

## TERM II 2018

### TOPIC ONE

#### SOIL

Soil is the top layer of the earth

It is the medium in which plants grow and where they get water and nutrients

#### TERMS USED IN SOIL

Land reclamation: this is the bringing back waste land to use

Drainage: this is the method of removing excess water from a water logged area.

Irrigation: this is the artificial method of providing water to crops in dry areas

Soil sampling: this is the taking of sample of soil from different parts of the field to analyse it in a laboratory

Soil texture: this means the different sizes of soil particles in an area

Soil structure: this is the way in which particles are arranged in the soil.

Soil profile: This is the vertical arrangement of the various soil layers.

#### IMPORTANCE OF SOIL

It holds water for plants

It contains nutrients for the growing plants

It contains air which plants need

It holds plants firmly into the ground

It is a home to small animals

#### COMPONENTS OF SOIL

Soil consists of the following

- a. Humus(organic matter)
- b. Water
- c. Air
- d. Particles of clay and sand (rock particles)
- e. Dissolved mineral salts (in-organic matter)

#### **Examples of minerals needed by plants**

1. Magnesium and iron
2. Potassium
3. Calcium
4. Phosphorus
5. Nitrates and phosphates

#### **EXPERIMENTS TO SHOW THAT:**

- I. Soil contains water

- II. Soil contains air

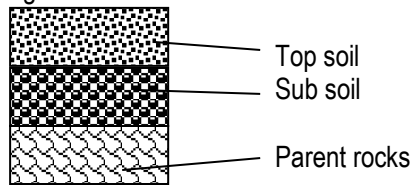
#### SOIL PROFILE

Soil profile is the vertical arrangement of soil layers. It is made up of three layers namely;

- Top soil
- Sub soil

- Parent rocks

Diagram



Top soil: This is the most important one because it contains most of the nutrients needed for plant growth.

Which soil layer is suitable for plant growth?

The top layer is the best for plant growth. This is because it contains humus.

### **TYPES OF SOIL**

There are three types of soil namely:

1. Loam soil
2. Clay soil
3. Sandy soil

#### **LOAM SOIL**

It has the following properties.

- a) It contains balanced particles of sandy and clay.
- b) It contains more humus than clay and sandy
- c) It is well aerated than clay.
- d) It contains all soil components in a balanced amount.

Therefore it is the best for crop growing.

#### **CLAY SOIL**

It has the following properties.

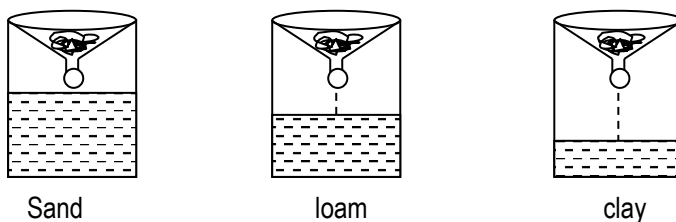
- a) It has little humus
- b) It has fine particles
- c) It is poorly aerated
- d) It retains a lot of water (it's poorly drained)
- e) It is sticky and heavy
- f) It is suitable for pottery.

#### **SANDY SOIL**

It has the following properties

- a) It is well drained
- b) It has poor rate of capillarity
- c) It has large and rough particles
- d) It is well aerated
- e) It dries quickly (it's well drained)
- f) It is suitable for construction or modelling

### **Experiment to find out drainage of water through the types of soil**



Equal volume of measured water was poured in each funnel. After sometime, water was collected in each jar.

#### **Observation**

More water was collected in a jar containing sand soil followed by the jar containing loam soil and least water in the jar containing clay soil.

## **Conclusion**

Sand soil is more permeable than the loam and clay soil.  
sand soil has the best drainage than other types of soil

## **SOIL CONSERVATION**

It is the practice of keeping soil in one place and fertile.  
If soil is not looked after properly it can lead to soil exhaustion  
Soil exhaustion is the loss of soil fertility.

### **Ways used in soil conservation**

- By crop rotation
- By mulching gardens
- By applying artificial fertilizers
- By marking the gardens
- By cover cropping
- By bush fallowing
- By practicing agroforestry
- By growing legumes

### **Methods used to conserve soil on hilly areas**

- Terracing
- Contour ploughing
- Strip cropping

### **Causes of soil exhaustion**

- a) Soil erosion
- b) Leaching
- c) Monoculture

Leaching is the washing away of soil nutrients from the top layer to the lower layer.

Causes of leaching

- a) Soil erosion
- b) Deep ploughing

## **Soil fertility**

This is the ability of the soil to support plant growth

### **Methods of improving soil fertility**

- Adding manure or artificial fertilizers in the soil
- By mulching the gardens
- By growing legumes
- By bush fallowing

Human activities that can cause soil erosion

- Swamp drainage
- Deforestation
- Overstocking/Overgrazing
- Over cultivation
- Uncontrolled bush burning

**Note:** Activities like swamp drainage, deforestation, overgrazing and bush burning leave the soil bare exposing it to agents of soil erosion

## **SOIL EROSION**

Soil erosion is the washing away of top soil.

Agents of soil erosion

An agent of soil erosion is the factor that helps soil erosion to take place.

They include:

- a) Wind
- b) Running
- c) Man
- d) Animals

### **CAUSES OF SOIL EROSION**

#### **Deforestation**

This is the massive cutting down of trees

#### **Overgrazing**

It is the keeping of animals on the small piece of land for a long time.

#### **Over cultivation**

This is the growing of crops on a piece of land year after year without leaving the land to rest.

#### **Bush burning**

It is the removing of plant cover using fire and leave the land bare.

#### **Mono cropping**

This is the growing of one type of crop repeatedly on the same piece of land

#### **Poor farming methods**

These include

Ploughing along the slopes

Planting crops along the slopes.

#### **Types of Soil Erosion**

They include:

- a) Sheet erosion. This is when flowing water takes away the top soil and begins making shallow channels in the ground
- b) Gully erosion. this is when a lot of soil is carried away by running water and big channels called gullies are made in the ground.
- c) Rill erosion. This is when flowing water takes away the top soil and begins making shallow channels in the ground
- d) Wind erosion

### **METHODS OF CONTROLLING SOIL EROSION**

Terracing. This is the cutting of steps (terraces) across the slopes to the speed of running water.

