

Soil is the top layers of the earth surface.

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

How soil is formed

Soil is formed in two ways namely:

- By weathering
- By decomposition of organic matter.

Weathering is the physical and chemical breakdown of rocks into small particles to form soil.

Decomposition is the rotting of dead organic matter.

Types of soil

There are three types of soil

- a) Clay soil.
- b) Loam soil.
- c) Sandy soil.

a) Clay soil

Characteristics of clay soil

1. Clay soil has fine particles
2. Clay soil has the highest rate of capillarity
3. Clay soil has the lowest rate of drainage
4. Clay soil is poorly aerated
5. Clay soil is sticky and heavy
6. It has a high-water retention capacity
7. Clay soil has little humus
8. It does not allow water to pass through it very fast
9. Clay soil has closely packed particles

Reasons why clay soil is not good for crop growing

1. Clay soil is water logged
2. Clay soil is sticky
3. Clay soil has little humus
4. Clay soil is poorly aerated

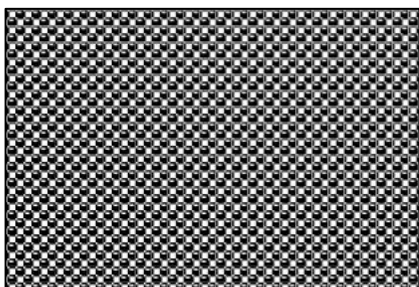
Reasons why clay soil is good for modeling

- ✓ Clay soil is sticky
- ✓ Clay soil contains lime

Importance of clay soil

- ✓ Clay soil is good for pottery work (making pots, ceramics and modeling).
- ✓ Clay soil is good for making bricks for building.
- ✓ Clay soil is good for making tiles for roofing.

Illustration of arrangement of particles in clay soil



Activity

1. What is soil?

2. State **two** ways in which soil is formed.

- (i) _____
(ii) _____

3. Define weathering.

4. Give any **two** types of soil.

- (i) _____
(ii) _____

5. State any **two** reasons why clay soil is not good for crop growing.

- (i) _____
(ii) _____

6. Mention any **two** reasons why clay soil is good for modeling .

- (i) _____
(ii) _____

7. State any **two** importance of clay soil.

- (i) _____
(ii) _____

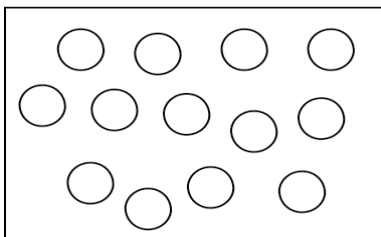
8. Which type of soil is good for making tiles for roofing?

b) LOAM SOIL

Loam soil is a mixture of clay soil and organic matter

Organic matter (humus) consists of decayed plants and animal matter

Loam soil usually has adequate water, air and humus to sustain plant growth.



Characteristics of loam soil

- ✓ It contains balanced particles of sandy and clay soil
- ✓ It contains more humus than clay and sandy
- ✓ Loam soil is well drained
- ✓ Loam soil is well aerated
- ✓ Loam soil has a good texture
- ✓ It contains both clay and sand particles
- ✓ It has a lot of humus for plant growth
- ✓ Has fairly larger air spaces as compared to clay soil

Importance of loam soil

- It is good for crop growing.

Reasons why loamy soil is good for growing crops

- ✓ Loam soil is well aerated
- ✓ Loam soil is well drained
- ✓ It contains balanced particles of sand and clay.
- ✓ Loam soil has good mineral content
- ✓ Loam soil has good capillarity
- ✓ Loam soil has humus

Illustration of arrangement of particles in loam soil

Activity

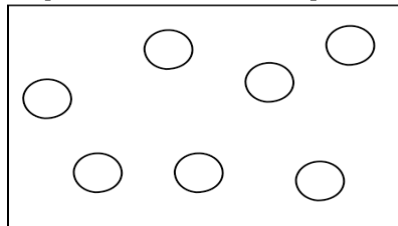
1. Which type of soil has rough and large particle?

2. State **one** use of soil to earthworms.
(i) _____
(ii) _____
3. Mention **two** importance of types of soil to man.
(i) _____
(ii) _____
4. Give any **two** ways in which plants depend on soil.
(i) _____
(ii) _____
5. Name the best soil for growing crops.

6. State any **two** ways in which soil is important to insects.
(i) _____
(ii) _____

c) SANDY SOIL

Illustration of arrangement of particles in sandy soil



Characteristics of sandy soil

- ✓ Sandy soil has little plant nutrients
- ✓ Sandy soil is the most aerated type of soil
- ✓ Sandy soil has wider air spaces (more porous)
- ✓ It has the highest rate of drainage
- ✓ It has the lowest capillarity
- ✓ Has large particles that make it to be well aerated
- ✓ Has poor water retention capacity
- ✓ It is easy to dig.
- ✓ Has a poor rate of capillarity

Capillarity is the uptake of water through the soil particles.

Capillarity is the tendency of water to rise through small narrow spaces.

Drainage is the capacity of the soil to allow water to pass through it.

Importance of sandy soil

- Used for building.
- Used for making glass and sand papers.

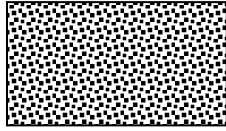
NB. It is not good for crop growing because it has a low water holding capacity.

Activity

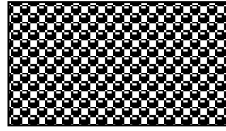
1. What is soil?

2. Mention three components of soil.
(i) _____
(ii) _____

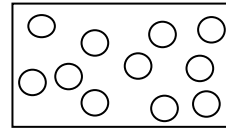
(iii) _____
3. a) Name the types of soil shown below.



A



B



C

(i) A _____

(ii) B _____

(iii) C _____

4. Which type of soil is best for making glasses?

5. Samuel, a P.3 child was told to model a pot. Where is he most likely to get the type of soil he is to use for modeling?

6. How is soil useful to plants?

1. Explain why sandy soil cannot retain water like clay soil.

2. What term is used to mean the tendency of water to rise through small narrow spaces?

3. Why is sandy soil not good for crop growing?

4. Why do sandy soil have very little plant nutrients?

Components of the soil

Components of soil are things which make up soil, they include:

1. Air
2. Water
3. Rock particles
4. Humus (Organic matter)
5. Organisms like bacteria, earth worms
6. Dissolved mineral salts (inorganic matter)

Importance of components of soil

a) Air

Aeration of soil is the addition of air to the soil by creating more pore spaces

- Air is used during germination
- Air is used by animals in the soil to respiration.
- Enables root perspiration to take place for living organisms in the soil.

NOTE:

Perspiration is the exchange of gases between the body of an organism and the surroundings

b) Water

Soil contains water as well.

Importance of water in the soil

1. Water is used by plants for germination
2. Making starch (it is a raw material for photosynthesis)
3. Promoting decay of matter

c) Rock particles (inorganic materials like: sand, gravels, clay formed by weathering)

- ✓ Provide space for air to occupy
- ✓ They break down into smaller particles to form soil

d) Humus

Humus is a dead decayed plants and animal matter.

Importance of humus found in the soil.

1. It provides plant nutrients to the soil.
2. It improves soil fertility.
3. Humus forms soil texture.
4. Humus absorbs moisture.
5. Humus makes the soil appear dark in colour.

Soil organisms

These are living things which live in the soil.

Types of soil organisms

1. Micro organisms
2. Macro organisms

Micro organisms

These are tinny living organisms which live in the soil.

Examples of micro soil organisms

- ✓ Bacteria
- ✓ Fungi

Macro organisms

These are larger living organisms which live in the soil.

Examples of macro organisms

1. Millipedes
2. Centipedes
3. Earthworms
4. Moles
5. Rabbits

Activity

1. State any **two** components of the soil.
(i) _____
(ii) _____
2. Define the word **soil aeration**.

3. What is perspiration?

4. State **two** importance of water in the soil.
(i) _____
(ii) _____
5. Mention **two** reasons why humus is important in the soil.
(i) _____
(ii) _____
6. What is the difference between soil micro organisms and soil macro organisms?

7. Mention any **two** examples of soil micro organisms.
(i) _____
(ii) _____
8. Give any **two** examples of macro organisms found in the soil.

- (i) _____
(ii) _____

Examples of animals that live in the soil

Bacteria, moles, porcupines, earth worms and ants

Bacteria like nitrogen fixing bacteria fix nitrogen in the soil and hence improving on soil fertility.

Earthworms

- ✓ Aerate the soil.
- ✓ Softens the soil /plough the soil
- ✓ Add soil fertility by breaking down dead plants and animal remains.

NB: Why do you think earthworms come out of the soil after raining?

- To breathe /take in oxygen.

Importance of soil to plants

1. Soil provides water for plant growth
2. Soil provides nutrients for plant growth
3. Soil provides surface for attachment of plant roots
4. Soil provides air for respiration of roots and soil organisms

Importance of soil to man

1. Man use soil for modelling.
2. Soil is used for growing crops.
3. Soil is used for construction of building.
4. Man use soil for making glasses.
5. Soil maintains the water table.
6. Soil is used for making ceramics.

Properties of soil

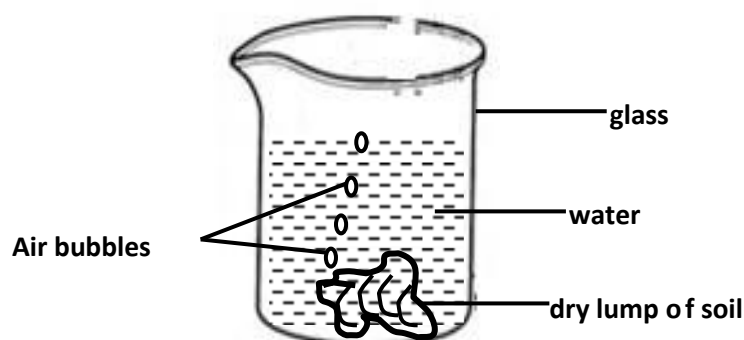
- It has air.
- It has water.
- It contains mineral salts.

An experiment to show that soil contains air

Materials needed

- Lump of soil
- Water
- Container 3
- Get water in a beaker or container, get a dry lump of soil and lower it into the beaker containing water

Below is an experiment carried out by a P.3 class.



(a) What does the above experiment show about soil?

- Observation

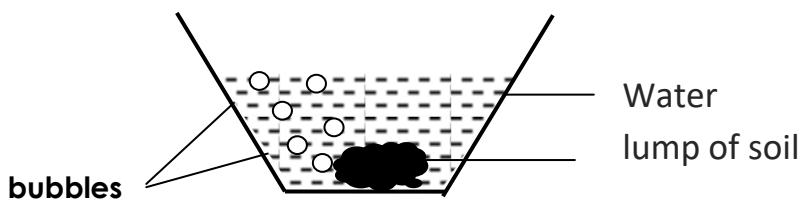
Bubbles of air will be seen coming out

➤ **Conclusion**

The bubbles represent the air in the soil escaping so soil contains air.

Activity

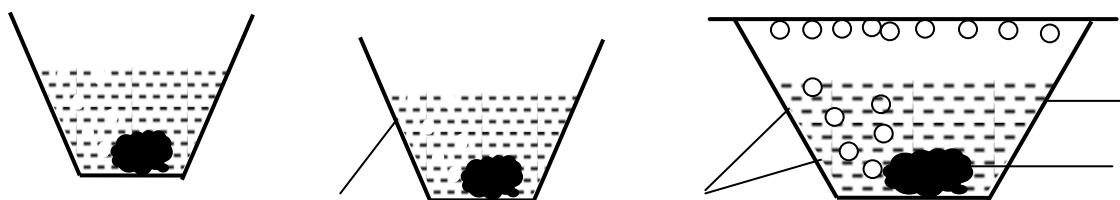
Below is an experiment carried out by a P.5 class. Use it to answer questions that follow.



- What does the above experiment show about soil?
- Apart from air, mention any two components of soil.
- How is air important to the living organisms in the soil.

Experiment to show that soil contains water

Get a dry lump of water and put it in a beaker. Put the beaker on fire and heat while covering the beaker



Empty beaker Lump of soil heat In the beaker

Observation

- Water droplets will be seen on the sides of the beaker and on the lid.

Conclusion

- Droplets of water represent the water escaping from the soli in form of water vapour.

Examples of Dissolved salts needed by plants

Magnesium and iron	Responsible for formation of chlorophyll
Potassium	Helps the plants to build resistance to diseases
Phosphorus	For formation of strong plant cell wall
Calcium	Help to strengthen the plant stem and leaves

Activity

- In one sentence show that you understand the following terms;
(a) Capillarity

(b) Drainage

- Why is sand soil not the best for crop growing?

- Name the bacteria that fix nitrogen in the soil.

- Outline any **two** properties of soil.

5. Why do you think earth worms come out of the soil after raining?

6. Why are farmer advised not to kill earth worms?

7. How do nitrogen fixing bacteria improve on soil fertility?

Soil profile

Soil profile is the vertical arrangement of soil layers.

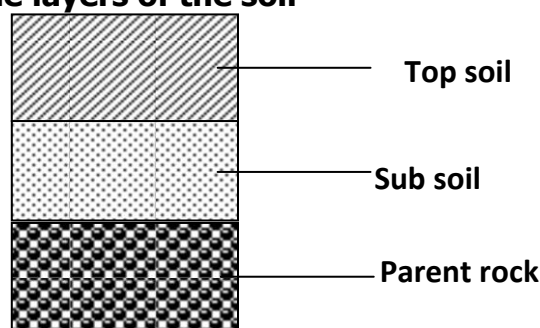
Or Arrangement of soil layers from top to bottom.

Areas where one can clearly see soil profile.

- Pit latrines.

– In trenches.

Illustration of the layers of the soil



Importance of the top most layer

- It contains most of the nutrients for plant growth.

Briefly explain the following terms.

1. **Soil texture**

These are the different sizes of soil particles in an area.

2. **Soil structure**

Soil structure is the way soil particles are grouped/ arranged.

3. **Soil sampling**

Soil sampling is the taking of soil from different parts of a field with the aim of analyzing it in a laboratory.

4. **Soil conservation**

Soil conservation is the way of looking after land in a way that it is kept fertile

5. **Soil exhaustion**

Soil exhaustion is the loss of soil fertility

6. **Leaching**

Leaching is the sinking of nutrients into lower layer of the soil where plant roots can't reach.

7. **Irrigation**

Irrigation is an artificial method of providing water to crops in dry areas where there is no rain.

8. **Silting**

Silting is the deposition of eroded soil into water bodies.

9. **Over cultivation**

This is the growing of crops on the same piece of land without giving to rest.

Activity

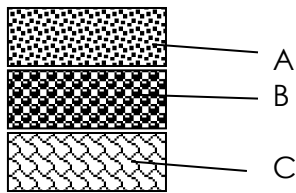
1. What is soil profile?

2. Mention any **two** areas where we can clearly see soil profile.

(i) _____

(ii) _____

Below is the illustration of the layers of the soil



3. How important is the layer marked A to the farmer's crops?

4. Mention any other **one** importance of the top most layers.

5. Name the layer of the soil marked C.

6. Briefly explain the following terms.

a) Soil structure

b) Soil sampling

c) Soil exhaustion

Soil erosion

Soil erosion is the washing away of top soil by its agents.

Agents of soil erosion

These are forces that carry away top soil from one place to another. These include:

- ✓ Running water
- ✓ Wind
- ✓ Man
- ✓ Moving animals

Causes of soil erosion

These are main activities that enable the agents to take away top soil.

How?

They expose the soil to agents

These include

Causes of soil erosion

- ✓ Overgrazing
- ✓ Deforestation
- ✓ Bush burning
- ✓ Overstocking
- ✓ Mining
- ✓ Mono cropping

- ✓ Brick making
- ✓ Over cultivation
- ✓ Road construction

Types of soil erosion

1. Sheet erosion: Top soil is washed away uniformly by running water
2. Gully erosion (deep channels)
3. Rill erosion (shallow channels)
4. Splash erosion /raindrop erosion
5. Stream /river bank erosion
6. Wind erosion

Activity

1. What is soil erosion?

2. Mention any **two** agents of soil erosion.

(i) _____

(ii) _____

3. List down at least **two** causes of soil erosion.

(i) _____

(ii) _____

4. State **two** types of soil erosion.

(i) _____

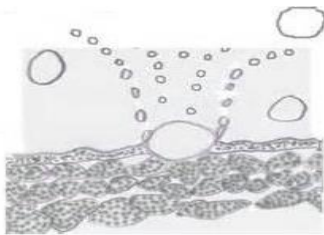
(ii) _____

- ✓ Gully erosion (deep channels)

This is when a lot of soil is carried away by running water and big channels called gullies are made in the ground.

- ✓ **Splash erosion**

This is the type of erosion which occurs when rain drops hit the bare ground and splash the soil particles from their original position.

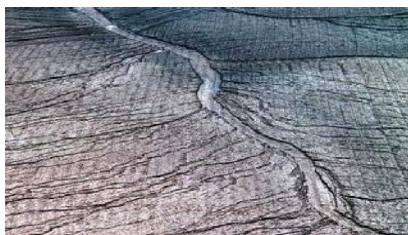


- ✓ **Rill erosion**

Rill erosion is also called shallow channels

This is when flowing water takes away the top soil and begins making shallow channels in the ground

This is the type of erosion which occurs when flowing water forms deep narrow channels

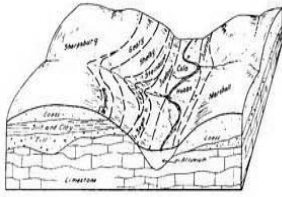


into the ground.

- ✓ **Sheet erosion**

- ✓ This is when flowing water takes away the top soil and begins making shallow channels in the ground

This is when top soil is removed uniformly from the ground by flowing water.



- ✓ **Gully erosion**

This is when deep and wide channels are made into the soil by flowing water.

Effects of soil erosion

- ✓ Soil erosion carries away fertile soil leading to poor plant growth.
- ✓ Soil erosion leads to landslides in mountainous areas.
- ✓ Soil erosion leads to soil exhaustion
- ✓ Soil erosion leads to loss of soil texture

Prevention and control of soil erosion

Methods of preventing soil erosion

- Mulching the garden
- Manuring
- Adding fertilizers
- Good farming practices
- Terracing
- Afforestation

Terracing

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

Terracing reduces the speed of running water

Advantages of terracing

Terracing controls soil erosion in hilly areas

2. Strip cropping:

It is also called bunding.

