Contemporary Science

TEACHER'S GUIDE

For Junior High Schools

8

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PREFACE

The Contemporary Science for Basic 7-9 is a set of three books developed for use by learners in Basic 7, 8 and 9 in Ghana. The books conform with the New Curriculum designed for Basic Schools in Ghana by the National Council for Curriculum and Assessment (NaCCA) for the Ministry of Education.

The set of books will enable learners acquire experiences for post-secondary education and work place. They are based on a Common Core Programme (CCP) that emphasises a set of high, Internationally bench-marked career and tertiary education readiness standards, for critical thinking and Problem Solving. The standards articulate what learners are expected to know, understand and be able to do by focusing on their social, emotional, cognitive and physical development.

The books have suggested the use of locally available materials that can be seen in the Ghanaian environment. Essentially, the content standards run through the entire curriculum with different aspects being emphasised each year.

The language is simple. Subject Specific Practices and Core Competencies have been integrated to enhance the acquisition of core skills by learners and also to develop cognitive, reasoning problem solving innovators.

The illustrations in the books will help learners understand scientific concepts easily. Study questions have been included to enable the learners assess themselves after every unit.

It is envisaged that the provisions in the books will help learners to fully acquire the knowledge, competencies and skills integrated in the new science curriculum. It will also assist the learners to understand basic scientific concepts and become critical thinkers, problem-solvers, creators, innovators, global communicators, collaborators, digitally-literate, culturally and globally sensitive citizens who will learn all their lives for personal development.

The guide is the main material that gives the appropriate methods, strategies, procedures, planning and resources for teaching the subject. It has Additional Information, Diagnostic Assessment Questions, Answers to all Study Questions and guidelines for all Test of Practical Activities, Group Work and Project Work.

The writing panel is a group of well-known Science educators. The books have been developed out of their wealth of experience acquired over the years in the field of Science education.

INTRODUCTION

The Teacher's Guide has been developed to empower teachers to be able to effectively assist learners as they make use of the Learner's Book. One outstanding feature of the Teacher's Guide is the fact that it clearly outlines the steps to be followed by teachers in ensuring the conduct of learner-centred Science Lessons that promote the acquisition of relevant science process skills by learners, hence improving their attitude towards the study of this integral subject. Each session within the guide contains approaches to enable teachers to clearly perform their roles as facilitators of the learning process.

The guide promotes meaningful learning by creating a clear link between the concepts to be taught and the daily experiences of the learner as well as the practical usefulness of the concept. One of the main features of the Science curriculum for Junior High School is the focus on the acquisition of core competencies and 21st Century Skills such as critical thinking and problem solving, communication and collaboration, digital literacy, creativity and innovation, cultural identity and global citizenship. In order for learners to acquire and exhibit these core skills, it is critical for teachers to create the opportunities for learners to explore and enjoy science learning through the use of different strategies and pedagogies.

A key aim for the science curriculum is to shape individuals to become scientifically literate, good problem solvers, with the ability to think creatively and develop the confidence as well as the competence to participate fully in the Ghanaian society as responsible local and global citizens. In order for this aim to be achieved, teachers need to create an enabling classroom and school environment. In this vein the guide outlines how teachers can achieve this target through adequate pre-lesson preparation, use of appropriate resources, learner-centred and dynamic classroom delivery.

In modern times, assessment is regarded as a crucial tool for promoting the attainment of learning outcomes rather than merely evaluating what the learner has learnt. The assessment provisions in the Teacher's Guide cover assessment for Learning, Assessment as Learning as well as Assessment of Learning strategies.
In each Lesson of the Teacher's Guide, the user (teacher) is provided with guidelines on how to make effective use of ICT as a pedagogical tool and also for the promotion of the acquisition of digital literacy skills by learners. Inclusivity in the science classroom is also promoted through the suggestion of different teaching and assessment strategies that cater for learners of different learning styles and abilities.

Other key features of the Guide include the suggestions of home learning activities to promote further study of science, provision of answers to various assessment tasks in the Learner's Book and the prompters to enable the teachers evaluate their own classroom delivery of each lesson. Summarily, the effective use of the guide by teachers will make science learning enjoyable for all learners and ultimately ensure the attainment of learning outcomes in the Learner's book as well as the Curriculum.

ORGANISATION OF THE TEACHER'S GUIDE

Strand: Strands are the broad learning areas or domains of the subject content to be studied.

Sub-strands: Sub-strands are the sub-divisions of the broad learning areas or strands.

Indicators: Indicators are clear outcomes or milestones that learners have to exhibit in each year to meet the content standard expectation. The indicators represent the minimum expected standard in a year.

Lesson: These align with the order of lessons in the Learner's Book and aid in cross referencing between the Guide and Textbook.

Teaching and Learning Resources:
This part details the relevant sources required for the effective teaching of the lesson. This includes improvised resources, ICT equipment such as mobile phones and laptops, science equipment and readily available local resources. Teachers are expected to gather these resources or in some cases, task learners to bring them to class in order to promote effective and interesting science learning.

Reference to Learner's Book pages: Refer to Learners Book pages
The purpose of this section of the guide is to ensure the alignment of the Guide to the Learner's Book. It promotes easy and seamless transition between the Guide and Leaner's book by directing the users of the Guide to relevant portions of the Textbook for purposes of easy cross referencing.

Learning Expectations:
These are learner centred outcomes that clearly outline what learners are expected to know, understand and be able to do after the lesson. They are provided to remind and guide teachers on the skills and competencies that their learners must demonstrate after the lesson as evidence of the acquisition of the target of the indicator.

Keywords:
The keywords here refer to subject specific words and terminologies that feature prominently in the lesson. The teacher is expected to understand these terminologies and also ensure the learners understand them.

Prior Preparation:
This sub-section of the Guide seeks to assist the teacher to prepare adequately before the actual classroom delivery.

Background:
The purpose of the background session is to provide basic and fundamental knowledge about the concept to be learnt. It also creates links between the present lesson and previous ones. The background also covers the real life application of the concept to be taught.

Additional Information:
This refers to further details on the concept of interest. It builds on the background and provides further insight about the lesson to the teacher.

Diagnostic Assessment:
The tasks set under the diagnostic session are meant to guide the teacher in identifying the possible challenges that will prevent the learners from achieving the set targets. It is expected that after diagnosis, the identified issues will be addressed in order to promote effective learning.

Teacher-Learner Activities:
This section contains the suggested approaches that will guide the teacher to effectively deliver the lesson in class. They are mostly learner-centred strategies.

Skills and Competences:
The subject specific skills as well as general 21st century skills and competencies that teachers are expected to promote in the lesson are captured under this section. They closely align with the Teacher-Learner activities.

Progress Assessment:
The progress assessment tasks are meant to consolidate the gains of learning and also scaffold further learning y identifying areas where clearers face challenges as the lesson proceeds, in order to provide the necessary redress.

Key Points of Lesson:
This section provides the essential aspects of the lesson which teachers need to stress on and which learners also must grasp.

Reflection:
Under this section, relevant questions are posed to enable the classroom practitioners to evaluate their classroom delivery and make necessary adjustments where the need be.

GOAL OF THE CURRICULUM

Goal:
The CCP science curriculum is to develop individuals to become scientifically literate, good problem solvers, have the ability to think creatively and have both the confidence and competence to participate fully in Ghanaian society as responsible local and global citizens.

Specific Aims:
The curriculum of the Common Core Science Programme for B7 to B9 is designed for learners to achieve the following aims:

1. Develop the spirit of curiosity, creativity, innovation and critical thinking for investigating and understanding their environment.
2. Develop skills, habits of the mind and attitudes necessary for scientific inquiry.
3. Communicate scientific ideas effectively.
4. Use scientific concepts in explaining their own lives and the world around them.
5. Live a healthy and quality life.
6. Develop humane and responsible attitude towards the use of all resources in Ghana and elsewhere.
7. Show concern and understanding of the interdependence of all living things and the Earth on which they live.
8. Design activities for exploring and applying scientific ideas and concepts.
9. Develop skills for using technology to enhance learning.
10. Use materials in their environment in a sustainable manner.

Expected Learning Behaviours:
The three integral domains that should be the basis for instructions and assessment include:

- Knowledge, Understanding and Application
- Process skills
- Attitudes and Values

Conclusion:
The Contemporary Science for Basic 7 to Basic 9 and their accompanying Teacher's Guides have been carefully written and designed to offer learners the opportunity to apply what they learn in their everyday activities.

Teaching is an art, and classroom situations differ under different learning environments. For that matter, do well to complement the texts in the Learner's Book and the guidelines in the Teacher's Guide with other relevant resources that suit your environment.

CONTENTS

STRAND 1

DIVERSITY OF MATTER

Unit 1: Materials

CONTENT STANDARD: B8.1.1.1 Demonstrate knowledge of types of mixtures, and understanding of the processes of scientific ways of separating the components of mixtures.