Contour ploughing. This is the digging of lines of contour across the slopes to slow the speed of running water.

Strip Cropping (Bunding). This is the growing of crops and strips of grass are left in the spaces to reduce the speed of running water.

Afforestation. This is the planting of trees in areas where they have never been before.

Reafforestation. This is the planting of trees in areas where they have been before.

Bush fallowing. This is the practice of leaving the land to grow bushy for some time.

Mulching. This is the covering of the soil with dry plant materials

The main purpose of mulching is to keep moisture in the soil.

The materials used to cover the top soil are called mulches.

Examples of Mulches

Dry grass like spear grass, elephant grass etc. , Dry banana leaves, Coffee husks, Maize straw, Sorghum straw, Wood shavings

#### **ADVANTAGES OF MULCHING**

- a) It controls soil erosion
- b) It improves on soil fertility
- c) It controls weed growth
- d) It conserves soil moisture.
- e) It moderates soil temperature
- f) It increases water infiltration in the soil.

#### **DISADVANTAGES**

- a) Mulches can be fire hazards
- b) Mulches may hide pests.

- c) Mulching is tiresome and expensive
- d) Mulches may act as breeding places for crop pests.
- e) Mulches may be a source of seeds of weeds.

Crop Rotation. This is the growing of different crops on the same piece of land seasonally. Crop rotation was discovered by Lord Shed Town

### **FACTORS TO CONSIDER WHEN CARRYING OUT CROP ROTATION**

- Legumes are rotated with other crops
- Crops in the same family should not follow each other.
- Cover crops should be alternated with less vegetative leaf crops
- Deep rooted crops to be rotated with shallow rooted crops.
- Crops easy to weed to be alternated with those difficult to weed.
- There should be resting phase

### **ILLUSTRATION**

#### **First Season**

Beans	Maize	Cabbage
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#### **Second season**

Cabbage	Beans	Maize
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#### **Third season**

Maize	Cabbage	Beans
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### **ADVANTAGES OF CROP ROTATION**

- a) It controls crop pests and diseases.
- b) Legumes add nutrients to soil
- c) It maintains soil fertility
- d) It controls soil erosion
- e) It improves crop yields.

Cover Cropping. This is the growing of crops which cover the soil. Such crops are called Cover crops.

Examples : Pumpkins, Peas, Tomatoes, Groundnuts etc.

Inter cropping. This is the growing of two or more crops on the same piece of land.

### **Groups of Fertilizers:**

1. Natural Fertilizers
2. Artificial fertilizers

### **1.NATURAL FERTILIZERS**

These are organic fertilizers which are made from decayed plant and animal remains

They include:

- a) Green manure. This is got from decayed green plants which are buried in soil.
- b) Farm yard manure. This is got from decayed animal dung and urine.
- c) Compost manure. This is obtained from decayed household refuse like left over foods, rubbish and other plant remains.

### **ADVANTAGES OF NATURAL MANURE**

1. They improve soil texture
2. They improve water retention in the soil
3. They release nutrients slowly
4. They stay longer in soil
5. They are made from organic matter, i.e. plants and animals.

### **DISADVANTAGES**

1. They smell badly
2. They are tiresome to make

3. Plant and animal matter may not be easily got.

### **ARTIFICIAL FERTILIZERS**

These are fertilizers which are made in factories.

#### **Types of artificial fertilizers**

- Straight fertilizers
- Compound fertilizers

#### **Straight fertilizer**

These are fertilizers that supply a single (one) nutrient (mineral ) to the soil

#### **Examples of straight fertilizer**

**Potash** - It provide ( supplies ) potassium

**Nitrogenous** – It supplies nitrates

**Phosphorus** – it supplies phosphates

**SSP** ( single super phosphate ) it supplies calcium phosphate or calcium sulphate

#### **Compound fertilizers**

These are fertilizers that supply (contain) more than one nutrient (mineral ) to the soil

Examples of compound fertilizers

- Diamonium phosphate
- N.P.K ( Nitrates , potassium and phosphorus )
- Can (calcium , Ammonium Nitrates )
- Mixture of potash and urea

#### **Qualities of good fertilizers**

- It should be easy to apply
- It should be easy to handle and store
- It should supply the required nutrient

**Activities in primary tillage** – slashing , deforestation , bush burning , ploughing

**Activities in secondary tillage** – harrowing , detaching , remove tree stumps, collecting weeds

### **ADVANTAGES OF ARTIFICIAL FERTILISERS**

- a) They are quick in improving soil fertility
- b) They contain the right nutrients in the right amounts
- c) They are applied basing on the nutrient lacking.

### **DISADVANTAGES**

- a) You may not know which type to use
- b) They destroy the soil texture if used for so long
- c) They are expensive to buy
- d) They are easily leached out of soil by water.
- e) They are applied at specific times only.
- f) They spoil crops if applied wrongly
- g) Over usage can pollute the soil

## **TOPIC TWO**

### **MATTER AND ENERGY**

Definition of energy

## **MATTER**

What is matter?

Matter is anything that has volume and mass OR Matter is anything that has weight and occupies space.

What is Volume?

Volume is the amount of space occupied by an object.

What is Mass?

Mass is the amount of matter contained in an object

States of Matter

Matter exists in three states namely

- a) Solids
- b) Liquids
- c) Gases

Examples of each state of matter

Solids	Liquids	Gases
Wood	Water	Air
Stones	Oil	Steam
Iron	Petrol	Smoke
Bricks	Soda e.t.c	smoke

## **Properties of matter**

Matter has weight

Matter occupies space

Matter exert pressure

## **Characteristics of each state of matter**

Solids

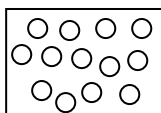
- I. Solids always have certain(definite) shapes
- II. Some solids change into liquids by heating
- III. Solids don't change the form of state when cooled
- IV. Some solids expand when heated
- V. Have molecules closely held together
- VI. The force of attraction between molecules is great (cohesion)



Molecules held together

Liquids

- a. Have no definite shapes i.e take the shape of the container
- b. Some liquids change into gases by heating
- c. Some liquids change into solids by freezing
- d. Liquids expand more when heated
- e. The cohesion force is weak and that is why molecules move about freely inside the liquids.

