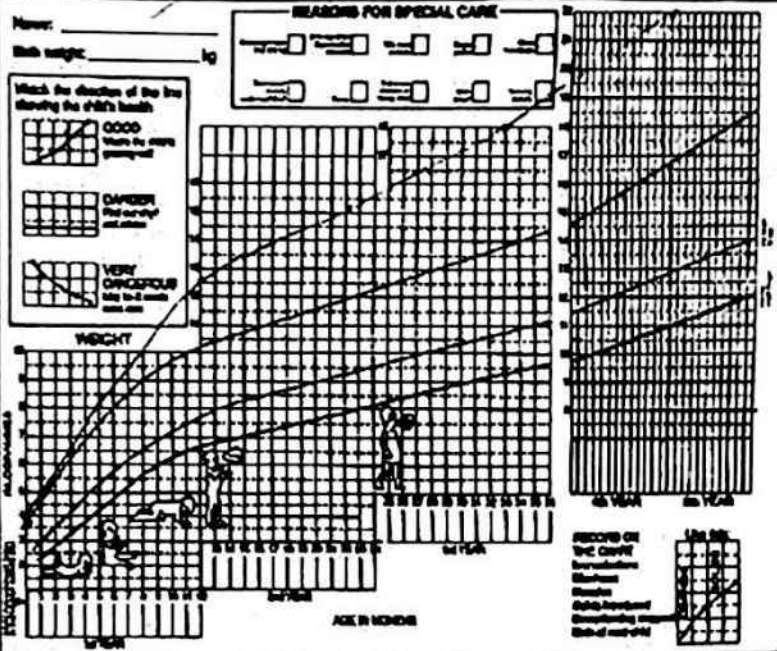
Where the Family Lives: _____

IMMUNISATIONS AND VITAMIN A

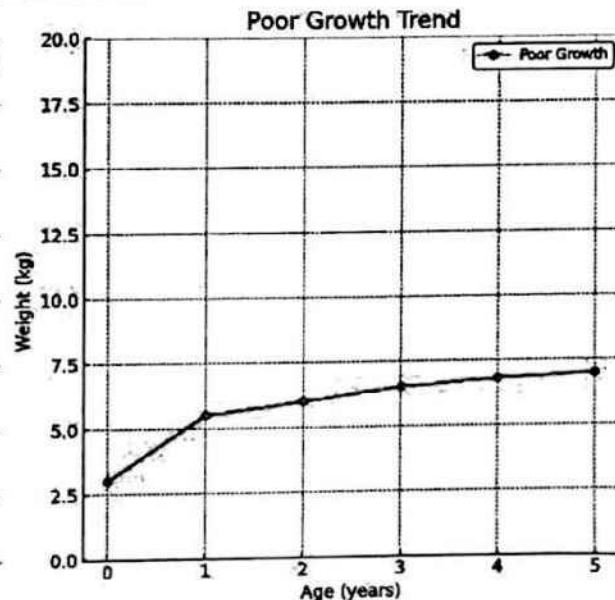
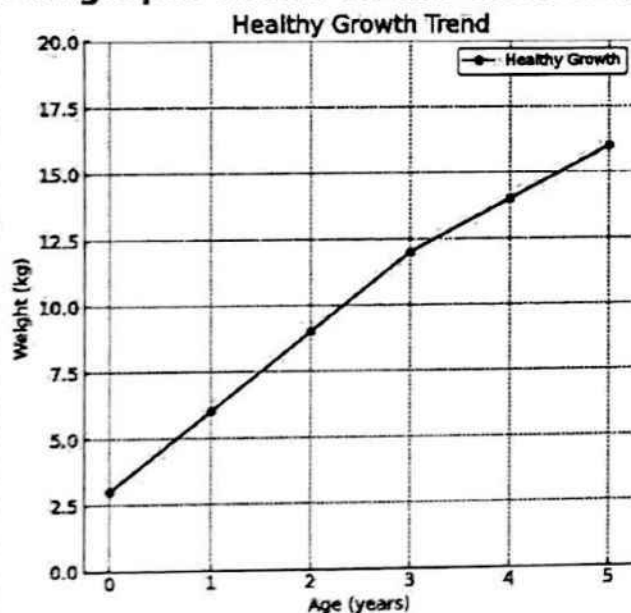
Write in date of immunisation

	0	1	2	3
BCE				
POLIO				
DPT				
MEASLES				
VITAMIN A				

TO PROTECT YOUR CHILD HAVE ALL IMMUNISATIONS DONE BEFORE THE FIRST BIRTHDAY



The graphs found on the Child Health Card



Explanation

Healthy Growth Trend: The straight curve shows a steady increase in weight as the child grows, indicating normal development.

Poor Growth Trend: The flat curve shows a slower or stagnant increase, indicating issues like malnutrition or frequent illnesses.

Growth Trend Explanation.

- The growth curve should rise steadily, showing regular weight gain.
- A flat or falling curve indicates poor growth or loss of weight.



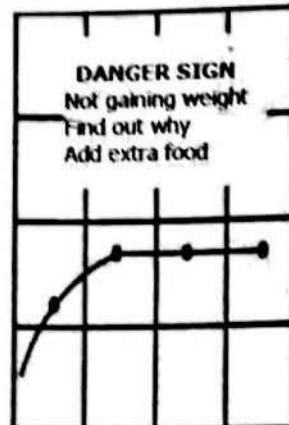
A nurse weighing a baby

Don't speak for Quality, let Quality speak for itself

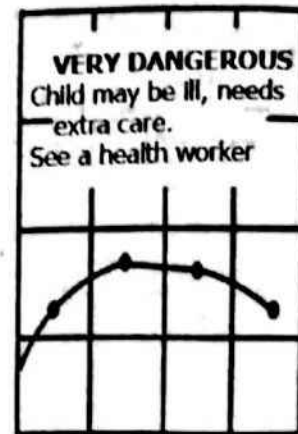
- Rapid weight gain beyond the normal range may signal overnutrition or health issues.
 - Malnutrition and frequent illnesses can hinder the growth of the baby.
- Other graphs explaining growth trend on the Child Health Card.**



Months



Months



Months

Point to note:

Watch the line showing the child's growth.

The growth curve should continue to go up every time you have your child weighed.

A simple explanation of a child health card.

vaccines	1	2	3
	Right dates of immunisation		
BCG vaccine	12/08/2023	completed	completed
Polio vaccine	12/08/2023	16/12/2023	12/01/2024
DPT vaccine	12/09/2023	16/12/2023	12/01/2024
Measles vaccine	12/06/2024	completed	completed

Explanation:

The child was born on 12/08/2023.

Reason. BCG and polio vaccines are given to babies at birth.

The immunisation was completed on 12/06/2024 because measles is given at the age of 9 months.

Importance of a child health card.

To a parent:

- It reminds the parent the next date of immunisation.
- It helps the parent to monitor the growth of the baby.
- It has a graph that with curves that show the weight of a child at different stages of growth.
- It has a graph that shows the weight of the child as he/she grows.
- It reminds the parent the correct date of birth of the child.
- It helps the parent to follow the immunization schedule.
- It provides evidence for the vaccines already given to the child.

To a health worker:

- It helps him/her to know the given vaccines and the remaining ones.
- It helps him/her to know the age and weight of a child.

 *Note: doctors/nurses usually check on the child health card before attending to a child.*

Reasons.

- ✓ *To know the correct vaccine to give the baby.*
- ✓ *To know the diseases which have been already immunised.*
- ✓ *To study the growth trend of the baby.*

To the school

- To know the child's correct name, date of birth and age.
- To prove the parenthood of the child.
- To know whether the child was immunised or not.

Roles played by a family in promoting immunisation.

- Taking children for immunisation.
- Sharing health information on immunisation.
- Organizing immunisation centres.
- Displaying immunisation posters.
- Participating in immunisation meetings.
- Reporting children who are not immunised.
- Reminding other people the date for immunisation.

Roles of school children in promoting immunization.

- Taking their siblings for immunisation.
- Reciting poems about immunisation.
- Singing songs about immunisation.
- Acting drama on immunisation.
- Informing their parents about national immunisation days.
- Cleaning immunisation centres.
- Going for immunisation.
- Writing posters about immunization.

Roles of the community in immunisation.

- Building immunisation centres.
- Sensitizing the mass about the importance of immunisation.
- Encouraging the mass to take their children for immunisation.
- Announcing the national immunisation days on media.
- Organising seminars to educate people about immunisation.

Evaluation activity 3.5

1. Name the document used by parents to monitor the health of a child..
- 2 a) Name the type of immunity acquired through;
i) Recovery from illness ii) Immunisation
- b) Give any **two** roles of a family in promoting immunisation in their area.
8. Name the immunisable disease transmitted by;
a) Rabid dog b) Aedes mosquito c) Housefly

Don't speak for Quality, let Quality speak for itself

Evaluation activity 3.5

4. State any **one** way in which the Child Health Card is important to a parent.
5. Write down any **two** pieces of information found on a child health card.
6. Apart from immunisable childhood diseases, write down any **two** other examples of immunisable diseases.
7. Give any **two** signs that a cholera patient shows.
8. The diagram below shows a medical document used in the promotion of the element of Primary Health Care (PHC). Study it and answer the questions that follow.

REPUBLIC OF UGANDA



MINISTRY OF HEALTH

CHILD HEALTH CARD

District:		Child's register No:	
Health Unit:		Birth weight (kgs)	
Child's Name:		Birth order:	
Sex	Date of Birth: / /		
Mother's Name:		Mother's Occupation:	
Father's Name		Father's Occupation:	
Where the child lives:			
Sub County/ Division			
Parish:			
LC 1:			

TICK REASONS FOR SPECIAL CARE			
Birth weight less than 2.5 kg	☐	Brothers or sisters under nourishment	☐
Birth defect	☐	Mother dead	☐
Other handicaps or illness	☐	Father dead	☐
Fifth child or more	☐	3 or more children in family dead	☐
Birth less than 2 years after last birth	☐	Twin child	☐

ANY OTHER REASONS FOR SPECIAL ATTENTION

Please carry this card every time you bring your child for care or attention

- a) Identify the medical document shown in the diagram above.
- b) State any **one** way in which the medical document above is important to a health worker.
- c) Name any **one** vaccine that the baby receives first basing on the above medical document.
- d) Which element of Primary Health Care (PHC) is promoted by using the above medical document?

MEANING OF KEY TERMS IN IMMUNISATION

Immunisation: Introducing vaccines into the body to boost immunity.

Immunity: Ability of the body to resist diseases.

Vaccines: Preventive drugs introduced into the body to boost immunity.

Antibodies: Defence proteins produced by white blood cells to fight against germs.

Cold chain: Keeping vaccines under cold conditions.

Tetanus jab: Vaccine given to casualties who have got cuts or wounds.

Artificial immunity: The type of immunity got through immunization.

Lockjaw: The inability to fully open the mouth caused by muscle stiffness.

Tetanus Toxoid: The vaccine given to pregnant mothers and adolescent girls.

Infant mortality: Death of young children in the community.

THEME:

HUMAN BODY

TOPIC : 4 THE DIGESTIVE SYSTEM

THE DIGESTIVE SYSTEM

This is a group of organs that help to break down food making it usable by the body.

Digestion is the process by which food is broken down into simple soluble substances that can be absorbed and used by the body.

Digestion makes usage of food in the body easy.

Digestion in humans begins from the mouth and ends in the ileum.

Forms/ types of digestion

Mechanical digestion.

This is the breakdown of food into smaller soluble particles by the action of teeth or stomach walls.

It takes place in the mouth and in the stomach.

In the mouth, mechanical digestion occurs due to the presence of teeth which break down food into smaller soluble particles.

In the stomach, mechanical digestion occurs due to the presence of stomach walls which churn food to form chyme.

Chemical digestion.

This is the breakdown of food into smaller soluble particles by the action of enzymes.

An enzyme is a chemical substance that speeds up digestion of food in the body.

Examples of enzymes which help in the digestion

salivary amylase, pepsin and rennin

Characteristics of enzymes

- They are protein in nature.
- They work on a specific food substance.
- They form same end products.
- They work in small amounts.
- They are destroyed on heating.

Roles of enzymes during food digestion.

- They speed up the rate of digestion.
- They help in the breakdown of food.
- They change food from one form to another.

Chemical digestion takes place in the mouth.

Reason. Due to the presence of salivary amylase that breaks down starchy food.

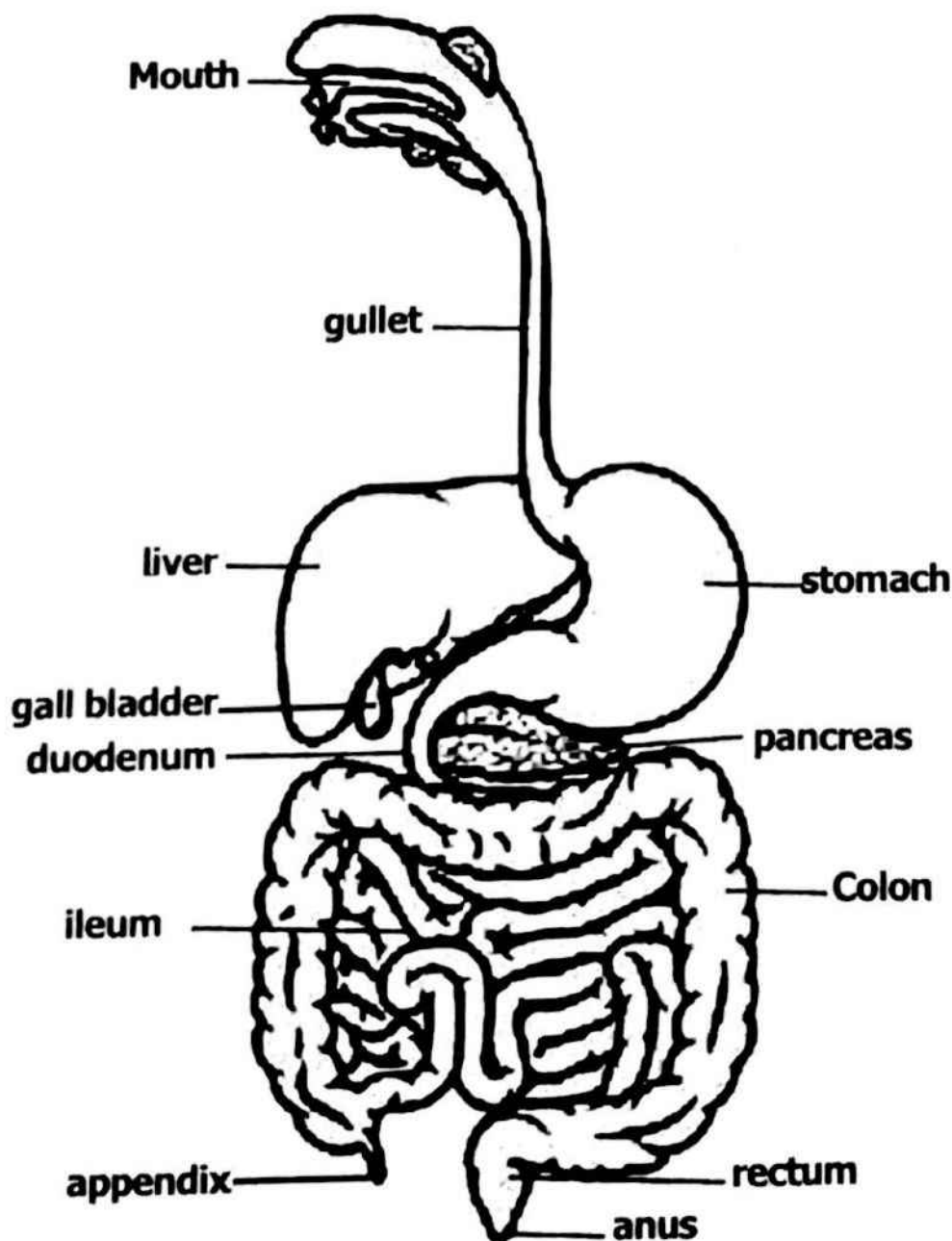
Chemical digestion also takes place in the stomach.

Reason. Due to the presence of pepsin and rennin which break down proteins.

Evaluation activity 4.1

1. Name the body system responsible for the breakdown of food into soluble substances.
2. What is meant by the term digestion?
3. Which process enables the body to easily absorb digested food?
4. Name **two** forms of digestion in the human body.
5. Give any **two** characteristics of enzymes.
6. State the role of enzymes during food digestion.
7. Which digestive enzymes breaks down starchy food in the mouth?
8. In which part of the alimentary canal is food digestion completed?

The human digestive system



Functions of each part of the digestive system

Mouth

It is where digestion of starchy food begins.

Digestion of food begins in the mouth.

Reasons

- Presence of ptyalin that speeds up the digestion of starchy food.
- Presence of teeth that break down food into smaller particles.

Note well: digestion of proteins and carbohydrates begins from the mouth. For proteins like beans, meat, eggs, ground nuts, soya beans, fish and grasshopper require breakdown by teeth and this is mechanical digestion.

Carbohydrates like maize, posho, rice, cassava, sweet potatoes, chapatti, bread and cakes require breakdown by the teeth which is mechanical digestion and action of salivary amylase e.g. cassava, sweet potatoes and irish potatoes which is chemical digestion.

Things that happen to food in the mouth.

- ✓ Food is chewed by teeth.
- ✓ Food is moistened by saliva.
- ✓ Food is rolled into bolus by the tongue.
- ✓ Food is softened by saliva.
- ✓ Food is mixed with saliva.

Substances in the mouth that help in food digestion

Saliva

It is the digestive juice produced in the mouth.

Functions of saliva during food digestion.

- It lubricates food for easy swallowing.
- It has salivary amylase that acts on starchy food.
- It softens food.
- It moistens food.

Teeth

They break down food into smaller particles that are easily digested.

Importance of chewing food in digestion.

- ✓ It eases food digestion.
- ✓ It increases the surface area for enzymes to act.
- ✓ It eases swallowing.
- ✓ It prevents indigestion.

Tongue

It rolls food into a bolus for easy swallowing.

A bolus is a ball-like mixture of chewed food bound together with saliva.

- It mixes food with saliva.
- It pushes food to the gullet during swallowing.
- It turns food for easy chewing

Gullet:

It is also called **oesophagus**.

It is the passage of food to the stomach.

This process is called **peristalsis**.

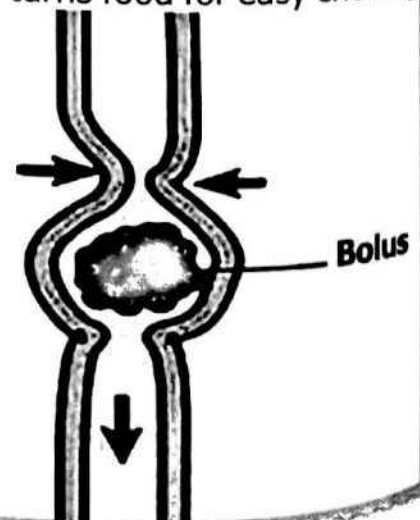
Peristalsis is the wave-like movement of food along the gullet.

Liver:

It produces bile juice which emulsifies fats.

Other functions of the liver are;

- It regulates blood sugar.



- It stores food and blood.
- It turns harmful substances in food into harmless ones.
- It produces heat in the body.

Gall bladder: It stores bile juice.

Stomach:

Chemical digestion of proteins begins from the stomach.

Reason. Presence of rennin and pepsin that act on proteins.

- It produces gastric juice which mixes with food in the mouth.
- Gastric juice contains rennin and pepsin.
- Pepsin changes proteins to peptides.
- Rennin coagulates milk proteins to prevent constipation in babies.
- Both rennin and pepsin work under acidic conditions.
- Salivary amylase works under alkaline condition.
- The stomach walls secrete hydrochloric acid.

Functions of hydrochloric acid during digestion.

- It kills germs that come along with food.
- It provides acidic conditions for rennin and pepsin to work.
- It stops the action of salivary amylase.

The action of salivary amylase stops when it reaches the stomach.

Reason. Presence of hydrochloric acid that deactivates its action.

Things that happen to food in the stomach.

- Food is churned to form chyme.

Chyme is a creamy liquid formed when food is churned in the stomach.

Churning is the process of turning and squeezing food by the muscular stomach walls.

- Food is temporarily stored.
 - Chemical digestion of proteins begins.
- Medicines, glucose, salt, water and alcohol are also absorbed in the stomach.

Bile duct: it directs bile juice to the duodenum.

Pancreas: it produces pancreatic juice.

Duodenum:

It is the upper part of the small intestine

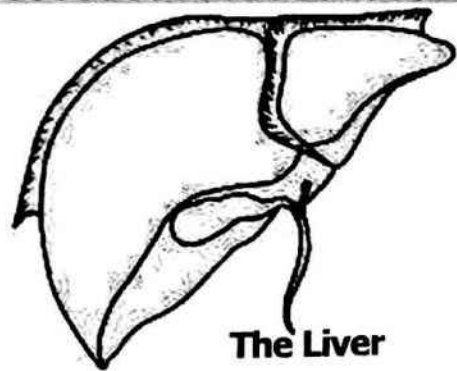
Its walls produce secretin which promotes the secretion of pancreatic juice.

Digestion of fats begins from the duodenum.

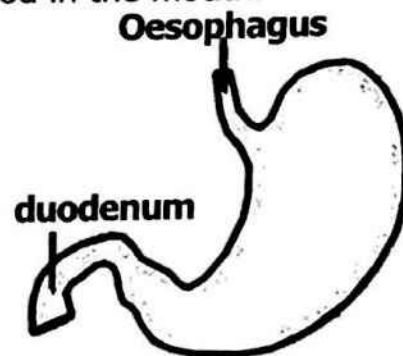
Reasons.

- Due to the presence of lipase which acts on fats.
- Presence of bile salts which help to break down fats.

 **Note:** Bile has no enzymes because bile salts break down fats.



The Liver



Oesophagus

duodenum

Ileum:

It is where absorption of digested food takes place.

This digested food include; glucose, amino acids and fatty acids and glycerol.

Vitamins and mineral salts are not digested but directly absorbed in the ileum.

Reason. They are already in soluble form.

Digestion of food ends in the ileum.

Reason. The ileum has a large surface area and numerous villi which facilitate absorption of food nutrients.

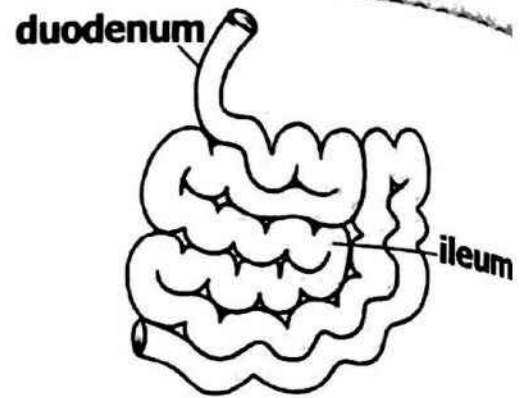
Classes of food and their end products

Carbohydrates ——— glucose

Proteins ——— amino acids

Fats ——— fatty acids and glycerol

The ileum is the lower part of the small intestine

**Reasons why the ileum is able to absorb digested food.**

- It has villi which increase the surface area for food absorption.
- It is coiled to increase the surface area for food absorption.
- It has a large number of blood capillaries to allow exchange of food materials
- The ileum is thin for digested food to easily pass through it.

Appendix:

It stores useful bacteria of the alimentary canal.

Colon:

It is where absorption of water takes place.

It is the upper part of the large intestine.

Absorption of food does not take place in the colon because there are no villi.

Rectum:

It stores undigested food materials before they are egested.

These undigested food materials are called faeces.

Faeces contains; water, dead cells, bacteria and roughage.

The rectum is the lower part of the large intestine.

Anus: it is the passage for faeces during egestion.

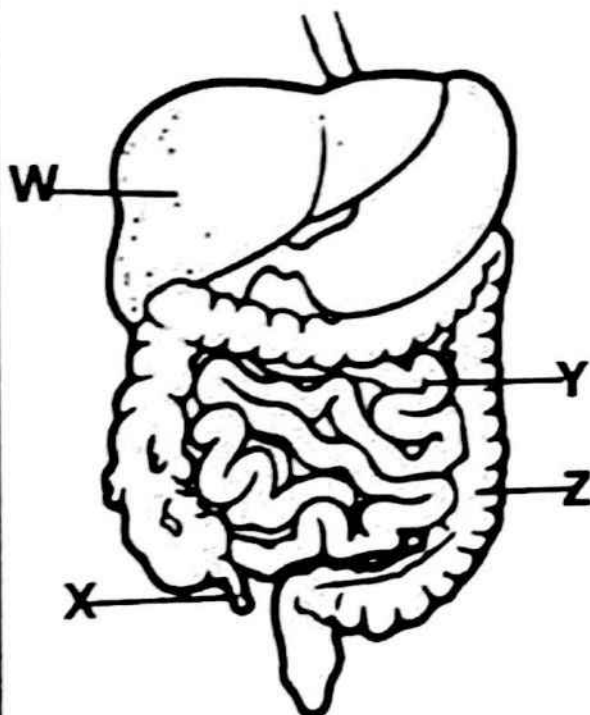
 **Note well:** the liver, gall bladder and pancreas are not parts of the alimentary canal. However, they are parts of the digestive system because they help in digestion.

Examples of digestive juice

Saliva from the mouth, bile from the liver, gastric juice from the stomach, pancreatic juice from the pancreas and intestinal juice from the ileum.

Evaluation activity 4.2

1. (a) Which digestive juice is produced in the mouth?
 (b) Write down any **two** things that happen to food in the mouth.
 (c) How is hydrochloric acid useful during digestion of food?
2. State any one function of the following during digestion:
 (a) Saliva (b) tongue
3. The diagram below is part of the human digestive system. Study and use it to answer the questions that follow.

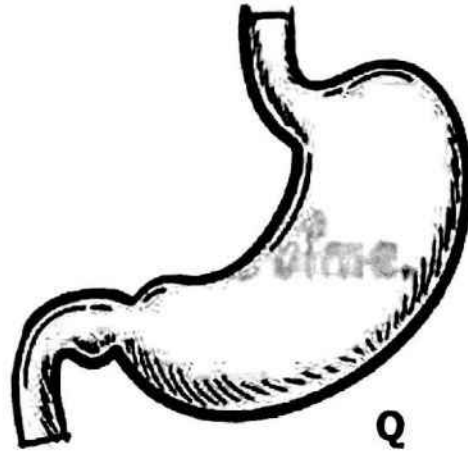
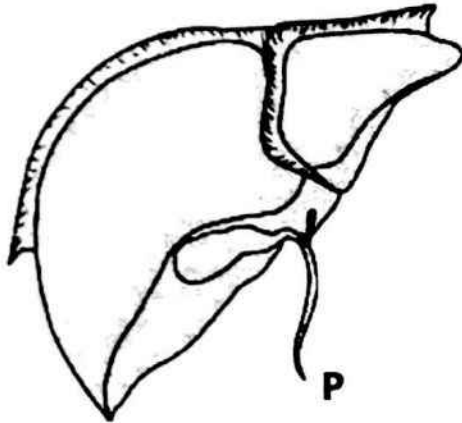


- (a) Name the parts marked **W** and **X**.
- (b) State the function of the parts marked **Y** and **Z**.
4. (a) Apart from enzymes, give any **two** other substances that help in food digestion.
 (b) State the role of enzymes during digestion of food.
 (c) Give any **one** way in which proper chewing of food is important during digestion.
5. By what process does food move throughout the alimentary canal.
6. Which structures in the ileum help in the absorption of digested food?
7. How is the liver useful during the process of digestion?
8. State any **one** way in which the ileum is suitable for food absorption.
9. In which part of the alimentary canal does digestion of the following food nutrients begin?
 (i) Proteins (ii) Fats
10. The table below shows some of the parts of the digestive system and the function of each. Complete the table correctly.

Part	Function
.....	Stores bile juice.
Duodenum	.....
.....	Stores food for some time.
Rectum	.....

Evaluation activity 4.2 continued

11. The diagrams below show organs of the digestive system. Study and use them to answer the questions that follow.



- Name the parts of the digestive system marked **P** and **Q**.
- Give any **one** function part marked **P** during digestion of food.
- Identify the digestive juice produced by the part marked **Q**.

DISEASES AND DISORDERS OF THE HUMAN DIGESTIVE SYSTEM

Diseases of the digestive system include; cholera, diarrhoea, typhoid, peptic ulcers, dysentery, liver cancer, liver cirrhosis and appendicitis

Disease	Cause	Signs and symptoms
cholera	bacteria	▪ Severe diarrhoea ▪ Rapid heartbeat ▪ Severe vomiting ▪ Dehydration
Diarrhoea	Bacteria Virus	➤ Passing out watery stool frequently ➤ Lack of energy ➤ Passing out less urine than normal. ➤ Dehydration
Typhoid	bacteria	❖ Fever ❖ Rash ❖ Abdominal pain ❖ General body weakness ❖ Headache
Dysentery	Bacteria Protozoa	➤ Blood-stained stool ➤ Abdominal pain ➤ General body weakness ➤ Mild fever ➤ Loss of weight

Disease	Cause	Signs and symptoms
Peptic ulcers	Bacteria Alcoholism Smoking Irregular meals	• Severe vomiting • Black sticky stool • Gastric sores on the stomach walls • Burning stomach pain • Bloating or belching • Fatty food intolerance

Ways of preventing and controlling diseases that affect the digestive system

- Drinking boiled water.
- Proper disposal of human wastes and rubbish.
- Washing hands before eating food.
- Washing hands after visiting the latrine.
- Washing fruits and vegetables before eating them.

Disorders of the Digestive System

bloating, indigestion, vomiting, intestinal obstruction and constipation
mnemonic: **BIVIC**

Constipation: This is the condition in which a person takes longtime without egesting.

The major cause of constipation is **lack of roughages in the diet.**

Other causes of constipation are; irregular meals and drinking too little or no water after eating food.

Signs of constipation are; painful egestion, difficulty in passing out stool, endless desire to pass out faeces, passing out hard faeces, using a lot of energy to push faeces when defecating.

Effects of constipation.

- It causes swelling of veins in the anus.
- It causes protrusion of intestines in the anus.

Constipation is prevented by feeding on food rich in roughage.

Ways in which roughage prevents constipation

- Roughages absorb water from the stool making it soft.
- Roughage adds bulk in stool making it easier to pass.
- Roughage stimulates intestinal muscle contractions.

Indigestion.

This is a condition in which food is not digested Properly.

It is caused by;

- ❖ Eating too much food.
- ❖ Improper chewing of food.
- ❖ Eating too much oily food or coffee.

Indigestion can be prevented by;

- ❖ Chewing food properly before swallowing it.
- ❖ Avoid over eating.
- ❖ Eating the right amount of food.
- ❖ Avoid eating hurriedly.
- ❖ Avoid eating too much oily food.
- ❖ Drinking enough water or juice after eating food.

Ways of maintaining good eating habits

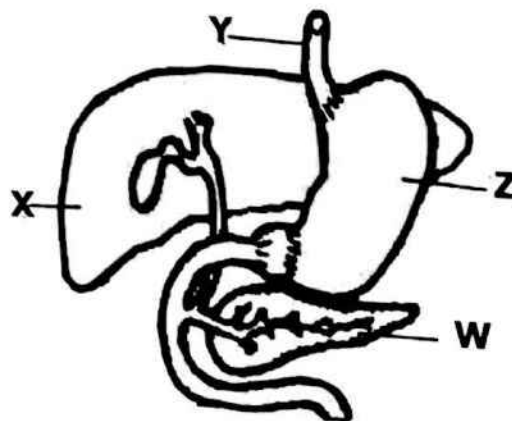
- Eating enough food at a time.
- Eating quietly.
- Chewing food properly.
- Drink fluids after eating food.

Behaviour and habits of maintaining the efficiency of the digestive system

- ✓ Feeding on a balanced diet.
- ✓ Having meals at regular intervals.
- ✓ Doing regular physical exercises.
- They increase appetite, Prevent obesity.*
- ✓ Eating the right amount of food.
- ✓ Going for regular medical checkup.
- ✓ Proper chewing of food before swallowing.

Evaluation activity 4.3

1. Mention **one** disease that affects the stomach because of alcoholism.
2. Which digestive disorder is prevented by including roughages in our diet?
3. State any **one** piece of advice that you give to children to help them prevent indigestion.
4. Apart from indigestion, give any **two** other disorders of the digestive system.
5. State any **two** health habits that help to improve the efficiency of the digestive system.
6. Which digestive disorder is caused by lack of dietary fibre in a diet?
7. How does feeding on roughages help to prevent constipation?
8. Give any **two** ways in which regular physical exercises help to maintain the efficiency of the digestive system.
9. State the major cause of constipation.
10. Give any **one** reason why an individual should chew food properly.
11. The diagram below is part of the human digestive system. Use it to answer the questions that follow.



- (a) Name the parts marked **Y** and **W**.
- (b) State the function of the part marked **Z**.
- (c) Give any **one** disease that affects the part marked **X**.

MEANING OF KEY TERMS IN DIGESTIVE SYSTEM

Digestion: The breakdown of food into simple soluble particles that the body can absorb.

Constipation: A condition where bowel movements are difficult to pass.

Enzyme: Chemical substances that speed up digestion of food in the human body.

Bile: Greenish-yellow fluid produced by the liver to emulsify fats.

Saliva: A watery fluid secreted by the salivary glands in the mouth.

Ileum: The lower section of the small intestine where digested food is absorbed.

Colon: The upper section of the large intestine where water is absorbed.

Faeces: Undigested food materials removed from the body through the anus.

Peristalsis: The wave-like muscular contraction along the gullet and intestine for food to pass

Indigestion: The intake of food through the mouth.

Egestion: The removal of faeces from the rectum through the anus.

Alimentary canal: The muscular tube in which food is moved along by the action of peristalsis.

Chyme: The semi-digested food that passes from the stomach into the ileum.

Duodenum: The upper section of the small intestine where digestion of fats begins.

Anus: The terminal opening of the alimentary canal, which is used for egestion.

THEME: THE ENVIRONMENT

TOPIC : 5 COMPONENTS OF THE ENVIRONMENT "SOIL"

Soil is the top layer that covers the earth's surface.

TYPES OF SOIL:

Features used to identify the type of soil

Size of the soil particles, Texture of the particles, Humus content, soil composition, inter-particle space and soil structure.

The types of soil are;

loam, clay and sand soil

Loam soil.

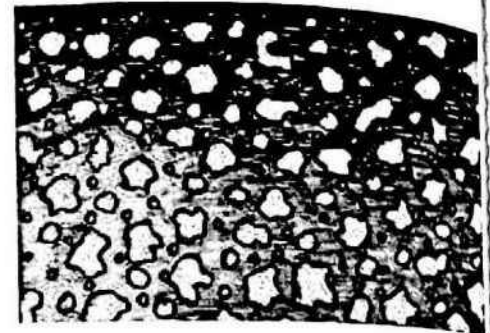
It is a mixture of sand, clay and humus.

It is suitable for growing crops.

Reason. Loam soil has high humus content.

Characteristics of loam soil.

- ✓ It has medium sized particles.
- ✓ It has moderate air spaces.
- ✓ It is dark coloured due to high humus content.
- ✓ It has high humus content.
- ✓ It has moderate water holding capacity
- ✓ It has efficient water drainage.



Clay soil.

Characteristics of clay soil.

- ✦ It has fine and smooth particles.
- ✦ It has small inter-particle spaces.
- ✦ It is waterlogged.
- ✦ It has high water retention capacity.

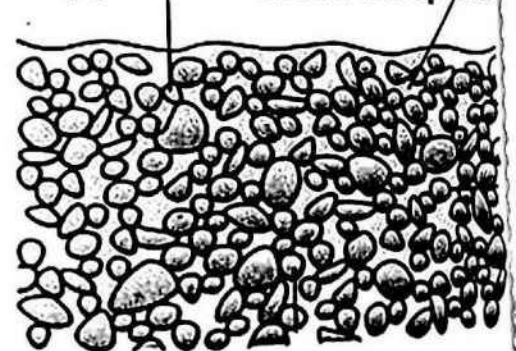
(Retains water for a long time)

Reason. Its particles are fine and closely packed together.

- ✦ It has closely packed particles.
- ✦ It has high capillarity.

Reason. It has smaller inter-particle spaces.

clay particle Small air spaces



Uses of clay soil to people.

- It is used for making ceramics. It has fine and sticky particles. Ceramics are objects made of clay soil.

Examples are;

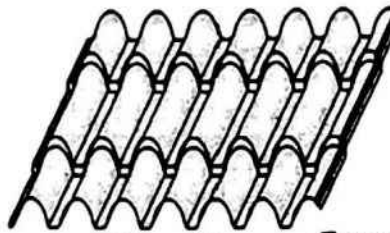
clay pots, clay tiles, clay cups, clay plates, clay charcoal stoves and flower vases.



clay pot



clay charcoal stove



roofing tiles



flower vase

- Clay soil is used for making bricks.
- Clay soil is used for growing yams, sugar canes and rice.

Sand soil

Characteristics of sand soil.

- It has large inter-particle spaces.
- It has high water drainage.

Reason. It has larger inter-particle spaces.

- It is highly porous.
- It has the lowest water retention capacity.

Reason. It has loosely large particles.

- It has the highest soil aeration rate.

Reason. It has larger air spaces between its particles.

- It has low humus content.
- It has rough and large particles.

Ways in which sand soil is useful to people.

- ✓ It is used for building houses and bridges.

Reasons.

It allows water to drain faster.

It is chemical resistant.

- ✓ It is used for making glasses.

Reason. It contains silica.

- ✓ It is used for making sand papers.

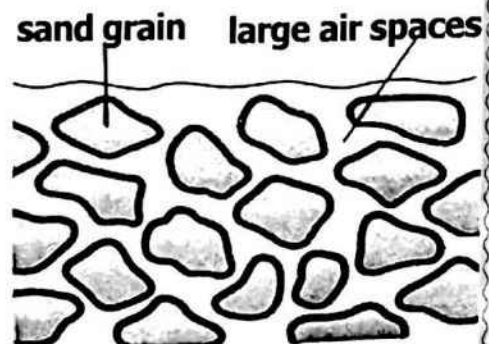
- ✓ It is used for filtering water.

- ✓ It is used for scrubbing saucepans.

- ✓ It is used for making building blocks

Reasons why sand soil is not suitable for growing crops.

- It dries up very quickly.
- It contains less humus

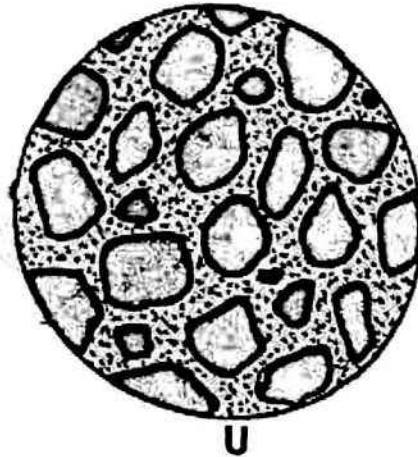
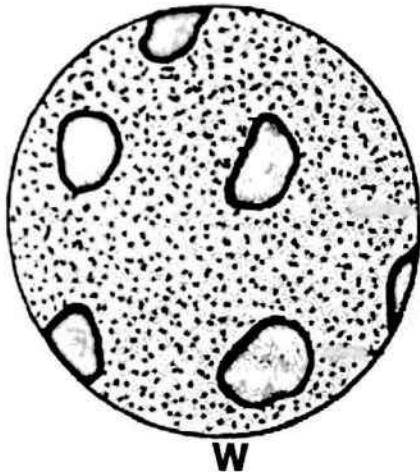


Evaluation activity 5.1

1. Which type of soil has rough and large particles?
2. State any **two** characteristics of clay soil.
3. Why is loam soil considered as the best soil for growing crops?
4. State any **two** features used to classify soil.
5. Why does sand soil drain water faster than clay soil?

Evaluation activity 5.1 Continued

6. (a) Apart from building, give any **two** other ways in which sand soil is useful to people.
(b) Mention any **one** building which involves the use of sand soil.
(c) State any **one** property of sand soil.
7. The diagrams below show types of soil. Study and use them to answer the questions that follow.



- (a) Identify the types of soil marked **W** and **U**
(b) Give any **one** way in which the type of soil marked **W** is important to people.
(c) Which type of soil is suitable for filtering water at home?
8. Why does clay soil retain water for a long time?
9. Give any **one** reason why clay soil is suitable for making pots.
10. State any **one** difference in structure between sand soil and clay soil

PROPERTIES OF SOIL.

Soil drainage

Soil drainage is the ability of the soil to allow water to pass through it.

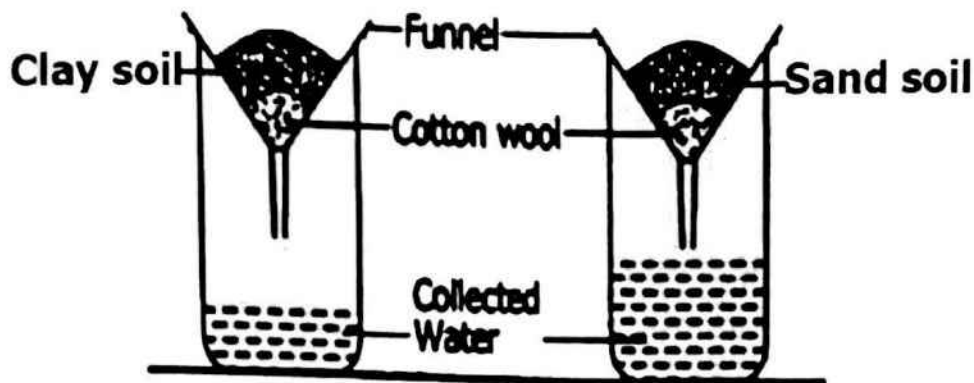
An experiment to find out soil drainage in sand and clay soil.

Materials needed: : two funnels, cotton wool, dry soil (sand and clay), water and two containers

What to do:

- (i) Place the funnel into the container and put cotton wool at the neck of each funnel.
- (ii) Put the equal amounts of dry clay and sand soil samples each in a separate funnel.
- (iii) Pour equal amounts of water on the soil samples.
- (iv) Leave the experiment to stand for ten minutes and collect water that passes through the soil samples in containers of the same size.

Set up



Observation:

- More water is collected in the container having sand soil.
- Less water is collected in the container having clay soil.
- Water drains quickly through sand soil but slowly through clay soil.

Conclusion:

Sand soil has the highest soil drainage.

Roles of the materials in the experiment

Funnels: They guide water into the soil samples.

Cotton wool: It filters water/Prevents soil from entering the container.

Dry soil: Represents the test samples.

Water: It simulates rainfall for drainage sampling.

Containers They collect drained water.

Soil capillarity

Soil capillarity is the rising of water between soil particles.

It is the upward movement of water through the soil.

An experiment to find out soil capillarity in sand soil clay soil and loam soil.

Materials needed: : 3 test tubes, dry sand, clay and loam soil, bowl of water

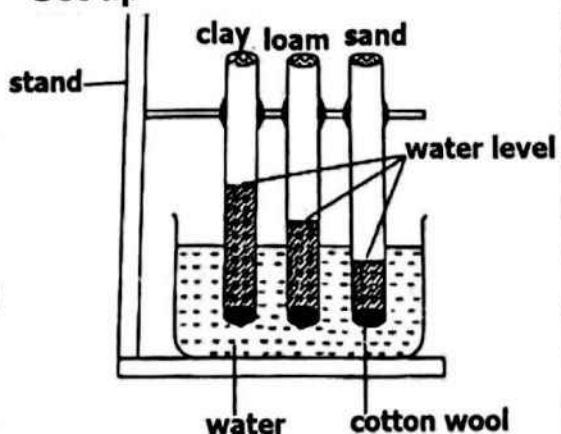
What to do:

- (i) Fill the test tubes with different types of soil.
- (ii) With the help of your two friends, turn the test tubes upside down.
- (iii) Put them in water at the same time.
- (iv) Leave them in water for about 10 minutes

Observation:

- Water rises higher in clay soil than in sand soil.
- Water rises lower in sand soil.

Set up



Conclusion:

Clay soil has the highest soil capillarity.

Roles of the materials in the experiment

Test tubes. they hold the soil for observation.

Cotton wool. Filters water.

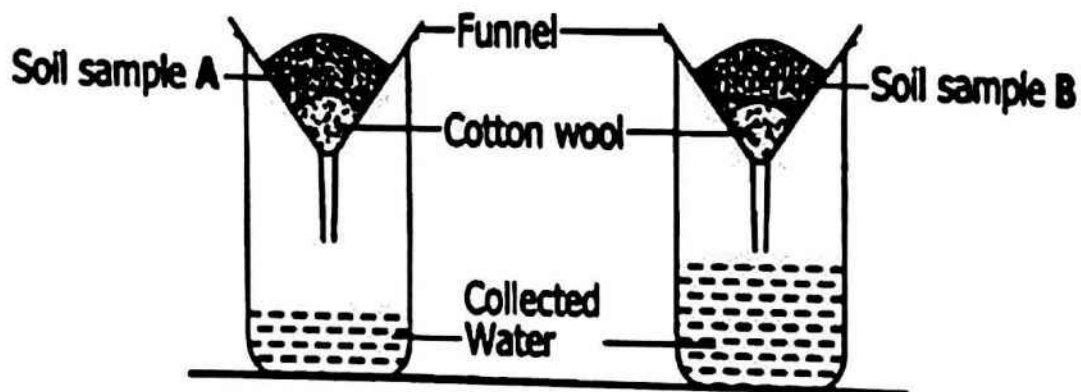
Dry soil. Medium for water to rise upwards.

Water. It is a source for capillarity action.

Bowl of water. It supplies water to test tubes.

Evaluation activity 5.2

1. Which type of soil has the highest rate of water drainage?
2. Why does sand soil drain water faster than clay soil?
3. The diagram below shows an experiment carried out on two equal amounts of soil samples **A** and **B**. equal amount of water was poured on the soil samples. The water that passed through the soil samples after ten minutes was collected in containers of the same size as shown. Study and use it to answer the questions that follow.



- (a) What property of soil was being studied in the experiment?
 - (b) State the function of the cotton wool in the experiment above.
 - (c) Given that **two** soil samples were from sand and clay, which of the two soil samples was clay?
 - (d) Give any **one** reason for your answer in (c) above.
4. Emulsify wanted to investigate soil capillarity. He had the following materials for the experiment; **Sample of clay and sand soil, water and a bowl.**
 - (a) Name any **one** material Emulsify forgot to include on the list of his materials
 - (b) In which soil sample did Emulsify find the highest soil capillarity?
 - (c) Give a reason for your answer in (d) above.
 - (d) Why did Emulsify include a bowl of water on the list of his materials?
 5. State any **one** property of soil which is;
 - (a) Highest in clay soil.
 - (b) Lowest in sand soil.
 - (c) Highest in sand soil.
 - (d) Lowest in clay soil

SOIL FORMATION

Soil formation is the process by which rocks break down and mix with organic matter to create soil over time.

Processes through which soil is formed

- Weathering of rocks ➤ Decomposition of organic matter

Weathering is the breakdown of rocks into small particles.

Weathering is the basic process and first stage of soil formation.

Forms/types of weathering

chemical weathering and physical weathering.

Causes of weathering of rocks in the environment

Factor	How it leads to weathering
Action of water.	Water enters cracks in rocks and breaks them apart over time. Rivers and streams wear away rocks over which they flow.
Action of air.	Wind carries sand and hits rocks, wearing them down.
Temperature.	Heat makes rocks expand, and cold makes them contract, causing cracks.
Movement of ice.	Ice in cracks expands and breaks rocks as it grows.
Quarrying.	People break rocks for building materials.
Action of plant roots.	Roots grow in cracks and push rocks apart.
Earthquakes.	Shaking from earthquakes cracks and breaks rocks.

Decomposition is the rotting of dead organic matter.

It is caused by the action of bacteria and fungi.

Components of Soil

- Humus ➤ Air ➤ Rock particles ➤ Organisms ➤ Water ➤ Mineral salts

Rock particles

These are inorganic materials formed by weathering.

They include sand, gravel, clay particles, silt

Importance of rock particles in the soil.

- Rock particles improve soil aeration. They provide spaces for air in the soil.
- They contain mineral salts needed for plant growth.

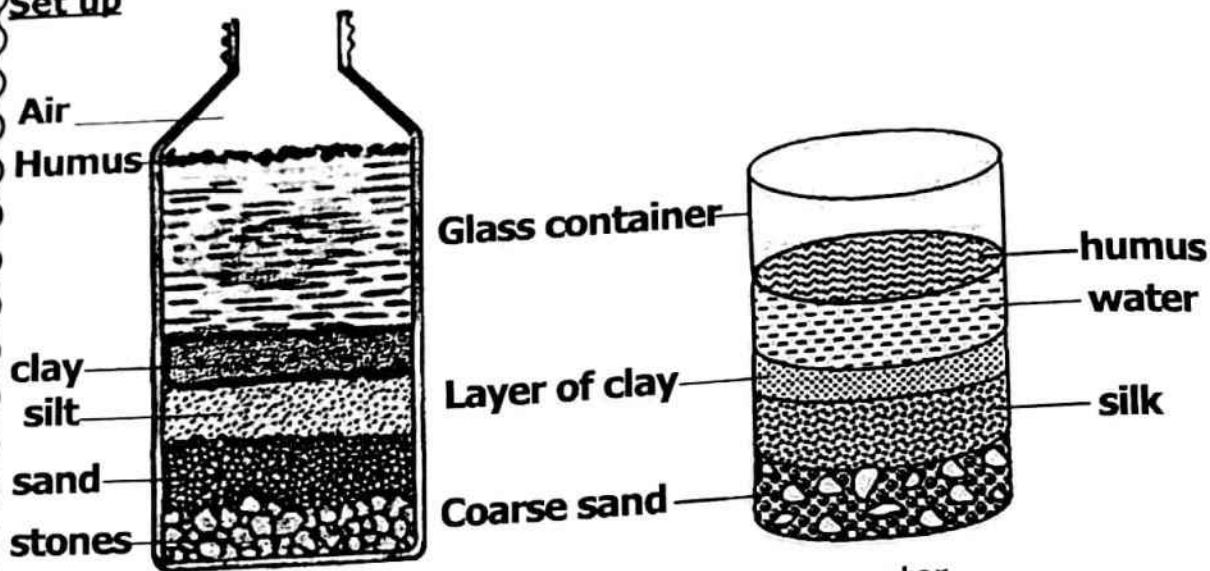
An experiment to show that soil contains rock particles.

Materials needed: garden soil, water, clear glass

What to do:

- (i) Half fill a clear glass with garden soil.
- (ii) Fill the remaining part of the glass with clean water.
- (iii) Cover the mouth of the glass with a palm of your hand and shake it thoroughly for some time.
- (iv) Allow water soil to settle. The compositions of rock particles will be seen.

Set up



Humus floats on water because it is less dense than water

Roles of the materials used:

- The transparent glass provides clear observation of rock particles.
- Water is used to dissolve soil to show the density of the rock particles.

Air

Air is found between soil particles.

Importance of air in the soil

- ✓ Oxygen enables soil organisms and roots to carry out respiration.
- ✓ Nitrogen enables legumes to make proteins.
- ✓ Oxygen is used by seeds during germination.

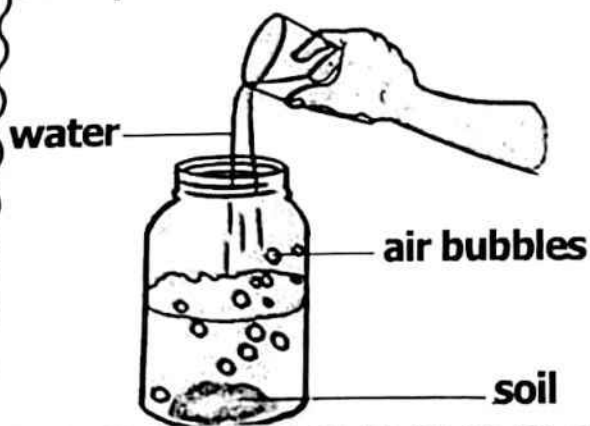
An experiment to show that soil contains air.

Materials needed: transparent glass, water, dry lump of soil

What to do:

- Get a transparent glass.
- Fill half of the glass with dry soil.
- Fill the remaining part of the glass with water.
- Air escapes from the transparent glass in form of bubbles.

Set up



Roles of the materials used

- The **transparent glass** provides clear observation of air bubbles.
- Water** is used to dissolve soil to form air bubbles.

Water

Importance of water in the soil

- ⇅ It is used for germination of seeds.
- ⇅ It promotes rotting of organic matter to form humus.
- ⇅ It makes soil soft and loose for plant roots to penetrate.
- ⇅ It is used by plants to make food.
- ⇅ It dissolves mineral salts in the soil.
- ⇅ It helps plants to grow.

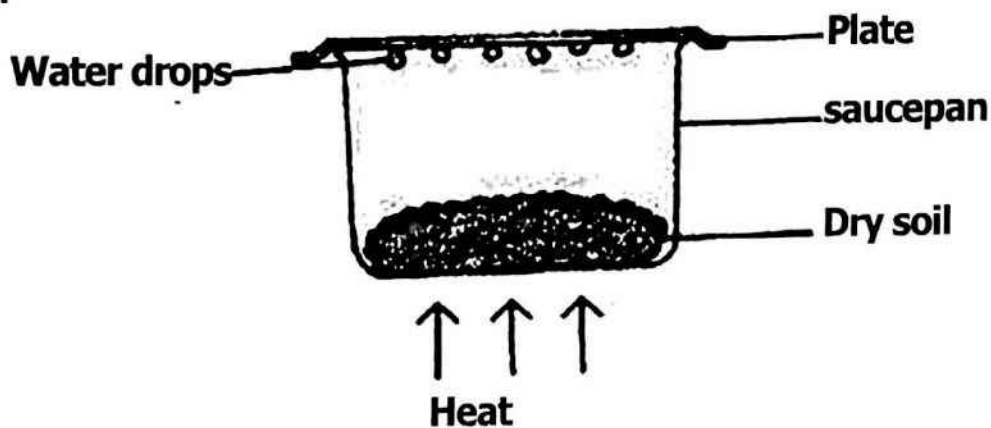
An experiment to show that soil contains water.

Materials needed: source of heat, saucepan, plate/lid and dry lump of soil

What to do:

- (i) Pour soil in saucepan and cover it with a lid.
- (ii) Heat the saucepan with soil for 15 minutes and cool it.
- (iii) Remove the lid and observe.
- (iv) The droplets of water seen on the cover/lid show that soil contains water.

Set up:



Roles of the materials:

- **Source** of heat is used to heat the soil to cause water droplets.
 - **Saucepan** is used to hold soil for heating.
 - **The lid** prevents evaporated water from the soil from escaping to the atmosphere.
- It holds the water droplets during evaporation.

Evaluation activity 5.3

1. (a) What is meant by the term weathering?
(b) Write down any **two** causes of weathering of rocks.
(c) Apart from weathering, name the other process by which soil is formed.
2. Name the component of soil that enables plants to make food.
3. Give any **two** ways in which air is important in the soil.
4. Identify the first stage in soil formation.
5. Name the process that causes the formation of;
(i) Humus (ii) Rock particles

Evaluation activity 5.3 Continued

6. In which way are bacteria useful in the process of soil formation?
7. Chloe wanted to demonstrate an experiment about soil. She carried out the following steps.
 - (i) Put the transparent glass on the table.
 - (ii) Poured water into the glass.
 - (iii) Lowered a lump of soil into the water.
 - (a) State what Chloe observed after lowering the lump of soil into water.
 - (b) What is the importance of the following materials that Chloe used in her experiment above?
 - (i) Water
 - (ii) Transparent glass
 - (c) According to the above steps, why did Chloe carry out the above experiment?
8.
 - (a) Apart from rock particles, give any **one** other non-living component of soil.
 - (b) Write down any **two** materials that make up rock particles.
 - (c) State any **one** way in which rock particles are important in the soil.

Humus

Humus are organic substances formed after rotting of plant or animal matter. Humus is formed after decomposition of plant or animal matter.

Components of humus are; dead rotten animals, dead rotten plants, animal wastes, plant residues.

Importance of humus in the soil.

- ✓ It holds soil particles together.
- ✓ It makes soil to hold water.
- ✓ It conserves heat in the soil for soil organisms.
- ✓ It provides plant nutrients.

Experiment to show that soil contains humus.

Materials needed: Soil, water, spoon, cup, transparent glass

Steps taken:

- i) Put the soil in the transparent glass.
- ii) Pour water in the glass with soil and stir well.
- iii) Leave the mixture to settle for some time.
- iv) Black matter will be seen floating on water. The black matter is humus.

Set up



Roles of the materials used

- **Water** is used to dissolve the soil to form the mixture.
- The **spoon** is used to stir the mixture of water and soil.
- The **transparent glass** is used for clear observation of black matter.

Living components of soil are bacteria and fungi

They help in the decomposition of organic matter to form humus.

Organisms that live in the soil are; earthworms, termites, moles, millipedes and caecilians

Importance of organisms in the soil.

- ❖ They help to improve soil aeration.
- ❖ They help in the formation of humus.
- ❖ They improve water drainage in the soil.

Importance of soil to organisms

- Soil is a source of food for organisms.
- Soil provides breeding grounds to organisms.
- Soil provides protection to organisms.
- Soil provides shelter

Mineral salts

They occupy the biggest percentage in the soil of all components of soil.

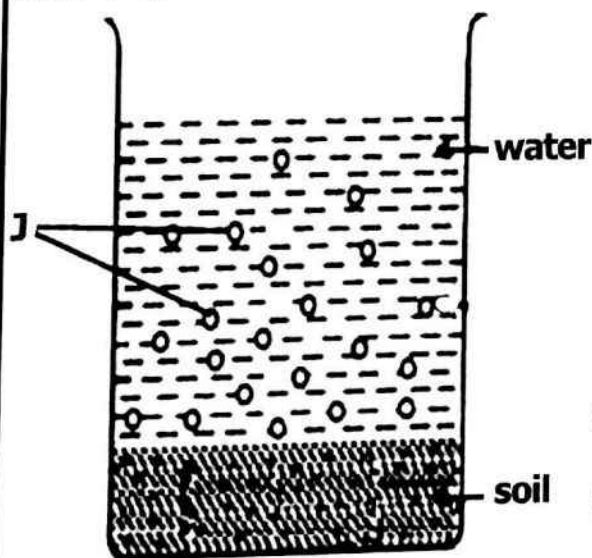
Importance of mineral salts in the soil.

- Magnesium and iron help in the formation of chlorophyll.
- Potassium helps plants to build resistance to diseases and drought.
- Calcium helps to make plant stems and leaves strong.
- Nitrates and phosphorus provide nitrogen for legumes to make proteins.

Evaluation activity 5.4

1. Which component of soil enables plants to make their own food?
2. Apart from improving soil aeration, identify any **two** other ways in which earthworms are important in the soil.

The diagram below shows an experiment carried out about soil. Use it to answer questions **3** and **4**



3. Name the substance marked **J**.
4. What does the experiment above show about soil?
5. Which component of soil occupies the greatest percentage in the soil?
6. State any **one** way in which termites benefit from soil.
7. Which component of soil provides nutrients in the soil?
8. How do organisms help to improve soil fertility?
9. State **one** way in which bacteria are useful in the formation of soil.
10. Name any **one** living component of soil.
11. Explain how humus is formed (2marks)

IMPORTANCE OF SOIL

- Soil supports plant growth.
- Sand soil is used for construction of buildings and roads.

- Clay soil is used for pottery.
- Soil is a habitat for animals like termites.
- Soil is a source of minerals like gold.

Soil profile

Soil profile is a vertical section showing soil layers. It is the vertical arrangement of soil layers.

Layers of soil are; topsoil, subsoil and parent rock/bedrock

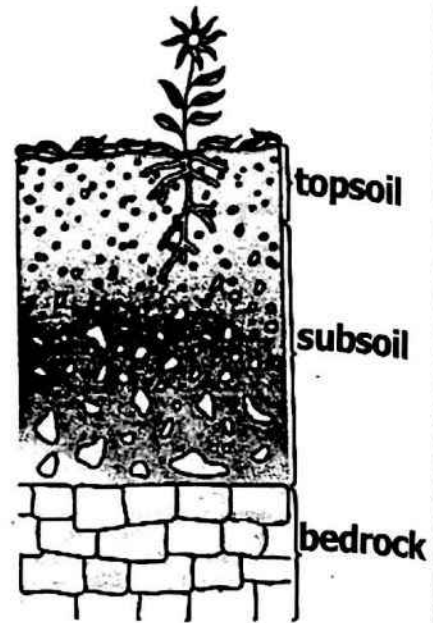
Topsoil is best for crop growth because it contains a lot of humus.

SOIL EROSION

Soil erosion is the removal of topsoil by its agents.

Types of soil erosion

sheet erosion, gully erosion, rill erosion and splash erosion.



Sheet erosion.

This is a type of soil erosion in which a thin layer of topsoil is removed uniformly.

The thin soil layer can be removed by flowing water or wind.

It takes place on plain land and gentle slopes.

Rill erosion

This is the erosion which occurs in areas where there is little vegetation or in fields where land has been cultivated.

Small water channels are formed by flowing water on the surface of soil.

Small water channels are called rills. Rill erosion is common in areas with gentle slopes.

Gully erosion

This is erosion where big channels or trenches are made into the soil by flowing water. Gully erosion creates deep channels in the ground. It occurs in mountainous or hilly areas. Gully erosion can cause landslides in mountainous areas.

