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P5 term 2

THEME: THE ENVIRONMENT

Topic 1/4: Components of the Environment "Soil"

Soil



It is the loose material that covers the earth's surface.

It forms 25% of the earth's surface. The rest is water.

Importance of soil

- (a) Soil is a habitat for animals such as earthworms, termites and ants
- (b) Soil contains plant nutrients
- (c) Soil supplies plants with water
- (d) Provide anchorage for the plant
- (e) Sand soil is used for building
- (f) Clay is used in pottery.

Exercise 1

- (a) State two functions of soil to plants.
- (b) State two functions of soil to man

Weathering

This is a process of soil formation by break down of rocks

Agents of weathering

- (i) Running water slowly wear out rocks
- (ii) Acid rain dissolve rocks
- (iii) Wind wear out rocks
- (iv) Animals: animal hoofs break rocks into small pieces.
- (v) Heating during day and cooling of rocks at night causes continuous expansion and contraction of rock which weaken it and cause them to break down
- (vi) Plant roots can break down rocks

Exercise 2

- (i) What is weathering
- (ii) List two agents of weathering

Components of soil

Soil contains

Water

Living microorganisms

Organic matter

Humus

Air

Exercise 3

- (i) List three components of the soil
- (ii) Give one use of each component listed in (i).

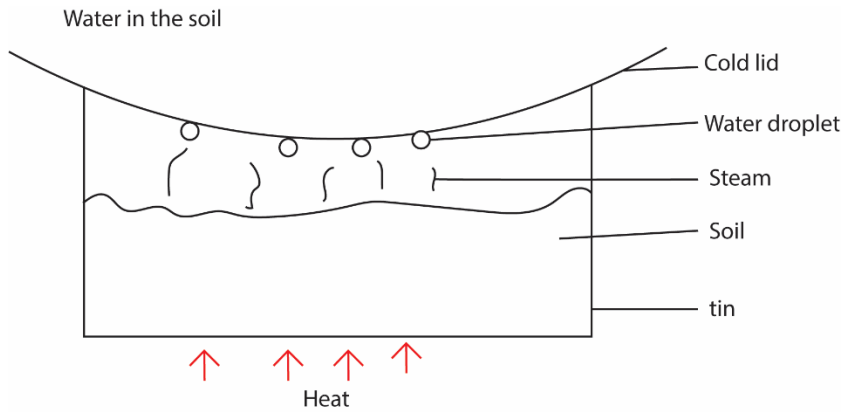
Investigating the presence of water in the soil

Requirements

A tin, Source of heat, some soil, Cold lid

Procedure

Heat the soil in a tin covered with cold lid



Observations

On heating the lower part of the lid is covered by water droplets

Conclusion

Soil contains water

Investigating the presence of humus in the soil

Requirements

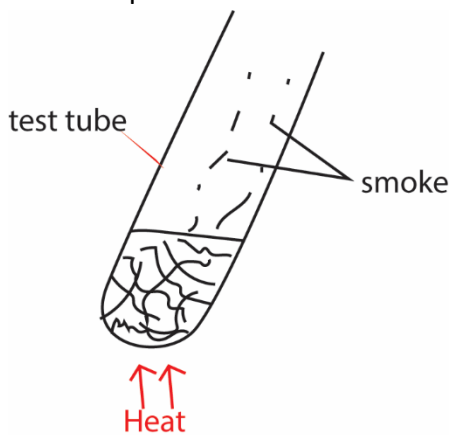
Test tube, Source of heat, some soil

Procedure

Heat the soil strongly in a test tube

Observation

Smoke is produced



Deduction

Smoke contain humus (organic matter)

Investigating the presence of air in the soil

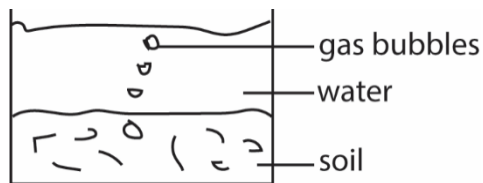
Requirements

Dry soil, a container, water

Procedure

- Pour water to the soil in a glass container

Observation



Air bubble seen

Conclusion

Soil contain air

NB. Sandy soil contains more air than clay soil due to its bigger particle size.