Indicator: B8.1.1.1.1 Identify types of mixtures by name and characteristics

LESSON 1: MIXTURES

Teaching And Learning Resources:

- common solid and liquid materials such as clay, pebbles, bottle tops, salt, sugar, sand, gari, gravel, oil, water
  Learner's Book 8: Pages 1 - 8

Learning Expectations:
At the end of the lesson, the learner will:

- will know different types of mixtures and how they are formed
- can explain how to separate common mixtures

Keywords: homogenous, heterogeneous, filtration, distillation, chromatography,

Prior Preparation:

- Ahead of the lesson make set-ups for separating mixtures through methods such as filtration, evaporation, decantation, use of a magnet and use of a separating funnel.
- Ask learners to bring small amounts of common solid and liquid materials such as water, cooking oil, marbles, gari, chalk etc.

INTRODUCTION

In daily living, we use a lot of materials that are a combination of two or more different substances. For example, the toothpaste we use to brush our teeth, the soup we use to eat fufu or the paint used for painting our schools or the mortar for building houses. These are all examples of mixtures. We will find out more about different mixtures and how they can be separated.

A mixture refers to the physical combination of two or more substances or elements. In the formation of mixtures, the substances that combine to form the mixture retain their individual properties. So we can also say mixtures consist of two or more substances that are not chemically combined.
Mixtures are usually separated into their components by physical means.

Additional Information

A mixture is a physical combination of two or more substances that are mixed but not chemically combined. The components of a mixture maintain their own physical properties. An example of a mixture is salt water. If you were to drink salt water, it would taste like water with salt in it.

Mixtures come in two main types: homogeneous and heterogeneous mixtures.
A homogeneous mixture is a mixture that is uniform throughout, meaning that one part of it has the same distribution of components as another part.
A heterogeneous mixture is a mixture that is not uniform throughout, meaning that there is an unequal distribution of the ingredients of the mixture.

Air is a homogeneous mixture of many different gases, including oxygen, nitrogen, carbon dioxide, and water vapour. Homogeneous mixtures are sometimes called solutions; especially when it is a mixture of a solid dissolved in a liquid or a liquid dissolved in another liquid.
An example of a heterogeneous mixture is a mixture of sand and groundnut. Heterogeneous mixtures are easily distinguished because their different components can be seen as individual substances whereas a homogeneous mixture all looks the same.

Diagnostic Assessment

Ask students to list the types of mixtures and give an example of each type of mixture.

Activity 1: Forming mixtures based on substances provided

Place learners into groups and ask them to form different mixtures based on the substances provided. Assist them to form solid-solid, liquid-solid and liquid-liquid mixtures.

Activity 2: Forming homogenous and heterogenous mixtures

With the aid of the substances assist students to form homogenous and heterogeneous mixtures from the materials available.

Activity 3: Forming different solutions and identifying solvent and solute

Using the same resources help students to form different solutions, identifying the solutes and solvent in each case.

Activity 4: Separation of mixtures
Guide learners to make use of the set-ups to separate various mixtures through filtration, decantation, sedimentation, etc.

Activity 5: Forming suspension and colloids
With the aid of clay, soap and water, assist the students to form a clay suspension (clay in water) and colloid (soapy water).

Activity 6: Finding out differences between suspension and colloid
Many learners face problems understanding the difference between a colloid and a suspension.
With the aid of the soapy water and muddy water, find out whether students have understood the similarities and differences between a suspension and a colloid.

Skills and Competences
Comparing, evaluating, manipulating, observing, cultural identity, collaboration, problem solving

Progressive Assessment
Engage learners to form different mixtures, identify the mixtures they have formed and identify the method for separating each mixture.

Main Points of the Lesson

- Methods of separating mixtures, include filtration, distillation, decantation, evaporation, and use of a separating funnel etc.
- Differences in physical properties such as size, boiling point, melting point, density and solubility can be used to separate mixtures.
- The process that separates a solid from a liquid in a heterogeneous mixture using a filter paper is called filtration.
- During a distillation, a liquid is boiled to produce a vapour that is then condensed into a liquid.
- Chromatography: separating components of a mixture that have differing adsorptive tendencies on a stationary phase as the mixture is passed over or through the stationary phase
- Centrifugation: the process of separating a liquid and a solid or two immiscible liquids by means of a centrifuge.
- Sublimation: a method of separation that involves heating some solid substances to convert them into the vapour state without passing through the liquid state.

Answers to Questions in learner's Book

1. A
2. A
3. A
4. D
5. A
6. C
7. D
8. B

Answers to essay type questions

1. a. Refer to page 1 of Learners' Book
   b. Refer to page 4 of Learners' Book

2. Refer to page 2 of Learners' Book

Answers to Practical Questions

1. a. A. Residue
      B. Funnel
      C. Residue
      D. Filtrate

   b. Filtration
   c. Sand and water; muddy water; chalk solution
   d. Stir the mixture carefully and gently.
      Pour the mixture carefully into the filter funnel
      Carefully position filter paper into the funnel

2. a. Distillation

   b. A - thermometer
      B - Bunsen burner
      C - condenser
      D - round bottom flask
      E - tripod stand

   c. Changes the state of a substance from gaseous to liquid
   d. Ethanol and water
   e. Differences in boiling point.

ICT: Watch a video on homogenous and heterogeneous mixtures by following the link below:

- https://www.youtube.com/watch?v=-p9vJB2jY0c

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Were the activities interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any reasons by which by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

CONTENT STANDARD: B8.1.1.2 Demonstrate understanding of atoms and the atomic structure of elements in the periodic table.

Indicator: B8.1.1.1.2 Explain how to separate common mixtures.

LESSON 2: SEPARATION OF MIXTURES

Teaching and Learning Resources:

- common solid and liquid substances such as clay pebbles, bottle tops, salt, sugar, sand, gari, gravel, oil, water.

Learner's Book 8: Pages 9 - 20

Learning Expectations:

At the end of the lesson, the learner will:

- know the types of mixtures and how they are formed
- explain how to separate common mixtures

Keywords:homogenous, heterogenous, filtration, distillation, chromatography

Prior Preparation:

- ahead of the lesson make set-ups for separating mixtures through the methods such as filtration, evaporation, decantation, use of a magnet and use of a separating funnel.
- task learners to bring small amounts of common solid and liquid materials such as water, cooking oil, marbles gari, chalk etc.

Background

In our homes how is groundnut separated from sand after roasting? Before beans is cooked, how are the small pieces of stone removed from the bowl containing the beans? The examples above show ways of separating mixtures. The method used in separating a giving mixture depends on the components of the mixture.

Additional Information:

The common methods used in separating mixtures include:

- Evaporation
- Sedimentation
- Filtration
- Distillation
- Sieving
- Hand picking
- Use of a magnet
- Winnowing
- Sieving
- Chromatography
- Centrifugation

Diagnostic Assessment
Ask students to list the types of mixtures and give an example of each type of mixture.

Activity 1: place learners into groups and ask them to form different mixtures based on the substances provided. Assist them to form solid-solid, liquid-solid and liquid-liquid mixtures.

Activity 2: Guide learners to make use of the set-ups to separate various mixtures through filtration, decantation, sedimentation, etc.

Activity 3: Engage learners in a discussion to find out the properties of the components of each mixture they formed and how that made it possible for them to separate the mixture.

Skills and Competences
Comparing, evaluating, manipulating, observing, cultural identity, collaboration, problem solving

Progress Assessment
Engage learners in a pair activity to match mixtures with their methods of separation

Key Points of Lesson

- Methods of separating mixtures, include filtration, distillation, decantation, evaporation, and use of a separating funnel etc.
- Differences in physical properties such as size, density, solubility can be used to separate mixtures.
- The process that separates a solid from a liquid in a heterogeneous mixture is called filtration.
- During a distillation, a liquid is boiled to produce a vapor that is then condensed into a liquid.
- Chromatography: separating components of a mixture that have differing adsorptive tendencies on a stationary phase as the mixture is passed over or through the stationary phase.
- Centrifugation: removing a substance from a solution by means of a centrifuge.
- Sublimation: vaporizing a solid and subsequently condensing its vapor.

Reflection
Many learners face problems understanding the difference between a colloid and a suspension. With the aid of the soapy water and muddy water, find out whether students have understood the similarities and differences between a suspension and a colloid.

Answers to Questions in learner's Book

1. A
2. A.
3. A
4. D.
5. A
6. C
7. D
8. B

Answers to Practical Questions

1. a. distillation
   b. A: thermometer
      B: Inlet
      C: Condenser
      D: outlet
      E: tripod stand
      F: Bunsen burner

c. Changes the state of a substance from gaseous to liquid

d. Ethanol and water

e. Differences in boiling point.

CONTENT STANDARD: B8.1.1.2 Demonstrate understanding of atoms and the atomic structure of elements in the periodic table.

Indicator: B8.1.1.2.1 Describe atoms as composed of sub-atomic particles.