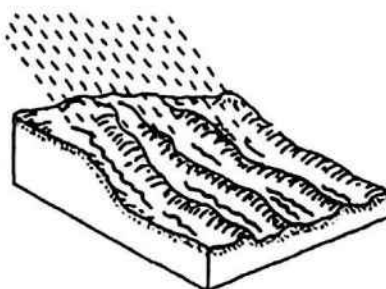
Splash erosion

This is the type of erosion in which raindrops hit bare soil and make soil particles loose. It is also called **raindrop/spatter erosion**.

Types of Soil Erosion



Sheet erosion



Rill erosion



Gully erosion

Factors that influence soil erosion in an area

- Landscape, Nature of soil, Strength of wind, Intensity of rainfall, Farming practices and Nature of vegetation

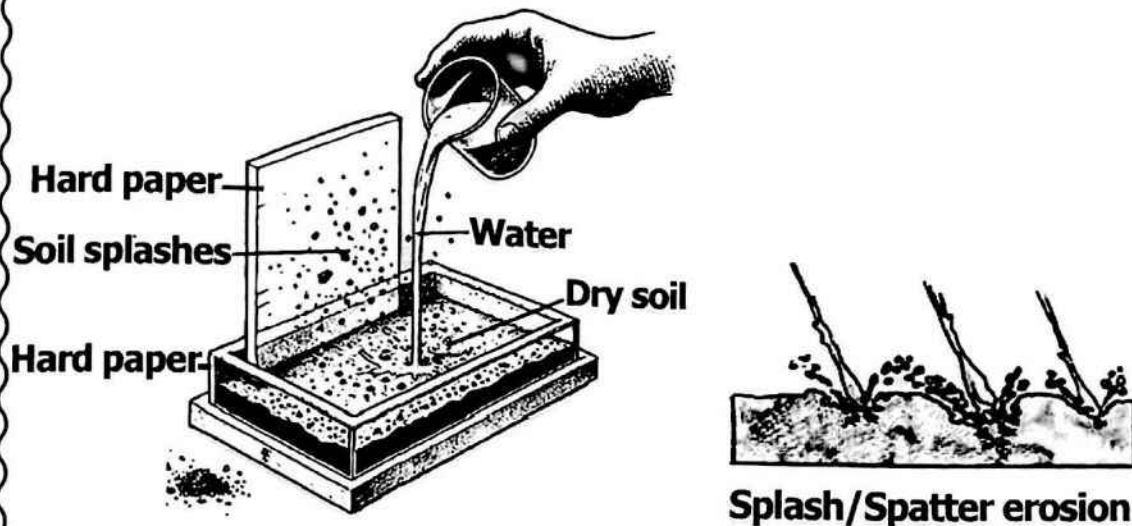
An experiment to demonstrate splash erosion.

Materials needed: water, dry soil and hard paper

What to do:

- (i) Collect soil from bare land and place it on a flat hard paper.
- (ii) Put water in a container and pour it slowly from a high level into soil.
- (iii) Observe the soil as water pours down on it.
- (iv) Falling water acts as raindrops which splashes or scatters the soil.

Set up



Causes of soil erosion

Cause	How it causes soil erosion
Overgrazing	It leaves the topsoil bare, exposing it to agents of soil erosion.
Deforestation	It leaves the topsoil bare, exposing it to agents of soil erosion.
Overcropping	It breaks down soil structure preventing the buildup of humus.
Overstocking	It leaves the topsoil bare, exposing it to agents of soil erosion.
Uncontrolled bush burning	It leaves the topsoil bare, exposing it to agents of soil erosion.
Ploughing downhill	It creates channels in the soil through which flowing water passes.

Agents of soil erosion

Agent	How it leads to soil erosion
Water	Rain provides a lot of surface run-off water which carries away large amounts of topsoil.

Don't speak for Quality, let Quality speak for itself

Agent	How it leads to soil erosion
Wind	Strong wind carries large amounts of soil in form of dust.
Animals	Animals carry out overgrazing leaving the land bare. Animal hooves carry away soil in their hooves as they walk over the soil. Animal hooves make soil particles loose and easy to be carried away by wind or flowing water.

Dangers/effects of soil erosion to the environment.

- Soil erosion causes soil exhaustion.

It removes top fertile soil.

It leads to loss of humus which binds soil particles together.

Note: soil exhaustion is the loss of soil fertility.

- Soil erosion destroys plants.
- Soil erosion causes potholes on roads.
- Soil erosion degrades the environment.
- Soil erosion leads to blockage of water bodies.
- Soil erosion causes accidents on the roads.
- Soil erosion leads to landslides.
- Soil erosion causes silting.
- Soil erosion blocks drainage channels.

Methods of controlling soil erosion

They include; mulching, terracing, strip cropping, planting trees, cover cropping, planting short grass, intercropping, contour ploughing, building gabions, bunding and alley cropping.

Mulching

Mulching is the covering of topsoil using dry plant materials.

The dry plant materials are called **mulches**.

Examples of mulches

- dry grass
- dry banana leaves
- dry coffee husks
- dry cereal stalks
- dry ground nut shells

Advantages of mulching

- ❖ Mulching controls soil erosion.
Mulches reduce the speed of flowing water.
Mulches trap soil from flowing with water.
- ❖ Mulching improves soil fertility.
Mulches decompose and form humus in the soil.
- ❖ Mulching conserves moisture in the soil.
Mulches minimise the rate of evaporation of water in the soil.
- ❖ Mulching controls the growth of weeds.
Mulches cut off the supply of sunlight for photosynthesis to the weeds.

Disadvantages of mulching.

- ✓ Mulching is tiring.
- ✓ Mulches are fire hazard.
- ✓ Mulches hide some crop pests e.g. termites
- ✓ Some mulches can grow into weeds.



Terracing

Terracing is the practice of making steps on a sloppy land.

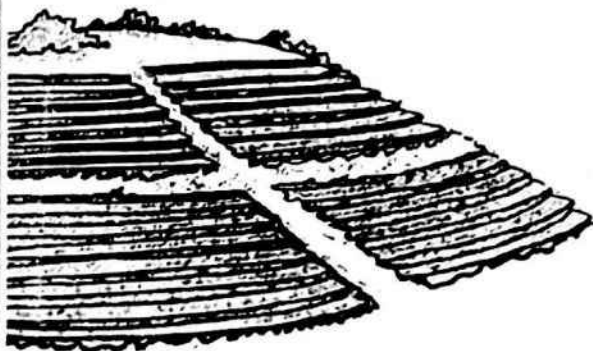
Terraces reduce the speed of flowing water.

Terracing is commonly practised in hilly areas or mountainous areas.

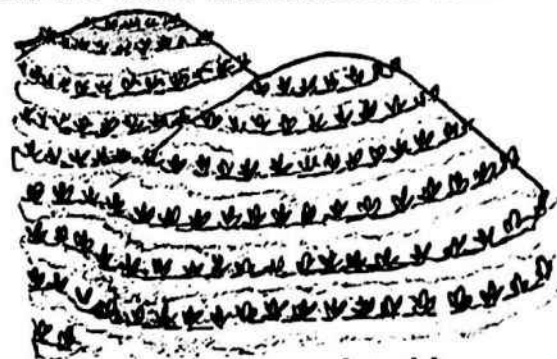
Contour ploughing

This is the practice of planting crops across the slope.

Contour planting is the growing of crops across the slopes following the contour lines. The furrows between the ridges hold the water and reduce its flow.



terracing



Contour ploughing

Mixed cropping/intercropping

Mixed cropping is the growing of more than one crop on the same piece of land at the same time.

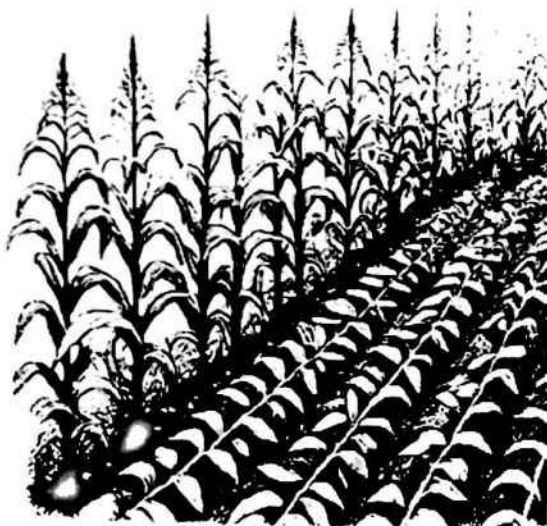
For instance, maize with beans, coffee with bananas

Cover cropping

Cover cropping is the growing of crops which cover the soil.

Examples of cover crops are; pumpkins, cabbage, sweet potatoes, peas, beans, and ground nuts.

Cover crops reduce the speed of flowing water.



Intercropping



Cover cropping

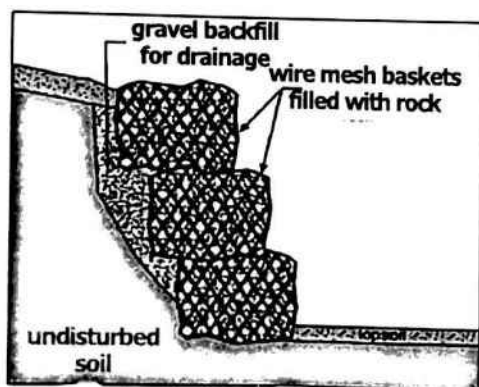
Methods of controlling soil erosion in hilly areas

terracing, contour ploughing, bunding, strip cropping, alley cropping and planting trees

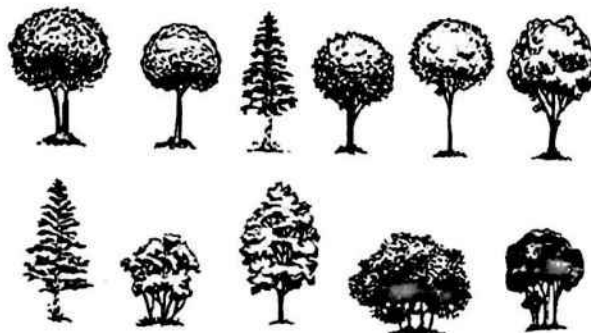
Methods of controlling soil erosion in the school compound

Planting short grass and. Grass reduce the speed of water flowing on the soil surface when it rains.

Planting trees. Trees act as windbreaks and tree roots hold soil particles together. Gabions help to control soil erosion on the roads. They reduce the speed of flowing water



Building gabions



planting trees

Evaluation activity 5.5

1. Which type of soil erosion creates deep channels in the soil?
2. (a) Identify the type of soil erosion common in hilly areas.
(b) State any **one** danger of soil erosion to the environment.
(c) Explain how deforestation causes soil erosion. (02 marks)
3. (a) Write down any **two** causes of soil erosion.
(b) Which agent of erosion causes gullies?
(c) How does soil erosion lead to soil infertility?

Evaluation activity 5.5 continued

4. Give any **one** way in which trees help to control soil erosion in an area.
5. Give any **two** methods of controlling soil erosion in hilly areas.
6. Why do road builders put gabions on road sides when constructing roads?
7. The list below gives some of the methods farmers use to control soil erosion. Use it to answer the questions that follow.

Terracing, Planting trees, Contour ploughing, Mulching

Which **two** of the methods given above are best for;

- (a) Land with a gentle slope? (b) Land with a steep slope?

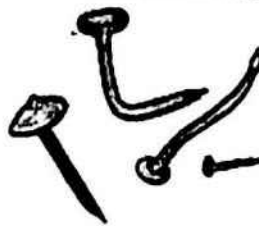
EFFECTS OF HARMFUL MATERIALS ON SOIL

Examples of harmful materials that affect soil

polythene bags, plastic materials, acid, rubber materials, broken glasses, broken bottles, engine oil and metallic materials



Chemicals



Nails



Broken glasses

Dangers/effects of harmful materials on soil.

- ✓ They pollute the soil.
- ✓ They block water drainage in the soil.
- ✓ They block soil aeration.
- ✓ They kill soil organisms.
- ✓ They make soil hard.
- ✓ They lead to waterlogging.
- ✓ They damage soil structure and texture.

Ways of controlling harmful materials on soil.

- Recycling wastes.
- Reusing wastes.
- Detrashing the soil.
- Burying wastes.
- Controlled burning of wastes.

Soil Exhaustion

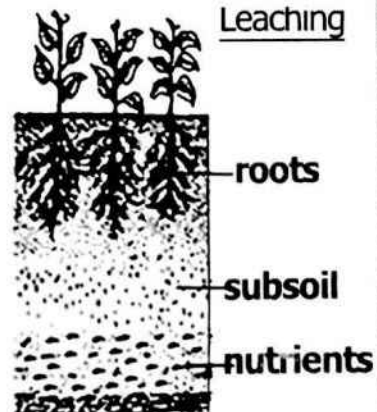
Soil exhaustion. Soil exhaustion is the loss of soil fertility.

Causes of soil exhaustion are; soil erosion, monocropping, leaching, loss of humus, overuse of artificial fertilisers and dumping harmful materials like polythene bags on soil.

Leaching. Leaching is the sinking of plant nutrients deeper into the soil where plant roots cannot reach.



Recycling



Leaching is caused by; floods and deep ploughing.

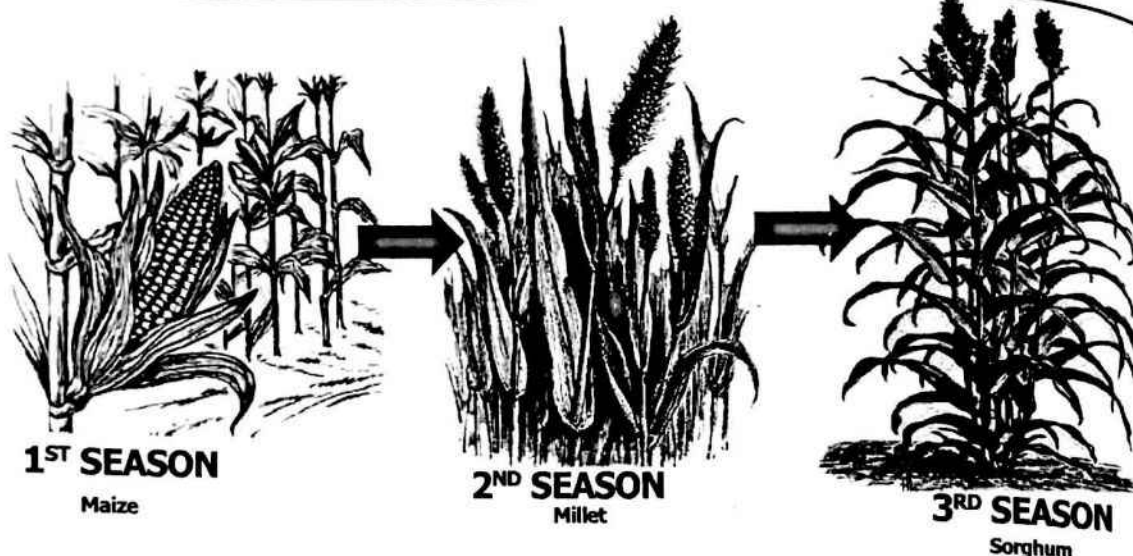
Leaching leads to loss of plant nutrients from topsoil.

It makes nutrients sink into deeper soil layers where plant roots cannot reach.

Monocropping/monoculture

Monocropping is the growing of the same type of crops on the same piece of land season after season. e.g.

1st season	2nd season	3rd season
maize	millet	sorghum



Nutrients for the crop being monocropped get used. This causes poor yields and affects soil.

SOIL CONSERVATION

Soil conservation is the practice of protecting soil from erosion and degradation to maintain its fertility and sustainability.

Methods of soil conservation.

Crop rotation, planting trees, mulching, applying fertilisers, agroforestry and terracing

Crop rotation

Crop rotation is the growing of different types of crops on the same piece of land season after season.

Different crops take different types and amount of nutrients from the soil.

1st season	Maize	cassava	Soya beans
2nd season	cabbage	Ground nuts	Millet
3rd season	cassava	Beans	Bush fallowing

Factors to consider before practising crop rotation

❖ Depth of the plant roots.

Crops with deep roots should alternate with those having shallow roots.

Reason. To prevent competition for plant nutrients into the soil.

❖ Type of crops to be grown.

Crops of the same type should not follow each other when planting seeds.

Reasons. To prevent competition for plant nutrients.

To prevent soil exhaustion due to monocropping.

❖ Resting period for the soil.

Bush fallowing is the practice of leaving land to rest for some time.

It enables land to regain/restore its fertility.

❖ Presence of legumes.

Legumes should alternate with other crops.

Legumes help to add nitrogen into the soil. In this way, they improve soil fertility

Advantages of crop rotation.

-It improves soil fertility.

Legumes grown during crop rotation help to add nitrogen into the soil.

-It controls crop pests and diseases.

It starves pests to death.

It breaks down the life cycle of pests.

-It controls the growth of weeds. Cover crops grown in crop rotation cut off sunlight supply to weeds.

A sample of crop rotation design



1ST SEASON
Maize (Cereals)



2ND SEASON
Ground nuts
Legumes



4TH SEASON
Bush fallowing
Resting Period



3RD SEASON
Sweet potatoes
Tuber crops

Evaluation activity 5.6

1. The table below shows crop farming practices. Study use it to answer the questions that follow.

A			B			
1 st season	2 nd season	3 rd season	Seasons	1 st season	2 nd season	3 rd season
maize	millet	sorghum	Crops	Wheat	peas	carrots

- Name the crop growing practices marked **A** and **B**.
 - Why are peas included in the crop growing practice marked **B**?
 - State any **one** way in which the crop growing practice marked **A** affects the soil?
- How does leaching reduce soil fertility?
 - Give any **one** harmful effect of polythene bags to soil.
 - In which **one** way does crop rotation help to improve soil fertility?
 - Give any **one** factor to consider when planning for crop rotation.
 - What is meant by the term soil exhaustion?
 - Why should bush fallowing be practiced in crop rotation?

SOIL FERTILITY

Soil fertility is the ability of soil to support plant growth.

Components of a fertile soil are; presence of mineral salts, air, water, humus and organisms.

Ways of improving soil fertility are; applying fertilisers, mulching the soil, crop rotation, planting trees, agroforestry and growing legumes.

Ways how soil loses its fertility are; through soil erosion, monocropping, leaching and bush burning

Fertilisers

Fertilisers are substances put in the soil to boost its ability to support plant growth.

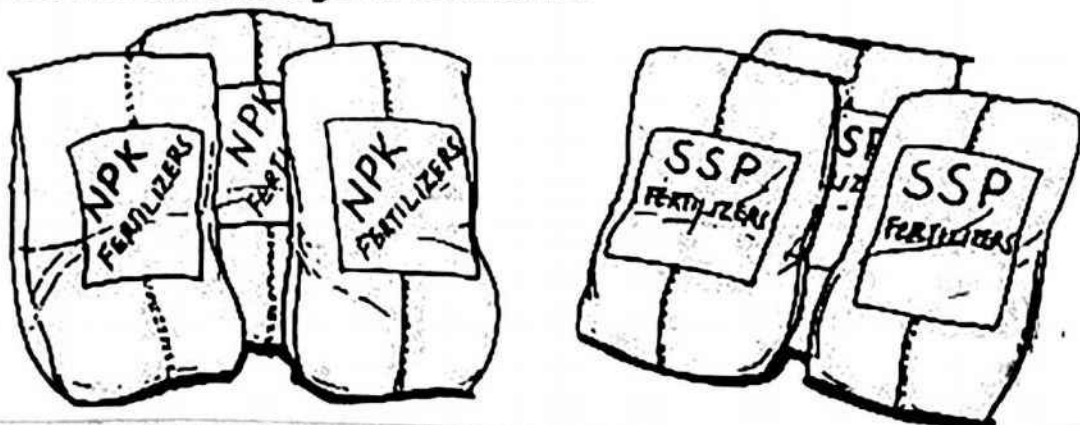
Classes/groups/types of fertilisers are; artificial fertilisers and natural fertilisers

Artificial fertilisers

These are plant nutrients made from chemicals in factories.

They contain large quantities of plant nutrients.

They are also called **inorganic fertilisers**.



Groups of artificial fertilisers are; straight fertilisers and compound fertilisers. **Straight fertilisers** supply one nutrient to the soil.

Examples are; single superphosphates, nitrogen fertilisers, phosphorus fertilisers, potassium Fertilisers, lime fertilisers, double superphosphate and potassium chloride.

Compound fertilisers supply more than one nutrient into the soil.

Examples are; CAN fertilisers, NPK fertilisers and Diammonium phosphate fertilisers

Advantages of artificial fertilisers	Disadvantages of artificial fertilisers
-They have high nutrient content. -They are easy to handle, use and store. -They easily dissolve in water in the soil. -They respond very fast if correctly applied. -They supply large quantity of soil nutrients. -They provide the needed nutrient effectively.	-They can easily leach into the soil. -They kill soil organisms. -They need special skills to use them. -They stay in soil for a shorter time. -They destroy soil texture and structure when overused. -They make soil acidic when overused.

Natural fertilisers

These are plant nutrients which are formed from decomposed plant and animal matter.

They are also called **organic fertilisers/manure**.

Examples/types of natural fertilizer are;

compost manure, farmyard manure, green manure and organic mulches

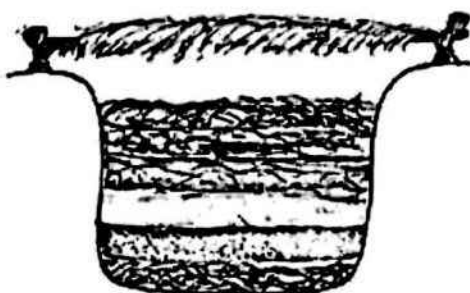
Compost manure

It is got from remains and animal wastes and household wastes after they have decomposed.

Components of compost manure

plant leaves, banana peelings, dry grass, leftover food and household refuse.

Methods of making compost manure



Pit method



heap method

Farmyard manure.

It is got from animals wastes like cow dung, chicken dropping, goat droppings and urine.

These materials can be got from coops, kraal/byre, hutch and barn.

The quality of farmyard manure depends on;

- ✓ The type of animals where manure is got.
- ✓ The type of feeds given to the animals.
- ✓ The level of protection given to the animals.
- ✓ The age of animals.
- ✓ The health state of animals.

Green manure

It is got from decayed leguminous plant materials such as leaves.

Legumes are used because they have high nitrogen content.

Legumes are suitable for making green manure during flowering stage.

Reason. They still contain nitrogen at flowering stage.

Organic mulches

These are plant materials used for mulching. Mulches rot and form humus.

Examples of mulches are; dry grass, dry maize stalks, dry coffee husks and dry banana leaves.

Advantages of natural fertilisers	Disadvantages of natural fertilisers
-They stay longer in the soil. -They are rich source of humus to the soil. -They improve on soil structure. -They are cheap to make. -They do not pollute the soil. -They provide a variety of plant nutrients.	-They are tiring to make. -They produce bad smell in the environment. -The nutrients take long to be released into the soil. -It takes a long process to make. -They take a lot of space when making. -They are difficult to carry to the garden. -They should be applied in large amounts.

Advantages of using natural fertilisers over artificial fertilisers.

- Natural fertilisers are cheap while artificial fertilisers are expensive.
- Natural fertilisers stay longer in the soil than artificial fertilisers.
- Natural fertilisers improve soil structure and texture unlike artificial fertilisers.
- Natural fertilisers provide a variety of nutrients while artificial fertilisers provide limited nutrients.
- Natural fertilisers do not pollute the soil while artificial fertilisers kill soil organisms when over used.
- Natural fertilisers do not require skilled labour while artificial fertilisers need skilled labour.

Advantages of using artificial fertilisers over natural fertilisers.

- Artificial fertilisers have a higher nutrient content than natural fertilisers.
- Artificial fertilisers are easier to handle, store and use than natural fertilisers.
- Artificial fertilisers respond faster to plants than natural fertilisers.
- Artificial fertilisers are easier to carry to the garden than natural fertilisers.

Methods of applying fertilisers in the garden

Method	How it is applied
Broadcasting	The fertilisers are spread all over the garden before preparation of the garden. This method is suitable for crops like millet, sorghum and wheat.
Placement	The fertilisers are put into planting holes together with seeds and covered.
Top dressing	The fertilisers around the plant or in a ring form.
Spraying	The fertilisers in liquid form are mixed and then sprayed using knapsack sprayer.



Top dressing



Broadcasting



Spraying

Placement



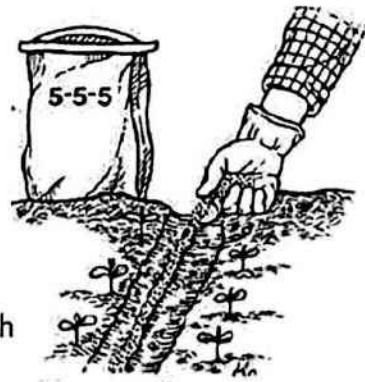
Placing seeds in the hole



Adding fertilizers in the hole



Covering the seeds and fertilisers in the hole with soil.



Placement

Making compost manure (project)

1. Choose a good place to make the compost pit.
2. Clear away bushes and weeds.
3. Dig a pit of about one metre deep and two metres wide.
4. Put the materials collected such as dry grass, leaves, maize stalks, farmyard manure, soil and arrange them as follows from bottom to top.
 - (a) Put hard leaves like hedge cuttings or maize stalks at the bottom of the pit.
Hard leaves help to trap nutrients
Hard leaves allow air to get in the compost material to rot quickly.
 - (b) Add to it fresh grass, leaves and kitchen waste material.

Making compost manure (project) continued

- (c) Put some farmyard manure to provide the organisms that cause decaying of matter.
Ash and sawdust can be added to improve on the nutrient content of the manure. This is mainly potassium.
- (d) Add a layer of topsoil to the decaying material.
Soil helps to maintain moisture and warmth in the pit or heap.
- (e) Turn the material in the pit from time to time to make sure all materials rot.
- (f) If the compost is made during dry season, water should be sprinkled on it. Water speeds up rotting of organic matter.
- (g) Put a stick to reach the bottom to check if the materials are completely decomposed.

Summary of the steps followed when making compost manure.

- (i) Collect the home refuse into a pit.
- (ii) Spread soil over the compost matter (home refuse) and sprinkle water over it.
- (iii) Cover the compost matter in a pit and keep turning the heap every after 14 days until it is ready.
- (iv) Spread the manure on the ground to cool for use.

Evaluation activity 5.7

- 1. Name the group of annual crops suitable for making green manure.
- 2. State any **two** ways of improving soil fertility.
- 3. At what stage are legumes suitable for making green manure?
- 4. Name any **two** methods of making compost manure.
- 5. (a) Give any **two** examples of natural fertilisers.
(b) State any **two** ways in which natural fertilisers are better than artificial fertilisers.

The diagram below shows a sack of fertilisers. Use it to answer questions 6 and 7.



- 6. Identify the type of fertilisers shown in the diagram above.
- 7. State any **one** advantage of using the type of fertilisers shown above.

The diagram below shows a type of soil erosion. Use it to answer questions 8 and 9.



- 8. Name the type of soil erosion shown above.
- 9. Mention the agent that leads to the occurrence of the type of soil erosion above.
- 10. State the importance of adding the following substances in the compost pit:
(i) Ash (ii) Farmyard manure
- 11. Which form of organic fertilizer is obtained from chicken droppings?

MEANING OF KEY TERMS IN SOIL

Soil: The top layer of the earth's surface.

Humus: Rotting organic matter in soil.

Soil drainage: The ability of soil to allow water flow through it.

Soil texture: The size of particles that make up the soil.

Soil structure: The way how soil particles are clumped together.

Soil porosity: Refers to pores within the soil.

Soil capillarity: The rising of water through the soil.

Soil erosion: The removal of topsoil by its agents.

Soil fertility: The ability of soil to support plant growth.

Decomposition: The rotting of organic matter.

Weathering: The breakdown of rocks into small particles.

Pedogenesis: The process of soil formation.

Mulching: The covering of topsoil using dry plant materials.

Crop rotation: The growing of different types of crops in the same garden seasonally.

Monocropping: The growing of the same type of crops on the same piece of land seasonally

Agroforestry: The growing of crops alongside trees on the same piece of land.

Contour ploughing: The practice of growing crops across the slope.

Ceramics: The products made from the clay soil.

Pottery: The craft of shaping and firing clay to create ceramic objects like pots.

Contour planting: The planting of crops across the slopes following contour lines.

Fertilisers: Substances put in the soil to boost its ability to support plant growth

THEME:

MATTER AND ENERGY

TOPIC : 6 HEAT ENERGY

MATTER

Matter is anything that has mass and volume.

Mass is the quantity of matter in an object.

Volume is the amount of space occupied by an object.

Matter is made up of small particles called **molecules**.

Properties of matter

A property of matter is a way of describing matter.

(i) Matter has weight.

(ii) Matter occupies space.

(iii) Matter exerts pressure.

Mnemonic used: **WEO**

An experiment to show that matter has weight

Materials needed: 2 balloons of the same size, 1 stick and 2 strings

Steps taken:

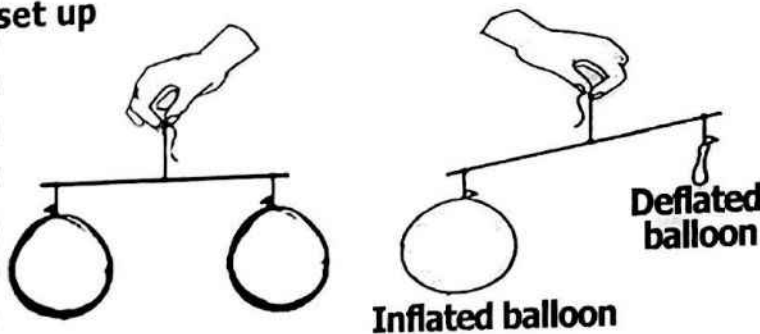
(i) Blow up air into two balloons of the same size.

(ii) Tie one balloon to each end of the stick using a short string.

(iii) Tie a long string around the middle of the stick and allow it to hang

(iv) Prick/pierce/pop one balloon using a pin

set up



Observation

The stick tilts towards the side with the inflated balloon.

Reason: the air inside the inflated balloon has weight.

Conclusion: Matter (air) has weight.

Note:

► The stick is tied in the middle allowed to hang to make it balance.

► The **short strings** hold the balloons on the stick.

► The **stick** holds the balloons on the stick.

An experiment to show that matter occupies space

Materials needed:

Water, basin, glass

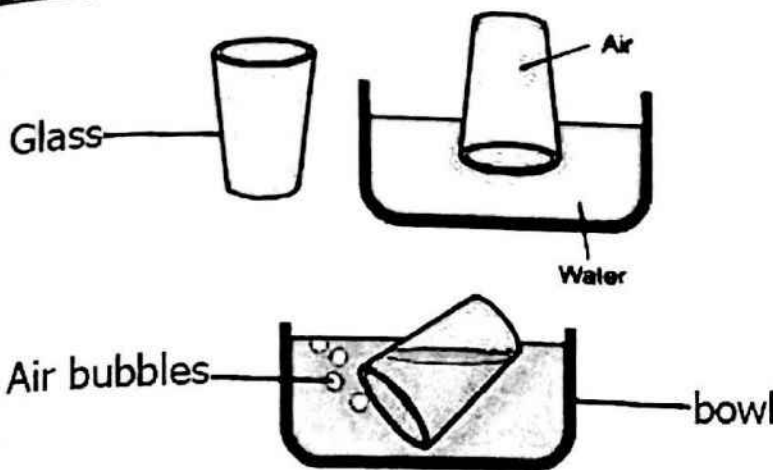
Steps taken:

(i) Pour water into the bowl.

(ii) Invert the glass into water

(iii) Tilt the glass to see the air bubbles coming out of the glass.

Set up



Observation

Bubbles of air start coming out of the glass as water enters it.

Points to Note:

In diagram 1, the water does not enter the glass.

Reason. The space inside the glass is occupied by air.

In diagram 2, the air

bubbles escape.

Reason. The space inside the glass has been occupied by water.

In diagram 2, water enters the glass to occupy the space left by escaping air.

Roles of the materials:

Water. To observe displacement caused by the glass.

Glass. To demonstrate that matter takes up the space.

Bowl. To hold the water for the experiment

An experiment to show that matter occupies space

Experiment 2

Materials needed: Water, 2 glasses

Steps taken:

- (i) Fill the glass with water up to its near top.
- (ii) Try to add more water into the glass using another glass.

Observation

- (iii) Water overflows the glass.

Reason. All the space inside the glass has already been occupied.

Conclusion

- (iv) This shows that matter (liquids) occupy space.

Set up



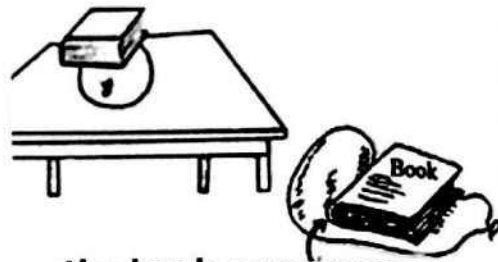
Experiment to show that matter exerts pressure.

Experiment 1

Materials needed: balloon, string and textbook, table

Steps taken:

- (i) Inflate the balloon with air.
- (ii) Tie the balloon to prevent air from escaping.
- (iii) Place it on the table.
- (iv) Place the textbook on the balloon.



the book compresses the balloon

Observation

The textbook exerts pressure on the balloon and it becomes compressed and flattened

An experiment to show that matter exerts pressure

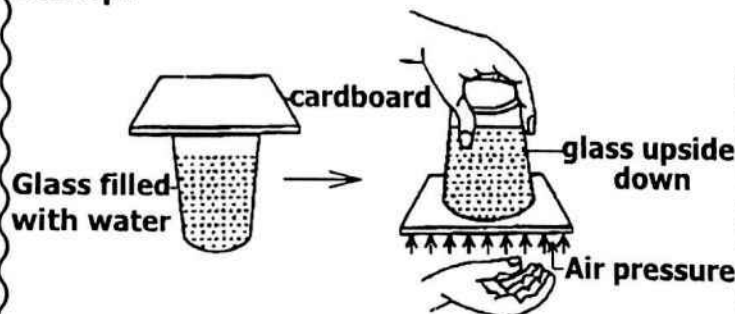
Experiment 2

Materials needed: Water, cardboard and glass

Steps taken:

- (i) Fill the glass with water up to the top.
- (ii) Cover the glass with a cardboard.
- (iii) Turn the glass upside down carefully without pouring water such that the cardboard is placed down.
- (iv) Remove the hands carefully.

Set up:



Observation

Water inside the glass does not pour out of the glass for some time.

Reason: The pressure outside the glass is equal to the pressure inside the glass.

Conclusion.

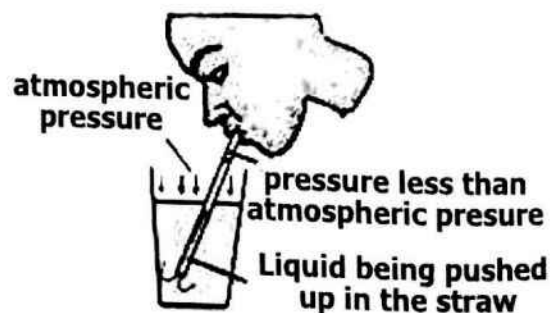
Matter (air) exerts pressure.

Roles of the materials:

Water. It creates air pressure inside the glass.

Glass. It holds water and traps air.

cardboard. Prevents water from pouring by holding air pressure.



An experiment to show that matter exerts pressure

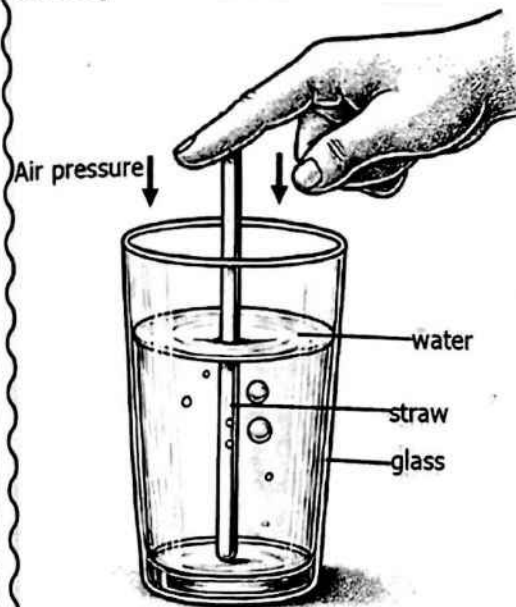
Experiment 3

Materials needed: Straw, glass and water

Steps taken:

- (i) Fill a glass halfway with water.
- (ii) Insert a straw into the water, ensuring part of it remains above the surface.
- (iii) Block the top end of the straw with your finger and lift it out of water.
- (iv) Observe that water remains in the straw, demonstrating that air pressure outside prevents the water from pouring.

Set up:



Roles of the materials in the experiment.

Water. Provides the medium to observe the effect of air pressure.

Glass. Holds the water securely for the experiment.

Straw. Acts as the conduit for trapping water and demonstrating air pressure.

Experiment to show that matter exerts pressure.

Experiment 4

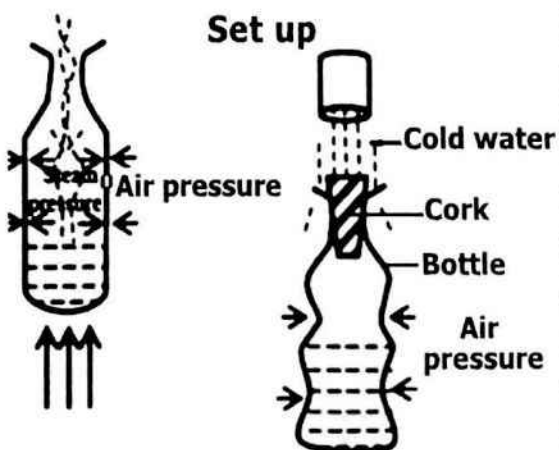
Materials needed: cold water, open bottle, charcoal stove

Steps taken:

- (i) Fill an open bottle with water and heat it.
- (ii) When steam is formed, cover the bottle tightly with the lid to keep steam inside the bottle.
- (iii) Pour cold water on the bottle. The bottle crumples/collapses inside.

Reason. The air pressure outside is greater than the air pressure inside the bottle.

Therefore, the air pressure outside pushes inside and crumples the bottle as there is no air inside to balance it. This shows that air exerts pressure.



 **Point to note:** Ballpoint pens have a small hole on them.

Reason: To allow air to enter the pen so that it exerts pressure on the ink for the pen to continue writing.

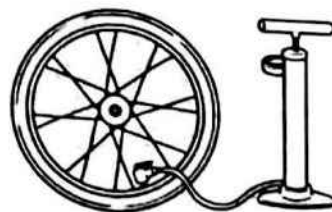
This is why when you write with a pen while that hole is closed, it stops writing after some time.

Importance of the properties of matter in our daily life

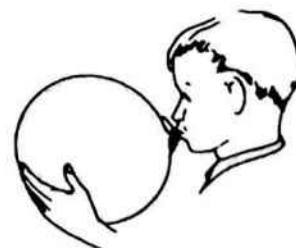
Property of matter	Importance
Matter has weight.	✦ It helps in measuring and carrying objects. ✦ It helps us to know how light or heavy things are. ✦ It helps in buying and selling goods by weighing them. ✦ It helps farmers to measure their harvests.
Matter occupies space.	✦ It helps in filling balloons. ✦ It helps in inflating bouncing castles. ✦ It helps in inflating mattresses. ✦ It is used in air bags. ✦ It helps in breathing in. ✦ It is used in diving equipment.
Matter exerts pressure.	✦ It enables people to drink soda using a straw. ✦ It helps people to draw water from taps and water pumps. ✦ It helps in filling balloons. ✦ It helps vehicle and bicycle tyres to support vehicles and bicycles. ✦ It helps in pumping air into a tyre. ✦ It enables the nurse to use a syringe and get medicine from a bottle. ✦ It enables a nurse to use a syringe to inject medicine into the body.



Drinking water using a straw



Inflating a bicycle tube



Filling air in a balloon

Note: Matter exerts pressure helps in filling balloons.

Reason: When you blow air into the balloon, the air particles push against (exerts pressure) on the inside walls of the balloon, making it to expand.



An inflated bouncing castle



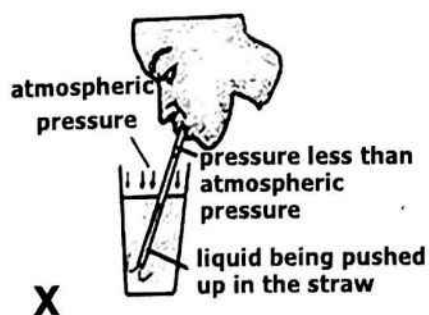
Inflating air into the ball



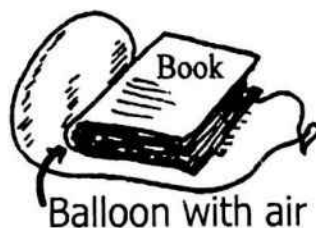
Water flowing from the tap

Evaluation activity 6.1

1. Give the meaning of the term matter.
2. Apart from air, name any **two** other substances that can exist as matter.
3. Give any **one** reason why air is called matter.
4. State any **two** properties of matter.
5. Identify the smallest particles that make up matter.
6. State any **one** difference between mass and volume.
7. The diagrams below show properties of matter. Use them to answer the following questions.



- (a) Identify the properties of matter marked **X** and **W**.
 - (b) Give any way in which the property of matter marked **X** is useful to people.
- Give the reason why water moves up the straw as shown in diagram **W**
- (c) Why does water overflow the glass as shown in diagram **W**?
8. You are provided with the following items;
2 balloons, 2 sticks and 2 strings
Describe how you can use the items to show that matter has weight.
(4 marks)
 9. State the property of matter shown in the diagram below



States of Matter

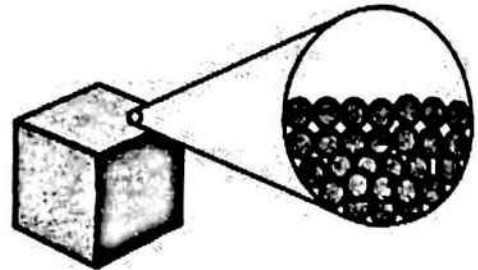
A state of matter refers to the group of matter with the same properties. The states of matter are identified by "**The arrangement of molecules in each state**".

The states of matter are; solids, liquids and gases.

SOLIDS

Physical properties of solids

- ✓ They have closely packed molecules.
- ✓ They have strong cohesion.
- ✓ They have fixed volume.
- ✓ They expand when heated.
- ✓ They allow heat transfer by conduction.
- ✓ They vibrate when heated.



Reasons.

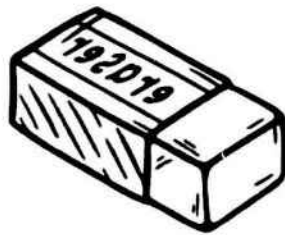
- (i) They have strong molecular bond between their particles.
- (ii) They have closely packed particles.
- (iii) They have strong forces between them.

Substances that exist as solid are;

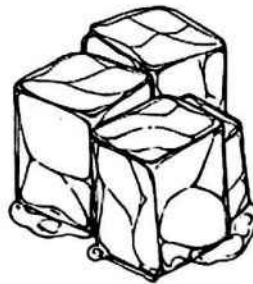
ice, stones, rubber, sugar, salt, sand, metals, wood, glucose, dust, flour, plastics and bricks



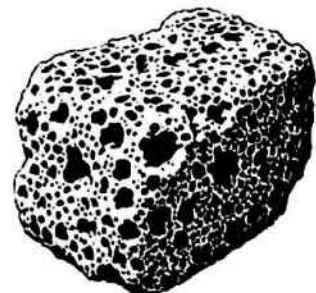
glass



rubber



ice



stone

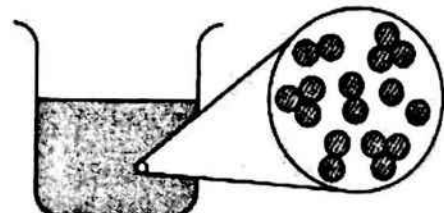
LIQUIDS

Physical properties of liquids

- They have loosely packed molecules.

Reason. Liquids have weak forces of attraction between their molecules.

- They do not have a definite shape.
- They have proper volume.
- They have strong adhesion.
- They allow heat transfer by convection.
- They evaporate when heated.
- They flow when poured.



 **Points to note.**

Liquids are able to take up the shape of the container.

Reason. *They do not have a definite shape.*

Liquids have loosely packed molecules.

Reason. They have weak intermolecular forces which make their molecules to move freely..

Liquids evaporate and flow.

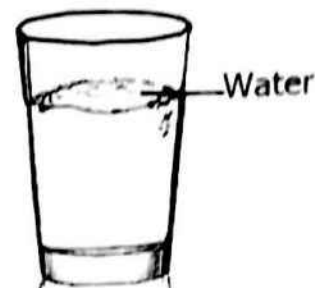
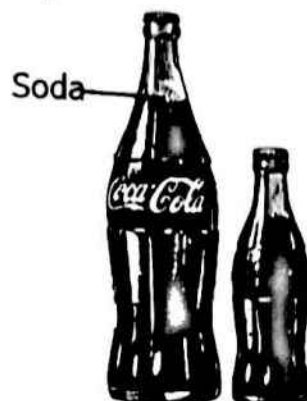
Reasons.

They have weak forces of attraction between their molecules.

Their molecules can freely move.

Substances which exist as liquids

Water, milk,
soda, juice,
beer, paraffin,
porridge,
oil,
petrol and diesel

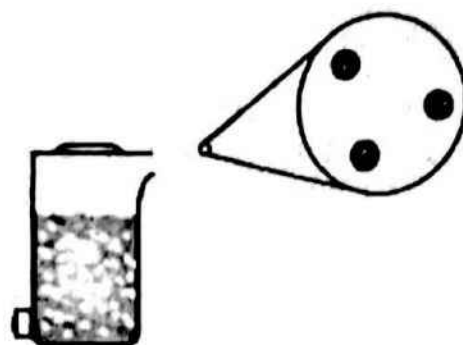


GASES

Physical properties of gases

- Their molecules are far apart.
- They have freely moving molecules.
- They have weakest cohesion.
- They allow heat transfer by convection.
- Their molecules are randomly arranged.
- They are ever moving at a high speed.

Reason. They have a lot of energy



Examples of gases

nitrogen, oxygen, rare gases and carbon dioxide

Substances that exist in gaseous state

Smoke and steam (water vapour)

Similarities between liquids and gases

- ❖ Both allow heat transfer by convection.
- ❖ Both are states of matter.
- ❖ Both have freely moving molecules.
- ❖ Both have spaced arranged molecules.



State	Definite shape	Definite volume
Solids	✓	✓
Liquids	×	✓
Gases	×	×

Don't speak for Quality, let Quality speak for itself

Behaviour of water in matter

Water exists in all the three states of matter.

Reason. The molecular physical properties of water change with the change in temperature.

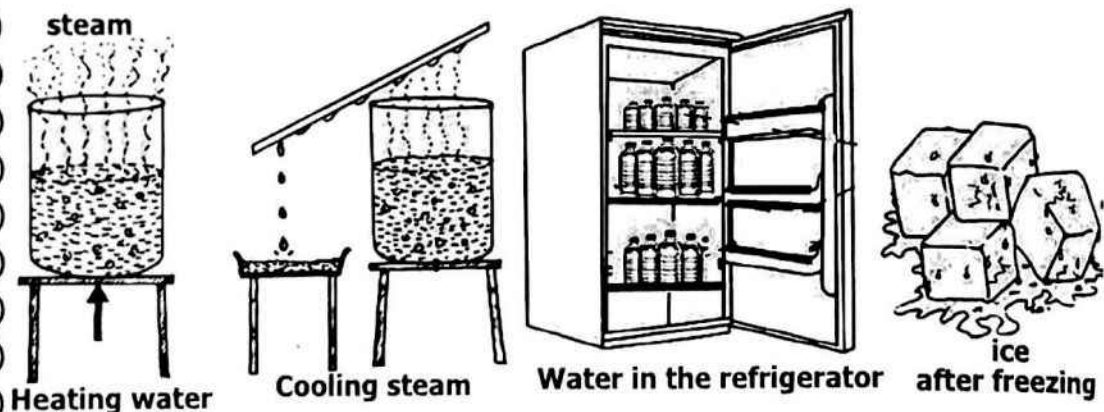
An experiment to show that water exists in all the three states of matter.

Materials needed: Water, charcoal stove, lid, container and refrigerator

Steps taken:

- (i) Heat water until it turns into steam which is a gaseous state.
- (ii) Cool the steam in a container. It will condense and become water which is a liquid state.
- (iii) Keep the water in a refrigerator over the night.
- (iv) It will freeze and become ice which is a solid state.

Set up:



Forces of attraction of matter

Cohesion and adhesion

Cohesion is the force of attraction between molecules of the same substances.

Examples are; water and water and wood and wood

It is strongest in solids.

Importance of cohesion

- It holds rain drops together as they fall.
- It causes formation of water drops when it rains.

Adhesion

Adhesion is the force of attraction between molecules of different substances.
It is strongest in liquids.

Examples are water and glass.

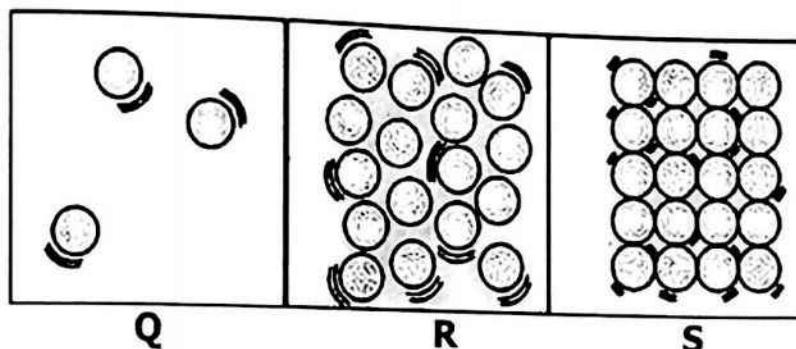
- Water droplets on a glass are held on a glass by adhesion force.

Importance of adhesion.

- It helps glue to stick two papers together.
- It enables white wash to stick on a paper.
- It enables paint to stick on wall.
- It enables ink of a ballpoint pen or marker to stick on a paper.

Evaluation activity 6.2

1. Name the substance that exists in all the three states of matter.
2. In which state of matter is;
 - (i) Porridge?
 - (ii) Steam?
3. The diagrams below show states of matter. Study and use them to answer the questions that follow.



- (a) Name the states of matter marked **Q** and **R**.
 - (b) By what process does heat travel through the state of matter marked **S**?
 - (c) State any **one** property of the state of matter marked **Q**.
4. State any **one** similarity between liquids and gases.
 5. Give any **one** reason why liquids flow and evaporate.

SOLUTES, SOLVENTS AND SOLUTIONS

A solute is a substance that dissolves in a liquid. Solute is soluble in a liquid. Solute is usually solids.

Examples of solutes; salt, sugar and glucose

A solvent is a substance in which a solute dissolves.

Solvents are usually liquids.

Examples of solvents are; water, milk, juice and soda
Water is a universal solvent because it dissolves all solutes.

A solution is a uniform mixture of a solute and a solvent.
Solute + solvent → solution

Examples of solutions are oral rehydration solution and paint.



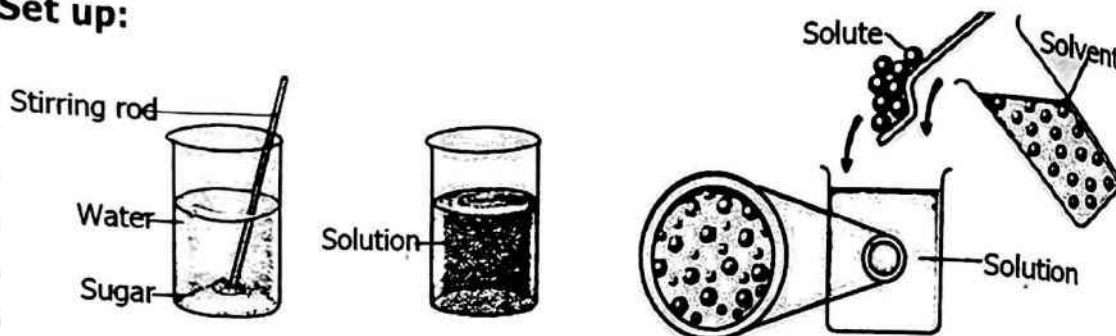
Experiment to show the behaviour of solutes in a liquid

Materials needed: Sugar, water, glass and stirring rod.

Steps taken:

- (i) Pour some water in a glass.
- (ii) Add a spoonful of sugar in it.
- (iii) Stir it completely.
- (iv) Sugar dissolves in water forming a solution.

Set up:



Points to note from the experiment

- When sugar is put in water and stirred;
- Sugar dissolves in water.

Reason. Sugar is soluble in water.

- Sugar acts as a solute while water acts as a solvent.

Insoluble Substances.

These are solids which do not dissolve in liquids.

Examples are; stones, ice, sand.

Some solid substances remain suspended in liquids when they are mixed and stirred. They form a mixture called **suspension**.

Examples are flour, soil dust and chalk dust.

Evaluation activity 6.3

1. Give the meaning of the following terms:
(i) Solute (ii) Solvent
2. Give the reason why water is called a universal solvent.
3. Apart from water, name any **two** other substances that can work as solutes.
4. Mention any **two** substances that can dissolve in water.
5. State the reason why salt dissolves when put in a soup during cooking.
6. State what happens to sugar when it is put in a cup of water and stirred.
7. Tr. Nectar put glucose in water and stirred. Glucose dissolved in water forming a solution.
 - (a) Identify the following from the mixture above.
(i) Solvent (ii) Solute
 - (b) Give the reason why glucose dissolved in water.
 - (c) Name any **one** other substance that behaves like glucose when put in water.

MIXTURES AND METHODS OF SEPARATING THEM

A mixture is a combination of two or more substances which can be separated by physical processes.

Examples of mixtures are; air, alloys, solutions, emulsion, and concrete.

Types of mixtures are; solid mixtures, liquid mixtures and solid and liquid mixtures.

Liquid mixtures are mixtures obtained by combining two or more liquids.

Examples are; water and paraffin, water and alcohol, water and oil and alcohol and mercury

Methods of Separating Liquid Mixtures

Using a separating funnel.

It is used to separate mixtures of immiscible liquids.

Immiscible liquids are liquids which do not mix completely. Such liquids have different densities.

Examples are; water and oil, water and mercury, water and diesel, water and paraffin

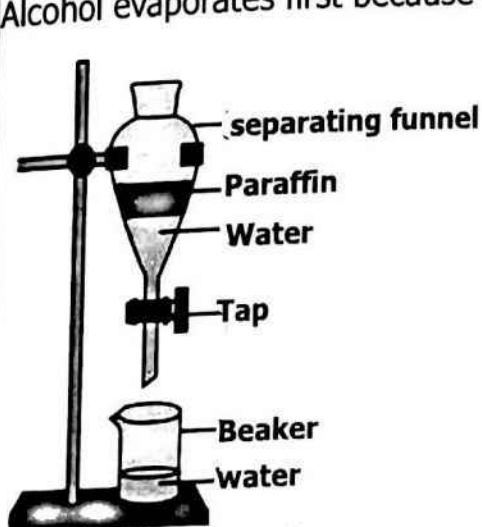
Note: Decantation can also be used to separate liquids with different densities.

Fractional distillation

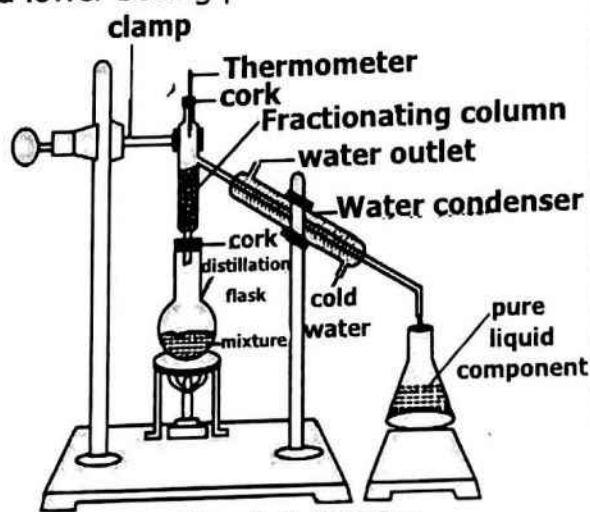
It is used to separate mixtures which mix completely but evaporate at different temperatures because they have different boiling points.

Examples of such mixtures are water and alcohol (ethanol)

Alcohol evaporates first because it has a lower boiling point.



Separating funnel



Fractional distillation

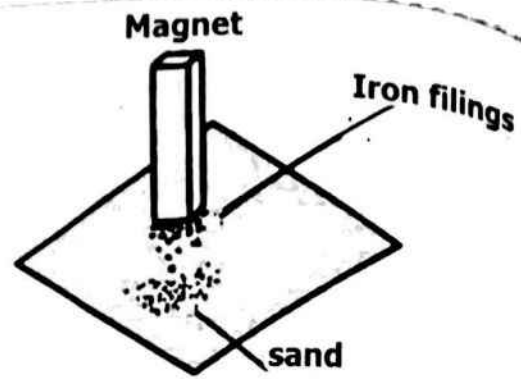
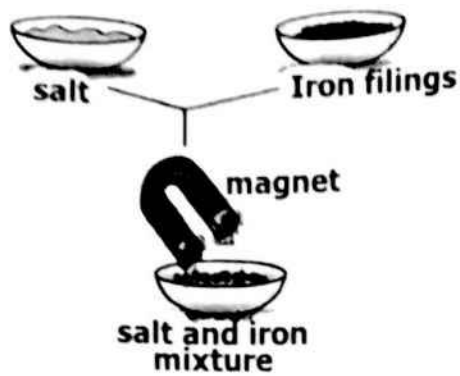
Solid mixtures are mixture formed when two or more solids are combined together.

Examples are; sand and millet, copper and iron filings, beans and rice, millet and husks.

Methods Of Separating Solid Mixtures

Using a magnet: It is used to separate mixtures where one is magnetic while the other is nonmagnetic.

Examples are; sand and iron filings, sugar and iron filings, rice and nails, flour and pins



Winnowing

It is used to separate mixtures with light and heavy particles.

It requires the presence of wind. the substance blown away by wind is called **chaff**

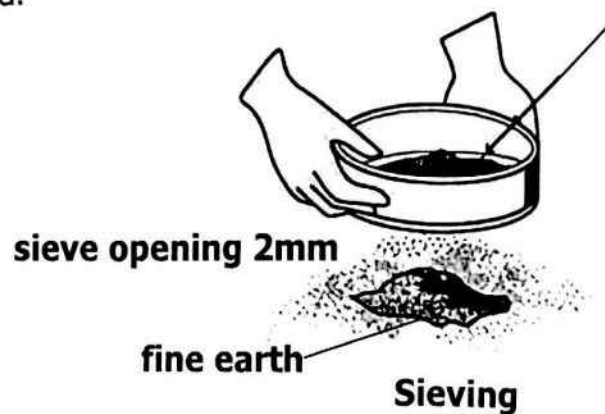
Examples are; millet and its husks, rice and its husks, sorghum and its chaff.

Sieving: It is used to separate big particles from a mixture using a sieve. The sieve keeps bigger particles while the small ones go through.

Example is big stones from sand.



Winnowing



Sorting/hand picking

It is used to separate the solid mixtures with almost the same size.

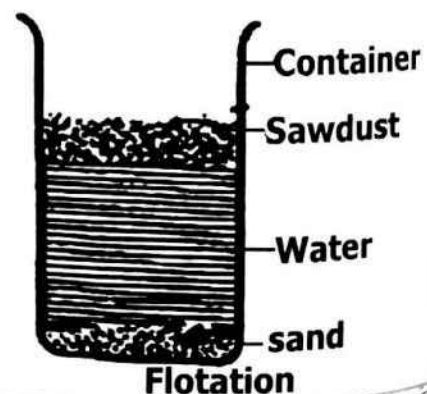
Examples are beans and sand, rice and small stones, maize grains and sand

Flotation: It is used to separate solid mixtures where one substance sinks and the other floats. It is used to separate the mixtures of different densities.

Examples are sawdust and sand, bad beans and good beans



sorting



Flotation

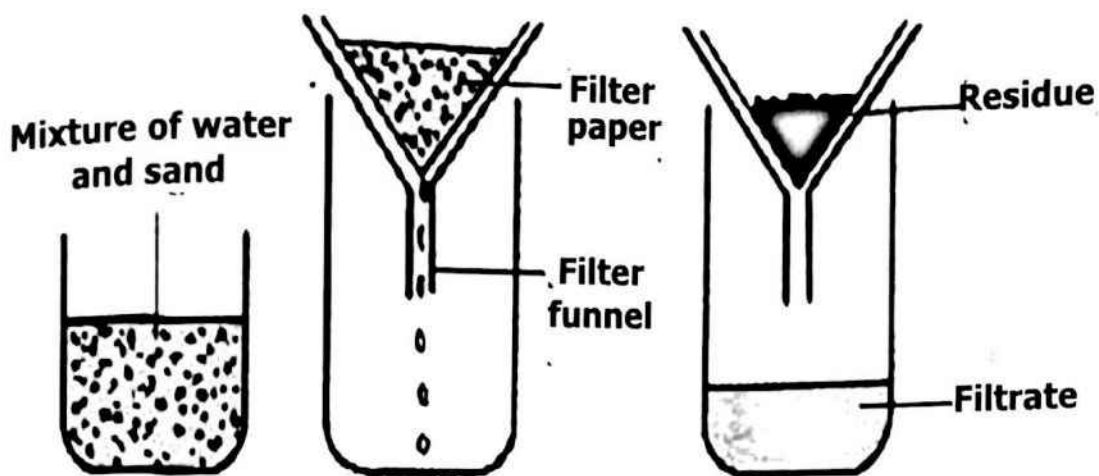
Methods of Separating Liquids and Insoluble Solids

They include filtration and decantation

Filtration

It is used to separate solid insoluble particles from a liquid.