Exercise 4

- Explain one experiment to show that soil contains air

Types of soil

There are three types of soil: sand, clay and loam whose properties are given in the table below

Soil property	Soil type		
	Sand	Clay	Loam
Soil particles	Big	Small	Mixture
Water drainage	High	Low	Moderate
Water retention	Low	High	Moderate
Capillarity	Low	High	Moderate
Air spaces	Big	Small	Moderate

Uses

Sand for building

Clay for pottery

The soil properties are: Capillarity, Drainage and Soil texture

Capillarity

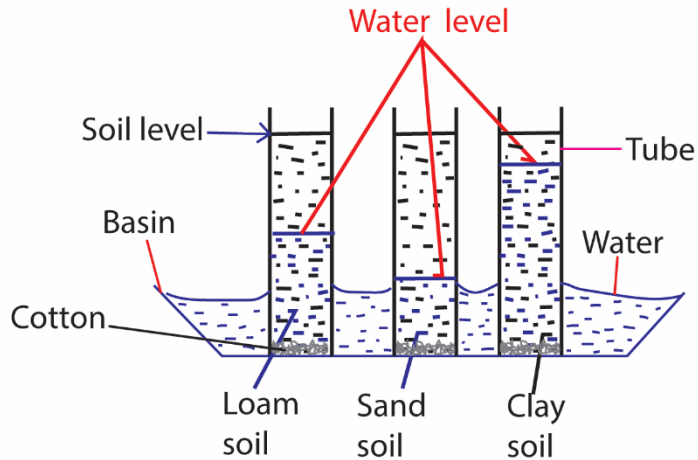
It is the rising up of water in the soil.

The set up below demonstrates soil capillarity

Exercise 5

- (i) State one use and one disadvantage of capillarity
- (ii) Name one soil type with the least and one type of soil with highest capillarity

Experiment to determine capillarity of the soil



Observation

Clay soil has highest capillarity followed by loam soil followed sand soil

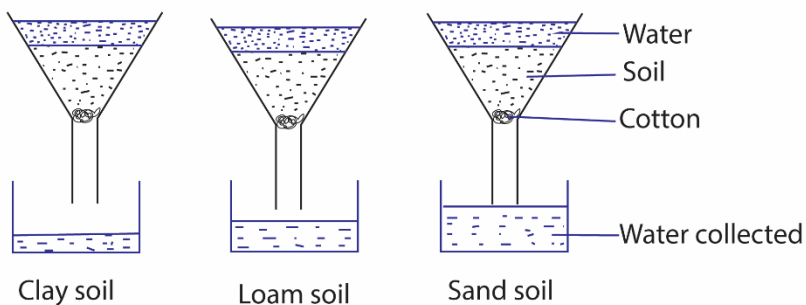
Application of capillarity

- (i) Raising of water in soiling during dry spells to be used by the plant
- (ii) Transport of water and mineral salts up the stem of plants
- (iii) Rising up of kerosene of in a wick of a lamp to initiate burning
- (iv) Wetting lower part of the walls of a house makes the house damp and uncomfortable

Drainage

It is the ability of water to pass through soil

Soil drainage



The size of the soil particles determines the ability of water to pass through.

Soil with large particles allows water to pass through easily and is said to have good drainage.

Soil with small particles does not allow water to pass through easily and is said to have poor drainage

Sand soil has good drainage while clay soil has poor drainage.

Water retention

This is the ability of soil to hold water.

A soil with good drainage has poor water retention.

Sand soil has poor water retention while clay soil has good water retention.

Water retention of sand soil can be improved by adding humus and this increases its water retention.

Loam soil is the best soil for farming because it has moderate capillarity, water retention and drainage.

Exercise 6

- (i) Distinguish between water retention and drainage of the soil.
- (ii) State one importance of water retention.

Soil erosion

This is the washing away of top soil by its agents

Disadvantages of soil erosion

It removes and carries top fertile soil

Agent of soil erosion

- (a) **Water:** running water loosen soil particles making it easy to carry away
- (b) **Wind:** blows away top soil from bare ground
- (c) **Animal hoofs** loosen soil particles making easy erode

Types of soil erosion

- (i) **Splash erosion:** occurs when soil is displaced by a rain drop.
- (ii) **Sheet erosion:** occurs when a thin uniform sheet of top soil is carried away.
- (iii) **Rill erosion:** occurs when water removes top soil leaving small channels in the soil
- (iv) **Gulley erosion** occurs when running water carry away top soil leaving deep U-shaped or V-shaped gulley.