LESSON 3: MATTER

Teaching and Learning Resources:

- Chart on the periodic table, chart on the atomic structure.

Learner's Book 8: Pages 21 - 27

Learning Expectations:

At the end of the lesson, the learner will:

- know the sub-atomic particles
- explain the terms atomic number, mass number and electronic configuration
- draw the periodic table of the first twenty elements

Keywords: electronic configuration, nucleons, molecules, mass number, atomic number

Prior Preparation:

- Draw a design of the atomic structure on the classroom floor or on the school field.

INTRODUCTION

Elements are made of tiny particles of matter called atoms. An atom is the basic unit of matter that can take part in a chemical reaction The atom consists of two main parts namely: The nucleus and the shells or energy levels. Some elements are made of molecules. e.g., oxygen.

The nucleus is the central part of the atom. The protons and neutrons are located in the nucleus and are collectively termed as nucleons. The electrons are contained in different levels of distances around the nucleus termed as shells or energy levels. Each shell has a maximum number of electrons that it can contain.
Each atom is made of subatomic particles called protons, neutrons and electrons.

Additional Information

The main sub-atomic particles are protons, neutrons and electrons. Their properties are summarized in the table below.

Particle	Symbol	Location	Electrical Charge	Relative Mass
Proton	p	Inside Nucleus	+1 (positive)	1
Neutron	n	Inside Nucleus	0 (no charge/ neutral)	1
Electron	e	In shells (outside the nucleus)	-1 (negative)	1/1840

Atomic Number and Mass Number

Atomic number refers to the number of protons in an atom. In an atom the atomic number is the same as the number of electrons. The symbol for atomic number is Z.

Mass Number (Nucleon number): This is the term used to describe the total number of protons and neutrons of a given atom. Its symbol is A.

Generally, an atom Y, is represented as ${}^{A}_{z}\mathbf{Y}$

Thus atomic number is written as a left subscript (bottom whiles the mass number is written as a right superscript top).

Since the mass number(A) represents the total number of protons and neutrons, the following expression can be written

$A = z + n$

Where A= mass number,

Z = atomic number and n = number of neutrons present in the atom.

From the equation above we can deduce that

$Z = A – n$ and also

$n = A – z$;

In a neutral atom, the number of protons present in the nucleus is always equal to the number of electrons present in the shells of the atom.

Diagnostic Assessment

Ask learners to draw a summary table on the sub-atomic particles, their charges, location within the atom and their relative atomic mass.

Activity 1: Drawing atommic model

Draw a model of the atom on the floor or school field. Engage students to identify the positions, relative masses and charges of protons, neutrons and electrons.

Activity 2: Identifying mass number and atomic number
Engage learners to work in pairs to identify the mass number and atomic number of different atoms drawn on the board or presented in a chart.
Using the equation; A = z + n, assist learners to know the relation between, mass number, atomic number, number of neutrons and number of electrons.

Activity 3: Arranging electrons in atomic models
Assist learners to know how to arrange electrons in an atom using models drawn on cardboards to represent orbitals.
Draw different circles to represent the K, L, M and N shells respectively. Place stones on each line to show the correct number of electrons that can be contained in each orbital.

Activity 4: Using periodic chart to relate atomic number to group or period of an element
With the aid of the chart on the periodic table, guide learners to know the relation between atomic number, electronic configuration and the group or period of an element.

Activity 5: Designing peiodic table of first twenty elements
Give learners a group work to make their own design of the periodic table of the first twenty elements on a piece of paper.

Activity 6:
Find-out whether students know the relation between atomic number, electronic configuration and the position of an element on the periodic table.

Skills and Competences
Comparing, evaluating, manipulating, observing, cultural identity, collaboration, problem solving

Progressive Assessment
Engage learners in a whole class activity where a student randomly mentions the name of an element. Other learners within the class are then required to mention the atomic number, group and period which the element belongs to.

Main Points of the Lesson

- An atom is the basic unit of matter that can take part in a chemical reaction.
- Atoms are made of subatomic particles: protons, neutrons, & electrons
- Atoms are composed of three sub-atomic particles namely, protons, neutrons, and electrons.
- Arrangement of electrons in shells is known as Electronic Configuration.
- The building blocks of matter are atoms, molecules and ions.
- Ions are formed when atoms loss or gain electrons.
- The periodic table shows the arrangement of elements into groups and periods.

ANSWERS TO QUESTIONS IN LEARNER'S BOOK

1. A
2. C
3. C
4. D
5. A
6. B
7. B
8. A
9. C
10. A

Answers to Essay Type Questions

1. Refer to pages 18-19 of Learner' Book.

2. Refer to pages 23 of Learner' Book.

3. a. 35 - 18 = 17
   b. 17 electrons
   c. 2, 8, 7
   d. Anion. it can accept one electron to fill its shell completely.
   e. Chlorine

4. Refer to page 19, 20 of Learners' Book 8.

Answers to Practical Question

A. electron
B. neutron
C. proton

b. sub-atomic particles
c. 2,2
d. i. positively charged; has a relative atomic mass of 1; found inside the nucleus
e. nucleus

ICT: Follow the link below for more ideas on the lesson above:

- https://edu.rsc.org/cpd/atoms-molecules-and-ions/3010574.article

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Were the activities interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any reasons by which by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

1 Sub-Strand 2: Living Cells

CONTENT STANDARD: B8.1.2.1 Demonstrate an understanding of the types of cells and their structure in relation to different organisms.

Indicator: B8.1.2.1.1 Examine and describe the structure of prokaryotic and eukaryotic cells.

LESSON: TYPES OF CELLS

Teaching and Learning Resources:

- video and chart or models on types of cells, A4 sheets, poster colours, pencils and erasers.
  Learner's Book 8: Pages 34 - 38

Learning Expectations:

At the end of the lesson, the learner will:

- explain the similarities and differences between eukaryotic and prokaryotic cells
- identify the importance of prokaryotes and eukaryotes to human health
- explain the harmful effects of some prokaryotes and eukaryotes on human health.

Skills and Competences: Comparing, evaluating, manipulating, observing, cultural identity, collaboration, problem solving.

Keywords: eukaryotes, prokaryotes, ribosome, mitochondrion, nucleus, cell membrane

Prior Preparation:

- Gather videos or prepare charts on prokaryotic and eukaryotic cells.

INTRODUCTION

Every living organism falls into one of two groups, eukaryotes or prokaryotes. The structure of the cells in a given organism determines whether the organism is a prokaryote or a eukaryote. In this lesson, we will explain in detail what prokaryotes and eukaryotes are and outline the differences between the two.

Additional Information

Every living organism falls into one of two groups: eukaryotes or prokaryotes. Cellular structure determines which group an organism belongs to. In this article, we will explain in detail what prokaryotes and eukaryotes are and outline the differences between the two.

Prokaryote definition
Prokaryotes are unicellular organisms that lack membrane-bound structures, the most noteworthy of which is the nucleus. Prokaryotic cells tend to be small, simple cells.

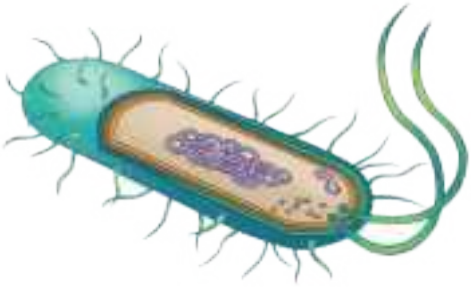


Fig. 1 - *A prokaryote cell*

While prokaryotic cells do not have membrane-bound structures, they do have distinct cellular regions. In prokaryotic cells, DNA bundles together in a region called the nucleoid.

Prokaryotic cell features
Here is a breakdown of what you might find in a prokaryotic bacterial cell.

- **Nucleoid:** A central region of the cell that contains its DNA.
- **Ribosome:** Ribosomes are responsible for protein synthesis.
- **Cell wall:** The cell wall provides structure and protection from the outside environment. Most bacteria have a rigid cell wall made from carbohydrates and proteins called peptidoglycans.
- **Cell membrane:** Every prokaryote has a cell membrane, also known as the plasma membrane, that separates the cell from the outside environment.
- **Capsule:** Some bacteria have a layer of carbohydrates that surrounds the cell wall called the capsule. The capsule helps the bacterium attach to surfaces.
- **Fimbriae:** Fimbriae are thin, hair-like structures that help with cellular attachment.
- **Pili:** Pili are rod-shaped structures involved in multiple roles, including attachment and DNA transfer.
- **Flagella:** Flagella are thin, tail-like structures that assist in movement.

Examples of prokaryotes
Bacteria and archaea are the two types of prokaryotes.

Do prokaryotes have mitochondria?
No, prokaryotes do not have mitochondria. Mitochondria are only found in eukaryotic cells. This is also true of other membrane-bound structures like the nucleus and the Golgi apparatus (more on these later).

One theory for eukaryotic evolution hypothesizes that mitochondria were first prokaryotic cells that lived inside other cells. Over time, evolution led to these separate organisms functioning as a single organism in the form of a eukaryote.