Examples are; water and sand, fruit juice and seeds, tea leaves and tea drink



The clear liquid is called **filtrate**.

The solid particles are called **residues**.

The filter paper traps residues.

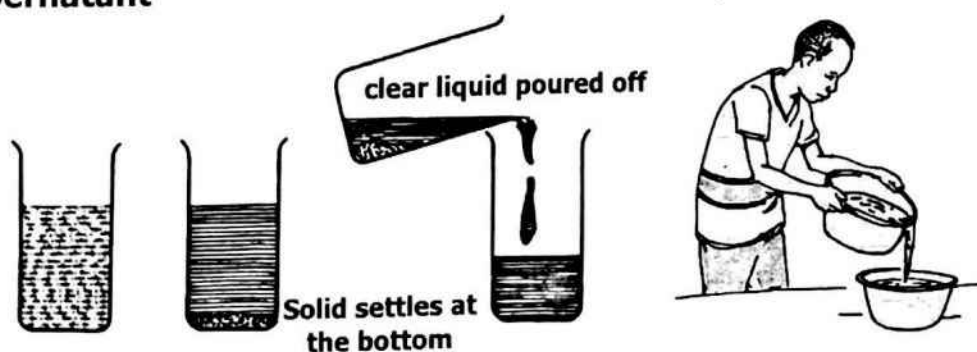
Importance of filtration in our daily life

- (i) It is used to separate fruit juice from seeds.
- (ii) It is used to obtain clean water from muddy water.
- (iii) It is used to make local salt from ash.
- (iv) It is used to separate tea leaves from tea drink.



Decantation

It is used to separate solid particles where solid particles are allowed to settle at the bottom of a container then the clear liquid is carefully poured off into another container. The clear liquid obtained by decantation is called **decantate** or **supernatant**



 **Note well.** Water obtained by decantation and filtration is not safe for drinking. Reason. The water still contains germs. It should be boiled before drinking to kill germs.

Evaporation to dryness

It is used to separate a solute from a solution.

Examples are; salt and sand, sugar and dust

How to Obtain Salt Mixed with Sand

- (i) Put the mixture of salt and sand in a clean container.
- (ii) Pour water in the mixture and stir to dissolve salt.
- (iii) Filter the mixture to obtain salt solution.
- (iv) Boil the salt solution to evaporate water to dryness. Salt crystals are seen.



Summary of the Methods used to Separate Different Mixtures

Method	Mixture separated
Filtration	Fruit juice from seeds
Decantation	Clean water from muddy water
Flotation	Good beans and bad beans
Fractional distillation	Water and alcohol
Evaporation to dryness	Salt and sand
Winnowing	Millet seeds and its husks
Sieving	Big stones from sand
Using separating funnel	Water and paraffin
Using a magnet	Sugar and iron filings
Sorting	Beans and sand particles

Evaluation activity 6.4

1. State the method that can be used to obtain salt that has dissolved in water.
2. State the method that can be used to separate:
 - (i) Fruit seeds in juice. (ii) Millet seeds mixed with its husks.

Evaluation activity 6.4 Continued

3. The diagram below shows a glass container into which water and cooking oil were poured. The two liquids settled as shown. Study and use it to answer the questions that follow.



- Which of the two liquids is represented by **Q** and **R**?
- State any **one** method that can be used to separate the two liquids.
- Why has liquid **Q** settled on top of liquid **R**?

4. The list below shows some of the methods used to separate the mixtures. Study and use it to answer the questions that follow.

sorting, filtration, flotation, fractional distillation

- Identify **two** methods from the list above that can be used to separate solid mixtures.
- Give **one** reason why you would use fractional distillation from the list above to separate the mixture of water and ethanol.
- State any **one** way in which filtration on the list above is important in our daily life.

5. (a) Name the method of separating mixtures used to prepare local salt at home.

- You are provided with the following items; salt and sand mixture, water, clean container, filter paper, spoon and charcoal stove

Describe how you can use the items to recover salt from the mixture.

(3 marks)

ENERGY

Energy is the ability to do work.

Sources of energy are; fast flowing water, the sun, fuels and food

Mechanical energy is the form of energy possessed by a body due to its position. There are two types/forms of mechanical energy i.e.

Kinetic energy, potential energy.

Mechanical energy = Kinetic + Potential energy

Kinetic Energy

Kinetic energy is the mechanical energy possessed by an object or body because it is moving

Instances where kinetic energy is possessed

- A rolling stone.
- A moving car or aeroplane
- Waterfall (flowing water)
- A leaf falling from the tree
- A brick dropping from the wall.
- A kite flying in air.
- Rain
- Wind
- A passenger seated in a moving car.



waterfall



rain



flying aeroplane



Learn, unlearn and relearn. It is wrong to say that passengers seated in a moving car possess potential energy because both a car and the passengers are in the state of motion.

This means both reach their destination at the same time.

Potential Energy

Potential energy is the energy which is stored in a body or object because of its position, shape or state.

Potential energy is called stored energy because it is energy that an object has but isn't being used yet.

For example: a stone up on a hill has energy stored because it can fall

Instances where potential energy can be possessed

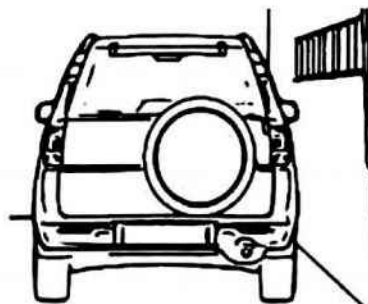
- A stone resting on the ground.
- A person seated on a chair.
- A person sleeping in the bed.
- A parked vehicle, bicycle or motorcycle.
- Stagnant water in a pool.
- A book resting on the table.



← Potential energy



A stone resting on the ground



A parked car



A child sitting on the chair

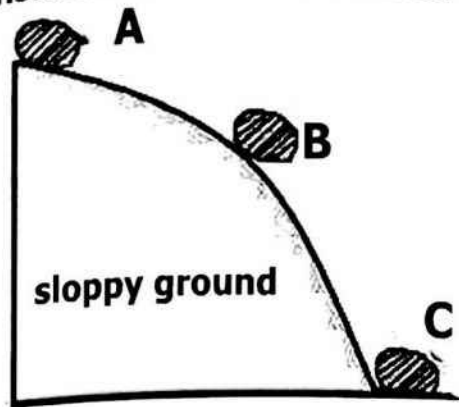


Learn, unlearn and relearn: it is wrong to define potential energy as the type of energy possessed by an object at rest because potential energy depends on an object's position or condition, not whether it is at rest. Note that an object can have potential energy even while moving.

For example. An object can have potential energy while moving if it is in a position

where it can still store energy due to its height or condition, like a pendulum at its highest point during motion or water in a flowing river at a high elevation. Don't forget! The higher the object, the greater its potential energy.

Transformation Of Mechanical Energy



Explanation on the sloppy ground

At **A**, the stone possesses potential energy.

Reason. Due to its elevated position in the gravitational field.

At **B**, the stone possesses kinetic energy.

Reason. The stone is rolling. /It is in motion.

At **C**, the stone possesses potential

energy.

Reason. The stone has reached the ground.

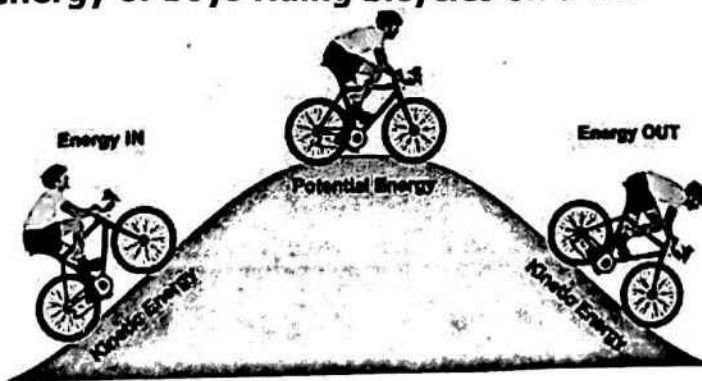
Note: When the stone reaches point C, it experiences heat and sound energy.

Energy changes

At **B** and **C**, kinetic energy to potential energy

At **C**, sound energy to potential energy or heat energy to potential energy.

Mechanical energy of boys riding bicycles on a hill



Bricks piled together in one place

Objects like bricks, possess potential energy depending on their positions or height. The higher the brick, the more potential energy it possesses.



Explanation:

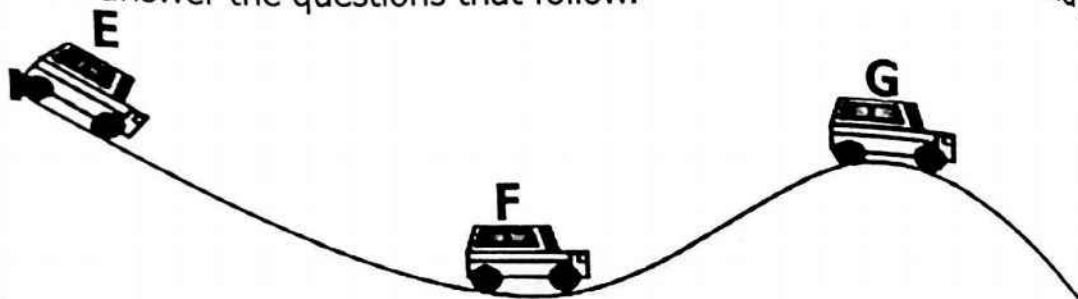
Brick **4** has more potential energy than brick **3**.

Brick **3** has more potential energy than brick **2**.

Brick **2** has more potential energy than brick **1**.

Evaluation activity 6.5

1. State the type of mechanical energy possessed by the jerrycan on the head of a child who is from fetching water walking back home.
2. (a) What type of mechanical energy does a ball have before it is kicked?
(b) State the energy change that takes place immediately the ball is kicked.
(c) Give **two** forms of energy produced by the ball as the goal keeper catches it.
3. The diagram below shows three cars moving on the hilly ground. Study and it to answer the questions that follow.



- (a) Identify the type of mechanical energy possessed by the car at E.
 - (b) Give the reason for your answer in (a) above.
 - (c) State any **one** energy change that takes place to the car at F.
 - (d) Mention any **one** form of energy that is produced by the cars at E, F and G.
4. What type of mechanical energy is possessed by passengers seated in a moving taxi?
 5. How is the kinetic energy of fast flowing water important in Uganda?

FORMS OF ENERGY

- Heat energy
- sound energy
- electrical energy
- light energy
- magnetic energy
- mechanical energy

Characteristics of forms of energy

- (i) They have the ability to do work.
- (ii) They can be transformed into other forms of energy.

HEAT ENERGY

Heat is a form of energy that flows from one place to another due to temperature difference. It flows from a hotter point to a cooler point.

Temperature is the degree of hotness or coldness of an object, body or place. Heat is measured in joules. Heat can also be measured in calories using a calorimeter.

Heat is a form of energy because;

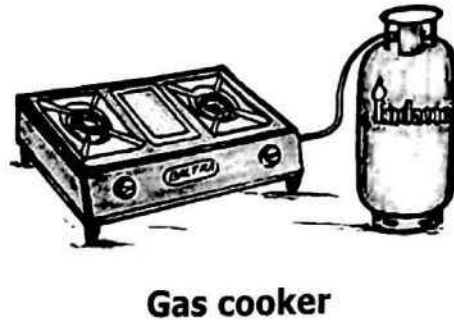
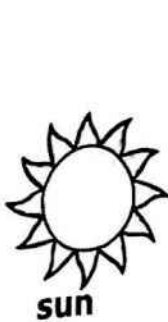
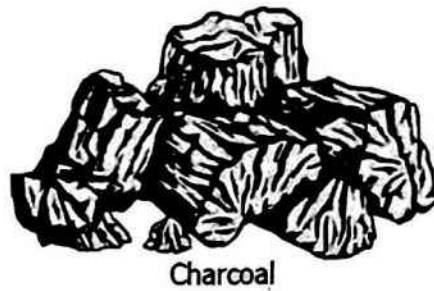
- ✓ Heat has the ability to do work.
- ✓ Heat can be transformed into other forms of energy.

Heat is not regarded as matter because;

- ⚡ Heat does not have volume and mass.
- ⚡ Heat does not have molecules.

Sources of heat

Natural sources	Artificial sources
• the sun • magma • fossil fuels • hot springs • decaying matter	▪ charcoal ▪ friction ▪ candle ▪ electricity ▪ gas cookers ▪ firewood



Point to note. The sun is the main natural source of heat because most of the energy originates directly or indirectly from the sun.

Fuels are substances that produce heat and light when burnt.

Examples are: firewood, petrol, charcoal, coal, diesel, biogas and paraffin

Processes that produce heat.

Burning, decomposition, volcanicity, respiration and fermentation

Ways in which heat energy is important in our daily life

- ✓ It helps to dry harvested crops.
- ✓ It helps in rain formation.
- ✓ It helps to preserve food.
- ✓ It helps in seed germination.
- ✓ It helps in cooking food.
- ✓ It helps in firing bricks.
- ✓ It helps in incubation of eggs.
- ✓ It helps to kill germs.

Ways in which heat helps to preserve food.

- It is used in smoking meat or fish.
- It is used in pasteurization.
- It is used in boiling milk.
- It is used in sun-drying food.
- It is used in irradiation.
- It is used in sterilizing milk.

Processes that require heat energy to take place

Germination, evaporation, sublimation, expansion, melting

Groups of people who use heat in their daily activities

Group of people	How they use heat energy
Blacksmith	• For melting metals. • For shaping metals. • For softening metals. • For forging metals. • For bending metals. • For moulding metals. • For joining metals.

Group of people	How they use heat energy
Crop farmers	▪ For drying harvested crops. ▪ For germination of their seeds after planting. ▪ Helps to form rain which supports crop growth.
Laundry workers// Dhobis	❖ For drying washed clothes. ❖ For ironing clothes.
Fish mongers	• For sun-drying fish. • For smoking fish. • For deep frying fish for sale.
Brick makers	▪ For firing bricks. ▪ For drying wet bricks. ▪ For hardening bricks.
Potters	• For hardening ceramics. • For drying ceramics.
Poultry farmers	▪ For incubating poultry eggs. ▪ For debeaking hens. ▪ For brooding chicks. ▪ For sun-drying poultry feeds. ▪ For boiling eggs for sale. ▪ For roasting chicken for sale.
Cooks	• For cooking food. • For boiling water or milk. • For smoking fish or meat. • For roasting meat.
Herbalists	▪ For boiling herbal medicine. ▪ For sun drying herbal medicine.
Brewers	▪ For distilling alcohol.
Doctors	▪ For sterilizing medical equipment to kill germs on them.

Dangers of heat energy in the environment

- It causes drought.
- Causes plastics to fade.
- It causes drying up of water sources.
- It kills some organisms.
- It destroys crops in the garden.

Evaluation activity 6.6

1. Give the meaning of the following terms:
(i) Heat (ii) Temperature
2. In which units is heat measured?
3. Name the form of energy that enables a primary five pupil to dry his/her school uniform after washing.
4. Mention any **one** process that produces heat energy.
5. Give any one reason why heat is regarded as a form of energy.

Evaluation activity 6.6 CONTINUED

The diagram below shows an item commonly found at home. Study and use it to answer questions 6 and 7.



6. Name the part marked **M**.
7. Give any **one** form of energy produced by the item above.
8. Apart from heat energy, write down any **two** other forms of energy.
9. State any **one** characteristic of forms of energy.
10. State any **two** ways in which each of the following group of people use heat energy in their daily activities.
(i) Laundry worker (ii) Brick maker
11. Give any **two** ways in which people use heat energy to preserve food at home.
12. Give the reason why the sun is regarded as the main natural source of heat in the environment.

EFFECTS OF HEAT ON MATTER

- Heat causes change in temperature.
- Heat causes changes of state of matter.
- Heat causes change in volume of matter.
- Heat causes change in shape of matter.
- Heat causes expansion of matter.

EFFECTS OF HEAT GAIN ON MATTER

- It makes matter to expand.
- It increases the temperature of matter.
- It causes evaporation of liquids.
- It causes melting of solids.
- It causes sublimation.
- It weakens matter.
- It causes change in shape and colour of matter.

EFFECTS OF HEAT LOSS ON MATTER

- It makes matter to contract.
- It reduces temperature of matter.
- It increases the volume of matter.
- It makes steam to condense.
- It causes freezing of liquids.

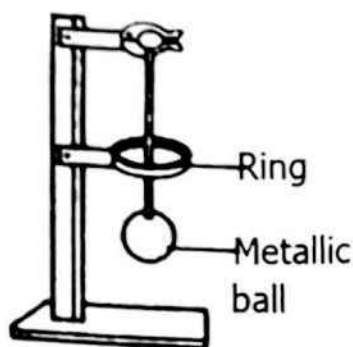
Experiment to show the behaviour of solutes in a liquid

Materials needed: a metallic ball, a ring equipment and a charcoal stove with hot charcoal.

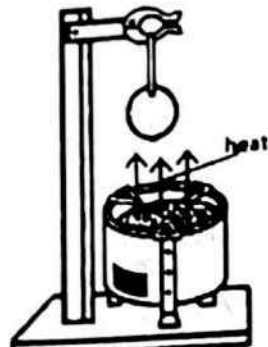
Steps taken:

- (i) Place the metallic ball through the ring to confirm it fits.
- (ii) Heat the metallic ball on the charcoal stove.
- (iii) Try passing the heated ball through the ring. It will not fit.
- (iv) Allow the ball to cool, then pass it through the ring again, it fits showing expansion on heating.

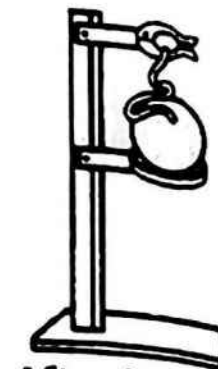
Set up:



Before heating



Heating



After heating



Points to note:

Before heating, the metallic ball passes through the ring.

After heating, the metallic ball does not pass through the ring.

Reason. The metallic ball had expanded on heating.

Conclusion. Metals expand when heated.

In order for the metallic ball to pass through the ring, it should be cooled/
pour water on it.

The charcoal stove provides heat needed to expand the metallic ball.

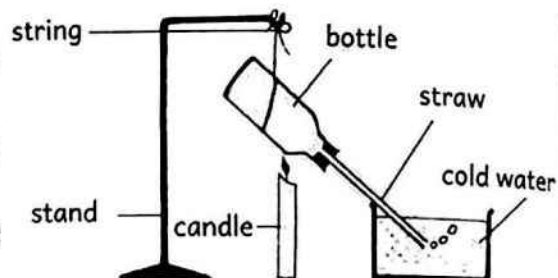
An experiment to show that gases expand when heated

Materials needed: a glass bottle, string, straw, cold water, stand, candle and container

Steps taken:

- (i) Get a small empty bottle.
- (ii) Insert a straw in the mouth of the bottle.
- (iii) Dip the free end of the straw into a container of cold water.
- (iv) Light a candle and heat the bottle gently. Gas bubbles are seen in cold water.

Set up



When inside the bottle is heated, it expands and escapes from the bottle.

Conclusion: Gases expand when heated.

Roles of the materials in the experiment

Glass bottle. It holds the gas to be heated.

String. It attaches the straw to indicate gas movement.

Straw. It acts as a pointer to detect gas expansion.

Cold water. It cools the gas after heating.

Wax candle. Provides heat to expand the gas.

Stand. Supports the bottle during heating.

Container. It holds water for cooling or heating.

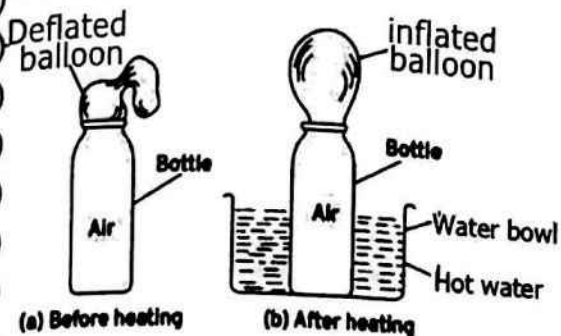
An experiment to show that gases expand when heated

Materials needed: a balloon, hot water in a container and bottle

Steps taken:

- (i) Place the balloon over the mouth of an empty bottle.
- (ii) Place the bottle into the hot water and observe.
- (iii) The balloon inflates, showing that gases expand when heated.

Set up



Roles of the materials in the experiment.

Balloon. It captures and shows expansion of the gas.

Hot water. Heats air in the bottle to make the balloon to expand.

Bottle. It holds the gas to be heated.

Gases have the greatest rate of expansion.

Reason. Their molecules are farther apart and free to move.
A balloon bursts when heated.

Reason. Due to expansion of air inside the balloon caused by heating.



Before heating



After heating

An experiment to show that liquids expand when heated

Materials needed: a bottle, coloured water, straw, warm water and rubber

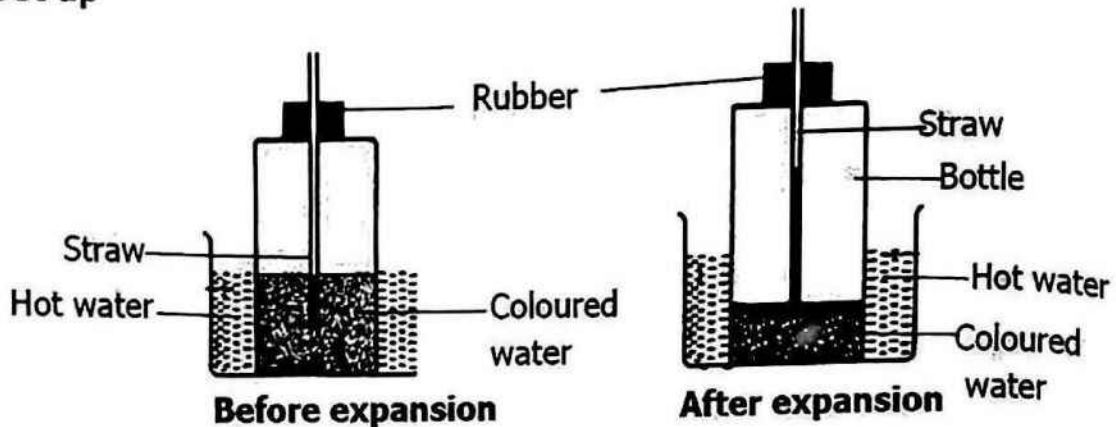
Steps taken:

- (i) Fill the bottle with coloured water.
- (ii) Insert the straw through the bottle's cap, sealing it with rubber.
- (iii) Place the bottle in hot water and observe the coloured water rises in the straw.
- (iv) The rise in the straw shows that the liquid expanded when heated

Set up

An experiment to show that liquids expand when heated

Set up



Remove the bottle from the hot water and let the coloured water cool down. The level of the coloured water in the straw falls/goes down.

Reason. The coloured water contracts due to loss of heat.

Roles of the materials in the experiment

Bottle. It holds the coloured water for the experiment.

Coloured water. It makes the expansion visible.

Straw. Shows the rising level of the water.

An experiment to show that liquids expand when heated

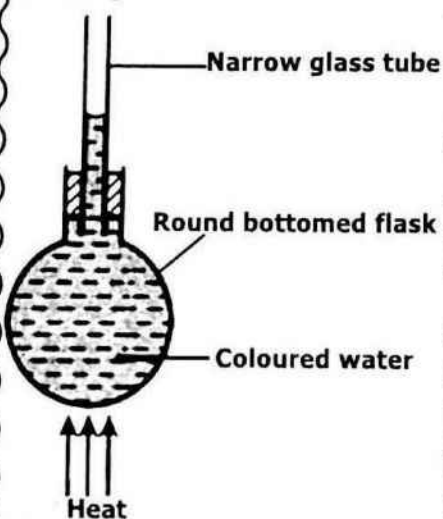
Experiment 2

Materials needed: coloured water, round bottomed flask, narrow glass tube, heat source and cork

Steps taken:

- (i) Fill the round bottomed flask completely with coloured water.
- (ii) Pass a narrow glass tube through the hole of the cork and fix the cork tightly into the flask.
- (iii) Observe the first level of coloured water in the narrow glass tube.
- (iv) Heat the bottom of the flask and observe the new level of coloured water in the narrow glass tube

Set up



Observation:

The level of water in the narrow glass tube first falls and then starts to rise again.

Explanation:

When the flask is heated, the flask gets heated first before the heat is passed to the water inside it.

Therefore, the flask expands first and increases in volume before coloured water, causing a fall in the water level.

However, when heat reaches the coloured water, it expands and increases in volume thus its level starts to rise in a narrow glass tube.

An experiment to show that liquids expand when heated

Experiment 2

Roles of the materials in the experiment

Round bottomed flask. It holds the coloured water for the experiment.

Coloured water. It makes the expansion visible.

Straw. Shows the rising level of the water.

Hot water. It provides heat to cause expansion.

Cork. It prevents escape of heat from the flask.

An experiment to show that liquids expand when heated

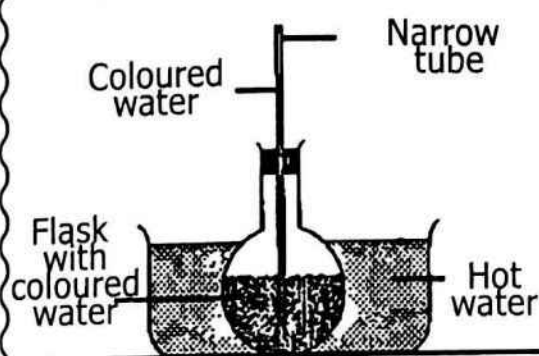
Experiment 3

Materials needed: coloured water, round bottomed flask, narrow glass tube, hot water and cork

Steps taken:

- (i) Fill the flask with coloured water.
- (ii) Fix a narrow tube in the flask using a cork.
- (iii) Place the flask in a container with hot water.
- (iv) Note the first level of coloured water. Observe the new level of water after sometime

Set up



Observation:

- The water in the narrow tube falls immediately.

Reason. Due to expansion of the flask.

- The water rises after sometime.

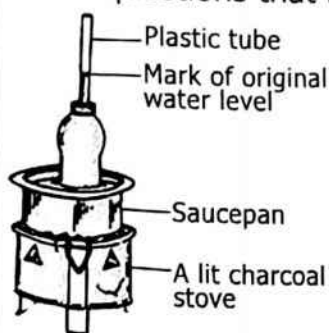
Reason. Due to expansion of the water more than the flask.

States	Effects of heat gain	Effects of heat loss
Solids	✓ It increases the temperature of solids. ✓ It causes melting of solids. ✓ It causes expansion of solids. ✓ It causes solids to sublime.	• It causes contraction. • It causes reduction in size. • It causes reduction in temperature
Liquids	✓ It causes liquids to expand. ✓ It causes liquids to evaporate. ✓ It reduces the volume of liquids. ✓ It increases the temperature of liquids.	• It causes freezing. • It causes reduction in density. • It causes contraction. • It causes increase in volume when frozen.

States	Effects of heat gain	Effects of heat loss
Gases	✓ It causes gases to expand. ✓ It causes gases to contract. ✓ It increases the temperature of gases.	• It causes condensation. • It causes desublimation.

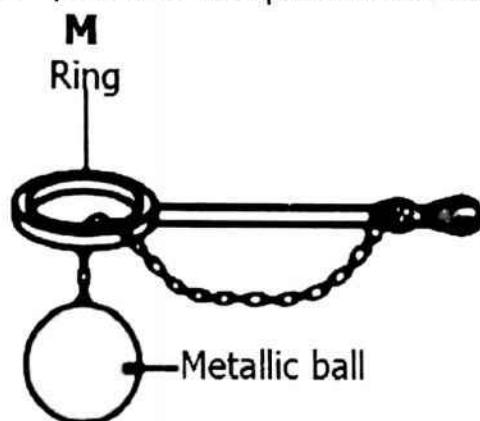
Evaluation activity 6.7

- State any **two** effects of heat gain on matter.
 - Give any **two** ways in which a blacksmith uses heat.
- The diagram below shows an experiment carried out by primary five pupils to demonstrate the behaviour of a certain state of matter. Use it to answer the questions that follow.

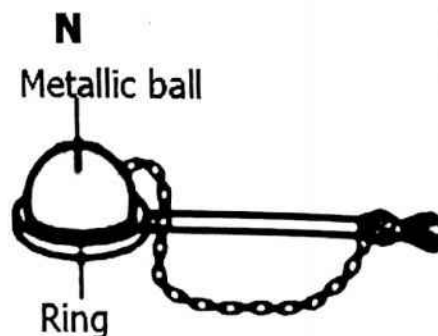


- Name the state of matter demonstrated in the experiment.
- State the reason why primary five pupils demonstrated the experiment above.
- Give the importance of the plastic tube in the experiment above.
- Identify the form of energy required by the primary five pupils to carry out the experiment above.

The diagram below shows an experiment carried out by Chloe. Use it to answer questions the questions below.



Before heating



After heating

- Identify the state of matter affected by heat in the experiment above.
- Give the reason why the metallic ball failed to pass through the ring at N.
- State what should be done for the metallic ball to pass through the ring.
- What does the experiment above show about matter?

Applications of Heat Gain and Heat Loss in Real Life.

Electric wires

Electric wires are loosely fixed between poles.

Reason. To give room for contraction on cold days.

To prevent the wires from breaking due to contraction during rainy weather/cold days.

If electric wires were fixed tightly between poles, they would break due to contraction on cold days.

The electric wires are placed very high up to prevent risks of electric shocks. Wooden poles are used to carry electricity.

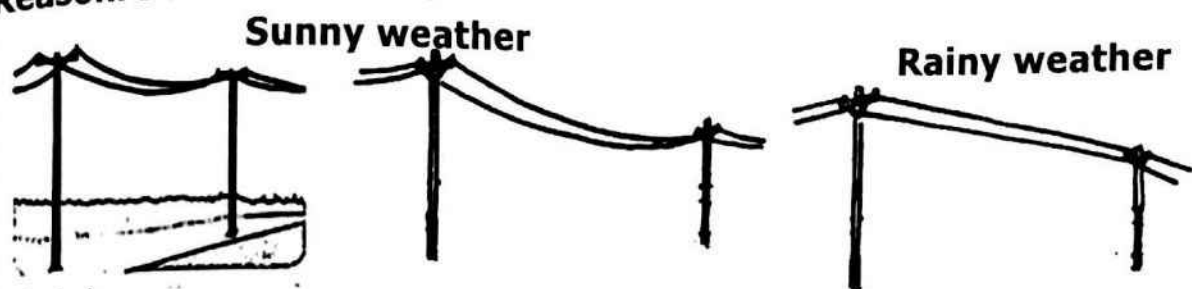
Reason. Wood is an insulator of electricity.

During sunny weather/hot weather, the electric wires appear loose or sagging.

Reason. Due to expansion.

During a rainy weather/cold day, electric wires appear tight.

Reason. Due to contraction



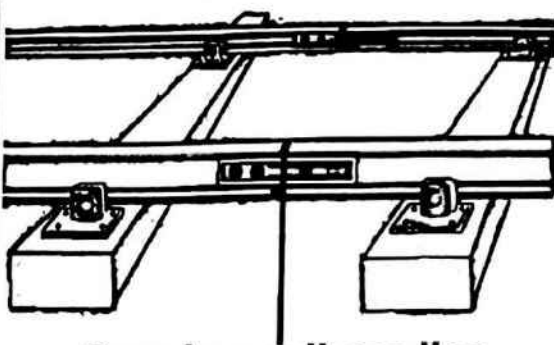
Note: Early in the morning when it is cold, electric wires contract and stretch tight between poles.

In the afternoon when it is hot, they expand and appear loose and sagging.

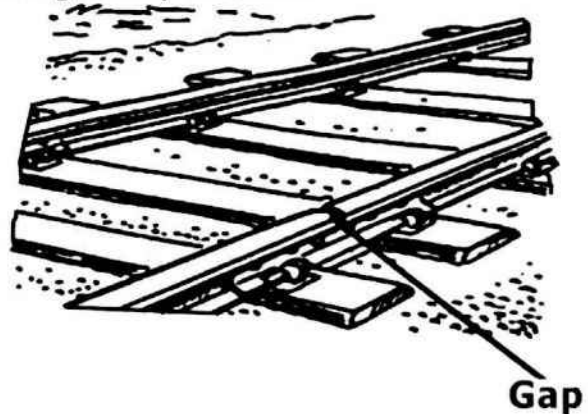
Railway lines

Gaps are left between railway lines during construction.

Reason. To give room for expansion during sunny weather.



Gaps in a railway line



When the temperature is low, the railway lines become straight again.

Note: if the gaps are not left, the rails expand and bend. This would cause railway accidents.

Space left in the bottle of soda

The space is usually left in soda bottles at its brim.

Reason. To give room for increase in volume when soda freezes.



Space

Points to note:

✓ When a bottle of soda is opened, carbon dioxide bubbles out. It is used to preserve soda because it prevents the breeding of bacteria in soda.

✓ When a soda bottle made of glass is put in a refrigerator, the soda freezes. The bottle cracks and breaks.

Reason. Due to increase in the volume of soda as it freezes

✓ When you pour cold water on hot glass/bulb/lantern, it cracks.

Reason. Due to sudden quick contraction of only the hot part of the glass.

✓ A balloon deflates when placed under cold flowing water due to contraction.

General Effects of Expansion and Contraction.

- They can lead to the development of cracks in walls.
- When hot tea is poured into a glass, it cracks because of uneven expansion.
- Expansion can cause the bending of railway lines. This can lead to railway accidents.
- Expansion causes sagging of electric and telephone wires.
- Contraction can cause breaking of electric or telephone wires if they are tightly fixed between poles.
- Balloons inflated and exposed to sunshine burst due to expansion of air inside them when heated.

Evaluation activity 6.8

1. State **one** practice done by railway builders to prevent the rails from breaking due to expansion on hot days.
2. Give **one** reason why electric wires are loosely fixed between poles.
3. Why does a glass bottle of soda crack when left in a refrigerator for a long time?
4. Identify the type of weather that makes electric wires to appear tight between poles.

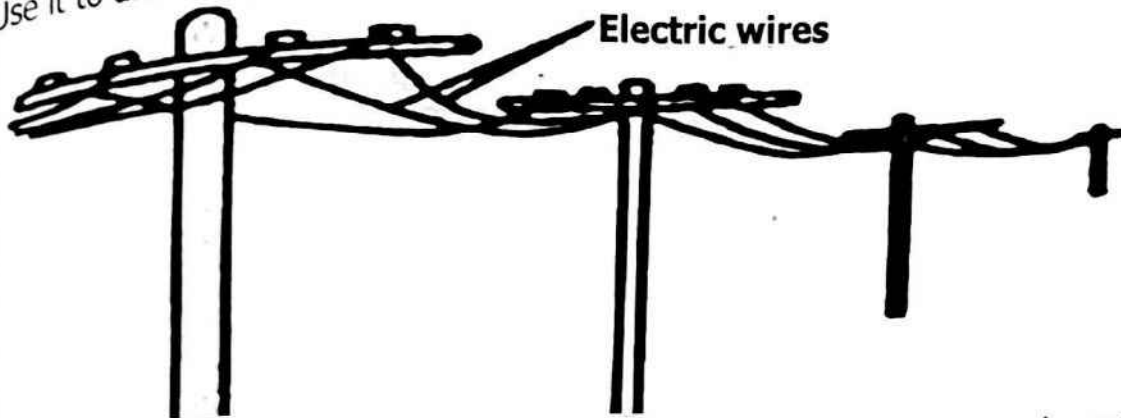
The diagram below shows a bottle of soda. Study and use it to answer questions 5 and 6.



5. Name the gas enclosed in the space marked **D**.

Evaluation activity 6.8 Continued

6. State the reason why soda manufacturers usually leave the space marked **D** when filling bottles of soda.
- The diagram below shows electric wires under a certain weather condition. Use it to answer questions 7 and 8.



7. In which kind of weather condition do the electric wires appear as shown above?
8. Why do the electric wires appear as shown above?
9. State the reason why gaps are usually left between railway lines during construction.
10. Give the reason why telephone wires appear tight during cold weather on poles.

CHANGES OF STATE OF MATTER

Changes of state of matter are caused by the change in temperature.

All changes of state of matter are physical changes.

Some changes of state of matter are caused by heat gain e.g., melting, evaporation and sublimation.

While others are caused by heat loss e.g., freezing, condensation and deposition.

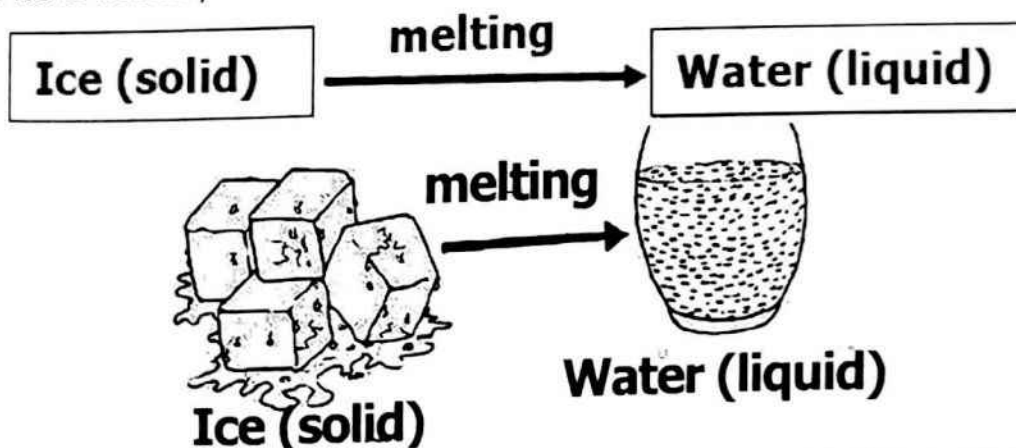
Melting

This is the process by which a solid changes into a liquid.

Examples of substances that melt;

ice, butter, ghee, metals, ice cream, wax, Vaseline

When ice is heated, it melts forming water. Ice is water in solid form.



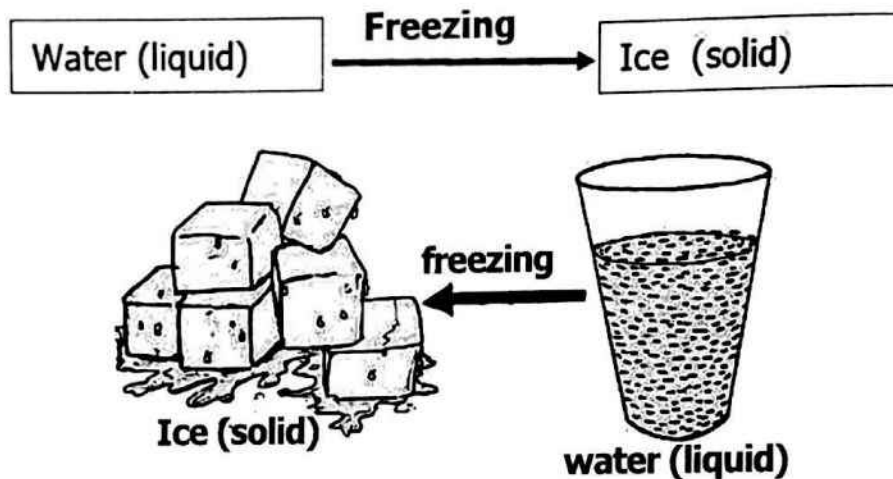
 **Note:** When ice melts; the volume reduces, the density increases and mass remains constant.

Importance of melting in our daily life.

- ✓ It enables people to extract honey.
- ✓ It enables the fuse to work.
- ✓ It enables the blacksmith to forge metals.
- ✓ It is used in ice skating.
- ✓ It enables us to obtain water from ice.
- ✓ It enables people to make alloys.

Freezing

This is the process by which a liquid changes into a solid.
When water freezes at 0°C or 32°F , it becomes ice.



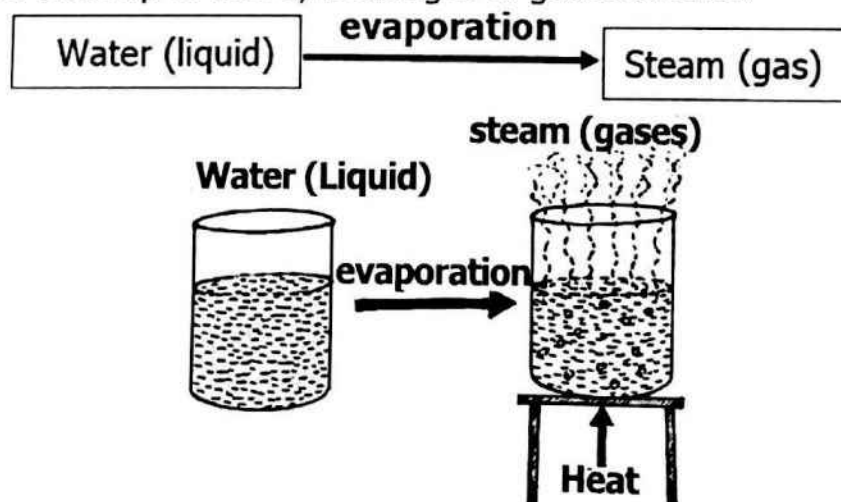
 **Note:** When water freezes, the volume increases, the density reduces and mass remains constant.

Importance of freezing in our daily life

- It is used in preserving food.
- It helps in cooling drinks.
- It is used in making ice cream.
- It helps in the formation of ice.

Evaporation

This is process by which a liquid changes into a gas.
Substances that evaporate include; water, alcohol, petrol and perfume
When water is heated, it changes into steam (water vapour)
When water boils up to 100°C , it changes to gaseous state.



Factors that affect the rate of evaporation

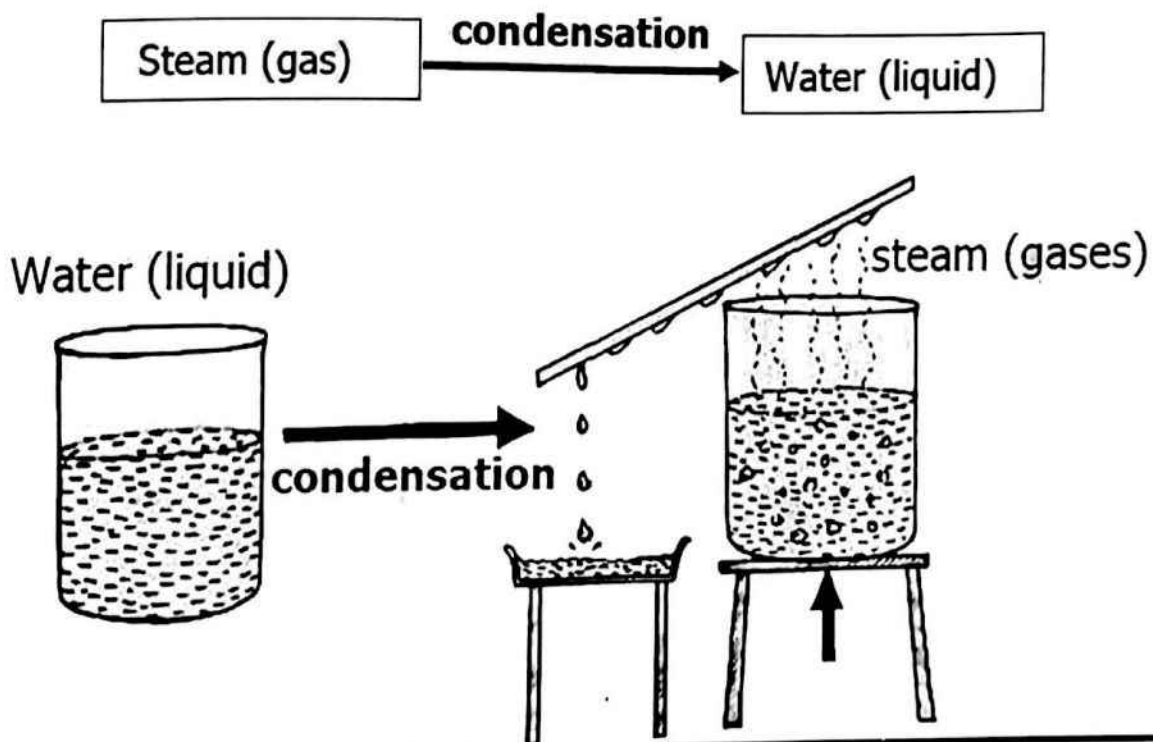
- Amount of heat.
- Temperature
- Surface area
- Speed of wind
- Humidity

Importance of evaporation.

- ✓ It helps in rain formation.
- ✓ It helps in mining salt from lakes.
- ✓ It helps to separate salt or sugar from sand.
- ✓ It helps in distillation process.
- ✓ It helps in cooling.
- ✓ It helps in drying wet clothes.

Condensation

This is the process by which a gas changes into a liquid.
When water vapour cools, it changes into water

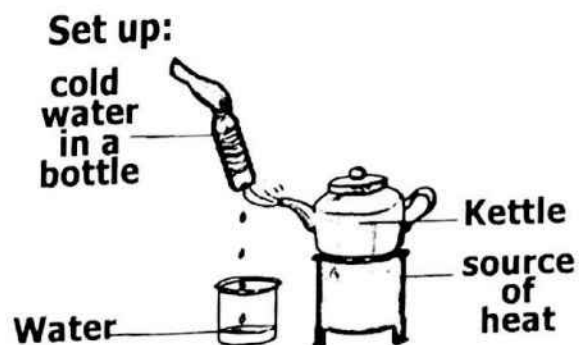


An experiment to demonstrate condensation

Materials needed: a kettle, charcoal stove, water, cup and bottle with cold water

Steps taken:

- Put water in a kettle.
- Boil the water to steam/vapour.
- Put cold water in the bottle.
- Hang the bottle with cold water at the spout of the kettle.



Observation.

Water droplets are formed on the surface of the bottle due to condensing warm air around the bottle. This is due to cold conditions.
The steam/ vapour will turn into liquid. This process is called condensation.

Roles of the materials in the experiment

Kettle: It holds water which is heated to produce steam.

Charcoal stove: It provides heat for the kettle.

Water: It is the source of steam.

Cup: It collects condensed steam.

Bottle with cold water: It cools the steam to condense into water droplets.

An experiment to find out the effect of cooling on air we breathe out

Materials needed: Transparent plastic ruler

Steps taken:

- (i) Open your mouth wide and bring the ruler closer to it.
- (ii) Blow air onto the ruler for about 10 minutes.
- (iii) Droplets of water will be seen on the ruler

Set up:



Observation:

When warm air from the body gets in contact with the cool ruler, it cools down.

On cooling, the air turns into water droplets on the ruler.

This shows that gases condense when cooled.

Formation of dew in the environment.

Dew refers to tiny droplets of water that form at night on the ground and other surfaces or objects out of door.

Dew is formed by condensation of water vapour at night.

Reason. There is low temperature to allow condensation of water vapour in the atmosphere.

Dew disappears during day time by evaporation.

Reason. There is high temperature for water droplets to evaporate.

Importance of dew

- Dew helps in rain formation.

- Dew cools the environment.

Importance of condensation

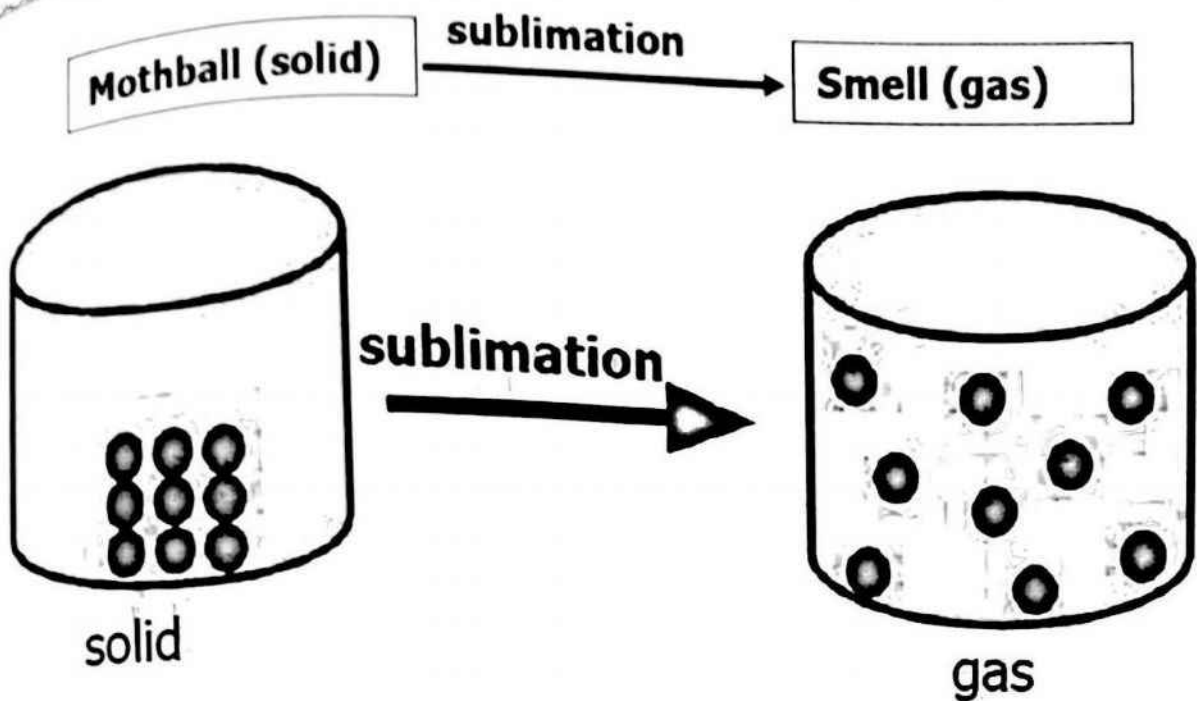
- It helps in rain formation.

- It helps in distillation.

Sublimation

This is the process by which a solid changes directly to a gas.

Examples of substances that sublime; mothballs, dry ice (solid carbon dioxide), incense sticks and urinal cakes.



Importance of sublimation in our daily life

- It enables solid air fresheners to produce pleasant smell in latrines/toilets.
- It enables mothballs put in clothes to produce bad smell against cockroaches.
- It enables burning incense sticks to produce unpleasant smell against mosquitoes.

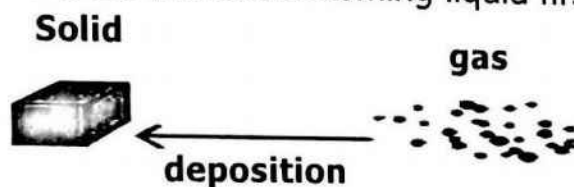
Deposition

This is the process by which a gas changes directly to a solid.

It is also called **desublimation**.

Example: Formation of frost. Here, water vapour in air turns directly into ice crystals on cold surfaces.

Frost is a thin layer of ice that forms on surfaces when water vapour in air directly changes into solid ice without becoming liquid first.

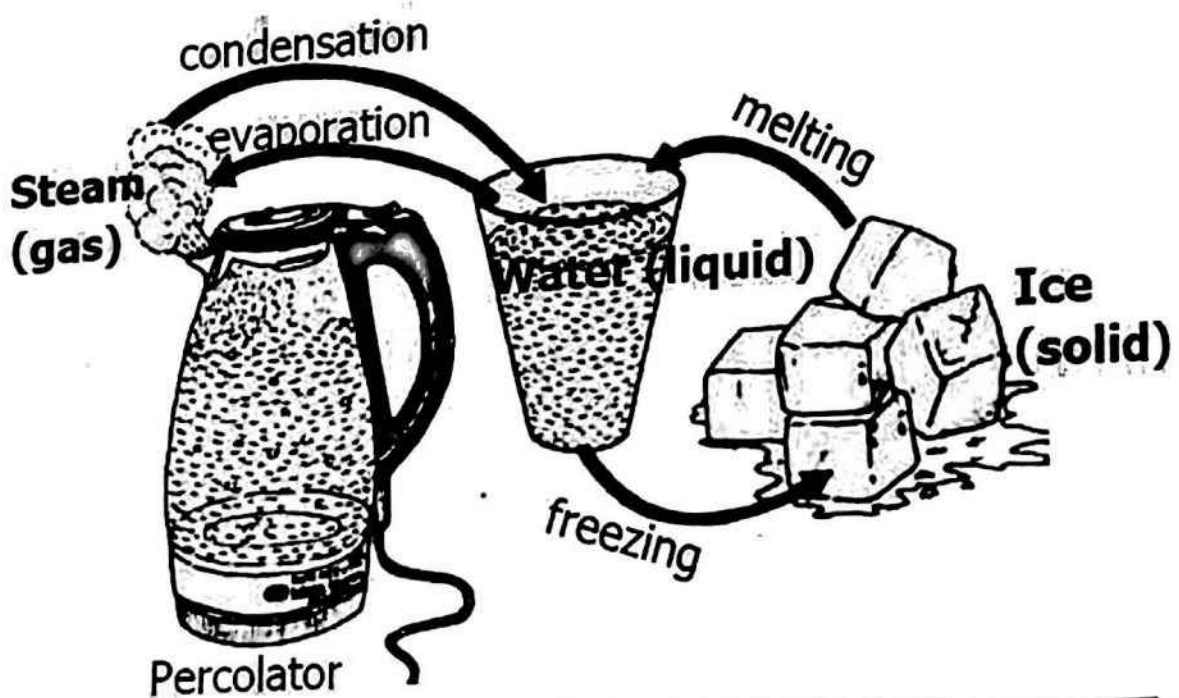
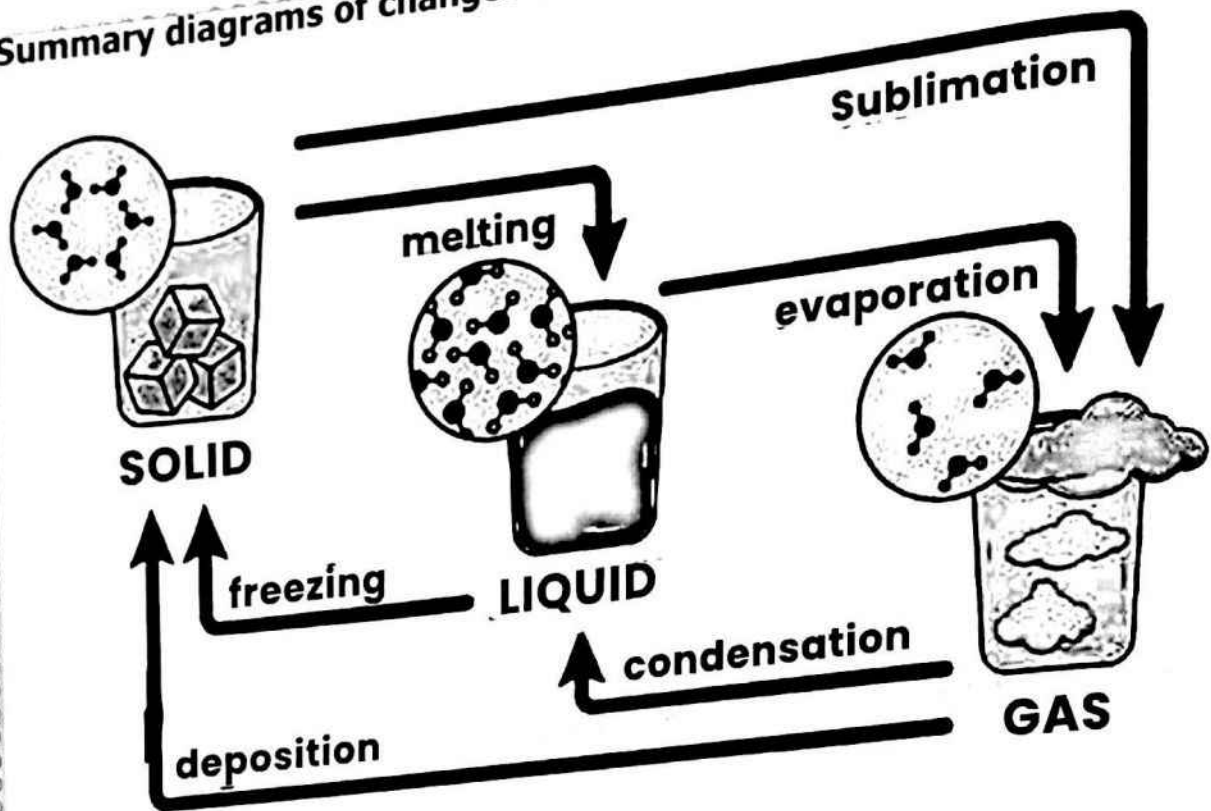


Summary table of changes of state of matter

Starts from	Changes to	Process is called
solid	liquid	melting
liquid	gas	evaporation
gas	liquid	condensation
liquid	solid	freezing
solid	gas	sublimation
gas	solid	deposition

Don't speak for Quality, let Quality speak for itself

Summary diagrams of changes of state of matter

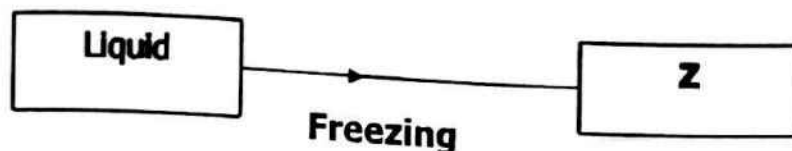


Evaluation activity 6.9

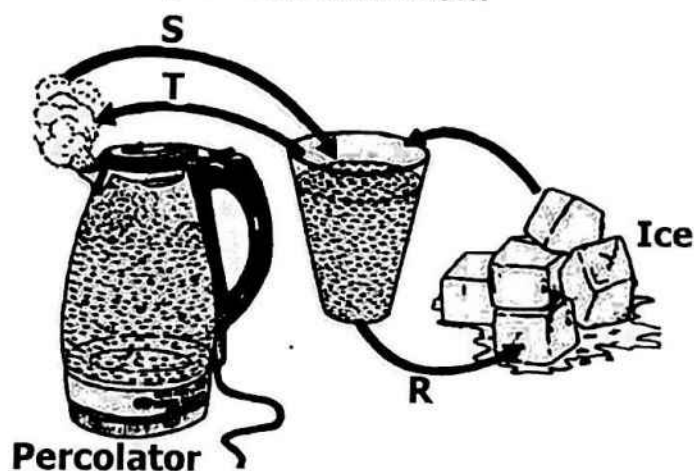
1. Name the form of energy which causes the changes of state of matter.
2. State any **two** factors that affect the rate of evaporation.
3. Write down any **two** changes of state of matter that take place in the absence of heat.
4. Give any **one** way in which evaporation is important in the environment.
5. State what happens to density when ice changes into water when heated.

Evaluation activity 6.9 Continued

The diagram below shows a change of state of matter. Use it to answer questions 6 and 7.



6. Identify the state of matter at **Z**.
7. Name the process by which **Z** changes back to liquid.
8. State what happens to water when the temperature drops to **0°C**.
9. Identify the physical process that leads to formation of the following;
 - (i) Ice
 - (ii) Rainfall
10. The diagram below shows the changes of state of matter. Study and use it to answer the questions that follow.

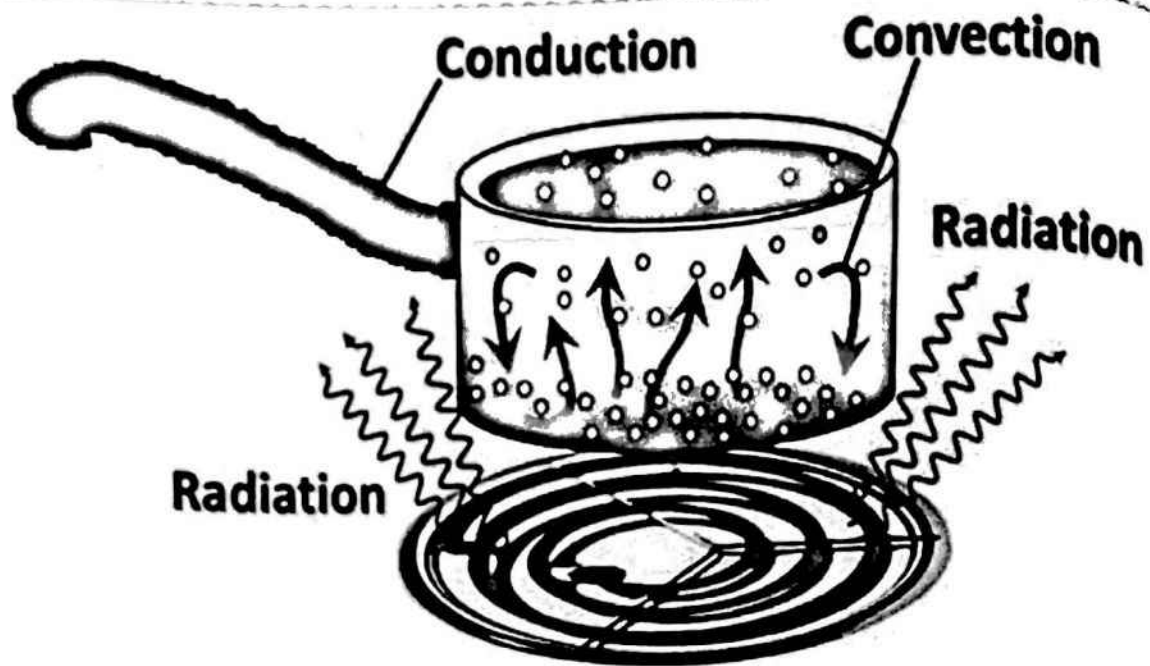


- (a) Name the changes of state of matter marked **R** and **T**.
- (b) State any **one** effect of heat on ice on the diagram above.
- (c) Give any **one** way in which the change of state of matter marked **S** is important in the environment.
11. (a) Name the change of state which takes place when;
 - (i) Vapour changes to liquids
 - (ii) A solid changes directly to gas
- (b) Apart from causing changes of state, give any **two** other effects of heat on matter.