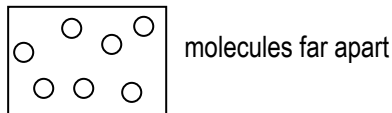


molecules

Gases

- I. Have molecules far apart
- II. Some gases cannot be seen but can be felt
- III. Gases have neither definite shapes nor volumes
- IV. Gases expand the most when heated

V. Gases cannot be touched



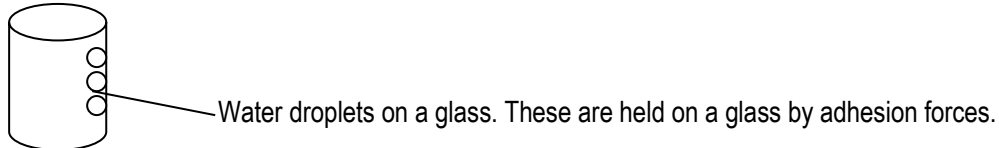
molecules are small particles that make up matter.

An atom is the smallest molecule in matter.

### Cohesion and adhesion forces

Cohesion is the force of attraction between molecules of the same substances. E.g. water and water, wood and wood.

Adhesion is the force of attraction between molecules of different substances e.g. water and glass



### Changes of states of matter

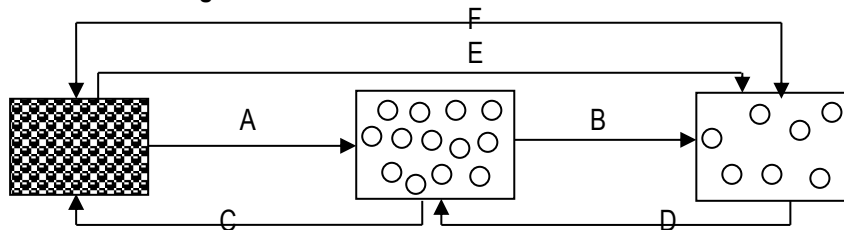
Matter can change from one state to another. The change can be caused by change in temperature. Heat energy is the energy responsible for changing matter from one state to another.

Some substances can easily change from one state to another

What is a substance?

A substance is a material that is made up of only one kind of matter

### Processes in changes of states of matter



**Melting** Is the process by which a solid changes into a liquid (ice changes into water)

**Evaporation** Is the process by which a liquid changes into a gas. (water changes into steam) it is also called vaporization.

**Freezing** Is the process by which a liquid changes into a solid (water changes into ice). It is also called solidification.

**Condensation** Is the process by which a gas changes into a liquid (steam changes into water)

**Sublimation (E and F)** Is the change of state from solid to gas or gas to solid directly.

Solutes , solvents and solutions

### A solute :

Is a substance that can easily dissolve in a liquid

Examples of solutes include , salt , sugar , glucose

### A solvent

Is a liquid that dissolves a solute.

Examples of a solvent is water.

NB: Water is called a universal solvent as it dissolves most solutes.

Substances which do not dissolve in a solvent such as water, is said to insoluble

Examples of insoluble substances includes stones , ash and sand.



## A solution

Is a substance formed after a solute has dissolved (disappeared ) in a solvent

Mixing and separating mixtures

### 1. Separating mixtures of solids and liquids

When separating mixtures of solids and liquids we use the following methods

- Filtration
- Decantation
- Distillation
- Evaporation to dryness

Filtration

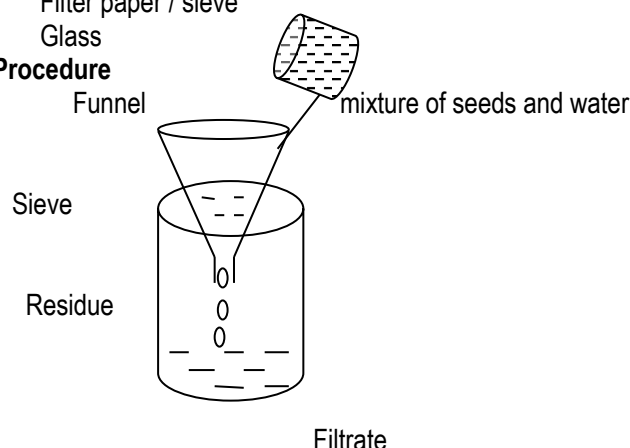
This is a process of separating solid insoluble substance (particles) from a liquid

- The method involves the use of a filter paper , sieve , apiece of cloth and a funnel
- The solid particles that remains on the filter or sieve are called residues and the liquid that goes through the filter / sieve is refered to as a filtrate.
- Filtration at home is used when
- Removing seeds from juice
- Removing tea leaves from tea
- Experiment about filtration

#### Things of use

- A mixture of juice and seeds
- Funnel
- Filter paper / sieve
- Glass

#### Procedure



#### Observation

The solid particles (seeds) remain on the sieve while the liquid part flows down the glass.

#### Conclusion

The solid remain on the sieve is the residue while the liquid part which flows down is the filtrate.

#### Application in daily

- Making juice
- Separating tea leaves from tea
- Removing suspended matter from water

### Separating mixtures of liquids. (liquids from liquid)

When two or more liquids are mixed together, they can be separated using methods below;

- Fractional distillation
- A separation funnel

#### Fractional distillation

This is a method used to separate liquids of the same density but evaporates at different temperatures.

- If water and alcohol are mixed together alcohol will evaporate first.

#### Separating funnels

This is a method used when separating liquids that don't mix easily eg water and oil , petrol and separate liquids of different densities.

Experiment to separate oil from water

Illustration

Separating funnel

Oil

Water

Tap

Separating mixtures of solids ( solid from a solid )

When separating solid mixtures together they can be separated using the following

- Floating (flotation )
- Using a magnet
- Hand picking (sorting )
- Sieving

#### **Flotation method**

This method is used to separate solid substances where one floats on the other e.g. saw dust and sand.

#### **Using a magnet**

This is a method used to separate solid mixtures where one is magnetic and the other is non magnetic.

Eg when a needle / pins falls in maize flour.

#### **Sieving method**

This is a method used to separate big particles from a mixture using a sieve e.g. big stones from sand.

### **Energy**

Energy is the ability to do work.

#### **Types of energy**

Kinetic energy

Potential energy

Kinetic energy is the energy possessed by a moving object (an object in motion) e.g. a stone thrown in air, a leaf falling on the ground, a boy running.