Human activities that lead to soil erosion

- (v) Over cultivation of soil loosens soil particles making it easy to be carried away
- (vi) Deforestation exposes soil to agents of soil erosion
- (vii) Bush burning exposes soil to agents of soil erosion
- (viii) Road construction exposes soil to agents of soil erosion

Means of stopping soil erosion (some explanation)

1. By terracing
2. Couture ploughing
3. Strip cropping
4. Planting trees

Exercise 8

- (a) What is soil erosion
- (b) State:
 - (i) One agent of soil erosion

- (ii) One means of stopping soil erosion

Soil fertility

This is the ability of the soil to produce high yield and maintain production over a long time

Means of improving soil fertility

1. **By crop rotation:** crop rotation prevents exhaustion of minerals and allows leguminous plants or plants with root nodules to add nitrogen.
2. Addition of manure or fertilizers: fertilizers can be organic or artificial
3. By mulching
 - mulching retains soil moisture
 - mulching prevents soil erosion
 - mulching add soil nutrients when the mulch decompose.

Exercise 9

- (i) What is soil fertility
- (ii) Name any two components that make the soil fertile

Natural fertilizers (organic)

Compost Manure

Definition: Compost manure is an organic fertilizer made by the **decomposition of plant and animal wastes** (like crop residues, kitchen scraps, leaves, and animal dung) under controlled conditions.

How to make compost manure

Microorganisms break down the organic matter in the presence of air and moisture, producing a dark, crumbly, nutrient-rich material.

Nutrients: Supplies essential nutrients such as **nitrogen, phosphorus, potassium**, and improves soil organic matter.

Benefits:

- Improves **soil fertility and structure**.
- Enhances **water retention**.
- Promotes **microbial activity** in the soil.
- Environmentally friendly way of recycling waste.

Farmyard Manure (FYM)

It is made from **decomposed mixture of animal dung, urine, bedding materials, and leftover feed**.

Improves **soil fertility** by adding organic matter and nutrients (nitrogen, phosphorus, potassium).

It enhances **soil structure, water retention, and microbial activity**.

Green Manure

It Consists of **plants grown and then ploughed back into the soil** (e.g., legumes like cowpea, sun hemp).

It adds **nitrogen and organic matter** to the soil.

Improves **soil texture, prevents erosion, and suppresses weeds**.

Organic Mulches

It is made from **plant residues** such as straw, leaves, grass clippings, or compost spread on soil surface.

It helps **conserve soil moisture**, regulate temperature, and reduce weed growth.

As they decompose, they **add nutrients and organic matter** to the soil.

In short:

- **Composite manure** enriches soil with plant and animal wastes
- **Farmyard manure** enriches soil with animal waste.
- **Green manure** uses live plants ploughed into soil.
- **Organic mulches** cover soil to conserve moisture and add nutrients.

Advantages of Natural Fertilizers (Manure)

- (i) **Improves soil fertility** by adding organic matter and nutrients.
- (ii) **Enhances soil structure** (better aeration and water retention).
- (iii) **Environmentally friendly** – recycles farm waste.
- (iv) **Promotes microbial activity** in the soil.
- (v) **Long-term benefits** – nutrients released slowly, sustaining crops.
- (vi) **Cheaper and locally available** compared to chemical fertilizers.

Disadvantages of Natural Fertilizers (Manure)

- (i) **Nutrient content is low** compared to chemical fertilizers.
- (ii) **Nutrients released slowly**, not suitable for quick crop demands.
- (iii) **Bulky and heavy** – difficult to transport and apply.
- (iv) **May contain weed seeds or pathogens** if not well decomposed.
- (v) **Requires large quantities** to meet crop nutrient needs.
- (vi) **Variable quality** depending on source and preparation.

Exercise 10

- (a) Lists the composition of
 - (i) Composite manure
 - (ii) Farm yard manure
 - (iii) Green manure
 - (iv) Organic mulches
- (b) Give one advantage and disadvantage of organic manure

Inorganic Fertilizers

These are chemical compounds artificially prepared to supply nutrients to plants for appropriate growth and development. The major elements supplied are nitrogen, phosphorus and potassium.

Reasons for applying fertilizers in the soil

- (i) To replace the nutrients lost through harvesting crops.
- (ii) To add nutrients deficient in a soil
- (iii) To get consistent yield.

Advantages of inorganic fertilizer

- (i) They are less bulky thus easy to transport and store.
- (ii) They are easy to apply.
- (iii) Contain known nutrients required by the plant
- (iv) They are soluble and release nutrients easily to the plants

- (v) They are easily applied by machines
- (vi) They can be applied at any stage of plant growth.
- (vii) Contain nutrients at known concentration

Disadvantages of inorganic fertilizers

- (i) They are expensive to buy
- (ii) They pollute the environment when misused
- (iii) Change soil pH
- (iv) They are easily leached
- (v) Influence survival of microorganisms
- (vi) Do not improve soil structure
- (vii) Pollute water bodies
- (viii) Have low residual effect
- (ix) Excessive application of some inorganic fertilizers e.g. nitrogenous fertilizers cause lodging of crops.