HEAT TRANSFER

Heat transfer is the flow of heat from the source to a cold place or point.

Methods of heat transfer are; conduction, convection and radiation



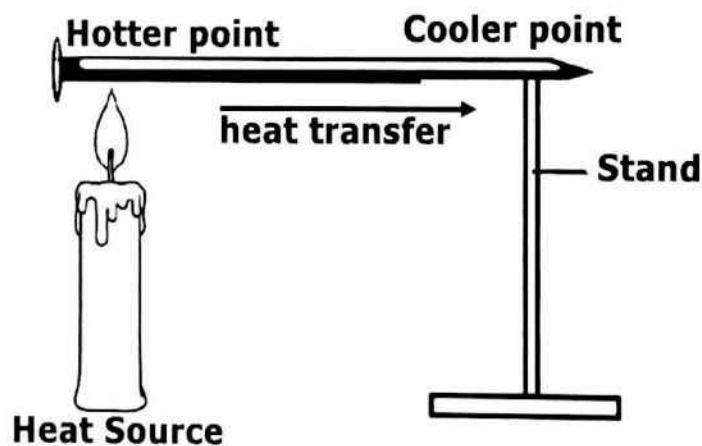
Convection and conduction take place in matter
Radiation does not need any form of matter to take place.

Conduction

Conduction is the process by which heat travels through solids.

It is the transfer of heat between objects that are touching or from one part of an object to another.

In conduction, heat is passed from particle to particle.



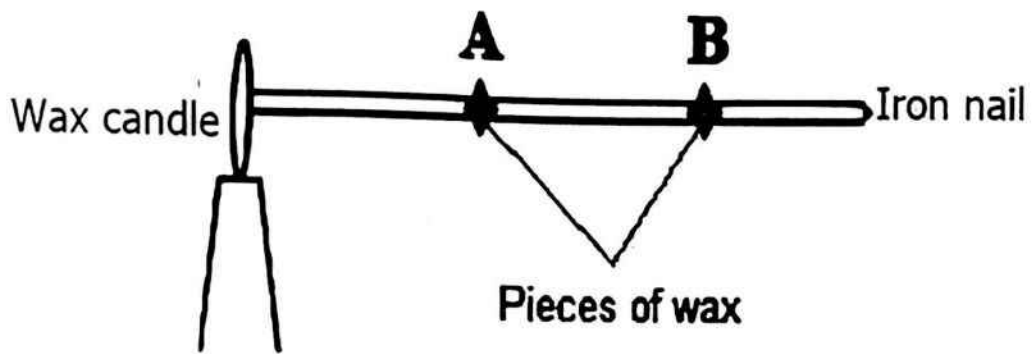
An experiment to show heat transfer by conduction in solids

Materials needed: pieces of wax, iron nail, wax candle

Steps taken:

- (i) Clamp one end of an iron nail.
- (ii) Attach pieces of wax at equal intervals.
- (iii) Heat the end of the iron nail in a candle flame.
- (iv) Observe wax falling from the iron nail

Set up:



Observation.

A piece of wax **A** melts and falls first because it receives heat first.

A piece of wax **B** melts and falls last because it receives heat last.

Conclusion

Heat travels through solids by conduction.

Roles of the materials in the experiment

Pieces of wax show how heat travels through the iron nail.

Iron nail It helps in heat transfer.

Wax candle: provides heat.

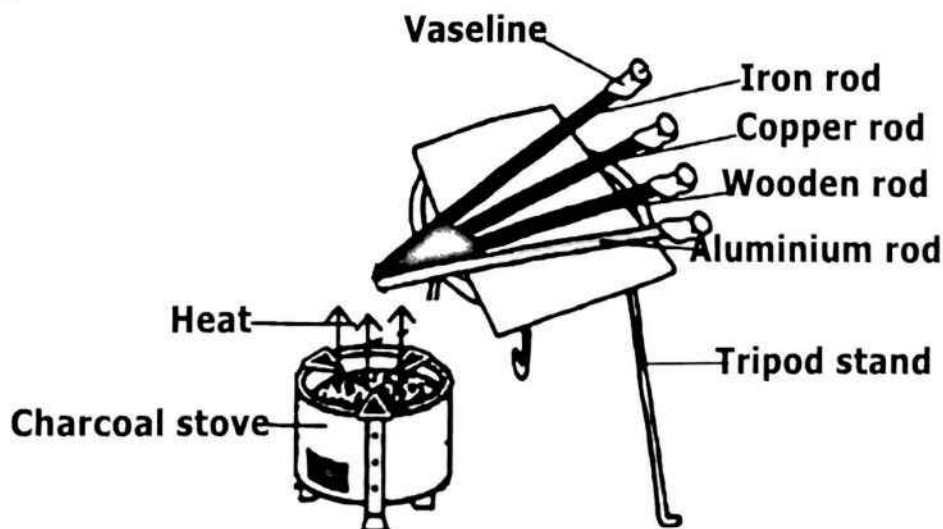
An experiment to show conduction of heat in different solids

Materials needed: Vaseline, iron, copper, wooden, aluminium rods and Bunsen burner/ charcoal stove

Steps taken

- (i) Place the iron, copper, wooden and aluminium rods on the tripod stand, applying Vaseline on each rod at equal intervals.
- (ii) Heat the rods using the Bunsen burner.
- (iii) Observe the melting rate of Vaseline on each rod to compare heat conduction.
- (iv) Record the time it takes for the Vaseline to melt on different rods.

Set up:



Observation

Vaseline melts fastest on the copper rod

Reason. It conducts heat fastest compared to all other metals.

The vaseline falls in this order; copper rod, aluminium rod and iron rod.

The Vaseline on wooden rod will not melt.

Reason. Wood is a poor conductor of heat.

Use mnemonic: **SCATIBG** to identify which metal is better than the other

Role of the materials in the experiment

The rods. They are used to test conduction of heat.

Vaseline. It indicates heat conduction through melting.

Tripod stand. It holds rods in place during the experiment.

Bunsen burner/Charcoal stove. It provides heat.

Importance of heat transfer by conduction

- It enables people to iron clothes.
- It enables people to cook food.
- It enables welder to weld metals.
- It enables mercury in thermometers to expand.
- It enables ladies to curl their hair in salons using tongs.

Conductors and insulators of heat

Heat conductors are materials which allow heat to pass through them easily.

They are also called good conductors of heat.

Examples are; iron, silver, zinc, mercury, lead, copper, aluminium and brass



Points to note:

Silver is the best solid conductor of heat.

Mercury is the best liquid conductor of heat.

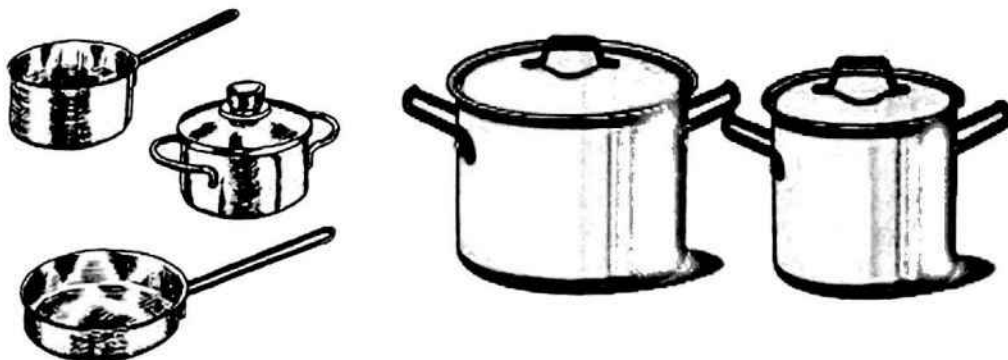
Aluminium is commonly used to make utensils because;

- It is a good conductor of heat thus make food to cook fast.*
- It does not rust.*
- It is cheap.*
- It is light and easy to bend.*

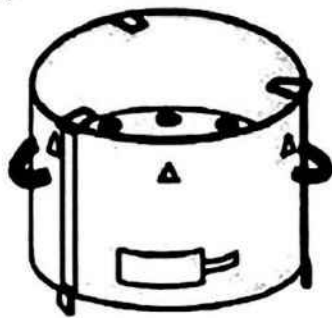


Examples of aluminium made utensils

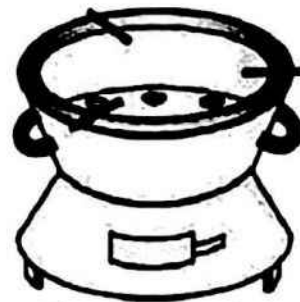
Saucepans, frying pans, spoons and forks



Silver is expensive and rare while copper is heavy.
 Metallic charcoal stoves use a lot of charcoal because most heat is lost through conduction.
 Clay charcoal stoves use less charcoal because clay retains heat.



Metallic charcoal stove



Clay charcoal stove

Uses of good conductors of heat to people.

- They are used to make cooking utensils.
- They are used to make motor engines.
- They are used to make clothes iron. The ironing part is made of metal to conduct heat.
- They are used to make distillation tubes

Heat insulators are materials that do not allow heat to pass through them easily. They slow down the movement of heat.

They are also called bad or poor conductors of heat.

Examples are; rubber, plastics, dry wood, cork, paper, porcelain, feathers, water, air, Clothes and asbestos

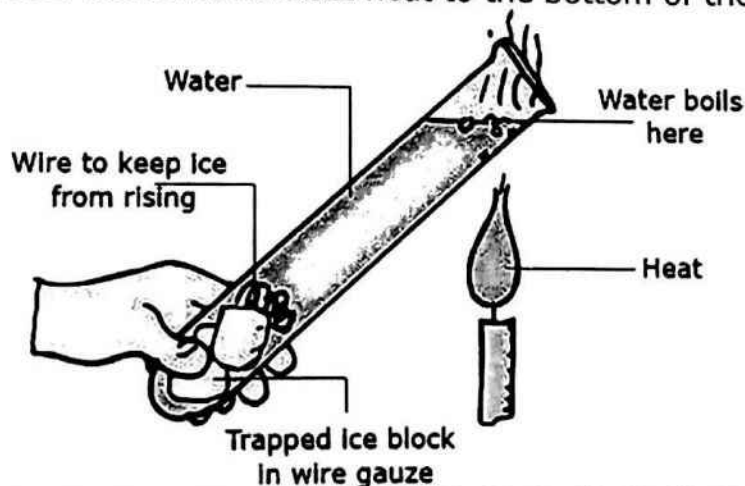
An experiment to show that water is a poor conductor of heat:

Materials needed: ice block, water, Bunsen burner, test tube and wire gauze

Steps taken:

- Fill the test tube with water and place an ice block wrapped in wire gauze at the bottom.
- Heat the top of the water in the test tube using the Wax candle
- The ice block does not melt as the water at the top boils.

Reason. Water does not conduct heat to the bottom of the test tube.



Role of the materials in the experiment

Ice block. To observe the effects of heat transfer.

Water. It is the medium to test heat conduction.

Test tube. It holds water and ice block.

Bunsen burner. It is the source of heat to heat the water.

Wire gauze. It holds ice block at the bottom/ It prevents ice from rising when water boils.

 **Note.** Firemen wear asbestos suits and gloves.

Reason. To protect themselves against fire burns.

An experiment to show that air is a poor conductor of heat

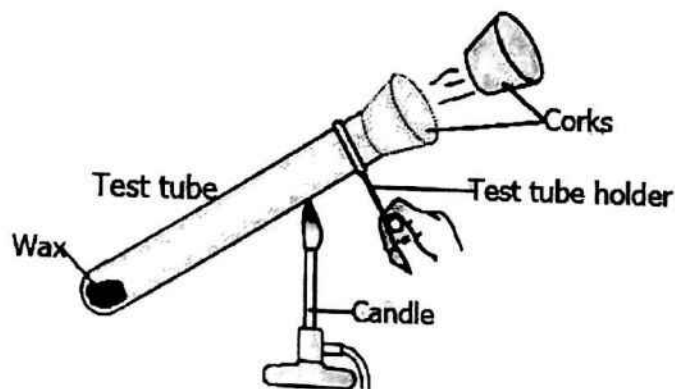
Experiment 1:

Materials needed: test tube, candle flame, cork, test tube holder and wax.

Steps taken.

- (i) Place a small piece of wax at the bottom of a test tube using a drop of water to stick it.
- (ii) Hold the test tube at an angle using a test tube holder.
- (iii) Gently heat the top of the test tube with a flame, ensuring the flame does not reach the wax.
- (iv) The wax does not melt at the bottom of the test tube

Set up:



An experiment to show that air is a poor conductor of heat

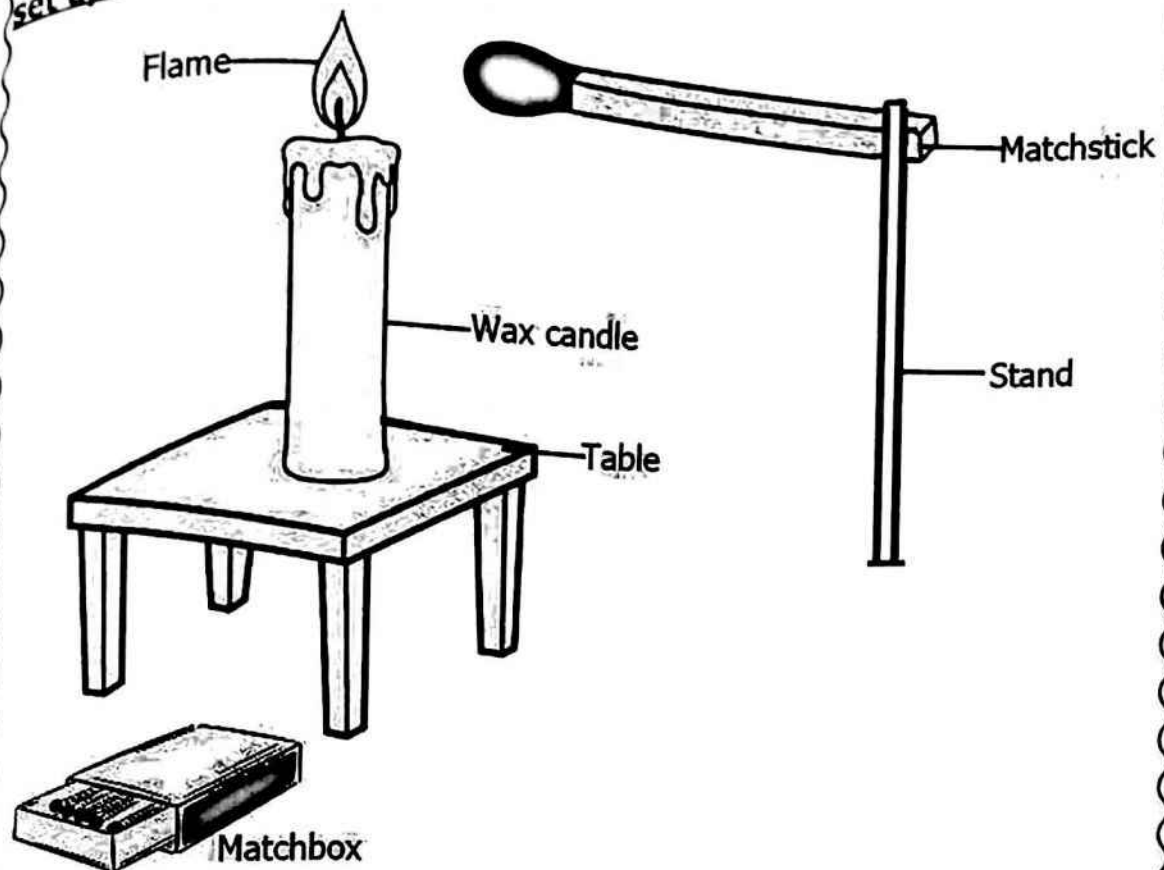
Experiment 2

Materials needed: matchbox, matchstick, table and wax candle

Steps taken:

- (i) Light a candle and put it on the table.
- (ii) Place a matchstick near the wax candle. (More than 2cm distance)

set up:



Observation:

The matchstick does not light.
Heat from the burning candle does not reach the matchstick to make it light.

Conclusion:

Air is a poor conductor of heat

Uses of insulators to people.

- They are used to carry hot substances.
- They keep the body warm during cold weather.
- They are used to make handles of frying pans and charcoal iron.
- The cork prevents heat loss or gain by conduction in a vacuum flask.

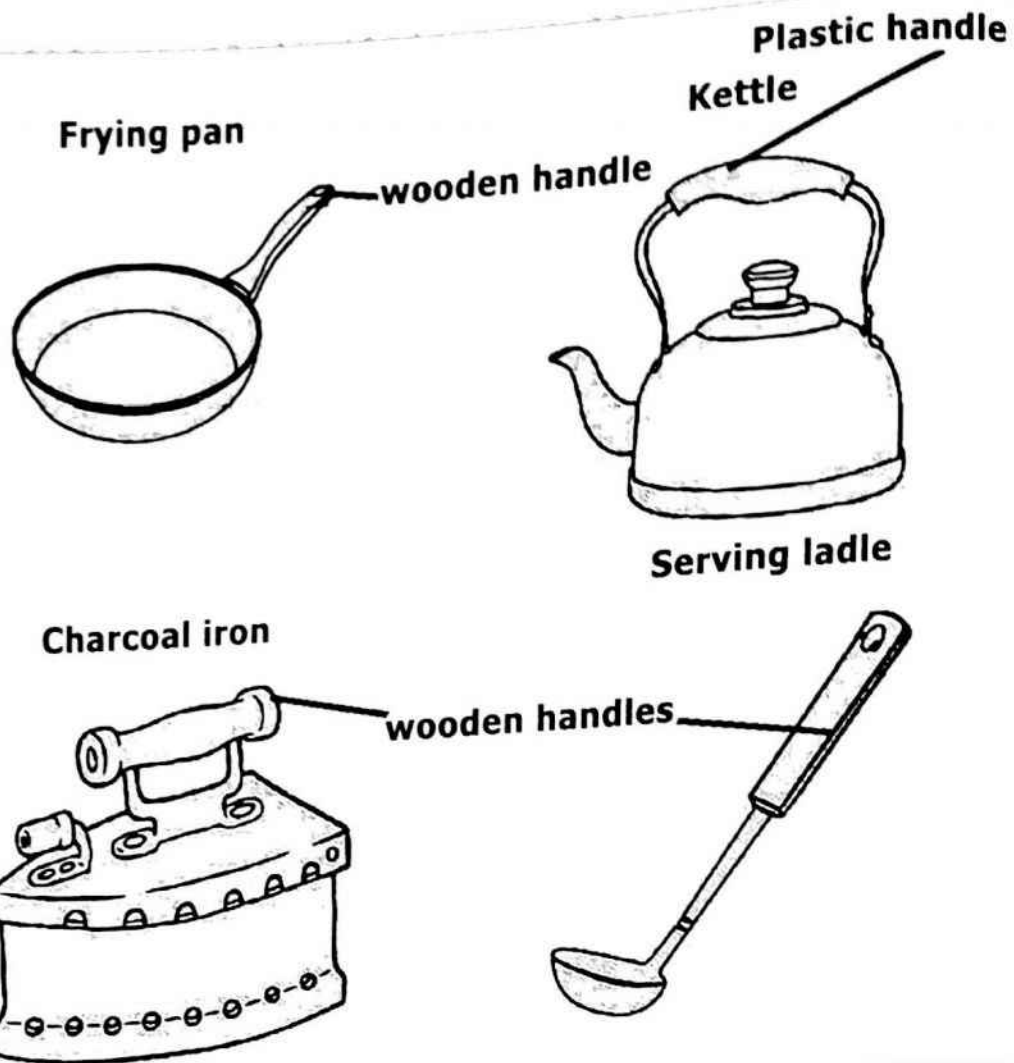


Points to note:

Sweaters, blankets and feathers prevent heat loss from the body.

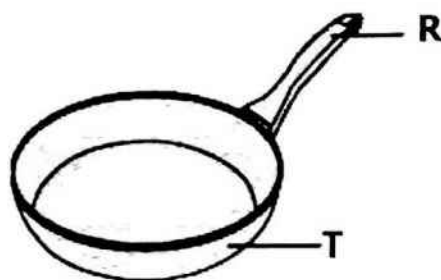
Handles of frying pans, kettles, charcoal iron and electric iron are made of wood or plastic.

Reason: To prevent the user's hands from getting burnt



Evaluation activity 6.10

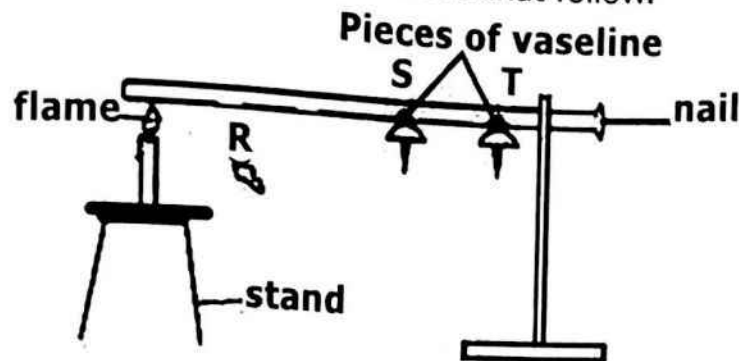
1. Which method of heat transfer does not need any form of matter?
2. Give the reason why most cooking pans are made of aluminium.
3. How is a sweater able to keep us warm at night?
4. Why is the handle of a charcoal iron made of wood?
5. The diagram below shows a cooking pan. Study and use it to answer the questions that follow.



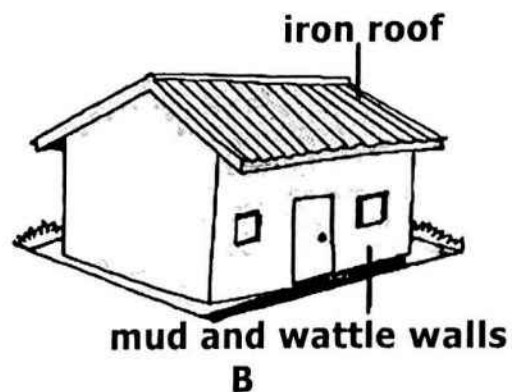
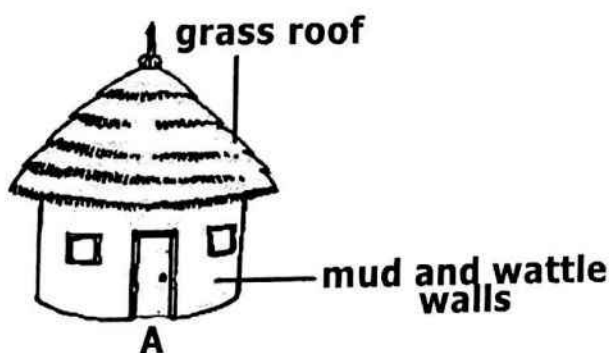
- (a) Name any **one** material used to make part **R**.
- (b) Give any **two** reasons why aluminium is commonly used to make part **T**.
- (c) How does heat travel through the above utensil when in use?

Evaluation activity 6.10 Continued

6. Apart from aluminium, name any **two** other examples of conductors of heat.
7. The diagram below shows pieces of vaseline put on the nail and heated. Study and use it to answer the questions that follow.



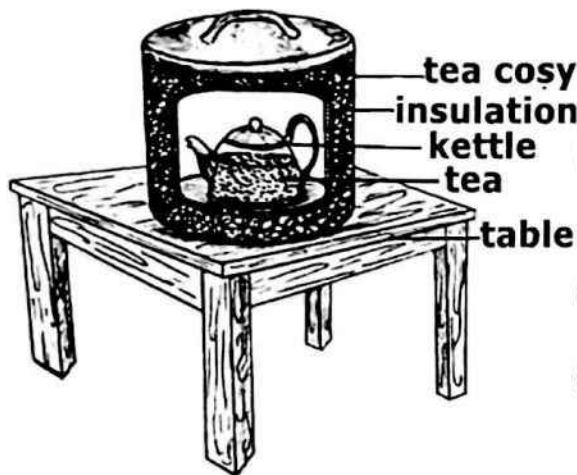
- (a) Identify the method of heat transfer demonstrated using the above experiment.
- (b) Why does the piece of Vaseline marked **R** fall first as shown in the experiment above?
- (c) State the importance of using pieces of Vaseline when carrying out the above experiment.
- (d) State any **one** effect of heat on the pieces of Vaseline used in the experiment above.
8. Give the reason why the ironing part of an iron box is made of metal.
9. Identify any **one** material that slows down the movement of heat.
10. State any **one** way in which heat transfer by conduction is helpful to school pupils.
11. The diagrams below show two houses. Study and use them to answer the questions that follow.



- (a) Identify the house that remains cool inside during dry season.
- (b) Give the reasons why the house you have identified in (a) above remains cool inside during dry season.
- (c) State any **two** advantages of using the house marked **B** over the house marked **A**.

Evaluation activity 6.10 Continued

12. The diagram below shows a tea cosy. Study and use it to answer the questions that follow.



- (a) State the reason why the tea in the kettle is able to remain hot for a long time.
- (b) State what would happen to tea if the kettle had been placed on a metallic table.
- (c) Give the reason for your answer in (b) above.
- (d) Mention **one** way in which the tea cosy above is similar to a thermos flask.

Convection

Convection is the process by which heat travels through liquids and gases. It is a method of heat transfer that happens when molecules flow within the substance itself.



Convection

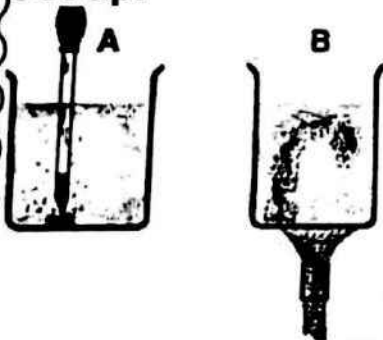
An experiment to show convection

Materials needed: ink, cold water, ink dropper, stove and small saucepan

Steps taken:

- (i) Pour cold water into a saucepan.
- (ii) Introduce an ink drop at the bottom with a dropper.
- (iii) Heat the water in the saucepan using wax candle.

Set up:



Observation and explanation

When the water is heated, the ink colour moves up and curves to return to the bottom forming some form of a circle. As the temperature increases, particles continue moving up and down.

Here, heat is carried by the movement of particles of matter. The up-and-down movement of ink is called convection.

There is uniform heating in a liquid due to convection currents.

Hot water is denser than cold water. The cooler water particles at the top being denser, replace the hot water particles by moving downwards.

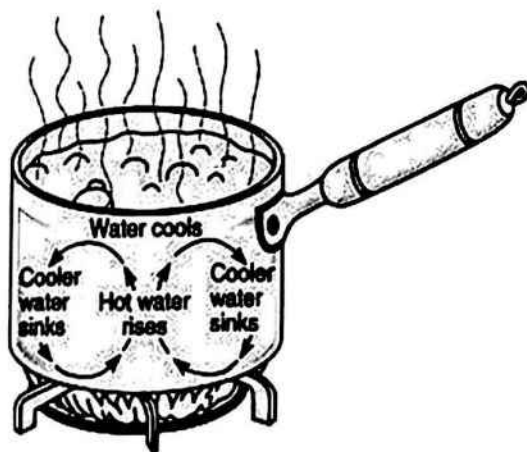
An experiment to show convection in liquids

Materials needed: water, saucepan and hot plate

Steps taken:

- (i) Pour water in a saucepan.
- (ii) Place the saucepan on the hot plate.
- (iii) Heat water until it boils.
- (iv) Observe the movement of water inside the saucepan.

Set up:



Observation and explanation.

When water is heated, hot water from the bottom of the saucepan moves upwards because it is less dense.

The cold water from the top moves downwards because it is denser.

The uniform heating in a liquid forms convection currents.

The arrows show the movement of water molecules (convection currents)

Water boils faster on the surface than at the bottom when heated.

Reason. Due to the effect of convection currents.

To show that water is boiling, bubbles will form and rise to the surface, releasing steam

Roles of the materials in the experiment.

Water. It demonstrates heat transfer.

Saucepan. It holds the water for heating.

Hot plate. It provides heat for the experiment.

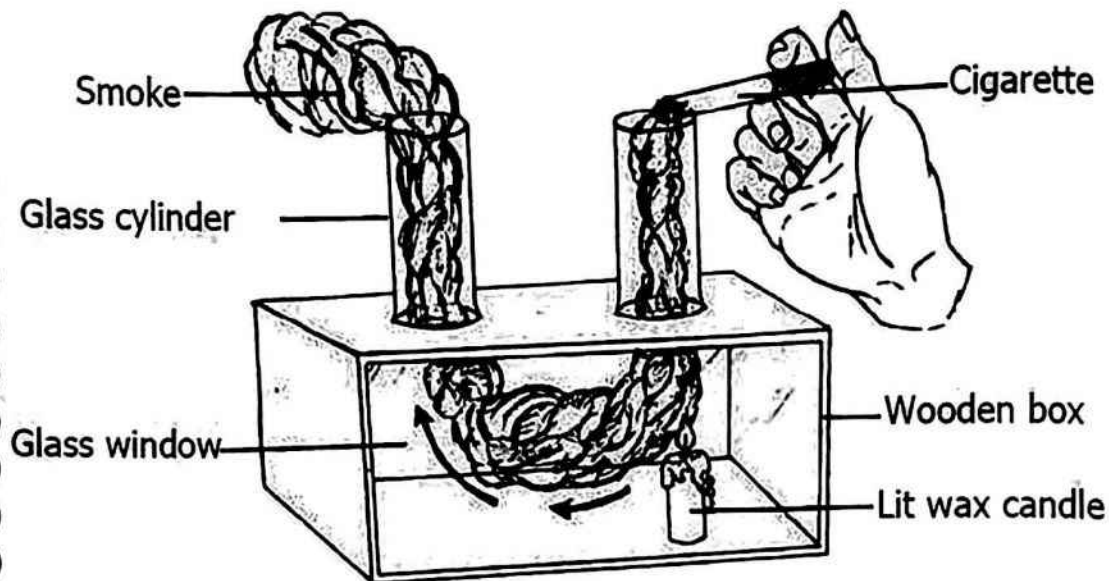
An experiment to show convection in gases

Materials needed: cigarette, glass cylinders, lit wax candle, glass window, wooden box

Steps taken:

- (i) Light the candle and place it in the wooden box.
- (ii) Make holes in the wooden box to insert glass cylinders.
- (iii) Place a cigarette at one of the glass cylinder's opening.
- (iv) Observe smoke moving towards the glass cylinders and above the flame

Set up:



Observation and explanation.

Smoke will rise straight upwards through the glass cylinders.

Reason. Smoke is less dense than air in the atmosphere.

This shows convection in gases

Roles of the materials in the experiment.

Cigarette: Produces visible smoke for tracking airflow.

A smouldering paper, or piece of cloth can be used instead of cigarette.

Glass cylinders: They direct smoke into the wooden box.

Lit wax candle: It provides heat to cause convection currents.

Glass window: It allows observation of smoke movement.

Wooden box: It contains and controls the experiment setup.

Places where convection in gases is applied.

Residential house, kitchen, VIP latrine, factory, hutch and Stevenson screen

Residential house

It has windows and doors which let fresh air into the house.

They allow light into the house.

Note: 1. Curtains are put on windows and doors to minimise light and for privacy.

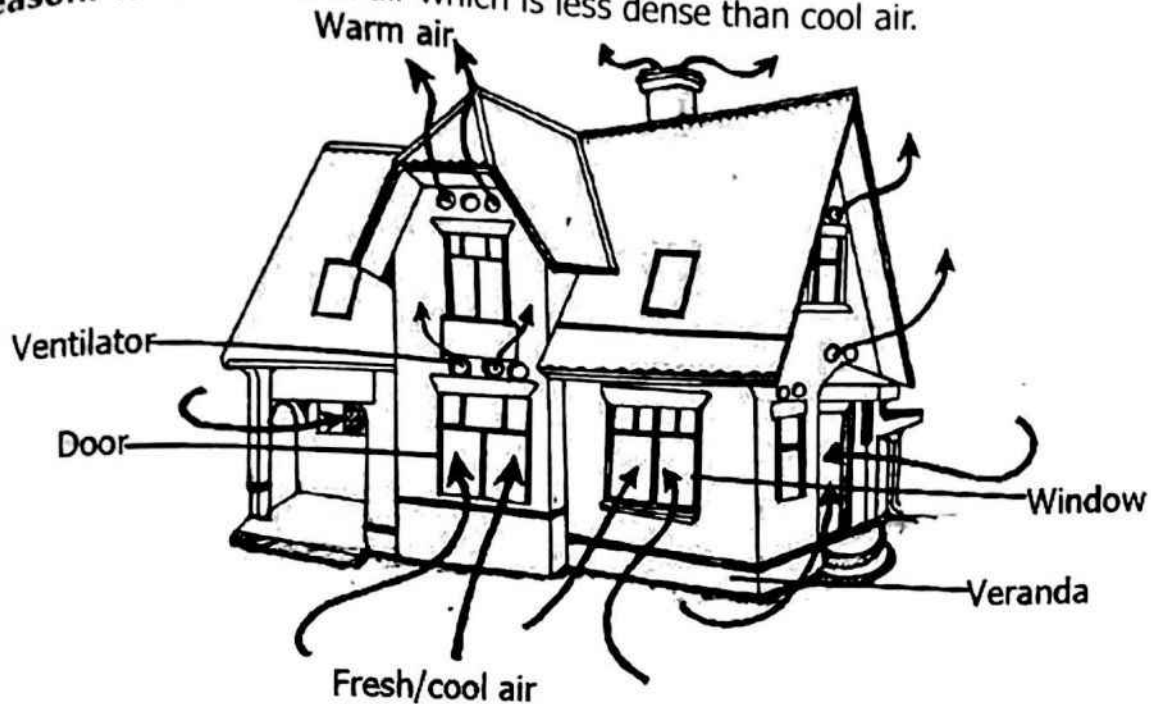
2. Windows and doors are put at the lower level than ventilators.

Reason. To let in fresh air which is denser than warm air.

Ventilators let out warm air from the house.

They are put at a higher level than windows and doors.

Reason. To let out warm air which is less dense than cool air.



Note: The arrows on the house above show free circulation of air in the house.

Importance of ventilation on the house

- It prevents suffocation.
- It prevents the spread of air borne diseases.

Other parts of the residential house

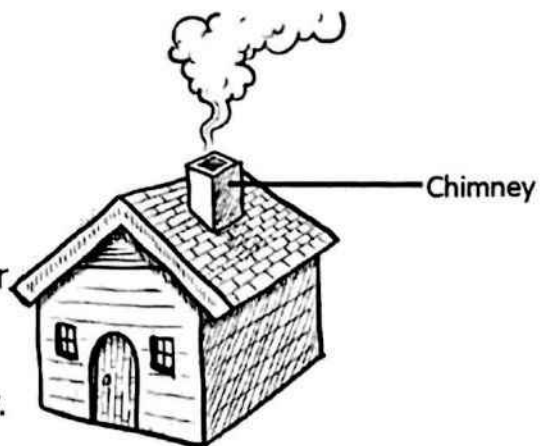
Veranda. It prevents flowing water from entering the house.

It provides extra support to the wall.

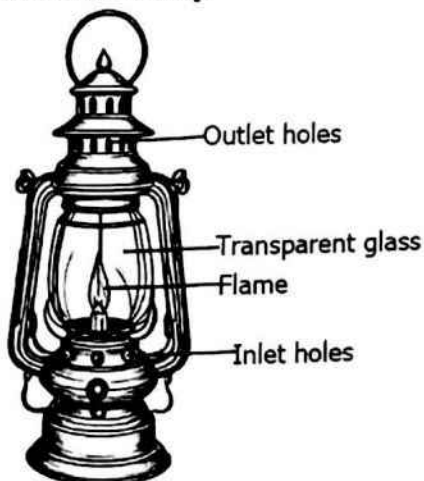
Roof. It protects people from bad weather conditions.

Chimney

It lets out smoke from the kitchen or factory.



Lantern lamp

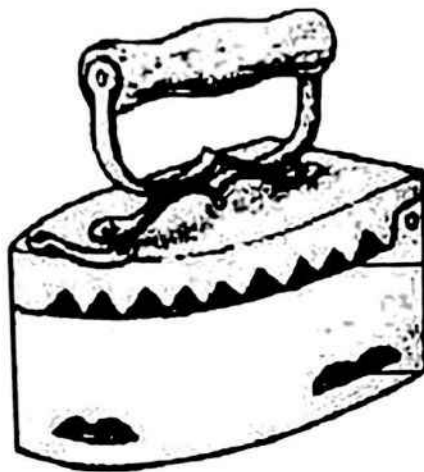


-The outlet holes let out warm air.

-The inlet holes allow fresh air to enter to support burning of the wick.

Note: paraffin reaches the wick by capillary action.

The glass is transparent in order to allow light to pass out to the surrounding.



-The inlet holes allow in fresh air to keep charcoal burning.

-The inlet holes let out ash from the charcoal iron.

-The outlet holes let out warm air from the charcoal iron.



Points to note

The handle is made of wood to prevent the user's hands from getting burnt.

The ironing part is made of metal to conduct heat.

Instances where convection currents are observed

- Air circulation in the house.
- Movement of smoke out of the chimney.
- Occurrence of breezes

Ways in which heat transfer by convection is important.

- ✓ It removes bad smell from latrines.
- ✓ It helps in boiling water.
- ✓ It drives smoke from the kitchen or factory.
- ✓ It helps in rain formation.
- ✓ It helps in lighting charcoal stoves and cigarettes.
- ✓ It helps in lighting iron boxes and candles.



Boiling milk



Burning candle



Burning cigarette

Human activities that require the presence of convection

Firing bricks

Explanation



- The source of heat is firewood
- Mud reduces heat loss by convection.
- Mud controls oxygen supply to the bricks.
- Grass shows that bricks have been fired/ burnt.
- Grass shows that heat has reached the top

Charcoal burning



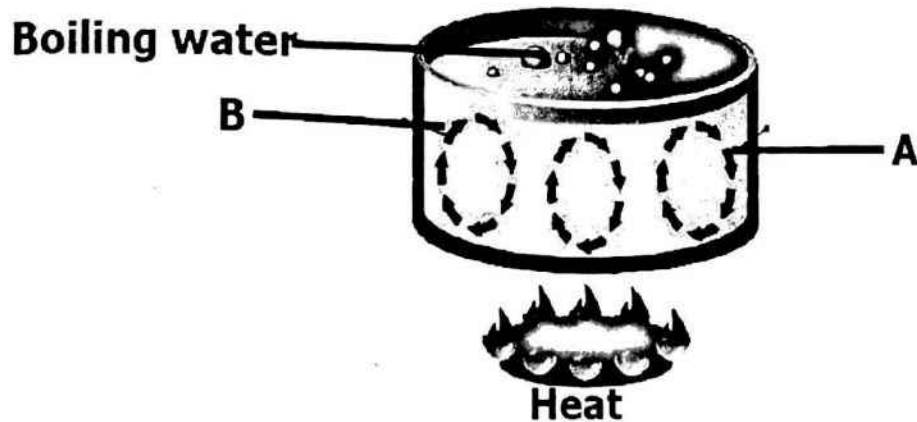
Explanation

- Soil reduces heat loss by convection.
- Soil controls oxygen supply to the bricks.
- Grass traps soil from falling on burning wood.
- Grass allows smoke to escape with minimal heat loss.

Note: Charcoal is formed when wood is burnt under the limited supply of oxygen.

Evaluation activity 6.11

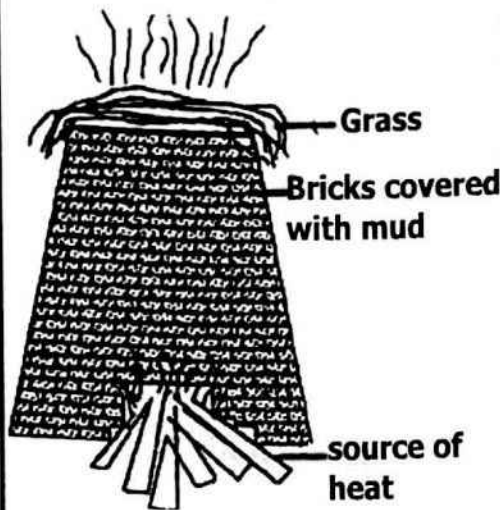
1. State the method of heat transfer that enables keeps charcoal burning on the charcoal stove.
2. Give the reason why ventilators are put above the windows and doors.
3. Name any **one** place where convection in gases is helpful.
4. Why does smoke move upwards when burning rubbish in the compound?
5. State the importance of the chimney on the kitchen.
6. The diagram below shows a saucepan with some water on fire. Use it to answer the questions that follow.



- (a) Identify the kind of water represented by the arrows marked **A** and **B**.
 - (b) Give the reason why the water represented by arrow **A** moves to the bottom of the saucepan as shown above.
 - (c) Name the method of heat transfer shown in the diagram above.
7. (a) Name the **two** states of matter through which heat travels by convection.
 - (b) State any **two** ways in which heat transfer by convection is helpful in our daily life.

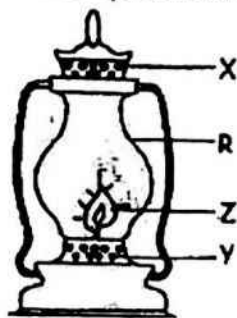
Evaluation activity 6.11 Continued

8. The diagram below shows firing bricks in a kiln. Study and use it to answer the questions that follow.



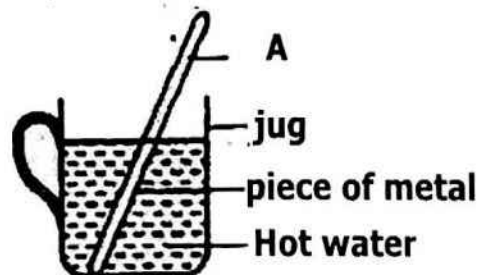
- Name the source of heat energy used in firing the bricks
- Give any **two** reasons the bricks are covered with mud before firing starts.
- State any one importance of grass put on top of the kiln during firing.

9. The diagram below shows a kerosene lamp. Study and use it to answer the questions that follow.



- Name the part marked with letter **Z**.
- Why is the part marked **R** made of glass?
- Give the importance of the parts marked **X** and **Y** when the kerosene lamp is in use.

The diagram below shows a piece of metal dipped in a jar containing hot water. Use it to answer question 10.



10. How does part **A** become hot yet it is in the hot water?

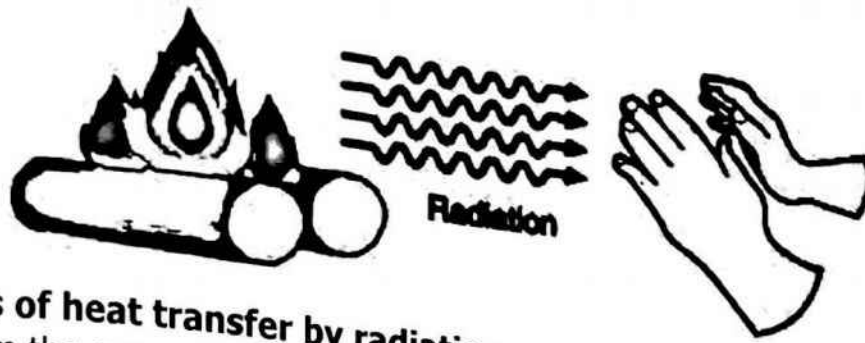
Radiation

Radiation is the process by which heat travels through space and vacuum. It is the transfer of heat in waves.

Radiation does not need any form of matter.

Heat travels through the vacuum because radiant heat does not need any

medium of transmission.
A vacuum is a space without matter.



Examples of heat transfer by radiation

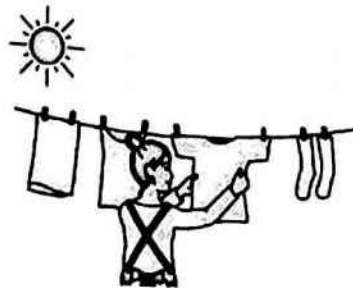
- Heat from the sun reaching the earth.
- Heat from the fire place reaching the person warming him/herself.
- Heat from the sun reaching harvested crops being sundried.

Importance of heat transfer by radiation

- It helps in drying harvested crops.
- It helps in drying clothes and bedding.
- It enables people to warm themselves.



People warming themselves



Drying washed clothes



Sun-drying crops

Summary of heat transfer

Medium	Heat transfer
Solids	conduction
Gases	convection
Liquids	convection
Vacuum/space	radiation

Comparison of heat transfer in states of matter

Speed	State of matter
Fastest/quickest	gases
Faster/quicker	liquids
Slowest	solids

Points to note:

- ✓ Heat travels fastest in gases because molecules in gases move freely.
- ✓ Heat travels slowest in solids because molecules in solids are closely packed thus they cannot move freely.
- ✓ Heat travels fastest by radiation and slowest by conduction.

Don't speak for Quality, let Quality speak for itself

Explanation:

- ☞ In conduction, heat is passed from one molecule to another because they are compact and packed together.
- ☞ In convection, one heated molecule carries heat to another molecule, but remember these molecules are not close to one another.
- ☞ In radiation, heat is just thrown through space, it travels at the speed of light, an example is heat from the sun to the earth.

Evaluation activity 6.12

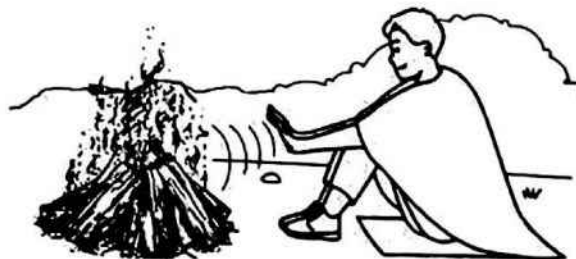
1. Which method of heat transfer helps cop farmers to dry their harvested crops?
2. What name is given to the space with absolutely nothing in it?
3. Give the reason why heat is able to travel through the vacuum.
4. State any **two** ways in which heat transfer by radiation is applied in our daily life.
5. By what process does heat from the sun reach the earth?

The diagram below shows maize put in sunshine to dry. Use it to answer question 6



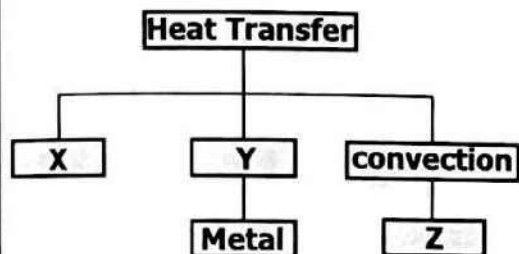
6. Name the method of heat transfer that enables maize in the diagram above to dry.
7. State any **two** ways in which heat transfer by radiation is applied in our daily life.
8. By what process does heat from the sun reach the earth?

The diagram below shows a boy warming himself. Study and use it to answer the questions that follow.



Evaluation activity 6.12 Continued

- Identify the method of heat transfer shown above.
 - Name any **one** medium through which the method of heat transfer above takes place.
 - Apart from warming himself, give any **two** other ways in which the boy benefits from the method of heat transfer above.
9. The table below shows methods of heat transfer. Study and use them to answer the questions that follow.



- Name the methods of heat transfer marked **X** and **Y**.
- Give any **one** state of matter that can be put at **Z**.
- State any **one** way in which the method of heat transfer at **Y** is important to people.

Heat conservation

Heat conservation is the process of maintaining heat for a certain period.

Ways of minimizing heat loss/ways of conserving heat

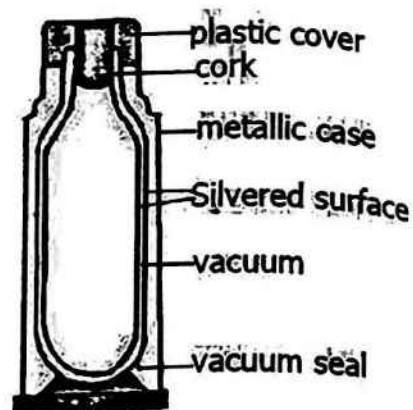
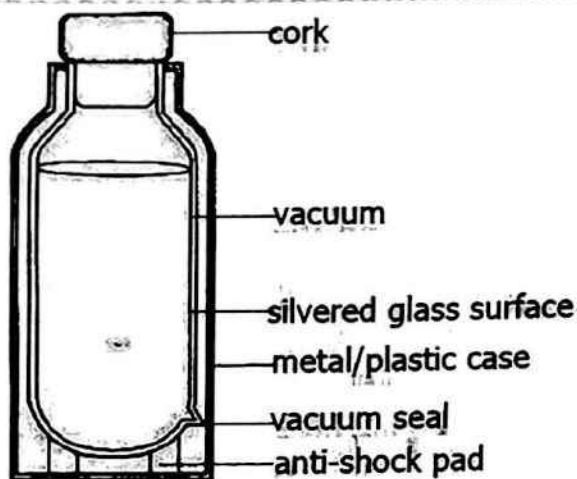
- Using a thermos flask.
- Using food flasks.
- Covering saucepans when cooking.
- Using energy saving stoves.
- Using heat exchangers.

The thermos flask

- A thermos flask is used to keep hot liquids hot or cold liquids cold.
- It is able to keep hot liquids hot by preventing heat loss by conduction, convection and radiation. Such hot liquids can be; hot water, hot milk, hot porridge
- It is able to keep cold liquids cold by preventing heat gain by conduction, convection and radiation. Such cold liquids can be; cold water, drugs, fruit juice, ice cubes, yoghurt, and cold milk.
- A thermos flask is also called a **vacuum flask**.



Don't speak for Quality, let Quality speak for itself



Part of the vacuum/thermos flask and their functions.

Part	Function
cork	It prevents heat loss or gain by conduction. Reason. It is a heat insulator. It can be made from; dry wood, rubber or plastic. Reason. They are heat insulators.
Vacuum	It prevents heat loss or gain by conduction or convection. Reason. It has no matter to transmit heat.
Vacuum seal	It prevents matter from entering the vacuum. If the vacuum seal breaks, the flask is out of function because the molecules enter the vacuum.
Silvered glass surface	It prevents heat loss or gain by radiation. Reason. The polished surface is a good reflector of heat. The walls of a vacuum flask are silvered to reflect radiant heat. Note: When heat reaches the silvered surface, it is reflected.
Anti-shock pad	It holds the thermos flask in position. It absorbs shock to prevent the glass from breaking or cracking. It is also a poor conductor of heat in the flask.
Metal/plastic case	It protects the inner parts of the flask from physical damage.
Cup	For taking the liquid kept in the flask.

Point to note:

When using a vacuum flask, fill the hot liquid up to the cork.

Reason. To reduce space in order to prevent evaporation of the liquid inside.

Factors that may make a thermos flask fail to function normally

- Broken vacuum seal.
- Cracks on the double glass wall
- Cracked cork
- Loose cork
- Half-filled liquid in the flask

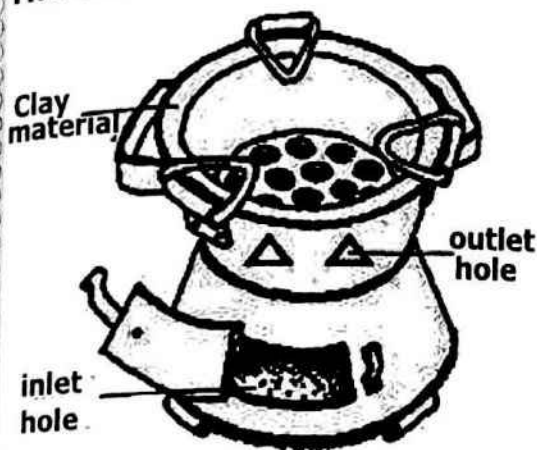
Reasons why thermos flasks are not commonly used by many people

- Some thermos flasks are expensive to buy.
- Some thermos flasks are delicate to handle

Advantages of using thermos flasks.

- They reduce the rate at which trees are cut for wood fuel to boil liquids.
- They reduce pollution by reducing the use of disposable plastic containers and paper cups.
- They are resistant to rusting.
- They control the breeding of bacteria and moulds in liquids.
- Some thermos flasks are portable.

The charcoal stove



- The inlet hole allows in fresh air to keep charcoal burning.
- The inlet hole lets out ash from the charcoal stove.
- The outlet hole lets out warm air from the stove.
- It lets out smoke from the charcoal stove.
- The clay material retains heat for a long time.



Point to not:

When making fire using firewood, spaces are left between firewood.

Reason. To allow oxygen to go to the burning firewood.

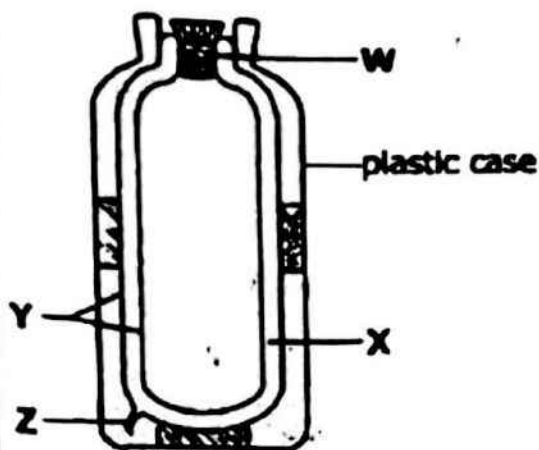
If spaces are not left, the oxygen supply is cut off and firewood stops burning.

Evaluation activity 6.13

1. Name the item at home that is used to keep liquids at the required temperature.
2. Give **one** reason why the vacuum in thermos flask prevents heat loss by conduction and convection.
3. State **one** way in which the use of thermos flasks helps to conserve the environment.
4. In which way is the thermos flask able to keep hot liquids hot for some time?

Evaluation activity 6.13 Continued

5. The diagram below is of a thermos flask. Study and use it to answer the questions that follow.



- Name the parts labelled **Y** and **Z**.
 - Give any **one** material that can be used for making part **W**.
 - Why is part **X** able to prevent heat loss by conduction and convection?
- Apart from the thermos flask, name any **one** other device that can be used to conserve heat at home.
 - Why is it advisable to fill the thermos flask with the liquid up to its cork?

8. The table below shows some of the parts of the thermos flask and the function of each part. Complete the table correctly.

Part	Function
.....	Prevents heat molecules from entering the vacuum.
Cork	.....
.....	Prevents heat loss or gain by radiation.
Vacuum	.....

- Give the function of the following parts on the charcoal stove.
 - Outlet hole
 - Clay body
 - Name the method of heat transfer that enables the charcoal on the charcoal stove to keep burning.
 - State the reason why a person making fire leaves spaces between firewood.

Reflectors and absorbers of heat

Reflectors of heat are shiny or light-colored surfaces that bounce away heat. They reduce heat absorption e.g., mirrors or aluminium foil and white clothes

Absorbers of heat are dark or dull surfaces that take in heat easily.

They warm up quickly. Examples are; black clothes, solar panels, solar water heaters, black pans and asphalt roads.

An experiment to show absorbers and reflectors of heat

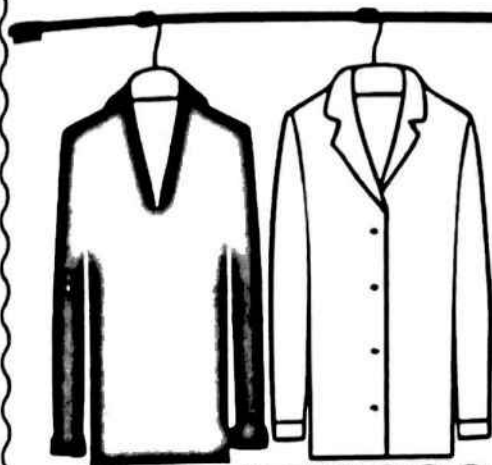
Materials needed: black shirt, white shirt, water and a basin

Steps taken

- (i) Fill a basin with water and dip a black shirt and a white shirt at the same time.
- (ii) Place a black shirt and a white shirt separately in sunshine for about 1 hour.
- (iii) Touch both shirts to find out the rate at which they dry.
- (iv) A black shirt dries faster than a white shirt.

Reason. A black shirt absorbs heat while a white shirt reflects heat.

Set up:



Point to note:

Most vehicles and houses in Uganda are painted white.

Reason. To reflect heat so as to remain cool inside.

An experiment to show absorbers and reflectors of heat

Materials needed: a dull surface, a polished surface, wax candle and two coins

Steps taken

- (i) Place wax on a dull surface.
- (ii) Place wax on a polished surface.
- (iii) Put a coin on each wax.
- (iv) Put a burning candle between the two surfaces.

Observations:

The wax on the dull surface melts faster making the coin to fall.

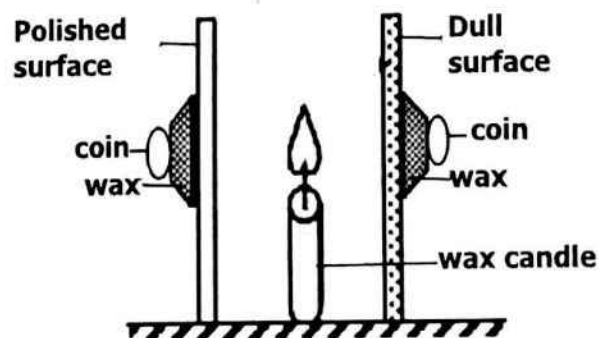
The wax on the polished surface melts slower making the coin take some time to fall.

Reasons.

Dull surfaces absorb more heat increasing the temperature and melting the wax quickly.

Polished surfaces reflect most heat, reducing the temperature and slowing wax melting.

Set up:



An experiment to show absorbers and reflectors of heat

Roles of the materials in the experiment

Wax: Indicates the amount of heat absorbed by melting.

Dull surface: Absorbs more heat, causing wax to melt faster.

Polished surface: Reflects more heat, slowing down wax melting.

Coin: Provides stable base for the experiment.

Candle: It provides heat for melting the wax on the surfaces.

Note: The candle is put midway between the surfaces in order for the surfaces to receive the same amount of heat.

Burning and putting out fire

Burning is a chemical reaction in which a substance reacts rapidly with oxygen and produces heat and light.

Conditions necessary for burning to take place

- Presence of fuel
- Presence of oxygen
- Presence of heat



An experiment to show that oxygen supports burning

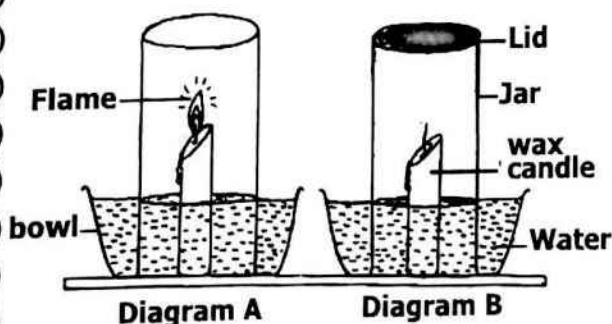
Materials needed: 2 wax candles, water, bowls, lid and 2 jars

Steps taken

- Pour water in the two bowls.
- Light both wax candles and place each in the bowls.
- Cover one candle with a lid, leaving the other exposed.
- The candle covered with a lid goes off.

Reason. Oxygen that supports burning is used up.

Set up:



Points to note:

After some time, the level of water in the jar in diagram B will rise.

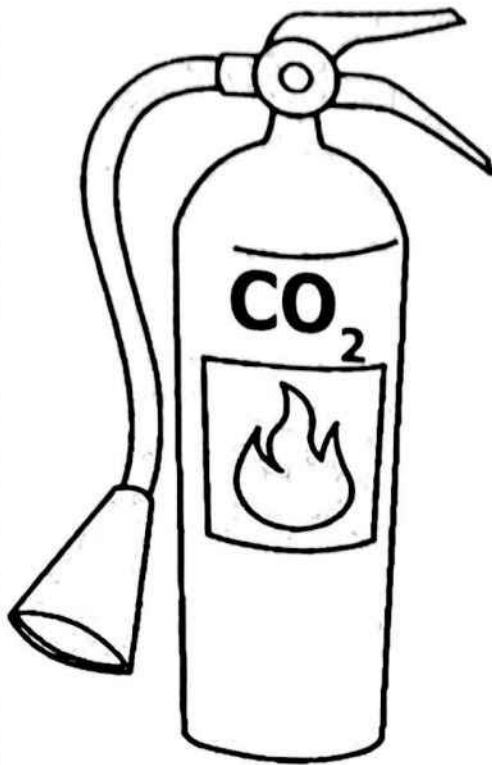
Reason. To occupy the space left by used up oxygen.