Potential energy is the energy possessed by a body at rest. E.g a car parked, a stone resting on the ground, a book placed on a table.

#### **Forms of energy**

Forms of energy are produced by objects.

Heat energy

Sound energy

Light energy

Electric energy

Chemical energy

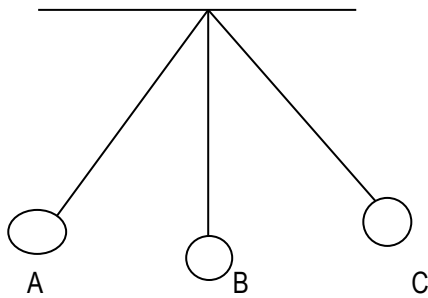
Solar energy

#### **Energy interconversion**

Energy can be converted from one form to another.

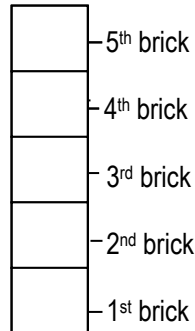
- A chemical energy stored in the candle wax is converted from heat energy to light energy.
- A ball kicked, it hits the goal post. Changes in energy are: potential to kinetic to sound then to heat energy.

Using a stone or a pendulum swinging in the air.



At A, the stone possesses potential energy.  
 At B, the stone possesses kinetic energy  
 At C, the stone possesses potential energy

The higher the object, the more the potential energy.  
 Illustration



On the above illustration brick 5 has more potential energy than brick 1 and brick 4 has more potential energy than brick 2.

## HEAT ENERGY

What is heat?

Heat is a form of energy that causes matter to become hot or warm OR Heat is a form of energy that increases the temperature of matter making it hot or warm.

Units for heat is calories or joules

## SOURCES OF HEAT

A Source of heat is anything that provides heat

Examples:

- Sun – this is the main natural source of heat in the environment
- Fire(fuels) from burning objects e.g firewood, charcoal
- Electricity
- Friction or objects rubbing against each other
- Food
- Decaying matter

## Uses of Heat energy

Heat energy is useful in many ways.

- It enables our bodies to function
- It enables us to cook food
- It helps in rain formation
- Hot objects produce light which enables us to see
- We use heated bodies to iron clothes
- Heat is used to kill germs
- Heat from the sun provides warmth to seeds to germinate
- Heat helps animals to feel warm
- People use heat to roast food.

## EFFECTS OF HEAT ON MATTER

Heat causes temperature of matter to increase

Heat can cause some solids to change to liquid and liquids to gases.

Heat can also cause some objects to expand (increase in size)

### **EXPANSION AND CONTRACTION**

Expansion is the increase in size of an object

Most substances increase in size when heated

Contraction is the decrease in size of an object

Solids, liquids and gases all expand and contract at different rates

Gases expand fastest, followed by liquids and solids expand least.

Gases expand greatest because their molecules are farther apart and free to move

**Experiments to show expansion in different states of matter.**

#### **Expansion in solids (diagram)**

Ball and a ring

Things to use

- Metallic ball
- Two metallic rings of the same size
- Source of heat

#### **Procedure**

#### **Illustration**

#### **Observation**

- Before heating the ball it was small in size thereby able to go through the ring.
- When the ball was heated. It increased in size thereby unable to pass through the ring.

#### **Conclusion**

Metals expand when heated.

#### **Experiment to show that gasses expand**

##### **Things to use**

- Ballon
- Bottle
- Source of heat

#### **Procedure**

#### **Illustration**

#### **Observation**

The ballon on the cold bottle is small in size.

After the air in the bottle has been heated the bottle has been heated , the balloon increases in size.

Explanation

The air in part II expands due to heat

#### **Conclusion**

Gases expand when heated.

Experiment to show that liquids expand when heated

##### **Things to use**

- Coloured water
- Flash
- Narrow tube
- Heat
- Beaker

#### **Procedure / set up**

### Observation

When the water in the beaker is heated.  
It will heat the coloured water which rises up the narrow tube

### Conclusion

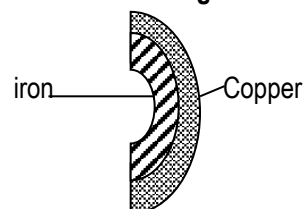
Liquids expand when heated

### A bimetallic strip

#### Before heating



#### After heating

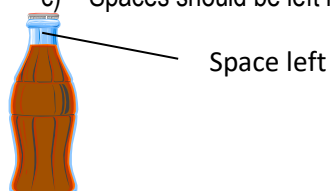


Copper expands faster than iron.

Reason: It's on the convex side of the bimetallic strip OR copper is longer than iron after expansion.

### PREVENTING BAD EFFECTS OF EXPANSION AND CONTRACTION

- a) Gaps should be left between railway lines to allow expansion on hot weather
- b) Electric wires should be loosely fixed on poles to allow contraction on cold weather
- c) Spaces should be left in soda bottles to allow the expansion of liquids inside when frozen.



### Expansion in gases

Gases have the greatest rate of expansion.

Experiment 1

Experiment 2

The water heats the bottle and the air inside the bottle expands causing the balloon to expand.

### HOW HEAT TRAVELS

There are three ways how heat travels from one place to another. These are:

- I. Conduction
- II. Convection
- III. Radiation

#### Conduction

This is the process by which heat passes (travels) through solids

In solids heat is transferred from one heated molecule to another. This transfers heat until the whole solid object is heated.

## EXPERIMENT TO SHOW HOW HEAT TRAVELS BY CONDUCTION

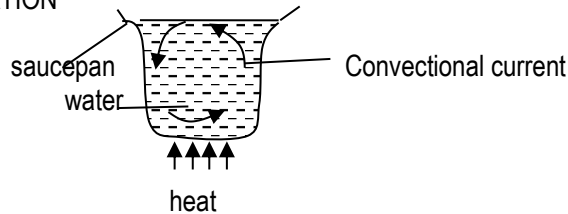
### Convection

This is the process by which heat travels through liquids and gases.

Heat in liquids and gases travels in form of convectional currents.

The particles which are heated become light and move upwards while the cooler and heavier particles move downwards.

