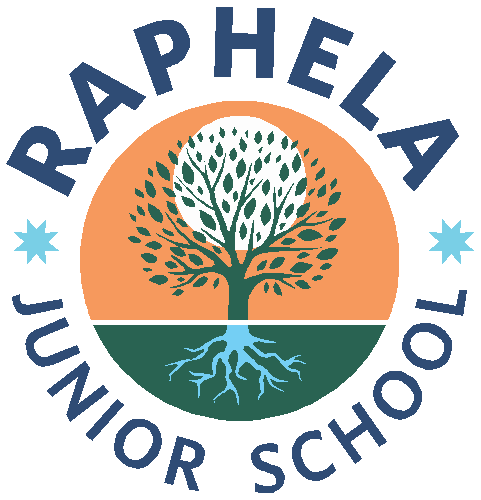
**RAPHELA JUNIOR SCHOOL**



**SCIENCE LESSON NOTES TERM 2**

 **PRIMARY FIVE**

**TOPIC: COMPONENTS OF THE ENVIRONMENT**

**SUB-TOPIC: SOIL**

* Soil is the top layer of the earth.
* It is the medium in which plants grow and where they get water and nutrients.

**TERMS USED IN SOIL**

* **Land reclamation**: this is the bringing back waste land to use
* **Drainage:** this is the method of removing excess water from a water logged area.
* **Irrigation:** this is the artificial method of providing water crops in dry areas
* **Soil sampling:** this is the taking of sample of soil from different parts of the field to analyse it in a laboratory
* **Soil texture:** this means the different sizes of soil particles in an area
* **Soil structure:** this is the way in which particles are arranged in the soil.
* **Soil profile:** This is the vertical arrangement of the various soil layers.

**TYPES OF SOIL**

There are three types of soil namely:

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

**LOAM SOIL**

It has the following properties.

1. It contains balanced particles of sandy and clay.
2. It contains more humus than clay and sandy
3. It is well aerated than clay.
4. It contains all soil components in a balanced amount.

Therefore it is the best for crop growing.

**CLAY SOIL**

It has the following properties.

1. It has little humus
2. It has fine particles
3. It is poorly aerated
4. It retains a lot of water
5. It is sticky and heavy
6. It is suitable for pottery.

**SANDY SOIL**

It has the following properties

1. It is well drained
2. It has poor rate of capillarity
3. It has large and rough particles
4. It is well aerated
5. It dries quickly
6. It is suitable for construction

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

Sand loam clay

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

**Observation**

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

**Conclusion**

Sand soil is more permeable than the loam and clay soil.

**Activity**

1. Define the term soil.

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1. Mention the three types of soil.

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1. Loam soil is the best soil for growing crops. Why is it so?

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1. Which type of soil gets water-logged during the rainy season?

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1. Why is clay soil able to retain water more than the other types of soil?

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**Practical research question.**

1. Collect dry samples of sand, clay and loam soil. Put each soil sample in its own tin. Pour equal amounts of water in each tin. Leave them for 15minutes. Check on them and record your observation.
2. Sand soil: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Clay soil: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Loam soil: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**COMPONENTS OF SOIL**

Soil consists of the following

1. Humus(organic matter)
2. Water
3. Air
4. Particles of clay and sand
5. Dissolved mineral salts (in-organic matter)
6. Living organisms

**1. Humus(organic matter)**

Humus is found on the top most layer of soil. It is black in colour.

Humus is formed from dead decayed plants and animals.

It is very good for plant growth**.**

**Importance of humus or organic matter.**

1. It improves soil fertility.
2. It enables soil to hold the right amounts of water.
3. Humus holds soil particles together.
4. It improves soil aeration**.**

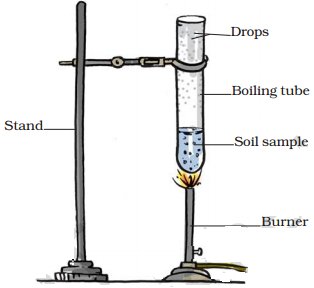
**2. Water or moisture**

* Soil consists of water or moisture between the particles. When soil is dry, the spaces in soil will have no water. When it is very wet, the spaces get filled with water and the soil becomes water logged.

**Importance of water.**

1. Water dissolves mineral salts for plants to absorb.
2. Plants use water to carry out photosynthesis.
3. It helps in seed germination.
4. Water softens the soil enabling plant roots to grow deeper.

**Experiment to show that soil contains water.**



of water

1. **Particles of clay and sand**

These include clay and sand particles formed from the breaking down of rocks into small pieces by the process called weathering.

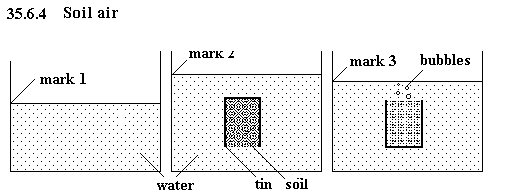
1. **Air**

* Air is a component of soil found between the spaces among soil particles called pore spaces.
* **Importance of air in soil.**

1. Air is the source of oxygen for respiration of plant roots.
2. Soil air provides oxygen for seed germination.
3. It provides nitrogen which improves soil fertility.
4. Soil air supports life of the living organisms in soil

**Experiment to show that soil contains air.**

**air**



1. **Mineral salts.**

Soil contains mineral salts needed for plant growth.

**Examples of minerals needed by plants**

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

**Importance of mineral salts in soil.**

1. Mineral salts help in the formation of chlorophyll in plant leaves.
2. Mineral salts help to strengthen plant stems and leaves.
3. Potassium helps plants build resistance to diseases and drought.
4. Plants use nitrates and phosphates to make plant proteins.
5. **Living organisms**

* These are small living organisms that live in then soil. Such as earth worms, millipedes, mole rats, ants, bacteria and fungi.
* **Importance of living organisms in soil.**

1. They create pores in the soil which improve soil aeration.
2. They create holes which improve water drainage in the soil.
3. When they die, they decompose and form humus.
4. Bacteria and fungi decompose dead plants and animals to form humus.

**Activity**

* + - 1. Which soil components support germination of seeds?

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. What is contained in organic matter?

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* + - 1. State two importance of soil air.

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* + - 1. Name any two living organisms found in soil.

i. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ii. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. How are mole rats and earth worms important to the soil?

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* + - 1. Which component of soil is used by plants to make their own food?

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* + - 1. Give three examples of mineral salts found in soil.

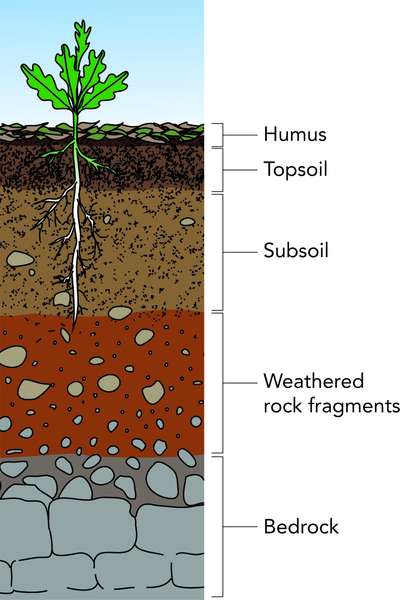
i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ iii. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**SOIL PROFILE**

* Soil profile is the vertical arrangement of soil layers. It is made up of three layers namely;
* Top soil
* Sub soil
* Parent rocks

**Diagram to show the soil profile**



or Parent rock

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

Which soil layer is suitable for plant growth?