Eukaryote definition
Eukaryotes are organisms whose cells have a nucleus and other organelles enclosed by a plasma membrane. Organelles are internal structures responsible for a variety of functions, such as energy production and protein synthesis.

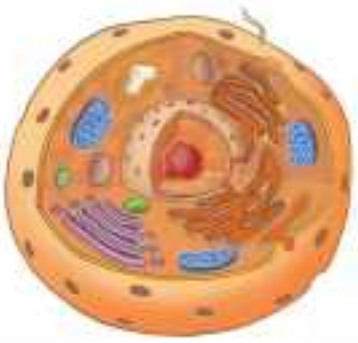


Fig. 2 - *A eukaryote cell*.

Eukaryotic cells are large (around 10-100 μm) and complex. While most eukaryotes are multicellular organisms, there are some single-cell eukaryotes.

Eukaryotic cell features
Within a eukaryotic cell, each membrane-bound structure carries out specific cellular functions. Here is an overview of many of the primary components of eukaryotic cells.

- **Nucleus:** The nucleus stores the genetic information in chromatin form.
- **Nucleolus:** Found inside of the nucleus, the nucleolus is the part of eukaryotic cells where ribosomal RNA is produced.
- **Plasma membrane:** The plasma membrane is a phospholipid bilayer that surrounds the entire cell and encompasses the organelles within.
- **Cytoskeleton or cell wall:** The cytoskeleton or cell wall provides structure, allows for cell movement, and plays a role in cell division.
- **Ribosomes:** Ribosomes are responsible for protein synthesis.
- **Mitochondria:** Mitochondria, also known as the powerhouses of the cell, are responsible for energy production.
- **Cytoplasm:** The cytoplasm is the region of the cell between the nuclear envelope and plasma membrane.
- **Cytosol:** Cytosol is a gel-like substance within the cell that contains the organelles.
- **Endoplasmic reticulum:** The endoplasmic reticulum is an organelle dedicated to protein maturation and transportation.

- **Vesicles and vacuoles:** Vesicles and vacuoles are membrane-bound sacs involved in transportation and storage.

Other common organelles found in many, but not all, eukaryotes include the Golgi apparatus, chloroplasts and lysosomes.

Examples of eukaryotes
Animals, plants, fungi, algae and protozoans are all eukaryotes.

Diagnostic Assessment
Ask learners to write the differences between plant and animal cells. Afterwards, ask them to mention the different types of cells.

Activity 1: Identifying main organelles of a cell.
With the aid of a chart on the plant cell, review the concept of cells with the class. Assist them to identify the main organelles of a cell and their functions.

Activity 2: Examining Prokayotic and Eukoryotic cells.
Show learner's videos or pictures of both eukaryotic and prokaryotic cells. Learners must work in pairs to critically observe the charts and talk about the differences and similarities between the two types of cells

Activity 3: Drawing prokaryotic and eukaryotic cells.
Assign learners to draw both prokaryotic and eukaryotic cells on A4 sheets and colour them beautifully.

Activity 4: Finding out differences between prokaryotes and eukaryotes.
Summarize the lesson by mentioning examples of prokaryotes and eukaryotes. With the aid of questions, find out whether the learners know the differences between the two main types of cells in terms of structures such as nucleus, cell membrane and organelles.

Progressive Assessment
Give learners a list of living organisms and ask them to classify them as prokaryotic or eukaryotic organisms.

Main Points of the Lesson

- There are two main forms of cells which are prokaryotic and eukaryotic cells.
- Prokaryotic cells do not have nucleus, cell membrane or organelles such as mitochondria and vacuoles.
- Organisms having prokaryotic cells are known as prokaryotes
- Eukaryotic cells have nucleus, membrane bound organelles, and cytoplasm.
- Examples of prokaryotes are bacteria and archaea.
- Humans, Animals, plants, fungi and protozoans all have eukaryotic cells.
- Both prokaryotic and eukaryotic cells have Ribosomes and DNA.
- Most prokaryotes are beneficial to human health and do not cause disease.
- Harmful bacteria that cause bacterial infections and disease are called pathogenic bacteria. Examples are Escherichia coli and Salmonella which cause food poisoning.

ANSWERS TO QUESTIONS IN LEARNER'S BOOK

1. C
2. C
3. A
4. B
5. B
6. A
7. C
8. B

Answers to Essay type Questions

1. Refer to page 29 of Learners' Book 8.
2. Refer to page 32 of Learners' Book 8.
3. Refer to page 33 of Learners' Book 8.
4. Refer to page 31 of Learners' Book 8.
5. Refer to page 35 of Learners' Book 8.

Answers to Practical Questions

Question One:

a. A is a prokaryotic cell
   B is a eukaryotic cell

b. Refer to learners' book page 32 for similarities between prokaryotes and eukaryotes

c. Refer to learner's book for differences between prokaryotes and eukaryotes

d. Bacteria and archaea are examples of prokaryotes.
   Animals and plants are examples of eukaryotes.

ICT: You can watch a very insightful video on cells by opening the link below on your web browser:

- https://www.youtube.com/watch?v=kcG1F88KQA0

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Were the activities interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any reasons by which by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

Indicator: B8.1.2.1.2

LESSON 2: CLASSIFICATION OF CELLS INTO EUKARYOTES AND PROKARYOTES

Teaching and Learning Resources:

- video and chart or models on types of cells, A4 sheets, poster colours, pencils and erasers.

Learner's Book 8: Pages 39 - 45

Learning Expectations:

At the end of the lesson, the learner will:

- explain the similarities and differences between eukaryotic and prokaryotic cells.
- classify organisms as prokaryotes or eukaryotes .

Keywords: eukaryotes, prokaryotes, ribosome, mitochondrion, nucleus, cell membrane

Prior Preparation:

- Prepare charts on differences between prokaryotic and eukaryotic cells.

Background

How does one distinguish between an eukaryote and a prokaryote? There are some key feature and structures that are seen in eukaryotes but are not present in prokaryotes.

Additional Information

While prokaryotic cells do not have membrane-bound structures, they do have distinct cellular regions. In prokaryotic cells, DNA bundles together in a region called the nucleoid.

Prokaryotic Cell Features

Here is a breakdown of what you might find in a prokaryotic bacterial cell.

- Nucleoid: A central region of the cell that contains its DNA.
- Ribosome: Ribosomes are responsible for protein synthesis.
- Cell wall: The cell wall provides structure and protection from the outside environment. Most bacteria have a rigid cell wall made from carbohydrates and proteins called peptidoglycans.
- Cell membrane: Every prokaryote has a cell membrane, also known as the plasma membrane, that separates the cell from the outside environment.
- Capsule: Some bacteria have a layer of carbohydrates that surrounds the cell wall called the capsule. The capsule helps the bacterium attach to surfaces.
- Fimbriae: Fimbriae are thin, hair-like structures that help with cellular attachment.
- Pili: Pili are rod-shaped structures involved in multiple roles, including attachment and DNA transfer.

- Flagella: Flagella are thin, tail-like structures that assist in movement.

Examples of prokaryotes
Bacteria and archaea are the two types of prokaryotes.

Eukaryotic cell features
Within a eukaryotic cell, each membrane-bound structure carries out specific cellular functions. Here is an overview of many of the primary components of eukaryotic cells.

- Nucleus: The nucleus stores the genetic information in chromatin form.
- Nucleolus: Found inside of the nucleus, the nucleolus is the part of eukaryotic cells where ribosomal RNA is produced.
- Plasma membrane: The plasma membrane is a phospholipid bilayer that surrounds the entire cell and encompasses the organelles within.
- Cytoskeleton or cell wall: The cytoskeleton or cell wall provides structure, allows for cell movement, and plays a role in cell division.
- Ribosomes: Ribosomes are responsible for protein synthesis.
- Mitochondria: Mitochondria, also known as the powerhouses of the cell, are responsible for energy production.
- Cytoplasm: The cytoplasm is the region of the cell between the nuclear envelope and plasma membrane.
- Cytosol: Cytosol is a gel-like substance within the cell that contains the organelles.
- Endoplasmic reticulum: The endoplasmic reticulum is an organelle dedicated to protein maturation and transportation.
- Vesicles and vacuoles: Vesicles and vacuoles are membrane-bound sacs involved in transportation and storage.

Examples of eukaryotes
Animals, plants, fungi, algae and protozoans are all eukaryotes.

Diagnostic Assessment
Ask learners to tabulate the differences between prokaryotes and eukaryotes based on the previous lesson.

Teacher-learner Activities

Activity 1: With the aid of unlabeled charts on eukaryote and prokaryote cells, ask learners to identify the two types of cells shown.

Activity 2: Let learners give reason for their answers.

Activity 3: Give learners a task to identify the key features of prokaryotes and eukaryotes**.**

Activity 4: Ask learners to tabulate the differences between prokaryotes and eukaryotes.