ILLUSTRATION



The particles nearest to the source of heat are heated and become light and move upwards while the cooler and heavier particles move downwards.

### Radiation

This is the process by which heat travels through vacuum

When heat travels by radiation, it doesn't need any medium of transmission.

#### Examples of radiation in nature

Heat from the sun reaches us by radiation.

When you sit near a fire place, charcoal stove (sigiri) or cooker or even ironing clothes using a flat iron, you receive heat by radiation.

ILLUSTRATION

### Importance of conduction

1. Conduction of heat enables us to iron our clothes.
2. It helps us to cook
3. Enables us to roast meat

### Importance of convection

4. Convection currents help to drive out bad smell through vent pipe of a VIP latrine.
5. Smoke is driven out of houses through chimneys by means of convection currents
6. A lit cigarette is kept burning by convection current
7. A Charcoal stove, flat iron and a lantern lamp continue burning by convection currents
8. Convection currents help us to get fresh air in our houses.
9. Water in a kettle on fire boils by convection current

### Importance of radiation

10. Radiant heat from the sun helps to dry our clothes and harvested crops
11. Heat from the fire reaches our bodies by radiation
12. Radiant heat from the sun helps in rain formation.

### A VACUUM FLASK

Why is it called a Vacuum flask?

It is called a Vacuum flask because it has a vacuum

**Illustration**

Cork – prevents heat loss by conduction

Vacuum – prevents heat loss by conduction. It also prevents heat gain by convection

Metal case – protects the double walled glass

Cup- it is used to take what is put in the flask

The double walled glass are silvered to reflect heat

The double sided walls prevent heat loss by radiation. The double silvered glass is so shiny to reflect heat.

A Vacuum flask is not commonly used mostly in rural areas because:

- I. It is expensive
- II. It is delicate i.e it is not easy to handle

## **CONDUCTORS AND INSULATORS**

A Conductor is any material that allows heat to pass through it.

Examples

Metals like Iron, Steel, Copper, Aluminum, mercury etc

All materials which allow heat to pass through them are termed as good conductors of heat

Aluminium is commonly used to make utensils because;

- It is cheap
- Does not rust
- It has a low density

Silver is the best conductor of heat but it is not commonly used because;

- It is very expensive
- It is heavy

### **Bad or poor conductors of heat**

Poor conductors of heat are materials which do not allow heat to pass through them. They are also called insulators.

Examples

Rubber, Plastic, Cork, Wood, cotton wool, cloth, feathers e.t.c

All materials which do not allow heat to pass through them are termed as poor conductors of heat

### **Application of insulators in our daily life**

Handles of saucepans, frying pans, flat irons, electric kettles are covered with plastic or wood to prevent our hands from getting burnt.

### **Experiment to show that water is a poor conductor of heat**

Water boils at the area being heated, while ice remains unmelted. The water does not conduct heat to the bottom.

### **Heat reflectors and heat absorbers**

- When heat falls on a shiny face, it is reflected.
- When it falls on a dull surface, it is absorbed.
- When it falls on a rough surface, it is absorbed.
- Black objects absorb most of the heat while shiny polished surfaces reflect most heat.

### **Note**

Most buildings are painted white inside to reflect heat and remain cool inside.

Refrigerators are painted white to reflect most heat and remain cool inside.

A person who puts on a black shirt feels a lot of heat than the one putting on a white one because black absorbs most heat while the white one reflects it.

## **TEMPERATURE**

Temperature is the hotness or coldness of an object or a place

Temperature is measured by an instrument called a **thermometer** which gives the units in **degrees**.

### **TYPES OF TEMPERATURE SCALES**

There are two types of temperature scales namely;

- I. Centigrade or Celsius scale

## II. Fahrenheit scale

On the centigrade scale, the freezing point or the lower fixed point is  $0^{\circ}\text{C}$  and the boiling point or the upper fixed point is  $100^{\circ}\text{C}$ .

On a Fahrenheit scale, the freezing point or the lower fixed point is  $32^{\circ}\text{F}$  and the boiling point or upper fixed point is  $212^{\circ}\text{F}$

### **THERMOMETERS**

A Thermometer is an instrument which is used to measure temperature.

Types of Thermometers

- a. Clinical thermometer
- b. The Six's minimum and maximum thermometer
- c. The Ordinary (wall) thermometer

### **CLINICAL THERMOMETER**

A Clinical thermometer is the type of thermometer used to measure the temperature of a human body. It is also called a doctor's thermometer. A Clinical thermometer is commonly found in Health centres, Clinics and Hospitals

#### **Characteristics of a Clinical Thermometer**

- I. It has an arrow that points to  $37^{\circ}\text{C}$  to show the normal body temperature
- II. Its scale starts from  $34^{\circ}\text{C}$  and ends at  $42^{\circ}\text{C}$
- III. It has a constriction or kink

#### **Diagram of a Thermometer (Clinical)**

A – mercury

B – bulb

C – kink or constriction

D – glass

**NB:** A kink prevents the backflow of mercury

When taking the temperature of a person, the thermometer can be placed in these places.

- I. Under the armpit
- II. In the mouth
- III. In the anus

Why should a health worker shake the thermometer before using it on another person?

It is because shaking makes the mercury to go back to the bulb.

### **THE SIX'S MINIMUM AND MAXIMUM THERMOMETER.**

This type of thermometer measures the minimum and maximum temperature of the day.

Maximum temperature is recorded during the day. While minimum temperature is recorded during the night.

This thermometer is commonly found in places like:

- I. Research stations
- II. Schools
- III. Universities
- IV. Weather stations

Diagram of the Six's Minimum and Maximum Thermometer

### **WALL THERMOMETER**

This is the type of thermometer which is hung in our houses and offices.