The candles exposed continues burning due to the presence of oxygen which supports burning.

When the candles go off as shown in diagram B, carbon dioxide occupies the jar.

Methods Of Putting Out Fire

1. Using a fire extinguisher.



Explanation

A fire extinguisher is used to put out fire in case of outbreak.

It contains carbon dioxide. Carbon dioxide does not support burning. This carbon dioxide is in solid form. Carbon dioxide displaces oxygen around fire.

It is painted with bright colours especially red to be easily seen in case fire breaks out.

It is commonly found at schools, petrol stations, banks, hospitals, homes, vehicles and supermarkets.

Steps taken to put out fire using a fire extinguisher

- (i) Pull the pin.
- (ii) Aim at the base of the fire.
- (iii) Squeeze the handle.
- (iv) Sweep from side to side.

Mnemonic used: **PASS**

2. Using dust and sand.

Sand cuts off the supply of oxygen to stop burning.

3. Using fire blankets

The fire blanket cuts off the supply of oxygen to stop burning.



REMEMBER WORD PASS



PULL



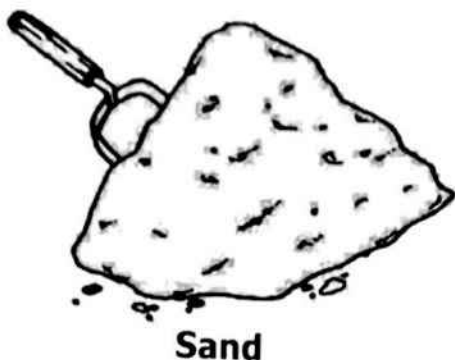
AIM



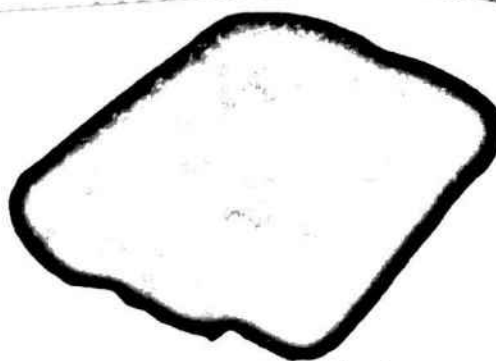
SQUEEZE



SWEEP



Sand



Fire blanket

4. Using water

This is used to put out non-petrol fire.

Water cuts off the supply of oxygen to burning material.

Water is not recommended to put out petrol fire because;

(i) Petrol floats on water and continues burning.

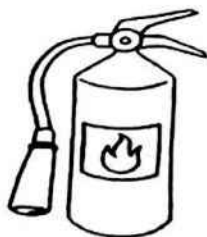
(ii) Water spreads petrol fire to other places.



Learn, unlearn and relearn: The reason that oxygen in water combines with fire to support burning of petrol fire is wrong because the oxygen in water is dissolved chemically and fire does not readily use it.

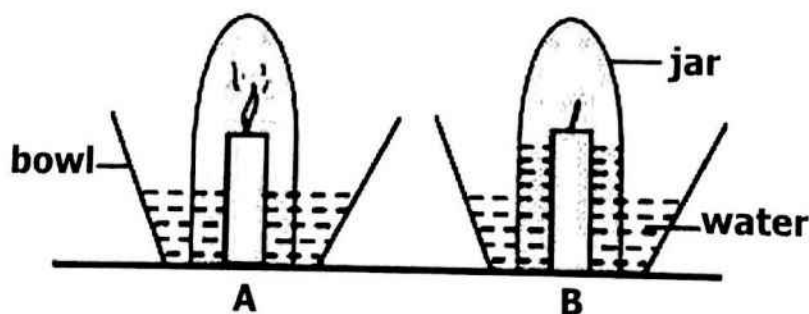
Evaluation activity 6.14

1. The diagram below shows an equipment commonly found at school. Use it to answer the following questions.



- Name the equipment shown above.
- Give **one** reason why the above equipment is always painted red.
- State the reason why the above equipment is recommended to be in schools.
- Identify the gas used in the equipment above.

2. The diagrams below show burning candles placed in a bowl containing water. Study and use them to answer the questions that follow.



- Name the gas found in the jar in diagram A.
- Give the reason why the candle flame goes off in jar as shown in diagram B.
- Why did the level of water rise in the jar as shown in diagram B?
- State the purpose of setting up the experiment above.

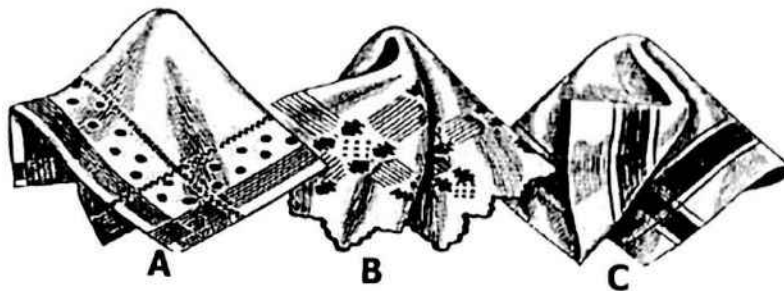
Evaluation activity 6.14 continued

3. The sentences below show the steps taken putting out fire using a fire extinguisher in wrong order.

- (a) Aim at the fire base.
- (b) Sweep from side to side.
- (c) Pull the pin.
- (d) Squeeze the handle.

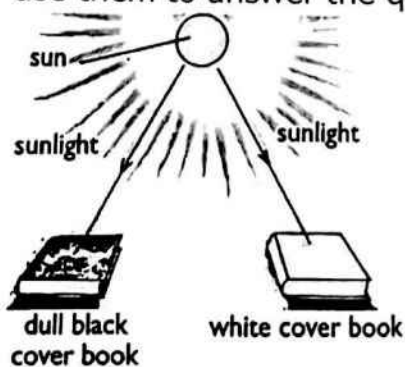
Write the sentences above to show the correct steps followed when putting out fire using a fire extinguisher in the spaces provided below.

4. A primary five pupil washed three handkerchiefs of the same size and material. She hanged them at the same time to dry as shown in the diagram below.



- (a) Identify the handkerchief that dried first.
- (b) Give a reason for your answer in (a) above.
- (c) State the method of heat transfer that enables the handkerchiefs above to dry.
- (d) Give any **one** other way in which the method of heat transfer stated in (c) above is helpful to a primary five pupil.

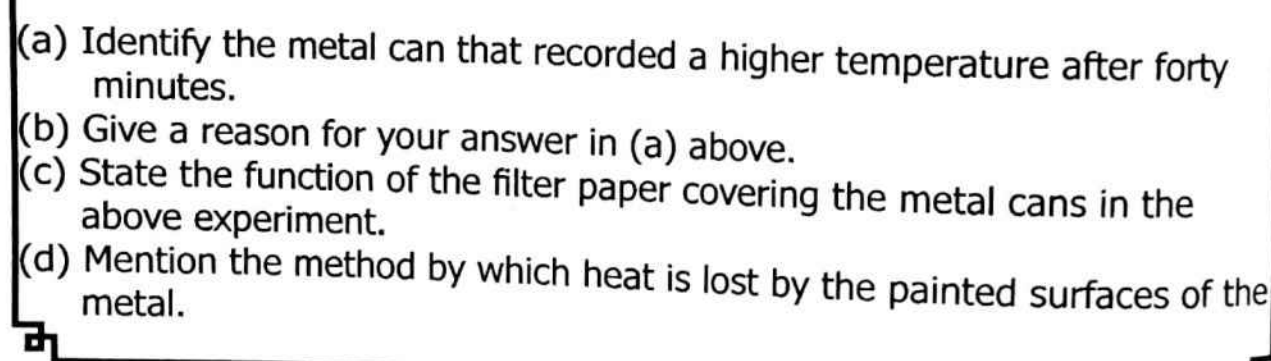
A primary five pupil was carrying out an experiment about heat. He put two books in sunshine for 30 minutes, one with a black cover and the other with a white cover. Study and use them to answer the questions 5 and 6.



- 5. Which of the two books was hotter after 30 minutes?
- 6. Give the reason why the book identified in 5 above was hotter after 30 minutes.

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Characteristics of the Six's thermometer

- It is reset using a magnet.
- It has two small steel indices.

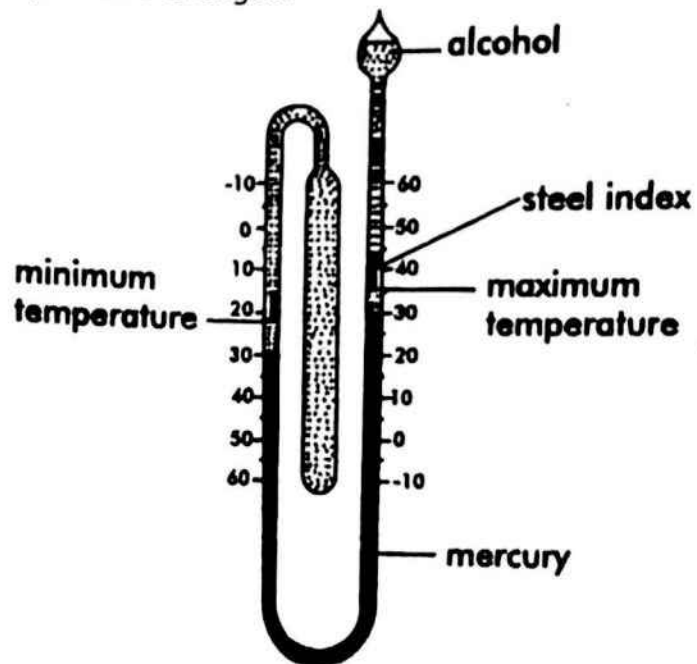
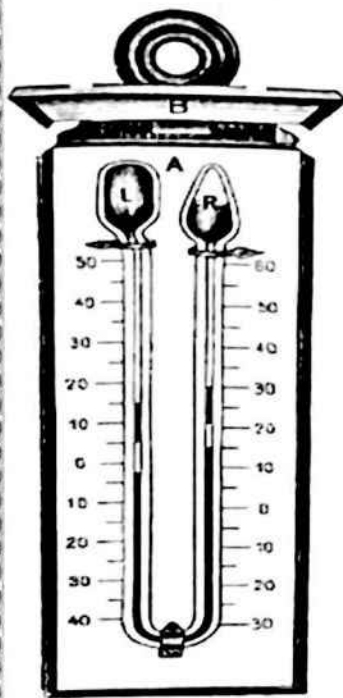
They enable the magnet to reset the thermometer.

They prevent mercury and alcohol from mixing up when reading temperature.

They enable the readers to take accurate temperature measurement.

- It uses both mercury and alcohol.
- It has a cylindrical bulb.

Reason. To ensure uniform expansion of the liquid for accurate temperature readings. The bulb has the vacuum. The vacuum allows the alcohol to expand and contract freely with the temperature changes.



A Six's thermometer has two arms, the right arm and the left arm.

The right arm measures the highest temperature of the day.

It uses mercury. Mercury is used to measure the highest temperature.

Reason: Mercury has a higher boiling point.

The left arm measures the lowest temperature of the day.

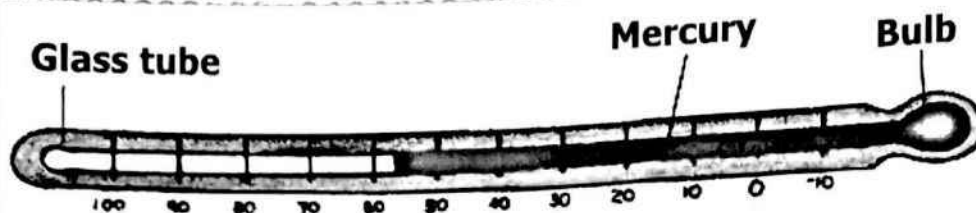
It uses alcohol. Alcohol is used to measure the lowest temperature.

Reason: Alcohol has a low freezing point.

The Six's thermometer is commonly found at; weather station, research stations, school and universities.

3. The ordinary thermometer.

- It is used to measure the temperature during simple experiments.
- It may contain mercury or alcohol.
- It is marked from 0°C to 100°C .
- It has a straight bore in its glass.

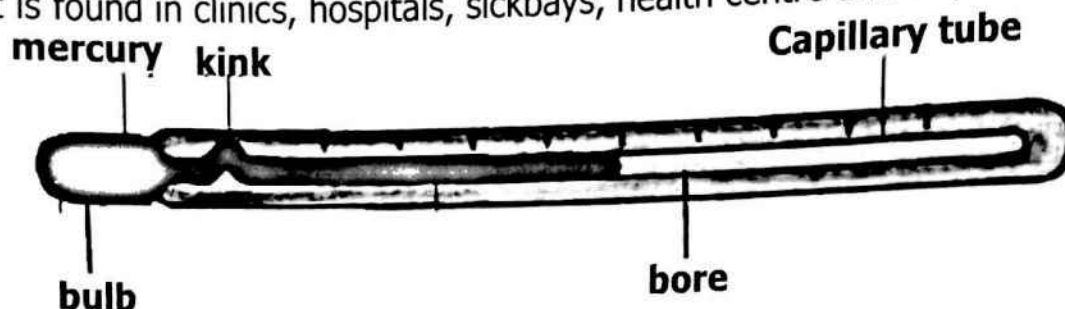


4. The clinical thermometer.

It is used to measure the human body temperature.

It uses mercury.

It is found in clinics, hospitals, sickbays, health centre and dispensaries.



Functions of parts of the clinical thermometer

Part	Function
Kink/ constriction	It prevents the backflow of mercury before temperature is read. It is bent to prevent mercury from falling back into the bulb before temperature readings are taken.
Stem/ capillary tube	It protects the inside parts of the thermometer. It is transparent to allow easy observation of mercury when taking temperature reading.
Bore	It stores mercury. It is made of metal Reasons. Metals are strong to protect delicate mercury. Metals are good conductors of heat.
Bore	It has a regular scale used to show level of mercury and be able to read the temperature. It provides the passage for mercury. It is very narrow to magnify small temperature changes for accurate readings.
Mercury	It indicates the temperature readings.

Characteristics of the clinical thermometer.

✓ It has an arrow that points to 37°C.

This is the normal temperature of the human being.

✓ Its scale starts from 35°C and ends at 42°C.

Reason. The body temperature of a live person cannot fall below 35°C or raise above 42°C. The normal human body temperature is 37°C or 98.6°C

Some clinical thermometers use Fahrenheit scale. The scale ranges from 95°F to 110°F.

Reason. The body temperature of a live person cannot fall below 95°F or rise

above 110°F

- ✓ It has a narrow bend (kink) to prevent the backflow of mercury.
- ✓ It is reset by shaking. Before it is used to another person, it should be shaken.

Reason. To make mercury flow back into the bulb. This enables the nurse to get accurate measurement of temperature for the patient.

- ✓ It can also be reset by putting it in ice after use.
- ✓ It is placed in the; anus, vagina, armpit and under the tongue

Reason: To cover the bulb completely in order to get accurate temperature measurement of the human body.

It is placed in the mouth under the tongue to prevent the person from biting the bulb.

 **Points to note:**

The bulb of the thermometer must be completely covered by the body.

Reason. In order to get the accurate body temperature.

The clinical thermometer should be sterilised using alcohol every after use to kill germs. It should not be sterilised using hot water.

Reason. Hot water makes the capillary tube to expand and break.

Other forms of clinical thermometer

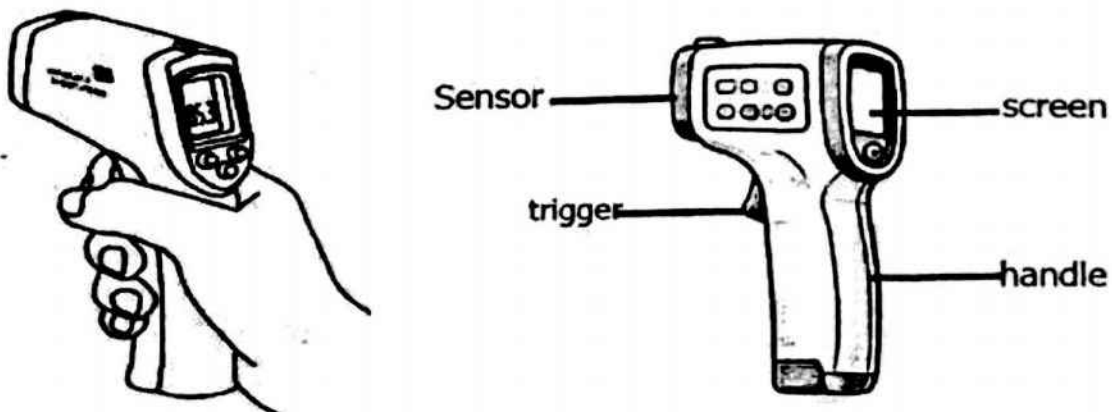
Digital clinical thermometer

- It measures body temperature by placing it in the armpit, anus or under the tongue.
- It has a digital screen to show the temperature.
- It beeps when the measurement is ready and is easy to use



The non-contact infrared thermometer

- It measures body temperature without touching the skin.
- Commonly known as called temperature gun.
- It reduces the spread of contagious diseases through body contact.
- It works quickly and displays the temperature on digital screen.



Don't speak for Quality, let Quality speak for itself

Functions of each part of the thermometers above

Screen. It displays/shows the temperature readings.

Reset button. It is used to reset the thermometer.

Sensor. It conducts temperature from the body.

Trigger. It activates the infrared sensor to measure the body temperature.

Advantages of using a non-contact infrared thermometer over other clinical thermometers.

- (i) A non-contact infrared thermometer reduces the risk of spreading infections while other clinical thermometers can easily lead to the spread of infections.
- (ii) A non-contact infrared thermometer measures temperature faster than other clinical thermometers.
- (iii) A non-contact infrared thermometer does not require physical contact unlike other clinical thermometers.
- (iv) A non-contact infrared thermometer is safer and more hygienic than other clinical thermometers.
- (v) A non-contact infrared thermometer is easier to use than other clinical thermometers.

Differences between a clinical thermometer and a Six's thermometer.

- (i) A clinical thermometer uses only mercury while a Six's thermometer uses both mercury and alcohol.
- (ii) A clinical thermometer has a kink unlike a Six's thermometer
- (iii) A clinical thermometer is reset by shaking while a Six's thermometer is reset by using a magnet.
- (iv) A clinical thermometer measures the human body temperature while a Six's thermometer measures temperature of the day.
- (v) A clinical thermometer has a straight stem while a Six's thermometer has a U-shaped stem.
- (vi) A clinical thermometer has one scale reading while a Six's thermometer has two scale readings.

Reasons why mercury is used in thermometers.

- ✓ It is a good conductor of heat.
- ✓ It does not stick to the walls of the bore.
- ✓ It is opaque thus easily seen.
- ✓ It has even and regular expansion.

Advantages of using mercury over alcohol in thermometers

- Mercury is a good conductor of heat while alcohol is a bad conductor of heat.
- Mercury does not stick to the walls of the glass while alcohol sticks to the walls of the glass.
- Mercury is easily seen compared to alcohol.

Advantages of using alcohol over mercury in thermometers

- Alcohol does not solidify easily while mercury can easily solidify.
- Alcohol expands faster than mercury.
- Alcohol is cheaper than mercury.
- Alcohol can be used to measure low temperature unlike mercury.

Differences between mercury and alcohol.

- Mercury is a liquid metal while alcohol is a liquid spirit.
- Mercury freezes at -39°C while alcohol freezes at -112°C .
- Mercury has regular expansion while alcohol has irregular expansion.
- Mercury has silver grey colour while alcohol is colourless.
- Mercury is denser than alcohol.
- Mercury does not stick to the glass walls unlike alcohol.
- The boiling point of mercury 357°C while the boiling point of alcohol is 78°C .

Reasons why water is not used in thermometers.

- Water is not easily seen.

Reason. It is colourless.

- Water sticks to the walls of the glass.
- Water needs a lot of heat to expand.
- Water is a bad conductor of heat.
- Water evaporates when heated.
- Water has a low boiling point.
- Water does not expand regularly/uniformly.

Water has a small range of expansion because it freezes at 0°C and boils at 100°C .

Scales used to measure temperature

Celsius/centigrade scale

This is where the freezing point of water is 0°C and boiling point of water is 100°C

Fahrenheit scale

This is where the freezing point of water is 32°F and boiling point of water is 212°F

Conversion from degrees Celsius to Fahrenheit and vice versa

$^{\circ}\text{C}$ to $^{\circ}\text{F}$	$^{\circ}\text{F}$ to $^{\circ}\text{C}$
$\frac{100}{180} (^{\circ}\text{F} - 32) = ^{\circ}\text{C}$	$\frac{180}{100} ^{\circ}\text{C} + 32 = ^{\circ}\text{F}$
OR	OR
$\frac{5}{9} (^{\circ}\text{F} - 32) = ^{\circ}\text{C}$	$\frac{9}{5} ^{\circ}\text{C} + 32 = ^{\circ}\text{F}$

• 100 comes from the 100 parts in the Celsius scale while the 180 comes from the 180 parts in the Fahrenheit scale.

• For Celsius scale, the range between freezing and boiling points (0°C and 100°C) is 100. This is why the scale is called Centigrade. Centi meaning 100 and grade meaning steps/degrees.

• For Fahrenheit scale, the range

between the freezing point and boiling point (32°F and 212°F) is 180

Note: The 32 in the formulas comes from the difference in the two scales in the Fahrenheit scale, in the Fahrenheit scale, the freezing point of water is set at 32°F , whereas in the Celsius scale, the freezing point of water is set at 0°C , which creates a difference of 32.

Thus, when converting from OF to OC, we subtract to balance the fahrenheit scale with the celsius scale.

When converting Celsius to Fahrenheit, we add the 32 to balance the celsius scale with the fahrenheit scale.

Converting from °C to °F

Formula: $^{\circ}\text{F} = \left(\frac{9}{5} \times ^{\circ}\text{C} \right) + 32$

Examples

1. Convert 20°C to Fahrenheit scale.

$$^{\circ}\text{F} = \left(\frac{9}{5} \times ^{\circ}\text{C} \right) + 32 \quad \left\| \begin{array}{l} ^{\circ}\text{F} = (9 \times 4) + 32 \\ ^{\circ}\text{F} = 36 + 32 \end{array} \right\| = 68^{\circ}\text{F}$$

2. Chloe kept her food in a food flask at the temperature of 82°C. After five hours, she measured the temperature of the food using an ordinary thermometer and found out that the temperature of her food had lowered by 17°C.

- (a) What was the temperature of her food after measurement? (1 mark)

$$\begin{aligned} \text{Initial temperature} - \text{Final temperature} \\ &= 82^{\circ}\text{C} - 17^{\circ}\text{C} \\ &= 65^{\circ}\text{C} \end{aligned}$$

- (b) Change the temperature of the food in (a) above to Fahrenheit scale. (3 marks)

$$^{\circ}\text{F} = \left(\frac{9}{5} \times ^{\circ}\text{C} \right) + 32 \quad \left\| \begin{array}{l} ^{\circ}\text{F} = (9 \times 13) + 32 \\ ^{\circ}\text{F} = 117 + 32 \end{array} \right\| = 149^{\circ}\text{F}$$

Converting from °F to °C

Formula: $^{\circ}\text{C} = \frac{5}{9} \times (^{\circ}\text{F} - 32)$

Examples

1. Change 140 °F to Celsius scale.

$$\begin{aligned} ^{\circ}\text{C} &= \frac{5}{9} \times (^{\circ}\text{F} - 32) \\ ^{\circ}\text{C} &= \frac{5}{9} \times (140 - 32) \quad \left\| \begin{array}{l} ^{\circ}\text{C} = \frac{5}{9} \times 108 \\ ^{\circ}\text{C} = 5 \times 12 \end{array} \right\| = 60^{\circ}\text{C} \end{aligned}$$

2. Claire put a metal from sunshine whose temperature was 50°F in a burning charcoal stove for about forty-five minutes. When she measured the temperature again using an ordinary thermometer, the temperature had raised by 27°F.

- (a). What was the temperature of the metal after measurement? (1mark)

$$\begin{aligned} \text{Initial temp.} + \text{final temp.} \\ &= 50^{\circ}\text{F} + 27^{\circ}\text{F} \\ &= 77^{\circ}\text{F} \end{aligned}$$

- (b) Express the temperature you have measured in (a) above to centigrade

scale. (3marks)

$$^{\circ}\text{C} = \frac{5}{9} (^{\circ}\text{F} - 32)$$

$$^{\circ}\text{C} = \frac{5}{9} (77 - 32)$$

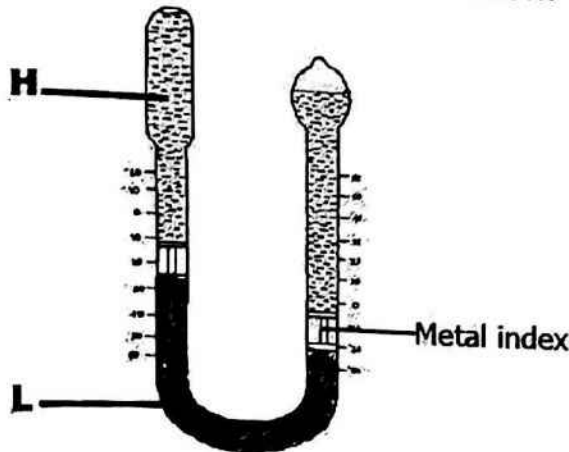
$$^{\circ}\text{C} = \frac{5}{9} \times 45$$

$$^{\circ}\text{C} = 5 \times 5$$

$$= 25^{\circ}\text{C}$$

Evaluation activity 6.15

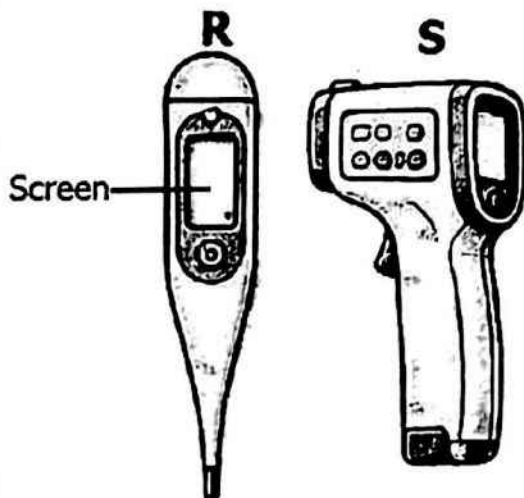
1. The diagram below shows a type of thermometer. Study and use it to answer the questions that follow.



- Name the liquids marked **H** and **L**.
 - State the importance of the metal index on the thermometer above.
 - Give any **one** reason why the liquid marked **H** is used in the type of thermometer above.
- Name any **one** scale in which temperature is measured.
 - State any **two** characteristics of a clinical thermometer.
 - Why is alcohol used in maximum and minimum thermometer?
- A patient was not feeling well. When the nurse measured her body temperature, it had increased by 3°C .
 - What was the body temperature of the patient?
 - Change the body temperature in (a) above to Fahrenheit scale.
 - Name the device used to reset the Six's thermometer.
 - State the relationship between heat and temperature.

Evaluation activity 6.15 Continued

6. The diagrams below show medical thermometers. Use them to answer the questions that follow.



- Name the medical thermometers marked **R** and **S**.
- Give the function of the screen on the medical thermometer marked **R**.
- State any one advantage of using the medical thermometer **S** over **R**.

MEANING OF KEY TERMS IN HEAT ENERGY

Dew: Water drops formed on the surface of the object when water vapour in the atmosphere condenses.

Atom: A basic unit of matter.

Matter: Anything that has mass and volume.

Energy: The ability to do work.

Mixture: A combination of two or more substances.

Heat: The form of energy that moves from a hotter point to a cooler point.

Solute: A solid that dissolves in a liquid.

Solvent: A liquid that dissolves a solute.

Solution: A uniform mixture of a solute and a solvent.

Molecules: Small particles that make up matter.

Vacuum: The space without matter.

Melting: The physical process from a solid to a liquid.

Evaporation: The physical process from a liquid to a gas.

Temperature: The degree of hotness or coldness of an object or place.

Thermometer: An instrument used to measure temperature.

Condensation: The physical process from a gas to a liquid.

Conduction: The process by which heat travels through solids.

Freezing: The physical process from a liquid to a solid.

Constriction: The narrow bend in a clinical thermometer that prevents the backflow of mercury.

Sublimation: The physical process from a solid to a gas.

Expansion: The increase in the size of an object when heated.

THEME:

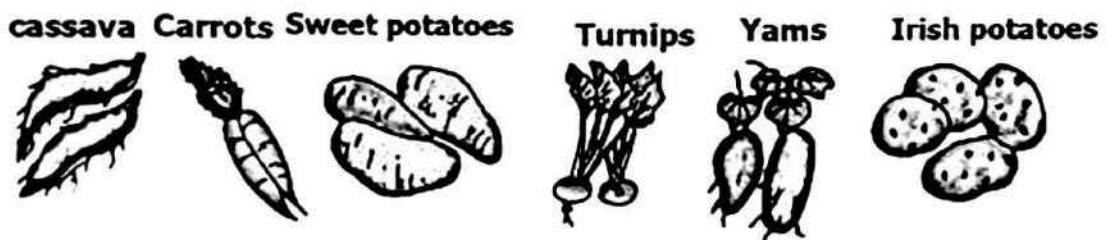
SCIENCE IN HUMAN ACTIVITIES AND OCCUPATIONS

TOPIC : 7 **OCCUPATIONS IN OUR COMMUNITY
(CROP GROWING)**

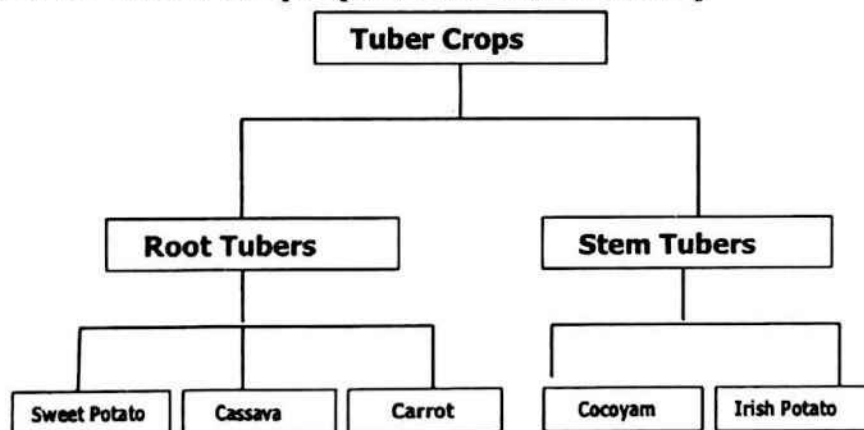
COMMON TUBER CROPS

Tuber crops are plants in the garden that store food in their swollen underground stems or roots.

The tuber stores food for the plant and supplies food to the new plant during vegetative propagation.



Groups/types of tuber crops (classification table)



Root tubers

Root tubers are crops that store food in their swollen underground roots. They have edible roots.

Examples of root tuber crops

- > cassava
- > sweet potatoes
- > carrots
- > turnips
- > beetroots
- > radishes
- > parsnips
- > sugar beet
- > white yams

Cassava



sweet potatoes



turnip



carrot

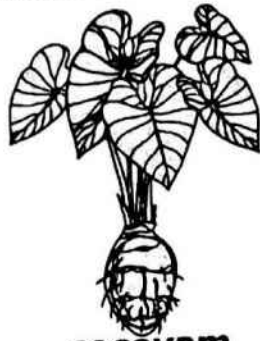


Don't speak for Quality, let Quality speak for itself

Stem tubers

Stem tubers are plants that store food in their swollen underground stems.

Examples of stem tubers are cocoyams (yams) and irish potatoes



cocoyam



irish potatoes

Characteristics of tuber crops

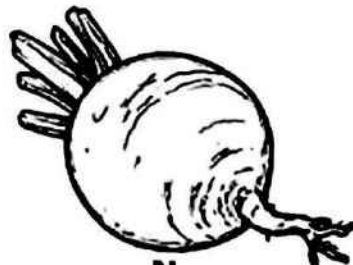
- They have swollen storage roots or stems.
- Their food storage parts are under the ground.
- They are mainly rich in carbohydrates.
- They develop adventitious roots.
- They have edible roots or stems.
- They have lateral buds.
- They have taproot system.
- The tubers contain a lot of starch.

Evaluation activity 7.1

1. State the meaning of the term tuber crops.
2. Name the **two** types of tuber crops commonly grown by people in your community.
3. State any **two** characteristics of tuber crops.
4. The diagrams below show tuber crops. Study and use them to answer the following questions.



M



N

- (a) Name the group of tuber crops to which crops marked **M** and **N** belong.
 - (b) State any **one** structural difference between the tuber crop **M** and **N**.
 - (c) Give **one** reason why you would encourage a brick maker to eat the tuber crops marked **M** and **N**.
5. Write down any **one** example of a stem tuber crop commonly grown by people.
 6. Give the reason why a cassava plant develops roots with tubers when mature.
 7. Apart from storing food for the plant, state any **one** other way in which tubers are useful on an irish potato.
 8. Name the group of tuber crops that have modified lateral roots.

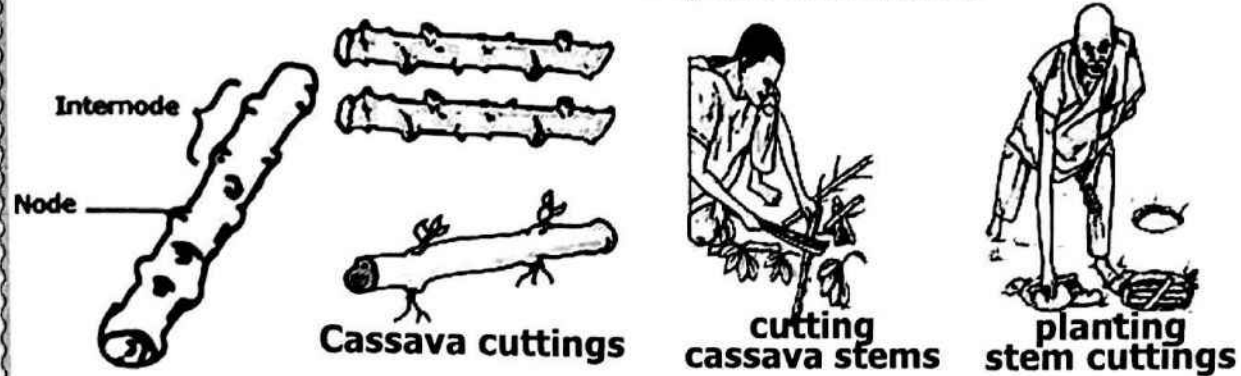
GROWING AND CARING FOR TUBER CROPS

Factors to consider when choosing tuber crops to grow.

- ✓ Resistance to diseases.
- ✓ Ability to give high yields.
- ✓ Fast growth rate
- ✓ Resistance to drought.
- ✓ The market value.
- ✓ Good taste of the tubers.

Growing cassava

Cassava is vegetatively propagated by planting stem cuttings. Its root tubers also sprout new shoots thus used for vegetative propagation. The stem cuttings have nodes that develop into new shoots.



The stem cuttings should be long enough to enable the plant produce more tubers. To develop more adventitious roots.

The cuttings are planted in shallow pits to allow easy sprouting of new shoots from the soil. Cassava is mainly grown using row planting

Caring for cassava crops

- Regular weeding
 - Pruning
 - Spraying pesticides.
 - Earthing up
- Earthing up is the heaping of soil around the plant.

Reasons why farmers heap soil around cassava plants

- To promote good growth.
- To protect the tubers from sunshine and pest damage.
- To encourage the formation of more tubers.
- To conserve moisture in the soil.



Pruning cassava



Earthing up cassava

Don't speak for Quality, let Quality speak for itself

Growing sweet potatoes

Sweet potatoes are propagated by planting the stem cuttings. These are called potato vines.

The potato vines are planted on ridges or mounds.



Potato vine



making sweet potato mounds



sweet potato garden



Point to note:

Mint and Rosemary plants can also be propagated by planting stem cuttings.

Caring for sweet potatoes

- Regular weeding
- Pruning
- Spraying pesticides.
- Earthing up

Earthing up is the heaping of soil around the plant.

Reasons why farmers heap soil around sweet potato plants

- To promote good growth.
- To protect the tubers from sunshine and pest damage.
- To encourage the formation of more tubers.
- To conserve moisture in the soil



Uprooting grass in a sweet potato garden



Earthing up sweet potatoes



Note: Sweet potatoes do not require mulching because;

The potato vines cover the soil surface. /Sweet potatoes are cover crops.

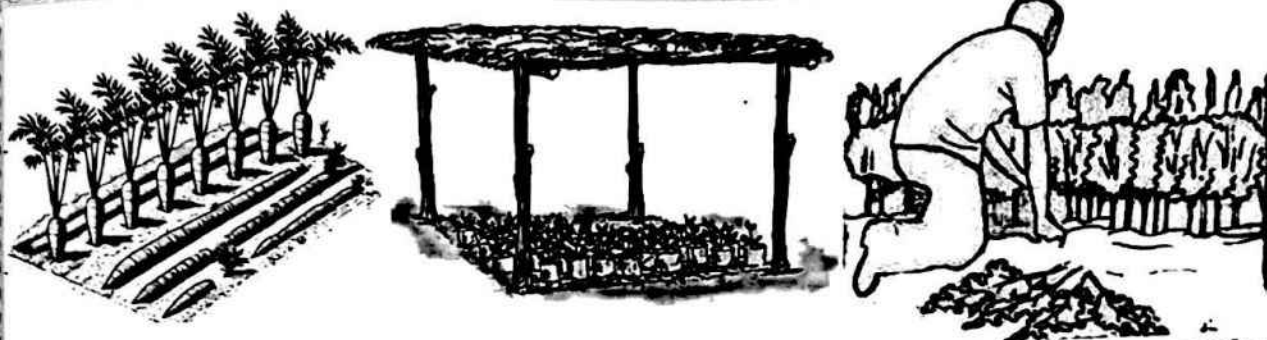
Growing carrots

Carrots are propagated by planting seeds.

The seeds are planted in ridges where holes are made in lines.

Other root tubers propagated by seeds are; turnips, beetroots, sugar beets and parsnips.

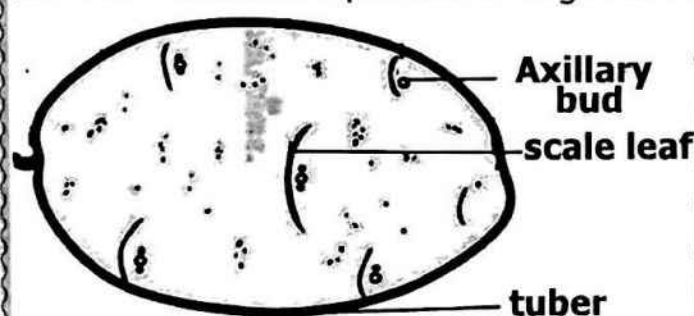
The seeds can be first raised from the nursery bed and later transplanted using a garden trowel.



a farmer thinning carrots

Growing irish potatoes

Irish potatoes are propagated planting the stem tuber.
The stem tuber has the axillary buds which develop into new shoot.
The stem tubers are planted in ridges or mounds.



Functions of each part

Tuber: It stores food for the irish potato.

It supplies food to the growing shoot.

Axillary bud: It develops into the new shoot.

Scale leaf: It protects the axillary bud from physical damage.

Caring for irish potatoes.

Weeding and earthing up

Weeding reduces competition for sunlight, nutrients and space with the weeds.

Earthing up helps tubers to grow into the soil easily.

Growing cocoyams

They are propagated by planting the slip.

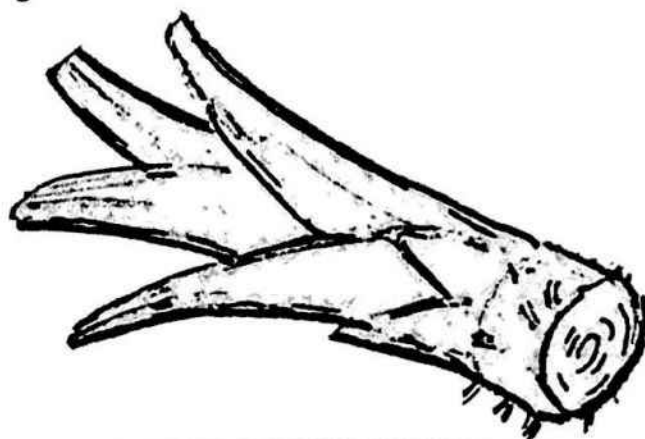
Cocoyams mainly grow well in swampy area.

Note well:

Root tuber yams have creeping and climbing stem e.g. a white yam.

Caring for cocoyams

weeding and pruning

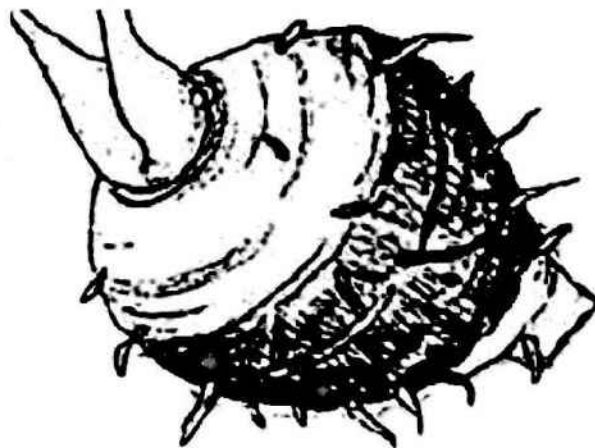


Don't speak for Quality, let Quality speak for itself

i Learn, unlearn and relearn:

What makes a cocoyam to be a stem tuber crop?

- The stem is under the ground.
- Leaves develop from the underground stem.
- It has nodes. Any plant in biology that has nodes is a stem.
- Those rings seen on the swollen parts are nodes (where leaves and buds develop from)
- With time, the stem keeps storing food made by leaves. This causes the stem to increase in size (it swells)
- That underground stem swollen with food in classification of crops is a stem tuber. Therefore, a cocoyam is a stem tuber.



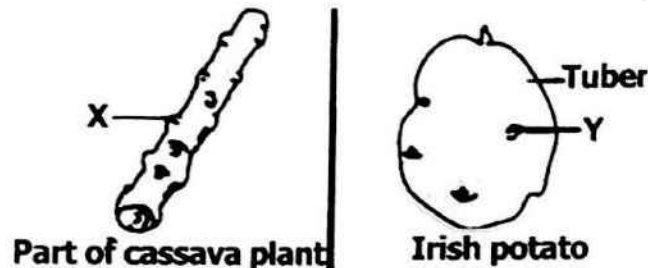
What makes a white yam to be a root tuber?

- It has an aerial stem. The stem grows above the ground.
- It has a weak stem. The leaves grow from the stem
- The stem is not underground. The stem is not swollen. Thus it cannot be a stem tuber.
- When you check its roots, they are swollen with stored food. Therefore, the white yam is a root tuber.



Evaluation activity 7.2

1. (a) Name any **two** root tuber crops that are propagated by the use of seeds.
- (b) Give any **two** factors to consider when choosing the variety of tuber crops to grow.
2. (a) Apart from earthing up, state any **two** other ways of caring for cassava crops.
- (b) Give any **one** advantage of earthing up cassava in the garden.
- (c) Name any **one** tuber crop that is planted in mounds.
2. The diagrams below show part of a cassava plant and an irish potato that are used in propagation. Study and use them to answer the questions that follow



- (a) Name the part of the cassava plant marked **X**.
- (b) State the method of vegetative propagation where the part of cassava plant shown above is used.
- (c) In which one is the function of part **X** of the cassava plant similar to that of part **Y** of the irish potato?
- (d) Give the importance of the tuber in the propagation the irish potato.
4. The table below shows tuber crops in part **A** and how they are planted in part **B**.

Part A: Tuber crop	Part B: How they are planted
White yam	Planting vines.
Sweet potato	Planting slips.
Cocoyam	Planting seeds
Carrot	Planting the tuber.

Match correctly the tuber crops with the ways how they are planted in spaces provided below.

- (i) White yam
- (ii) Sweet potato
- (iii) Cocoyam
- (iv) Carrot

COMMON PESTS AND DISEASES FOR TUBER CROPS

Pests are organisms that destroy crops.

Common pests for root tubers are; rats, monkeys, nematodes, moles, squirrels and Caterpillars and caterpillars.

Common pests for stem tubers are; worms, monkeys, nematodes and millipedes

Characteristics of tuber crop pests

- ✓ They have sharp incisors which bite or cut tubers.
- ✓ They have sharp claws to dig the soil to get tubers.
- ✓ They have fingers used to uproot the tuber plants. e.g., monkeys
- ✓ They have strong mouth parts to cut and chew leaves e.g., caterpillars

Monkey



Squirrel



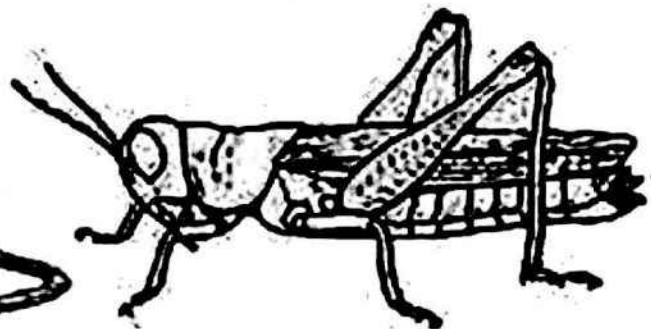
Locust on the leaf



Mole rat



Rat



Locust

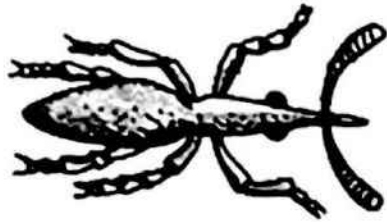


Monkey

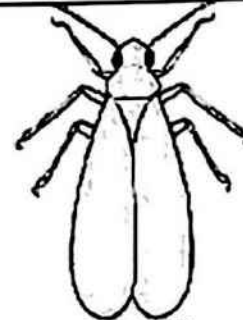


Squirrel

Tuber crop	Pests
Cassava	Whitefly, monkeys, cassava green mite, caterpillars, wild pigs
Sweet potatoes	Eelworms, weevils, caterpillars, moles, monkeys and wild pigs
Carrots	Aphids, cutworms, eelworms, moles, toot knot and nematodes
Cocoyams	Termites, locusts, moles and yam beetles



sweet potato weevil



white fly

Common diseases that affect tuber crops

Cassava mosaic

It is caused by virus.

It makes the leaves to develop white and yellow spots which prevent photosynthesis from taking place.

It is spread by the white fly. It affects growth of the cassava plants leading to poor harvest.

Bacterial blight

It is caused by bacteria and affects the leaves of tuber crops.

It affects sweet potatoes, irish potatoes and cocoyams.

The one that affects sweet potatoes is called potato blight.

The bacteria cause dark brown patches on the leaves, making them appear white.

The tubers become brown under the skin and start rotting.

Wilt disease

It affects the leaves and stems of plants.

It makes them to wilt and later drop off from the plant

Effects of pests and diseases to tuber crops.

- They reduce on the crop yields.
- They cause rotting of root crops.
- They damage the tubers.
- They cause holes on tubers and leaves.
- They cause stunted growth to crops.
- They cause withering of the plants

Signs of tuber crops affected by pests and diseases

- Rotting of tubers
- Holes on tubers and leaves
- Leaf yellowing
- Leaf curling

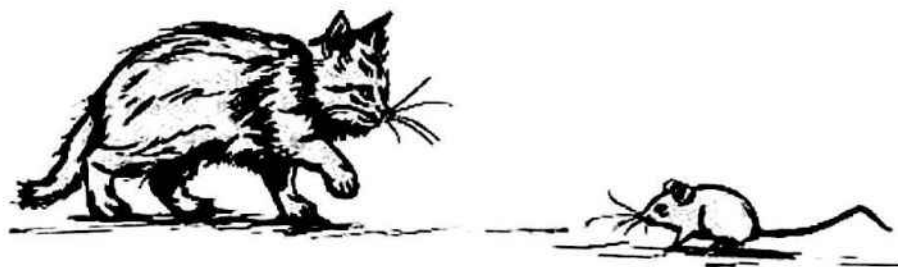


Methods of controlling pests and diseases of tuber crops

Mechanical methods	• Physical guarding by the farmer. • Fencing the garden. • Setting mouse-traps. • Hanging scarecrows in the garden. • Uprooting the infected crops.
Biological methods	▪ Taming a cat to kill and eat rats. ▪ Keeping a dog to kill squirrels and moles. ▪ Use of ladybird to feed on aphids. ▪ Use of wasps to control caterpillars.
Cultural methods	- practising crop rotation. - Early planting and harvesting. - Timely weeding. - Planting resistant crop species. - Planting disease-free cuttings or vines. - Proper spacing of crops.
Chemical methods	• Spraying pesticides. • Dusting the affected crops. • Using rat poison to kill rats.

Evaluation activity 7.3

1. Give the meaning of the term crop pest.
 2. Mention any **two** examples of tuber crop pests.
 3. State any **two** characteristics of tuber crop pests.
 4. (a) Give the importance of the following features to a squirrel.
 - (i) Sharp claws
 - (ii) Sharp incisors
 - (b) State any **two** cultural methods commonly used by farmers to control tuber crop pests.
 5. Identify any **one** effect of pests and diseases on tuber crops.
- The diagram below shows a method of controlling tuber crop pests. Use it to answer questions 6 and 7.



6. Identify the method of controlling tuber crop pests shown in the diagram above.
7. State any **one** advantage of using the method above over poisoning.
8. Give any **two** tuber crops that are affected by bacterial blight disease.
9. Name the germ that causes mosaic disease in cassava crops.

Evaluation activity 7.3 Continued

10. Which part of cassava is attacked by cassava mosaic disease? The diagram below shows a common tuber crop pest that affects cassava plant. Use it to answer questions **11** and **12**.



11. Identify the tuber crop pest shown above.

12. Name the disease of cassava transmitted by the tuber pest shown above.

HARVESTING PROCESSING AND STORAGE OF TUBER CROPS

Harvesting is the removal of ready or mature crops from the garden.

Tuber crops are harvested by digging out or uprooting.

Wet/rainy season is the suitable season for harvesting tuber crops.

Reason. The soil is soft which reduces damage on the tubers when digging out. Tuber crops are also harvested during dry season for easy drying and processing into flour because there is enough sunshine to dry them.

Harvesting cassava

Cassava is harvested by digging out and uprooting.



Digging cassava



Harvested cassava



Uprooting cassava

Ways of processing cassava

Peeling cassava, sun-drying, grating,

Washing cassava, roasting, deep-frying

Slicing cassava, milling, boiling

Uses of processed cassava

- It is used for preparing a meal.
- It is used to make chips.
- It is used to make flour.
- It is sold for money.

Uses of pounded flour obtained from cassava.

- For making cassava bread.
- For making pancakes.
- For making local beer and local glue.
- For making porridge

Harvesting sweet potatoes

They are harvested by digging out or uprooting.

It can be done using a hoe or pointed stick



Harvesting sweet potatoes



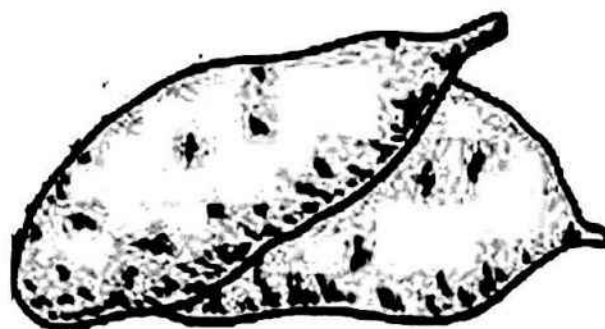
Harvested sweet potatoes

Ways of processing sweet potatoes.

- Peeling sweet potatoes
- Washing
- Pounding when dried.
- Grating
- Slicing sweet potatoes.
- Sun-drying
- Roasting



Slicing a sweet potato tuber



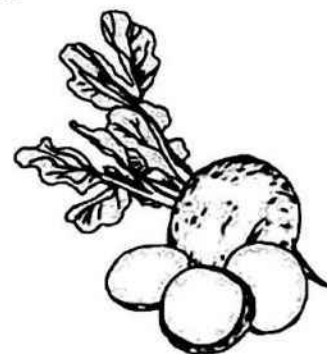
Harvesting carrots and turnips

Harvesting is done by uprooting or digging out.

Carrots can be eaten in raw form, as salads or added to soup.

The leaves of turnips can be picked and then prepared as salads.

Carrots are processed by peeling, slicing, washing and cooking



Harvested turnips

Harvesting irish potatoes

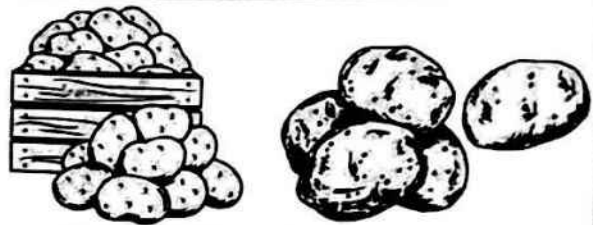
They are harvested by digging out or uprooting.

They are processed by;

- Peeling
- Slicing
- Deep frying
- Sun-drying.

They can be used to make chips.

They can be prepared for a meal.



Harvested irish potatoes

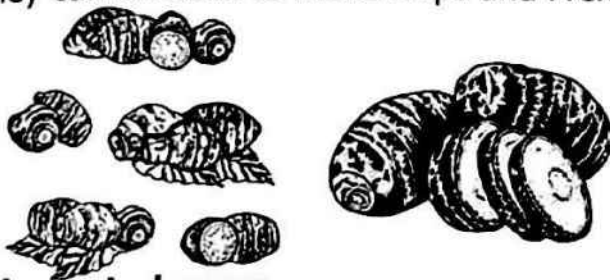
Harvesting yams

Yams are harvested by digging out or uprooting.

Yams can be sliced, dried and milled into flour.

Fresh yams can be peeled, boiled and pounded until a sticky elastic dough is produced.

They can be used to make chips and French fries.



Harvested yams

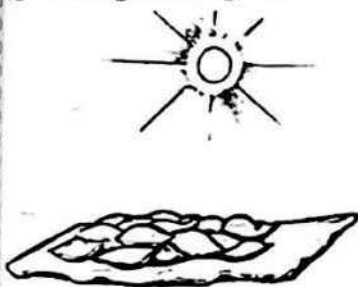
Importance of tuber crops to people

- ✓ They are source of food.
- ✓ They are sold for money.
- ✓ They are used for propagation.
- ✓ They are used to make flour.
- ✓ They are used to spice food.

Methods of preserving tuber crops

Preserving tuber crops is the way of keeping tubers safe for a long time without going bad.

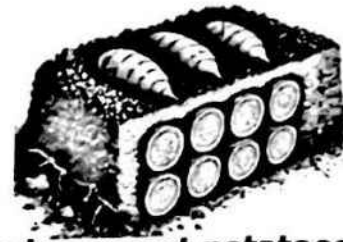
- ❖ Sun-drying.
- ❖ Burying in the soil under the shade.
- ❖ Refrigerating carrots and turnips.



Sun-drying



Refrigerating carrots



Burying sweet potatoes in soil

Importance of preserving tuber crops.

- ✓ It ensures food security.
- ✓ It adds value to tubers.
- ✓ It prevents tubers from developing new shoots when stored.
- ✓ It increases on their life span.
- ✓ It makes it easy to transport tubers.

Storage Of Tuber Crops

- They can be stored in granaries. The granary should have rat guards.
- Reason.** To prevents rats from entering the granary to spoil stored food.
- Flour should be packed in dry sacks.

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- The sacks should be placed on dry pieces of wood that are slightly raised
Reason. To prevent the sacks from absorbing moisture from the floor.

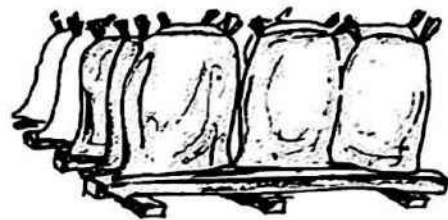
 **Note well.** If the sacks are placed on the floor directly, the flour absorbs moisture from the floor and gets spoilt.

- Irish potatoes need to be stored in a cool dry place.

 **Note.** Storing them in sacks is not good because; the sacks generate a lot of heat and start rotting.



Rat guards



Sacks on raised stands

Qualities of a good granary for storing dried tuber crops.

- ❖ It should have rat guards. They prevent rats from climbing into the granary to destroy stored tubers.
- ❖ It should be leakproof. This prevents rain from falling in the granary which leads to rotting of tubers.
- ❖ It should have ample space. This enables the granary to accommodate enough tubers.
- ❖ It should be well ventilated. This promotes free circulation of air in the granary.
- ❖ It should be raised above the ground. This prevents dampness from the ground.

SCIENCE ORIENTED CLUBS

These are clubs that involve pupils in activities which are related to science issues.

They enable pupils to do practical science activities.

Aims of the science-oriented clubs in schools

- To promote learning of science in the school.
- To enable learners know how scientists work.
- To boost children's interests in science subject.
- To equip learners with knowledge and skills for future careers.

Examples of science-oriented clubs that can be formed in a school.

- | | |
|---------------------------|------------------------|
| ➤ The Young Farmers' Club | ➤ Science Contest Club |
| ➤ Science Quiz Club | ➤ Science Debate Club |
| ➤ Science Exhibition Club | ➤ Wildlife Club |
| ➤ School Environment Club | |

The Young Farmers' Club

This is an association in a school where members learn practical skills on crop growing and livestock rearing.

Activities done by The Young Farmers' Club

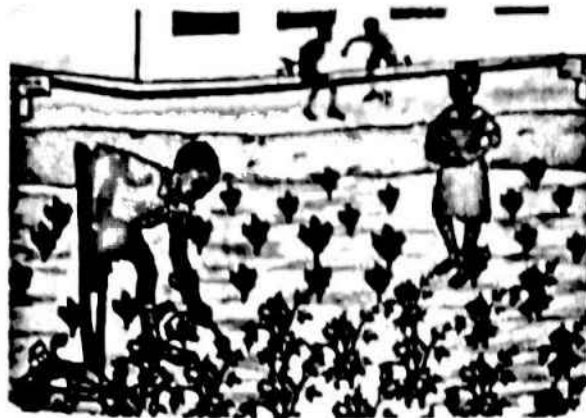
- Growing crops.
- Rearing animals.
- Setting up woodlots.
- Organizing agricultural seminars and debates.
- Organising field trips.
- Setting up botanical garden.
- Caring for crops and animals.

Importance of the young farmers' club in a school

- It enables pupils to acquire modern farming skills.
- It enables the school to get more food.
- It boosts learners' interest in farming.
- It enables pupils learn how to care for crops and animals.
- It encourages the conservation of the school environment.
- It enables pupils to learn how to keep farm records.

Activities done by the School Wildlife Club

- Making and maintaining the tree nursery bed.
- Tree labelling
- Bird watching
- Setting up botanical garden.
- Establishing woodlots.
- Constructing aquaria.

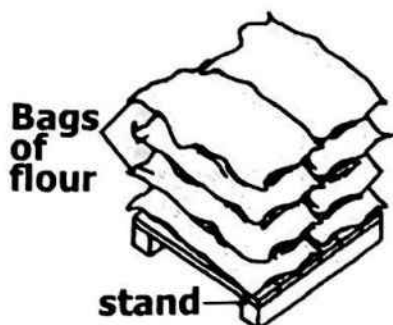


Pupils weeding a school garden

Evaluation activity 7.4

1. Name the season that is suitable for harvesting tuber crops.
2. Give any **one** method used to harvest tuber crops.
3. State any **two** ways in which people can use pounded flour got from dried cassava tubers.
4. Mention any **one** way in which sweet potatoes can be kept fresh for some time.
5. Why should a granary have rat guards on its stands?

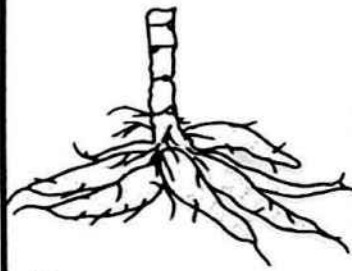
The diagram below shows bags of cassava flour in a store. Use it to answer question 6.



6. Why are bags of cassava flour put on such a raised stand?
7. State one disadvantage of keeping Irish potatoes in sacks for a long time.

Evaluation activity 7.4 Continued

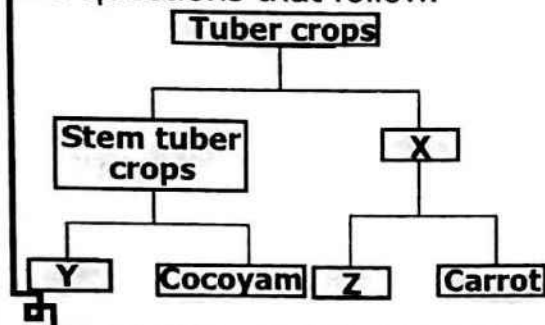
The diagram below shows a root tuber crop. Use it to answer questions 9 and 10.



9. Name the root tuber crop shown in the diagram above.
10. State any **one** way in which the root tuber crop above can be processed at home.
11. (a) Write down any **two** activities done by the Young Farmers' Clubs in schools.