This is the growing of crops and strips of grass are left in the spaces to reduce the speed of running water.

It reduces the speed of running water

3. Contour ploughing:

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

It helps to reduces the speed of running water

4. Afforestation:

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

This also keeps the soil covered from direct rain drops.

5. Re-afforestation:

This is the planting of trees where they have been ever existed.

This also keeps the soil covered from direct rain drops.

6. Cover cropping: planting cover crops between plants that take long to mature.

Cover crops

These are crops that are planted between plants that take long to mature.

Qn: How does cover cropping prevent soil erosion?

Cover crops reduce the speed of running water

Qn: How does inter-cropping reduce soil erosion?

Reduces the speed of running water

Examples of cover crops include:

- ✓ Beans

- ✓ Peas
- ✓ Pumpkins
- ✓ Cabbages
- ✓ Sweet potatoes

7. **Bush fallowing**

This is the practice of leaving the land to grow bushy for some time.
Bush fallowing allows the land to rest and regain its fertility.

Importance:

- It enables the land to regain its fertility
- It controls soil erosion

8. **Mulching:** is the covering of top soil with plant materials.

Materials used for mulching 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

1. Mulching controls soil erosion
2. Mulching control the growth of weeds
3. Mulching improves on soil fertility
4. It conserves soil moisture
5. It moderates soil temperature
6. It increases water infiltration in the soil.

Disadvantages of mulching

1. Mulches hide some pests.
2. Dry mulches can be fire hazards.
3. Some mulch can grow into weeds.
4. Mulching is tiresome and expensive
5. Mulches may be a source of seeds of weeds.
6. Some mulches stop water from reaching the soil

Agro – forestry

This is the practice of growing crops and planting of trees on the same piece of land.

Advantages of agro – forestry

1. It controls soil erosion
2. It provides double income to the farmer
3. It is a source of fuel
4. It improves soil fertility
5. It is a source of nutritious foods

Activity

1. State **two** methods of conserving the soil.
(i) _____
(ii) _____
2. State **two** advantages of terracing
(i) _____
(ii) _____
3. What is the difference between afforestation and re-afforestation

4. In which way does cover cropping prevent soil erosion?

5. Suggest way in which inter-cropping reduces soil erosion.

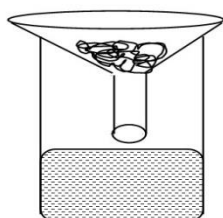
6. State any **two** examples of cover crops.

- (i) _____
 (ii) _____
7. State **two** advantages of mulching.
 (i) _____
 (ii) _____
8. Mention any **two** disadvantages of mulching.
 (i) _____
 (ii) _____
9. Define the term agro – forestry.

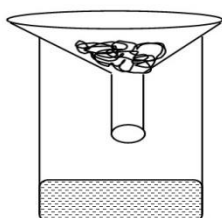
10. State **two** advantages of agro – forestry.
 (i) _____
 (ii) _____

Experiment to find out the permeability or drainage of water through different types of soil

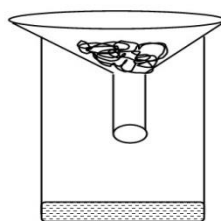
Take 3 glass funnels. Place loose plugs of cotton wool in each of the 3 funnel. Half fill the funnels with equal volumes of dry sand, clay and loam soil.



Sand soil



clay soil



loam soil

Now pour equal volume of measured water in each funnel, some water will pass through the layer of soil in each funnel and will be collected

Observation

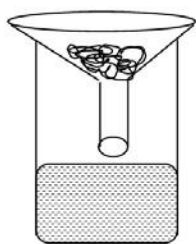
After one hour water is collected in jar containing sand followed by loam soil and little water in clay

Conclusion

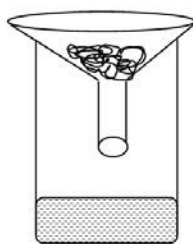
Sand is more permeable than any other type of soil or sand allows water to pass through it easily

Activity

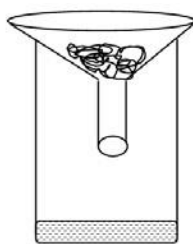
Use the diagrams below about soil and answer questions that follow.



A



B



C

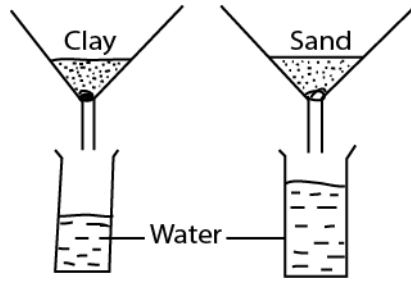
1. Name the type of soil marked

a. Soil B

b. Soil C

2. What experiment are the above diagrams representing?

54. Equal volume of sandy and clay soils were placed into containers as shown in the diagram below. Equal volumes of water were poured into each soil type at the same time. After 10 minutes the volume of water collected are as shown in the diagram.



3. through which soil did the water drain faster?

4. Give a reason for your answer.

5. Why do the two types of soil allow water to drain at different rates?

6. Which type of soil has the highest rate of capillarity?

7. Why is layer marked X best for growing crops?

8. Define the following terms

a) Soil exhaustion

b) Soil conservation

c) soil structure

d) soil texture

9. (a) What is soil erosion?

(b) Outline any **two** agents of soil erosion.

(i)

(ii)

(c) Identify any **two** causes of soil erosion.

(i)

(ii)

10. Name any **two** types of soil erosion.

(i)

(ii)

11. Outline any **two** ways of controlling soil erosion in hilly areas

(i)

(ii)

.....Soil exhaustion

This is the way soil loses its fertility

Causes of soil exhaustion

- ✓ Poor farming methods e.g mono cropping, shifting cultivation, over cropping, bush burning, Monoculture (mono-culture)
- ✓ Leaching of mineral salts
- ✓ Soil erosion

Leaching

Leaching is the sinking of plant nutrients deeper into the soil where plant roots can't reach. Leaching is the washing away of soil nutrients from the top layer to the lower layer.

Causes of leaching

1. Soil erosion
2. Too much rainfall
3. Deep ploughing
4. Increased use of fertilizers

How to improve on the soil fertility

1. Mulching the garden
2. Crop rotation
3. Manuring
4. Inter cropping
5. Bush fallowing
6. Addition of fertilizers
7. By terracing
8. Afforestation

Activity

1. Define soil exhaustion.

2. State any **two** causes of soil exhaustion.

(i) _____

(ii) _____

3. What is leaching?

4. Mention any **two** causes of leaching.

(i) _____

(ii) _____

5. State **two** ways how can we improve on the fertility of the soil.

(i) _____

(ii) _____

Fertilizers

These are substances put in the soil to increase its fertility.

Types of fertilizer

- ✓ Artificial fertilizers.
- ✓ Natural fertilizers/ organic fertilizers/ manure

Artificial fertilizers

These are chemical elements/substances manufactured from industries.

Are fertilizers got from inorganic matter artificially.

Common examples of artificial fertilizers

1. NPK – Nitrogen phosphorous Potassium
2. CAN – Calcium Ammonium Nitrates
3. SSP _ Single super phosphate

4. UREA – contains some element of nitrates.

Types of artificial fertilizers

- ✓ Straight fertilizers.
- ✓ Compound fertilizers.

Straight fertilizers

These are fertilizers that supply one nutrient to the soil.

Examples: SSP (single super phosphate), nitrogen, phosphorus, potassium.

Compound fertilizers

These are fertilizers that supply more than one nutrient to the soil.

Examples: ammonium phosphate, NPK fertilizers.

Advantages of using artificial fertilizers

1. They have a high nutrient content needed by the plants.
2. They are easy to handle, use and store.
3. They are quick in improving soil fertility
4. They help to make plants resistant to diseases as they grow.
5. They provide the needed minerals without fail.
6. They supply a large quantity of mineral salts.
7. They provide freedom of choice to farmers as they buy the type they need.
8. They improve crop yield.
9. They supply the correct amount of mineral salts to the soil.

Disadvantages of using artificial fertilizers

1. They are expensive to buy.
2. They require skilled labour to apply it.
3. They stay in the soil for a shorter period.
4. They are poisonous to animals, people and birds.
5. They pollute water sources when washed there.
6. They destroy soil texture and structure.
7. They make the soil acidic.
8. They kill organisms in the soil.
9. Their application needs special skills.

Activity

1. Mention any **two** types of fertilizers.

(i) _____
(ii) _____

2. What name is given to the fertilizers got from inorganic matter artificially?

3. Write these short forms in full.

a) NPK: _____

b) SSP: _____

4. Mention any **two** types of artificial fertilizers.

(i) _____

(ii) _____

5. State any **two** disadvantages of using artificial fertilizers.

(i) _____

(ii) _____

6. Mention any **two** reasons for using artificial fertilizers.

(i) _____

(ii) _____

7. Mention **two** ways of making the soil fertile.

(i) _____

(ii) _____

8. Mention any **two** ways how soil loses its fertility

(i) _____

(ii) _____

9. Identify **two** ways how one can improve on soil fertility.

(i) _____

(ii) _____

Natural fertilizers (manure)

These are fertilizers made from decayed plant and animal materials (humus)

Examples of natural fertilizers

1. Compost manure made from kitchen refuse like banana, sweet potato peelings
2. Farm yard manure made from animal droppings
3. Green manure made from leaves dropping off plants
4. Organic mulch.

Advantages of natural fertilizers

1. They improve soil texture
2. They make soil hold water for a long time.
3. They stay for a longer time in the soil
4. They release nutrients slowly
5. They cannot spoil soil.
6. They are available locally

Disadvantages of natural fertilizers

1. They smell badly
2. They are tiresome to make
3. Nutrients take long to be released for plants to use
4. it is not easy to collect plant and animal matter
5. They can be sources of weeds

Activity

1. Suggest any **two** advantages of mulching.

(i) _____

(ii) _____

2. Name **two** disadvantages of mulching.

(i) _____

(ii) _____

3. How does mulching controls soil erosion?

4. In which way can mulching keeps water in the soil?

5. What are fertilizers?

6. Mention any **two** natural fertilizers you know.

(i) _____

(ii) _____

7. Outline any **two** advantages of using natural fertilizers.

(i) _____

(ii) _____

8. Suggest any **two** disadvantages of natural fertilizers.

(i) _____

(ii) _____

9. Write FYM in full.

Compost manure

Compost manure is the manure got from both plant and organic waste matter left to decay.

Things used for making compost manure

- ✓ Banana peeling.
- ✓ Dry grass
- ✓ Maize stalks
- ✓ Leaves

COMPOST HEAP



Importance of compost manure

- ✓ Adds humus to the soil (improves soil fertility)
- ✓ It controls leaching
- ✓ Improves soil structure

Advantages of compost manure

1. It is cheap.
2. Its nutrients last for a longer time
3. It is not poisonous to people, animals and birds
4. It does not require skilled labour to apply it.
5. Provides many nutrients to the soil at the same time.

NB: When making compost manure, water should be added to the compost heap to make the rotting faster.

Disadvantages of compost manure

- ✓ It produces bad smell
- ✓ It takes a lot of space
- ✓ Soil nutrients take long to be released into the soil
- ✓ It is hard to tell which nutrients is present in the compost manure

Activity

1. State **two** materials used for making compost manure.

- (i) _____
- (ii) _____

2. Mention **two** importance of compost manure.

- (i) _____
- (ii) _____

3. Give any **two** advantages of compost manure.

- (i) _____
- (ii) _____

4. State any **two** disadvantages of compost manure.

- (i) _____
- (ii) _____

5. Why should water be added to the compost heap?

Green manure

It is made from green crops especially legumes that are ploughed back into the soil at the flowering stage.

Qn. Why legumes are widely used?

Ans. They can rot in a shorter time.

Advantages of green manure

1. It lasts for several seasons in the soil.
2. It rots and mixes easily into the soil.
3. Its nutrients last for a longer time
4. It is not poisonous to people, animals and birds
5. It does not require skilled labour to apply it.

Disadvantages of green manure

1. It is time wasting.
2. It requires a lot of labour to plough it back into the soil.
3. It is not easy to tell which nutrient is present in the green manure.

Farm yard manure

Farm yard manure is the manure got from animal wastes like dung and urine mixed with their bedding materials

Advantages of farm yard manure

1. It is cheap
2. Its nutrients last for a longer time
3. It is not poisonous to people, animals and birds
4. It does not require skilled labour to apply it.
5. Provides many nutrients to the soil at the same time

Disadvantages of farm yard manure

1. It contains little amount of mineral salts.
2. Produces bad smell
3. It takes a lot of space
4. Soil nutrients take long to be released into the soil
5. It is not easy to tell which nutrient is present in the compost manure.

Soil pollutants

Soil pollutants are substances which pollute the soil

Soil pollutants are harmful materials which lowers the quality of the soil

Examples of soil pollutants

1. Polythene papers (Buveera)
2. Plastic materials
3. Rubber materials (old shoes)
4. Glasses and broken bottles
5. Metallic materials and scraps like nails, tins, etc
6. Concrete from broken buildings.

Ways soil is polluted.

1. Pouring used oil from Engines, factories etc to the soil
2. Dumping or throwing polythene papers don't allow water to enter the soil
3. Dumping metal scrap on the soil
4. Using pesticides to spray crops

Effects of harmful materials on the soil

1. Non-degradable materials do not rot or decay
2. They prevent or block air and water from entering the soil

3. They lead to soil exhaustion
4. Oil kills the organism which stay in the soil

Ways of properly handling wastes.

1. Reusing plastic materials like jerry cans for other purposes like fetching water.
2. Making new things from some wastes (recycle)
3. Returning some wastes like bottles to the factories that make sodas.
4. Reducing on the production of non-biodegradable materials.
5. Rejecting/ refusing the use of non-biodegradable materials like polythene bags.

Activity

1. What is farm yard manure?

2. State **two** advantages of farm yard manure.
(i) _____
(ii) _____
3. Suggest any **two** disadvantages of green manure.
(i) _____
(ii) _____
4. What are soil pollutants?

5. Give **two** examples of soil pollutants.
(i) _____
(ii) _____
6. Suggest **two** materials used to make compost manure.
(i) _____
(ii) _____
7. Why should water be added when making compost manure?

SOIL BARRIERS

These are things (materials) that prevent soil from being carried away by the agents of soil erosion.

Examples of soil barriers

- ✓ Grass
- ✓ Cover crops
- ✓ Trees /roots
- ✓ Rocks
- ✓ Concrete walls
- ✓ Contours

SOIL CONSERVATION

Is the maintaining (preserving) of soil fertility.

Ways of conserving soil fertility

Soil Fertility can be maintained by practicing:

1. Crop rotation
2. Mulching
3. Cover cropping
4. Mixed farming
5. Application of the fertilizers
6. Agro-forestry.
7. Afforestation /re-afforestation
8. Bush fallowing
9. Terracing hilly areas
10. Rotational grazing

11. Afforestation
12. Contour ploughing
13. Strip cropping

Importance of soil conservation

- ✓ Retains soil fertility
- ✓ Retains soil moisture
- ✓ Prevents spread of diseases and pests.

Activity

1. What are soil barriers?

2. State any **two** examples of soil barriers.

(i) _____

(ii) _____

3. Define soil conservation.

4. State any **two** ways of conserving soil erosion.

(i) _____

(ii) _____

5. Mention any **two** importance of soil conservation.

(i) _____

(ii) _____

TOPIC 2: MATTER AND ENERGY

THEME: MATTER AND ENERGY

TOPIC 6: HEAT ENERGY

LESSON

Energy is the body's ability to do work

Matter is anything that has mass and volume

OR anything that has weight and occupies space

The meaning of each of the following

1. **Mass** is a quantity of matter in an object.
2. **Volume** is the space occupied by an object.
3. **Molecules** are the smallest particles of matter.
4. **Molecules** are held together by cohesion or adhesion forces.
5. **Cohesion force** is the force of attraction between molecules of the same kind.
6. **Adhesion force** is the force of attraction between molecules of different kinds.
7. **Atoms** are the smallest indivisible particles of matter
8. **Weight** is the gravitational force exerted on an object by the earth.

Properties of matter

- 1) Matter has weight
- 2) Matter occupies space
- 3) Matter exerts pressure
- 4) Matter expands when heated

Activity

1. Define the following terms:

a) energy

b) matter

c) Volume

d) Molecules

2. Mention any **two** forces that hold molecules together.

(i) _____

(ii) _____

3. What is :

a) cohesion force

b) adhesion force

c) atoms

4. State **two** properties of matter

(i) _____

(ii) _____

LESSON

States of matter

There are three different states of matter

1. Solids
2. Liquids
3. Gases

Solids

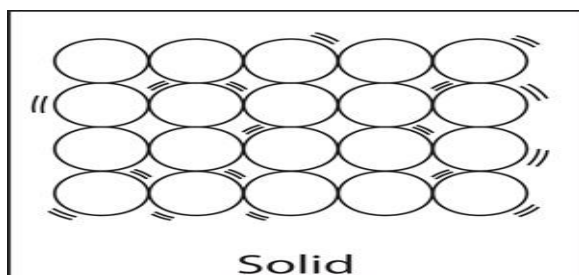
Examples of solids

- ✓ Wood
- ✓ Rubber
- ✓ Glass
- ✓ Plastic

Characteristics of solids

- 1) Molecules are closely packed together
- 2) Particles are held together very tightly.
- 3) Heat travels through solid state by conduction
- 4) Molecules do not move from position but vibrate.
- 5) Solids have shape, size and volume apart from irregular objects.

Diagram to show the arrangement of molecules



Liquids

Examples of liquids

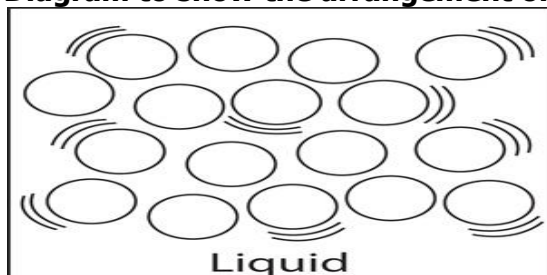
- ✓ Water
- ✓ Soda
- ✓ Oils
- ✓ Juice

Characteristics of liquids

- 1) Molecules are fairly spaced.