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

**IMPORTANCE OF SOIL**

1. It holds water for plants
2. It contains nutrients for the growing plants
3. It contains air which plants need
4. It holds plants firmly into the ground
5. It is a home to small animals
6. Clay soil is used for modelling.
7. Sand soil is used for building.
8. Soil is used to build houses like huts.
9. Soil is used for making bricks.

**SOIL FORMATION.**

* Soil is formed by two processes or ways, namely:
  + - 1. Weathering of rocks
      2. Decomposition of organic matter
* **Weathering of rocks.**

**Weathering** is the process by which rocks break down into small particles to form soil. Weathering of rocks takes place by two processes namely; **physical process** and **chemical process.**

**Causes of physical weathering.**

* + - * 1. **Changes in temperature:** when it is hot, rocks expand and when it is cold they contract. These changes in temperature lead to cracking of rocks into small particles to form soil.
        2. **Rain:** when rain water containing a weak acid reacts with the rock minerals some rock particles peel off or are broken down into small particles to form soil.
        3. **Animal movements:** animals with hooves crack the rocks during their movements.
        4. **Human activities:** some human activities e.g construction, mining, quarrying and farming lead to the breaking down of rocks into small particles. Hence forming soil.
        5. **Land slides:** these are common in mountainous areas. Landslides cause rocks to break down into small particles forming soil.
* **Decomposition of organic matter.**

This is where dead plants and animals decompose to form soil. It forms soil with the help of bacteria and fungi.

**Activity**

How do we call the vertical arrangement of soil layers?

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Draw a well labelled diagram to show the soil profile

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Give four uses of soil to man.

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How is soil useful to plants?(Give two)

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What is weathering?

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Mention three causes of weathering.

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Describe the two ways by which soil is formed.

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**SOIL EROSION**

* Soil erosion is the removal of top soil from one place to another by its agents.

**Agents of soil erosion.**

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

They include:

1. Wind
2. Running
3. Man
4. Animals

**Causes of soil erosion**

1. **Deforestation:**

This is the massive cutting down of trees.

1. **Overgrazing:**

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

1. **Over cultivation:**

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

1. **Bush burning:**

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

1. **Mono cropping:**

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

1. **Poor farming methods**

These include

Ploughing along the slopes

Planting crops along the slopes.

**Types of Soil Erosion.**

They include:

1. **Sheet erosion:** This is the uniform removal of top soil from the ground.
2. **Gully erosion:** This is when a lot soil is carried away by running water and big channels called gullies are made in the ground. The gullies sometimes turn into big ditches.
3. **Rill erosion**: This is when flowing water takes away the top soil and begins making shallow channels in the ground.
4. **Wind erosion:** This is the uniform removal of top soil from the ground by strong wind.
5. **Splash erosion:** This is where soil is hit by rain drops and soil particles are scattered later to be washed away by running water.

**EFFECTS OF SOIL EROSION.**

* + - 1. Soil loses its fertility.
      2. Soil erosion makes the land hard and difficult to plough.
      3. Gully erosion leads to washing away of some crops.
      4. It causes silting.
      5. It causes blockage of drainage systems.
      6. Gully erosion destroys road.

**Activity**

What does the term soil erosion mean?

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State two agents of soil erosion.

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Deforestation is one of the causes of soil erosion. Mention any other three factors that lead to soil erosion.

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What is gully erosion?

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Apart from gully erosion, give two other types of soil erosion.

i. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ii. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What are the effects of soil erosion to farmers?

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Mr. Wambuzi is a farmer. He rears 20 goats on a 5-10meters piece of land using the Tethering method. Is Mr. Wambuzi a good farmer? Give a reason to support your answer.

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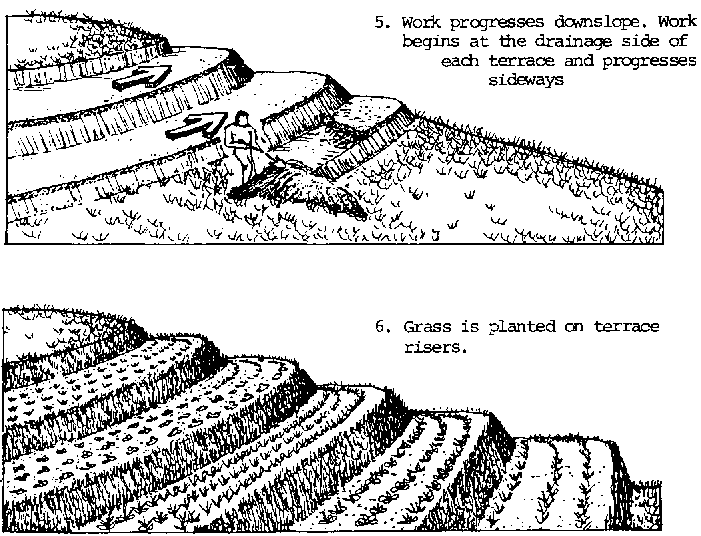
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Using diagrams, illustrate the difference between gully erosion and rill erosion.

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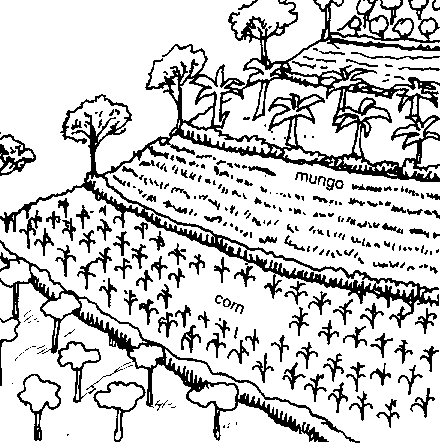
**METHODS OF CONTROLLING SOIL EROSION**

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

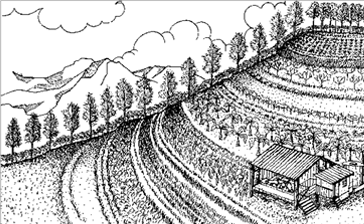


1. **Contour ploughing.** This is the digging of lines of contours across the slopes to slow the speed of running

Water.



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



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



1. **Reforestation.** This is the planting of trees in areas where they have never been before.
2. **Bush fallowing.** This is the practice of leaving the land to grow bushy for some time.
3. **Crop rotation.** This is the growing of different types of crops on the same piece of land seasonally.
4. **Mulching.** This is the covering of the soil with dry plant materials

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

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

**Examples of Mulches**

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

**ADVANTAGES OF MULCHING**

1. It controls soil erosion
2. Mulches decay and form humus
3. It controls weed growth
4. It moderates soil temperature
5. It increases water infiltration in the soil.

**DISADVANTAGES**

1. Mulches can be fire hazards
2. Mulches may hide pests.
3. Mulching is tiresome and expensive
4. Mulches may act as breeding places of pests
5. Mulches may be a source of seeds of weeds.