(b) Give any **two** ways in which Young Farmers' Clubs are important in schools.

The table below shows groups of tuber crops. Study and use it to answer the questions that follow.



- (a) Name the group of tuber crops at **X**.
- (b) Give any two tuber crops that can be put at **Z**.
- (c) How is the propagation of a carrot different from that of the tuber at **Y**?

MEANING OF KEY TERMS IN OCCUPATIONS IN OUR COMMUNITY: CROP GROWING

Tuber crops: Plants that have swollen underground food storage stems or roots.

Root tubers: Plants that have swollen underground food storage roots.

Stem tubers: Plants that have swollen underground food storage stems.

Crop pests: Organisms that destroy crops.

Pruning: Removal of unwanted parts from the plant.

Earthing up: Heaping soil around the tuber plant.

Weeding: The removal of unwanted plants that grow in the garden.

Cassava mosaic: The viral disease that affects the leaves of cassava plants.

THEME:

THE WORLD OF LIVING THINGS

TOPIC :

8 BACTERIA AND FUNGI

BACTERIA

Bacteria are single-celled microscopic organisms without a nucleus.

The study of bacteria and their effects on organisms is called **bacteriology**.

Bacteria are microscopic because they can only be seen using a microscope.

They cannot be seen using our naked eyes.

They are unicellular organisms because they are made up of a single cell.

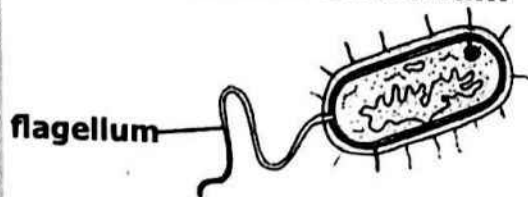
Characteristics of bacteria

- They are single-celled.
- They are microscopic.
- They reproduce by binary fission/cell division.
- They have no nucleus.
- They have no uniform shape and size.
- They feed parasitically or saprophytically.

Places where bacteria are found.

In air, water, soil, animal bodies, rubbish, latrines, decaying matter, plants, wounds, blood

The structure of bacterium



The flagellum is used for movement.



Breeding In Bacteria

Places where bacteria breed.

rubbish pits, pit latrines, wounds, water and decaying matter

Conditions that favour the breeding of bacteria

- Presence of warmth
- Presence of moisture.
- Presence of air.
- Presence of food.

Condition	function
Warmth	Speeds up bacterial growth and reproduction
Food	Provides energy and nutrients for survival
Moisture	Supports metabolic processes and nutrient absorption
Air	Supplies oxygen for aerobic bacteria

 **Note:** High temperature, very low temperature and chemicals do not favour the breeding of bacteria.

Mode of reproduction in bacteria

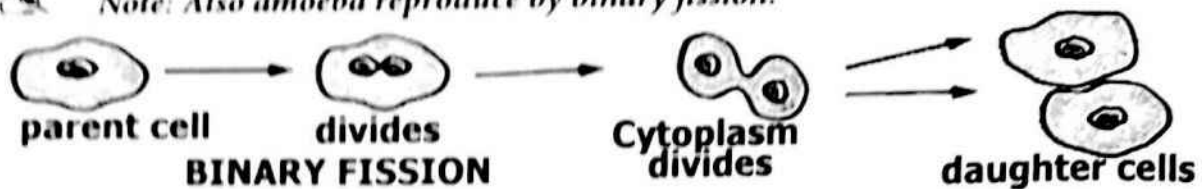
Binary fission.

Binary fission is asexual reproduction in which the parent cell of a single-celled

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organism divides equally to form two new cells.

Note: Also amoeba reproduce by binary fission.



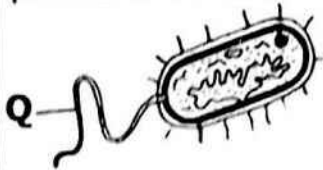
Shapes of bacteria

- rod shaped bacteria
- spiral-shaped bacteria
- spherical shaped bacteria
- comma-shaped bacteria



Evaluation activity 8.1

1. Name the group of single-celled organisms that have no nucleus in them.
 2. State any **two** characteristics of bacteria.
 3. List down any **two** places where bacteria can be found.
 4. State any **one** condition that favours the multiplication of bacteria.
 5. State the difference between the reproduction in bacteria and that of a hen.
- The diagram below shows the structure of bacterium. Use it to answer questions **6** and **7**.



6. Name the part of the bacterium marked **Q**.
7. Give the function of the part marked **Q** to the bacterium above.

8. Apart from bacteria, name **one** other single-celled organism that reproduces by binary fission.
 9. Name the instrument that doctors can use to see harmful bacteria in the person's blood.
 10. Give **one** reason why bacteria are referred to as microscopic organisms.
 11. State any **one** reason why bacteria breed in dustbins.
 12. Apart from dustbins, mention any one other place where bacteria breed.
 13. Give any **one** way in which bacteria get their food for multiplication.
- The diagram below shows a mode of reproduction in an organism. Study and use it to answer questions **14** and **15**.



14. Identify the mode of reproduction shown in the diagram above.
15. Name any **one** organism that reproduces as shown in the diagram above.

The Nature of Bacteria

Bacteria can be useful or harmful.

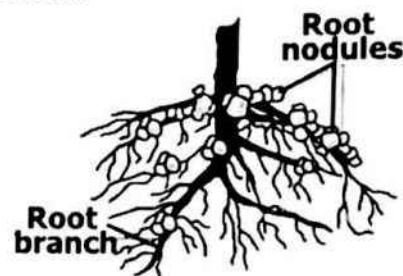
Ways in which bacteria are useful in the environment

- ❖ Bacteria reduce the volume of faeces in pit latrines and septic tanks. They break down faeces and stop them from heaping up in the pits.
- ❖ Bacteria help in decomposition of organic matter.
- ❖ Bacteria found in root nodules fix nitrogen into the soil.

These bacteria are called nitrogen fixing bacteria.

- ❖ Some bacteria are used in making vaccines.
- ❖ Bacteria found in the gut help in the digestion of food.
- ❖ Bacteria help in the production of biogas.
- ❖ Bacteria help in the production of yoghurt. They cause fermentation of milk.
- ❖ Bacteria help in the making of vitamin B12.
- ❖ Bacteria are used in the making of antibiotics.
- ❖ Bacteria help in the production of manure.
- ❖ Bacteria help in soil formation.

They help in decomposition of organic matter.



Experiment to show that bacteria help in decomposition

Materials needed: fresh leaves, soil, transparent jar and water

Steps taken

- (i) Put the leaves in the jar, then add a layer of soil to cover them.
- (ii) Sprinkle some water to keep it moist and leave the jar in warm place for a week.
- (iii) The leaves begin breaking down over time as bacteria decompose them.

Roles of the materials

Fresh leaves. They provide organic matter for bacteria to decompose.

Soil. It contains bacteria needed for the decomposition process.

Water. It speeds up the rate of decomposition of fresh leaves.

Transparent jar. It allows observation of decomposition process.

Processes that take place by the action of bacteria.

Fermentation, decomposition, digestion and nitrogen fixation

Products obtained by the action of bacteria.

Yoghurt, cheese, biogas, vaccines, antibiotics and compost manure.

Ways in which bacteria are harmful in the environment

- (i) They cause diseases to animals and plants.

Bacterial diseases in people are; tetanus, cholera, typhoid, tuberculosis, dental caries

Bacterial diseases in livestock are; anthrax, mastitis, foot rot, heartwater

Bacterial diseases in plants are; bacterial blight, bacterial wilt, crown gall and soft rot.

- (ii) They cause poor yields in crops.

- (iii) They cause food poisoning.
- (iv) They make wounds to become septic.
- (v) They make milk to go sour.

Experiment to show that bacteria make food to go bad

Materials needed: plate, tablespoon, boiled beans

Steps taken

- (i) Put boiled beans in a plate.
- (ii) Leave the beans in their soup for three days.
- (iii) Scoop beans using a tablespoon smell and taste them.
- (iv) The beans change their smell and taste after three days.

Roles of the materials

Boiled beans. They provide food for bacteria to grow and spoil.

Tablespoon. It is used to scoop beans to smell and taste after three days.

Plate. It holds the beans for observation of spoilage.

Prevention, control and treatment of bacterial diseases

- ❖ Drinking boiled water and milk.
Boiled water or milk is free from pathogenic bacteria.
- ❖ Isolating infected people.
It prevents the spread of bacterial diseases like cholera to healthy people.
- ❖ Immunization
It provides antibodies in the body which fight against pathogenic bacteria.
- ❖ Washing hands with clean water and soap.
It kills and removes pathogenic bacteria from hands.
- ❖ Eating clean and well cooked food.
It reduces the outbreak and spread of bacterial diseases.
- ❖ Proper disposal of rubbish and human wastes.
It reduces the breeding grounds for bacteria.
- ❖ Proper use of latrines/toilets.: It reduces the breeding of bacteria.
- ❖ Regular brushing of teeth.
It removes food remains that attract pathogenic bacteria on teeth.
- ❖ Regular bathing.
It kills and removes pathogenic bacteria from the human body.
- ❖ Sterilizing medical equipment. It kills pathogenic bacteria.

Ways of treating bacterial diseases

- Using antibiotics.
- Using antiseptics.
- Using essential drugs

Antibiotics

Antibiotics are medicines used to kill harmful bacteria in the body.

Examples of antibiotics are; penicillin, tetracycline, amoxicillin and septrin



Antiseptics

Antiseptics are chemicals which are used to kill harmful bacteria on surfaces and wounds.

Antiseptics prevent wounds from becoming septic by killing bacteria.

Examples of antiseptics are; Dettol, iodine, surgical spirit, jik, jeyz, salt solution, savlon and hydrogen peroxide.

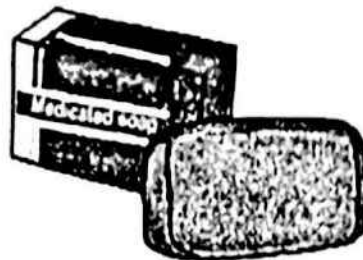
They are used to clean latrines or toilets and floors.
They reduce the smell in latrines.



soap



liquid soap



Evaluation activity 8.2

1. Name any **one** process that takes place in the presence of bacteria.
2. State any **two** ways in which bacteria are important in the environment.
3. State **one** way in which bacteria are useful in the following:
(i) Formation of soil (ii) Treatment of sewage (iii) Production of yoghurt
4. Give any **one** way in which liquid soap is useful when cleaning toilets.
5. State the difference between antibiotics and antiseptics.
6. Mention any **two** ways of controlling bacterial diseases in people.

The diagram below shows drugs used to kill bacteria in the human body. Use it to answer question 7.



7. Identify the antibacterial drugs shown above.
8. How does regular washing of hands with soap and water help in the prevention of pathogenic bacteria?

FUNGI

Fungi are simple saprophytic organisms which do not contain chlorophyll.

They do not make their own food because they lack chlorophyll.

They live on other living things as parasites or on dead decaying matter as

saprophytes.

Fungi have microscopic hollow filaments called **hyphae**.

Characteristics of fungi

- They have a nucleus in their cells.
- They feed saprophytically or parasitically.
- They reproduce by means of spores or cell budding.

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- They have thread-like structures called hyphae.
- They grow in damp places.
- Most fungi have many cells except yeast.

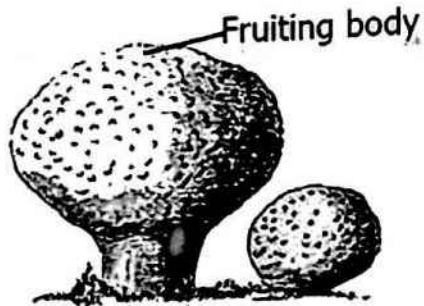
Places where fungi are found

In water, on dead trees, in soil, rotting food, plants and animals.

Examples of common fungi are; mushrooms, puffballs, yeast and toadstools



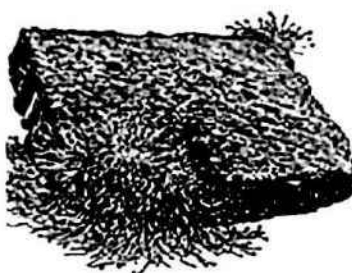
Mushrooms



Puffball



Toadstools



Moulds



Yeast



Bracket fungus

Fungi	Characteristics
Mushrooms	• Grow during rainy season. • Grow on pieces of wood, around cow dung and brew-refuse, dead organic matter and near anthills. • They are rich in proteins, vitamins and mineral salts. • They contain vitamin B and D and iron.
Puffballs	Have a fruiting body which releases tiny spores that are carried in the air .
Toadstools	• Grow on old tree stumps during rainy season. • They are brightly coloured. • Toadstools are poisonous fungi. • They grow in the wild.
Yeast	• They are single-celled fungi. • They contain a lot of sugar. • They feed on sugar. • They produce alcohol. • Yeast are important in the brewing of alcoholic drinks like wine.

Fungi	Characteristics
Moulds	- Have tiny bodies which are thread-like. - They normally grow on leftover foods.

Parts of a fungus (Mushroom)



Functions of each part

Cap. It holds and protects the gills.

Gills. It produces spores.

Note: Sunlight enables fungi to form spores

Ring. It holds the cap when it is still young.

Stipe/stalk. It holds the cap in upright position.

Mycelia. They absorb nutrients from decaying matter.

Reproduction In Fungi

Conditions that favour the breeding of fungi

Presence of moisture, presence of food, and presence of warmth

Condition	Function
Warmth	Speeds up spore germination and fungal growth
Food	Provides nutrients for energy and reproduction
Moisture	Supports spore germination and hyphal development

Most fungi reproduce **by means of spores** except yeast.

Yeast reproduces **by cell budding**.



Feeding in fungi.

They absorb nutrients from decaying matter. / They feed saprophytically.

This is called saprophytic feeding.

Saprophytes are organisms that feed on dead organic matter.

Most fungi are saprophytes because they feed on dead organic matter.

Parasitic feeding e.g, Rhizopus and smut.

Uses of fungi

- Mushrooms are source of food.
- Yeast is used in brewing alcohol.
- Yeast speeds up fermentation.
- Yeast is a source of vitamin B1.
- Yeast is used to flavour cheese.
- Penicillium is used to make penicillin.
- Fungi help in decomposition of organic matter
- Fungi are source of local medicine.
- Mushrooms are sold for money.
- Yeast is used for baking.
- Yeast makes dough to raise.
- Yeast ferments sugar and oxygen in the dough

point to note: Yeast ferments sugar and oxygen in the dough to produce carbon dioxide gas, which causes the dough to raise. This gives bread a light and spongy texture.

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Examples of useful fungi: Mushrooms, yeast, penicillium and truffles. Truffles and mushrooms are edible fungi.

Experiment to show / demonstrate the action of yeast

Materials needed: a container, baking powder and water

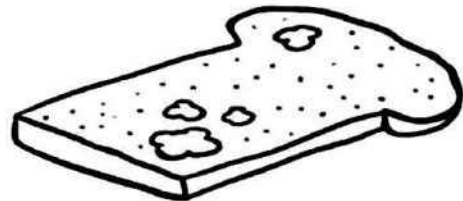
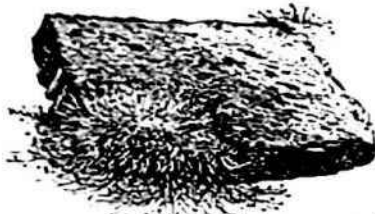
Steps taken

- (i) Pour some water into the container.
- (ii) Put baking powder in the water.
- (iii) The water forms bubbles of carbon dioxide that rise.
- (iv) Yeast causes the formation of carbon dioxide.

Dangers of fungi.

- ✓ Moulds make food to go bad.
- ✓ Pathogenic fungi cause diseases.
- ✓ Fungi cause food poisoning by producing toxins.
- ✓ Toadstools are poisonous when eaten.

Examples of harmful fungi are; toadstools, puffballs, smut and rhizome moulds



Moulds growing on bread. This makes bread to go bad

Evaluation activity 8.3

1. Name the fungus which normally grows on leftover foods.
2. Give any **two** examples of fungi.
3. State any **two** characteristics of fungi.
4. Name the gas produced by yeast that rises dough when baking bread.
5. In which way is reproduction of yeast different from that of other fungi?
6. Name the fungus used in bakery industries.
7. The diagrams below show modes of reproduction in organisms. Study and use them to answer the questions that follow.



- (a) Name the modes of reproduction marked **E** and **F**.
- (b) Give any **one** organism that undergoes the mode of reproduction marked **E**.
- (c) State any **one** use of the organism that undergoes the mode of reproduction marked **F** to people.
8. Write down any **two** industries that use fungi when manufacturing products.
9. State any **one** role of yeast when baking bread.
10. Mention any **two** dangers of harmful fungi to people.

Evaluation activity 8.3 Continued

11. Name the fungus used to make antibiotics.
12. Identify any **two** food values the body receives when an individual eats mushrooms.
13. Give any **one** example of poisonous fungi.
14. Name the fungus that leads to the production of carbon dioxide.
15. The diagram below shows a mushroom. Study and use it to answer the following questions.



- (a) Name the parts marked **O** and **P**.
- (b) Identify the reproductive substance produced by part marked **P**.
- (c) State the reason why part marked **Q** is useful to a mushroom.

Common fungal diseases in people

These diseases mainly affect the skin.

Examples are; ringworm infection, athlete's foot, dhobi's itch, jock itch, barber's itch and candidiasis (thrush).

Candidiasis is a fungal venereal disease caused by poor hygiene. It affects the genitals.

Use mnemonic: **DR. JACB**



Ringworm infection



Athlete's foot

Ways in which fungal diseases spread among people

- Through body contact.
- Sharing shoes or stocking.
- Through sexual intercourse.
- Improper use of toilets.
- Wearing wet stocking or shoes.
- Sharing clothes, basins, bedding or buckets.
- Putting on wet knickers.

Signs and symptoms of fungal diseases that attack people.

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Disease	Signs and symptoms
Ringworm infection	- Round-white patches on the skin. - Hair falling off the skin. - Itching of the skin.
Athlete's foot	-Peeling of the skin between toes. -The skin between toes become white and cracks. -Wounds between toes.
Candidiasis	-Itching of the private parts. -Burning pain when urinating. -Sore genital organs. -Smelly discharge from the vagina.

Prevention and control of diseases caused by fungi.

- Regular bathing.
- Using fungicides and powder.
- Avoid sharing shoes or socks.
- Avoid body contact with an infected person.
- Wearing clean and dry shoes.
- Washing and ironing clothes.
- Changing shoes regularly.
- Wearing clean and dry knickers.

Common fungal diseases in plants.

Root rot, smut, Panama disease, cigar end rot, maize rust, coffee berry disease, powdery mildew and leaf spot.

Prevention and control of fungal diseases in plants

- ❖ Spray plants using fungicides.
- ❖ Practice crop rotation.
- ❖ Uproot and burn the infected plants.
- ❖ Plant resistant varieties.
- ❖ Seed dressing to control fungi.

Similarities between bacteria and fungi.

- ✓ Both require warmth, moisture and food to breed.
- ✓ Both cause decomposition.
- ✓ Both reproduce asexually.
- ✓ Both cause fermentation.
- ✓ Both feed saprophytically or parasitically.

Differences between bacteria and fungi.

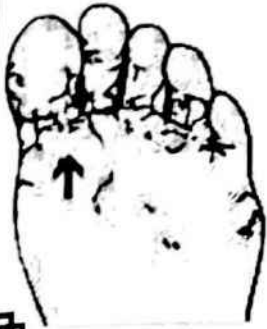
- Fungi reproduce by cell budding or by means of spores while bacteria reproduce by binary fission.
- Bacteria are single celled while most fungi have many cells except yeast.
- Bacteria reproduce faster than fungi.
- Some bacteria make their own food while fungi cannot make their own food.
- All bacteria are microscopic while most fungi can be seen using our naked eyes.

Evaluation activity 8.4

1. Name the fungal caused sexually transmitted disease which is spread through poor hygiene.
2. State any **one** way in which Athlete's foot can be controlled among school children.
3. Mention any **two** ways in which bacteria are similar to fungi.
4. Name any **two** food processing methods that use fungi.

Evaluation activity 8.4 continued

The diagram below shows a foot suffering from a disease.
Use it to answer questions 5 and 6.



4. Identify the disease of the skin that affects the foot shown in the diagram above.
5. Name the germ that causes the skin disease shown by the foot above.

MEANING OF TERMS USED IN BACTERIA AND FUNGI

Antiseptics: Chemicals used to kill harmful bacteria on surfaces.

Antibiotics: Chemicals used to kill harmful bacteria in the body.

Fungicides: Chemicals used to kill harmful fungi.

Saprophytes: Organisms that feed on dead decaying matter.

Mycelium: The mass of filaments which form the main part of a fungus.

Hyphae: A microscopic hollow filament in a fungus.

Binary fission: A form of asexual reproduction where a single cell divides into two daughter cells.

Budding: A form of asexual reproduction which grows a new group of cells out of the side of the parent body.

Bactericide: Chemicals used to kill harmful bacteria.

Bacteriology: The study of bacteria and their effects on organisms.

Microscope: An instrument used to view tiny organisms.

THEME:

MANAGING CHANGES IN THE ENVIRONMENT

TOPIC :

9

TYPES OF CHANGES IN THE ENVIRONMENT (BIOLOGICAL, PHYSICAL AND CHEMICAL CHANGES)

CHANGES IN THE ENVIRONMENT

(i) Biological changes (ii) Physical changes (iii) Chemical changes

BIOLOGICAL CHANGES

Biological changes are changes that take place in organisms but do not involve chemical reactions.

Characteristics of biological changes

- ✓ They take place in living things only.
- ✓ They cause change in size, weight and height.
- ✓ They form new substances.
- ✓ They are irreversible.

Examples of biological changes in organisms

Biological changes in animals

- moulting - hatching of eggs - metamorphosis - changing colours
- growth - reproduction - gaining or losing weight - fertilisation

Biological changes in plants

- ⇅ germination ⇅ fruiting ⇅ flowering ⇅ reproduction ⇅ growth
- ⇅ shedding leaves ⇅ ripening of fruits ⇅ fertilisation

Explanation of some examples of biological changes.

Moulting

It is the shedding of old skin, feathers or cuticle in animals.

It enables animals to grow.

It is similar to shedding of leaves in plants.

Changing colours

Chameleons change their colours for protection and to get their prey.

Metamorphosis

It is the change in body structure of an insect as it passes through different stages of life cycle.

It is common in; bees, houseflies, butterflies, cockroaches, locusts and grasshoppers

It enables insects to increase in number.

Ripening of fruits

It is the process by which fruits become softer, sweeter and more flavourful as they mature.

It is a sign of maturation in plants.



Learn, unlearn and relearn: transpiration, pollination, seed dispersal, sweating and transpiration are not biological changes in the environment.

Illustrations showing some of the examples of biological changes

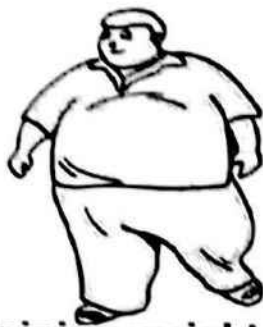
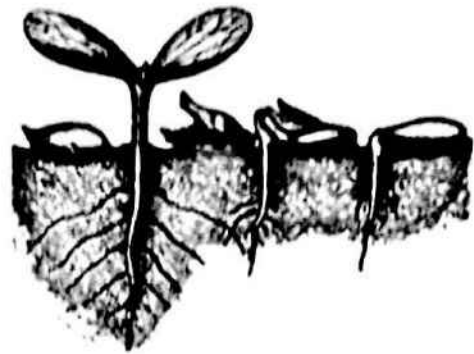
Shedding leaves



Moulting



Germination



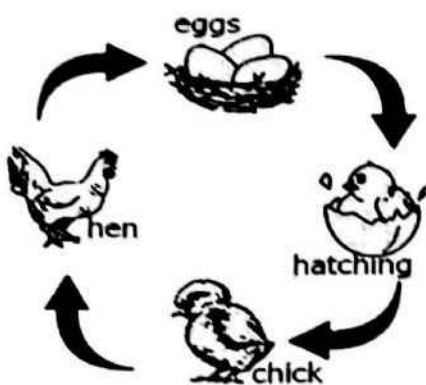
Gaining weight



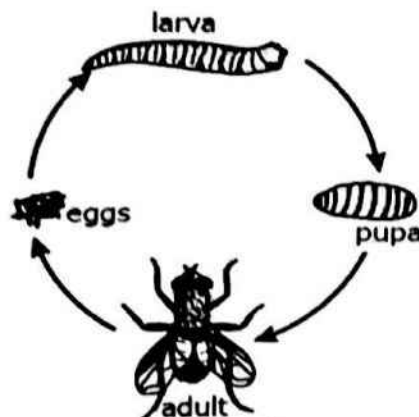
Losing weight



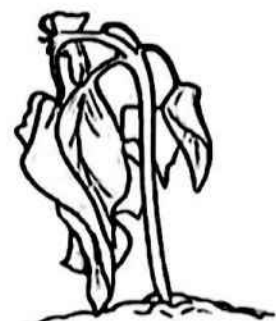
Flowering



Life cycle of a bird



Life cycle of an insect



Wilting in a plant

Evaluation activity 9.1

1. Name the type of change that takes place when a fruit ripens.
2. State any **two** characteristics of biological changes.
3. Give the reason why moulting is called a biological change.
4. State any **one** factor that can lead to loss of weight in human beings.
5. In which **one** way is the changing of colours helpful to a chameleon?
6. Give any **one** example of a biological change in plants.
7. Name the biological change that enables insects to grow bigger in size.
8. Write down any **two** examples of biological changes that take place in both animals and plants.

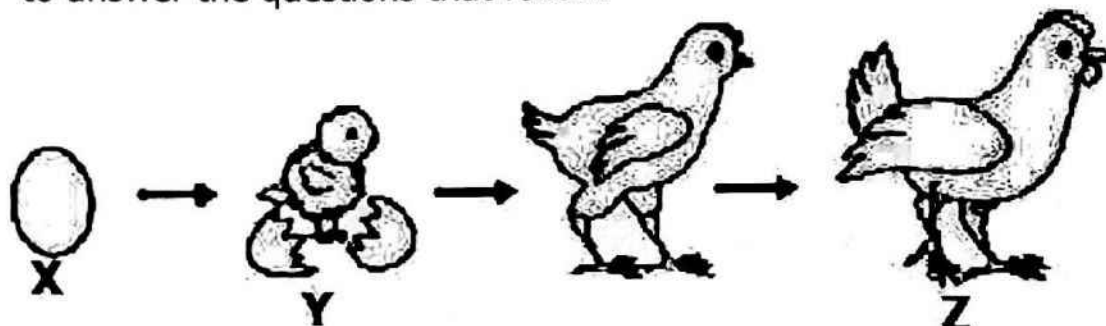
Evaluation activity 9.1 Continued

The diagram below shows a biological change in a bird. Study and use it to answer questions 9 and 10



9. Identify the biological change shown above.
10. State any **one** condition necessary for the above biological change to take place.
11. Apart from biological changes, give **two** other types of changes in the environment.

12. The diagram below shows a type of change in a bird. Study and use it to answer the questions that follow.



- (a) What type of change is shown in the diagram above?
- (b) Name the stages of the bird marked **X** and **Y**.
- (c) State the role of the stage marked **Z** in the reproduction of the bird.

MANAGING BODY CHANGES

Examples of body changes in human beings and how they are managed.

Body change	How it is managed.
Growth of hair.	• Regular washing of hair. • Trimming/shaving overgrown hair. • Combing hair.
Growth of toe and finger-nails	• Grooming toe or fingernails. It destroys breeding places for vectors.
Body odour	• Regular bathing. • Regular washing of clothes. • Shaving hair around pubes and in armpits. • Use of deodorants. • Washing underpants regularly. • Using antiperspirants.
Menstruation	• Regular changing of sanitary pads. • Regular bathing. • Feeding on food rich in iron. It helps to replaces the lost blood during menstruation period.

Body change	How it is managed.
Gaining or losing weight	• Proper feeding. • Doing regular physical exercises.
Falling sick	• Proper medication. • Sleeping under treated mosquito nets. • Drinking boiled water. • Proper feeding.

Pieces of guidance to managing body changes

- Having good lifestyles.
- Avoid smoking and alcoholism.
- Maintaining personal hygiene.
- Controlling vectors.

Sources of information about body care

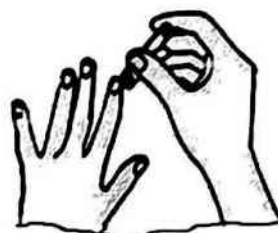
- Through parents.
- Through magazines.
- Through teachers.
- Through radio and TV talk shows.



Combing hair



Shaving hair



Grooming fingernails



Physical exercising

Effects of biological changes in the environment.

- They cause multiplication of living things.
- They cause increase in size and weight of organisms.
- They cause the formation of new cells.
- They cause maturity of organisms.

Importance of biological changes in the environment

- They enable organisms to multiply.
- They enable animals to grow through moulting.
- They enable animals to protect themselves.
- They enable life to continue through reproduction.
- They enable organisms to get food.

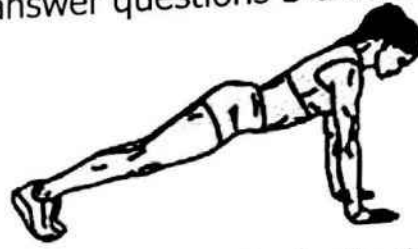
They include; fruiting, flowering, ripening of fruits, camouflaging and germination

Evaluation activity 9.2

- (a) Write down any **two** body changes that need to be managed.
(b) Give any **two** ways in which body changes can be managed.
- State any **one** way in which biological changes are important in the environment.
- Name any **two** biological changes that provide food to people.
- How is moulting in animals similar to germination in plants?

Evaluation activity 9.2 continued

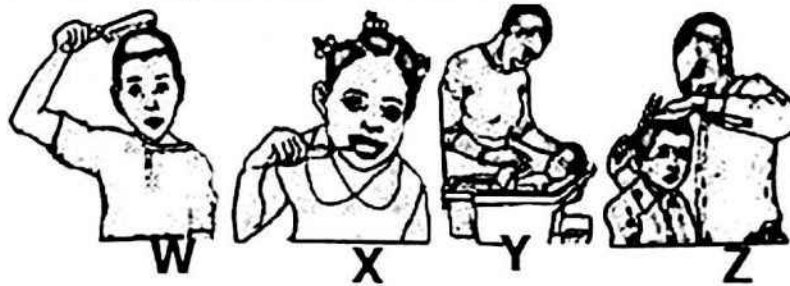
The diagram below shows an activity carried out by a person to manage body changes. Use it to answer questions 5 and 6.



5. Identify the activity used to manage the body changes shown in the diagram.
6. Give any **one** body change managed when a person carries out the activity above.
7. State any **two** effects of biological changes in the environment.
8. Write down any **two** pieces of guidance used in managing body changes.
9. Name any **one** part of the human body that needs to be managed well.
10. The table below shows some of the examples of biological changes and the meaning of each. Complete the table correctly.

Change	Meaning
.....	Shedding an old skin in animals.
Camouflaging	.....
.....	The growth changes in an insect from egg to adult.
Germination	.....

11. The diagrams below show activities done to manage body changes. Use them to answer the questions that follow.



- (a) Name the activities marked **W** and **Y**.
- (b) Give **one** reason why the girl is carrying out the activity marked **X**.
- (c) Mention **one** parasite controlled by carrying out the activity marked **Z**.

CHEMICAL CHANGES

Chemical changes are irreversible changes that involve chemical reactions.

Characteristics of chemical changes

- ✓ They form new permanent substances.
- ✓ They are irreversible.
- ✓ Substances change their mass.
- ✓ Size, shape and weight of an object change.

 **Point to note:** In chemical changes, chemical properties of the substance change.

Examples of chemical changes in the environment.

Burning

This is a chemical reaction in which heat and light are produced.

It requires oxygen, fuel and heat to take place.

It forms ash and produces carbon dioxide as the new permanent substances.

Its importance:

- It helps to dispose rubbish in the environment.
- It helps in preparing land through controlled bush burning.
- It enables people to get light from candles.
- It helps in the formation of charcoal.

Decomposition

This is the breakdown of organic matter by the action of bacteria and fungi.

It forms humus as a new permanent substance.

Its importance:

- It helps in the formation of soil.
- It reduces bad smell by breaking down rotting matter.
- It reduces organic wastes in the environment.

Fermentation

This is a chemical process by which a starchy substance breaks down into a simpler substance by the help of yeast and bacteria.

It requires a fungus called yeast to take place.

It forms new permanent substances like alcohol, carbon dioxide, biogas, kimchi and yoghurt.

Its importance:

- It helps in brewing of alcohol.
- It helps in the production of biogas.
- It helps in the making of yoghurt.
- It helps in making bread.

Respiration.

This is the burning of glucose in the body cells to produce energy.

It requires food and oxygen to take place.

It produces carbon dioxide and water vapour as new permanent substances.

Its importance:

- It enables the body to produce energy.
- It enables the body to get rid of water vapour and carbon dioxide.

Boiling of an egg. Boiling an egg is irreversible and changes the chemical composition of an egg.

Heating sugar in a saucepan. Heating white grains of sugar makes them to turn into a brown substance.

 **Note:** Chemical changes give out carbon dioxide except photosynthesis.

Photosynthesis This is the process by which plants make their own food.

It requires sunlight and chlorophyll as conditions to take place.

It forms starch and oxygen as new permanent substances.

It enables plants to get food.

Experiment To Show A New Permanent Substance Formed By Burning (Chemical Change)

Materials needed: Match box, charcoal stove, charcoal and polythene paper

Steps taken

- (i) Place charcoal inside the charcoal stove.
- (ii) Light the charcoal using a match from a match box and polythene paper.
- (iii) Place the lit charcoal stove in an area where charcoal can receive fresh air.
- (iv) Allow the charcoal to burn completely until only ash remains.

Set Up:



Importance of the materials in the experiment.

- The match box provides heat for burning charcoal.
- The charcoal is fuel needed for burning.
- Polythene bag spreads fire to all charcoal to burn fast.

Evaluation activity 9.3

1. State the type of change that takes place when charcoal burns to ash.
2. Give **one** reason why heating sugar in a saucepan is regarded as a chemical change.
3. State any **two** ways in which fermentation is important in our daily life.
4. Which chemical process leads to the production of energy in the body?
5. Write down any **one** chemical change that causes the production of carbon dioxide.
6. The diagram below shows a chemical process. Use it to answer the questions that follow.



- (a) Identify the chemical process shown above.
- (b) State what will happen when part **K** is burnt completely.
- (c) Give any **two** conditions necessary for the above chemical process to take place.
7. In which type of change are the properties of the substance formed permanently different from those of the original one?
8. Give **one** way in which rusting is important to the environment

Evaluation activity 9.3 Continue

9. In the table below, part **A** shows chemical changes and part **B** has the conditions they require to take place.

Chemical change	Conditions required
Respiration	Presence of fuel, heat and oxygen.
Rusting	Presence of yeast and sugar.
Fermentation	Presence of food and oxygen.
Burning	Presence of oxygen and water

Match the chemical changes in part A of the table above with the conditions they require in the spaces provided below.

- (i) Respiration
- (ii) Rusting
- (iii) Fermentation
- (iv) Burning

Rusting as a Chemical Change

Rusting is the formation of a brownish coating on iron metals when oxygen and water react on it.

Rusting forms a new permanent substance (rust) and is irreversible.

A metal gets a reddish-brown coating called **rust**.

Main cause of rusting

Contact and reaction of water and oxygen on a metal.

Conditions for rusting to take place

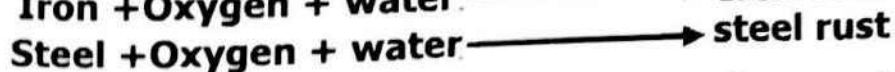
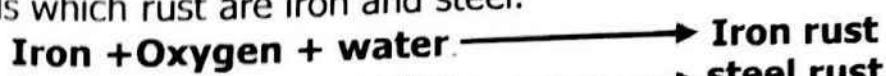
Presence of oxygen. Oxygen makes iron to change into rust.

Presence of water. Water speeds up rusting process.

Rust is the reddish-brown substance that forms on a metal when exposed to oxygen and water.



Metals which rust are iron and steel.



Metals which do not rust are copper, aluminium, brass, gold and stainless steel.

Importance of rusting to the environment

- It helps in addition of iron into the soil.
- It improves soil fertility.

Disadvantages/effects of rusting on metals

- It makes cutting tools blunt.
- It makes metals weak.
- It changes and spoils the colour of metals.
- It reduces the efficiency of the machines.
- It wears and tears off metallic tools.
- It makes keys fail to fit in padlocks.
- It makes metals develop holes.
- It reduces the thickness of metals e.g., iron sheets

Don't speak for Quality, let Quality speak for itself

- It pollutes water and makes it poisonous.
- It makes bolts and nuts hard to unscrew

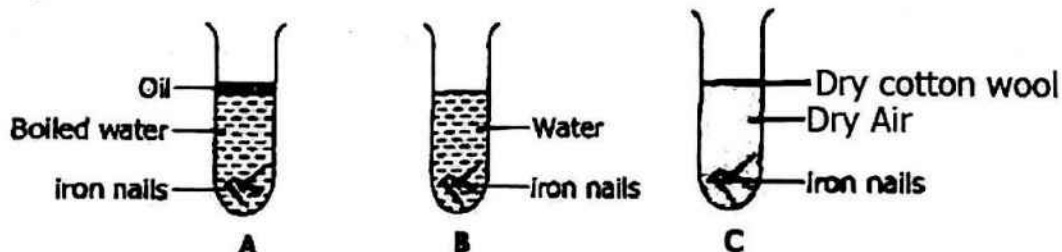
Experiment to demonstrate rusting in metals.

Materials needed: three test tubes, nine new iron nails, unboiled water, oil, boiled water, dry cotton wool

Steps taken:

- Take three test tubes **A**, **B** and **C** and put three new iron nails in each test tube. The test tubes hold the iron nails for the experiment.
- In test tube **A**, pour boiled water and oil in it.
Boiled water is used to remove oxygen from the test tube/Boiled water lacks oxygen. Oil cuts off the supply of oxygen to the iron nails.
- In test tube **B**, pour unboiled water and leave it open. Unboiled water contains oxygen.
- Put dry cotton wool in test tube **C**.
Dry cotton wool does not contain oxygen and water

Set up:



Observation:

After some days, the iron nails in test tube **A** do not rust.

Reasons. Boiled water does not contain oxygen to support rusting.
Oil cuts off the supply oxygen to the nails.

The iron nails in test tube **B** rust.

Reason. The iron nails are exposed to oxygen and water necessary for rusting to take place.

Iron nails in test tube **C** do not rust.

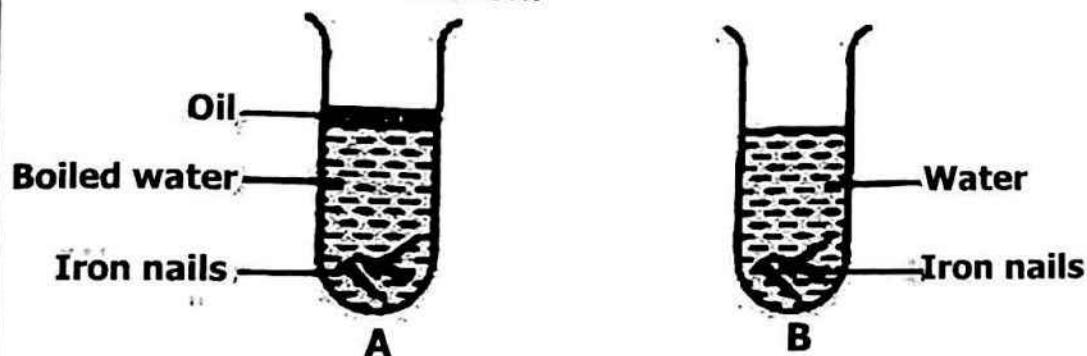
Reason. Dry cotton wool does not contain moisture needed for rusting to take place.

Evaluation activity 9.4

- Name the chemical process that is destructive to iron metals.
- (a) What type of change takes place when an iron tool rusts?
(b) Give **two** conditions necessary for rusting to take place on an iron tool.
(c) State any **one** effect of rusting on an iron tool.
- Identify the chemical substance formed when iron reacts with water and oxygen.
- State the main cause of rusting in steel metallic tools.
- Give **one** way in which rusting is important to the environment.

Evaluation activity 9.4 Continued

6. A primary five boy forgot a knife outside the kitchen for three days. He found when it has a brown substance on it.
- Identify the brown substance formed on the knife.
 - Name the process that led to the formation of the brown substance on the knife.
 - Give any **two** ways in which the process named in (b) above affects the knife.
7. The diagrams below show an experiment about rusting. Use them to answer the questions that follow.

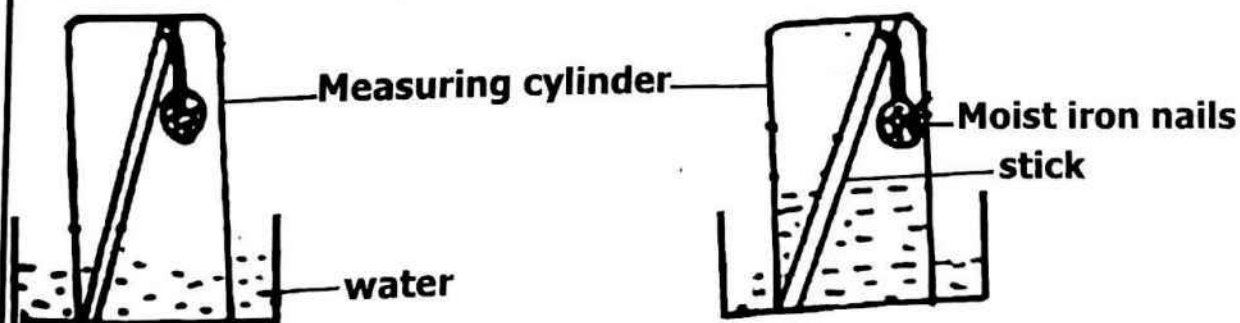


- In which of the containers will the iron nails rust after some days?
- Why would the iron nails in the container you have identified rust?
- Give a reason why oil was poured in container **A**.
- What would happen to the nails if they were painted before being put in the containers?

The list below shows metals. Use it to answer questions **9** and **10**.

gold, aluminium, copper, steel

- Identify the metal on the list above that is affected when exposed to water and oxygen.
 - Give the reason why aluminium on the list above is used to make utensils.
11. The diagrams below show an experiment on a chemical change in the environment. Use them to answer the questions that follow.



- Identify the chemical change that is investigated in the experiment above.
- State what happened to the iron nails after a few days.
- Give the reason why the level of water rose up after a few days as shown in diagram **B**.
- State the purpose of carrying out the experiment above.

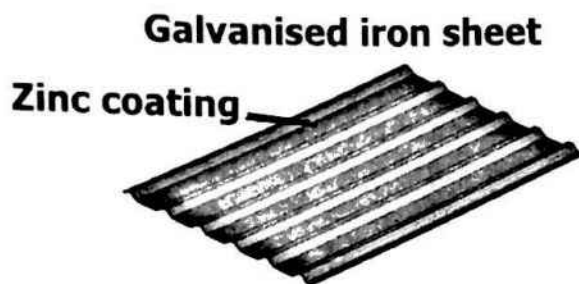
Methods used to Prevent/Control Rusting in Metallic Tools

Lubrication. Oil or grease cuts off the supply of oxygen and water to the metal.

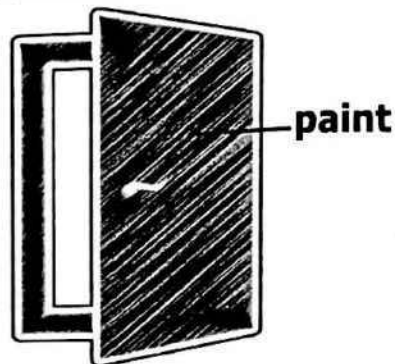
Painting. Paint prevents direct contact of oxygen and water to the metal.

Galvanizing. This is the coating of a metal with a layer of zinc. A layer of zinc prevents oxygen and water supply to the metal. This is used on iron sheets.

Keeping metallic tools in a raised dry place. A dry place lacks oxygen and water needed for rusting to occur.



Painted metallic door



Similarities between rusting and burning

- Both are chemical changes.
- Both need oxygen to take place.
- Both give out carbon dioxide as a byproduct.

Differences between rusting and burning.

- Rusting requires oxygen and water to occur while burning requires oxygen only to occur.
- Rusting forms iron oxide while burning forms ash and carbon.
- Rusting does not give out heat and light while burning sometimes produces both heat and light.

Advantages of chemical changes in the environment.

- Heat produced from burning is used in cooking food.
- Respiration helps the body to produce energy.
- Fermentation helps in brewing of alcohol.
- Decomposition helps in the formation of soil.
- Rusting adds iron into the soil.

Effects of chemical changes in the environment.

- They cause formation of new substances.
- They reduce the weight, size and mass of objects.
- They cause the formation of alcohol and yoghurt.
- They lead to the production of heat energy.

Disadvantages of chemical changes in the environment

- ⇕ They cause metals to wear out.
- ⇕ They cause air pollution.
- ⇕ They cause breeding of vectors and germs.
- ⇕ They make milk to go bad.
- ⇕ They cause destruction of property.

Evaluation activity 9.5

1. Explain how painting helps to prevent a panga from rusting. (2marks)
2. Apart from painting, mention any **two** methods used to prevent rusting in metals.
3. (a) State any **two** effects of rusting on iron sheets.
(b) Give any **two** ways of preventing iron sheets from rusting.
4. Nails were placed in a water as indicated below for a week. Use the information to answer the questions that follow.
 - (i) Nail **1** was painted.
 - (ii) Nail **2** was not painted.
 - (iii) Nail **3** was greased.
 - (a) Which of the nails changed its colour after a week?
 - (b) What will grease do in nail 3 above?
 - (c) Why was nail **1** painted?
5. State any **one** way in which chemical changes are similar to biological changes.
6. Give any **one** reason why people are encouraged to paint their window and door frames before putting them on the house.
7. State any **two** negative effects caused by chemical changes in the environment.

PHYSICAL CHANGES

Physical changes are changes which do not form new substances.

Characteristics of physical changes

✓ Most of them are reversible.

Reason. The chemical composition of a substance remains the same.

✓ No new substance is formed.

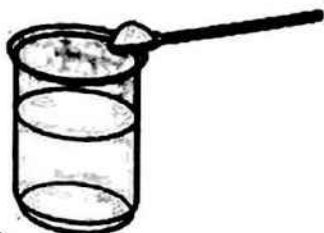
✓ There is change in shape, size and form.

✓ The mass of the substance remains constant.

✓ There is change in weight.

Examples of physical changes in the environment.

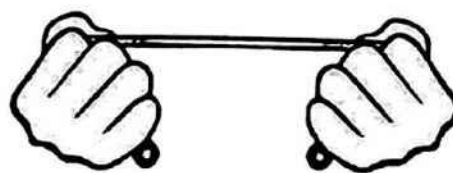
- | | | | | |
|---------------------------------------|----------------------------|---------------|----------------------|---------------|
| ➤ melting | ➤ freezing | ➤ evaporation | ➤ condensation | ➤ deposition |
| ➤ sublimation | ➤ dissolving of solutes | | ➤ expansion | ➤ contraction |
| ➤ shrinking | ➤ stretching a rubber band | | ➤ breaking of an egg | |
| ➤ crushing of maize grains into flour | | | | |
| ➤ chopping of wood into small pieces | | | | |



Sugar dissolving



Ice melting



Stretching rubber band

Don't speak for Quality, let Quality speak for itself

Examples of physical changes in nature

- ❖ landslides
- ❖ earthquakes
- ❖ faulting
- ❖ changes in weather
- ❖ volcanic eruption

Examples of irreversible physical changes

- Cracking an egg
- Tearing a piece of paper.
- Breaking a glass
- Chopping wood into pieces
- Pounding nuts

Physical Changes in Weather/sky

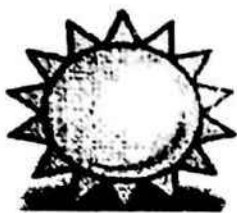
Weather is a condition of the atmosphere at a given time and place.

Factors that cause physical changes in weather

- rainfall
- wind
- sunshine
- temperature
- cloud cover
- humidity

Examples of physical changes in weather

- rainy weather
- windy weather
- sunny weather
- cloudy weather



Sunny weather



Rainy weather



Windy weather



Cloudy weather

Physical Changes In States Of Matter

Melting. The physical process in which a solid changes to a liquid.

Example: ice turning into water

Melting causes the formation of water from ice and cooking oil from butter, cheese or ghee.

Freezing. The physical process in which a liquid changes to a solid

Example: water turning into ice.

Freezing causes the formation of ice.

Condensation. The physical process in which a gas changes to a liquid.

Example: water vapour (steam) turning into water

Condensation causes the formation of rain and alcohol.

Evaporation. The physical process in which a liquid changes to a gas.

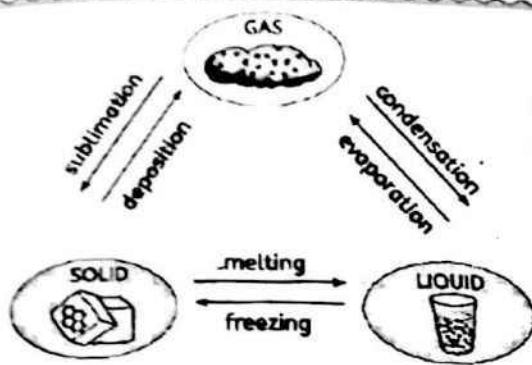
Example: water turning into steam when boiling.

Evaporation causes the formation of rain.

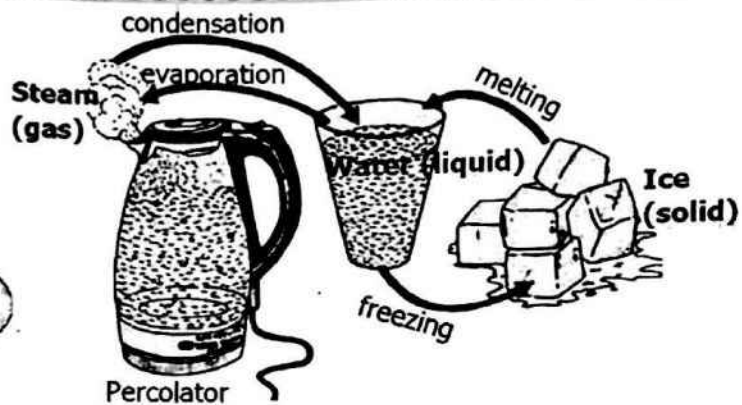
Sublimation. The physical process in which a solid changes directly to a gas.

Example: urinal cakes producing a pleasant smell in the latrine.

Deposition. The physical process in which a gas changes directly to a solid.



Physical changes in matter

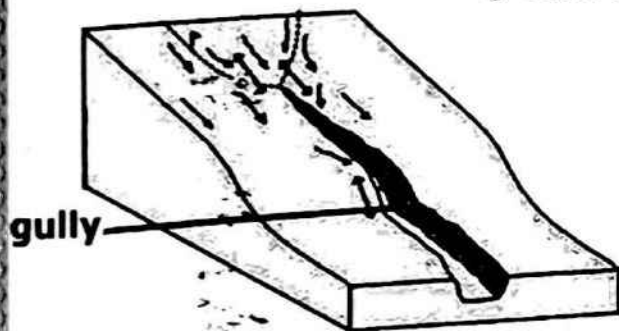


Physical Changes Caused by Soil Erosion.

Soil erosion is the removal of topsoil from the ground by its agents.

These agents include; flowing water, wind and animals.

Soil erosion causes flat bare ground to change into gullies.



Effects of physical changes caused by soil erosion.

- They cause loss of soil fertility.
- They destroy plants.
- They lead to landslides.
- They cause blockage of water bodies.
- They cause silting.
- They cause land degradation.
- They create gullies and floods.

- They cause water pollution.
- They damage drainage channels and roads.



Floods caused by soil erosion



Silting of a water body

Physical Changes Caused by Landslides

A landslide is a mass of soil or rocks that moves down the slope of a mountain or hill slope.

Landslides are caused by; soil erosion, deforestation, ploughing uphill and heavy rainfall.

Effects of physical changes caused by landslides.

- They cause destruction of crops
- They destroy roads.
- They cause loss of lives of people and other animals.
- They cause destruction of people's property.
- They cause flooding of rivers.
- They lead to displacement of people.

Physical changes caused by volcanic eruption

Volcanic eruption is the release of magma from a volcano due to pressure beneath.

Examples of physical changes caused by volcanic eruption

- Changing of a solid rock into lava.
- Solidifying of the lava.

Effects of physical changes caused by volcanic eruption.

- They cause loss of lives of people and other animals.
- They cause destruction of people's property.
- They cause destruction of crops.
- They destroy roads.
- They lead to displacement of people.

Effects of physical changes in the environment

- ✓ They lead to the formation of rain.
- ✓ They lead to the formation of dew.
- ✓ They lead to the formation of ice.
- ✓ They lead to the formation of snow.



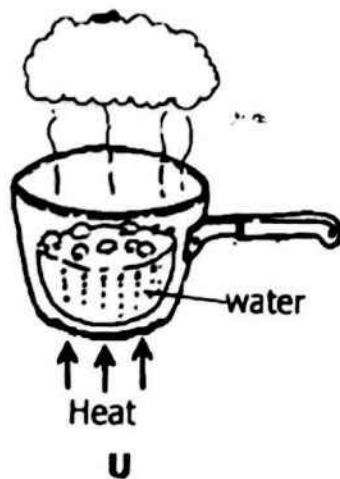
Landslides/mudslides



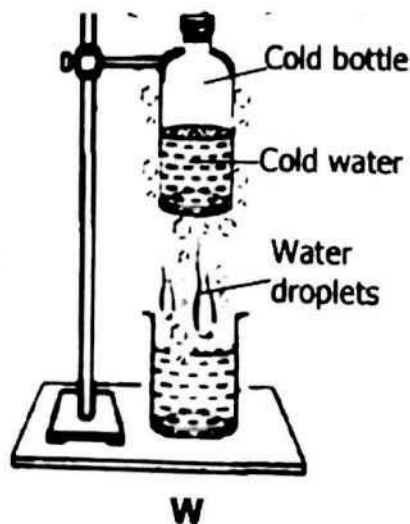
Volcanic eruption

Evaluation activity 9.6

1. (a) Give any **two** examples of physical changes.
(b) State any **two** characteristics of physical changes.
2. The diagrams below show a physical change. Study and use them to answer questions.



U



W

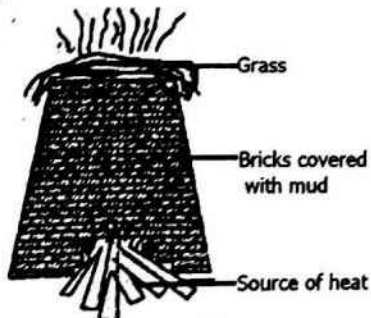
- (a) Name the physical changes marked **U** and **W**.
- (b) State the condition necessary for the physical change marked **U** to take place.
- (c) Name any **one** substance formed when the physical change marked **W** takes place.

Evaluation activity 9.6 Continued

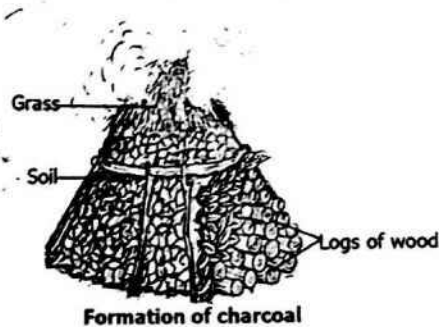
3. State the type of change that takes place when;
- (a) A knife rusts. (b) Water freezes. (c) A fruit ripens.
- (d) Salt dissolves in water.
4. (a) Name the physical change which leads to the formation of the following;
- (i) Ice (ii) Rainfall
- (b) State any **two** effects of physical changes caused by soil erosion in the environment.

Positive effects of changes to the environment

- ✓ Biological changes lead to continuity of life.
- ✓ Physical changes cause rain formation.
- ✓ Burning provides heat for cooking and firing bricks in a kiln.
- ✓ Burning helps in the formation of charcoal.
- ✓ Rusting adds iron to the soil.
- ✓ Fermentation enables people to produce alcohol.
- ✓ Burning forms ash. This ash is used in;
- Controlling crop pests.
- preserving seeds and grains.
- preparing local salt



Firing bricks in a kiln



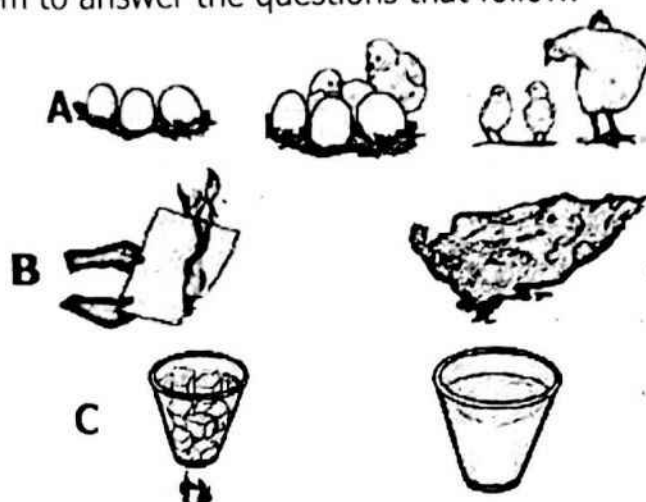
Formation of charcoal

Negative effects of changes to the environment

- Burning pollutes the environment with smoke.
- Burning bushes causes soil erosion.
- Rotting spoils fresh foods.
- Physical changes in nature lead to loss of people's lives.
- Burning leads to destruction of people's property.
- Evaporation causes loss of moisture in the soil.
- Too much rainfall causes floods in an area.
- Rusting damages metallic tools and iron sheets.
 - It makes them weak.
 - It makes sharp tools blunt.
 - It causes them to develop holes.

Evaluation activity 9.7

1. Name the type of changes that allow life of organisms to continue.
2. State any **two** positive effects of changes in the environment.
3. Identify the chemical change that leads to the production of smoke in the environment.
4. In which way is the smoke produced by burning car tyres affect the environment?
5. State the effect of rotting on bread.
6. The diagrams below show types of changes in the environment. Study and use them to answer the questions that follow.



- (a) Name the types of changes marked **A** and **C**.
 - (b) State any **one** danger of the type of change marked **B** to the environment.
 - (c) Give any one process in matter that undergoes the type of change marked **C**.
7. (a) Apart from ash, name any **one** other new substance produced during burning of wood.
 - (b) Give any **two** ways in which ash produced by burnt wood is important in our daily life.
 - (c) Mention any **one** form of energy produced as wood burns to ash.
8. Give any **two** ways in which rusting as a chemical change damages metallic tools.

MEANING OF KEY WORDS IN TYPES OF CHANGES IN THE ENVIRONMENT

Biological change: A change that takes place in an organism.

Fermentation: The chemical process by which a starchy substance breaks down into a simpler substance by the help of yeast and bacteria.

Burning: A chemical process in which a substance reacts with oxygen to produce heat and light.

Rusting: The corrosion of iron or steel to form iron oxide.

Faulting: The breaking and displacement of rocks in the earth's crust.

Landslides: A mass of soil or rocks that moves down the slope of a mountain.

Decomposition: The rotting of organic matter.

Melting: The physical process by which a solid changes into a liquid.

Dew: Water droplets formed on surfaces when water vapour in the atmosphere condenses.

Earthquake: A sudden shaking of the earth as a result of abrupt shifting of rocks along a fault in the underground rocks.

Physical change: A reversible change which does not form a new substance.

Weather: The condition of the atmosphere at a given place and time.

Chemical change: The irreversible change which forms a new permanent substance.

Atmosphere: The layer of gases surrounding the earth.

Respiration: The chemical breakdown of food in the body cells to produce energy.

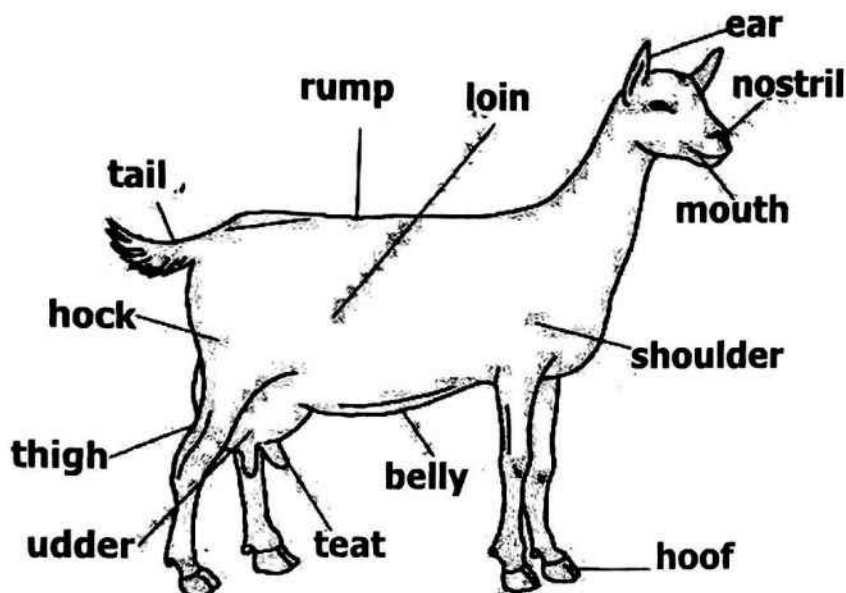
Weathering: The breakdown of rocks into small particles.