- 2) Molecules are loosely held together.
- 3) Liquids have a proper volume (capacity)
- 4) Liquids have no definite shape (take up the shape of the container in which they are poured)
- 5) Heat travels through liquids by convection

Diagram to show the arrangement of molecules in liquids



Gases

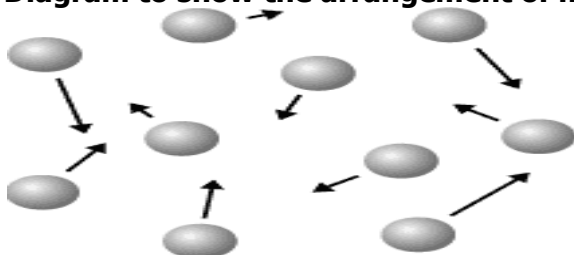
Examples of gases

- 1) Nitrogen
- 2) Carbon dioxide
- 3) Oxygen
- 4) Rare gases

Characteristics of gases

- 1) Molecules are far apart
- 2) Gases have no definite shape
- 3) Gases have a particular volume.
- 4) Molecules move freely.
- 5) Heat travels through gases by convection

Diagram to show the arrangement of molecules in gases



ACTIVITY

- 1) State **two** examples of liquids.
 - (i) _____
 - (ii) _____
- 2) Cite **two** characteristics of liquids.
 - (i) _____
 - (ii) _____
- 3) What are gases?

- 4) State **two** examples of gases.
 - (i) _____
 - (ii) _____
- 5) State **two** characteristics of gases.
 - (i) _____
 - (ii) _____
- 6) State the process by which heat travels through gases.

- 7) State **two** examples of solids.
 - (i) _____
 - (ii) _____
- 8) State the process by which heat travels through solid state.

LESSON

ENERGY

Energy is ability to do work

Forms of energy

- 1) Heat energy
- 2) Sound energy
- 3) Light energy
- 4) Sound energy
- 5) Electric energy
- 6) Magnetic energy
- 7) Chemical energy
- 8) Solar energy.

Types of energy

1. Kinetic energy
2. Potential energy

Characteristics of forms of energy

- ✓ They can make work possible
- ✓ Energy can be changed from one form to another

Potential energy

Is the energy that is stored by an object at rest.

Examples of potential energy

- ✓ A baby being asleep in a cot
- ✓ A car standing still at traffic lights
- ✓ A pupil sitting and listening to the teacher
- ✓ A stone / book ruler resting on a table /ground /cupboard etc

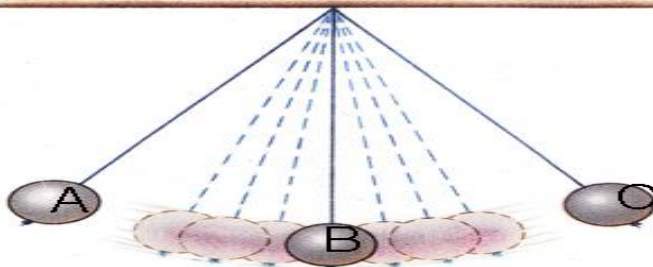
Kinetic energy

This is the energy possessed by a moving object or an object in motion. It is also referred to as the energy in motion

Examples of kinetic energy

- ✓ A girl running along the road
- ✓ An arrow flying through the air
- ✓ A stone thrown up in air
- ✓ A brick dropping from a wall
- ✓ A leaf falling to the ground from a tree

Think of a stone or a pendulum swinging in air



At A, the stone possess potential energy

At B, the stone possess kinetic energy

NOTE: a person who runs with any object balancing on the head possesses Kinetic energy while the object possesses potential energy

ACTIVITY

- 1) State **two** forms of energy.

(i) _____
(ii) _____

- 2) Mention any **two** types of energy.

(i) _____
(ii) _____

- 3) Define potential energy.

- 4) State any **two** examples of potential energy.
(i) _____
(ii) _____
- 5) Define kinetic energy.

- 6) Mention any **two** examples of kinetic energy.
(i) _____
(ii) _____
- 7) Okello carried baby Tumusiime on the back and kept walking around soothing him. What type of energy was possessed by:
a) Okello?

b) Baby Tumusiime?

LESSON

HEAT ENERGY

Heat energy is a form of energy that increases temperature of an object

Standard units for measuring heat is Calories

Instruments used to measure heat.

Heat **Calorimeter**

Sources of heat

These are objects that produce heat.

Types of sources of heat

- ✓ Natural sources of heat
- ✓ Artificial sources of heat

Natural sources

Natural sources of heat provided by nature

Examples of natural sources of heat

1. Sun (main natural source of heat)
2. Fire
3. Friction
4. Decomposition
5. Fuels like firewood, diesel, oil, charcoal, petrol
6. Compression
7. Erupting volcanoes

Artificial sources of heat

These are sources of heat made by people.

Examples of artificial sources of heat

1. Lamps
2. Bulbs
3. Electricity
4. Candles

Uses of heat to man

1. We used heat for ironing clothes
2. Heat is used to run some machines e.g. steam engines, diesel engines
3. Heat is used to dry harvested crops before storage.
4. Heat helps in rain formation
5. Heat enables us to cook our food
6. Heat can act as a disinfectant.
7. Heat or warmth is used for seed germination

ACTIVITY

- 1) Name the form of energy that increases temperature of an object.

2) Mention the instrument used for measuring heat.

3) How is the use of calorimeter different from that of a thermometer?

4) State **two** types of sources of heat.

(i) _____

(ii) _____

5) Give any **two** examples of natural sources of heat.

(i) _____

(ii) _____

6) Why is friction referred to as the natural source of heat?

7) Draw and name any **two** examples of artificial sources of heat.

8) Give any **two** uses of heat to man.

(i) _____

(ii) _____

LESSON

Effects of heat on matter

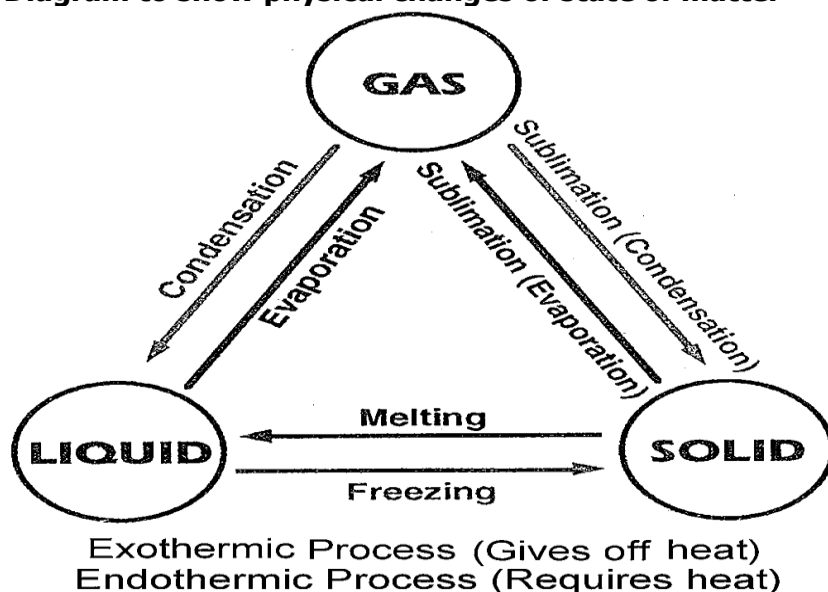
1. Heat makes matter expand
2. Heat causes rise in temperature
3. Heat causes change in state of matter
4. Heat makes molecules in gases and liquids mobile
5. Heat causes melting.
6. Heat causes evaporation.
7. Heat causes sublimation

➤ **Evaporation** is the change of state from liquid to gas.

➤ **Melting** is a change of state from solids to liquids

➤ **Sublimation** is the change of state from gas to solid and vice versa.

Diagram to show physical changes of state of matter

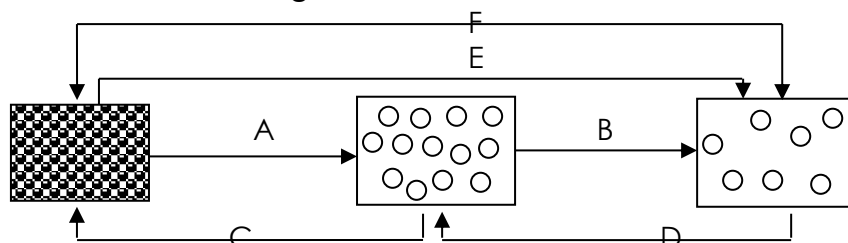


- A** - Melting is the physical change from solid to liquid
- B** - Evaporation is the physical change from liquid to gas.
- C** - Freezing is the physical change from liquid to solid.
- D** - Condensation is the physical change from gas to liquid
- E** - Sublimation is the physical change from solid to gas.
- F** - Sublimation is the physical change from gas to solid.

ACTIVITY

- 1) What is matter?
- 2) Below is a diagram of a change in the state of matter.

Processes in changes of states of matter



- 3) State any **two** effects of heat on :

a) Solid

(i) _____

(ii) _____

b) Liquid

(i) _____

(ii) _____

- 4) What causes rise in temperature of an object?

- 5) Why is freezing referred to as exothermic process?

- 6) Mention any **two** examples of endothermic process in the environment.

(i) _____

(ii) _____

- 7) What is evaporation?

- 8) State the physical change of an object from solid to gas.

LESSON

EFFECTS OF HEAT ON EACH STATE OF MATTER

1. Heat causes temperature of matter to increase
2. Heat can cause some solids to change to liquid and liquids to gases.
3. Heat can also cause some objects to expand (increase in size)

EFFECTS OF HEAT ON SOLIDS

Heat make metals expand.

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 solid

Metallic ball ring experiment

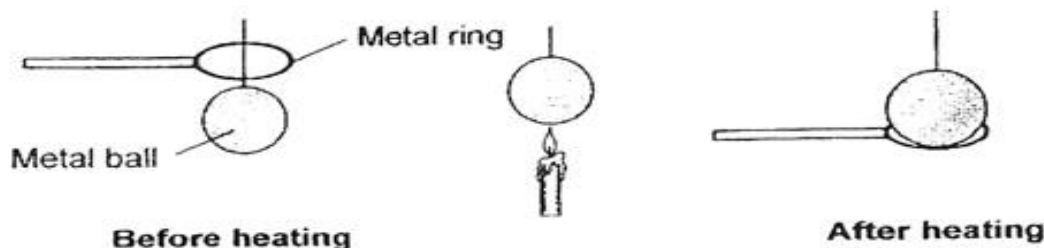
Things to use

- Metallic ball

- Two metallic rings of the same size

Source of heat

- a). Before heating the metallic ball goes through the ring.



Observation

Before heating the ball, it was small in size thereby able to go through the ring.

When the ball was heated, it expands and it cannot pass through the ring

When the ball is cooled again, it passes through the ring

Reasons why metallic ball did not go through the ring after heating

The metallic ball had expanded

Conclusion

Metals expand when heated

Bimetallic strip

- ✓ This is a strip which consists of two metals with different expansion rates.
- ✓ Bimetallic strips are used in thermostats.
- ✓ A thermostat is a device that switches electric appliances on and off automatically.

Things that use the thermostat

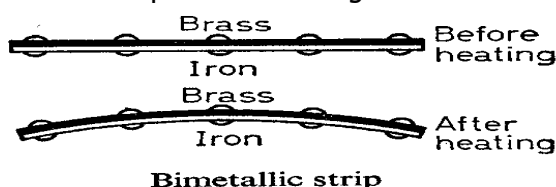
- Electric flat irons
- Refrigerators
- Car indicators
- Air conditioners

Experiment

What do you think can happen to the metallic ball if dipped into cold water?

The hot metallic ball will contract and pass through the ring again.

Bimetallic strip before heating and after heating



Observation

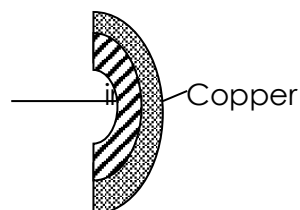
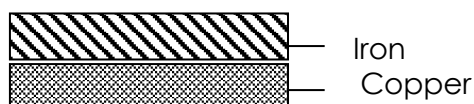
The iron strip heats up and expands faster than the copper strip hence bending towards the copper.

Qn: 1. which of the two metals is the best conductor of heat?

Importance of a bimetallic strip

Bimetallic strips are used in automatic switches of electric kettles, flat irons, fridges, freezers

Activity



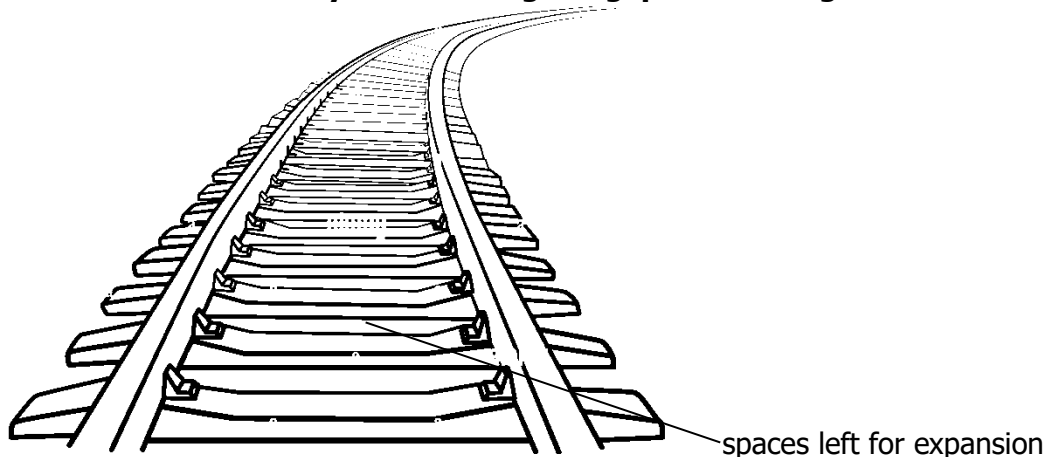
Copper expands faster than iron.

PREVENTING BAD EFFECTS OF EXPANSION AND CONTRACTION

- Gaps should be left between railway lines to allow expansion on hot weather
- 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.

Illustration of a railway line showing the gaps left during construction.



Qn: What would happen if gaps were not left between rails during construction?

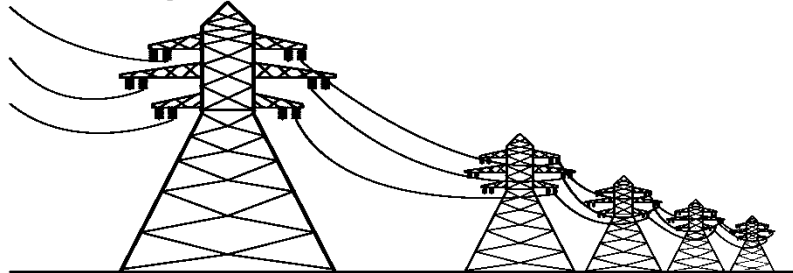
The rails would expand on hot days bend and cause railway accidents.

Why are gaps left between railways during construction?

To leave room for expansion on a hot day

Diagrams to show the effect of heat on electric / telephone wires

On a hot day



Electric / telephone wires expand become loose and starts sagging / slacking

On a cold day wire contract and become shorter appearing relatively tight.

Why are gaps left between electric / telephone wires during construction?

To allow room for expansion

2. What would happen to the wires when tied tightly fixed on the poles?

The wires would break due to contraction on cold days

ACTIVITY

1) What do you understand by the term bimetallic strip?

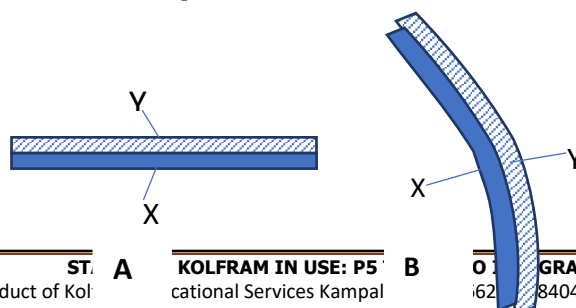
2) What is a thermostat?

3) Mention any **two** things that use the thermostat.

(i) _____

(ii) _____

The diagram below shows a metallic rod made of two different metal X and Y bound together as shown in A. when heated, the rod bends as shown in B. use the diagram to answer questions below



4) Which of the metal expands faster, X or Y?

5) Give a reason for your answer in 25.

6)

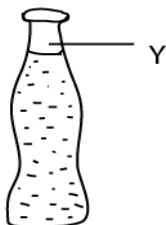
7) State **one** importance of a bimetallic strip.

8) Why are gaps left between railways during construction?

9) What would happen if gaps were not left between rails during construction?

10) Why are gaps left between electric wires during construction?

The diagram below is of a sealed soda bottle. Use it to answer questions 3 and 4.



11) Why was the space labelled Y left in the bottle?

12)

Name the gas that bubbles out when the soda is opened.

13) Apart from light, carbon dioxide and water, what else does a leaf need to accumulate food?

14) What would happen to the wires when tied tightly fixed on the poles?

15) What happens to electric wires on the following

a. Cold days.

b. Hot days.

LESSON

EFFECTS OF HEAT ON ICE.

What happens to ice when heated?

- Ice melts
- The volume decreases, the density increases and the mass remain the same.

EFFECTS OF HEAT ON GASES

What happens to gases when:-

- a). Heated - Gases expand
- b). Cooled - Gases contract

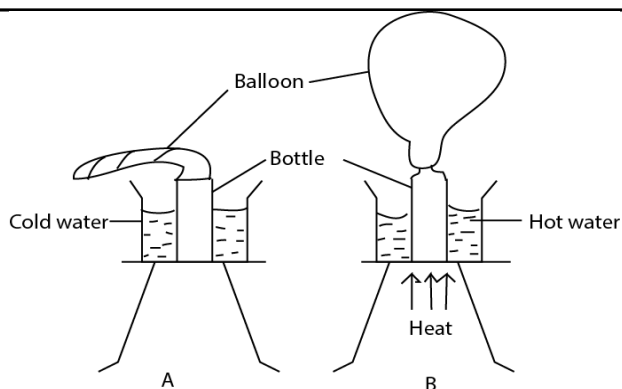
QN:1. Why does the balloon expand after being heated?