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

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

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

**ILLUSTRATION**

**First Season**

|  |  |  |
| --- | --- | --- |
| Beans | Maize | Cabbage |

**Second season**

|  |  |  |
| --- | --- | --- |
| Cabbage | Beans | Maize |

**Third season**

|  |  |  |
| --- | --- | --- |
| Maize | Cabbage | Beans |

**ADVANTAGES OF CROP ROTATION**

1. It breaks the life cycle of pests
2. Legumes add nutrients to soil
3. Parasitic weeds are controlled
4. It maintains soil fertility
5. It controls soil erosion
6. It improves crop yields.

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

Examples : Pumpkins, Peas, Tomatoes, Groundnuts etc.

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

**SOIL CONSERVATION**

* It is the taking care of soil to retain its nutrients and fertility.

**Ways by which soil can be conserved.**

1. By mulching
2. By crop rotation
3. By afforestation
4. By bush fallowing
5. By planting cover crops
6. By adding fertilizers

* If soil is not looked after properly it can lead to soil exhaustion
* **Soil exhaustion is the loss of soil fertility.**

**Causes of soil exhaustion**

1. Soil erosion
2. Leaching
3. Mono cropping

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

**Causes of soil leaching**

a) Soil erosion

b) Deep ploughing

**Activity**

* + - 1. What term is given to “the practice of taking care of soil to retain its nutrients and fertility”?

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* + - 1. Give four methods of soil conservation.

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* + - 1. Suggest any three good farming practices that prevent soil erosion.

i. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ iii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* + - 1. How do farmers in Bududa District prevent soil erosion? (Give two ways)

i. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* + - 1. Define soil exhaustion.

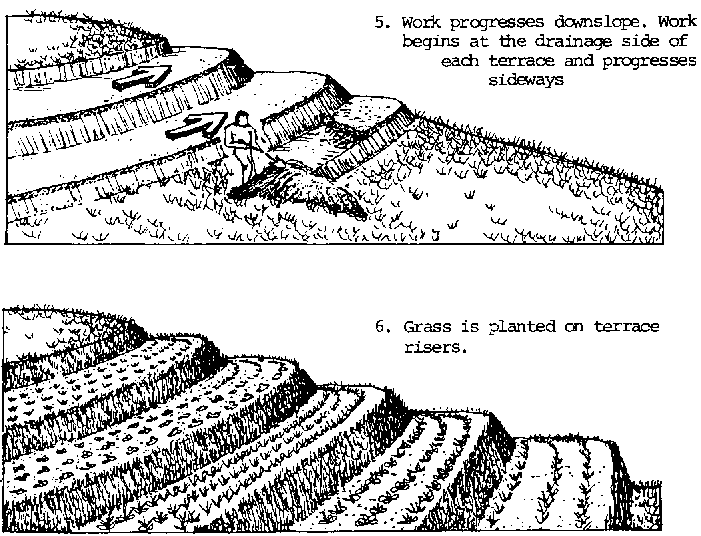
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* + - 1. Write down two methods farmers in Ngongo Hills can use to prevent soil exhaustion.

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* + - 1. Which good farming practice is represented in the diagram below?

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* + - 1. If you were a farmer in Kasese District, draw a diagram to illustrate the method of farming you would use.

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**SOIL FERTILITY**

* Soil fertility is where soil contains enough water, air, humus and nutrients for proper plant growth.

**Ways of maintaining soil fertility**

1. Practicing crop rotation
2. Leaving the soil to rest (bush fallowing)
3. Practicing mulching
4. Using fertilizers

* There are two groups of fertilizers namely:

1. Natural Fertilizers
2. Artificial fertilizers

**1.NATURAL FERTILIZERS**

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

They include:

1. **Green manure**. This is got from decayed green plants which are buried in soil.
2. **Farm yard manure**. This is got from decayed animal dung and urine.
3. **Compost manure.** This is obtained from decayed household refuse like left over foods, kitchen refuse and other plant remains.

**ADVANTAGES OF NATURAL MANURE**

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

**DISADVANTAGES**

1. They smell badly
2. They are tiresome to make
3. Plant and animal matter may not be easily got.

**2.ARTIFICIAL FERTILIZERS**

* These are fertilizers which are made in factories.

**Types of artificial fertilizers**

1. Straight fertilizers
2. Compound fertilizers
   1. **Straight fertilizers**

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

**Examples of straight fertilizers**

* **Potash** - It provides ( supplies ) potassium
* **Nitrogenous** – It supplies nitrates
* **Phosphorus** – It supplies phosphates
* **SSP ( single supper phosphate ) -**  It supplies calcium phosphate or calcium sulphate
  1. **Compound fertilizers**
* These are fertilizers that supply (contain) more than one nutrient (mineral ) to the soil

**Examples of compound fertilizers**

* Dramonium phosphate
* N.P.K ( Nitrates , potassium and phosphorus )
* Can (calcium , Amonium Nitrates )
* Munate of potash and urea

**Qualities of good fertilizers**

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

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

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

**ADVANTAGES OF ARTIFICIAL FERTILISERS**

1. They are quick in improving soil fertility
2. They contain the right nutrients in the right amounts

**DISADVANTAGES**

1. You may not know which type to use
2. They destroy the soil texture if used for so long
3. They are expensive to buy
4. They are easily leached out of soil by water.
5. They are applied at specific times only.

**Activity**

* + - 1. Describe soil fertility.

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* + - 1. State two ways of maintaining soil fertility.

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* + - 1. How can farmers acquire and maintain good crop yields?

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* + - 1. Name the two types of fertilizers.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ii. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Mention three examples of artificial fertilizers.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ iii. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ii. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Natural fertilizers are organic fertilizers which are made from decayed plant and animal remains. Write down the three kinds of natural fertilizers.

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ii. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. List three advantages of natural fertilizers.

i. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* + - 1. Give two importance of artificial fertilizers.

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**MULCHING.**  This is the covering of the soil with dry plant materials

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

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

**Examples of Mulches**

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

**ADVANTAGES OF MULCHING**

* 1. It controls soil erosion
  2. Mulches decay and form humus
  3. It controls weed growth
  4. It moderates soil temperature
  5. It increases water infiltration in the soil.

**DISADVANTAGES**

* 1. Mulches can be fire hazards
  2. Mulches may hide pests.
  3. Mulching is tiresome and expensive
  4. Mulches may act as breeding places of pests
  5. Mulches may be a source of seeds of weeds.

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

**CROP ROTATION.** This is the growing of different types of crops on the same piece of land seasonally.

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

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

**ILLUSTRATION**

**First Season**

|  |  |  |
| --- | --- | --- |
| Beans | Maize | Cabbage |

**Second season**

|  |  |  |
| --- | --- | --- |
| Cabbage | Beans | Maize |

**Third season**

|  |  |  |
| --- | --- | --- |
| Maize | Cabbage | Beans |

**ADVANTAGES OF CROP ROTATION**

1. It breaks the life cycle of pests
2. Legumes add nutrients to soil
3. Parasitic weeds are controlled
4. It maintains soil fertility
5. It controls soil erosion
6. It improves crop yields.

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

Examples: Pumpkins, Peas, Tomatoes, Groundnuts etc.