Skills and Competences
Comparing, evaluating, manipulating, observing, cultural identity, collaboration, problem solving.

Progress Assessment
Give learners a task to give some importance or harmful effects of prokaryotic and eukaryotic organisms.

Key Points of Lesson
- There are two main forms of cells which are prokaryotic and eukaryotic cells.
- Eukaryotic cells have nucleus, membrane bound organelles, and cytoplasm.
- Examples of prokaryotes are bacteria and archaea.
- Most prokaryotes are beneficial to human health and do not cause disease.
- Harmful bacteria that cause bacterial infections and disease are called pathogenic bacteria.

Examples are Escherichia coli and Salmonella which cause food poisoning.

Reflection
With the aid of questions, find out whether students know the difference between the two main types of cells in terms of structures such as nucleus, cell membrane and organelles.

Answers to Questions in learner's Book
1. C
2. B
3. B
4. C

Answers to Practical Questions
1. A is a prokaryotic cell
   B is an eukaryotic cell

ii. refer to learners book for similarities between prokaryotes and eukaryotes
iii. refer to learner's book for differences between prokaryotes and eukaryotes
iv. bacteria and archaea are examples of prokaryotes.
    Animals and plants are examples of eukaryotes.

STRAND 2

CYCLE

Unit 1: Earth Science

CONTENT STANDARDS: B8.2.1.1 Demonstrate understanding of the process of Carbon cycle as an example of repeated pattern of change in nature and how it relates to the environment.

Indicators: B8.2.1.1.1 Explain the process of the carbon cycle.

LESSON 1: THE CARBON CYCLE

Teaching And Learning Resources

- A picture/chart of the carbon cycle.
- A model of the carbon cycle.
- A video clip on the carbon cycle
- A video clip on the role of carbon cycle in the environment,
- A video clip on the effect of carbon cycle on the food chain
- A chart showing the role of the carbon cycle in the environment.

Learner's Book 8: Pages 46 - 51

Learning Expectations:

At the end of the lesson, the learner will:

- identify the carbon cycle from the internet, charts or pictures and write short notes on what happens at each stage.
- produce a flow chart to trace the process of the carbon cycle in nature.
- explain the process of the carbon cycle depicting processes such as
- photosynthesis
- respiration
- burning
- decay
- compile information on the carbon cycle and give reasons by which why it is a repeated pattern e.g.it is because the carbon is circulated continuously in the environment.
- describe the role of the carbon cycle in maintaining balance in the composition of air in the environment.
- explain the effect of the carbon cycle on food chains, using diagrams.
- describe the relationship between greenhouse gases and the carbon cycle.

Learning Skills:

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: carbon cycle, photosynthesis, respiration, burning, decay. greenhouse gases

Prior Preparation:

- Gather videos or prepare charts on prokaryotic and eukaryotic cells.

INTRODUCTION

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Main points of the lesson

- Carbon cycle explains the movement of carbon between the earth's biosphere, geosphere, hydrosphere and atmosphere.
- Carbon dioxide in the atmosphere is taken up by the green plants and other photosynthetic organisms and is converted into organic molecules that travel through the food chain.
- Carbon atoms are then released as carbon dioxide when organisms respire.
- The formation of fossil fuels and sedimentary rocks contribute to the carbon cycle for very long periods.
- The carbon cycle is associated with the availability of other compounds as well.

Additional Information

Carbon is the foundation of all life on Earth. It is required to form complex molecules like proteins and DNA. This element is also found in our atmosphere in the form of carbon dioxide (CO_2). Carbon helps to regulate the Earth's temperature, makes all life possible, is a key ingredient in the food that sustains us, and provides a major source of the energy to fuel the global economy.

The carbon cycle describes the process in which carbon atoms continually travel from the atmosphere to the Earth and then back into the atmosphere. Since our planet and its atmosphere form a closed environment, the amount of carbon in this system does not change. Where the carbon is located — in the atmosphere or on Earth — is constantly in flux.

On Earth, most carbon is stored in rocks and sediments, while the rest is located in the ocean, atmosphere, and in living organisms. These are the reservoirs, or sinks, through which carbon cycles.

Carbon is released back into the atmosphere when organisms die, volcanoes erupt, fires blaze, fossil fuels are burned, and through a variety of other mechanisms.
In the case of the ocean, carbon is continually exchanged between the ocean's surface waters and the atmosphere, or is stored for long periods of time in the ocean depths.
Humans play a major role in the carbon cycle through activities such as the burning of fossil fuels or land development.

Carbon is important for all the known living systems, and life could not exist without it. Carbon is available in the form of hydrocarbons other than food and wood such as fossil fuel, methane gas, and crude oil. Carbon fibres have multiple uses since they are strong, yet lightweight, durable material. These fibres are used in making tennis rackets, fishing rods, aeroplanes, and rockets. Industrial diamonds are used for drilling and cutting rocks. In ecosystems, the carbon cycle is important because it transfers carbon, a life-sustaining factor, through species from the atmosphere and oceans and back to the atmosphere and oceans again. Scientists are currently researching ways in which humans can use other fuels containing non-carbons for electricity production.

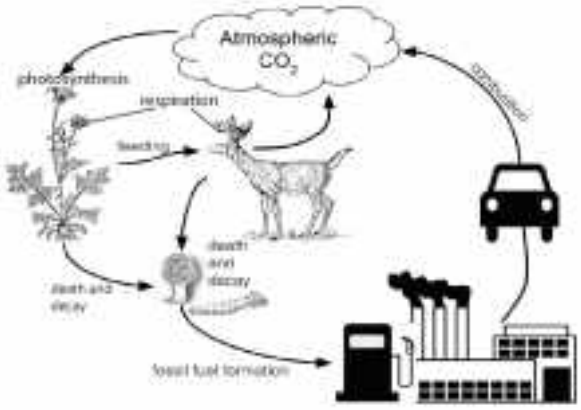


Fig. 1 - *The Carbon Cycle*

ICT: You may visit the following links for more information:

- https://en.wikipedia.org/wiki/Carbon_cycle
- https://www.youtube.com/watch?v=GXGPL0sZ3CY

Progressive assessment

Check prior knowledge by asking the learners of the carbon cycle.
Ask the learners to think-pair -share on the following issues

- Living things comprises animals and plants. They can breathe.
- Which gas do animals use up and give out?
- Which gas do plants use up and give out?
- Describe the role of the carbon cycle in the environment.
- Ask the learners explain the process in the carbon cycle using the think-pair-share approach

Take feedback from the learners.

Activity

See Page 40 - 42 of Learner's Book 8

The activities are designed to enable learners explain the process of the carbon cycle.

- Guide learners to carry out Activity 1 in page 42 of the Learner's Book 8 investigate the process of the carbon cycle.
- Guide the learners to observe pictures, charts and models of the carbon cycle.
- Engage the learners to discuss the processes in the carbon cycle.
- Show the learners a video on the carbon cycle.
- From their observations of the pictures and after viewing the video, ask the learners to write short notes on what happens at each stage.
- Ask each group of learners to produce a flow chart to trace the process of the carbon cycle in nature.
- Ask each group to explain the process of the carbon cycle depicting processes such as: Photosynthesis, Respiration, Burning, Decay.
- Engage each group to compile information on the carbon cycle and give reasons by which why it is a repeated pattern e.g. it is because the carbon is circulated continuously in the environment and present a report to the class for discussion.
- Guide learners to carry out activity 1 in pages xx of the Learner's Book 8 to investigate the role of carbon cycle in the environment.
- Engage the learners to watch a video clip on the role of carbon cycle in the environment.
- Ask them to observe a chart on the role of carbon to the environment.
- Engage the learners to discuss the role of carbon in the environment.
- Engage each group of learners to discuss the relationship between the carbon cycle and a food chain.

Main Points of the Lesson

- Plants use carbon dioxide and sunlight to make their own food and grow.
- The carbon becomes part of the plant.
- Plants that die and are buried may turn into fossil fuels made of carbon like coal and oil over millions of years.
- When humans burn fossil fuels, most of the carbon quickly enters the atmosphere as carbon dioxide.
- Carbon dioxide is a greenhouse gas and traps heat in the atmosphere. Without it and other greenhouse gases, Earth would be a frozen world.
- Humans have burned so much fuel that there is about 30% more carbon dioxide in the air today than there was about 150 years ago, and Earth is becoming a warmer place.