Due to expansion of air inside the plastic bottle

3. What happens to the balloon when the bottle is removed from the hot water?

The balloon collapses due to contraction of the air inside the plastic bottle.

The diagram to shows a setup of an experiment on how air expands



1. Why does a bulb swell out as shown in B?
2. Suggest what you think the experiment is intended to show?

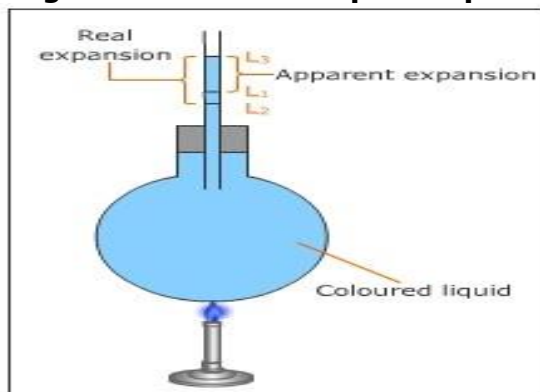
effects of heat on liquids

- ✓ Liquids expand when heated.
- ✓ Liquids evaporate when heated.
- ✓ Liquids contract when cooled

Effects of freezing of liquids

- ✓ Liquids increase in volume
- ✓ Liquids reduce in density
- ✓ Mass of liquids remains the same.

Diagram to show that liquids expand when heated



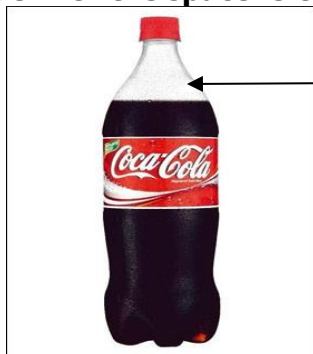
Qn: 1. why is space left while bottling drinks like soda?

To leave room for increase in volume when frozen

2. Why is carbon dioxide packed in bottled drinks like soda?

To preserve the soda

A bottle with the space left



Space left to give room for increase in volume on freezing.

Effects of heat on sublimates

Sublimates are substances which can directly change from solid to gas.

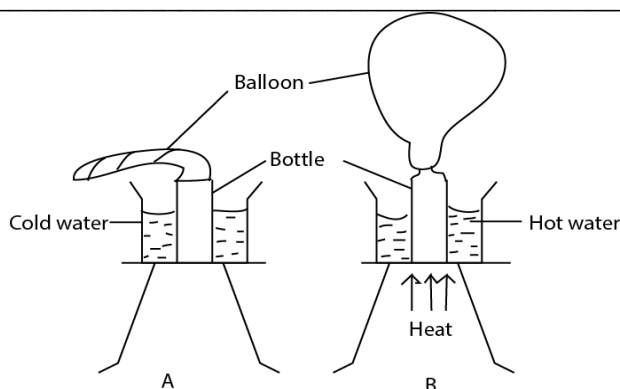
Examples of sublimates

- ✓ Iodine granules (crystals)
- ✓ Ammonium chloride(salts)
- ✓ Solid carbon dioxide.

ACTIVITY

- 1) What happens to ice when heated?

- 2) When ice melts, volume decreases, the density increases and the mass remain the same. State the reason.



- 3) Why does a bulb swell out as shown in B?

- 4) Suggest what you think the experiment is intended to show?

5)

E State what will happen to gases when:-

a). Heated?

b). Cooled?

- 6) Why does the balloon expand after being heated?

- 7) State any **two** effects of heat on liquids.

(i)

(ii)

- 8) State **two** effects of freezing of liquids

(i)

(ii)

- 9) Why is space left while bottling drinks like Mirinda soda?

- 10) Why is carbon dioxide packed in bottled drinks like soda?

- 11) Which substances can directly change from solid to gas?

- 12) Mention **two** examples of sublimates

(i)

(ii)

LESSON

TEMPERATURE

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

Standard units for measuring temperature is degrees

The instrument used to measure temperature is called a thermometer.

Thermometer

Thermometer is an instrument used to measure temperature.

TYPES OF TEMPERATURE SCALES

A thermometer is read in two scales namely:-

- ❖ Degrees Celsius / centigrade scale
- ❖ Degrees Fahrenheit scale

Types of Thermometers

- Clinical thermometer
- The Six's minimum and maximum thermometer
- The Ordinary (wall) thermometer

The following thermometer measure the following:-

- Lowest temperature of the day **Minimum thermometer**
- Highest temperature of the day **Maximum thermometer**
- Room temperature or temperature of the air **Wall thermometer**
- Highest and lowest temperature of the day **Six's thermometer**
- Human body temperature **Clinical thermometer**

Places where we find clinical thermometer in daily life

- ✓ In clinics
- ✓ In hospitals
- ✓ In dispensaries

Places or common sites on our bodies where a clinical thermometer can be placed while measuring the human body temperature

- ✓ Under the arm pits
- ✓ In the anus
- ✓ In the vagina
- ✓ In the mouths / under the tongue

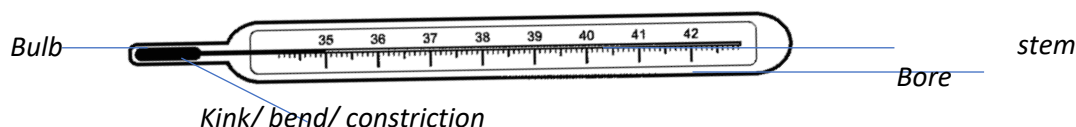
NOTE: A clinical thermometer is commonly placed in the above parts because they completely cover the bulb

Characteristics of a Clinical Thermometer

- It has an arrow that points to 37°C to show the normal body temperature
- Its scale starts from 34°C and ends at 42°C
- It has a constriction or kink

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.

Diagram of a clinical thermometer



Kink: It prevents the back flow of mercury before readings are taken.

Importance of each part

Kink prevents the back flow of mercury before readings are taken.

Bulb stores mercury.

Stem magnifies mercury thread.

-It protects the bore.

-It is where the thermometer reading is taken.

Bore allows expansion and contraction of mercury.

Glass envelope acts as a magnifying glass

ACTIVITY

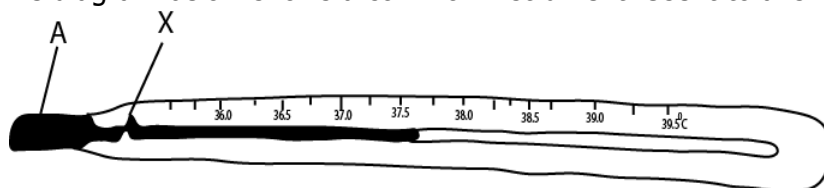
- Define the term temperature.

- State the standard units for measuring temperature.

- Name the instrument used to measure temperature.

- 4) Name the thermometer used for measuring the temperature of the air
- 5) State the main use of a clinical thermometer to a nurse.
- 6) State **two** places where we can find clinical thermometer in daily life
 - (i) _____
 - (ii) _____
- 7) Mention any **two** common sites on our bodies where a clinical thermometer can be placed while measuring the body temperature.
 - (i) _____
 - (ii) _____
- 8) State the reason why clinical thermometer is commonly placed under the arm pits.
- 9) What is the importance of glass envelope to a clinical thermometer?
- 10) Which part of the clinical thermometer:
 - a) store mercury?
 - b) prevents the back flow of mercury to the bulb before the actual temperature is taken?

1. The diagram below shows a common instrument. Use it to answer the questions (a) to (d).



- (i) What is the use of the above instrument?
 - (ii) Name the liquid labelled A.
 - (iii) Why is the liquid named in (b) used in the instrument?
 - (iv) What is the importance of part marked X?
- 11) State any **two** liquids commonly used in thermometers.
- (i) _____
 - (ii) _____

LESSON

SIX'S THERMOMETER (MINIMUM AND MAXIMUM THERMOMETER)

- ✓ A six's thermometer is used to measure both minimum and maximum temperature of the day.
 - ✓ Maximum temperature is recorded during the day. While minimum temperature is recorded during the night.
 - ✓ It uses both mercury and alcohol.
 - ✓ The left-hand side measures minimum temperatures and the right hand side measures maximum temperatures.
 - ✓ A six's thermometer uses indices
 - ✓ Readings are taken at the lower part of an index
 - ✓ Indices are re-set using a magnet
- This thermometer is commonly found in places like:
- ☒ Research stations
 - ☒ Schools

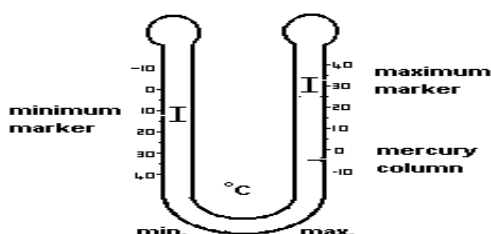
- ✓ Universities
- ✓ Weather stations

Diagram of the Six's Minimum and Maximum Thermometer

Differences between a clinical thermometer and maximum & minimum thermometer

Clinical thermometer	Minimum and maximum thermometer
It uses mercury	It uses both mercury and alcohol
Measures body temperature	Measures temperature of a place
It has a kink/bend	Has no kink/bend
It has no indices	It uses indices

Drawing of maximum & minimum 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°C

LIQUIDS USED IN THERMOMETERS

There are two liquids used in thermometers namely:

Liquids commonly used in thermometers.

- a) Alcohol
- b) Mercury

Water is not used in the clinical thermometer.

Reasons why water is not used in a clinical thermometer

1. It is colourless so it not easily seen
2. It sticks on the wall glass of the tube
3. Water is a bad conductor of heat
4. Water needs a lot of heat to expand.
5. Water does not expand uniformly.
6. It evaporates when heated

Reasons why mercury is used in thermometers

1. Mercury is a good conductor of heat
2. Mercury does not stick on the walls of the bulb / bore.
3. Mercury is easily seen in the glass.
4. Mercury doesn't boil easily
5. Mercury has even and regular expansion.

Reason why a clinical thermometer is sterilized using surgical spirit

- Boiling it will make the stem expand and burst.

Advantages of using alcohol

1. Alcohol doesn't solidify easily
2. Alcohol expands by six times than that of mercury

The normal human body temperature

- ✓ Celsius 37°C.
- ✓ 98.6/ 98.4 degrees Fahrenheit.

ACTIVITY

1. Name the thermometer that uses both mercury and alcohol.

2. State **two** differences between a clinical thermometer and maximum & minimum thermometer.

3. Name any **two** liquids used in Six's thermometer.
(i) _____
(ii) _____
4. State **two** reasons why mercury is used in a thermometer
(i) _____
(ii) _____
5. Mention **two** reasons why water is not used in a clinical thermometer
(i) _____
(ii) _____
6. Why do doctors shake a clinical thermometer before using it on other patients?

7. State the main reason why a clinical thermometer is sterilized using surgical spirit.

8. State **two** advantages of using alcohol in a clinical thermometer.
(i) _____
(ii) _____
9. State any **two** types of temperature scales.
(i) _____
(ii) _____

CONVERSION OF SCALES

Converting from Centigrade scale to Fahrenheit scale

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

5

$$9C + 160 = 5F$$

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

Changing from Celsius to Fahrenheit

d. 20°C

$$F = \left(\frac{C \times 9}{5} \right) + 32^{\circ}$$

$$F^{\circ} = \left(\frac{20 \times 9}{5} \right) + 32$$

5

$$F^{\circ} = (4 \times 9) + 32$$

$$F^{\circ} = 36 + 32$$

$${}^{\circ}F = 68^{\circ}$$

e. 25°C

$$F = \left(\frac{C \times 9}{5} \right) + 32^{\circ}$$

$$F^{\circ} = \left(\frac{25 \times 9}{5} \right) + 32$$

5

$$F^{\circ} = (5 \times 9) + 32$$

$$F^{\circ} = 45 + 32$$

$${}^{\circ}F = 77^{\circ}$$

f. 5°C

$$F = \left(\frac{C \times 9}{5} \right) + 32^{\circ}$$

$$F^{\circ} = \left(\frac{5 \times 9}{5} \right) + 32$$

5

$$F^{\circ} = (1 \times 9) + 32$$

$$F^0 = 9 + 32$$

$$^0F = 41^0$$

g. 0°C

$$F = (c \times 9) + 32^0$$

$$F^0 = (0 \times 9) + 32$$

$$F^0 = 0 + 32$$

$$F^0 = 0 + 32$$

$$^0F = 32^0$$

g. 80°C

$$F = (c \times 9) + 32^0$$

$$F^0 = (80 \times 9) + 32$$

$$F^0 = (16 \times 9) + 32$$

$$F^0 = 144 + 32$$

$$^0F = 176^0c$$

h. 100°C

$$F = (c \times 9) + 32^0$$

$$F^0 = (100 \times 9) + 32$$

$$F^0 = (20 \times 9) + 32$$

$$F^0 = 180 + 32$$

$$^0F = 212^0$$

ACTIVITY

Change the following from degrees Celsius to degrees Fahrenheit

1. 5°C
2. 10°C
3. 100°C
4. 0°C

Changing temperature from Fahrenheit to Celsius

When changing temperature from Fahrenheit to Celsius, we

Use the formulae: **$(F - 32) \times \frac{5}{9}$**

9

Examples

Change 41°F to $^{\circ}\text{C}$

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

$$^{\circ}\text{C} = (41 - 32) \times \frac{5}{9}$$

$$^{\circ}\text{C} = (41^{\circ} - 32) \times \frac{5}{9}$$

$$^{\circ}\text{C} = 9 \times \frac{5}{9}$$

$$^{\circ}\text{C} = 1 \times 5$$

$$^{\circ}\text{C} = 5^{\circ}$$

Change 68°F to $^{\circ}\text{C}$

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

$$^{\circ}\text{C} = (68^{\circ} - 32) \times \frac{5}{9}$$

$$^{\circ}\text{C} = 36 \times \frac{5}{9}$$

$$^{\circ}\text{C} = 4 \times 5$$

$$^{\circ}\text{C} = 20^{\circ}$$

Change 32°F to $^{\circ}\text{C}$

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

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

$$^{\circ}\text{C} = 0 \times \frac{5}{9}$$

$$^{\circ}\text{C} = 0 \times 5$$

$$^{\circ}\text{C} = 0^{\circ}$$

Change 59°F to $^{\circ}\text{C}$

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

$$^{\circ}\text{C} = (59^{\circ} - 32) \times \frac{5}{9}$$

$$^{\circ}\text{C} = 27 \times \frac{5}{9}$$

$$^{\circ}\text{C} = 3 \times 5$$

$$^{\circ}\text{C} = 15^{\circ}$$

Change 95°F to $^{\circ}\text{C}$

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

$$^{\circ}\text{C} = (95^{\circ} - 32) \times \frac{5}{9}$$

$$^{\circ}\text{C} = 63 \times \frac{5}{9}$$

$$^{\circ}\text{C} = 7 \times 5$$

$$^{\circ}\text{C} = 35^{\circ}$$

Change 77°F to $^{\circ}\text{C}$

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

$$^{\circ}\text{C} = (77^{\circ} - 32) \times \frac{5}{9}$$

$$^{\circ}\text{C} = 45 \times \frac{5}{9}$$

$$^{\circ}\text{C} = 5 \times 5$$

$$^{\circ}\text{C} = 25$$

ACTIVITY

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

180

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

Change from Fahrenheit to Celsius

1. 68°C
2. 32°C
3. 41°C
4. 77°C

LESSON

HEAT TRANSFER

How heat travels through the states of matter

1. Solids by Conduction
2. Liquids by Convection
3. Gases by Convection
4. Vacuum by Radiation

Vacuum

A vacuum is a space without molecules.

Importance of molecules in heat transfer

Molecules act as a medium of heat transfer

Qn: In which state of matter does heat travel?

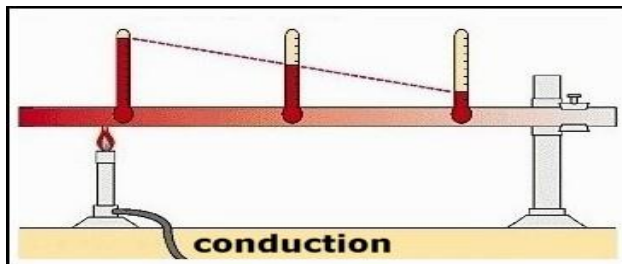
A) **Fastest** – gases

Why? The molecules in gaseous state move freely than in any other state of matter.

Slowest – Solids

Why? The molecules do not move freely.

An illustration of heat transfer in solids



Qn: 1. how does heat move from point B to point A?

By conduction

2. Which of the above wax will melt first?

Wax 1.

Reason: Wax 1 is nearest to the flame

3. Which of the above wax will melt last?

Wax 4

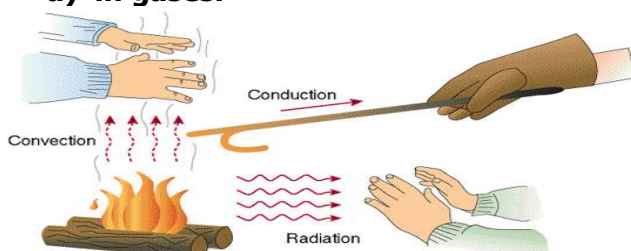
Reason: wax 4 is furthest from the flame.

Importance of heat transfer by conduction

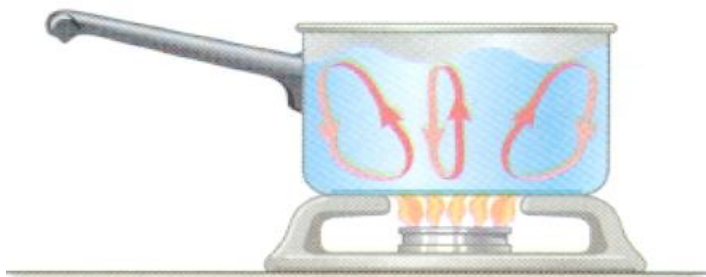
- Ironing our clothes using hot bodies like flat irons, iron boxes.
- Cooking food.
- Boiling water in a kettle.
- Welding or smelting metallic objects.
- Roasting meat using an iron rod.