Exercise 11

- (a) State one advantage and one disadvantage of inorganic manure

Pollution

Pollution is the introduction of wastes or harmful substances into the environment, making the environment unfit to support life in a healthy way. The materials that cause pollution are called **pollutants**. The components of the environment that can be polluted include air, water and soil.

Sources of soil pollutants

- (i) sewage
- (ii) industrial effluents/wastes
- (iii) use pesticides
- (iv) excessive use of fertilizers
- (v) urban wastes, broken glass, plastics and Chemicals / oils

Effects of soil pollution

- Oil spillage suffocates microorganism
- Plastics and glass prevent proper growth of plant root and drainage

- Burning alter soil quality

Soil conservation

It a means of taking cares of the soil to maintain soil fertility

Methods of soil conservation

- Avoid excessive use of pesticides and fertilizers
- Avoid dumping of industrial wastes in the soil
- Avoid burning vegetation cover
- Control soil erosion
- Control grazing

Environmental degradation

It is defined as any change or disturbance to the environment perceived to be deleterious or undesirable. Or it is the inability of the environment to support life.

Natural causes

- Earth quakes
- Flood
- Natural fires
- Storms

Human causes

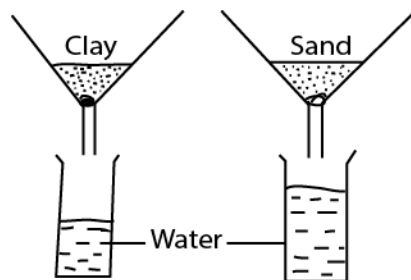
- Over cultivation
- Deforestation
- Pollution
- Urban wastes

Effects of environmental degradation

- Loss of wild life
- Ozone layer depletion
- Human diseases

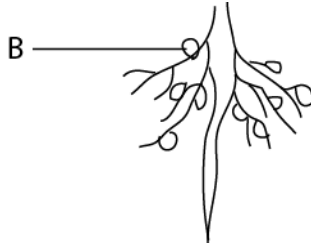
Exercise 11

1. State one way in which bacteria can be useful to man.
Nitrogen fixing bacteria in root nodules of legumes fix nitrogen into the soil
Bacteria cause decay and conversion of animal wastes to humus.
2. What is pollution?
Release of toxic substances in environment.
Dumping garbage
3. Name one activity that causes air pollution.
Release of industrial fumes in atmosphere
4. 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.



- (a) Through which soil did the water drain faster?
Sand
 - (b) Give a reason for your answer.
More water went through due to bigger particle sizes with big air space
 - (c) Why do the two types of soil allow water to drain at different rates?
They have different particle size
They have different air spaces
5. State one way in which bacteria is useful to man.
Convert rubbish to humus
Fix nitrogen to the soil
 6. Give the main reason why crop rotation maintain fertility.
 - **When legumes are included they fix nitrogen in the soil.**
 - **Crop rotation prevents exhaustion of a single nutrient.**

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



- (a) Name the part labelled B.
Root nodules
- (b) What group of plants have such roots
Leguminous plants
- (c) What does part labelled B contain?
bacteria
- (d) What is the function of what you named in (c) above?
Fix nitrogen to the soil
8. Mention one agent of soil erosion.
Animal
running water
wind
9. State the first stage of soil formation from rocks.
Weathering
10. Apart from contour ploughing, strip ploughing and mulching, give one other practice which is useful for soil conservation on hilly ground.
Terracing
11. What is soil erosion?
Soil erosion is the washing away of top soil by agents such as wind, running water.
12. Give a reason why water passes through sandy soil fastest.
Sandy soil has big particles and air spaces
13. (a) Name two agent of soil erosion.
(i) wind
(ii) running water
(iii) animal
- (b) How does trees stop soil erosion?
(i) they reduce the speed of wind
(ii) their roots hold the soil particles together.

(c) How does tree-cutting in an area lead to soil erosion?

Expose the soil to agents of soil erosion

14. Why is mulching a good practice to as human growers?

- **controls soil erosion**

- **retains moisture in the soil**

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

Sandy soil has bigger particles than clay soil

Sandy soil has bigger air space than clay soil

16. In which way do bacteria help in soil formation?

Cause decay forming humus

17. (a) In which way does the cutting of tress (deforestation) cause soil erosion?