- It measures temperature in that room
- It uses mercury
- Normal room temperature is  $25^{\circ}\text{C}$

### **LIQUIDS USED IN THERMOMETERS**

There are two liquids used in thermometers namely:

- I. Mercury



## II. Alcohol

### **REASONS WHY MERCURY IS USED IN THERMOMETERS**

- Mercury is easily seen
- Mercury does not stick on the glass
- Mercury is a good conductor of heat
- Mercury does not boil easily
- Mercury has even and regular expansion

### **ADVANTAGES OF USING ALCOHOL OVER MERCURY**

- It does not solidify easily
- Alcohol expands more than mercury
- Alcohol is cheaper than mercury

### **DISADVANTAGES OF USING WATER IN THERMOMETER**

- It is colourless so it not easily seen
- It sticks on the wall glass of the tube
- It is a bad conductor of heat
- It needs a lot of heat to expand
- Its expansion is not uniform
- It evaporates when heated

### **CONVERSION OF SCALES**

a) Converting from Centigrade scale to Fahrenheit scale

$$\frac{9C}{5} + 32 = F$$

5

$$9C + 160 = 5F$$

Derived from the formula  $\frac{180}{100} + 32 = ^\circ F$

b) Changing from Fahrenheit scale to Centigrade scale

Derived from the formula  $\frac{100}{180} (F - 32) = ^\circ C$

$$\frac{5}{9} (F - 32) = ^\circ C$$

Difference between heat and temperature

### **BURNING AND RUSTING**

Burning is a chemical reaction in which heat and light are produced

The gas that is given out during burning is carbondioxide

The gas that is needed for burning to take place is oxygen

### **EXPERIMENT TO SHOW THAT OXYGEN SUPPORTS BURNING**

#### **ZONES OF A BURNING CANDLE**

- Blue zone
- Yellow zone
- Pale blue zone
- Central zone of unburnt zone

### **An experiment to show that oxygen supports burning**

Burning candle

Carbondioxide remains in the glass

### **PUTTING OFF FIRE**

- I. Using fire extinguisher
- II. Using dust
- III. Using sand
- IV. Using water
- V. Wrapping yourself in a thick blanket
- VI. Rolling yourself on the ground

### **Reasons why Water is not used to put off fire caused by petrol**

Petrol is less dense than water therefore it floats on water and fire continues burning

### **Rusting**

Rusting is a chemical reaction which needs the presence of water and oxygen. A metal gets a brown coating called rust. Oxygen and water are the requirements needed for rusting to take place.

### **REQUIREMENTS OF RUSTING**

In order iron to rust the following must be available

- I. Oxygen
- II. Moisture (water)

NB: When an iron bar rusts it forms a product called iron oxide.

### **EXPERIMENT ON RUSTING**

### **DISADVANTAGES OF RUSTING**

- a) It results in wearing away iron and steel equipment
- b) It changes and spoils the colour of metals.
- c) Bolts become hard to unscrew after rusting
- d) Keys fail to fit in padlocks after rusting
- e) Water from rusty containers becomes poisonous
- f) Rusting makes cutting materials blunt.

### **HOW TO PREVENT RUSTING IN METALS**

By oiling and greasing

By painting

By using tar

By galvanizing

By enameling

By making iron stainless steel

### **COMPARING BURNING AND RUSTING**

#### **SIMILARITIES**

- a. Both require oxygen to take place
- b. Both are chemical reactions

#### **DIFFERENCES**

Burning needs only oxygen to take place while rusting needs both oxygen and moisture to take place

## **TOPIC THREE**

### **GROWING CROPS**

### **Importance of a school garden to the school**

- It helps the children to learn: how to dig, how to care for crops
- Children get the food to eat for lunch
- The school gets money after selling excess food

### **Factors to consider when planning a School garden**

- Availability of capital
- Availability of enough modern tools
- Enough well drained fertile piece of land
- Availability of disease free seeds or seedlings
- You should consider the land make up

### **Ways of acquiring capital**

- Through acquiring loans
- Through fundraising
- Given in kind
- Through mortgaging of personal property

### **Stages of preparing of land**

Primary tillage

This is the clearing (removal) of the natural vegetation cover.

### **Secondary tillage**

This involves loosening of soil in preparation of planting

### **Garden tools**

Tool	Diagram	Use
1. Trowel		For transplanting seedlings
2. Watering can		Watering crops
3. Secateurs		Pruning
4. Shears		Trimming hedges
5. Axe		Cutting tree stump
6. Rake		Collecting rubbish
7. Forked hoe		Loosening hard or rocky soil
8. Garden fork		Turning manure
9. Knapsack sprayer		Spraying crops

### **Planting**

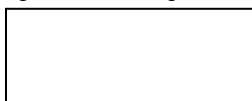
Planting is done in the wet / rainy season because there is enough rain water to support plant growth

### **Types of Planting**

#### **Row planting:**

This is a method which involves planting of crops in rows

Diagram showing broadcasting method



### **Advantages**

It reduces risks of crop pests and diseases

It allows easy weeding and harvesting

Better and more crop yields are produced  
It minimizes competition for sunlight and plant nutrients  
It leads to wastage of land

### **Broadcasting method**

This method involves scattering of seeds in a well prepared garden especially small seeds like sim sim, millet, rice, beans sorghum  
Diagram showing broadcasting method

### **Advantages**

It saves time during plant  
Maximum utilization of land in the garden  
It doesn't need any skilled person and not tiresome

### **Disadvantage**

#### **It promotes overcrowding of crops**

It's difficult in weeding, pest control and harvesting  
Poor or low crop yields are produced

### **Qualities of good planting materials**

They should be disease free  
They should be disease resistant varieties  
They should be able to germinate (viable)

### **A Nursery Bed/ seed bed**

A nursery bed is a place where seeds are first planted before taking them to a well prepared garden

#### **Advantages of a nursery bed**

It provides shelter to seedlings against direct sunlight and storm  
It allows proper selection of seedlings before transplanting  
It allows in water infiltration into the soil before transplanting

#### **Factors to consider when setting a nursery bed**

Shelter against run off water  
Shelter against direct sunlight, storm and harsh weather

### **Examples of seeds planted in a nursery bed**

Tomatoes, tobacco, cabbages, carrot, egg plants, rice etc  
Examples of seeds planted directly in the main garden  
Maize, beans, groundnuts

### **Caring of seedlings or plants**

Transplanting: this is the transfer of seedlings from a nursery bed to a well prepared garden  
A seedling is a young plant in a nursery bed

**Pruning:** this is the cutting off of excess branches on a plant. E.g oranges, lemons, coffee, cocoa, tea, bananas, guava, etc.