Diagram to show convection of heat

a) in gases.



b) in liquids



Importance of convection in our daily life

1. It helps smoke to move out of the kitchen through the chimney.
2. Convection current helps in free circulation of fresh air in our houses.
3. Convection currents help in formation of breezes.
4. It helps in taking of bad smell through the vent pipes of a VIP latrine.

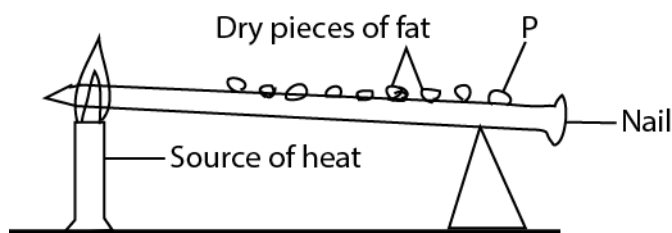
Importance of each of the following on a house

1. **Ventilators:** let out warm air
2. **Windows:** let in fresh air
3. **Doors:** let in fresh air

ACTIVITY

- 1) How does heat travels through
 - a) Solids
 - b) Liquids
 - c) Vacuum
- 2) In which state of matter does Convection take place?
- 3) What name is given to a space without molecules?
- 4) State the importance of molecules in heat transfer.

5. The diagram below is of an experiment performed by a p5 class. Study it and answer the question that follow.



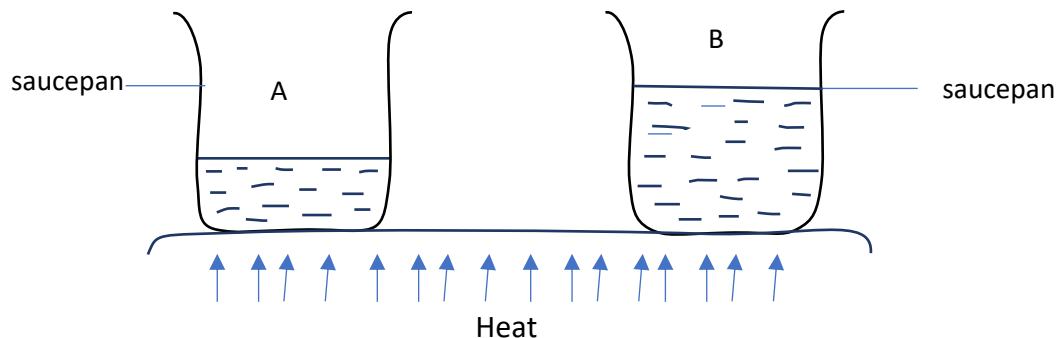
- (a) what is the experiment about?
 - (b) What is the importance of fats pieces
 - (c) What will happen to piece P after sometimes?
 - (d) Give a reason for your answer in (c).
- 5) In which state of matter does heat travel?
- a. **Fastest**

b) State the reason to support your answer.

c) **Slowest**

d) State the reason to support your answer above.

1. Two containers A and B containing some water as in the diagram below, were heated.



(a) In which container did water boil first?

(b) Explain your answer in (a) above.

(c) Why do you think water in container B will take some time to boil?

- 6) State any **two** importance of heat transfer by conduction.

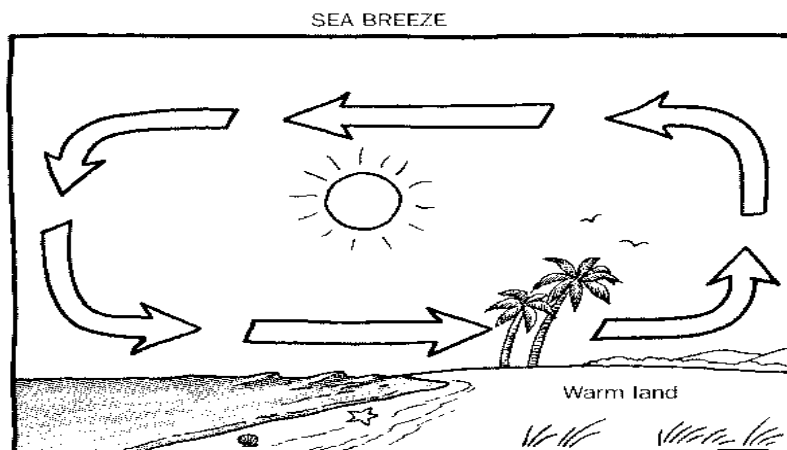
- 7) Mention any **two** importance of convection in our daily life

LESSON

SEA AND LAND BREEZE

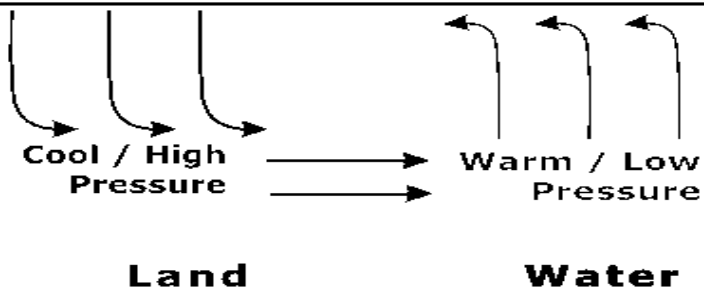
Sea breeze

It is when cool gentle current from the sea moves to the land to replace the warm risen air. It occurs during day.



Land breezes

It is when cool gentle current from the land moves to the sea to replace the warm risen air. It occurs at night.



K.A. Lemke

N.B.: Sea breeze brings cool fresh air on land.

RADIATION

Radiation is the process by which heat passes through a vacuum.

How does a person standing in Lira city on sunny day receive heat from the sun? By radiation

Importance of heat transfer by radiation in the environment

- Radiation is used while roasting meat, fish or chicken in an oven.
- It helps in warming our bodies using warmers or heaters.
- It dries harvested crops.
- It dries wet clothes on wires.

Reflectors and absorbers of heat

Reflectors: are shiny surface that reflect heat and light

Examples of reflectors

- Mirrors
- Glasses

Absorbers: are dull / black surface that absorb heat and light.

Examples of Absorbers

1. Black clothes
2. Black cars

Why are most houses, vehicles and fridges in most tropical countries like Uganda painted white?

To reflect heat

If John washed a black and a white shirt and spread under sunshine;

Which shirt would dry first?

The black shirt

Reason: Black absorbs a lot of heat.

Last? The white shirt

Reason: The white shirt would reflect heat.

ACTIVITY

- 1) Name the process by which heat passes through a vacuum.

- 2) How does a person standing in Moyo on sunny day receive heat from the sun?

- 3) State any **two** importance of heat transfer in the environment..

(i) _____

(ii) _____

- 4) What are reflectors?

- 5) State any **two** examples of reflectors.

(i) _____

(ii) _____

- 6) What are absorbers as used in heat energy?

- 7) State any **two** examples of absorbers

(i) _____

(ii) _____

- 8) Why are most houses, vehicles and fridges in Uganda painted white?

- 9) If John washed a black and a white shirt and spread under sunshine.

a) Which shirt would dry first?

b) State the reason to support your answer.

c) Which shirt would dry last?

d) State the reason to support your answer.

LESSON

Conductors and insulators of heat

Conductors are materials which allow heat to pass through them easily.

Good conductors:

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

Examples of good conductors of heat

- 1) Iron
- 2) Mercury
- 3) Aluminum
- 4) Brass

- 5) Zinc
- 6) Copper
- 7) silver

Aluminum 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;

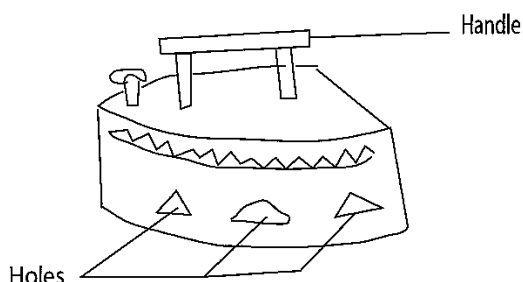
- It is very expensive
- It is heavy

Use of conductors

1. Conductors are used to make saucepans
2. Conductors are used to make kettles
3. Conductors are used to make bottoms of iron boxes

Activity

2. The diagram below shows a charcoal flat iron box.



- (a) Why is the handle of the flat iron box made of wood?
- (b) State the main reason why the handle of the iron box is not made out of metal.
- (c) State **one** use of holes in that iron box.
- (d) Mention one use of iron box at home.

.....

.....

(e) How does heat from the iron box reached the user's body?

.....

Bad or poor conductors of heat

Poor conductors of heat are materials which do not allow heat to pass through them

Insulators of heat

Insulators are the materials which don't allow heat to pass through them easily.

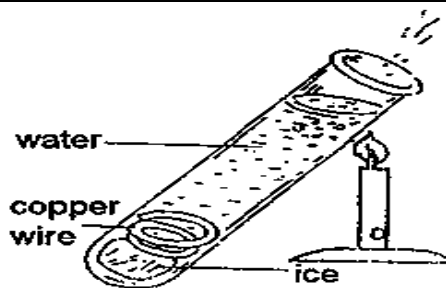
OR

Insulators are bad (poor) conductors of heat

Examples of poor conductors of heat

- i Distilled Water
- ii Rubber
- iii Plastic
- iv Paper
- v Wood
- vi Cotton wool
- vii Cloth
- viii Cork
- ix Wool

Experiment to show that water is a poor conductor of heat



Observation

- Ice did not melt
- The water will boil at the area being heated while the ice cubes at the bottom will remain unmelted.

Uses of Insulators

1. Paper is used to make cards
2. Cloth keeps us warm
3. Cork prevents heat loss in a vacuum flask.
4. Handles of saucepans, frying pans, flat irons, electric kettles are covered with plastic or wood to prevent our hands from getting burnt.

Why are handles of iron boxes, frying pans, flat irons made of wood, rubber / plastics?

To prevent the user from getting burnt

Heat reflectors and heat absorbers

Reflectors of heat (Heat reflectors)

These are objects that reflect heat.

- ✓ When heat falls on a shiny surface, it is bounced/reflected

Application of reflectors

1. Most refrigerators are painted white to reflect heat and remain cool inside
2. People in hot areas wear white clothes to reflect heat
3. Most buildings are painted white to reflect heat and remain cool inside
4. A Stevenson screen is painted white to reflect heat
5. Most vehicles are painted white to reflect heat

Absorbers of heat (Heat absorbers)

Heat absorbers are objects that absorb heat.

- ☑ When heat falls on a dull coloured surface, it is absorbed.
- ☑ 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 wearing a black shirt feels hotter than a person wearing a white shirt on a hot day because black absorbs heat while white reflects heat.

ACTIVITY

- 1) Which materials allow heat to pass through them easily?

- 2) State any **two** examples of good conductors of heat.

(i) _____

(ii) _____

- 3) What are insulators of heat?

- 4) Mention any **two** uses of conductors.

(i) _____

(ii) _____

- 5) State any **two** examples of poor conductors of heat

(i) _____

(ii) _____

6) State any **two** uses of Insulators

(i) _____

(ii) _____

7) Why are handles of iron boxes made of wood, rubber or plastics?

8) State any **two** applications of reflectors in our daily life.

(i) _____

(ii) _____

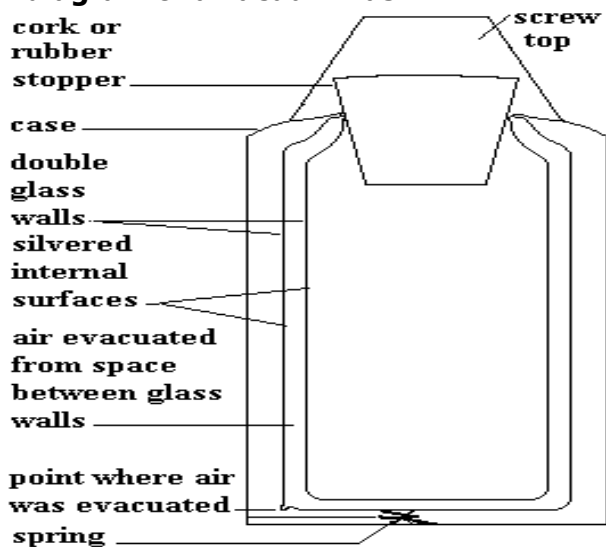
9) State the reason why person wearing a black shirt feels hotter than a person wearing a white shirt on a hot day.

LESSON

A Vacuum Flask (Thermometer Flask)

A vacuum flask keeps hot things hot and cold things cold.

A diagram of a vacuum flask



Uses of each part of a vacuum flask

- 1) **Cork:** Prevents heat loss or gain by conduction
- 2) **Cork base.** This supports the glass in position.
- 3) **Doubled silvered surfaces:** prevents heat loss or gain by radiation (a good reflect of heat).
- 4) **Vacuum:** Prevents heat loss or gain by both conduction and convection.
- 5) **Felt (cork base):** Absorbs shocks to prevent the glass from breaking.
- 6) Felt are also poor conductors of heat.
- 7) **Plastic/metal case.** This protects the double walled glass
- 8) **Vacuum seal:** Prevents matter from entering the vacuum.

ACTIVITY

1. Of what importance is the thermos flask at home?

2. Why is a vacuum seal important in thermos flask?

3. What is the use of the cork on the vacuum flask?

4. Why are the walls of a vacuum flask double silvered?

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

- I. Blue zone
- II. Yellow zone
- III. Pale blue zone
- IV. Central zone of unburnt zone

An experiment to show that oxygen supports burning

Burning candle

Carbondioxide remains in the glass

PUTTING OFF FIRE

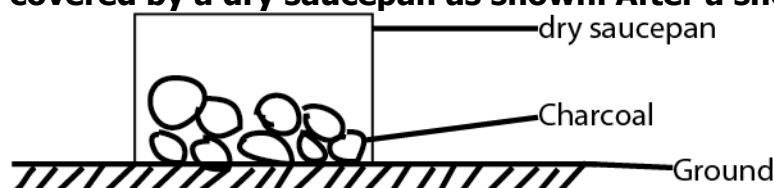
- I. Using fire extinguisher
- II. Using dust
- III. Using sand
- IV. Using water
- V. Wrapping yourself in a thick blanket
- VI. Rolling yourself on the ground

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

Activity

1. In the diagram below, burning charcoal was removed stove (sigiri) and it was covered by a dry saucepan as shown. After a short time, it stopped burning.



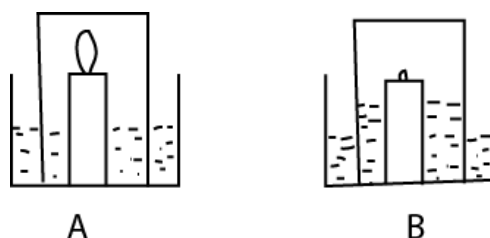
What is the experiment about?

Explain why the charcoal stopped burning when the saucepan was lowered on it.

Apart from supporting burning , mention any **two** uses of oxygen

Activity

1. The diagram below shows two stages in an experiment. Use it to answer the questions that follow



(a) Why did the candle flame go off in B?

.....

(b) What happened there after?

.....

(c) Name the gas inside when the candle flame goes off.

.....

(d) What is the air used for?

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

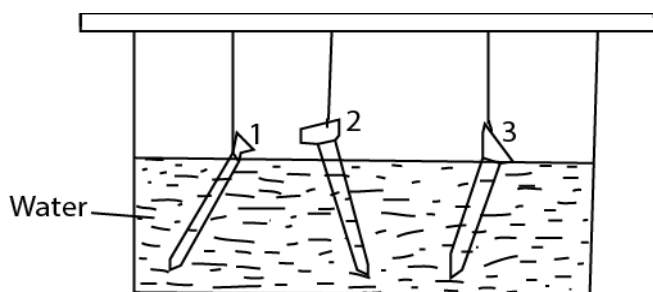
- I. Oxygen
- II. Moisture (water)

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

EXPERIMENT ON RUSTING

4 nails were placed in water as indicated below for one week .us the information to answer to answer the question that follow.

- Nail 1 was painted
- Nail 2 was not painted
- Nail 3 was greased.



(a) Which of the nails above have changed its colour overnight?

(b) What will grease do in nail 3 above?

(c) Why are metal object painted?

(d) Which nails will remain unaffected?

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 BURINING AND RUSTING

SIMILARITIES

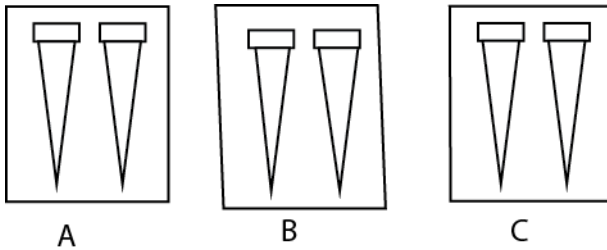
- a. Both require oxygen to take place
- b. Both are chemical reactions

DIFFERENCES

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

Activity

1. The diagram below shows two nails under three different conditions



In A – the nails were wrapped in clean wet cloth

In B – the nails were wrapped in clean dry cloth

In C- the nails were smeared with oil and then wrapped in a clean wet cloth.

(a) In which case did the nail rust?

(b) What is the importance of smearing with oil

(c) Name two conditions necessary for rusting.

TOPIC 3: GROWING CROPS

THEME: SCIENCE IN HUMAN ACTIVITIES AND OCCUPATION

TOPIC 1: OCCUPATION IN OUR COMMUNITY: CROP GROWING

LESSON

A crop is any plant grown and cared for.

A school garden is a piece of land at school which is meant for crop growing

Types of crops grown by farmers

ROOT CROPS

Root crops are crops that store their food in the swollen underground roots.

Examples of root crops

- 1) Cassava
- 2) Sweet potatoes
- 3) Carrots
- 4) Yams

Fruit crops

These are crops that produce fruits.

Examples of fruit crops are

- a) Apples
- b) Avocado
- c) Pineapple
- d) Oranges
- e) Mangoes
- f) Guavas
- g) Lemons
- h) Maize

Cereal crops

These are crops which produce grains.

Examples of cereal crops;

- 1) Rice

- 2) Wheat
- 3) Millet
- 4) Sorghum
- 5) Oat
- 6) Maize
- 7) Marley

Vegetable crops

Vegetable crops are crops that we eat their leaves.

Examples of vegetables are;

Spinach
Lettuce
Cabbages
Dodo (Amaranthus)
Nakati
Buuga
Sukuma wiki
Cucumber

Leguminous crops;

These are crops with nodules on their roots.