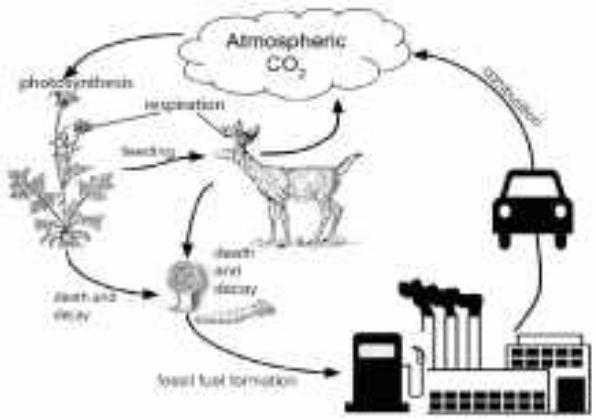


Fig. 2 - *The Carbon Cycl*e

ICT: You may visit the following links for more information:

- https://courses.lumenlearning.com/wm-biology2/chapter/the-carbon-cycle/

Home Work/Project

Let learners carry out a project as outlined in the Learner's Book 8 to:

- Use the internet, compile information on the carbon cycle and give reasons by which why it is a repeated pattern e.g. it is because the carbon is circulated continuously in the environment in different forms
- Use the internet, charts or pictures and write short notes on what happens at each stage of carbon cycle.
- Use the internet and other source of information, describe the relationship between greenhouse gases and the carbon cycle
- Let learners, in groups carry out a project as outlined in the Learner's Book 8 to write short notes on relationship between photosynthesis and respiration and the carbon cycle.

Think and Discuss

- Learners in pairs should discuss the process of the carbon cycle. Take feedback from the various groups. Ensure that the less abled learners participate in the discussion. Emphasise group work comprising 3 - 5 learners
- Learners in pairs should discuss root systems of plants. Take feedback from the various groups.
- Ensure that the less able learners participate in the discussion.

Diagnostic assessment

Let learners provide answers to questions at the end of the lesson in their exercise books.

ANSWERS TO QUESTIONS

Objectives

1. C
2. B
3. A, B
4. A
5. A
6. A
7. C
8. D

Answers to Test of Practical's

1. Carbon cycle

2. Is the process where carbon is circulated in the environment.

3. The ecosystem will not function leading to the destruction of food chain. If there is no carbon cycle the transfer of energy among living things in an ecosystem will not be complete.

4. a. Photosynthesis is the process by which green plants manufacture their own food using carbon dioxide from the atmosphere, water and mineral salts from the soil and energy from the sun. Green plants use energy from the sun to convert carbon dioxide and water into organic compounds (glucose). Oxygen gas is released in the process.
   b. Respiration is the process by which animals and plants use oxygen to break down complex food such as glucose into carbon dioxide and water. Animals rely on plant for food, energy and oxygen. Our cells require oxygen to break down the food we consume through cellular respiration.
   c. Decomposition Dead organisms are broken down into smaller pieces by the process of decay. Organisms such as earthworms are involved in this process. Plants can absorb and use these compounds again, completing the cycle.

5. a. It maintains the proper functioning of the ecosystem
   b. It regulates the movement of carbon in the atmosphere
   c. The sinks and sources of carbon in the carbon cycle help to manage the amount of greenhouse gases in our atmosphere

6. Respiration
   - Plants (as well as photosynthetic algae and bacteria) then utilise some of the carbohydrates stored as an energy source to carry out their biological functions. Animals, fungus, and bacteria are among the consumers of e-cigarettes.
   - Plants, photosynthetic algae, and bacteria combine carbon dioxide (CO_2) from the atmosphere with water to generate carbohydrates ($C_6H_{12}O_6$). Carbohydrates are used to store energy. Oxygen (O_2) and other by-products are released into the atmosphere.

7. a. The carbon dioxide that accumulates in the atmosphere insulates the surface of the Earth. It's like a warming blanket that holds in heat. This energy increases the Earth's average surface temperature, heats the oceans and melts polar ice. As a consequence, sea levels and weather changes occur.
   b. By the continuous circulation of carbon in the environment

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Were the activities interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any reasons by which by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

CONTENT STANDARDS: B8.2.1.1 Demonstrate understanding of the process of Carbon cycle as an example of repeated pattern of change in nature and how it relates to the environment.

Indicators: B8.2.1.1.2 Describe the role of the carbon cycle to the environment.

LESSON 2: THE ROLE OF CARBON CYCLE TO THE ENVIRONMENT

Teaching And Learning Resources

- A picture/chart of the carbon cycle.
- A model of the carbon cycle.
- A video clip on the carbon cycle
- A video clip on the role of carbon cycle in the environment,
- A video clip on the effect of carbon cycle on the food chain
- A chart showing the role of the carbon cycle in the environment.

Learner's Book 8: pages 52 - 55

Learning Expectations:

At the end of the lesson, the learner will:

- describe the role of the carbon cycle in maintaining balance in the composition of air in the environment.
- explain the effect of the carbon cycle on food chains, using diagrams.
- describe the relationship between greenhouse gases and the carbon cycle.

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons

Resources

- A picture of the carbon cycle
- A model of the carbon cycle,
- A video clip on the role of carbon cycle to the environment,
- A video clip on the effect of carbon cycle on food chain
- A chart showing the role of the carbon cycle to the environment. Making and using simple models

Keywords: Photosynthesis, respiration, greenhouse gases.

Prior Preparation: Gather charts on the carbon cycle.

INTRODUCTION

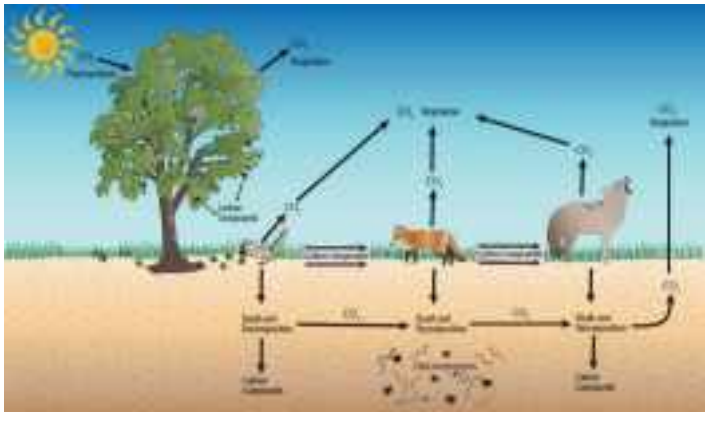
One week, that is, four periods will be enough to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

Carbon is important for all the known living systems, and life could not exist without it. Carbon is available in the form of hydrocarbons other than food and wood such as fossil fuel, methane gas, and crude oil. Carbon fibres have multiple uses since they are strong, yet lightweight, durable material. These fibres are used in making tennis rackets, fishing rods, even aeroplane, and rockets. The industrial diamonds are used for drilling and cutting rocks. In ecosystems, the carbon cycle is important because it transfers carbon, a life-sustaining factor, through species from the atmosphere and oceans and back to the atmosphere and oceans again. Scientists are currently researching ways in which humans can use other fuels containing non-carbon for electricity.

Main Points Of The Lesson

Plants use carbon dioxide and sunlight to make their own food and grow.
The carbon becomes part of the plant.
Plants that die and are buried may turn into fossil fuels made of carbon like coal and oil over millions of years.
When humans burn fossil fuels, most of the carbon quickly enters the atmosphere as carbon dioxide.
Carbon dioxide is a greenhouse gas and traps heat in the atmosphere. Without it and other greenhouse gases, Earth would be a frozen world.
Humans have burned so much fuel that there is about 30% more carbon dioxide in the air today than there was about 150 years ago, and Earth is becoming a warmer place.



PROGRESSIVE ASSESSMENT

Starter

Check prior knowledge by asking the learners to describe the role of the carbon cycle to the environment.

Ask the learners to think-pair -share on the following:
Explain the processes in the carbon cycle.
Take feedback from around the room.

Activity
See Page 52 of learner's Books 8
The activities are designed to enable learners describe the role of the carbon cycle to the environment.

- Guide learners to carry out the activity 1 in pages 52 of the Learner's Book 8 to investigate the role of carbon cycle to the environment.
- Engage the learners to watch a video clip on the role of carbon cycle in the environment.
- Ask them to observe a chart on the role of carbon to the environment.
- Engage the learners to discuss the role of carbon in the environment.
- Engage each group of learners to discuss the relationship between the carbon cycle and a food chain.

Project
Let learners, in groups of three, carry out a project as outlined in in pages xx of the Learner's Book 8 to write short notes on relationship between photosynthesis and respiration and carbon cycle.

Home Task
Let learners, in groups of three, carry out a project as outlined in in pages xx of the Learner's Book 8 to use the internet and other source of information, describe the relationship between greenhouse gases and the carbon cycle

Think And Discuss
Learners in pairs should discuss root systems of plants. Take feedback from the various groups. Ensure that the less abled learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

ANSWERS TO EXERCISES

Section A

1. C
2. B
3. C
4. A
5. D
6. C

1. If there is no carbon cycle the transfer of energy among living things in an ecosystem.

2. Plants, photosynthetic algae, and bacteria combine carbon dioxide (CO_2) from the atmosphere with water to generate carbohydrates (H_2O). Carbohydrates are used to store energy. Oxygen (O_2) and other byproducts are released into the atmosphere.
Respiration
Plants (as well as photosynthetic algae and bacteria) then utilise some of the carbohydrates stored as an energy source to carry out their biological functions. Some carbs persist in the form of biomass (the bulk of the plant, etc.). Animals, fungus, and bacteria are among the consumers of e-cigarettes.