Diagram of a garden tool used to prune

### **Advantages**

Pruning reduces the rate of transpiration  
Reduces competition for sunlight and air  
Reduces overweight and over crowding of the plant

### **Thinning**

This is the removal of excess and poor growing seedlings in a nursery bed and plants in the garden

### **Advantages**

Reduced competition for nutrients from the soil  
Reduces hiding places for pests  
It allows easy testing and pest control

### **Plant training or staking**

This is the provision of support with a stick frame to a plant to grow up right

Plants which are staked include: tomatoes, passion fruits

### **Advantages**

Allows easy spraying and pruning  
Allows easy harvesting of crops and weeding  
All the parts of the plants receive enough light

## **WEEDS**

Weeds are unwanted plants growing in the garden

E.g. Elephant grass, Star grass, Coach Grass, Finger millet weed, Black jack, wondering Jew, sword grass, spear grass.

### **Advantages of weeds**

Some weeds are used as vegetables to man  
Some weeds are eaten by wild animals  
Weeds help to control soil erosion since they cover the soil  
Weeds rot and turn into manure

### **Disadvantages of weeds**

Weeds compete with crops for plant nutrients  
Some weeds are poisonous to man and livestock  
Weeds lower the crop yields  
Weeds are alternative food for some pests.

Ways of controlling weeds

- By mulching
- By crop rotation
- By slashing
- By spraying using herbicides
- Biological weed control method.
- By uprooting and burning .

## **PESTS**

A Pest is a bird, insect or animal which destroys plants or A pest is an organism which spoils crops

### **Effects of pests to plants**

They reduce the yield of the crop  
They make plants unhealthy  
They lower the quality of the crops

<b>STORAGE CROP PEST</b>	<b>FIELD</b>	<b>CROPS DESTROYED</b>
Bean weevils	Aphids	Beans, ground nuts, carrots, cabbages
Maize weevils		Maize

Red flour beetles		Maize
Rats		Maize
	Termites	Cereals
	Locusts	All cereals
	Stalk borer	Sugarcane, maize, rice, sorghum
	Cut worms	Tomatoes, potatoes, cabbage, beans
	Banana weevil (legless grub)	Banana
	Rats and moles	Maize, cassava, rice, wheat
	Monkeys	Maize, cassava
	Thrips	Tea, coffee, onions, beans, bananas

### **Methods of controlling Crop pests**

Practice crop rotation - to starve life cycle of pests

Spray or dust with Agro-Vet chemicals

Practice early planting

Planting clean varieties and disease free and resistant varieties

### **Crop Diseases**

<b>Disease</b>	<b>Crop</b>	<b>Cause</b>
Bacteria wilt	Tomatoes, sweet potatoes	Bacteria
Bacterial blight	Cotton	Bacteria
Black rot	Cabbage	Bacteria
Maize streak	Maize	Virus
Ratoon stunting disease	Sugar cane, sorghum	Virus
Mosaic	Cassava, potatoes, tobacco tomatoes	Virus
Rosette	Groundnuts	Virus
Panama	banana	

### **Methods of controlling diseases**

Practice crop rotation

Dust with chemicals

Plant disease free and resistant varieties

### **Ways of controlling weeds in a garden**

Uprooting and burning them

Regular weeding to prevent them from flowering

Cut and bury the weeds

Spray with herbicides

Mulching and shading the crops

### **Types of crops grown**

Cereals crops (grain crops) e.g. sorghum, millet, rice, wheat, maize

Fruits e.g. Apples, oranges, mangoes, pawpaw, pineapples, guava

Vegetables e.g. cabbages, cucumber, spinach, lettuce

Root crops e.g. cassava, sweet potatoes, and carrots

### **Legumes (leguminous crops)**

These are crops which have root nodules on the roots and store their seeds in pods. E.g beans, peas, ground nuts, soya beans

### **Diagram of a Legume root system**

Root nodules store Nitrogen fixing bacteria  
Nitrogen fixing bacteria trap Nitrogen from air in the soil and turn into nitrates  
Nitrates is used by plant as plant food  
Plants also use nitrogen and starch to make plant proteins

### **Root crops**

These are crops that store food in their roots. They are also called root tubers.  
Examples; Cassava, sweet potatoes, carrots

### **Mode of propagation**

Stem cutting	-	cassava
Sweet potato vines	-	sweet potato
Seeds	-	carrots

### **Harvesting**

Harvesting is the removal of ready crops from the garden usually done in a dry season  
Why?  
To allow easy drying of crops since there is enough sun heat.

### **Methods of harvesting root crops**

Uprooting of the crop  
Doffing with hoes, sticks and any hard tool.

### **Harvesting tools includes**

Tool	Diagram
<ul style="list-style-type: none"><li>- Knife</li><li>- Panga</li><li>- Hoe</li><li>- Sickle</li></ul>	

### **Preservation of food**

Some crops can be preserved by:  
Sundrying like root crops, cereal, legumes  
Smoking  
Refrigeration etc

### **Storage of crops**

In granaries (diagram)  
In silos

### **Structures and function**

Rat guards  
Stands  
Shelter

### **Conditions for proper storage**

The grains should be stored when they are dry  
Stores should have good ventilation  
Presence of rat guards and shelter on the store  
Regular dusting of crops with pesticides

### **Qualities of a good food store**

- It should be well ventilated

- It should be water proof
- It should be kept dry and clean at all times
- It should be raised from the ground to prevent dampness.

### **Marketing**

Marketing is the buying and selling of crop produce.

### **Co-operative societies**

Co-operative societies consist of groups of people who join together to do things or business they cannot do successfully as individuals

### **Functions of cooperative societies**

Buy farmer's produce at reasonable price

Extend loans to farmers to buy tools, pesticides, etc

They offer advisory services to farmers

They find markets and market farmer's produce

### **Examples of co-operative societies which used to exist.**

East – Mengo Cooperative society

West – Mengo cooperative society

Busoga Growers Co-operative Society

Bugisu Co-operative Society

### **Young farmers clubs in schools**

#### **Functions**

Teach school children how to grow and care for crops

Help in food production

Grow crops and sell them to get money

Keeping and using farm records

### **Farm records**

Are written information about the activities on the farm.

#### **Importance of records**

They help to know your expenditure

They help to know the profit and loss the farmer is making after selling his produce

They help in proper future planning

They help in fair taxation of the farmer



## **TOPIC FOUR**

### **BACTERIA AND FUNGI**

#### **BACTERIA**

Bacteria are tiny organisms made up of one cell. They are so small that they cannot be seen using naked eyes. They are seen using a microscope. This is why they are called micro organisms

Where are bacteria found?