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

**TOPICAL QUESTIONS.**

* + - 1. What term is given to the **“Top layer of the earth in which plants grow and get water and nutrients”?**

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* + - 1. What is the importance of soil? (Give two)

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* + - 1. Some of the components of soil are **air** and **water.** State any other two components of soil.

i. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Give four examples of minerals needed by plants.

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   * + 1. How do we call the vertical arrangement of soil layers?

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* + - 1. Write down the three main types of soil.

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\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Write brief notes about the following types of soil:

1. Loam soil: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. Clay soil: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. Sand soil: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* + - 1. What does the term soil conservation mean?

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* + - 1. What is the cause of soil exhaustion?

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* + - 1. Give the meaning of the term “**leaching”**.

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* + - 1. Mention two causes of soil leaching.

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* + - 1. Soil erosion is the washing away of top soil. Write down four causes of soil erosion.

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* + - 1. State the types of soil erosion.

i. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ iii. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* + - 1. Mr. Mwaka and his family took a walk in the neighborhood. “We need to walk the other side. There is a big ditch ahead of this side,” said Mrs. Mwaka as they walked down the path. Which type of soil erosion do you think had taken place to create that big ditch?

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* + - 1. Describe three methods of controlling soil erosion.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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iii. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. List two examples of mulches you know.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ii. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Mention two advantages of mulching.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ii. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Give one disadvantage of mulching.

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* + - 1. Namara planted beans in January. After harvesting the beans, she planted maize in March. In June, Namara planted groundnuts. She was very happy because her crop harvests were of good quality each time. Which good farming method was Namara practicing?

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* + - 1. Suggest two factors to consider when carrying out crop rotation.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* + - 1. State two advantages of crop rotation.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* + - 1. How do we call the growing of two or more crops on the same piece of land?

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* + - 1. Soil fertility is the state where soil contains enough water, air, humus and nutrients. Give three ways of maintaining soil fertility.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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iii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Identify the two groups of fertilizers.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. What are natural fertilizers?

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* + - 1. Mention two examples of natural fertilizers.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Write down three advantages of using natural manure.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* + - 1. Give one disadvantage of natural manure.

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* + - 1. Artificial fertilizers are fertilizers which are made in factories. Give two advantages and disadvantages of using artificial fertilizers.

**Adavntages**

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Disadvantages**

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* + - 1. List down three qualities of good fertilizers.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**TOPIC: MATTER AND ENERGY**

**SUB-TOPIC: MATTER**

What is matter?

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

What is Volume?

* **Volume is the amount of space occupied by an object.**

What is Mass?

* **Mass is the amount of matter contained in an object.**

What is weight?

* **Weight is the pull of gravity on the mass of an object.**

**Properties of matter**

1. Matter has weight
2. Matter occupies space
3. Matter exert pressure

**States of Matter**

Matter exists in three states namely

1. Solids
2. Liquids
3. Gases

**Examples of each state of matter**

|  |  |  |
| --- | --- | --- |
| **Solids** | **Liquids** | **Gases** |
| Wood | Water | Air |
| Stones | Oil | Steam |
| Iron | Petrol | Smoke |
| Bricks | Juice, e.t.c |  |

**Characteristics of each state of matter**

1. **Solids**
2. Solids always have a definite shape.
3. Some solids change into liquids by heating,
4. Solids don’t change the form of state when cooled.
5. Some solids expand when heated.
6. Solids have molecules closely held together.
7. The force of attraction between molecules (cohesion) is great.

Molecules held together

1. **Liquids**
2. Liquids have no definite shape i.e they take the shape of the container.
3. Some liquids change into gases by heating.
4. Some liquids change into solids by freezing.
5. Liquids expand more when heated
6. Liquids occupy space and have volume.
7. Molecules in liquids are spaced.

molecules

1. **Gases**
2. Gases have molecules far apart.
3. Some gases cannot be seen but can be felt.
4. Gases have neither definite shapes nor volume.
5. Gases expand the most when heated.
6. Gases cannot be touched.
7. Gases occupy any space available.

molecules far apart

**NOTE:**

* **Molecules** are small particles that make up matter.
* **An atom** is the smallest molecule in matter.

**Cohesion and adhesion forces**

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

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

Water droplets on a glass. These are held on a glass by adhesion forces.

**Changes of states of matter**

* Matter can change from one state to another. The change can be caused by change in temperature.

Heat energy is the energy responsible for changing matter from one state to another.

Some substances can easily change from one state to another

* What is a substance?

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

**Processes in changes of states of matter**

F

E

A B

C D

**A = melting.** Melting is the process by which a solid changes into a liquid (ice changes into water)

**B = evaporation.** Evaporation is the process by which a liquid changes into a gas. (Water changes into steam) it is also called vaporization.

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

**D = condensation.** Condensationis the process by which a gas changes into a liquid (steam changes into water)

**E and F = sublimation.** Sublimationis the change of state from solid to gas or gas to solid directly.

**Activity**

* + - 1. What is matter?

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\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Name the three states of matter.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ iii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Give two examples of each state of matter.

Solids: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Liquids: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Gases: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Identify at least two differences between solids and liquids.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Manzi collected grass from his compound. He took it to the rubbish pit for burning.
         1. In which state of matter was the grass before burning?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - * 1. In which state of matter was the grass after burning?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - * 1. Which state of matter was the smoke?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Mention one characteristic of each state of matter.

Solids: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Liquids: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Gases: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. **Matter has weight, matter occupies space.** Name any other property of matter.

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* + - 1. Define the following processes:
         1. Freezing:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - * 1. Condensation:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - * 1. Sublimation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - * 1. Melting: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**SOLUTES , SOLVENTS AND SOLUTIONS**

**A solute:**

A solute is a substance that can easily dissolve in a liquid.

Examples of solutes include, salt, sugar, glucose

**A solvent**

A solvent is a liquid that dissolves a solute.

Examples of a solvents is water.

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

A substance which does not dissolve in a solvent such as water, is said to be

**insoluble.**

Examples of insoluble substances includes stones, ash, flour and sand.

**A solution**

A solution **i**s a substance formed after a solute has dissolved (disappeared) in a solvent.

**Mixing and separating mixtures**

**1. Separating mixtures of solids and liquids**

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

1. Filtration
2. Decantation
3. Distillation
4. Evaporation to dryness
5. **Filtration**

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

* The method involves the use of a filter paper , sieve , a piece of cloth and a funnel
* The solid particles that remain on the filter or sieve are called residues. The liquid that goes through the filter / sieve is referred to as a filtrate.
* Filtration at home is used when removing seeds from the juice made.
* Removing tea leaves from tea

**Experiment about filtration**

**Things to use**

* A mixture of juice and seeds in a cup or jar
* Funnel
* Filter paper / sieve
* Cup or jar

**Procedure**

Funnel(Sieve) mixture of seeds and juice

Residue

Filtrate

**Observation**

The solid particles (seeds) remain on the sieve / funnel while the liquid / juice flows down to the glass.

**Conclusion**

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

**Application of filtration in daily life.**

* Making juice
* Separating tea leaves from tea

**Evaporation to dryness:**

* This method is used to recover solutes from solvents. E.g separating salt from a solution of water and salt, separating sugar from a solution of water and sugar.
* The solution is heated, then the water evaporates leaving the solute (salt/sugar) in the container.