3. a. It maintains the proper functioning of the ecosystem.
   b. It regulates the movement of carbon in the atmosphere.
   c. The sinks and sources of carbon in the carbon cycle help to manage the amount of greenhouse gases in our atmosphere.

4. The carbon dioxide that accumulates in the atmosphere insulates the surface of the Earth. It's like a warming blanket that holds in heat. This energy increases the Earth's surface average temperature, heats the oceans and melts polar ice. As consequences, sea level rises and weather changes.

5. By continuous circulation of carbon in the environment.

Reflection
At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Were they interesting and stimulating?
- Were the majority of the class responding as you would expect them to?
- Are there any reasons you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

ICT
You may visit the following links for more information:

- https://courses.lumenlearning.com/wm-biology2/chapter/the-carbon-cycle/

2 Sub-Strand 2: Life Cycle of Organisms

CONTENT STANDARDS: B8.2.2.1 Demonstrate an activity to show the life cycle of the Anopheles mosquito and show how the effects of the mosquito on humans can be managed.

Indicator: B8.2.2.1.1 Describe the life cycle and economic importance of the Anopheles mosquito.

LESSON 1: THE LIFE CYCLE AND ECONOMIC IMPORTANCE OF THE ANOPHELES MOSQUITO

Teaching And Learning Resources:

- Mosquito net, glass jar and cover, water, hand lens.

Learner's Book 8: Pages 56-60

Learning Expectations:

At the end of the lesson, the learner will:

- observe and draw the different stages of the life cycle of the anopheles mosquito e.g. by breeding the mosquito in a glass jar.
- describe the economic importance of the Anopheles mosquito.

Learning Skills:

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: anopheles, economic, environment. malaria

Prior Preparation:

- Gather videos or prepare charts on prokaryotic and eukaryotic cells.

INTRODUCTION

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Main Points of the Lesson

The life cycle of the Anopheles mosquito consists of four distinct stages namely egg, larva, pupa and adult stage.

Some potential breeding places of Anopheles mosquito are stagnant water, thick bushes around houses, unhygienic environments of dirty utensils and refuse dump and empty tins, coconut shells, and broken bottles containing water.

There is economic importance of mosquitoes. These include reliable and necessary food source for creatures ranging from fish to birds, help filter detritus for plant life to survive, help in pollinating flowers, are responsible for the transmission of many medically important pathogens and parasites such as viruses and bacteria causing diseases such as malaria and dengue, provide employment to doctors, pharmaceuticals, manufactures of insecticides and producers of mosquito nets for the treatment and prevention of malaria.

Additional Information

Anopheles is a genus of mosquito first described and named by J. W. Meigen in 1818. About 460 species are recognised; while over 100 can transmit human malaria, only 30–40 commonly transmit parasites of the genus Plasmodium, which cause malaria in humans in endemic areas. Anopheles gambiae is one of the best known, because of its predominant role in the transmission of the most dangerous malaria parasite species – Plasmodium falciparum. Like all mosquitoes, anopheles go through four stages in their life cycle: egg, larva, pupa, and adult. The first three stages are aquatic and last 5-14 days, depending on the species and the ambient temperature. All species of mosquitoes have four life cycle components: an egg stage; four larval stages; a non-feeding pupal stage; and an adult stage. Mosquito eggs are laid either singly or together in a raft- like structure that floats on water, and they hatch via one of two mechanisms.

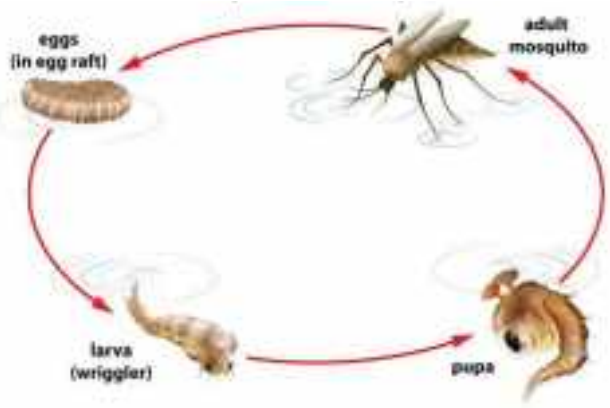


Fig. 3 - *Life Cycle of the Anopheles Mosquito*

ICT: You may visit the following links for more information:

- https://www.youtube.com/watch?v=JhfcHxHvXOg

Progressive Assessment

Check prior knowledge by asking the learners to describe the life cycle and economic importance of the Anopheles mosquito.

Ask the learners to think-pair-share on the following:

- Find out the causes of malaria.

Ask for group contributions

Activity: Observing life cycle of Anopheles Mosquito

See Page 56 of Learner's Book 8

The activities are designed to enable learners describe the life cycle and economic importance of the Anopheles mosquito.

- Guide learners to carry out Activity 1 in page 56 of the Learner's Book 8 to observe the life cycle of the Anopheles mosquito.
- Engage the learners to discuss the kinds of mosquitoes and the diseases each one causes.
- Engage the learners to watch a video clip on the life cycle of the Anopheles mosquito.
- Ask the learners to fetch clean water with a glass jar and place it in suitable place in the classroom and do not cover it.
- Guide the learners to monitor the uncovered water and record what they see daily with a hand lens to find out the presence of eggs on the surface of the water.
- Engage the learners such that when they detect that there are larvae on the surface of the water, they should cover the glass jar with the mosquito net to trap the adult mosquito when it appears.
- Ask the learners to take a sketch the various stages of development of the mosquito as seen in the glass jar.

Think and Discuss

Learners in pairs should describe the life cycle and economic importance of the Anopheles mosquito.

Take feedback from the various groups.

Ensure that the less abled learners participate in the discussion.

Home Work/Project

Let learners carry out a project to:

- Look for a potential breeding grounds of mosquitoes in the community.
- Create a poster to create awareness of the dangers posed by mosquitoes.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

Answers to Exercises (Objectives)

1. A
2. B
3. B
4. D
5. B

Answers to Essay Type Questions

1. Refer to pages 56 and 57 of the learners' book 8.
2. Refer to pages 57 and 58 of the learners' book 8.
3. In ponds, fresh stagnant water in gutters, fresh water in cans, tins, wells.

Answers to Test of Practicals

a. Anopheles Mosquito
b. I - Adult anopheles mosquito
   II - Pupa
   III - Egg
   IV - Larva
c. I $\longrightarrow$ III $\longrightarrow$ IV $\longrightarrow$ II
d. Able to float on the surface of water. It is light. It is tiny.
   Any 2

Reflection
At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any reasons by which by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

INDICATOR: B8.2.2.1.2 Discuss the impact of the Anopheles mosquito on human and how it can be controlled.

LESSON 2: THE IMPACT OF THE ANOPHELES MOSQUITO ON HUMANS

Teaching And Learning Resources

- video clips on the breeding places of mosquitoes in Ghana.
- internet

Learner's Book 8: pages 61-66

Learning Expectations:

At the end of the lesson, the learner will:

- discuss the impact of the female Anopheles mosquito as a vector of plasmodium on humans.
- generate solutions to control malaria in Ghana.
-

Learning Skills:

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: malaria, infectious pathogen, parasite, mid gut, disseminate

Prior Preparation:

- Gather videos or prepare charts on prokaryotic and eukaryotic cells.

INTRODUCTION

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

The female mosquito has a specialised apparatus to penetrate the skin of its victim. At the end of the slender proboscis, there are two pairs of cutting stylets that slide against one another to slice through the skin. Once through the skin, the mosquito's proboscis begins probing for a tiny blood vessel. If it does not strike one on the first try, the mosquito will pull back slightly and try again at another angle through the same hole in the skin. Inside the proboscis are two hollow tubes,

one that injects saliva into the microscopic wound and one that withdraws blood. The mosquito's saliva includes a combination of antihemostatic and anti- inflammatory enzymes that disrupt the clotting process and inhibit the pain reaction (so that the victim is unaware of the bite!). The female mosquito lays 30-150 eggs every 2-3 days. Human blood is needed to nourish these eggs and Anopheles shows the most regular cycles of blood feeding and egg laying. As a corollary, by using personal protective measures against mosquito bites, like using mosquito nets, one can deny the blood meal and hence help in mosquito control. Mosquitoes can fly up to several kilometres! And they can reach far off places by taking shelter in motor vehicles, ships and aircraft.

Main Points of the Lesson

The malaria parasite is transmitted by the Anopheles mosquito.

Anopheles mosquitoes transmit pathogens including malaria parasites, filarial worms (which elephantiasis), and arboviruses (arthropod-borne viruses which infect the muscles bands of the mid gut and other visceral tissues after dissemination from infected gut cells). These pathogens infect the mosquito gut when ingested with a blood meal, disseminate through the insect blood to other tissues and are transmitted to a new human host upon another mosquito bite some days later. The time pathogens spend in mosquitoes is known as extrinsic incubation period.