Examples are;

- i) Ground nuts
- ii) Bean crops
- iii) Pea crops
- iv) Soya bean crops

Tuber crops

Types of tuber crops

- 1) Root tubers
- 2) Stem tubers

Root tubers

These are crops which store their food in their swollen roots.

Examples of root tuber crops

- 1) Cassava
- 2) Sweet potatoes
- 3) Carrots
- 4) Coco yams

Stem tubers

These are crops which store their food in their swollen underground stems.

Examples of stem tubers

- 1) Irish potatoes
- 2) White yams

Characteristics of stem tubers

1. They have auxiliary bud (eye)
2. They have scaly leaves

Which part of an Irish potato do we eat?

The swollen underground stem

Activity

- 1) Give **two** examples of root crops commonly grown in your area.

(i) _____
(ii) _____

- 2) What are stem tubers?

- 3) Why is a sugar cane grouped under stem tubers?

- 4) How are the following crops propagated?

- i) cassava _____
 - ii) sweet potatoes _____
 - iii) bananas _____
- 5) Which food value do we get from eating mostly root crops?

 - 6) Define the term thinning.

 - 7) Suggest any **two** importance of weeding
(i) _____
(ii) _____
 - 8) In **two** ways how pruning is an advantage for farmers
(i) _____
(ii) _____
 - 9) Define the term pruning.

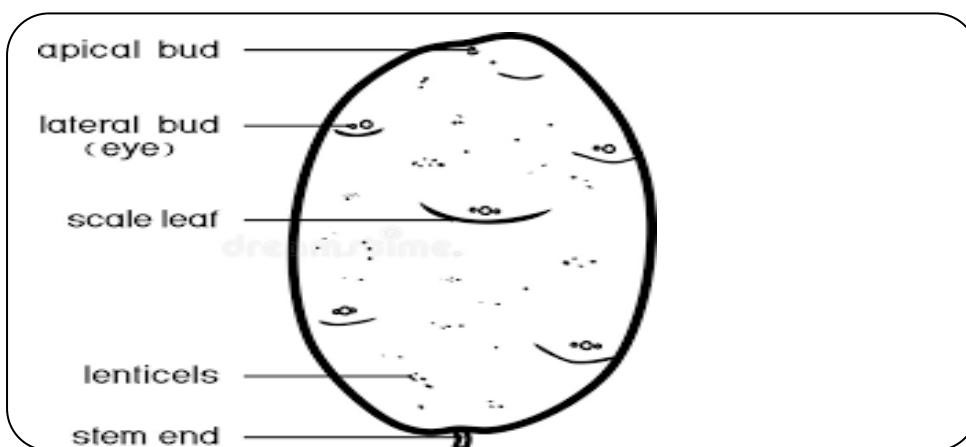
 - 10) What is staking?

 - 11) How is a root tuber different from a stem tuber?

 - 12) Outline any **two** other root crops besides sweet potatoes
(i) _____
(ii) _____

LESSON

Illustration of an Irish potato



Importance of legumes to the soil

- 1) Root nodules contain nitrogen fixing bacteria
- 2) Root cap protects the root tips from damage
- 3) They help to fix nitrogen in the soil.
- 4) Root hair sucks water and mineral salt from the soil.

How are the following crops propagated?

Crop	Propagation
Cassava	By planting stem cuttings
Sweet potatoes	By planting vines / stem cuttings
Carrots	By planting carrot seeds
Yams	By planting the roots

LESSON

Factors to consider while planning a school garden

- 1) Enough capital
- 2) Water source

- 3) Seeds to plant
- 4) Labour source
- 5) Garden tools
- 6) The well drained piece of land
- 7) It should be protected from animals

Qualities of a good school garden

- 1) Should have a nursery bed
- 2) Should have a record chart
- 3) It should have a demonstration garden
- 4) It should not be very far from the school
- 5) It should be near a water source

Importance of a school garden to pupils

- 1) Helps learners to learn how to dig
- 2) Helps learners to learn how to grow different crops
- 3) Helps learners to know how to care for crops

Importance of a school garden to a school

- 1) It is a source of food
- 2) It is a source of income
- 3) For learning purposes

Planting crops

Planting

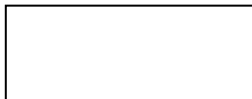
Planting is done in the wet / rainy season because there is enough rain water to support plant growth

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

A nursery bed is also called seed bed.

This is a piece of land where seedlings are first raised before being taken to the main garden.

Crops that can be raised from a nursery bed

- 1) Tomatoes
- 2) Onions
- 3) Egg plants
- 4) Carrots
- 5) Tobacco
- 6) Cabbages
- 7) Rice
- 8) Egg plants
- 9) Coffee plants

Examples of seeds planted directly in the main garden

Maize, beans, groundnuts

Factors to consider when setting a nursery bed

Shelter against run off water

Shelter against direct sunlight, storm and harsh weather

Importance of a nursery bed to seedlings

- 1) It protects seedlings from harsh weather conditions
- 2) It helps seedling to get used to harsh weather conditions after hardening off

Importance of a nursery bed to a farmer

- 1) It helps in proper selection of good seedlings
- 2) It gives time to a farmer to prepare the main garden
- 3) It helps the farmer to care for seedlings

Activities carried out on a nursery bed

- 1) Watering
- 2) Weeding
- 3) Thinning
- 4) Pruning
- 5) Spraying with chemicals
- 6) Hardening off.

Hardening off

This is the gradual removal of the shade to make seedlings get used to harsh weather conditions.

ACTIVITY

- 1) Mention **two** factors to consider while planning a school garden.
(i) _____
(ii) _____
- 2) Why does the school need to consider labour source before establishing school garden?

- 3) Mention **two** qualities of a good school garden.

- 4) Cite **two** importance of a school garden to pupils

- (i) _____
 (ii) _____
- 5) Mention **two** problems associated with school garden activities.
 (i) _____
 (ii) _____
- 6) Write **two** reasons why seeds can be first grown in a seed bed
 (i) _____
 (ii) _____
- 7) What is hardening off?

- 8) Mention **two** importance of a nursery bed to seedlings.
 (i) _____
 (ii) _____
- 9) Give **two** importance of a nursery bed to a farmer.
 (i) _____
 (ii) _____

DEMONSTRATION ON HOW TO GROW AND CARING FOR DIFFERENT CROPS

Crop growing practices

These are different activities done before and after planting seeds

Examples of crop growing practices

They all refer to all ways in which farmers care for their crops in the garden.

They include:

1. Weeding
2. Thinning
3. Watering
4. Manuring
5. Applying fertilizers.
6. Staking
7. Mulching
8. Providing shade.
9. Pruning.

Weeds

Weeds are plants which grow in a place where they are not wanted.

Examples of weeds

1. Wild finger millet grass
2. Black jack
3. Wandering Jew
4. Spear grass
5. Star grass
6. Couch grass
7. Elephant grass
8. Nut grass
9. Timothy grass
10. Macdonald's eye

Advantages of weeds

- a) Some weeds are used as vegetables to man
- b) For thatching houses
- c) Weeds are eaten by wild animals
- d) Some weeds control soil erosion
- e) For mulching
- f) Some weeds are used in the making of herbal medicine
- g) When weeds rot, they improve on soil fertility

Dangers of weeds

- 1) Weeds hide pests and diseases
- 2) They lead to poor growth of crops
- 3) Some weeds are poisonous to animals
- 4) Weeds compete with crops for sunlight, water and soil nutrients
- 5) Weeds make it hard for farmers to prun, spray and harvest
- 6) It is expensive to control weeds.
- 7) Reduce human efficiency during farm operation
- 8) Reduce quality of farm products

9) Activity

1. What are crop growing practices?

2. Mention any **two** examples of crop growing practices.

(i) _____

(ii) _____

3. What term is used to mean plants which grow in a place where they are not wanted?

4. Mention any **two** examples of weeds.

(i) _____

(ii) _____

5. State any **two** uses of weeds.

(i) _____

(ii) _____

6. Give any **two** examples of weed used for mulching.

(i) _____

(ii) _____

7. Mention any **two** dangers of weeds to the crop farmers.

(i) _____

(ii) _____

LESSON

Weeding

Weeding is the removal of unwanted plants from the garden.

Ways of controlling weeds.

1. By uprooting and burning them
2. By crop rotation
3. By mulching the garden
4. By spraying with herbicides
5. Slashing the weeds
6. Biological weed control method.

Advantages of weeding a garden

1. It makes harvesting easy.
2. It creates spaces for farm activities.
3. It reduces overcrowding of plants in the garden
4. It controls the easy spread of diseases.
5. It reduces competition for light, nutrients, water and space in the garden.

6. It prevents the easy spread of crop pests.

Activity

1. What are weeds?

2. In which way can root hair be of important to plants?

3. Name any **one** plant propagated by stem cuttings

4. Name the way in which yams are propagated.

5. State **two** ways of caring for crops growing in swampy areas.

6. In which way is weeding different from weeds?

7. In which way can weeds improve on soil fertility?

8. How is weed different from weeding?

9. Mention any **two** garden tools used for weeding

(i) _____

(ii) _____

10. State any **two** ways of controlling weeds in the garden.

(i) _____

(ii) _____

11. Name the chemical used for controlling weeds.

12. Suggest **two** reasons why weeds are more successful than crop plants in the garden.

(i) _____

(ii) _____

13. Mention any **two** reasons why farmers weed their cross in the garden.

(i) _____

(ii) _____

LESSON

Thinning

This is the removal of excess seedlings and poor growing seedlings from a planting hole or a nursery bed.

Examples of crops that needs thinning

- 1) Maize
- 2) Cotton
- 3) Rice
- 4) Millet
- 5) Sorghum
- 6) Simsim

Methods of thinning

- 1) Uprooting/digging out the plant
- 2) Cutting the plant at the base area

Tools used for thinning

- 1) Panga

- 2) Hoe
- 3) Hands

Importance of thinning

- 1) It reduces hiding places for pests
- 2) It gives good space for pruning, spraying and harvesting
- 3) It reduces competition for sunlight, air, water and soil nutrients
- 4) Thinned materials can be used for mulching
- 5) Crops grow bigger and yield more
- 6) It controls pests

ACTIVITY

1. What scientific term is used to mean the removal of excess seedlings from a planting hole or a nursery bed? _____
2. Why do farmers thin seedlings in the nursery beds?

3. Mention any **two** methods of thinning crops.
(i) _____
(ii) _____
4. Mention any **two** tools used for thinning crops
(i) _____
(ii) _____
5. Mention any **two** advantages of thinning crops.
(i) _____
(ii) _____
6. Give **two** commonly thinned crops
(i) _____
(ii) _____

LESSON

Pruning

This is the removal of some branches or leaves from a plant.

Plants that are pruned include

- 1) Banana
- 2) Coffee
- 3) Cocoa
- 4) Lemons
- 5) Oranges

Garden tools used for pruning

- 1) Secateurs
- 2) Pruning saw
- 3) Shear
- 4) A sickle

Importance of pruning

- 1) It reduces hiding places for pests
- 2) It gives good space for pruning, spraying and harvesting
- 3) It reduces competition for sunlight, air, water and soil nutrients among crops
- 4) Pruned materials can be used for mulching
- 5) Pruning reduces overcrowding of plants in the garden
- 6) Crops grow bigger and yield more

Mulching

This is the covering of soil with dry plant materials.

Note: Plant materials used in mulching are called mulches.

Common examples of mulches

- 1) Dry maize plants
- 2) Dry leaves

- 3) Coffee husks
- 4) Wood shavings
- 5) Dry banana fibres

Advantages of mulching

- 1) Mulching controls pests
- 2) Mulching improves soil fertility
- 3) Mulching maintains soil moisture
- 4) Mulching controls the growth of weeds

Disadvantages of mulches

1. Mulches can easily catch fire and burn crops.
2. Mulches are hiding places for crop pests e.g. rats.
3. Some mulches can turn into weeds
4. Mulches can easily catch fire and destroy crops
5. Mulching is tiring
6. It provides breeding ground for pests and disease vectors.
7. It is expensive to carry out.

ACTIVITY

1. What is mulching?

2. What name is given to the materials used in mulching?

3. Give any **two** examples of mulches.
(i) _____
(ii) _____
4. Why are dry banana leaves used as mulches?

5. Mention **two** advantages of mulching.
(i) _____
(ii) _____
6. State any **two** disadvantages of mulching.
(i) _____
(ii) _____
7. Mention any **two** crop pests which breed under mulches.
(i) _____
(ii) _____
8. State any **two** disadvantages of mulching.
(i) _____
(ii) _____

LESSON

Types of Mulching Materials

• Organic materials.

They include sawdust, wood shavings, coffee pulp, dry grass, banana leaves, dry maize stalks and any other appropriate vegetation.

Inorganic/synthetic materials

They can be black, yellow or transparent polythene sheets.

NB; how does mulching conserve soil moisture?

Mulching prevents direct sun rays from reaching the soil to cause evaporation.

How does mulching improve soil fertility?

Mulches rot and form humus.

How does mulching control soil erosion?

By reducing the speed of fast flowing water

ACTIVITY

1. What name is used to mean materials used for mulching in the garden?

2. State any **two** types of mulching materials.

(i) _____

(ii) _____

3. Mention any **three** examples of organic materials.

(i) _____

(ii) _____

4. Give another name for inorganic materials.

5. How does mulching conserve soil moisture?

6. How does mulching improve soil fertility?

7. How does mulching control soil erosion?

8. Apart from mulching mention any **two** ways of controlling soil erosion.

(i) _____

(ii) _____

Below is an illustration of a farm activity. Use it to answer questions that follow

(a) Name the crop growing activity illustrated below.



(b) What scientific name is used to mean materials which can be used to carry out the above activity?

(c) Mention any **two** materials which can be used to carry out the above illustrated activity.

(i) _____

(ii) _____

(d) **State** any **two** importance of carrying out the above illustrated activity.

(i) _____

(ii) _____

LESSON

Staking

Staking is supporting plants having weak stems using strong sticks

Methods of staking

(a) **Propping.**

This is providing support to tall varieties of bananas and those with heavy bunches using forked (Y- shaped) stakes.

(b) **Trellising.**

This is providing support to crops with vines using wire or sisal strings. The strings are held by poles at definite spacing e.g. in passion fruits.

(c) **Earthing up**

This is the placement of soil in form of a heap around the base of the plant.

(d) **Training**

This is the use of sticks or wires to give support to a growing plant. E.g in tomatoes

Examples of staked crops are;

1) Banana

2) Passion fruits

3) Vanilla crops

4) Tomatoes

Reasons for staking

- 1) Staking enable easy spraying of crops
- 2) Staking protect fruits from damage from the ground
- 3) Staking give support to the plants
- 4) Staking enables easy harvesting and weeding of crops.

ACTIVITY

1. What is staking?

2. Mention any **two** methods of staking.

(i) _____

(ii) _____

3. Give **two** examples of staked crops.

(i) _____

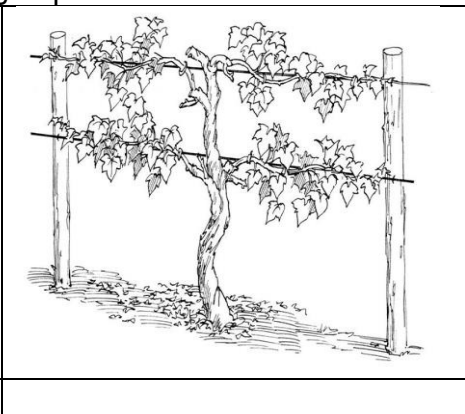
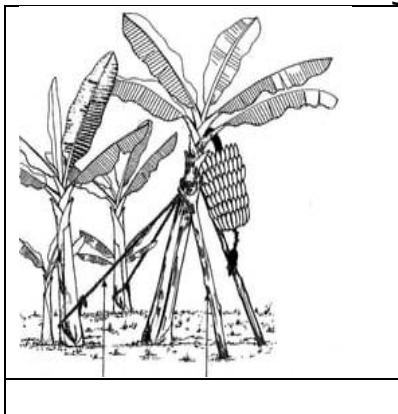
(ii) _____

4. Mention any **two** reasons for staking crops in the garden.

(i) _____

(ii) _____

6. Name the methods of staking of plants shown below.



LESSON

Crop rotation

It is the growing of different types of crops on the same piece of land seasonally.

Advantages of crop rotation

1. It maximizes utilization of nutrients
2. It controls weeds
3. It controls soil pests and diseases
4. It improve on soil fertility
5. There is soil structure improvement
6. It controls soil erosion

Note:

1. Legumes are alternated with non – leguminous plants.
Why: They make soil more fertile since legumes add nutrients to the soil.
2. Shallow rooters are alternated with deep rooters.
Why? This balances the use of nutrients from soil at different levels.
Watering: Is the supply of water to crops

Factors influencing crop rotation

- 1) Crop root depth
- 2) Soil structure
- 3) Pests and disease control.
- 4) Weed control
- 5) Crop nutrient requirement
- 6) Soil fertility

ACTIVITY

1. What is crop rotation?

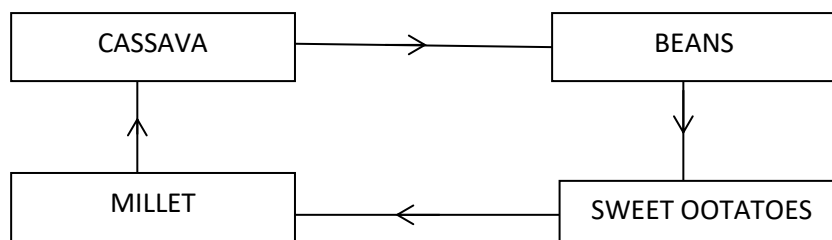
2. Mention any **two** reasons for carrying out crop rotation.

(i) _____

(ii) _____

3. Why are legumes alternated with non – leguminous plants?

4. **The diagram below shows a crop rotation cycle**



5. 16. What is the importance of beans in this cycle to the rest of the crops?

6. State the reason why shallow rooters are alternated with deep rooters.

7. Mention any **two** factors influencing crop rotation

(i) _____

(ii) _____

8. Mention **two** farm expenses reduced by practicing crop rotation.

(i) _____

(ii) _____

LESSON

Common crop pests and diseases

Crop pests are living things that spoil/destroy crops.