**2. Separating mixtures of liquids. (liquid from a liquid)**

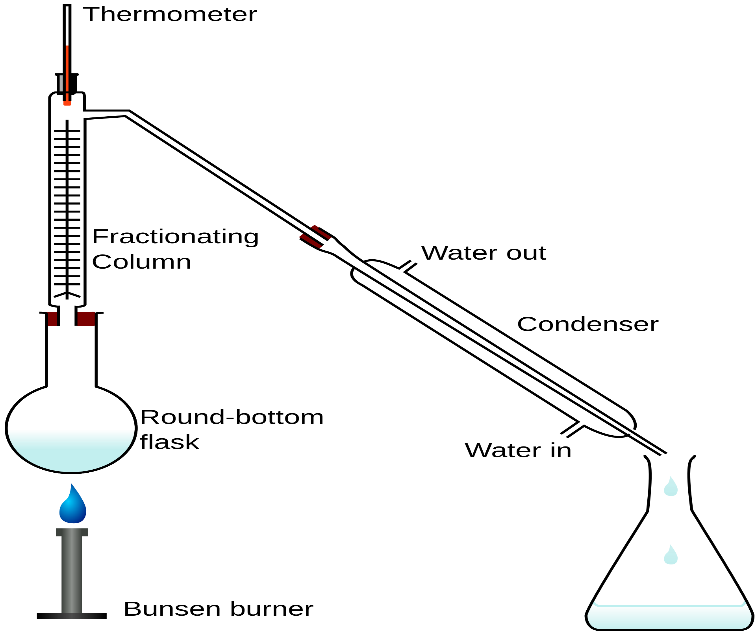
When two or more liquids are mixed together, they can be separated using methods below;

* Fractional distillation
* A separation funnel

**Fractional distillation**

* This is a method used to separate liquids of the same density but evaporate at different temperatures.
* If water and alcohol are mixed together alcohol will evaporate first.

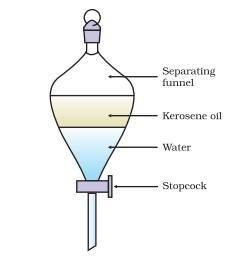
**Separating water from alcohol**



**Separating funnel**

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

**Experiment to separate oil from water**



**Separating mixtures of solids ( solid from a solid )**

* When separating solid mixtures, they can be separated using the following:
* Floating (flotation )
* Using a magnet
* Hand picking (sorting )
* Sieving

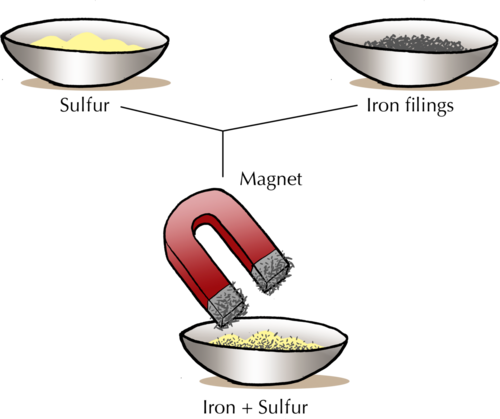
**Flotation method**

* This method is used to separate solid substances where one floats on the other eg sow dust and sand.

**Using a magnet**

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

Eg when a needles / pins fall in maize flour, iron filings mixed with sulfur powder



Iron filings attached to the magnet

**Sieving method**

* This is a method used to separate big particles from small particles using a sieve eg big stones from sand.



**Activity**

* + - 1. Water is the main solvent for all soluble substances. What is a solvent?

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* + - 1. Give the meaning of the following terms:
         1. Solution: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
         2. Solvent: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      2. State two methods used to separate solid mixtures.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Identify a method that can be used to separate salt from ash.

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* + - 1. Define the following terms:

1. Residue: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Solute: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Filterate:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Ruella accidentally poured all the salt she had in the water jar. She panicked to try getting the salt back but she couldn’t. She was very sad. Please help Ruella recover her salt.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* + - 1. Ssebidde made passion fruit juice for his mother. Ssebidde served the juice with the seeds in it. His mother told him to remove the seeds from the juice without leaving any. How can Ssebidde remove the seeds from the juice?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**ENERGY**

* Energy is the ability to do work.

**Types of energy**

There are two types of energy, namely;

1. Kinetic energy
2. Potential energy
3. **Kinetic energy:** is the energy possessed by a moving object or an object in motion. e,g. a stone thrown in air, a leaf falling on the ground, a boy running, an animal running, a rolling ball, etc.
4. **Potential energy:** is the energy possessed by a body at rest. E.g a parked car, a stone resting on the ground, a book placed on a table, etc.

**Forms of energy**

Forms of energy are produced by objects, namely:

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

**Energy inter-conversion**

Energy can be converted from one form to another.

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

**Using a stone or a pendulum bob swinging in the air.**

At A, the stone possesses potential energy.

At B, the stone possesses kinetic energy

A B C

At C, the stone possesses potential energy

**Activity**

* + - 1. What type of energy do you possess when seated?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Define the term “**energy**”.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* + - 1. List the types of energy.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. What type of energy does a mango falling off a tree possess?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Name three forms of energy.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ iii. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Which form of energy changes ice to water?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. What do we mean by the following terms:

1. Kinetic energy: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Potential energy: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**HEAT ENERGY**

* What is heat?

**Heat is a form of energy that causes matter to become hot or warm.**

**OR:**

**Heat is a form of energy that increases the** **temperature of matter making it hot or warm.**

* The units for measuring heat are **joules(J)**

**Sources of heat**

A Source of heat is anything that or produces heat.

Examples:

1. Sun – this is the main natural source of heat.
2. Fire(fuels) from burning objects e.g. firewood, charcoal
3. Electricity
4. Friction or objects rubbing against each other
5. Food
6. Decaying matter

**Uses of Heat energy**

* Heat energy is useful in many ways.

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

**Effects of heat on 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)
4. Heat causes chemical changes on matter. E.g. papers burning to ash.

**EXPANSION AND CONTRACTION**

* **Expansion**: is the increase in size of an object. Most substances increase in size when heated
* **Contraction:** is the decrease in size of an object
* Solids, liquids and gases all expand and contract at different rates
* Gases expand fastest, followed by liquids and solids expand slowest.
* Gases expand greatest because their molecules are farther apart and free to move

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

**Expansion of solids**

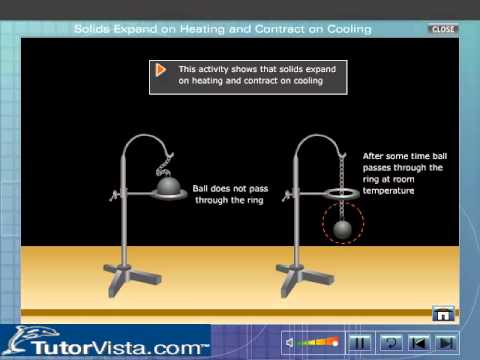
**Things to use**

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

**Procedure**

* Pass the metallic ball through the ring while it is still cold.
* Heat the ball for some time and try to pass it through the ring again.

**Illustration**



**Metallic ball passes through the ring after cooling**

**Metallic ball does not pass through the ring after heating**

**Observation**

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

**Explanation**

* When the ball is cold, it passes through the ring as in A.
* When ball is heated, it expands and it cannot pass through the ring because it has become bigger.