THEME: SCIENCE IN HUMAN ACTIVITIES AND OCCUPATIONS

TOPIC : 10 KEEPING GOATS, SHEEP AND PIGS

KEEPING GOATS

External features of a goat.



Functions of some external features of the goat

Part	Function
Horns	They are used for protection through goring.
Udders	They store milk used for feeding the kids.
Rump	It stores fats which are source of warmth.
Nostrils	They are used for smelling.
Hooves	They are used for stepping firmly on the ground. They protect the inner parts from physical damage.
Ears	They are used for hearing and body balance.
Tail	It is used for propulsion during movement.

Reasons why people keep goats in our community

- (i) To get meat
- (ii) To get milk.
- (iii) To sell and get money.
- (iv) To get mohair.

Ways in which keeping goats is important to people.

- (i) Goats are sold for money.
- (ii) Goats provide meat and milk.



A man selling milk to a child

- (iii) Goats provide skins to leather industries.
 (iv) Angora goats provide mohair to textile industries.
 (v) Droppings from goats are used as farmyard manure.

Products got from goats

skin, milk, blood, horns, hooves, mohair, meat (chevon)



Skin



Milk



Horn

Product	Uses
Skin	It is used as a seat when dried. It is used to make drums, belts and shoes. It is used to dress on handles of pangas and knives. The process of turning hides into leather is called tanning
Horn	It is used for communication. It is used for artwork.
Mohair	It is used for making blankets. It is used for making carpets. It is used for making rain coats.
Hooves	They are used for making glue and buttons.

Methods of preserving skins from goats

Wet salting

Salt is applied on the wet skin got from an animal.

Salt dehydrates the skin

Suspension drying

The skin is put in sunshine to dry by supporting it with frames of sticks.



Suspension drying

Advantages of suspension drying

- It keeps the skin clean.
- It is cheap.
- It keeps the skin flat with no folds

Products got from goat skins

belts, shoes, wallets, bags, drums, watch straps



bag



shoe



belt

Don't speak for Quality, let Quality speak for itself

Industries that use products got from goats

- leather industry
- textile industry
- milk processing industry
- meat processing industry

Practices that affect the quality of goat products.

- ❖ Poor feeding
- ❖ Beating goats
- ❖ Poor housing
- ❖ Branding goats

Ways in which farmers can improve on the quality of goat products

- Crossbreeding
- Upgrading
- Castration
- Regular vaccination.
- Proper feeding
- Proper housing
- Selective breeding
- Avoid practices that harm goat skins e.g branding.

Advantages of rearing goats over cattle

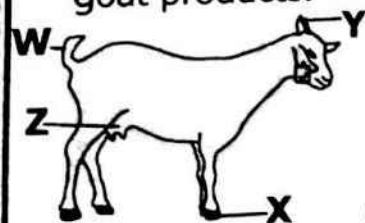
- Goats are cheaper to feed than cattle.
- Goats have lower water demand than cattle.
- Goats need a smaller space than cattle.
- Goats provide quicker source of income turnover than cattle.
- Goats multiply faster than cattle.
- Goats need less attention than cattle.

Problems faced by farmers who keep goats

- Shortage of capital for managing goat project.
- Price fluctuations for goat products.
- Pests and diseases that affect goats.
- Drought conditions.
- Shortage of veterinary services for goats.

Evaluation activity 10.1

1. (a) Give **one** example of an exotic breed of goats kept in Uganda.
(b) Name **one** example of fibre got from goats.
(c) State any **two** reasons why some farmers would prefer rearing goats to cattle.
2. (a) State **one** way in which goat farming contributes to the development of leather industry.
(b) Apart from leather industry, give any **one** other example of industry that uses goat products.
(c) State any **two** ways in which farmers can improve on the quality of goat products.



- (a) Name the parts marked **W** and **X**.
 - (b) Give the function of part marked **Y** to a goat.
 - (c) Identify the part that enables people to get milk from the goat.
4. (a) Name the type of industry that uses the following products in goats;
- (i) Skin
 - (ii) Mohair
- (b) Apart from providing products, give any two other ways in which goats are important to people in your community.

BREEDS OF GOATS

Breeds of goats are different clans of goats with similar characteristics. These characteristics are; colour, size, body shape, productivity and growth rate.

Factors to consider when selecting the breeds of goats to keep.

- ☐ Growth and maturity rate of the goats.
- ☐ Productivity of the goats.
- ☐ Resistance to harsh weather conditions.
- ☐ Quality of the breeds.
- ☐ Resistance to tropical diseases.
- ☐ The quality of the goat products.
- ☐ The weight of the body of the goats.

Local breeds of goats

These are breeds of goats that have been kept in Uganda for many years.

They are also called indigenous/native/traditional breeds of goats.

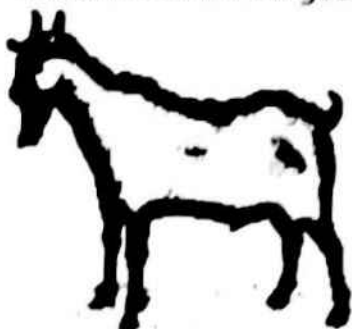
Local breeds are best improved **by crossbreeding**.

Characteristics of local breeds of goats

- They take long to mature.
- They produce less meat and milk.
- They produce hard meat.
- They are resistant to harsh weather.
- They are resistant to parasites and diseases.

Examples of local breeds of goats

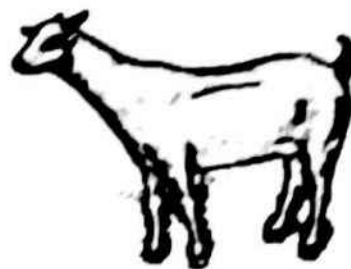
- Turkana goats
- Mubende goats
- Galla goats
- Boer goats
- Small East African goats
- Somali goats



Mubende goat



Galla goat



Somali goat

Exotic breeds of goats

These are goats imported from overseas.

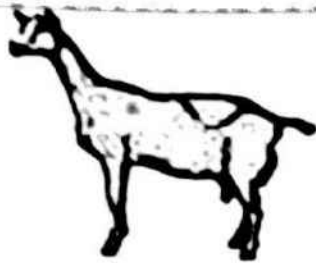
Characteristics of exotic breeds of goats.

- They have specific colours.
- They grow and mature fast.
- They are less resistant to diseases.
- They need much attention.
- They produce a lot of meat and milk.
- They produce soft and tender meat.

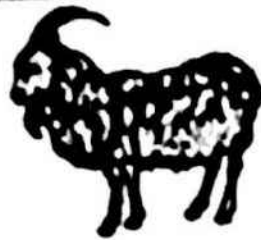
Examples of exotic breeds of goats

- Toggenburg goats
- Angora goats
- Saanen goats
- Alpine goats

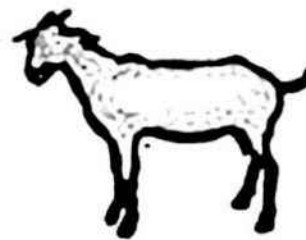
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Saanen (female)



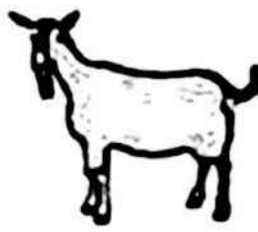
saanen (male)



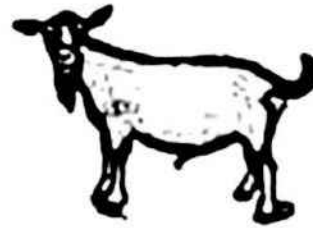
Nanny



Billy



Toggenburg Nanny



Toggenburg billy

Reasons why most farmers in Uganda do not keep exotic breeds of goats.

- (i) They are less resistant to diseases and parasites.
- (ii) They need special feeds to produce better products.
- (iii) They are expensive to manage.
- (iv) They cannot withstand harsh weather.

Advantages of keeping local breeds over exotic breeds of goats.

- (i) Local breeds are resistant to tropical diseases unlike exotic breeds.
- (ii) Local breeds are resistant to harsh weather unlike exotic breeds.
- (iii) Local breeds are easier to manage than exotic breeds.

Advantages of keeping exotic breeds over local breeds of goats

- (i) Exotic breeds grow and mature faster than local breeds.
- (ii) Exotic breeds produce more meat and milk than local breeds.

Disadvantages of keeping local breeds over exotic breeds of goats

- (i) Local breeds take long to grow yet exotic breeds grow faster.
- (ii) Local breeds produce less meat and milk compared to exotic breeds.

Disadvantages of keeping exotic breeds over local breeds of goats

- (i) Exotic breeds need much attention yet local breeds need less attention.
- (ii) Exotic breeds are easily attacked by tropical diseases compared to local breeds.
- (iii) Exotic breeds cannot resist harsh weather yet local breeds can resist harsh weather.

Crossbreed goats

These are goats got by mating a local goat and an exotic goat.
Examples are Somali goats and Anglo-Nubian goats.

Types of goats

- dairy goats
- meat goats
- dual-purpose goats

Dairy goats

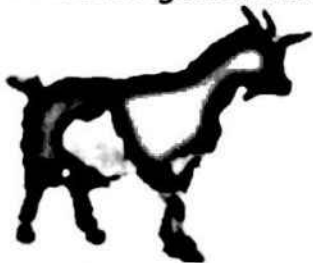
These are goats kept mainly for milk production.

Characteristics of dairy goats

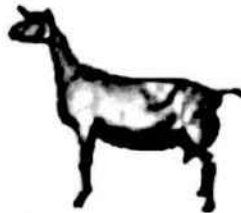
- ✦ They have large udders and teats.
- ✦ They are docile.
- ✦ They produce a lot of milk.
- ✦ They are triangular in shape.

Exotic breeds of goats kept for milk.

- Saanen goats
 - Toggenburg goats
 - Alpine goats
 - Anglo-Nubian goats
- Mnemonic: SATA**



Toggenburg goat



Saanen goat



Alpine goat

Meat goats

These are goats which are mainly kept for chevon production.

Examples of meat breeds of goats

- Boer goats
- Galla goats
- Mubende goats
- Small East African goats
- Somali goats

Dual purpose goats

These are goats kept for both meat and milk.

Examples of dual-purpose goats: Somali goats, Mubende goats and Galla goats



Note well: Angora goats and Cashmere goats are mainly kept for mohair production.



Angora goat

Evaluation activity 10.2

1. (a) Write down any **two** examples of exotic breeds of goats.
(b) State any **two** reasons why most farmers in Uganda do not rear exotic breeds of goats.
2. (a) Apart from Toggenburg, give any **two** other exotic breeds of goats kept mainly for milk production.
(b) State any **one** characteristic of dairy goats.
(c) Give any **one** way in which a farmer can increase the production of milk in Toggenburg goats.
3. (a) State any **two** factors to consider when selecting the breed of goats to keep.
(b) Name any **two** examples of local breeds of goats kept by people in Uganda.
4. The diagram below shows a breed of goats. Study and use it to answer the questions that follow



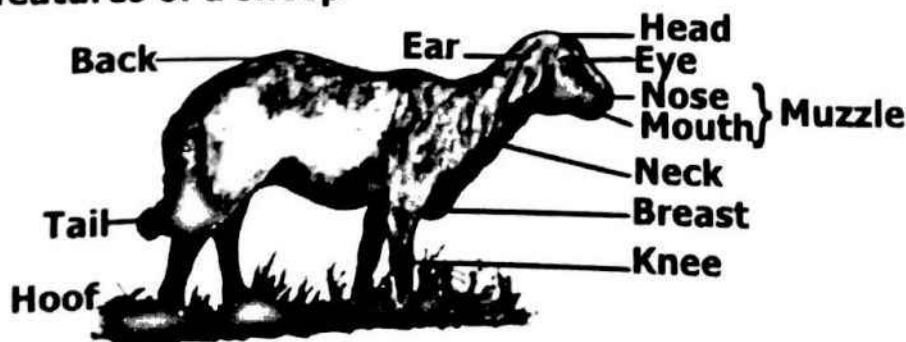
- (a) Name the exotic breed of goat shown in the diagram above.
 - (b) Identify the main product obtained from the exotic breed of goat above.
 - (c) Give any **two** practices that can be done to improve the product obtained from the exotic breed of goat above.
5. The list below shows breeds of goats. Study and use it to answer the questions that follow.

Mubende goat, Saanen goat, Galla goat, Angora goat

- (a) Name any **one** breed of goats that can survive on little grass and water.
- (b) Give the main reason why the farmer would keep Saanen goat on the list above.
- (c) Identify the breed of goat on the list above that is useful to textile industries.
- (d) State any **one** reason why you would advise a farmer to keep Saanen goat instead of Galla goat on the list above.

KEEPING SHEEP

External features of a sheep



External parts of a sheep

Functions of some external features of the sheep

Part	Function
Rump	It stores fats which are source of warmth.
Nostrils	They are used for smelling.
Hooves	They are used for stepping firmly on the ground.
Ears	They are used for hearing and body balance.
Tail	It is used for propulsion during movement.
Mouth	It is used for feeding.

Reasons why people keep sheep in our community

- To get mutton.
- To get wool.
- To sell and get money.

Ways in which keeping sheep is important to people.

- ❖ Sheep are sold for money.
- ❖ Sheep provide skins to leather industries.
- ❖ Sheep provide wool to textile industries.
- ❖ Droppings from sheep are used as farmyard manure.
- ❖ Sheep provide meat and milk.

Products got from sheep include;

- mutton
- wool
- skin
- hooves

BREEDS OF SHEEP

Breeds of sheep are different clans of sheep with similar characteristics. These characteristics are; colour, size, body shape, productivity and growth rate.

Factors to consider when selecting the breeds of sheep to keep.

- ⊕ Productivity of the sheep.
- ⊕ Growth and maturity rate of the sheep.
- ⊕ The quality of the sheep products.
- ⊕ The weight of the body of the sheep.
- ⊕ Quality of the breeds.
- ⊕ Resistance to tropical diseases.
- ⊕ Resistance to harsh weather conditions.

Local breeds of sheep

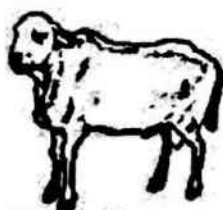
These are breeds of sheep that have been kept in Uganda for many years. They are also called indigenous/native/traditional breeds of sheep. Local breeds are best improved by crossbreeding.

Characteristics of local breeds of sheep

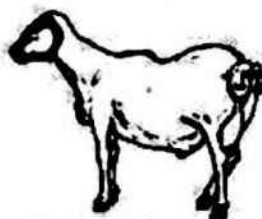
- They take long to mature.
- They are resistant to parasites and diseases.
- They produce less mutton.
- They produce hard mutton.
- They are resistant to harsh weather.

Examples of local breeds of sheep

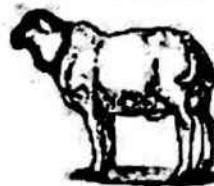
- Black head-Persian sheep
- Masai sheep
- Somali sheep



Masai sheep



Somali sheep



Black-headed Persian

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Exotic breeds of sheep

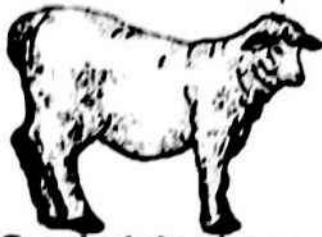
These are sheep imported from overseas.

Characteristics of exotic breeds of sheep.

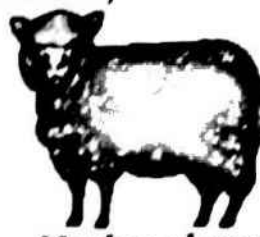
- They have specific colours.
- They are less resistant to diseases.
- They produce a lot of mutton.
- They grow and mature fast.
- They need much attention.
- They produce soft and tender meat

Examples of exotic breeds of sheep

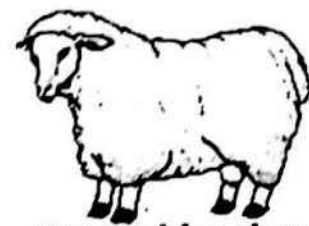
- Merino sheep
- Dorper sheep
- Rambouillet sheep
- Corriedale sheep
- Hampshire down sheep
- Romney Marsh sheep
- Dorset sheep



Corriedale sheep



Merino sheep



Hampshire down sheep

Reasons why most farmers in Uganda do not keep exotic breeds of sheep.

- They are less resistant to diseases and parasites.
- They need special feeds to produce better products.
- They are expensive to manage.
- They cannot withstand harsh weather

TYPES OF SHEEP

These are breeds of sheep kept for a specific purpose.

Mutton breeds

The local sheep breeds kept for meat include;

Blackhead Persian sheep, Masai sheep and Somali sheep

The exotic sheep breeds kept for meat include;

Dorper sheep, Chirot sheep, Sufflock sheep, Dorset sheep and Hampshire down sheep

Wool breeds

These are breeds of sheep kept for wool production.

Wool is also called fleece.

They include; Merino sheep, Corriedale sheep and Romney Marsh

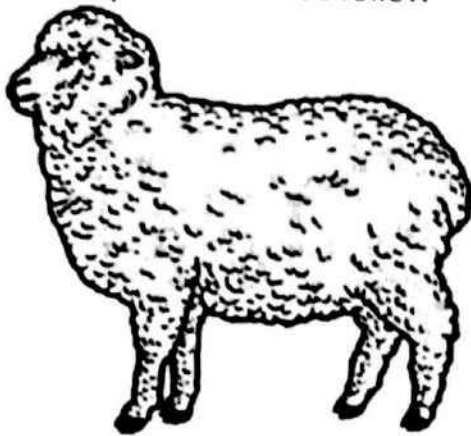
Dual purpose sheep

These are breeds of sheep kept for both meat and wool production.

They include; Corriedale sheep, Rambouillet sheep and Romney Marsh

Evaluation activity 10.3

- 1.(a) Write down any **two** examples of exotic breeds of sheep.
(b) State any **two** ways in which sheep are important to people in your community.
2. (a) Apart from Merino sheep, give any **two** other exotic breeds of sheep kept for wool production.
(b) State any **one** characteristics of exotic breeds of sheep.
(c) Give any **two** ways in which a farmer can increase the production of meat in sheep.
- 3.(a) State any **two** factors to consider when selecting the breed of sheep to keep.
(b) Name any **two** examples of local breeds of sheep kept by people in Uganda.
4. The diagram below shows a breed of sheep. Study and use it to answer the questions that follow



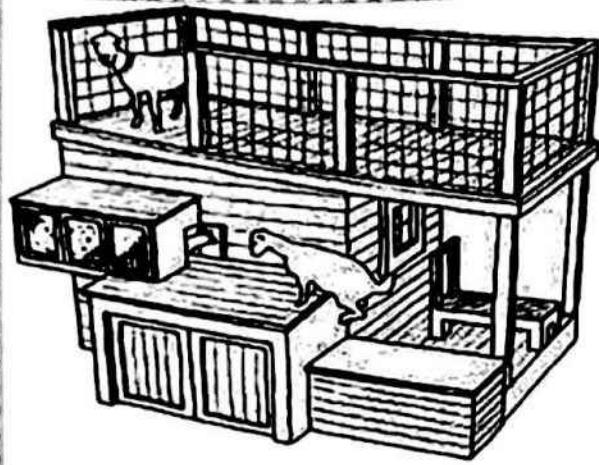
- (a) Name the exotic breed of sheep shown in the diagram above.
 - (b) Identify the natural fibre obtained from the exotic breed of goat above.
 - (c) Give any **two** practices that can be done to improve the production of the natural fibre obtained from the exotic breed of sheep above.
- 5.The list below shows breeds of sheep. Study and use it to answer the questions that follow.
- Masai sheep, Rambouillet sheep, Somali sheep, Romney Marsh**
- (a) Name **two** breeds of sheep from the list above that are commonly kept by farmers in Uganda.
 - (b) Give any **one** reason why the farmer would keep Rambouillet sheep on the list above.
 - (c) Identify the breed of sheep on the list above that is useful to textile industries.

HOUSING AND MANAGEMENT OF GOATS AND SHEEP

The house of goats and sheep is called a **barn**.

Advantages of proper housing of goats and sheep

- (i) It protects goats and sheep from predators.
- (ii) It protects goats and sheep from bad weather.
- (iii) It is easier to feed goats and sheep.
- (iv) It reduces easy spread of diseases.



Qualities of a good shed for keeping goats and sheep

(i) It should be built with a slanting floor.
Reason. To allow easy flow of urine from the floor.

To allow easy flow of water to the ground during scrubbing.

(ii) It should be raised above the ground.
Reason. To prevent dampness on the floor.

(iii) It should be well ventilated. This can

be done using a wire mesh.

Reason. To allow free air circulation in the barn.

(iv) It should be built with dry wooden floor.

Reason. To enable the droppings to go down through the spaces in the floor. To allow urine dry in order to prevent dampness on the floor.

(v) It should be well cemented.

Reason. For easy cleaning of the barn.

FEEDING GOATS AND SHEEP

Advantages of proper feeding of goats and sheep

- It improves the quality of milk and meat.
- It boosts the immunity against diseases.
- It promotes faster and proper growth of animals.

Examples of feeds given to goats and sheep

Grass, plant leaves, banana peelings, shrubs, fodder crops and mineral licks

Goats and sheep should be given a block of salt to lick

Reason. To enable them get more mineral salts in their bodies.

Browsing is the feeding of goats on pasture that has grown high up.

This pasture include; tender grass, tree twigs, brambles, vines and low shrubs. Goats are active foragers that browse with their heads up, nibbling the tips of the plant.

They can stand on hind legs to reach higher plants.

Browsing reduces the risk of tapeworm infestation in goats.

Other examples of browsers are giraffes, kobs, zebras and antelopes.

GRAZING GOATS AND SHEEP

Grazing is letting animals to eat grass or pasture.

Systems of grazing goats and sheep are; rotational grazing and zero grazing.

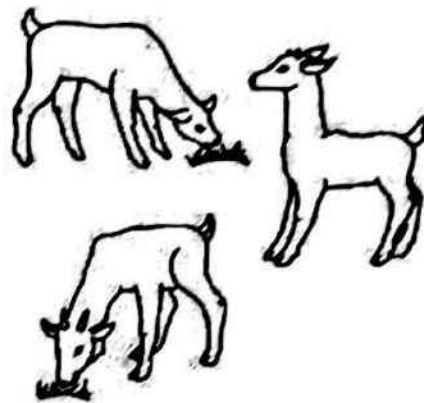
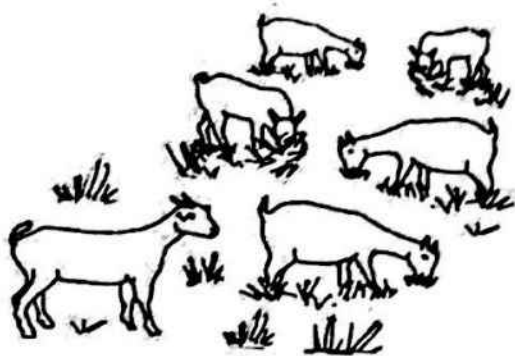
Methods of grazing goats and sheep are; free range method, paddocking and tethering.

1. Free range method

This is a method where animals are left to move freely as they feed on different types of pasture and monitored by a herdsman.

This method of grazing is commonly used in rural areas.

Reason. There is enough land for grazing livestock.



Advantages of free-range method.

- ✓ Animals feed on the variety of feeds.
- ✓ Animals get enough physical exercises.
- ✓ It is cheap to use.
- ✓ Less labour is required to look after goats.

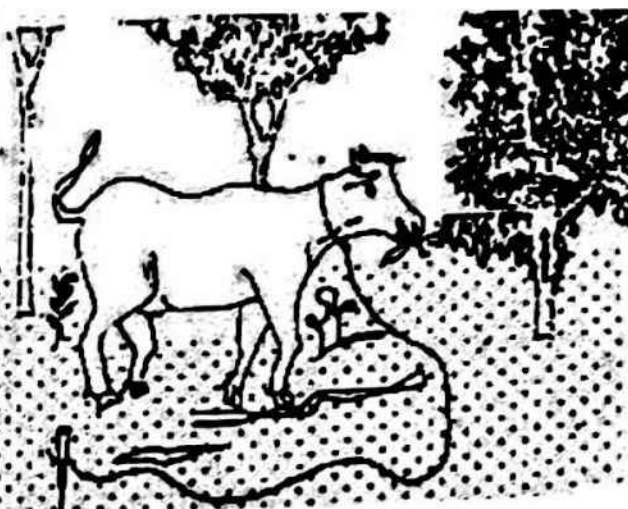
Disadvantages of free-range method

- ❖ The method requires a lot of land.
- ❖ Animals can stray and spoil people's crops.
- ❖ It is difficult to keep records.
- ❖ Animals are exposed to predators and parasites
- ❖ Animals can easily be stolen by thieves.
- ❖ Inbreeding is difficult to control.
- ❖ Diseases can easily be spread among the goats.

2. Tethering method

Tethering is a method of grazing where goats are tied to pegs or trees using ropes.

The farmer shifts the animal to another area when the pasture in the previous area finished.



Advantages of tethering method.

- Tethering is cheap to use.
- Less labour is required.
- Goats cannot stray and destroy crops.
- Animals do not move long distances.
- Small piece of land is used to graze on goats.
- The farmer chooses the best pasture for the goats.

Disadvantages of tethering method

- Animals can easily be stolen.
- The rope can easily strangle the animal.
- Animals are exposed to predators.

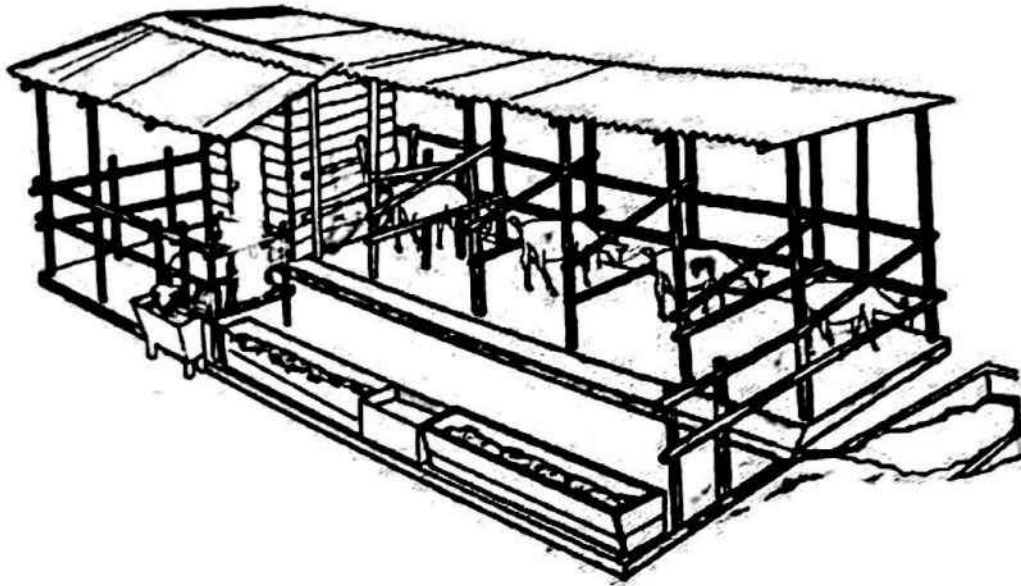
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- The animals do not get enough physical exercises.
- Only few animals can be kept.
- Animals have no choice for the grass to eat.

3. Zero grazing

This is a system of grazing where animals are fed on prepared feeds from indoors.

This system of grazing goats is commonly used in towns due limited piece of land.



Advantages of zero grazing

- ⇓ Feeds are not wasted.
- ⇓ Farmyard manure is easily collected.
- ⇓ Animals are protected from bad weather.
- ⇓ It is easy to spot sick animals.
- ⇓ Animals are protected from predators.
- ⇓ There are less risks of getting diseases.
- ⇓ There is no wastage of feeds.

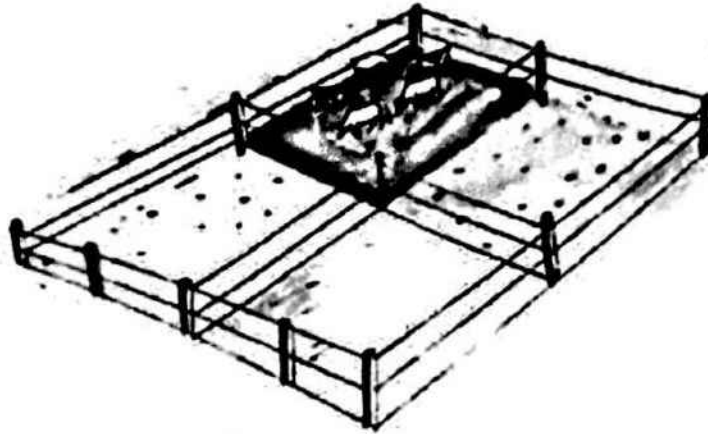
Disadvantages of zero grazing.

- ❖ The method is expensive to start and maintain.
- ❖ It requires a lot labour.
- ❖ Animals do not get enough physical exercises.
- ❖ There is easy spread of diseases in case of an outbreak.

4. Paddock/paddock grazing

Paddock is a method of grazing where the grazing land is divided into units or plots called paddocks.

The paddocks are separated using a fence and the farmer keeps moving the animals from one paddock to another.



Paddock grazing

Advantages of paddocking

- The farmer gets time to do other activities.
- Pasture is properly used.
- Animal dung and urine are evenly distributed. They decay to form humus for pasture to grow again.
- It controls easy spread of pests on a farm.

How? The method breaks the life cycle of pests.

How? It starves pests to death.

- Record keeping is easy.
- Paddocking controls overgrazing.
- It can be used for commercial purpose.

It manages a big number of animals.

Disadvantages of paddocking

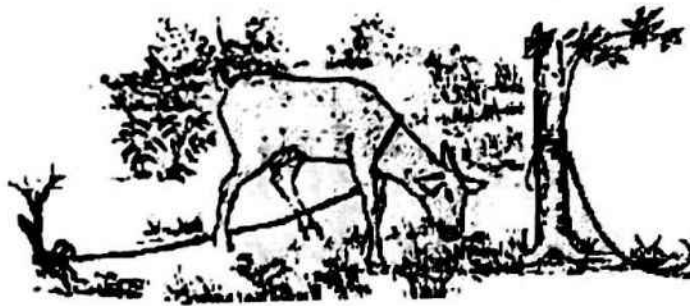
- ✓ Paddocking requires a large piece of land.
- ✓ Paddocking is expensive to start.
- ✓ Animals do not get enough physical exercises.
- ✓ Animals have no choice on the type of grass to eat.

Evaluation activity 10.4

1. What is meant by the term browsing in goats?
2. State any **one** advantage of having proper housing for goats.
3. State **one** way in which paddocking method of grazing goats helps to break the life cycle of pests on a farm.
4. State any **two** characteristics of a good goat shed.
5. Give **one** reason why goat shed should be built with a slanting floor.
6. Mention **one** way in which air circulation in a goat barn can be improved.
7. Name any **two** methods of grazing goats and sheep.
8. Give any **two** reasons why most farmers used free range method of grazing goats.

Evaluation activity 10.4 continued

9. The diagram below shows one of the methods of grazing goats in Uganda. Study and use it to answer the questions that follow.



- Name the method of grazing goats shown in the diagram above.
 - Give any **two** advantages of using the method shown in the diagram above.
 - Write down any **one** disadvantage of using the method above when grazing goats.
10. The table below shows methods of grazing goats and the how they are used in grazing goats. Complete the table correctly.

Method	How it is used
.....	Goats are left to feed on grass on their own.
Paddock	.....
.....	Goats are tied on the peg with a rope
Zero grazing	.....

Ways of caring for goats and sheep

- Proper feeding.
- Proper housing.
- Regular vaccination.
- Regular cleaning of the barn.
- Proper medication in case of sickness.

Reproduction in goats and sheep

Goats and sheep produce live young ones. This is a form of sexual reproduction.

Flushing up

Flushing up is the provision of highly nutritious feeds to a female animal to facilitate ovulation.

Advantages of flushing up animals

- It increases chances of ovulation in female animals.
- It increases multiple birth in female animals.

A **nanny** is a female goat while a **billy** is a male goat.

A **ewe** is a female sheep while a **ram** is a male sheep.

When a nanny goat is on heat, it mates with the billy goat and becomes pregnant.

Heat period.

Heat period is the time when a female animal is ready for mating with a male animal.

Signs of a nanny goat/ewe on heat.

- ✓ Loss of appetite.
- ✓ It mounts others.
- ✓ Becomes restless.
- ✓ Stands still when mounted.
- ✓ Whitish discharge from the vulva.
- ✓ The vulva becomes reddish.

After mating, a nanny or a ewe becomes pregnant.

Signs of pregnancy in a nanny or a ewe

- (i) The animal stops the heat period.
- (ii) The udder enlarges.
- (iii) Presence of milk in the udder.
- (iv) Swelling of the udder.

Ways of caring for the pregnant nanny or ewe.

- ❖ Steaming up
- ❖ Providing enough clean water. This stimulates milk production in mammary glands.
- ❖ Drying off. This is the act of stopping milking a female animal.
- ❖ Proper feeding

Steaming up

Steaming up is the feeding of a pregnant animal on highly nutritious diet before delivery.

Proteins are mainly used during steaming up.

Advantages/importance of steaming up.

- It promotes proper growth of the foetus.
- It stimulates milk production and let down.
- It prepares the body of the pregnant animal for birth.

Gestation period.

Gestation period is the length of pregnancy in animals.

It is the time between fertilization and kidding or lambing.

The gestation period of a nanny or a ewe is **5 months (150 days)**

Kidding is the act of giving birth by a nanny while **lambing** is the act of giving birth by a ewe.

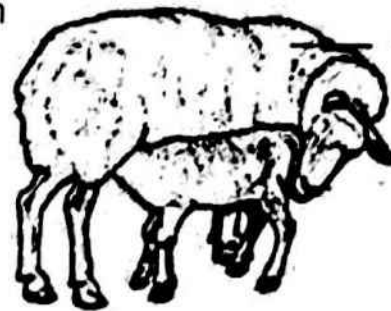
A young one of a goat is called a **kid** while a young one of a sheep is called a **lamb**.

Factors to consider when choosing a good goat/sheep to breed.

- (i) Well-developed udder and teats.
- (ii) Good lambing or kidding ability.
- (iii) Free from diseases
- (iv) Free from hereditary effects



mating in goats



Evaluation activity 10.5

1. State any **two** ways of caring for goats and sheep.
2. (a) What is meant by the term flushing up?
(b) Give any **one** advantage of flushing up in farm animals.
(c) Name any **two** farm animals in which flushing up can be done.
3. (a) Mention any **two** signs of a nanny goat on heat.
(b) Give any **two** ways of caring for a pregnant nanny goat.
4. Write the term used to mean the following in sheep and goats;
(i) Giving birth in goats. (ii) The length of pregnancy.
(iii) The female sheep. (iv) Giving birth in sheep.
5. What is the gestation period of a nanny goat?
6. (a) State the meaning of the term steaming up.
(b) Name the class of food suitable for steaming up goats.
(c) State any **two** advantages of steaming up in goat management.

FARM MANAGEMENT PRACTICES DONE IN SHEEP AND GOATS 1.

Sheep shearing

Sheep shearing is the cutting of overgrown wool from the sheep. The wool removed from sheep is called **fleece**.

Reasons for shearing sheep

- To regulate the body temperature of the sheep.
It prevents overheating of the sheep during dry season.
 - To remove hiding places for ectoparasites like ticks. It exposes the ticks.
- Sheep shearing is recommended to be done during dry season.

Reasons. The weather is warm enough for sheep to survive without wool on their bodies. To protect the sheep against coldness.

Advantages of shearing

- ◆ It prevents overheating of sheep
- ◆ It reduces the breeding of ectoparasites on sheep.
- ◆ It enables the farmer to get wool.

■

 *Note well. If shearing is done during wet season, sheep dies due to coldness. Wool insulates sheep against coldness.*



Learn, unlearn and relearn

It is wrong to say that shearing is done in summer because we don't have a summer season in Uganda. Note that we only have two seasons in Uganda i.e Dry season and wet season

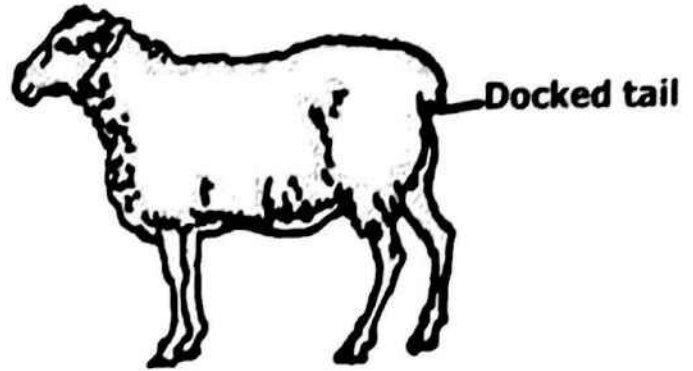
2. Docking

Docking is the cutting off of the tail from a young sheep.

It is done using a sharp knife

Reasons for docking sheep

- To prevent flystrikes. These flies are called horse flies.
- To keep the sheep clean. It prevents the soiling of dung on the tail.



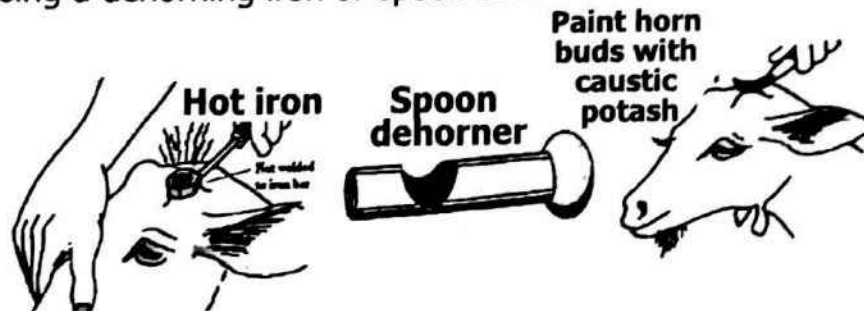
Advantages of docking sheep

- ✓ It enables the sheep to grow fat.
- ✓ It keeps the sheep clean.
- ✓ It makes mating easy in ewes. It exposes the vulva to the ram.

3. Dehorning/disbudding

Dehorning is the removal of horn buds from the head of an animal.

It is done using a dehorning iron or spoon dehorner



Advantages of dehorning

- It reduces the risk of injury among animals.
- It makes transportation of goats easy.
- It increases the space in the goat shed.

4. Hoof trimming

This is the cutting off of overgrown hooves from an animal.

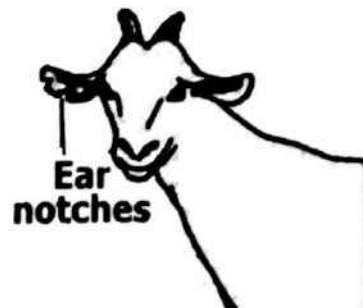
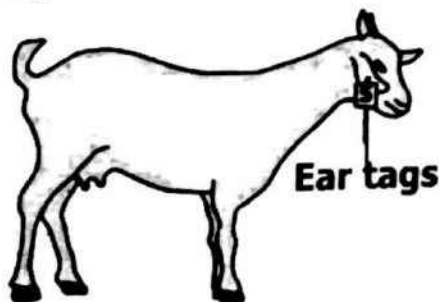
Farmers carry out hoof trimming to control foot rot in animals.

Hoof trimming eases the movement of the animal.

5. Identification markings. For easy identification of the goat.

Ear tagging. This is the fixing of plastic or metallic tags on the animal's ear.

Ear notching. This is when the animal's ear is cut with marks at its edges.



Hoof trimming

6. Castration

Castration is the removal or destruction of testes from a male animal.

It should be done at around 7 months of age.

A castrated ram or billy is called a **wether**.

Methods of castration

Open castration

This is where the scrotum is cut using a sharp knife or razorblade to remove the testes.

Closed castration

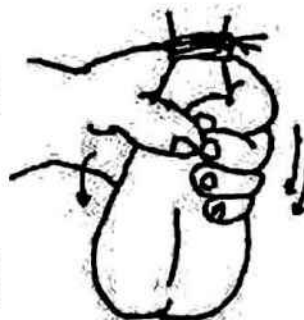
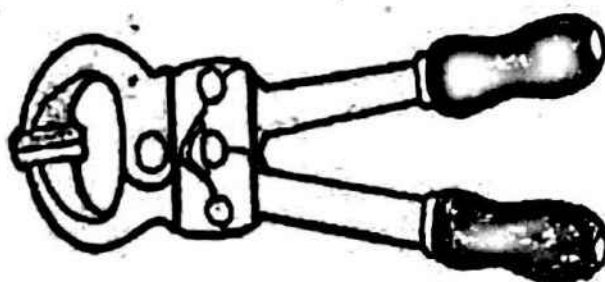
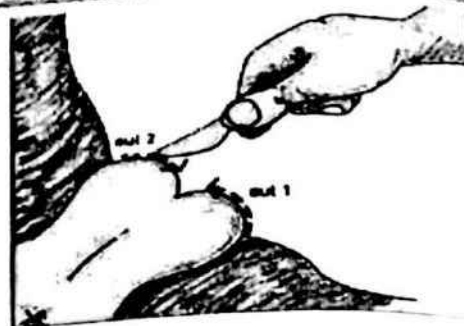
This is where a burdizzo is used to break the blood vessels leading to the testes.

The burdizzo has blunt edges.

Loop or rubber ring method

In this method, a rubber band is used to squeeze the testes.

This method is suitable for calves.



Advantages of castration.

- Animals grow faster and fatten.
 - It controls inbreeding in animals.
 - It prevents unnecessary mating.
- Testes that produce sperms are removed or deactivated.
- It makes animals docile.

Disadvantages of castration to animals

- It can cause too much loss of blood.
- The wounds may become septic to an animal.
- It inflicts a lot of pain to an animal.

7. Deworming

This is the practice of giving medicine to farm animals to kill endoparasites. Deworming is done by drenching or dosing.

Drenching is the giving of liquid medicine to animals through the mouth.

It is done using a drenching gun or a drenching bottle.

Dosing is the giving of solid medicine to a farm animal.



Drenching



Dosing



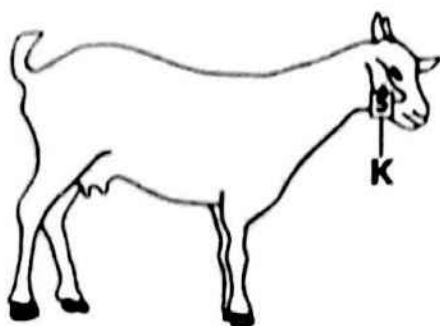
Drenching gun

Practice	Importance
Spraying	It controls ectoparasites.
Dusting	It controls ectoparasites.
Deticking	It controls ectoparasites like ticks.
Dipping animals in acaricides	It controls ectoparasites.

Evaluation activity 10.6

1. Name the disease in goats and sheep controlled by hoof trimming.
2. How does docking make mating easy in sheep?
3. Mention any **one** method used in deworming sheep.
4. Give any **two** reasons why farmers dehorn their goats.

The diagram below shows one of the management practices in goat rearing. Use it to answer questions **5** and **6**.



5. Name the management practice shown with letter **K**.
6. How is the above practice important to a goat farmer?
7. Give the importance of a drenching gun to a goat farmer.
8. Give any **one** reason why sheep farmers carry out docking in female sheep.
9. State any **one** advantage of castrating billies and rams on the farm.
10. The diagram below shows a farm practice done in sheep rearing. Study and use it to answer the questions that follow.



- (a) Identify the farm practice shown in the diagram above.
- (b) Name the suitable season for carrying out the practice above.
- (c) Give any **one** reason why the season you have named in (b) above is recommended for carrying out the practice above.
- (d) Mention the product obtained from the farm practice shown in the diagram above

DISEASES OF GOATS AND SHEEP

Conditions that lead to the outbreak of diseases in goats and sheep

- i) Poor hygiene ii) Poor feeding. iii) Lack of regular vaccination.
- iv) Presence of pests.

Bacterial diseases of goats and sheep

Disease	Signs and symptoms	Prevention and control
Anthrax	• Fever • Shivering • Sudden death • Blood-stained droppings	- Bury the carcasses at least 3 metres deep. - Regular vaccination.
Mastitis Affects the udder and teats	▪ Blood stains in milk. ▪ Swollen udder and teats. ▪ Pus in milk. ▪ Udder may stop producing milk.	- Treat early with antibiotics. - Clean the milking place. - Use a strip cup to detect clots in milk.
Pneumonia Affects the lungs	▪ Difficulty in breathing. ▪ Coughing ▪ Discharge from the nose. ▪ Fever ▪ Dull and sleepy.	- Treat the infected animal in isolation. - Treat early with antibiotics. - Give animals enough water.
Foot rot Affects the feet	❖ Limping ❖ Rotting and smelly feet. ❖ Inability to move properly. ❖ Swelling of the feet. ❖ Pus discharge from the hooves.	- Keep the barn clean daily. - Clean the animal's feet with antiseptic. - Give soft foods. - Do not force animals to walk. - Regular hoof trimming. - Treat with antibiotics.
Heartwater Spread by ticks	▪ Fever ▪ The tongue comes out. ▪ Animals move in circles. ▪ Eyelids twitch.	- Early treatment - Spraying acaricides to kill ticks. - Dipping animals in acaricide solution.
Black-quarter	• Dullness and shivering. • Fever • Swollen muscle with pain	- Early treatment with antibiotics. - Vaccination every year.
Brucellosis	➤ Abortion or dead foetus. ➤ Swollen testicles in rams.	- Culling infected animals. - Regular vaccination.

Viral diseases of goats and sheep

Disease	Signs and symptoms	Prevention/control
Foot and mouth disease	- Swollen and painful hooves. - Continuous salivation in the mouth. - Loss of milk production. - Lameness in animals. - Wounds on the tongue. - Loss of weight. - Pus in hooves. - Bad smell in hooves. - Limping of the animals. - Animals cannot feed properly.	- Keep the barn clean daily. - Impose quarantine. - Clean the animals' feet with antiseptic solution. - Regular vaccination. - Cull all the infected animals.
Nairobi sheep disease	- Blood-stained diarrhoea. - Difficulty in breathing. - Fever - Swollen lymph nodes - Nasal discharge. - Rapid weight loss.	- Regular vaccination. - Controlling ticks. - Impose quarantine. - Rotational grazing. - Practice biosecurity. - Clean the shed regularly.
Rift valley disease	- Fever - Staggering and diarrhoea. - Abortion in pregnant animals.	Regular vaccination
Sheep fox	- Fever - Excessive production of saliva. - Discharge from the nose	- Provide clean pasture. - Keep the sheep house clean. - Vaccinate the animals. - Isolate the infected animals. - Bury the carcasses.

Protozoan diseases of goats and sheep

Disease	Signs and symptoms	Prevention/control
Nagana Spread by tsetse fly	- High temperature. - Loss of milk production. - Eyes become watery. - Loss of appetite - Loss of weight - Runny eyes.	- Trim the hooves. - Impose quarantine. - Take sheep to dry places. - Clear bushes around the home. - Use tsetsefly trap.

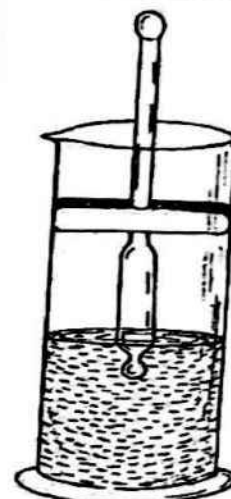
Disease	Signs and symptoms	Prevention/control
Coccidiosis	• Diarrhoea • Weakness • Loss of weight in kids. • Abortion in pregnant animals.	- Provide clean feeds and water. - Keep the barn clean daily. - Proper spacing of animals. - Regular vaccination.

Examples of some equipment found on the goat and sheep farm

Tsetse fly trap

strip cup

lactometer



Tsetse fly trap

It is used to trap and kill adult tsetse flies.

Strip cup

It is used to detect the presence of mastitis in milk.

Lactometer

It is used to determine the amount of water added in milk.

PESTS (PARASITES) THAT AFFECT GOATS AND SHEEP

A parasite is an organism that depends on another organism for food or shelter. Types of parasites are ectoparasites and endoparasites.

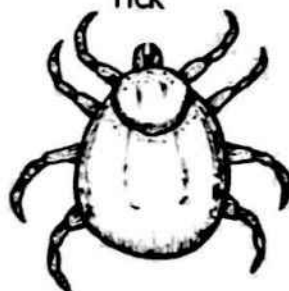
Ectoparasites are parasites that live on the skin of the host. They are also called external parasites.

Examples of ectoparasites are ticks, mites, tsetse flies, lice and stable flies

Flea



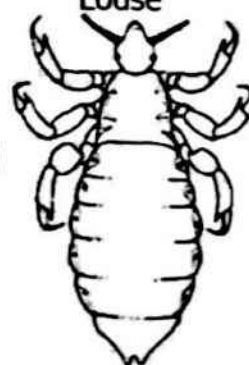
Tick



Mite



Louse



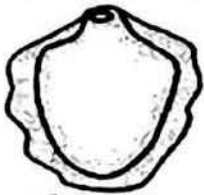
Ticks spread tick borne diseases like heartwater, east coast fever, anaplasmosis and redwater

Remembered as; **HEAR**

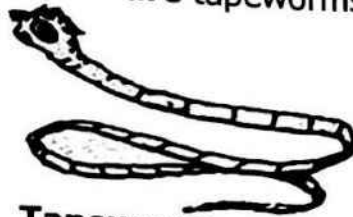
Tsetse flies spread nagana

Endoparasites are parasites that live in the intestines or liver of the host. They are also called **internal parasites**.

Examples of endoparasites are tapeworms, roundworms and liverflukes.



Liver fluke



Tapeworm



hookworms

Effects of parasites to goats and sheep.

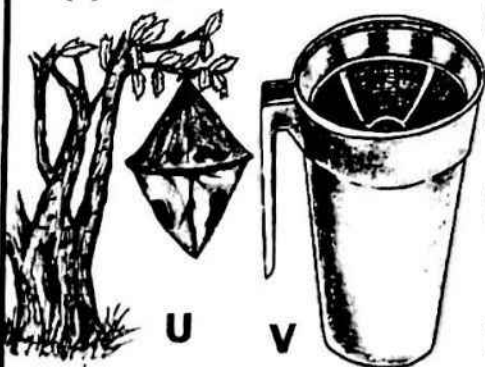
- (i) They transmit diseases to goats and sheep.
- (ii) They lower the quality of animal products.
- (iii) They suck blood from animals leading to anaemia.
- (iv) They cause damage to the skin of an animal.

Ways of controlling ectoparasites in goats and sheep.

- ✓ Spraying using acaricides
- ✓ Dipping goats in acaricide solution
- ✓ Dusting goats with acaricides.
- ✓ Practising paddock grazing
- ✓ Practising double fencing
- ✓ Creating tick buffers
- ✓ Regular deworming
- ✓ Hand picking

Evaluation activity 10.7

1. (a) What germ causes mastitis in goats?
(b) Give any **two** signs of mastitis in goats.
(c) State any **one** way of controlling mastitis in goats.
2. Name the disease in sheep that makes animals to move in circles.
3. Give any **two** viral diseases that attack goats on the farm.
4. (a) Apart from ticks, name any **one** other goat pest.
(b) State any **one** disease spread by ticks to goats.
(c) Give any **two** ways in which tickborne diseases can be controlled in goats.
5. (a) Name any **two** products got from sheep.
(b) What does shearing refer to in sheep rearing?
(c) How can a farmer control pneumonia in sheep?



- (a) Name the disease in goats that requires the use of equipment marked **U** and **V**.
- (b) State any **one** sign of the disease that requires the use of equipment marked **U**.
- (c) Identify the part of the nanny goat affected by the disease that requires equipment marked **V**.

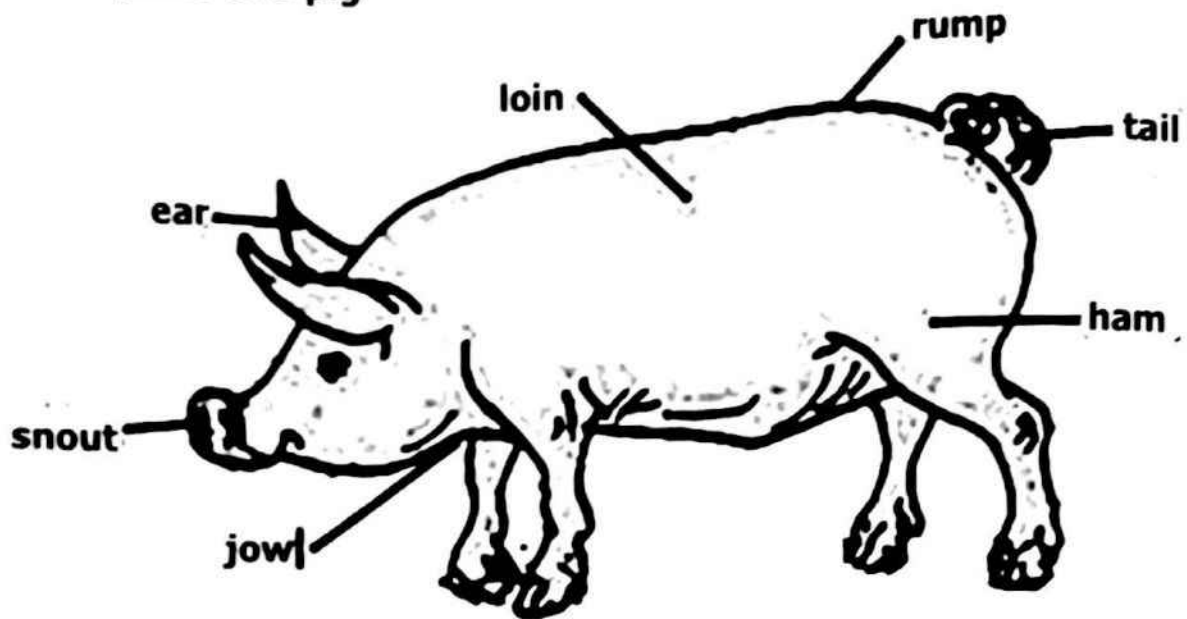
7. Apart from tickborne diseases, name **one** other disease spread by ticks to sheep.
8. (a) Give any **two** ways in which parasites affect goats and sheep.
(b) Mention any **two** ways of controlling parasites in goats and sheep.

KEEPING PIGS

Pig farming is practice of keeping and managing domestic pigs.

Piggery is a farm of pigs.

External parts of a pig



Reasons why people keep pigs.

- (i) To get pork.
- (ii) To sell and get money.

Ways in which pigs are important to people.

- (i) They are source of pork.
- (ii) They provide lard (fats) for making sausages.
- (iii) They are source of income.
- (iv) Their droppings are used as farmyard manure.
- (v) They are used for practical studies.

Local breeds

These are breeds of pigs which have been in Uganda for many years.

They can be improved by crossbreeding.

Examples of local breeds of pigs

- Black pigs
- Spotted pigs

Characteristics of local breeds of pigs

- They are more resistant to diseases.
- They are smaller in size.
- They take long time to mature.
- They have different colours.

Exotic breeds of pigs

These are breeds of pigs got from overseas.

Characteristics of exotic breeds of pigs

- ✓ They grow very fast.
- ✓ They produce high quality pork.
- ✓ They are less resistant to diseases.
- ✓ They produce more piglets.

Examples of exotic breeds of pigs.

- Landrace pigs
- Large white pigs
- Poland China pigs
- Large Black pigs
- Hampshire pigs
- Wessex saddleback pigs
- Berkshire pigs
- Middle White Black pigs

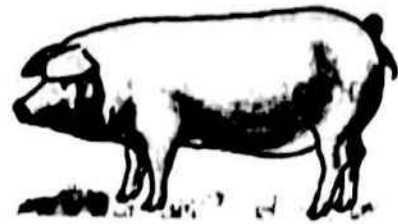
Large white pig



Saddleback pig



Landrace

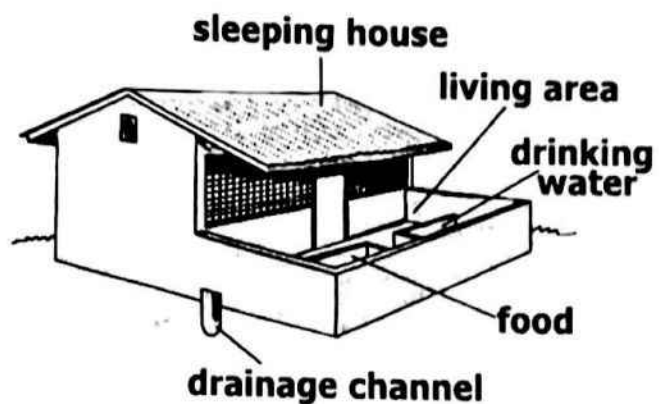
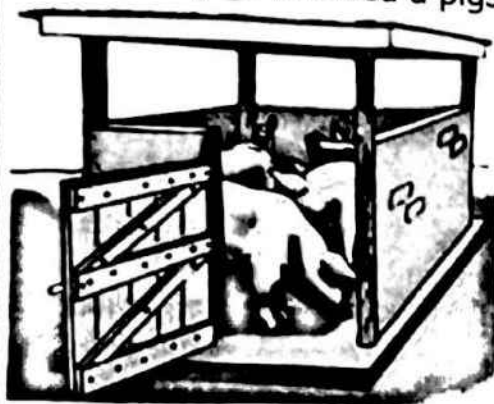


Middle white pig



Proper Housing and Management of Pigs

A house for pigs is called a pigsty.



Advantages of proper housing of pigs.

- ❖ It protects pigs from predators.
 - ❖ It protects pigs from bad weather.
- These include; sunshine and rainfall.
Pigs easily dies when overheated.

Reason. They have a lot of fats with little fur to protect their bodies

- ❖ It is easier to feed pigs.
- ❖ It reduces easy spread of diseases among pigs.

Qualities of a good pigsty

- ☞ It should be built with a slanting floor.

Reason. To allow easy flow of urine and their droppings from the floor.

- ☞ To allow easy flow of water to the ground during scrubbing.

- ☞ It should be well roofed.

Reason. To protect pigs from sunshine and rain.

- ☞ It should be well ventilated. This can be done using a wire mesh.

Reason. To allow free air circulation in the barn.

- ☞ It should be built with dry wooden floor.

Reason. To enable the droppings to go down through the spaces in the floor.
To allow urine dry in order to prevent dampness on the floor.

➤ It should be well cemented.

Reason. For easy cleaning of the barn.

Ways of keeping the pigsty clean.

✓ Removing wastes daily

✓ Scrubbing the floor.

✓ Replacing beddings

✓ Keep drainage channels unclogged.

FEEDING PIGS

Advantages of proper feeding of pigs.

❖ Pigs grow faster and fatter.

❖ Pigs produce high quality pork.

❖ Pigs are not easily attacked by diseases.

What pigs feed on

Pigs feed on; cabbage leaves, sweet potato leaves, cassava leaves.

Commercial feeds like; maize bran, cotton seed cake and pig mash.

Pigs eat less plant materials because they have a simple digestive system.

Pigs eat more on cold days in order to maintain their body temperature.

On hot days, pigs drink a lot of water to cool their body temperature.

They roll themselves in mud to cool their body temperature. This is called **wallowing**.

Types of feeds given to pigs

Type of feeds	Age group and type of pigs	Purpose of the feeds
Creep feeds	Piglets, 10 days to 8 weeks	- To supplement milk. - To boost early growth. - To ease transition to solid food.
Sow and weaner meal	Sow, gilts, boars, weaners	- Provides balanced nutrients for sows and weaners to support milk production and pig's growth.
Finisher or fattener meal	Pigs ready for sale	- To enable the pigs gain weight quickly before slaughter.

SYSTEMS OF KEEPING PIGS

Extensive system.

This is a system where pigs are left to roam about looking for their own food.

Advantages of extensive system of keeping pigs

• It is cheap to feed pigs.

• Pigs eat a variety of food.

• The system requires less labour.

• They pigs get enough physical exercises.