Pests can be birds, animals or insects.

Examples of crop pests

- 1) Monkeys
- 2) Squirrels
- 3) Rats
- 4) Locusts
- 5) Moles
- 6) Weevil
- 7) Weaver birds
- 8) American bale worms
- 9) Rhinoceros
- 10) Maize stalk borer
- 11) Eel worms

ROOT CROP PESTS AND DISEASES

Pests:

Pests are living organisms that destroy crops e.g. birds, worms, insects, rodents etc

Diseases:

Diseases are illness /sickness in living organisms i.e. plants and animals.

A table showing crops, pests and the part they destroy

Crop	Pest	Affected part
Cassava	Green cassava mite, rat, squirrels, moles Whitefly,	Tips of cassava shoot, roots
Sweet potato	Squirrels, rats, moles eel worm	Roots

Irish potato	Irish aphid	leaves
Carrots	Eel worm	Roots
Sugar cane	Stalk borer, aphids, termites	Stem
Banana	Banana thrips, Banana weevil	Fruits Stem/corm
Tobacco	White fly	Leaves
Coconut	Rhinoceros	Fruits
Cabbages	Cut worm	Stem
Coffee & cocoa	Mealy bug	Leaves
Maize	Maize stalk borer	Stem

Diseases of some crops

The table below shows crops, diseases and the part affected.

Crop	disease	Affected part
Cassava	Cassava mosaic Brown steak	leaves
Sweet potato	Sweet potato blight	Leaves & stems
Sugar cane	Leaf spot disease, Raton stunting disease	Leaves/Stem
Banana	Wilt disease, cigar end rot Panama disease	Leaves Stem/leaves
Cabbages	Black rot disease	leaves
Coffee tea	Wilt disease Coffee berry disease Armillary root disease	Leaves Coffee berries Roots
Maize	Maize streak	Leaves
Mangoes	Powdery mildew, smuts	Leaves & stems
Ground nuts	Rosette disease	Leaves
Cotton	Bacterial blight disease	

Characteristics of root crop pests

- 1) Pests which damage the shoot system (leaves and stem /branches) have strong mouth parts to cut and chew the leaves.
- 2) Pests which destroy the tubers have sharp claws which help them to dig the soil
- 3) They have sharp incisors which bite or cut the roots /tubers.
- 4) Other pests that damage root crops have fingers which they use to uproot the root a crop e.g. apes and monkeys.

Examples of insect pests

- 1) Locusts
- 2) Caterpillars
- 3) Army worms
- 4) Sweet potatoes weevils
- 5) Variegated grasshoppers

Effects of pests damage on crops

- 1) The leaves and stems loses chlorophyll
- 2) The root tubers get damaged
- 3) The root crop which develop are of a poor quality
- 4) They lead to poor yields
- 5) They lead to stunted growth

Dangers of pests to crop farmers

- 1) Pests damage farmer's crops
- 2) Reduces on the crop yields
- 3) Cause decay of root crops
- 4) Wastes money to control them

Uses of pests to farmers

- 1) Some pests are a source of food to man e.g. grasshoppers and locusts.
- 2) Some are eaten by farmer's poultry e.g. caterpillars

Common signs of pests and diseases damage on crops

1. Holes in leaves, fruits & stems on crops
2. Change in colour of leaves, stem and fruits
3. Rotten plant parts
4. Pre – mature ripening
5. Abnormal deformed parts
6. The root crops which grow are of poor quality and do not have the right taste
7. Stunted growth

ACTIVITY

1. What are crop pests?

2. Suggest any **two** uses of pests to farmers

(i) _____

(ii) _____

3. Mention any **two** cultural control method of pests

(i) _____

(ii) _____

4. Define the term crop rotation.

5. Identify any **two** characteristics of root crop pests

(i) _____

(ii) _____

6. Name the pest that attacks the following root crops.

(i) Cassava _____

(ii) sweet potatoes _____

(iii) carrots _____

LESSON

Major Control Methods of Pests

Mechanical control method

- 1) physical guarding (Fencing the garden)
- 2) Silting traps /scares
- 3) Staying scary crows

The above methods can control pests like wild pigs, moles, birds, rodents

Biological pest control

This is where a predator is used to control the pests e.g. you can tame a cat to kill rats.

Cultural methods

- 1) By practicing crop rotation
- 2) The available pests of a particular crop
- 3) Early planting and harvesting
- 4) Practicing resident species /varieties
- 5) Through proper control of weeds
- 6) By planting disease free materials

Chemical control method

This is a method where a farmer sprays pesticides /insecticide to kill the pests.

Harvesting and storage of crops

Harvesting

Harvesting is the removal of mature and ready crops from the garden.

Harvesting is normally done during dry season.

Why harvesting should be done during dry season

There is enough sunshine to dry the harvested crops

Methods of harvesting crops

- 1) Hand picking
- 2) Plucking
- 3) Cutting
- 4) Doffing with hoes, hands, sticks
- 5) Uprooting

Disadvantages of early harvesting

- 1) Seeds contain a lot of moisture, so they can rot
- 2) The quality of seed is poor
- 3) The grain are small and shrunk
- 4) The seeds are not good for harvesting

Ways of processing crops

- 1) Sun drying
- 2) Smoking
- 3) Adding chemicals to crops

Crop Storage

Crop storage is the keeping of harvested crops safely for future use.

Methods of storing root crops

Temporary storage e.g. burying the tubes under wet soil

Long time storage (after drying the slices) e.g. storing in granaries /sacks /slices (modern stores) silos

Storage facilities

Granaries, Silos, Stores

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.

Q. Why should rat guards be fixed on a granary?

To prevent rats from entering the granary

How is the rat guards adapted to their function?

Rat guards have slippery surfaces that make rats to slide when entering the granary.

Conditions for proper storage

- 1) The grains /seeds should be stored when they are dry
- 2) The roof of the store should not be leaking
- 3) The store should have good ventilation
- 4) Rat guards should be fixed on the granary
- 5) Root crops should be dried first before storing them
- 6) Seeds should be dusted with pesticides before storing them

ACTIVITY

- 1) State the difference between root crops and stem tubers

- 2) Mention any **two** root crop pests you know.

(i) _____

(ii) _____

- 3) Mention any **four** ways of controlling crop pest.

(i) _____

(ii) _____

- 4) Cite down **two** ways of caring for crops.

(i) _____

(ii) _____

- 5) In one sentence show that you understand the following terms.

(i) Crop rotation _____

- (ii) Staking _____
 (iii) Mulching _____
 (iv) Agro forestry _____
 (v) Thinning _____
- 6) Define the term crop storage.

- 7) Identify the methods used in harvesting the following crops.
 a) Cassava _____
 b) Tomatoes _____

KEEPING AND USING FARM RECORDS

LESSON

Farm records

These are details or information concerning all activities that take place on a farm.

Example of farm records used on root crops

- 1) Farm inventory e.g. farm equipment size of lands.
- 2) Cash record e.g. money spend or received when carrying out the project
- 3) Non-cash records – unpaid for labour may be family members
- 4) Records of production e.g. number of acres planted /map of the farm

Importance of keeping farm records

- ☒ They help in proper future planning
- ☒ They help in fair taxation of the farmer
- ☒ To know the progress of the farm
- ☒ Proper records can be used to get loans in the bank
- ☒ To know whether the farmer is making profits or losses

SPECIMEN OF FARM RECORDS SHEET

Date	Crop planted	Date of weed control	Date of manuring	Date of harvest	Date of sale
2/2/2005	Cassava	3/3/2005	3/4/2005	7/7/2005	13/5/2005

ACTIVITY

- 1) What are farm records?

- 2) Mention any **two** importance of keeping farm records
 (i) _____
 (ii) _____
- 3) How can root crops be cared by crop farmers

- 4) Give any **two** examples of stem tubers
 (i) _____
 (ii) _____
- 5) State any **two** importance of farm records on a crop farm.

- 6) Identify the main role of the wildlife club in a school like Gombe Standard Primary School.

- 7) Which is the best season for crop growing

- 8) How are the following crops propagated
 i) Sweet potatoes: _____
 ii) Cassava _____
 iii) Carrots _____

9) Which food value is mostly obtained from root crops

10) Give the difference between a pest and a parasite.

LESSON

SCIENCE CLUBS / SOCIETIES IN THE SCHOOL

The science clubs

Science club is a club which involve learners in science related activities.

Examples of Science related societies.

- 1) Wildlife clubs
- 2) Red cross clubs
- 3) Young farmers clubs
- 4) Science contest
- 5) Science exhibition
- 6) Science quizzes
- 7) Science projects
- 8) Science paper presentation

Importance of science activities to learners

- 1) Develop a positive attitude in learners towards science.
- 2) Expose learners to the kind of work that can lead to their career
- 3) Shape learners for their future career in the science field i.e. doctors, engineers, surgeons, dentists, electricians, and agriculturalist.

Wildlife club

Enables learners to learn more about uncultivated plants and wild animals that exist in the natural environment

Roles of the wild life club

- 1) Protecting the environment.
- 2) Conserving the environment.
- 3) Teaching or sensitizing others to protect or conserve the environment.

Activities done by the wildlife clubs in school

- 1) Maintaining a free nursery in the school
- 2) Tree labeling
- 3) Establishing wood / tree projects
- 4) Monitoring wildlife abusers e.g. poachers
- 5) Bird watching
- 6) Preventing water, air and soil pollution
- 7) Setting up a botanical garden
- 8) Construction of an aquarium

Aims of the science-oriented clubs in school

- 1) To promote /boost children's interests in the science subject
- 2) To enable children to know how scientists work.
- 3) To equip learners with knowledge and skills for their future career.
- 4) To promote learning of science in the school.

The young farmers club

The young farmers clubs include young boys and girls in and out of school who are interested in farming.

Roles of the young farmers clubs

- 1) To keep animals and grow crops.
- 2) To teach other farmers better farming methods.

Qn: When are the activities of young farmer's clubs done?

- After school time

Qn: Under which department / ministry in Uganda are the young farmers clubs?

- Ministry of agriculture, fisheries and animal husbandry

Role of the department of agriculture in young farmers clubs

- 1) To unite all the young farmers' clubs in the country.
- 2) To set up competitions in school where prizes are given to winners.
- 3) Train and send technical people to teach and answer questions of the young farmers.
- 4) To teach young farmers better farming methods.
- 5) To start money making and savings projects for self support.

ACTIVITY

1. Suggest **two** aims of the science oriented clubs in school.
(i) _____
(ii) _____
2. Mention **two** importance of the young farmers clubs.
(i) _____
(ii) _____
3. Identify any **two** importance of science activities to learners.
(i) _____
(ii) _____
4. Outline any **two** examples of science oriented societies.
(i) _____
(ii) _____
5. When are the activities of young farmer's clubs done?

6. How is Science club different from the young farmers club?

7. Mention **two** roles of the wild life club to the environment.
(i) _____
(ii) _____
8. Give **two** activities done by the wildlife clubs in school.
(i) _____
(ii) _____
9. Mention **two** roles of the young farmers clubs.
(i) _____
(ii) _____

TOPIC 4: BACTERIA AND FUNGI

Bacteria are microscopic single celled organism that is present everywhere.

Bacteria are single celled organisms that reproduce by means of binary fission.

Bacteria cannot be seen using our naked eyes. This is because they are too tinny to be seen with our eyes.

They are seen using the microscopes.

Bacteria moves by use of flagella.

Places where bacteria are found

1. Animal bodies
2. Contaminated water
3. Contaminated food
4. In the Soil
5. In decaying matter
6. Nodules of legumes
7. Pit latrines
8. Rubbish pits
9. In air

Reproduction of a Bacteria

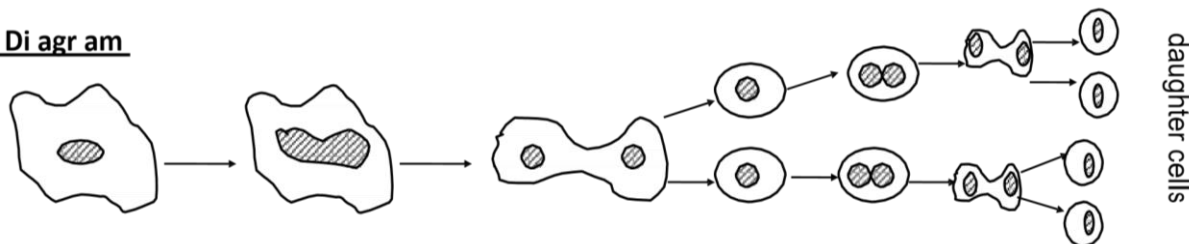
- 1) By cell division (binary fission)
- 2) By spore formation

Note: Bacterium is a singular form of the word **Bacteria**.

Illustration of binary fission

- Binary fission is when the bacterium divides into two bacterial cells that are genetically identical

Diagram



Nature of bacteria

✓ **Aerobic bacteria**

These are bacteria which need oxygen to respire.

✓ **Anaerobic bacteria**

- These are bacteria that do not need oxygen to respire and many of them cause disease.

ACTIVITY

1. What are bacteria?

2. Name the scientific instrument used for observing bacteria.

3. How do bacteria reproduce?

4. Name the structure used by the bacteria to move.

5. State any **two** reasons why bacteria move from one place to another.

6. Identify **two** places where bacteria are found.

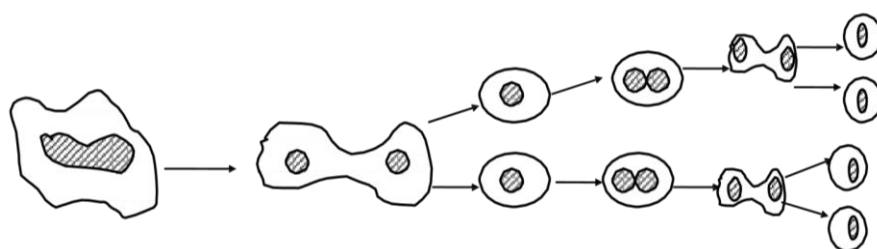
7. What do you understand by:

a) Aerobic bacteria

b) Anaerobic bacteria

8. In which way is reproduction in bacteria similar to that in fungi?

The diagram below shows the mean of reproduction in living things. Use it to answer questions that follow.



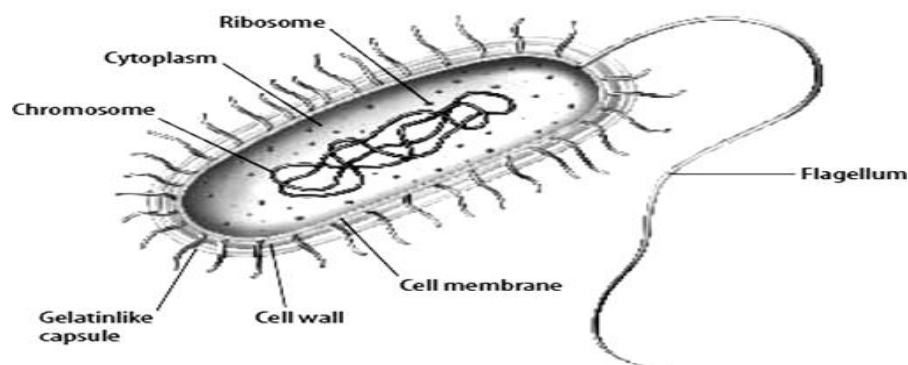
9. Name the mean of reproduction shown above.

10. Which group of living things reproduce by the mean shown above?

11. State any **two** common places where we can find the organism named in (b) above.

Lesson

The structure of a bacterium



Nucleus: controls activities of the cell.

Cilia: used for movement while other use the flagellum.

Cytoplasm: liquid matter in the cell.

Vacuole: sac for waste materials/ food.

Cell wall: holds the nucleus, cytoplasm, and vacuole and allows food and air into the cell.

It also allows the cell to excrete waste.

Characteristics of bacteria

- Bacteria are single celled (have one cell)
- They reproduce by binary fission
- Bacteria are microscopic organisms.
- Bacteria respire.

Groups of bacteria

Bacteria are grouped according to their :

1. Shapes
2. Way of feeding
3. Way of locomotion
4. Absence or presence of the protein capsules

Types of bacteria

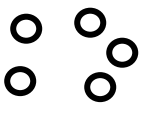
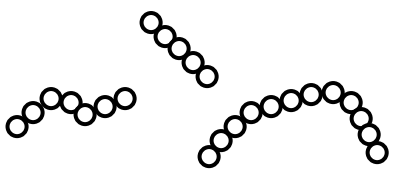
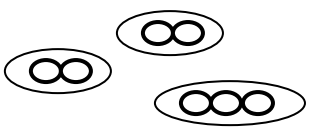
1. Spherical bacteria/cocci
2. Rod-shaped bacteria/bacilli
3. Spirilla(spiral) bacteria/spirochaete
4. Vibrios bacteria

Spherical bacteria/cocci

They are also called cocci bacteria. They cause pneumonia, boils sore throats.

They are spherical in shape

Examples of spherical bacteria

		
<i>Staphylococcus</i> (boils, blood poisoning)	<i>Streptococcus</i> (cause sore throat, scarlet fever)	<i>Diplococcus</i> cause pneumonia)

Rod-shaped bacteria/bacilli

Rod shaped bacteria are also called **bacilli**.

They are cylindrical in shape.

They cause anthrax, typhoid

Examples of rod shaped bacteria

Bacillus anthracis

Salmonera typhi

Spirilla(spiral) bacteria/spirochaete

The spirilla bacteria do not move while the spirochaete move.

Example.

Treponema causes syphilis, Vibrio cholera causes cholera

Examples of spiral bacteria

Treponema

Vibrios bacteria

They are also called comma shaped bacteria.

Example is vibrios cholerae which causes cholera.

Viruses are also pathogenic but they are much smaller than bacteria

They do not reproduce on their own; they need some host in order to reproduce. This makes them slower and moves awkward at reproduction.

Reasons why viruses are not classified as living organisms

- They cannot reproduce on their own; they need a host cell in order to reproduce.
- They are not cells but particles
- They do not have nucleus, cytoplasm, or cell membranes which are common in cells of living organisms.
- They are smallest than bacteria and can only be seen by use of **electro – microscope**.