**Conclusion**

Metals expand when heated.

**A bimetallic strip**

Copper

Iron

Before heating after heating

Copper expands faster than iron.

**Experiment to show that gasses expand**

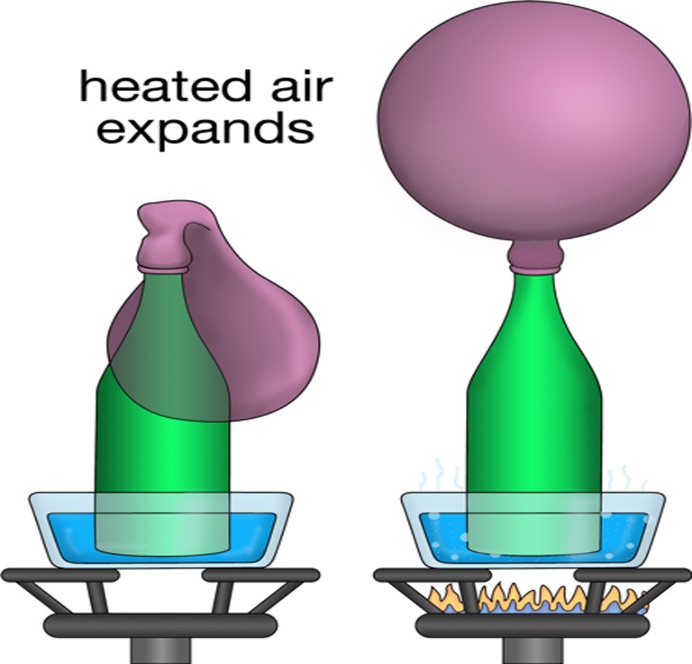
**Things to use**

* Balloon
* Bottle
* Source of heat

**Procedure**

* Tie a balloon on the bottle.
* Put the bottle on a source of heat for some time.

**Illustration**



**Balloon blows up after heating**

**Balloon falls before heating**

**Observation**

* The balloon on the cold bottle is small in size. After the air in the bottle has been heated, the balloon increases in size.

**Explanation**

* The water heats the bottle and the air inside the bottle expands causing the balloon to expand.
* The air in part II expands due to heat.

**Conclusion**

* Gases expand when heated.

**Experiment to show that liquids expand when heated**

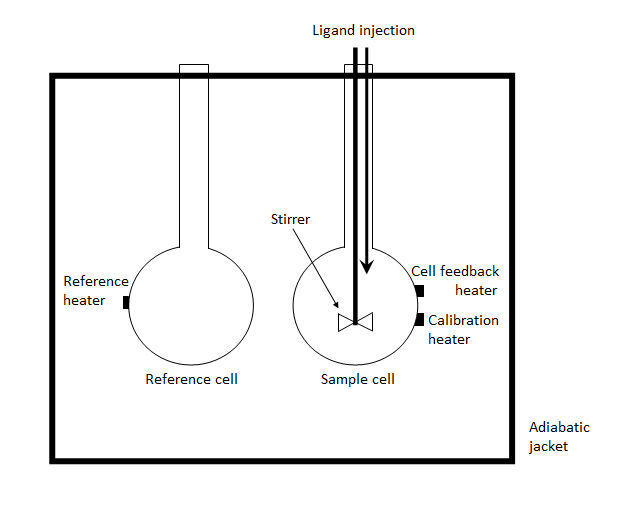
**Things to use**

* Coloured water
* test tube
* Heat source
* Bottle
* Cork

**Procedure/ set up**

* Put water in the bottle
* Fill a test tube with coloured water.
* Put a cork with the test tube on the bottle mouth and mark the water level in the test tube.
* Heat the bottle for some time.

**Illustration**



**Observation**

* When the water in the bottle is heated, it will heat the coloured water which rises up the narrow tube.

**Conclusion**

* Liquids expand when heated

**APPLICATION OF EXPANSION AND CONTRACTION EFFECTS ON MATTER IN DAILY LIFE.**

1. Gaps are left between railway lines to allow expansion on hot weather.
2. Electric wires are left loose on poles to allow contraction on cold weather.
3. Gaps are left in soda bottles to allow the expansion of liquids inside when frozen.



Space left

**Activity**

* + - 1. Heat is the form of energy that increases the temperature of matter making it hot or warm. Identify any four sources of heat.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ iii. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ iv.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Apart from a flat iron, give any other appliance used to change electric energy to heat energy.

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* + - 1. Mention three uses of heat to us.

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ii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

iii\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Give one use of heat energy to the environment.

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* + - 1. Why are electric wires left loose between poles?

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* + - 1. While constructing the New Nile Bridge, the Engineer advised that rollers must be put at the bridge edges. Explain why the Engineer gave that advice.

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* + - 1. State two applications of expansion and contraction in our environment.

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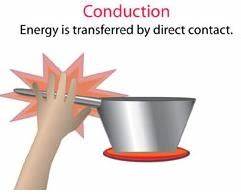
**HOW HEAT TRAVELS**

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

1. Conduction
2. Convection
3. Radiation
   * + 1. **Conduction**

* This is the process by which heat travels through solids.
* In solids heat is transferred from one heated molecule to another. This transfers heat until the whole solid object is heated.

**Experiment to show how heat travels by conduction**



Hot metallic handle

Hot plate

Metallic pan

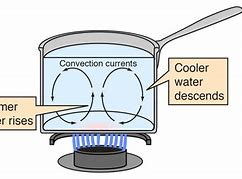
**Importance of conduction**

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

* This is the process by which heat travels through liquids and gases.
* Heat in liquids and gases travels in form of convectional currents. The particles which are heated become light and move upwards while the cooler and heavier particles move downwards.

**Experiment to show how heat travels by convection.**

Boiling water



Warmer water rises

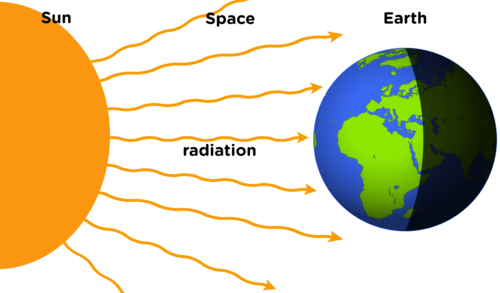
The particles nearest to the source of heat are heated and become light and move upwards while the cooler and heavier particles move downwards.

**Importance of convection**

1. Convection currents help to drive out bad smell through vent pipe of a VIP latrine.
2. Smoke is driven out of houses through chimneys by means of convection currents
3. A lit cigarette is kept burning by convection current
4. A Charcoal stove, flat iron and a lantern lamp continue burning by convection currents
5. Convection currents help us to get fresh air in our houses.
6. Water in a kettle on fire boils by convection current
   * + 1. **Radiation**

* This is the process by which heat travels through vacuum
* When heat travels by radiation, it doesn’t need any medium of transmission.

**Experiment to show how heat travels by radiation.**



**Examples of radiation in nature**

1. Heat from the sun reaches the earth by radiation.
2. When you sit near a fire place, charcoal stove (sigiri) or cooker or even ironing clothes using a flat iron, you receive heat by radiation.