Disadvantages of extensive system of keeping pigs

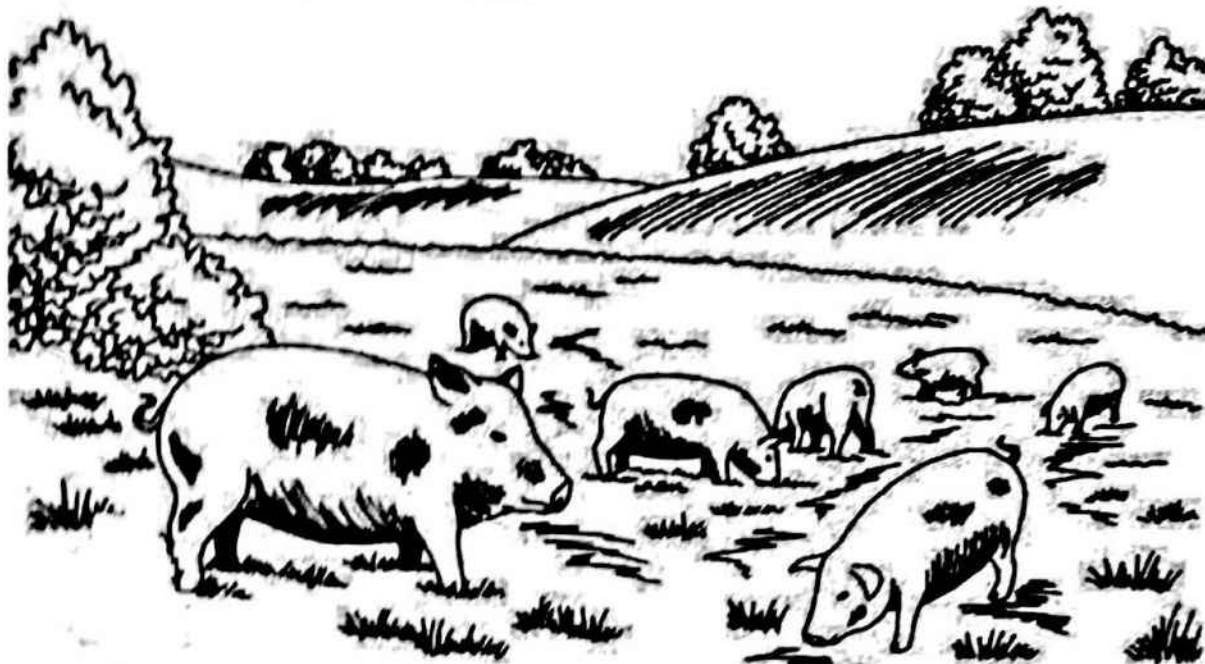
- Pigs are easily infected by diseases and parasites.

- The pigs can easily be stolen by thieves.

- Pigs can stray and destroy people's crops.

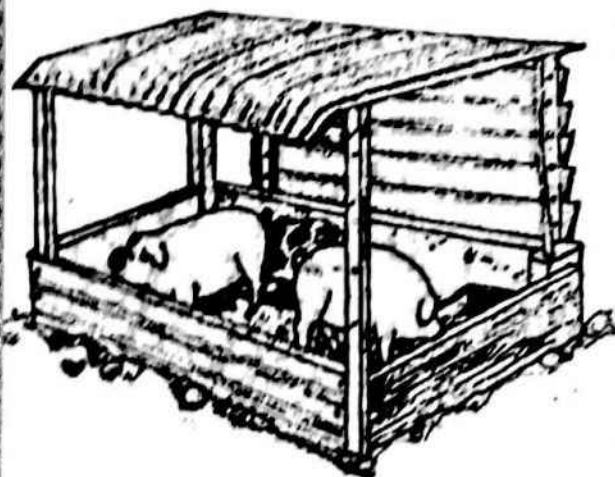
- Pigs can easily be killed by wild animals.

The pigs can easily become wild.



Intensive system

This is a system where pigs are kept and fed indoors (in sty)



Advantages of intensive system of keeping pigs

- The pigs in most cases are healthy.
- The pigs give high yields.
- Pigs receive maximum care and attention.
- It is easy to monitor individual pigs.
- Pigs grow and mature quickly.
- Pigs are protected from predators

Disadvantages of intensive system of keeping pigs

- It is expensive to feed and treat pigs.
- It is tiring to use as pigs require a lot of attention.
- In case of disease outbreak, many pigs can die.

Evaluation activity 10.8

1. (a) Write down any **two** commercial types of feeds given to pigs.
(b) Why do pigs eat more food during a rainy weather?
(c) Apart from feeding, give any **one** other way of caring for pigs at home.
2. (a) Give any **one** reason why the pigsty should be built with a slanting floor.
(b) Apart from having a slanting floor, state any **two** other features of a pigsty.
(c) Mention any **one** way in which pigs are important to people.

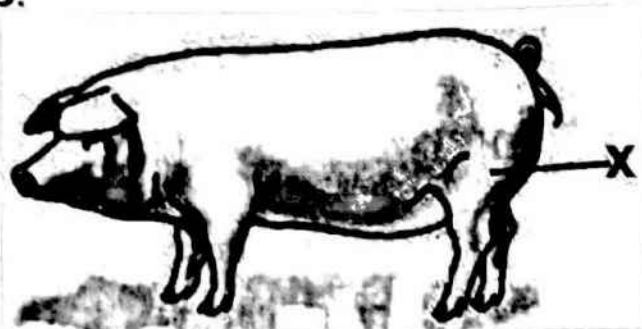
Evaluation activity 10.8 Continued

3. The diagram below shows a system of rearing pigs. Study and use it to answer the questions that follow.



- (a) Identify the system of keeping pigs shown above.
- (b) Give any **two** ways in which pigs benefit from the system above.
- (c) State any **one** problem caused by pigs when the system shown above is used when rearing pigs in your community.

The diagram below shows external features of a pig. Use it to answer questions 4 and 5.



- 4. Name the part marked X.
- 5. On the diagram above, label the organs for hearing.

REPRODUCTION IN PIGS

Farrowing is the act of giving birth to piglets by a sow.

A group of piglets born at the same time by the same sow is called **litter**.

The smallest piglet among the litter is called a **runt**.

A **sow** is a female pig while a boar is a male pig.

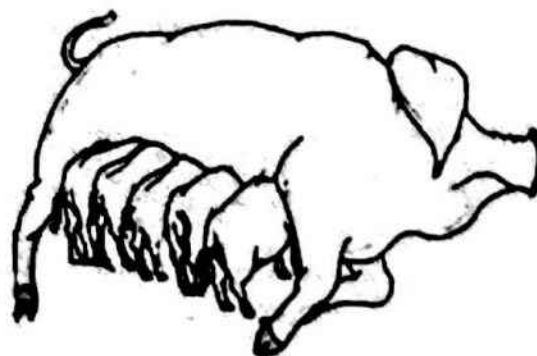
A sow takes **3 months, 3 weeks and 3 days (115)** days to farrow.

A pigsty should have a farrowing pen. A farrowing pen should have guard rails.

Reason. To prevent the mother from crushing the piglets when suckling them.



Farrowing pen (crate)



Ways of caring for piglets.

- ❖ Giving piglets a drug containing iron. This prevents anaemia.
- ❖ Giving piglets creep feeds.
- ❖ Deworming piglets.
- ❖ Proper feeding of the suckling sow to increase milk production for the piglets.
- ❖ **Tooth clipping.** This is the cutting of sharp canine teeth of young piglets. It is done to prevent piglets from hurting the teats of the sow while they are suckling. It should be done one day after birth.
- ❖ **Castration.** This is the removal or deactivation of testes in boars.
A castrated boar is called a **hog**.

 **Note.** It is difficult to castrate boars (male pigs)

Reason. Testes in boars do not dangle. (swing in space)

Reasons why farmers castrate their boars.

- (i) To control unnecessary mating.
- (ii) To make the boars grow fat.
- (iii) To control inbreeding.
- (iv) To make the boars grow faster.

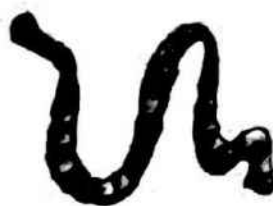
COMMON PARASITES AND DISEASES OF PIGS

Common Parasites That Attack Pigs

Endoparasites that attack pigs are; roundworms, tapeworms and liver flukes.



Roundworm



Tapeworm



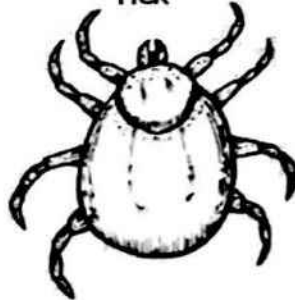
Liver flukes

Ectoparasites that attack pigs are; fleas, lice and ticks

Flea



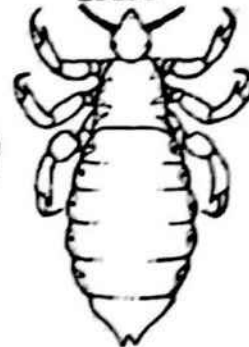
Tick



Mite



Louse



Effects of parasites to pigs.

- They suck blood causing anaemia.
- They reduce the quality of pork.
- They spread diseases to pigs.
- They cause irritation to the animal.

Ways of controlling parasites in pigs.

- Regular deworming.
- Smearing the pig's skin with waste engine oil.
- Giving clean feeds and water.
- Spray pigs with disinfectants regularly.

Don't speak for Quality, let Quality speak for itself

Common Diseases Of Pigs

Disease and germ	Signs and symptoms	Control and prevention
African swine fever Also called hog cholera Germ: virus	• Pigs become weak • Fever • Staggering • Bloody diarrhoea • Weakness in hind legs. • Drooping head • Coughing	- Regular vaccination. - Impose quarantine to the affected areas. - Keep the pigsty and feeding equipment clean. - Kill and bury or burn the carcasses of infected pigs.
Swine flu Germ: virus	▪ Fever ▪ Bleeding from all body openings	- Isolate the infected animals
Piglet anaemia Worms//malnutrition	- o Weakness - o Rough skin	- Regular deworming. - Give anthill soil to piglets to lick. - Give iron tablets to piglets
Pneumonia Germs: bacteria//virus	• Difficulty breathing. • Coughing • Discharge from the nose. • Fever dullness • Loss of appetite	- Treat early with antibiotics. - Keep pigs in warm pigsty.

Other diseases that attack pigs are; anthrax, foot rot and foot and mouth disease.

STARTING PIG, GOAT AND SHEEP PROJECT

Reasons for starting a pig, goat and sheep project

- To acquire skills and experience in animal management.
- To generate money from the sales of the animals.
- To get knowledge on how to keep farm records.
- To create employment opportunities to people.

Factors to consider when starting a pig, goat and sheep project.

Factor	Importance of the factor
Land	It is used for setting up the farm. It is used for growing pasture for feeding livestock.
Capital	It is used to buy the farm tools and equipment. It is used for paying workers. It is used to buy livestock. It is used to buy feeds.
Labour	Needed to look after animals and carry out farm activities like vaccination

Factor	Importance of the factor
Management	It is needed to carry out the day today activities on the farm.
Market	For selling livestock products like meat and milk. For buying farm requirements like tools, drugs and feeds.

Record Keeping in Activities Carried out on Pig, Goat and Sheep Farm

Record keeping is the gathering and storing of information about various activities and transactions carried out on a farm.

Farm records are written information about different activities and transactions carried out on a farm.

A health record

Date	Health problem	Animals (s) affected	Treatment/control method	Cost of treatment
04/6/2024	Pneumonia	Sheep No. 2 and No. 6	Antibiotics	Shs. 15, 000
10/08/2024	Worm infestation	Lambs (05)	Dewormers	Shs. 33, 000
15/09/2024	Nairobi sheep disease	All sheep	Vaccination	Shs. 40, 000

Examples of information on farm records.

- ✓ Health status of animals and crops.
- ✓ Date when the animals will give birth.
- ✓ Type of fertilisers used for planting
- ✓ Amount spend on feeding and vaccination.
- ✓ Size of the farm
- ✓ Date of planning
- ✓ Size of paddocks

Examples of farm records.

Production record:

Provides information about animal products.

It helps in planning schedules and related activities.

Feeding records:

Feeding records show the amount of feeds given to animals in a specific period of time.

Health records:

These show cases of diseases, their diagnosis and treatment. It also shows dates for vaccination and health conditions of different animals.

Importance of keeping health records.

- It allows farmers to carry out culling of animals easily.
- It helps to monitor the health of the animals.
- It helps a farmer to know the kind of treatment given to particular animals.
- It helps to identify sick animals on the farm.
- It helps to know the expenditure on treatment.

- It helps the farmer to plan for the health of animals.
- It helps to know common diseases and ways of preventing them.
- It helps to know the dates and number of animals treated.

Sales records:

These show the income, daily expenditure and total sales.

Inventory records:

These show detailed list of all the items used on the farm.

Breeding records.

These show the breeds of animals kept on the farm.

Ways in which keeping farm records is important to a farmer.

- It helps a farmer to plan for the farm.
- It helps a farmer to know the income and expenditure on the farm.
- It helps a farmer to know the profits and losses made on a farm.
- It helps in decision making regarding the future of the project.
- Records can be used as reference when a farmer wants to get loans.
- It helps a farmer to be taxed fairly by the government.
- It helps a farm to identify areas development and investment.

Evaluation activity 10.9

- (a) Give any **one** way in which capital is important when starting a sheep project.
 - (b) Apart from capital, mention any **two** other factors to consider when starting a sheep project.
 - (c) State any **one** reason why farmers set up sheep projects on their farms.
2. The table below shows an example of a farm record. Study and use it to answer the questions that follow

Date	Health problem	Animals (s) affected	Treatment/ control method	Cost of treatment
01/8/2023	Mastitis	Sheep No. 4 and No. 8	Antibiotics	Shs. 17,000
12/10/2023	Worm infestation	Kids (06)	Dewormers	Shs. 25,000
03/11/2023	Anthrax	All goats	Vaccination	Shs. 50,000

- Name the farm record above.
- Apart from anthrax, mention any **one** other disease which is controlled by the method used on 03/11/2023.
- Give any **two** reasons why keeping such a record is important to farmers.

MEANING OF KEY TERMS IN KEEPING GOATS, SHEEP AND PIGS

Nanny goat: A female goat.

Billy goat: A male goat.

Kid: A young one of a goat.

Kidding: The act of giving birth in goats.

Browsing: The feeding of goats on the softer parts of the plant.

Tethering: Tying a rope on a goat in a grazing land.

Heat period: The time when a female animal is ready for mating.

Mohair: The animal fibre got from goats.

Shearing: The removal of mature wool from the sheep.

Lambing: The act of giving birth in sheep.

Lamb: A young one of a sheep.

Docking: The practice of cutting the sheep's tail short.

Lard: Fats got from pigs.

Bacon: Meat from the back or sides of the pig.

Boar: A male pig.

Sow: A female pig.

Gilt: A young sow which has not yet farrowed.

Piglet: A young one of pigs.

Farrowing: The act of giving birth in pigs.

Tooth clipping: The practice of removing sharp teeth from the mouth of piglets.

Flushing up: The practice of highly nutritious feeds to female animals to increase ovulation.

Ham: Meat got from heavy muscles behind the parts of the pig.

Pork: Meat got from pigs.

Chevon: Meat got from goats.

Mutton: Meat got from sheep.

Hog: A castrated pig

Litter: A group piglets farrowed at the same time by the same sow.

Runt: The smallest and weakest piglet among the litter.

Fleece: Fur from sheep before it is being turned into wool.

Ewe: A female sheep.

Ram: A male sheep.

Wether: A castrated billy or ram.

THEME: HUMAN HEALTH

TOPIC : 11 FOOD AND NUTRITION

Food is a substance taken in to nourish the body.

Food is a substance taken into the body and adds nutritional value.

Classes of food are; carbohydrates, proteins, vitamins and mineral salts.

Nutrition is the process by which food is taken in and used by the body.

Forms of feeding milk to babies

1. Breastfeeding
2. Bottle feeding

BREASTFEEDING

Breastfeeding is the act of suckling the baby on milk produced by the mother's mammary glands.



Breast milk is considered to be the best food for babies.

Reason. Breast milk contains all food values needed by the baby.

Breast milk contains; carbohydrates, proteins, vitamin, lipids and mineral salts.

Reasons why breastfeeding is recommended for at least two years

- (i) To strengthen the immunity of the baby.
- (ii) It delays the next pregnancy. It delays monthly ovulation.
- (iii) Breast milk is a complete diet for the baby.
- (iv) Breastfeeding improves the health of the mother.

Advantages of breastfeeding to the baby.

- (i) Breast milk provides a balanced diet to a baby.
- (ii) Breast milk boosts the immunity of a baby. It provides antibodies to the body.
- (iii) Breast milk is easy to digest. It contains low fat content.
- (iv) Breast milk does not get contaminated easily.
- (v) Breast milk is ever ready for the baby.
- (vi) Breast milk tastes good to the baby.
- (vii) Breast milk is always at the right temperature for the baby to feed.

Disadvantages of breastfeeding to a baby.

- (i) A baby may get HIV/AIDS from the infected mother.
- (ii) A baby may become malnourished if the mother produces less milk.

Advantages of breastfeeding to the mother.

- (i) It is a natural family planning method.
- (ii) Breast milk is always clean.
- (iii) Breast milk does not require preparation.

- (iv) Breast milk is cheap in terms of money.
- (v) Breastfeeding saves time.
- (vi) Breastfeeding improves the mother's health.

Disadvantages of breastfeeding to the mother.

- (i) The nipples may get wounds when the baby bites them.
- (ii) Breastfeeding requires health lifestyle choices.
- (iii) The mother may get breast infection through the wounds.
- (iv) Frequent flow of breast milk causes bad smell to the mother.

Advantages of breastfeeding to the family.

- (i) It is cheap in terms of money.
- (ii) It requires less labour in feeding the baby.
- (iii) Each baby in the family gets a healthier start of life.
- (iv) It brings happiness to the family when the baby and mother are healthy.

Disadvantages of breastfeeding to the family.

- (i) Breastfeeding mother needs a lot of feeding to maintain milk production.
- (ii) Causes neglect of other family members by the mother.

Evaluation activity 11.1

1. (a) Give the meaning of the following terms:
 - (i) Food
 - (ii) Nutrition
- (b) Mention the **two** forms of feeding milk to the baby.
2. Give any **two** reasons why breastfeeding is encouraged for at least two years.
3. Give **one** way in which breastfeeding helps to promote the following;
 - (i) Natural immunity
 - (ii) Family planning
4. State any **one** reason why breastfeeding is considered to be the best food for babies.

The diagram below shows a method of feeding milk to a baby. Use it to answer questions **5** and **6**.



5. Identify the method of feeding milk to the baby shown above.
6. Give any **one** advantage of feeding milk to the baby using the method above.
7. Name any **one** disease that babies can contract from their mothers through breastfeeding.
8. State **one** reason why breast milk is easy to digest in the baby's stomach.

BOTTLE FEEDING

Bottle feeding is the act of feeding a baby on milk using a bottle or cup.

Forms of milk used in bottle feeding

- (i) Commercial infant milk formula
- (ii) Animal milk
- (iii) Expressed milk

A feeding bottle



A feeding cup



Bottle feeding a baby



Conditions that can lead to bottle feeding in babies

- When the mother has breast cancer.
- When the mother is dead.
- When the mother is HIV positive.
- When the mother is not around.

Advantages of bottle feeding.

- ✓ Bottle feeding protects the baby from getting HIV/AIDS.
- ✓ Other family members can participate in feeding the baby.
- ✓ In case the mother dies, a baby gets milk.
- ✓ It enables working mothers to feed their babies.

Disadvantages of bottle feeding:

A: To the baby

- The baby is at a great risk of illness.
- The nutrients in milk are destroyed by boiling.
- Bottles can easily get contaminated.
- The milk does not contain a balanced diet.
- The milk does not provide antibodies to the baby.
- Animal milk is hard for the baby to digest.
- Animal milk does not promote health growth of the baby.
- The milk may not be available for the baby all the time.

B: To the mother

- It is time consuming to the mother to boil milk.
- It encourages early pregnancy to the mother.
- The bottles are difficult to clean.
- Powdered milk is difficult to prepare.

C: To the family

- It is expensive in terms of costs.
- It is time wasting to prepare the bottle.
- It is tiring to prepare milk.
- It is difficult to keep the bottles clean.

Weaning a baby

Weaning is to accustom a baby to other food alongside breast milk.

Weaning is encouraged at the age of 6 months due to the following reasons;

- (i) The baby needs more nutrients for body growth.
- (ii) To supplement on breast milk.
- (iii) To prevent deficiency diseases like kwashiorkor and anaemia.

Weaning babies are mostly affected by kwashiorkor due to rapid use of proteins in their bodies for growth.

(iv) To enable the baby get enough iron.

Factors that can lead to early weaning of the baby.

- When the mother has breast cancer.
- When the mother has wounds on the teats.
- When the mother dies.
- When the mother is sick for a long time.

Common kinds of food used when weaning a baby

- mashed potato
- mashed beans
- porridge
- mashed posho
- mashed matoke
- mashed egg yolk
- sweet bananas



Points to note:

Weaning babies should be given soft food.

Reason. They have not yet developed molars and premolars to chew solid food.

Weaning babies should be fed frequently.

Reason. They have a small stomach and eat little at a time.

Weaning babies should be given small lumps of food.

Reason. To ease digestion of food.



Evaluation activity 11.2

1. Name the form of feeding in babies that requires the use of milk from a cow.

The diagram below shows a feeding bottle. Study and use it to answer questions 2 and 3.



2. Name the part marked **G**.

3. State the form of feeding milk on the baby where the bottle above is used.

4. The diagrams below show two mothers feeding their babies on milk. Study and use them to answer the questions that follow.



E



F

(a) Name the methods of feeding the baby on milk marked **E** and **F**.

(b) Mention any **one** advantage of feeding a baby using the method marked **E**.

(c) Give any **one** reason why health workers discourage mothers from using the

method of feeding the baby on milk marked **F**.

5. State any **two** conditions that can lead to bottle feeding in babies.

6. Give any **two** problems faced by mothers who use bottle feeding to give their babies milk.

THE VULNERABLE GROUP OF PEOPLE

Vulnerable group of people are people whose health can be easily harmed. They need special care and diet.

Diseases, malnutrition and injuries are common health problems that affect the vulnerable.

Vulnerable need soft food, soft drinks and balanced diet.

Groups of vulnerable people in a community

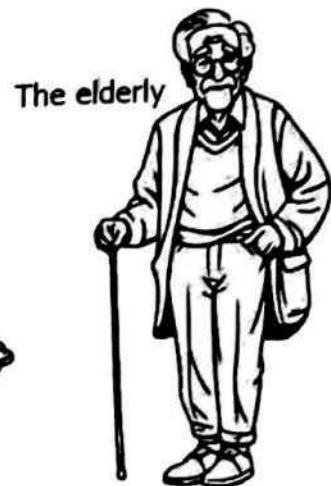
- the sick ➤ babies ➤ the elderly ➤ weaning babies
- breastfeeding mothers ➤ pregnant mothers



The baby



The sick



The elderly



Pregnant mother



Breastfeeding mother



Weaning baby

Conditions Under Which Some Groups Of People Can Be Vulnerable

Women

- ✓ When they are pregnant.
- ✓ When they fall sick.
- ✓ When they are giving and after giving birth.
- ✓ When they are old.
- ✓ When they are breastfeeding.

Men

- When they are old.
- When they fall sick.
- When they are disabled.

Children.

- When they are still babies.
- When they are still being breastfed.
- When they are being weaned.
- When they are sick.

Food For The Vulnerable People

Babies

Proteins. To build their bodies.
To promote their body growth.

Note well. Babies need more proteins than adults.

Reason. Babies need more proteins to build their bodies yet those of adults is already built.

Vitamins. To protect babies against diseases.

Carbohydrates. To provide extra energy to their bodies.

Pregnant mothers

Proteins. To repair worn out body tissues.
To replace worn out body cells.
To promote proper growth of the foetus.

Carbohydrates. To get more energy to carry the unborn baby.

Iron. To enable the formation of more blood for the mother and unborn baby.

Note: pregnant women usually eat clay soil in order to get iron.

Calcium. To build up the strong bones of the unborn baby.

Vitamins. To protect herself from getting infection.

The sick

Proteins. To repair worn out body tissues during sickness.
To replace worn out body cells during sickness.

Types of Patients

Invalid. An invalid is a patient who is very ill and cannot do anything for him/herself.

Convalescent

A convalescent is a patient who is undergoing treatment and is recovering from an illness.

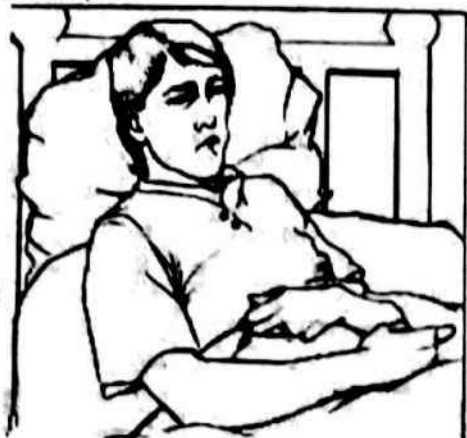
Sick people need to feed on a balanced diet in order to;

- (i) Fight the sickness.
- (ii) Prevent further problems like dehydration
- (iii) To repair worn out body tissues.
- (iv) To get back the lost energy during sickness

Fluids like clean boiled water, fruit juice and milk
To maintain hydration in their bodies.

vitamins e.g., vitamin C. To improve the immune system of the body.

carbohydrates. To enable them regain the lost energy during sickness



Don't speak for Quality, let Quality speak for itself

soft food and soft drinks. They have little energy to chew food.

The elderly

Proteins. To repair worn out body tissues.

To replace worn out body cells.

Vitamins. To build up immunity which is weakened by old age.

Problems that affect elderly people.

- Loss of teeth.
- Stomach problems.
- General body weakness.
- Mental problems
- Indigestion

Breastfeeding mothers

A lot of fluids like fruit juice, soup, milk, tea, water and porridge.

To increase the production of milk in the breasts.

To maintain hydration in the body.

Food rich in calcium and iron

Calcium replaces that being taken by the baby in breast milk.

Soyabeans, milk and spinach are sources of calcium.

Food rich in iron replaces the one lost during breastfeeding

meat, seafood, beans, liver, millet and milk are sources of iron.



Ways of Caring for Vulnerable Groups of People

The sick

- Feeding them on a balanced diet.
- Giving them company.
- Reassuring them of quick recovery.
- Guidance and counselling.
- Bathing them.
- Reminding them to take their drugs.
- Visiting them.
- Helping them to wash and iron their clothes.

Pregnant women

- ❖ Providing a balanced diet.
- ❖ Providing appropriate clothing.
- ❖ Encouraging them to go for ante-natal care.
- ❖ Encouraging them to do physical exercises.
- ❖ Allowing them to have enough rest and sleep.
- ❖ Helping them with domestic work.

The elderly

- Washing for them clothes.
- Cooking for them food.
- Bathing those who are unable.
- Monitor their medication in case they are sick.
- Helping them to do domestic work.
- Providing company to them.
- Cleaning their homes.

Breastfeeding women

- Provide nutritious meals.
- Encouraging regular postnatal check-ups.
- Provide a lot of fluids to maintain hydration.
- Allowing rest and time for breastfeeding sessions.
- Offering emotional support.

Babies

- ↑ Ensuring proper feeding.
- ↑ Providing clean clothes.
- ↑ Taking them for immunisation.
- ↑ Proper medication in case they fall sick.
- ↑ Regular bathing of the baby.
- ↑ Provide safe and clean sleeping environment



Bathing a baby

Evaluation activity 11.3

- (a) What is meant by the term vulnerable group of people?
(b) Apart from the sick, name any **one** other group of vulnerable people in the community.
(c) State any **two** ways in which you can care for the sick in your community.
- (a) Give any **two** conditions in which women are vulnerable.
(b) State any **two** ways in which family members can care for vulnerable women.
- (a) Write down any **two** sources of iron for a breastfeeding woman.
(b) State the reason why the breastfeeding woman should eat food rich in iron.
(c) Give any **one** way in which the breastfeeding woman can increase milk production in her mammary glands.
- The diagrams below show groups of vulnerable people. Study and use them to answer the questions that follow.



X



W

- Name the group of vulnerable people marked **W**.
- State any **one** health problem that affects the vulnerable person marked **X**.
- Give **one** reason why the vulnerable person marked **W** should be fed on food rich in more proteins than

the vulnerable person marked **X**.

- Mention any **one** way in which you can care for the vulnerable person marked **W** at home.

5.(a) State the meaning of the term weaning.

- Name any **two** forms of food used by mother when weaning their babies.

(c) Give any **one** reason why weaning is recommended at the age of six months.

Traditional Customs and Food Taboos in Communities

Traditional customs

Traditional customs are established practices which are accepted in a community.

Examples of traditional customs about food.

- Sharing a meal with a visitor.
- Sharing food with those who do not have.
- Kneeling when serving or peeling food.
- Sharing drinks like beer with others.
- Slaughtering animals like chicken for visitors.
- Sharing harvests with others.
- Sitting while eating food.

Importance of traditional food customs.

- They encourage cooperation.
- They encourage respect for food.
- They promote food hygiene.

Disadvantage of traditional customs.

- Some customs promote gender imbalance.

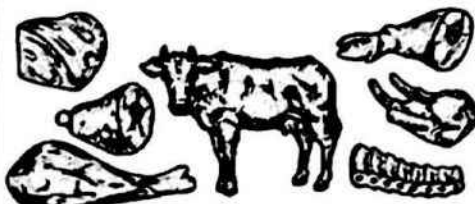


Food Taboos

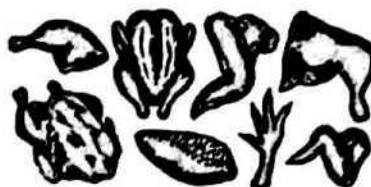
Food taboos are cultural or religious customs that forbid people from preparing and eating certain types of food.

Examples of food taboos in a community

- Muslims are not supposed to eat pork.
- Catholics are not supposed to eat meat on Friday during Lent and Advent.
- Women were not supposed to eat chicken by some tribes.
- Children suffering from measles in Buganda are not supposed to eat meat.
- People are not allowed to eat the totem of their tribes.
- The Hindus are not supposed to eat beef.
- Muslims are forbidden from eating meat from an animal slaughtered by a non-Muslim.



Meat (beef)



Chicken



grasshopper

Advantages of food taboos

- They help to conserve the environment.
- They prevent people from eating poisonous food.
- They help some families to get enough food.
- They help to preserve wildlife in the environment.

Disadvantages of food taboos to the community

- ❖ Food taboos can cause deficiency diseases
- ❖ Food taboos affect children's growth and development.
- ❖ They limit nutritional variety and balance.
- ❖ They restrict economic opportunities related to food.

Good eating habits in our communities

- Wash hands before eating food.
- Do not talk while eating food.
- Cook or serve food in a clean place and containers.
- Wash raw food like fruits well before eating them.
- Chew food properly before swallowing.

Food Consumption Patterns In The Community

Food consumption patterns depend on;

- (i) Availability of food in the environment.
- (ii) The cultural attachment to particular food.
- (iii) Food path of the area.
- (iv) The type of environment.
- (v) Climate of an area

Staple food of different communities

A staple food is a type of food that is commonly eaten by most people in a particular area.

It is the most common main or most important part of a community's diet.

Most staple foods are energy giving food (carbohydrates)

Common staple food consumed in different regions of Uganda.

Region	Staple Food
South -western Uganda	Irish potatoes and peas
Northern Uganda	Food: Cassava and millet Sauce: simsim, ground nut paste, smoked meat and green vegetables.
Eastern Uganda	Food: Millet, maize, bananas, sweet potatoes, and cassava. Sauce: beans, green vegetables, fish and ground nut paste
Central Uganda	Food: Matoke and sweet potatoes. Sauce: beans, fish, ground nuts and green vegetables
Western Uganda	Food: Sweet potatoes, irish potatoes, matoke, millet and sorghum Sauce: beans, peas, ghee, green vegetables.



Irish potatoes



Maize



Sweet potatoes

Don't speak for Quality, let Quality speak for itself



Cassava



Millet



Sorghum

Challenges faced by people when getting their staple food

- Food contamination.
- Floods which wash away crops.
- Drought which causes crops to wither.
- Theft of crops.
- Crop pests and diseases.
- Landslides which destroy crops.
- Lack of food storage facilities.
- Poor transport network.

Evaluation activity 11.4

1. (a) State the meaning of the term food taboo.
 (b) Give any **one** religious food taboo observed by people in your community.
 (c) Mention any **one** effect of food taboos to the health of children.
2. (a) Write down any **two** factors that determine food consumption patterns in your community.
 (b) State any **two** challenges faced by people when getting staple food in the community.
3. (a) Give any **two** ways of caring for staple food when still in the garden.
 (b) Write down any **two** examples of good eating habits accepted in your community.
4. The diagrams below show some of the staple food eaten by people in Uganda. Study and use them to answer the questions that follow.



- (a) Name the staple food marked **M** and **N**.
- (b) Give any **one** reason why most people in Uganda use the foodstuff marked **N** as their staple food.
- (c) Mention **one** food value mainly found in the staple food marked **M** and **N**.

MEANING OF KEY TERMS IN FOOD AND NUTRITION

Food: Anything taken in to nourish the body.

Invalid: A patient who is very ill.

Nutrition: The process of taking in and using food in the body.

Staple food: A type of food that is commonly eaten by most people in a particular area.

Weaning: The gradual introduction of semi-solid food to a baby alongside breast milk.

Breast feeding: The act of suckling a baby on milk produced by the mother's breasts.

Vulnerable people: People who can easily be harmed.

Convalescent: A patient who is recovering from an illness.

Community: A group of people working or living together.

Balanced diet: A meal that contains all food values in their right amount.

Nutrients: Substances which are essential for healthy growth.

Food taboo: A practice that forbids people from eating certain types of food.

Deficiency disease: A disease that results from poor feeding.

Carbohydrates: Energy giving food.

Proteins: Body building foods.

Vitamins: Health giving food.

Kwashiorkor: A deficiency disease caused by lack of proteins in a diet.

Consumption: Action of using up something e.g., food.

THEME: HUMAN HEALTH

TOPIC : 12 PRIMARY HEALTH CARE (PHC)

Primary Health Care is a collection of essential health activities which are planned to meet the health needs of all people in a community.

It is essential health care which requires individuals, families and communities to work together to solve their health problems.

Importance of Primary Health Care in the community.

- ✓ It controls population growth.
- ✓ It reduces high infant and maternal mortality rate.
- ✓ It helps to prevent malnutritional diseases.
- ✓ It ensures care for the disadvantaged,
- ✓ It encourages environmental protection.
- ✓ It promotes administration of first aid services.
- ✓ It provides health education to people.
- ✓ It encourages communal participation in solving health problems.
- ✓ It controls communicable diseases.
- ✓ It promotes safe use of water.
- ✓ It promotes good health lifestyles.
- ✓ It promotes personal hygiene and sanitation.

ELEMENTS OF PRIMARY HEALTH CARE

These are services that help to improve and maintain the health of the community.

1. Health Education

Health education is the process of providing information and teaching skills to promote and maintain healthy lifestyles.

Issues addressed during health education

- Advice on proper sanitation
- Advice on proper nutrition
- Good health lifestyles and practices
- Adolescent health
- Prevention of common diseases.
- Proper personal hygiene.
- Immunisation of children
- Procedures of giving first aid
- Reproductive health
- Ante-natal care
- Prevention of environmental pollution.



Ways of giving health education to the community

- ☞ Through radio and TV health talk shows.
- ☞ Through music, dance and drama.
- ☞ Through social media platforms.
- ☞ Through community meetings by VHTs.
- ☞ Through health assemblies at school.
- ☞ Through posters.
- ☞ Through newspapers.
- ☞ Through billboards.
- ☞ Through storytelling.

Importance of health education to the community

- ✓ It teaches people ways of promoting sanitation.
- ✓ It makes people aware of certain diseases.
- ✓ It educates people the importance of immunization.
- ✓ It creates awareness on the effects of high population.
- ✓ It sensitises people on how to improve personal hygiene.

2. Food and nutrition

This is promoted by feeding on a balanced diet.

People are encouraged to get involved in food production to promote food and nutrition.

Importance of food and nutrition

- It prevents deficiency diseases.
- It helps in providing food for good health and growth.
- It helps to boost people's immunity.
- It teaches people the proper ways of handling food.
- It helps people to feed on a balanced diet.

Challenges faced by people when promoting food and nutrition

- Food contamination
- Floods and drought.
- Pests and diseases.
- Soil exhaustion

3. Immunisation

This is done through administering vaccines in the body.



Injection method



Oral method

Activities involved in immunisation.

- Taking children for immunisation
- Observing national immunisation days.

Importance of immunisation

- It helps to prevent immunisable childhood diseases.
- It helps to reduce high infant mortality rate.

4. Maternal and child health

This involves giving health care to pregnant women for safe motherhood.

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Activities done under maternal and child health

- ❖ Immunisation
- ❖ Guidance and counselling on health matters.
- ❖ Testing for HIV/AIDS and other STDs.
- ❖ Provision of mosquito nets and mama kit,
- ❖ Family planning matters
- ❖ Nutritional education
- ❖ Ante-natal care services



Examining the foetal pulse



Guidance and counselling

Groups of people who need maternal and child health

- pregnant mothers
- breastfeeding mothers
- babies

Importance of maternal and child health

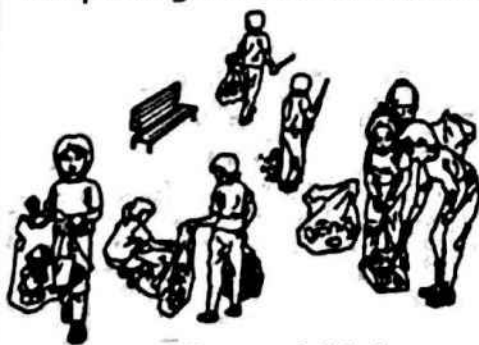
- It ensures the health of an expectant mother.
- It ensures that breastfeeding mothers and their babies are safe.
- It reduces infant and maternal mortality rate.
- It promotes safe motherhood.
- It prevents infant killer diseases.

5. Water and Sanitation

This involves keeping the environment clean and providing safe water.

Activities done to promote water and sanitation

- Sweeping the compound and houses.
- Mopping houses.
- Fencing water sources.
- Using clean containers to fetch water.
- Scrubbing toilets.
- Draining stagnant water.
- Disposing rubbish and faeces.



Picking rubbish



Burning rubbish



scrubbing the floor

6. Oral and dental health care

Oral health is general cleanliness of one's mouth.

Dental health care is the general care given to one's teeth.

Activities done to promote oral and dental health care

- Regular brushing of teeth and the tongue.
 - The tongue is brushed in order;
 - To remove the food remains that attract bacteria.
 - To prevent bad breath.
 - To kill germs on the tongue.
- Rinsing the mouth after meals.
- Dental flossing the teeth.
- Going for regular dental checkups.



Brushing teeth



Dental flossing



Dental servicing the tooth

Importance of oral and dental health care

- It promotes the cleanliness of the mouth and teeth.
- It prevents diseases of teeth like dental caries.
- It prevents bad odour from the mouth.

Evaluation activity 12.1

1. (a) Give any **one** way in which Primary Health Care (PHC) is important to a community.
(b) State the element of Primary Health Care which is promoted by each of the following activities;
 - (i) Sweeping the kitchen
 - (ii) Putting drops of polio vaccine into the mouth of a child.
 - (iii) Eating a balanced diet.
2. (a) In which **one** way is each of the following elements of Primary Health Care (PHC) important to the community?
 - (i) Water and sanitation
 - (ii) Maternal and child health
(b) Give any **two** health care services which are provided through maternal and child health.
3. (a) Give any **one** way in which each of the following elements of Primary HealthCare (PHC) is important in the community.
 - (i) Food and nutrition
 - (ii) Maternal and child health
(b) Identify any **two** ways of giving health education to a community.

Evaluation activity 12.1 Continued

4. The diagrams below show activities done to promote Primary Health Care. Study and use them to answer the questions that follow.



- Identify the element of Primary Health Care promoted by carrying out the activities marked **X** and **W**.
- Give any one way in which the activity marked **W** helps to promote the health of people in the community.
- Name any one viral disease prevented by carrying out the activity marked **X**.

7. First Aid

This involves giving initial help to accident victims before getting further treatment.

Activities done to administer first Aid to casualties

- Raising the legs slightly higher than the head.
- Applying mouth to mouth breathing.
- Tying the bandage at the cut.
- Tying an armband around the fractured arm.
- Putting the burnt part in cold water.



Mouth to mouth breathing



Different forms of first aid



Bandaging the cut

Importance of giving first Aid to casualties

- It saves life of the casualty.
- It promotes quick recovery of the casualty.
- It controls excessive bleeding.
- It reduces pain to the casualty.

8. Personal hygiene

This is the general cleanliness of the body and things we use.

Activities done to promote personal hygiene

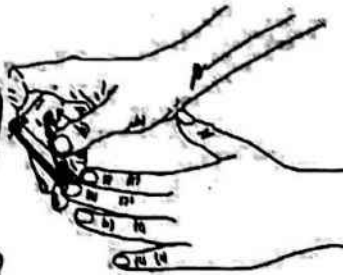
- Regular bathing.
- Brushing teeth daily.
- Combing hair.
- Ironing clothes
- Washing clothes and hands.
- Grooming toe and fingernails.
- Trimming overgrown hair.



Washing clothes



Washing hands



Grooming fingernails



Bathing a baby

Importance of personal hygiene

- It promotes the human body cleanliness.
- It prevents skin diseases like scabies.
- It prevents bad smell from the body.
- It prevents parasites like lice.

9. Family planning

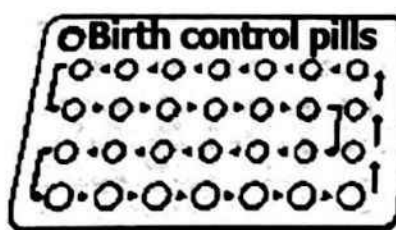
This is the using birth control methods to produce children when only when one is ready for them. The methods help the mother to have child spacing.

Activities done to promote family planning

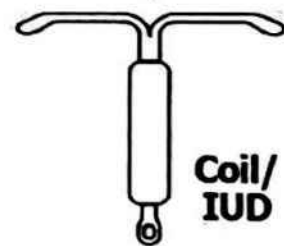
- Vasectomy
- Tubal ligation
- Prolonged breastfeeding.
- Swallowing birth control pills.



Condom



Birth control pills



Coil/
IUD

Importance of family planning

- It controls population growth.
- It reduces the risk of maternal anaemia in women.
- It reduces infant mortality rate
- It gives the mother's body time to repair.

10. Control of Communicable Diseases (CCD)

This element helps to control the outbreak and spread of communicable diseases in the community.

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Communicable diseases are infections that spread from an infected person to a healthy one.

They can spread through air, water, mucus, blood, handshake, insect bites or food.

Examples include; COVID 19, tuberculosis, pertussis, cholera, AIDS, influenza and measles.

Activities done to control communicable diseases.

- (i) Wearing face mask. It prevents a person from inhaling contaminated air. It controls COVID 19, tuberculosis, flu, diphtheria, pneumonia, pertussis and meningitis.
- (ii) Boiling water for drinking. It kills germs in water.
- (iii) Washing hands with clean water soap. It helps to remove and kill germs from hands
- (iv) Immunizing children. It protects children against infant killer diseases e.g., measles.
- (v) Spraying insecticides. It helps to kill insect vectors like mosquitoes, cockroaches and houseflies.



Wearing face mask



Mosquito net



Spraying insecticides

PRINCIPLES OF PRIMARY HEALTH CARE (PHC)

These are rules which must be followed in carrying out Primary Health Care programme.

Full community participation.

It ensures that health programs address real community needs.

Equal care for everyone.

It enables all people to receive health services.

Social acceptability.

It encourages community trust and use of health services.

Equitable health services.

It enables vulnerable people to enjoy health services.

Affordable health services.

It makes health care accessible to people of all income levels.

It enables everyone to participate and benefit from it.

Total health for all.

It enables everyone to stay healthy and strong.

Accessible health services.

It enables everyone to reach and benefit from health care easily.

Evaluation activity 12.2

1. State any **one** element of Primary Health Care (PHC) which is important in the prevention of COVID 19.
2. Name the element of Primary Health Care which promotes human body cleanliness.
3. State any **two** principles of primary health Care. (PHC)
4. The diagrams below show materials used to promote elements of Primary Health Care. Study and use them to answer the questions that follow.



- (a) Name the element of Primary Health Care that requires the use of materials marked J and K.
 - (b) Give any **one** way in which the material marked J helps to promote the health of the teeth.
 - (c) State any **one** importance of the element promoted by using the material marked K to the community.
5. The table below shows some of the elements of Primary Health Care and the importance of each element. Complete the table correctly.

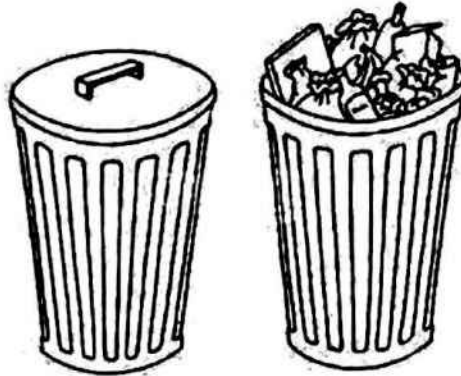
Element	Importance
.....	It relieves pain from an accident victim.
Oral and dental health care	.....
.....	It controls malnutrition in children.
Family planning	.....

6. (a) Give **one** reason why primary health care should be;
- (i) Cheap and affordable.
 - (ii) Equitable to all people.
- (b) Write down any **two** viral diseases that involve Control of Communicable Diseases.

Primary Health Care Activities That Promote Community Hygiene

Community hygiene is the cleanliness of the environment in which a particular community lives.

1. Disposing rubbish in dustbins.



The dustbin should have a lid to prevent rubbish falling outside the dustbin. The lid prevents bad smell from coming out of the dustbin.

2. Disposing excreta in latrines or toilets.

3. Organising community cleaning sessions.

This involves cleaning places like water sources, trading centres, health centres and markets.

4. Reusing empty plastic materials.

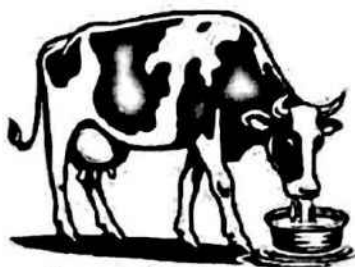
 They include plastic bottles and basins.

Ways in which empty plastic bottles can be utilized

- (i) For raising seedlings.
- (ii) For growing vegetables.
- (iii) For carrying materials like food.
- (vi) For drip irrigation.
- (v) Used as feeding troughs for animals.
- (vi) For making crafts.

Plastic materials pollute the soil.

Plastic materials make the environment dirty.



A cow drinking water from a basin.



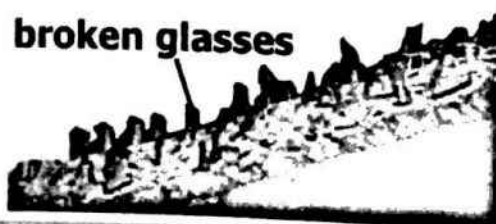
Raising seedlings from plastics



Drip irrigation in a bottle

5. Reusing broken bottles.

They can be reused by builders to fix them on top of perimeter wall fences. This prevents animals and human intruders from climbing the fence into the compound.



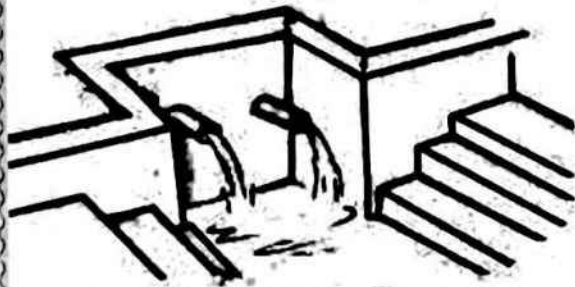
6. Protecting water sources. This is done by;

- Dredging water drainage channels.
- Sweeping around the water source.
- Fencing the water source
- Building pit latrines at least 30 metres away from the water source.
- Trimming around the water source.
- Picking rubbish around the water source.

Reason. To prevent excreta from seeping into water to contaminate it.

- Constructing a protective slab around water tanks.

This reduces water contamination as it prevents dirty water from getting into the tank from the ground.



A protected spring water source



A protected borehole

Activities done by the School Environment Club to protect water sources

- Fencing the water source.
- Picking rubbish near water source.
- Planting trees around the water source.
- Cleaning the water source.
- Digging around the water source.

Primary Health Care Activities That Promote School Hygiene

- ❖ Sweeping the compound.
- ❖ Collecting rubbish in dustbins.
- ❖ Sweeping and mopping classrooms.
- ❖ Providing water and soap for washing hands.
- ❖ Slashing tall grass around the compound.
- ❖ Putting rules that promote school hygiene.



General cleanliness



Putting rubbish in a dustbin



Tippy-tap

Responsibilities of individuals, family and community in health promotion.

The Responsibilities of Individuals

- Washing clothing and bedding.
- Ironing clothing and bedding.
- Brushing teeth daily.
- Combing hair.

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- Washing eyes.
- Bathing every day.



Combing hair

- Grooming toe and fingernails.
- Washing hands regularly with clean water and soap.



Washing hands



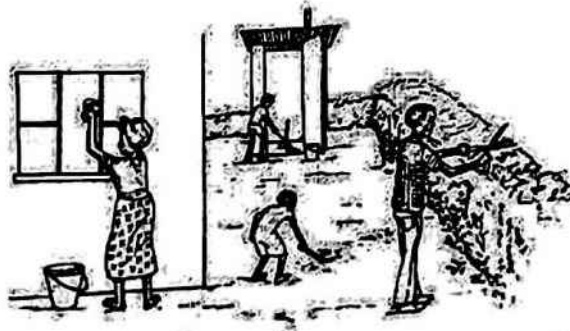
Brushing teeth

The Responsibilities of a Family

- Preparing food in clean places.
- Boiling water for drinking.
- Sharing health information.
- Keeping houses clean and well ventilated.
- Attending health meetings or seminars.
- Teaching family members basic health skills.
- Feeding family members on a balanced diet.
- Keeping food in clean containers.
- Providing dustbins.
- Taking children for immunisation.



Dustbin



Maintaining family hygiene



Boiling water

The Responsibilities of a community

- ❖ Organizing health meeting or seminars.
- ❖ Carrying out health survey in homes.
- ❖ Participating in immunization campaigns.
- ❖ Constructing rehabilitation centres for the disabled.
- ❖ Cleaning markets and water sources.
- ❖ Constructing health centres.
- ❖ Forming village health committees.
- ❖ Filling up potholes on feeder roads to reduce accidents.
- ❖ Setting up by-laws on health promotion.



Community health care



Cleaning around water

Suitable lifestyles and good health practices

Healthy lifestyles are habits that promote physical, mental and emotional well-being.

Examples Of Suitable Health Lifestyles

Feeding on a balanced diet.

- It maintains proper body health and growth.

Getting enough sleep and rest.

It helps to refresh the brain.

Maintaining good body posture.

- It prevents back and chest pain.
- It promotes proper growth of bones.
- It promotes proper digestion of food.

Going for regular medical checkups.

- It helps to prevent health problems early.
- It helps in monitoring overall health.
- It helps in early detection of diseases.

Doing regular physical exercises.

- They improve on the body fitness.
- They reduce overweight.
- They make bones and muscles grow strong.
- They increase flexibility in the joints.

Avoid the use of alcohol and tobacco smoke.

- It prevents diseases like lung cancer and peptic ulcers.



Physical exercising



Proper feeding

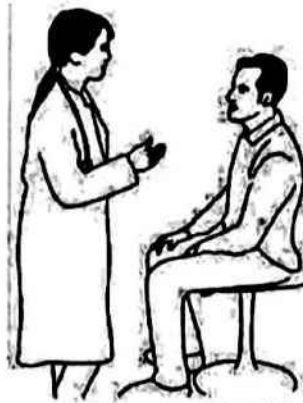


Medical checkup

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Resting and sleeping



Getting medical advice



Proper sitting posture

Ways of preventing diseases without using drugs

- (i) Observing good personal hygiene.
- (ii) Maintaining proper sanitation.
- (iii) Having enough rest and sleep.
- (iv) Doing regular physical exercises.
- (v) Reheating leftover food before eating.

Good health practices

- ❖ Sharing knowledge about health.
- ❖ Conducting school health parades.
- ❖ Doing regular physical exercises.
- ❖ Having a school health committee.

The School Health Committee

A School Health Committee is a group of people responsible for promoting and maintaining health standards in a school.

Members of the School Health Committee

- Health prefects
- School nurse
- Head teacher
- Parents' representative

Roles Of The School Health Committee

- ✓ Organizes pupils to clean the school.
- ✓ Sets up health rules in a school.
- ✓ Conducts school health parades.
- ✓ Plans for health talk shows.
- ✓ Provides hand washing facilities.
- ✓ Raises health funds for the school.
- ✓ Identifies and reports health problems.
- ✓ Encourages immunization programs.

School Health Parades

A School Health Parade is an assembly organized to check on the hygiene of pupils.

This is an element under Health Education



Activities done during a School Health Parade.

- Checking children's teeth.
- Identifying children with uncombed hair.
- Checking on the hygiene of the school uniform.
- Checking children's skin.
- Checking toe and fingernails.
- Identifying pupils with ill health.

Body parts checked on the School Health Parade

Hair, eyes, ears, teeth, tongue, fingernails, head, toenails, skin and feet

Groups of people who carry out Health Parade at school.

- Teachers
- School nurses
- Health prefects
- Matrons
- Head teacher

Importance of School Health Parades

- They help pupils to improve on their personal hygiene
- They help to identify skin diseases among pupils.
- They help pupils to learn how to prevent skin diseases like ringworm infection.

Diseases that can easily be identified during School Health Parade

Ringworm infection, athlete's foot, dental caries, measles, scabies and mumps

School Health Club

This is an association of members in a school which promotes health of children.

Other health clubs are Village Health Team and Public Health Official Team.

Activities done by the School Health Club to improve the health of people.

- Organizing health meetings.
- Organizing health parades.
- Displaying posters with health messages at school.
- Supervising general cleaning sessions.
- Organizing health talk shows at school.
- Destroying the breeding places for vectors.
- Reporting health problems.
- Monitoring food preparation.
- Mobilizing funds to buy sanitary facilities.

Examples of health messages that can be displayed in a school compound.

- ✓ Avoid littering the compound.
- ✓ Keep the compound clean.
- ✓ Observe standard operating procedures.
- ✓ Follow PIASCY messages.
- ✓ Dump rubbish in dustbins or rubbish pits.
- ✓ Wash hands after visiting the latrine or toilet



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Evaluation activity 12.3

1. Mention any **one** activity a School Health Club can do to improve the health of people in a school.
2. Name any **one** body part that may be checked during a school health parade.
3. The diagram below shows a person wearing a protective item made of cloth. Use it to answer the following questions.



- (a) Name the protective item labelled **K**.
 - (b) Identify any **two** diseases that can be prevented by the use of the protective item **K**.
 - (c) Mention any **one** good practice of using the protective item **K**.
4. (a) Give any **two** ways in which Primary Health Care (PHC) is an important programme in the community.
(b) State any **two** roles of a School Health Committee.
 5. Give any **two** ways of protecting water sources in the community.
 6. Give any **one** way in which you can utilize empty plastic bottles at home.
- The diagram below shows a substance used to promote health of people. Use it to answer questions **7** and **8**.



8. Name the substance marked **M** from the bottle above.
8. Which element of Primary Health Care is promoted by using the substance marked **M**
9. Give **one** reason why we should regularly wash our hands with clean water and soap.
10. State any **one** reason why a pit latrine should be built at least 30m from the water source.
11. Write down any **one** activity that a School Environment Club can do to protect a school water source.

CHILD TO CHILD PROGRAMME

This is where older children with more knowledge teach young children good health habits.

Activities carried out under child to child programme

- Teaching young children toilet habits.
- Teaching young children table manners.
- Teaching young children how to brush teeth.
- Teaching young children how to bathe.
- Teaching young children how to avoid STDs.
- Teaching young children how to wash their knicker or pants.
- Caring for sick children.
- Teaching body changes during adolescence.



Importance of child to child programme.

- ⇕ It promotes personal hygiene among children.
- ⇕ It promotes proper care among children.
- ⇕ It controls the out break of diseases like diarrhoea and athlete's foot.
- ⇕ It promotes proper use of toilets/latrines by young children.

People with Special Needs in the Community

These are people who are weak and easily injured because of their physical conditions.

Examples of people with special needs

The sick, the disabled, babies, the elderly

Ways of caring for people with special needs.

The sick

- Taking them to the hospital.
- Giving them drugs at the right time.
- Giving them company.
- Visiting them.
- Helping them to wash and iron their clothes
- Feeding them on a balanced diet.
- Guidance and counselling the sick. cancer.
- Reassuring them of quick recovery.

Importance of guidance and counselling.

- It makes sick people to feel less scared.
- It helps to provide information about the disease to the sick.
- It prevents sick people from spreading the diseases e.g., in HIV patients.
- It helps the sick to have hope of recovery.
- It enables sick people to adhere to treatment.
- It prevents the sick from feeling neglected.



Taking drugs



Nursing the sick



Counselling the sick

The elderly

- Feeding them on a balanced diet.
- Helping them to do domestic work.
- Washing their bedding and clothing.

Note: the elderly should be fed frequently

Reason. They eat little food at a time since they lack appetite.

They should be fed on soft food due to loss of teeth.



Elderly with no teeth

The young

- Feeding them on a balanced diet.
- Dressing babies in warm clothes during cold weather.
- Keeping them clean daily.
- Keeping chemicals out their reach. This helps to prevent child poisoning.
- Proper medication when they are sick.
- Taking them for immunization.
- Teaching them good behaviour.



A baby putting on a raincoat



Feeding the baby



Bathing the Baby

The disabled

These include; the lame, the blind, the dumb, the deaf and the crippled.

The disabled can be cared for by;

- (i) Constructing for them rehabilitation centres.
- (ii) Helping the blind to find their way.
- (iii) Constructing ramps besides staircases.
- (iv) Providing practical skills to the lame.
- (v) Using gesture language to communicate to the deaf.



Pushing a wheelchair



Helping the blind on the road



Using gestures for the deaf

Evaluation activity 12.4

1. (a) Write down any **two** activities done under Child-to-Child programme.
(b) Give any **two** ways in which Child to Child programme is important in the community.
2. (a) Apart from the elderly, name any **one** other group of people with special needs in the community.
(b) State any **two** ways of caring for the elderly people in the community.
(c) Give any **one** reason why elderly people should be fed on soft food frequently.
4. The table below shows elements of Primary Health Care (PHC) in part **A** and their importance in part **B**.

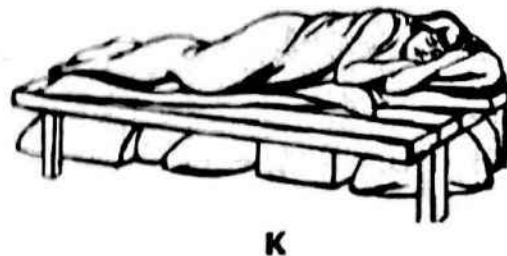
A: Element of PHC	B: Importance
Immunization	-It maintains human body cleanliness.
Sanitation	-It promotes quick recovery.
First Aid	-It prevents infant killer diseases.
Personal hygiene	-It controls the breeding of vectors.

Match correctly the elements of Primary Health Care with their importance in the spaces provided below.

- (i) Immunization
- (ii) Sanitation
- (iii) First Aid
- (iv) Personal hygiene

Evaluation activity 12.4

4. The diagrams below show some of the health lifestyles practices. Study and use them to answer the questions that follow.



- (a) Name the health lifestyle marked **K**.
- (b) Give any **two** ways in which the health lifestyle marked Q is important to the human body.
- (c) Identify the body organ maintained by carrying out the health lifestyle marked **K**.

MEANING OF KEY TERMS IN PRIMARY HEALTH CARE

Health: General wellbeing of a person.

Hygiene: The practice of maintaining cleanliness.

Ante-natal care: The health care given to pregnant mothers.

Sanitation: The general cleanliness of the environment.

Oral hygiene: The practice of keeping one's mouth clean.

Personal hygiene: The general cleanliness of the body and things we use.

Immunisation: The introduction of vaccines into the body to boost immunity.

Excreta: Refers to human wastes.

Disposal: The process of getting rid of waste/refuse.

Lifestyle: The way in which an individual conducts him/herself.

Health parade: An assembly conducted at school for health inspection of pupils.

Health survey: The critical investigation of health in the community.

First Aid: The first help given to a casualty before getting further treatment.

Health education: A seminar conducted to give health information to people in a community.

School Health Club: An association of members in a school which promotes health of children.

Child to child programme: This is where older children with more knowledge teach young children good health habits.

Primary Health Care: The essential health care where individuals, families and communities work together to solve their health problems.

Congratulations, You Have Completed Primary Five Syllabus!



ABOUT THE AUTHOR

Jamie Humphrey is a professional teacher of Integrated Science and Mathematics. He has taught in prominent schools within Kampala and Wakiso districts in Uganda. He has sufficient knowledge and experience in teaching Integrated Science at primary level as well as Biology and Chemistry at secondary level.

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ABOUT THE BOOK

The Sure Key Integrated Science has been developed basing on the current Primary Five Integrated Science standard curriculum prescribed by the NCDC of Uganda. The book covers all the topics of Primary Five Integrated Science syllabus.

The flow of content in this book matches with that of the Primary Five standard curriculum. The book has clear diagrams and variety of experiments on most of the concepts to enable the pupil understand the concepts well as science requires Practical approaches and observations.

Similarly, the exercises in this book cater for all the three levels of assessment ie, Recalling, Understanding & Application.(RUA), as prescribed by UNEB PLE setting. In addition, the exercises are set basing on the Competence Based Curriculum (CBC) to help learners apply what they are being assessed.

It is my sincere hope that this reference book will be of unwavering value to Primary Five Pupils, teachers and researchers.

A PRODUCT OF SUREKEY EDUCATION SERVICES

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THE SUREKEY INTEGRATED SCIENCE

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