Bacteria can be found everywhere but they are mostly found in places like:

- a) In water
- b) Soil
- c) In air
- d) Bodies of animals and plants
- e) Latrines and rubbish pits

Bacteria feed saprophytically

#### **How do bacteria reproduce?**

Bacteria reproduce by the process called Binary fission or cell division

Bacteria need warmth and food to reproduce

Some bacteria need oxygen to breathe these are called aerobic bacteria

Other bacteria do not need oxygen these are called anaerobic bacteria

Many anaerobic bacteria cause diseases

#### **Types of Bacteria**

Bacteria are grouped according to their shapes

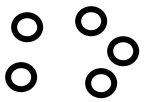
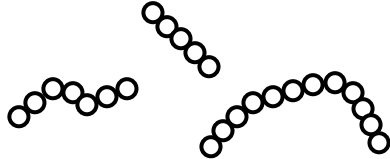
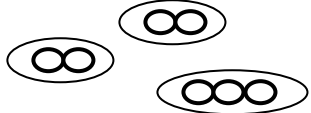
There are four types of bacteria namely:

##### **1. The Spherical bacteria**

These cause boils, sore throat, pneumonia etc

Examples: Staphylococcus cause boils, Streptococcus cause sore throat, Streptococcus diplococcus cause pneumonia

#### **DIAGRAMS**

		
Staphylococcus	Streptococcus	Streptococcus diplococcus




## 2. Rhomb shaped or cylindrical bacteria

These are called bacilli

Some of these cause anthrax, typhoid and food poisoning

Examples: bacillus anthracis cause anthrax, salmonella typhi cause typhoid fever, mycobacterium causes tuberculosis.

### DIAGRAMS

		
Salmonella typhi		Mycobacterium

## 3. Spirilla and spirochaete

The spirilla bacteria do not move while the spirochaete move. Example triponema cause syphilis

## 4. Vibrios

These are comma shaped bacteria

Example

Vibrio cause cholera

Diagram

### USEFUL BACTERIA

- Bacteria help in the rotting of materials.
- Help in the breaking of volumes of faeces in latrines
- Some are used in the making of vitamin B12
- Some are used in making cheese and yoghurt by fermenting milk
- Bacteria found in nodules on roots of legumes help to improve soil fertility

### HARMFUL BACTERIA

- They cause diseases
- They make food to go bad e.g milk

### FUNGI

Fungi are living organisms which feed on dead decaying matter as saprophytes

They grow in moistened places

Their bodies are made up of branched threads called hyphae

The hyphae make their bodies called Mycelium

Most fungi reproduce by means of spores apart from yeast which reproduces by cell budding.

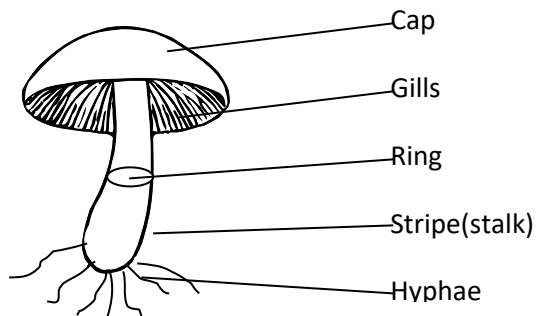
### EXAMPLES OF FUNGI

- Mushroom
- Toad stools
- Puff ball
- Yeast
- Moulds

### USEFUL FUNGI

- Some fungi are eaten e.g. mushroom
- Yeast is used to give flavor to cheese
- Yeast is used when baking bread
- Yeast is also used in brewing beer
- Yeast is a good source of vitamin B1
- Penicillin moulds are used to make antibiotic called Penicillin
- Mushrooms are also a source of income after selling.

### A mushroom



The gills of a mushroom are used to produce and store spores  
 Mushrooms are unable to make food because they don't have chlorophyll  
 They absorb food nutrients from dead decayed matter as saprophytes

### HARMFUL FUNGI

- Some fungi are poisonous e.g. toad stools
- Some fungi cause diseases like; ring worm, athlete's foot, eczema, finger nail deformation
- Fungi also cause diseases in plants e.g.: Potato blight, Maize rust, Tomato blight, Rice blast
- Some fungi make food to go bad e.g. mould grows on food

### Differences between bacteria and fungi

Fungi	Bacteria
Reproduce by means of spores	Reproduce by binary fission
They are multicellular	They are single celled
Fungal diseases are not immunisable	Bacterial diseases are immunisable
Some are eaten as food	No bacteria are eaten as food
Fungal diseases are spread through close body contact	Bacterial diseases are spread through air, water and insects

### Ways of controlling fungal and bacterial diseases

#### Heat

Strong heat kills germs. This is why

- We boil drinking water
- We iron clothes
- We cook food before eating
- We boil milk before drinking
- Some medical equipment are sterilized by steaming or boiling

#### Sunlight

Most germs breed in dark moistened places

So we must allow light into our rooms through windows

#### Cleanliness

We must maintain hygiene and sanitation in order to keep away germs

**Fresh air**

Enough fresh air keeps away germs

This is why living houses must be well ventilated

**Chemicals**

Using some chemicals help to kill germs

Examples

- a) Vim b) Jeyz c) Doom e.tc

**Using essential drugs**

Essential drugs are drugs used to prevent diseases, cure diseases and reduce signs and symptoms

Examples: Penicillin, septrin, chloroquine, quinine

**PIONEERS OF SCIENCE**

1. Edward Jenner (1749 – 1795). He first immunized someone against a disease.
2. Louis Pasteur. He discovered that fermentation, decay and various diseases are caused by bacteria. He also discovered that milk goes bad because of germs. He developed the methods of immunizing against anthrax and rabies.
3. Sir Ronald Ross. He was the first to discover the cause of malaria
4. Sir Alexander Fleming. He discovered an antibiotic called Penicillin
5. Joseph Lister. He discovered antiseptic which prevents wounds from becoming septic.
6. Robert Koch. He discovered the bacteria which causes anthrax and tuberculosis.
7. Sir. William Harvey. He was the first scientist to discover that blood circulates around the body
8. Karl Landsteiner. He discovered the blood groups.