**Importance of radiation**

1. Radiant heat from the sun helps to dry our clothes and harvested crops.
2. Heat from the fire reaches our bodies by radiation.
3. Radiant heat from the sun helps in rain formation.
4. Radiant heat from the sun helps green plants to make their own food.
5. Radiant heat from the sun is used to produce solar energy.

**Activity**

* + - 1. Apart from liquids, name one other state of matter through which heat is transferred by convection.

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* + - 1. How does heat from the sun heat the ground?

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* + - 1. If you put a saucepan of water on fire, how does heat travel to make the water boil?

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* + - 1. Explain the term “**conduction**”. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* + - 1. What is a vacuum? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* + - 1. How does heat travel through a vacuum?

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* + - 1. Give at least two uses of the following processes to man:

1. Conduction: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Convection: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Radiation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

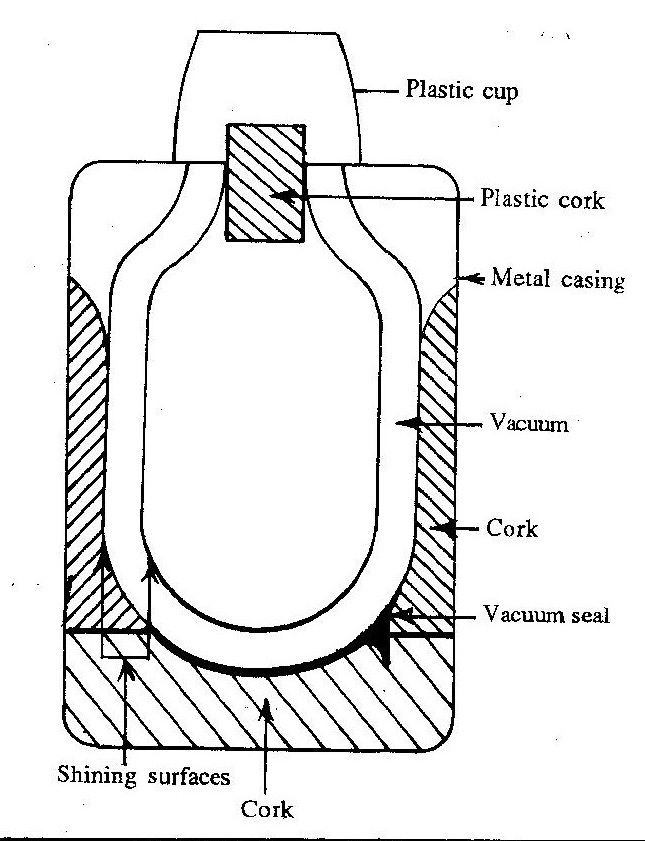
**A THERMOS FLASK**

* A thermos flask is also known as **a vacuum flask.**

Why is it called a Vacuum flask?

* It is called a Vacuum flask because it has a vacuum.

**Diagram of a vacuum flask / thermos flask.**



* **Cork** – prevents heat loss by conduction
* **Vacuum** – prevents heat loss by conduction. It also prevents heat gain by convection
* **Metal / plastic case** – protects inner parts of the thermos flask.
* **The double walled silvered glass**: reduces heat loss by radiation.
* **Vacuum seal**: prevents heat loss from the double silvered walls.
* A Vacuum flask is not commonly used mostly in rural areas because:

1. It is expensive
2. It is delicate i.e. it is not easy to handle

**CONDUCTORS AND INSULATORS**

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

**Examples**

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

* All materials which allow heat to pass through them are termed as good conductors of heat
* Aluminium is commonly used to make utensils because;
* It is cheap
* Does not rust
* It has a low density
* Silver is the best conductor of heat but it is not commonly used because;
* It is very expensive
* It is heavy

**Bad or poor conductors of heat**

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

**Examples**

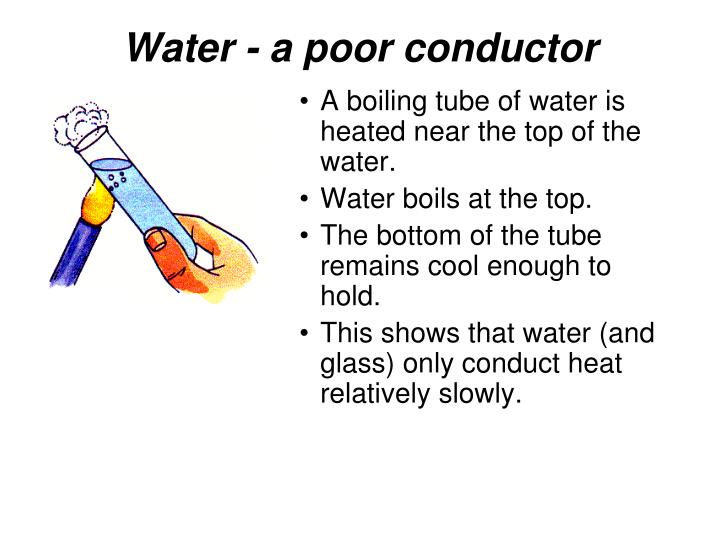
Rubber, Plastic, Cork, Wood, cotton wool, cloth, feathers etc.

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

**Application of insulators in our daily life**

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

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



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

**Heat reflectors and heat absorbers**

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

**Note**

* Most buildings are painted white inside to reflect heat and remain cool inside.
* Refrigerators are painted white to reflect most heat and remain cool inside.
* A person who puts on a black shirt feels a lot of heat than the one putting on a white one because black absorbs most heat while the white one reflects it.

**Activity**

* + - 1. Draw a well labelled diagram of a thermos flask.
      2. What is the function of a cock?
      3. How do the silvery walls of a vacuum flask prevent heat loss?
      4. In which state of matter does heat travel slowest?
      5. What special name is given to “bad conductors of heat”?
      6. Why are handles of flat irons and saucepans made out of plastic?
      7. Name at least two of the following:
         1. Good conductors of heat:
         2. Bad conductors of heat:

**TEMPERATURE**

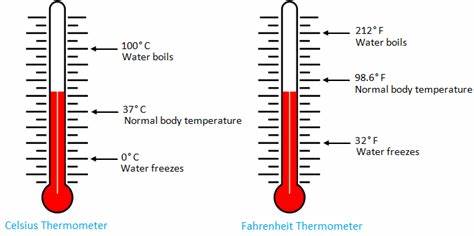
* **Temperature** is the hotness or coldness of an object or a place.
* Temperature is measured by and an instrument called a **thermometer** which gives the units in **degrees.**

**Types of temperature scales**

There are two types of temperatures scales namely;

1. Centrigrade or celcius scale
2. Fahrenheit scale

* On the centrigrade scale, the freezing point or the lowest fixed point is 0°C and the boiling point or the upper fixed point is 100°c.
* On a Fahrenheit scale, the freezing point or the lowest fixed point is 32°F and the boiling point or upper fixed point is 212°F



**THERMOMETERS**

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

**Types of Thermometers**

1. Clinical thermometer
2. The Six’s minimum and maximum thermometer
3. The wall thermometer
4. The ordinary scientific thermometer
6. **CLINICAL THERMOMETER**