This leaves land bear and exposed to agents of soil erosion such as running water, wing and animals

(b) Suggest any three methods of farming which can prevent soil erosion.

(i) terracing

(ii) mulching

(iii) strip cropping

18. Why is a clay soil able to retain water much longer than the other types of soil?

Clay soil has small particles which do not easily lose water

19. Give any one way in which soil is important to a plant.

Soil provide anchorage

Soil provides water to the plant

Soil provides nutrients to the plant

20. The list below gives some of the methods farmer use to control soil erosion

Use it to answer the questions that follow

-Terracing

-Planting trees

- Contour ploughing

-Mulching

Which two of the methods given above are best for?

(a) Land with a gentle slope?

(i) Planting trees

(ii) Mulching

(b) Land with a steep slope?

(i) Terracing

(ii) Contour ploughing

21. Mention any one natural resource found under the ground and is used as fuel.

Petroleum

Coal

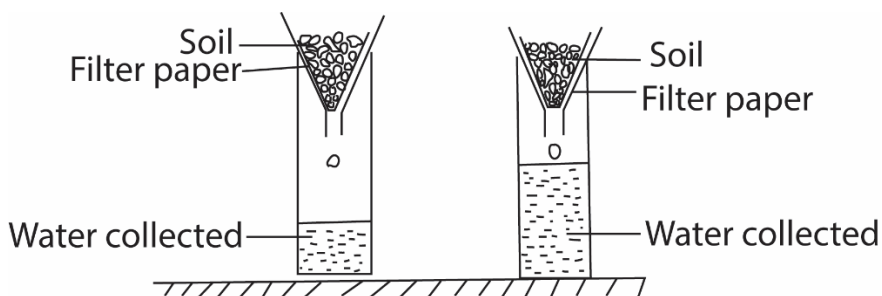
22. Apart from rock particles and living organisms, name other part of soil.

Water

Humus

Air

23. Equal amount of water were poured into soil A and B shown in the diagram below:



(a) From which soil did more water drop?

B

(b) State why more water dropped from soil you have named in (a) above.

Soil B has big particles than soil A.

(c) Name the type of soils in B

Sandy soil

(d) Give one use of the type of soil in A

Molding

Farming

24. How does mulching help to keep moisture in the soil?

Reduces evaporation

25. (a) State any two natural causes of environmental degradation

(i) Volcanic eruption

(ii) Flooding

(iii) Natural fires

(b) Give two human causes of environmental degradation

(i) **Overgrazing**

(ii) **Over cultivation**

(iii) **Pollution**

(iv) **Excessive use of fertilizers**

26. Which components of soil is used by plants to make their food?

Water is a raw material for photosynthesis

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

Sand soil

28. State the method of controlling soil erosion where a farmer plough land across a slope

Contour ploughing



Contour ploughing

29. Apart from decomposition, in which ways is soil formed?

Weathering

30. Give one way in which farmers can improve on the supply of nitrogen in the soil without the use of artificial fertilizers
- Plant leguminous plant.
 - Add composite manure
31. In the table below, part A shows some activities carried out by farmers and B shows the effects of the activities

A Activities	B Effects
Irrigation Afforestation Mulching Crop rotation	- Preserves soil moisture - Leads to death of crop pests - Promotes conventional rainfall - Allows growth in all seasons

Write the correct effect to the activity in the space provided below

- (i) Irrigation – **allows growth in all seasons**
 - (ii) Afforestation – **promote conventional rainfall**
 - (iii) Mulching – **preserves soil moisture**
 - (iv) Crop rotation- **leads to death of crop pests**
32. (a) Give any two examples of non-renewable resource in environment
- (i) **water**
 - (ii) **trees**
- (b) State any two ways of conserving non- renewable resources
- (i) **recycling**
 - (ii) **using sparingly**
33. (a) Write down any two causes of soil erosion
- (i) **wind**
 - (ii) **running water**
- (b) Which agent of soil erosion causes gullies?
- Running water**
- (c) How does soil erosion lead to soil infertility?
- Removes top fertile soil**
34. How is water as a renewable resource replaced in the environment?
- By rain**
35. (a) Write down any two causes of weathering of rocks.
- (i) **water**
 - (ii) **wind**
- (b) Apart from weathering, name the other process by which soil is formed.

Decomposition of organic matter

(c) How do living organism is soil help to improve soil fertility?

Fix nitrogen in root nodules

Decomposition of organic matter

Thank You

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