Conditions necessary for bacteria to breed or multiply

1. Absence of chemicals that kill them
2. Presence of certain amount of air
3. Optimum temperature
4. Presence of food
5. Presence of moisture

Conditions that do not favour breeding of bacteria

1. High temperature
2. Very low temperature
3. Presence of chemicals

ACTIVITY

1. What is binary fission?

2. State any **two** conditions that favor the breeding of bacteria.

(i) _____

(ii) _____

3. Mention any **two** conditions which do not favour the growth of bacteria.

(i) _____

(ii) _____

4. Mention any **two** types of bacteria.

(i) _____

(ii) _____

5. **Name the type of bacteria shown below.**



6. Name the disease spread by the bacteria shown above.

7.

8. State **two** conditions that can kill the above type of bacteria.

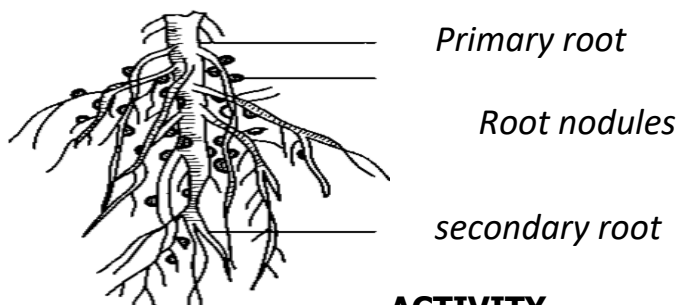
(i) _____

(ii) _____

LESSON

Importance of useful bacteria

1. Bacteria break or digest fibre food/ roughage / cellulose in the caeca of birds
2. Bacteria help in decomposition / rotting of dead plants and animals
3. Bacteria help to reduce on the amount of faeces in pit latrines as well as sewage tanks
4. Bacteria help in fermentation of beer, ghee, yoghurt, and cheese.
5. Bacteria help in making humus (manure) in compost pits)
6. Bacteria help to reduce on the amount of garbage as they rot.
Bacteria do not help in ripening of fruits. They only destroy them .
Ripening of fruits is brought by the ethylene hormone in plants.
Bacteria that cause diseases to people are called **pathogens**.
7. Nitrogen fixing bacteria fix nitrogen back into the soil to improve soil fertility



ACTIVITY

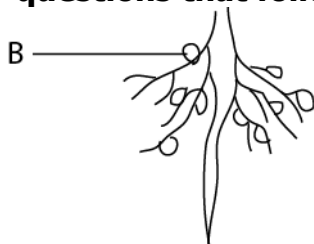
1. How are bacteria found in latrines useful?

2. Name the hormones responsible for the ripening of fruits.

3. Why is it not advisable to pour chemicals in the latrines?

4. What are pathogens?

1. The diagram below shows the root of a plant. Use it to answer the questions that follow.



- (a) Name the part labelled B.

(b) What does part labelled B contain?

(c) What is the function of what you named in (c) above?

(d) Name the organisms which are found in structures marked with letter B.

(e) Name the plant group with structures marked with letter B.

5. State any **two** examples of plants with structures marked with letter B.

(i)

(ii)

LESSON

Harmful bacteria

These are bacteria which cause diseases to human beings, plants and other animals.

Dangers of harmful bacteria

1. Harmful bacteria cause diseases to both animals and plants.
2. Bacteria cause poor yields to crops
3. Bacteria cause food poisoning
4. Bacteria contaminate food and makes it poisonous to human health

Examples of diseases by bacteria in animals

1. Typhoid
2. Diphtheria
3. Mastitis
4. Anthrax
5. Syphilis
6. Diarrhoea
7. Tuberculosis
8. Pneumonia

Examples of diseases caused by bacteria in plants

1. Blight disease
2. Wilt disease
3. Black rot disease

ACTIVITY

1. What are harmful bacteria?

2. State any **two** ways bacteria are harmful to people.

(i)

(ii)

3. How do bacteria make food unsafe for eating?

4. Mention any **two** examples of animal diseases caused by bacteria.

(i) _____

(ii) _____

5. Give any **two** examples of diseases caused by bacteria in plants

(i) _____

(ii) _____

6. Which type of bacteria cause the following disease

i) Gonorrhoea

ii) Syphilis

iii) Cholera

7. Suggest any **two** ways in which bacteria are harmful to the plants.

8. Which bacteria do the following?

a. Add nitrogen back into the soil

b) _____ Make _____ food _____ go _____ bad?

c) _____ Cause _____ typhoid

d) _____ Cause _____ cholera

9. Identify any **two** immunisable disease caused by bacteria

LESSON

How to control dangers caused by harmful bacteria

1. Immunization/vaccination of animals
2. Treating animals with antibiotics
3. By using disinfectants to kill bacteria
4. Through pasteurization (involves) heating the food stuffs to a high temperature and sealing it before suddenly cooling it
5. Maintaining proper hygiene

6. Through sterilization of medical instruments e.g. syringe
7. Proper ventilation of animal house (pneumonia)
8. Spraying plants with chemical that kill bacteria

Chemicals used for killing bacterial germs

- Antiseptics
- Disinfectants
- Antibiotics

Antiseptics are chemicals used to kill germs in the wounds or sewerage systems.

Examples of antiseptics

Iodine solution, spirits, hydrogen peroxide

Disinfectants are chemicals used to kill germs on the surfaces.

Examples of disinfectants

Liquid soap, disinfectant balls, bar soap like Protex, Deltal

Antibiotics are drugs used to treat bacterial infections.

Examples of antibiotics.

Aspirin, Ampicillin, Septrin, Tetracycline.

Antibiotics can be in form of tablets, syrups or cream

Sterilization is the method of killing germs on medical instruments using heat or chemical.

Activity

1. Name **one** medical instrument that needs to be sterilized to avoid transmission of bacterial infection.

2. How are antiseptics able to prevent wound from becoming septic?

3. Name the cheapest and commonest antiseptics used in killing germs in wounds.

4. Define the following terms:

Disinfectants

Antibiotics

5. Give any **two** examples of:

Antiseptics

Disinfectants

Antibiotics

6. State any **two** states of matter in which antibiotics exist.

7. How is antibiotics different from antiseptics?

8. Suggest any **two** importance of useful bacteria.

9. Outline **two** dangers of harmful bacteria

FUNGI

Fungi are simple organisms that feed on decaying plants and animal matter.

Fungi are saprophytes because they feed saprophytically (obtain soluble food from dead organic matter).

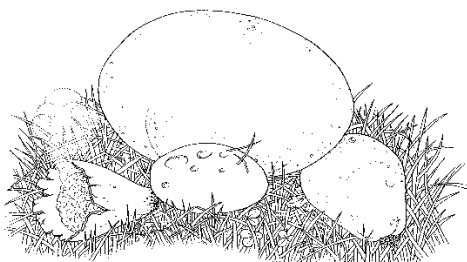
Fungi do not have proper roots but mycelium.

They use mycelium to absorb food from dead and decaying plants and animal matter.

They are both cellular and unicellular organism.

Examples of fungi

1. Mushrooms
2. Puffball
3. Toadstools
4. Yeast
5. Moulds
6. Potato blight fungus



Characteristics of fungi

1. Fungi exist in both as single celled (unicellular) or multicellular organisms.
2. Fungi lack chlorophyll (they can't make their own food)
3. They grow in moistened places
4. Their bodies are made up of branched threads called **hyphae**.
5. Fungi feed saprophytically or parasitically
6. They have nuclei in their cells

7. They reproduce by means of spores except yeast which reproduce by cell budding.

How different fungi reproduce

- a) Yeast by cell budding.
- b) Moulds by means of spores.
- c) Toad stools by means of spores.

Groups of fungi

- ✓ Saprophytic fungi
- ✓ Parasitic fungi

- **Saprophytic fungi**

Saprophytic fungi are fungi which feed on dead and decayed plant and animal remains.

- **Parasitic fungi**

Parasitic fungi are fungi which feed on other plants.

ACTIVITY

1. What are multicellular organisms?

2. Why is a mushroom not a plant?

3. Mention any **two** examples of fungi
(i)

(ii) _____

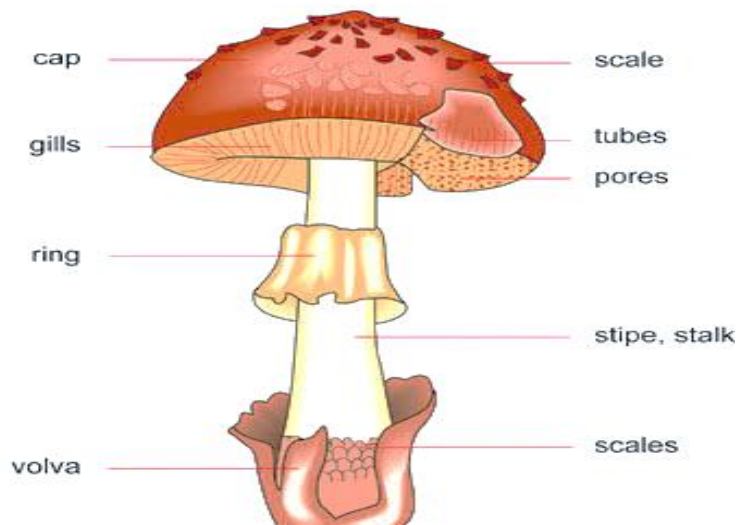
4. How do mushrooms reproduce?

5. State the feeding mode of fungi

Importance of fungi

- 1. Some fungi like yeast are used to bake bread and cakes
- 2. Some fungi like mushrooms are a source of food to man
- 3. Some fungi like moulds (*penicillium rotatum*) are used to make medicines
- 4. Yeast is used to brew local beer or ferment fruit juices to make wine
- 5. Fungi help in decomposition of rubbish in rubbish pits to make humus
- 6. Yeast is used to flavor cheese
- 7. Some are herbal medicine like mushroom
- 8. Some are source of income like mushroom
- 9. Yeast is a source of vitamin B that prevents beriberi

MUSHROOM



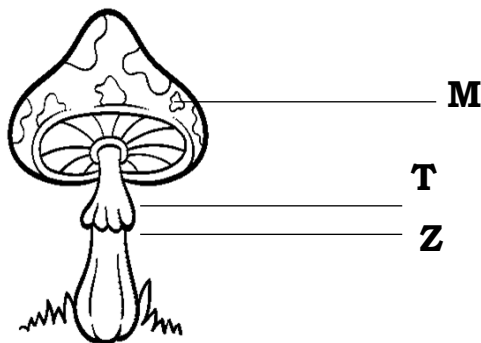
A part of a mushroom

Functions of each part of a mushroom

1. **Cap** holds and protects the gills.
2. **Gills** produce and stores spores.
3. **Stalk/stipe** holds the cap in position.
4. **Hyphae or mycelium** helps in absorbing food from decaying matter.
5. **Ring**: It holds the cap when a mushroom is still young.
6. **Volva**:
7. **Scales**:
mushrooms cannot make their own food because they have no chlorophyll. They feed saprophytically

Activity

1. Use the diagram below to answer the questions that follow



2. (a). Name parts marked

i. M

ii. T _____

iii. How is part Z important to a mushroom?

3. How are gills important to the mushrooms?

4. Why can't mushroom make its own food?

5. Which food value do we get from mushrooms?

6. Which part of a mushroom helps in absorbing food from decaying matter in the soil?

7.

8. State any **two** uses of mushroom to people.

(i)

(ii)

9. Mention any **one** economic value of mushroom to people.

(i)

(ii)

10. Identify any **two** characteristics of fungi

(i)

(ii)

11. Why can't a mushroom make its own food?

LESSON

Uses of fungi

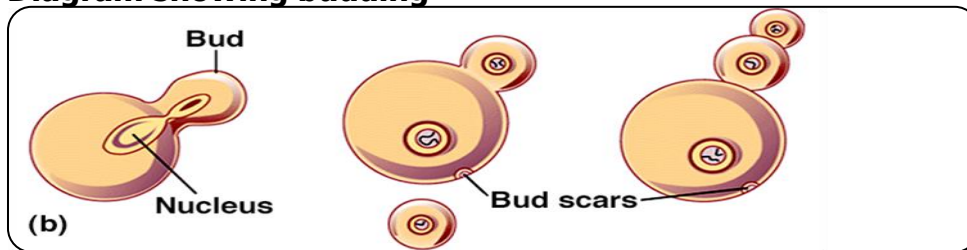
1. Yeast is a source of vitamin B
2. Yeast is used in making or brewing of alcohol
3. Fungi helps in decomposition of organic matter
4. Penicillium mould are used to produce medicine e.g. penicillin antibiotics
5. Yeast is used to increase the volume of dough in bakeries
6. Fungi are source of local medicine
7. Fungi helps in the formation of humas
8. Mushrooms are eaten as food.

How do fungi reproduce?

Most fungi reproduce by means of **spores** unlike Yeast which reproduces by **cell budding**

Budding is the process by which a daughter cell breaks off from the parent cells.

Diagram showing budding



Yeast is a fungus which exist as a single celled.

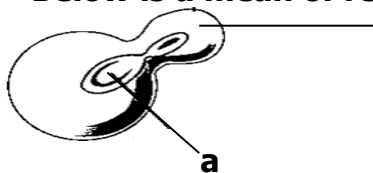
Yeast live in sugar containing juices

It reacts with sugar to form alcohol. This process is called fermentation.

ACTIVITY

1. State the fungus which reproduce by budding.
- 2.
3. How does yeast help in the formation of alcohol?
- 4.
5. What is fermentation?
- 6.
7. In which way is the reproduction of most fungi different from that of the yeast?
- 8.
9. State any **two** uses of yeast to man.
- 10.
11. Name the main food value we obtain from man.
- 12.
13. Name the fungus which helps in brewing of alcohol.
- 14.
15. Name the mould from which penicillin antibiotics are made.
- 16.

Below is a mean of reproduction in an organism.



17. Name the mean of reproduction shown above.
- 18.
19. Name **one** organism which reproduce by the mean shown above.

LESSON

HARMFUL FUNGI

Harmful fungi are poisonous fungi which when eaten can cause death to man or an animal.

Examples of harmful fungi

1. Toadstools
2. Puffballs
3. Bracket fungi

Toadstools are poisonous to people when eaten.

They resemble the mushrooms but they have brightly colored than the mushrooms.
Moulds reproduce by means of spores.

Examples of mould include: mucor, penicillin and Rhizopus

Dangers of harmful fungi

- ✓ Harmful fungi cause food poisoning
- ✓ Some make food to go bad like moulds
- ✓ Harmful fungi cause several diseases to both plants and animals

Examples of fungal diseases in animals

1. Ring worms (cause round patches on the skin)
2. Athletes foot (attacks the skin between the toes)
3. Oral thrush caused by Candida
4. Finger nail deformation
5. Eczema

Examples of fungal diseases in plants

1. Panama e.g. in banana
2. Cigarand rot
3. Blast wilt
4. Potato blight
5. Smuts
6. Black rust fungus
7. Coffee berry disease (rust)
8. Root rot in tea plants.

ACTIVITY

1. State any **one** example of poisonous fungi.
- 2.
3. Name the fungal disease which cause round patches on the skin.
- 4.
5. Mention any **two** fungal diseases to animals.
- 6.
7. Give any **two** fungal diseases to animals.
- 8.
9. State any **two** conditions that favor breeding of fungi.
- 10.
11. Name the fungi which make food go bad.
- 12.
13. How do mould reproduce?
- 14.
15. Mention any two examples of moulds.
- 16.
17. By what means do toadstools obtain their food?

LESSON

How to control the dangers caused by harmful fungi

1. Boiling milk and water before drinking.
2. Reheating and warming cold food before eating it.
3. Salting the food.

4. Ironing the clothes
5. Pickling – putting vinegar in edible vegetables and other foods.
6. Avoid eating uncovered food.
7. Spray plants with fungicides.
8. Get early treatment for any fungal infection /disease.
9. Sterilize all surgical instruments to kill all the germs.
10. Irradiation in canned foods.
11. Avoid eating or catching poisonous fungi.
12. Proper management of house refuse and rubbish
13. Proper use of the latrine.
14. Avoid sharing towels, socks, under wears etc.
15. Use medicated soap to bathe e.g. Dettol, protex, etc.
16. Use disinfectants in cleaning toilets e.g., jeyz.

ACTIVITY

1. State any **two** liquid substances which contain fungi.
- 2.
3. State **one** reason why we need to warm cold food before eating it.
4. How do salting help to control the spread of yeasts?
- 5.
6. Mention any two health habits that can limit the dangers caused by pathogens.
- 7.
8. Give any **two** common places where pathogens live.
- 9.
10. State any **two** surgical instruments which can transmit fungal infections.
- 11.
12. State any **two** fungal diseases to:
 - (i) Animals
 - (ii)
 - (iii) Plants
 - (iv)
13. Mention any **one** example of poisonous fungi.
- 14.

LESSON

Similarities between bacteria and fungi

1. Both feed saprophytically
2. Both can be useful and harmful
3. Both cause diseases which are curable
4. Both can make food to go bad (food poisoning)
5. Both cause fermentation
6. Both can cause rotting /decomposition
7. Some of them cause diseases while others are useful to man
8. Some are single celled while others are multicellular

Differences between bacteria and fungi

1. Bacteria reproduce by means of cell division (binary fission) while fungi reproduce by means of budding and spores.
2. Some fungi are edible while bacteria are not eaten
3. Bacteria are single celled while most fungi are multicellular
4. All bacteria are very tiny microscope while some fungi like mushrooms are big
5. Bacteria reproduce much faster than fungi
6. Some bacteria make their own food by combining some simple chemical substance while fungi cannot make their own food

Ways of preventing bacterial and fungal diseases

- ✓ Using strong heat to kill germs
- ✓ Opening doors and windows to let in sunlight in the rooms
- ✓ Maintaining proper sanitation
- ✓ Houses should be properly ventilated
- ✓ Using chemicals to kill germs

ACTIVITY

1. How are bacteria different from fungi?

2. Where are bacteria found in our environment?

3. Name any **one** poisonous fungus.

4. Give the **two** types of bacteria

(i)

(ii)

5. How do the following reproduce?

a) Yeast

b) Bacteria

6. Give the importance of fungi to people

(i)

(ii)

7. How are bacteria useful to people?

8. How does a mushroom feed?

9. How is the reproduction of most fungi different from that of yeast?