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

**Characteristics of a Clinical Thermometer**

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

**Diagram of a Clinical Thermometer**

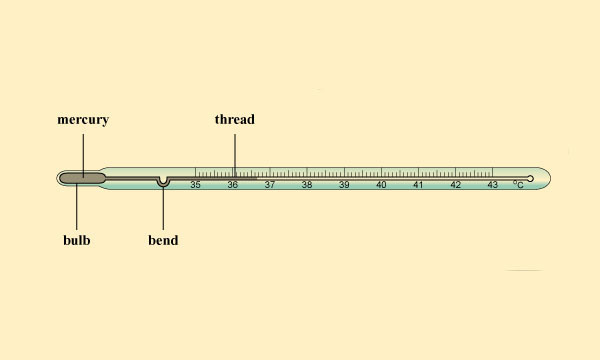
**B**

**C**

1. Mercury
2. Bulb/thin glass
3. Kink/construction/bend
4. Glass wall

**D**

**A**



**NB**:

* A kink (bend) prevents the backflow of mercury.
* When taking the temperature of a person, the thermometer can be placed in these places.
* In the armpit
* In the mouth
* In the anus
* Why should a health worker shake the thermometer before using it on another person?  
  It is because shaking makes the mercury to go back to the bulb.

1. **THE SIX’S MINIMUM AND MAXIMUM THERMOMETER.**

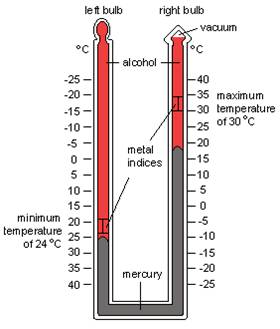
* This type of thermometer measures the minimum and maximum temperature of the day.

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

This thermometer is commonly found in places like:

* Research stations
* Schools
* Universities
* Weather stations

**Diagram of the Six’s Minimum and Maximum Thermometer**



1. **WALL THERMOMETER**

* This is the type of thermometer which is hung in our houses and offices.
* It measures temperature in the room
* It uses mercury
* Normal room temperature is 2500 C

**Diagram of a wall thermometer**



**Liquids used in thermometers**

There are two liquids used in thermometers namely:

1. Mercury
2. Alcohol

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

1. Mercury is easily seen.
2. Mercury does not stick on the wall of the thermometer.
3. Mercury is a good conductor of heat.
4. Mercury does not boil easily
5. Mercury has even and regular expansion

**ADVANTAGES OF USING ALCOHOL OVER MERCURY**

1. It does not solidify easily.
2. Alcohol expands 6 times more than mercury.

**DISADVANTAGES OF USING WATER IN THERMOMETER**

1. It is colourless so it not easily seen.
2. It sticks on the wall glass of the tube.
3. It is a bad conductor of heat.
4. It needs a lot of heat to expand.
5. Its expansion is not uniform.
6. It evaporates.

**CONVERSION OF SCALES**

1. **Converting from Centrigrade scale to Fahrenheit scale**

* 1ºC = 9º F **OR**  1.8º F

5

* The formula is: **( ºC × 9 ) + 32º = ºF**

**5**

1. **Changing from Fahrenheit scale to Centrigrade scale**

The formula is: **5 (F – 32) = 0C**

**9**

**Activity:**

* + - 1. **Temperature** is the hotness or coldness of an object or a place. What do we use to measure temperature?

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* + - 1. Name two types of thermometers.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Identify the liquids commonly used in thermometers.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. Mention one reason why mercury is commonly used in thermometers.

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* + - 1. Why is there a bend/kink in a clinical thermometer?

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* + - 1. Name the type of thermometer used to measure the highest and lowest temperatures of the day.

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* + - 1. Change the following from Celsius to Fahrenheit.

**( ºC × 9 ) + 32º = ºF )**

**5**

* 1. **0 ⁰C**
  2. **100 ⁰C**

**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

**PUTTING OFF FIRE**

1. Using fire extinguisher
2. Using dust
3. Using sand
4. Using water
5. Wrapping yourself in a thick blanket
6. Rolling yourself on the ground

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

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

Rusting is a chemical reaction which needs the presence of water (moisture) and oxygen

The product of rusting is iron rust or iron oxide

**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

1. Oxygen
2. Moisture (water)

**DISADVANTAGES OF RUSTING**

1. It results in wearing away iron and steel equipment
2. It changes and spoils the colour of things
3. Bolts become hard to unscrew after rusting
4. Keys fail to fit in padlocks after rusting
5. Water from rusty containers becomes poisonous
6. Rusting makes cutting materials blunt.

**HOW TO PREVENT RUSTING IN METALS**

1. By oiling and greasing
2. By painting
3. By using tar
4. By galvanizing
5. By enameling
6. By making iron stainless steel

**COMPARING BURINING AND RUSTING**

**SIMILARITIES**

1. Both require oxygen to take place
2. Both are chemical reactions

**DIFFERENCES**

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

**TOPICAL QUESTIONS.**

* + - 1. What is energy?

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* + - 1. Give the two types of energy.

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* + - 1. Kinetic energy is the type of energy possessed by a body in motion. Give four examples of kinetic energy.

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iii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ iv.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. One Saturday morning, Kiraza was jogging from home to Mulawa market, and back home. After three rounds of the exercise, he lay down on a mat to rest.

1. What type of energy did Kiraza possess while jogging?

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1. What type of energy did Kiraza possess while lying on the mat?

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* + - 1. List the different forms of energy.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ iii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ iv. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. The standard unit for measuring heat is **joules.** Define “**heat**”. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* + - 1. a. What is a source of heat?

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* 1. The sun is the main natural source of heat. Mention any other two examples of sources of heat.

i. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. Write down the uses of heat energy.

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8. Some solids melt when heated, some solids become red hot. Some solids burn to ash and others expand when heated. Liquids boil and evaporate when heated. State four effects of heat on matter.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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iii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

iv.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

9. How does heat travel?

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10. Define convection?

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11. Radiation is the process by which heat travels through gases. Mention two examples of radiation in nature.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ii. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

12. a. How does heat travel through solids?

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b. What is the importance of conduction? (Give three)

i. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ii. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

iii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

13. Does heat travel through a vacuum? Give a reason to support your answer?

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14. Give two reasons why a vacuum flask is not commonly used in rural areas.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ii. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

15. a. Iron is a good conductor of heat. What is a **“conductor”?**

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b. Silver is the best conductor of heat. Why is it not commonly used?

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c. State three good conductors of heat.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ iii. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

16. a. Define the term **“insulators”.**

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b. Mention four examples of bad conductors of heat.

i\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ iii. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ii.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c. Give two applications of insulators in daily life.

i.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ii. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

17. Last Sunday evening, Biol lit the charcoal stove to roast some maize. Her little sister sat near the charcoal stove to get some warmth. While roasting the maize, Biol accidentally burnt her fingers.

a. By what process of heat transfer did Biol’s fingers get burnt?

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b. How did the heat from the Charcoal stove reach her sister to get warm?

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18. Change the following from degrees Centigrade (⁰C) to degrees Fahrenheit (⁰F)

a. 25⁰C

b 15⁰C

19. Change the following from degrees Fahrenheit (⁰F) to degrees Centigrade (⁰C)

a. 77⁰F

b 59⁰F

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**END**