Methods used for controlling mosquitoes are grouped into following:

- Environmental control
- Chemical control
- Biological control

ICT: You may visit the following links for more information:

- https://www.dabur.com/odomosprotect/blog/what-are-the-most-common-mosquito-breeding-sites

Progressive Assessment

Check prior knowledge by asking the learners of the impact of the Anopheles mosquito on humans and how it can be controlled.

Ask the learners to think-pair -share on the following:

- List three potential breeding grounds for the mosquito.
- What causes malaria?

Take feedback from around the room.

Activity: Finding out the impact of mosquitoes on humans..
See Page 61 of Learner's Book 8
The activities are designed to enable learners discuss the impact of the Anopheles mosquito on humans and how it can be controlled.

- Guide learners to carry out Activity 1 in page 61 of the Learner's Book 8 to find out the impact of mosquitoes on humans.
- Engage the learners to watch a video clip on the breeding places of mosquitoes in Ghana. Guide the learners to visit the community and locate breeding grounds of mosquito.
- Ask the learners to observe the following:
- A charts showing the life cycle of Anopheles mosquito.
- A picture of female Anopheles mosquito.
- A video clip on Anopheles mosquito biting someone to suck blood.
- A malaria patient on hospital bed.
- Ask the learners, in groups, to present a report on the effects of malaria to class for discussion.
- Engage the learners to identify measures to control malaria in their communities.

Home Work/Project
Let learners, in groups, carry out a project as outlined the Learner's Book 8 to:

- Locate some potential breeding grounds of mosquitoes in their communities.
- Apply some common methods to control mosquito spread in your communities.
- Present their report to class for discussion.

Think and discuss
Learners in pairs should discuss the impact of the Anopheles mosquito on humans and how it can be controlled.
Take feedback from the various groups.
Ensure that the less able learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

ANSWERS TO EXERCISES

Objectives

1. C
2. D
3. A
4. B
5. A

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any reasons by which by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

2 Sub-Strand 3: Crop Production

CONTENT STANDARDS: B8.2.3.1 Demonstrate knowledge and skills in planting crops on different seed beds.

Indicators: B8.2.3.1.1 Explore the different seed beds for planting crops in your community.

LESSON 1: THE DIFFERENT SEED BEDS FOR PLANTING CROPS

Teaching And Learning Resources

- Video clip on types of seed beds and crops planted on each.
- A picture or chart showing different types of seed beds.
- Samples of real crops for different seed beds.
- Seeds, seedlings, cuttings, leaves and roots of crops common in the community.
- Common crops in the locality, e.g. maize, onion. tomato, cassava tiger nuts.

Learner's Book 8: pages 67-72

Learning Expectations:

At the end of the lesson, the learner will:

- identify and discuss different seed beds for planting different crops.
- list and compare the differences and similarities among seed beds in the community.
- match the types of seed beds with the types and stages of crops planted in your community.
- observe and discuss the practice of planting different crops in different seed beds.
- chose different plant parts, (seeds, seedlings, cuttings, leaves, roots) and plant them in different seed beds.
- measure the heights, sizes, number of flowers, and number of fruits of plants grown in different seed beds.
- identify the differences and similarities in the heights, sizes, number of flowers and fruits of crops grown in different seed beds using tables and graphs.
- write and give presentations on the reasons by which for differences in the heights, sizes, number of flowers and number of fruits of plants grown in different seed beds.

Learning Skills:

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations

- Making comparisons
- Making and using simple models

Keywords: raised bed, sunken bed, waterlogged, climatic, moisture, cultivation, compost, cuttings, leaves, roots, planting, seeds, seedlings, heights, sizes, number of flowers, fruits

INTRODUCTION

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

In preparing the seedbed for planting using tillage, the soil is disturbed and mixed vertically (in place) to loosen the soil and break up large clumps in order to optimize soil-to-seed contact. This disturbance affects the porosity and structure of the soil and, therefore, affects processes such as the movement of air, water, and heat (drying and warming), and root penetration and growth. During tillage, some soil can be thrown upward more than twice the depth of tillage. Immediately after tillage, the depth of the disturbed soil is normally 20–30% greater than its depth before tillage. Although the loosening that tillage causes can persist for weeks to months, eventually the soil reconsolidates. In general, the intent of tillage during seedbed preparation is to cause the vertical movement of soil, not horizontal; however, soil is moved both vertically and horizontally by all forms of tillage. Because of wide differences among seedbeds in physical characteristics, temperature, and availability of water and mineral nutrients, establishment of plants varies greatly in different seedbeds.

Mineral soil usually is a good seedbed because of its high infiltration capacity, adequate aeration, and capacity to establish close hydraulic contact between soil particles and seeds. Because of its high water-holding capacity, sphagnum moss often is a suitable seedbed for germination, but it may subsequently smother small seedlings. Decayed wood also is an excellent natural seedbed for seeds of some plants, probably because of its capacity for retention of water .A seed bed or seedling bed is the local soil environment in which seeds are planted. Often it comprises not only the soil but also a specially prepared cold frame, hotbed or raised bed used to grow the seedlings in a controlled environment into larger young plants before transplanting them into a garden or field.

A seedling bed is used to increase the number of seeds that germinate. There are two types of beds used in planting vegetables; we have the Sunken bed and the Raised bed. These beds are used under different conditions. The sunken bed is that type of vegetable bed with a concave surface, that is, the edges are more prominent than the surface of the bed. Plant growth factors control or influence plant characteristics as well as adaptation. In general, there are two factors affecting plant growth and development: genetic and environmental. The genetic factor is also called internal factor

because the basis of plant expression (the gene) is located within the cell. The environmental factor is considered external, and refers to all factors, biotic and abiotic, other than the genetic factor. Both plant growth factors interact in various ways. The genetic factor determines the character of a plant, but the extent to which this is expressed is influenced by the environment.

Main Points of the Lesson

- A seed bed is a piece of land on which seeds or seedlings are grown.
- There are three main types of seed beds namely, flat beds, raised beds and sunken beds.
- A sunken bed is a bed below the ground level.
- Raised beds are beds that are raised above the surround ground.
- Flat beds involve putting the organic matter on width of a bed, leaving path spaces between.

The main difference between sunken bed and raised bed is that sunken bed is below the ground level while the latter is above the surrounding ground level. Different crops are suitable for various seed beds. It is important to practice the of planting different crops in different seed beds.
There are differences and similarities in the heights, sizes, number of flowers and fruits of plants grown in different seed beds.
Different seed beds have different water conservation.

A Sunken Bed

A Raised Bed

A Flat Bed

Fig. 4 - Types of Beds

Progressive Assessment

Check prior knowledge by asking the learners of the different seed beds for planting crops in their communities.
Ask the learners to think-pair -share on the following:

- Description of land preparations
- What are seed beds?
- What type of seed beds are used for planting crops?
- Identify different seed beds
- State the crop suitable for such a seed bed.
- Take feedback from each groups

- Check prior knowledge by asking the learners for differences and similarities in the heights, sizes, number of flowers and fruits of plants grown in different seed beds.
- Ask the learners to think-pair -share on the following:
- Explain why different crops such as onions, tomatoes, cabbages, and pepper grown in different seed beds have different sizes are of different sizes.
- Take feedback from around the room.

Activity: Exploring different seed beds for planting crops.
See Page 60-64 of Learner's Book 8
The activities are designed to enable learners explore the different seed beds for planting crops in their communities.

- Guide learners to carry out investigating seed beds for planting crops.
- Engage the learners to watch a video clip on the seed beds for planting crop and the kinds of crops planted on each bed.
- Arrange for a visit for the learners to some farms in their communities to identify types of seed beds used to plant crops and ask them to present a report on their visit to class for discussion.
- Engage the learners to look carefully at the charts/ pictures showing different types of seed beds.
- Ask them to identify the different types of crops on each seed bed.
- Engage them to match the types of seed beds with the kind of crops planted on them.
- Engage the learners to list and compare the differences and similarities among seed beds found in their communities.
- Guide learners to carry out planting of different crops on different seed beds.
- Engage the learners to prepare five sunken beds, five raised beds and five flat beds.
- On each bed let the learners plant or sow seeds, seedlings, cuttings, leaves and root crops.
- Engage them to perform all necessary cultural practices till harvest.
- Encourage group presentations among learners.
- Guide learners to carry out Activity 1 in pages 64 of the Learner's Book 8 to compare and contrast the differences in heights, sizes, and flowering of crops grown in different seed beds.
- Ask the learners to assemble different types of crops for cultivation.
- Engage them to cultivate the same types of crops in a sunken, raised and flat bed.
- Guide the learners to monitor the growth of the plants until they are matured.
- Engage them to measure the heights, sizes, number of flowers, and number of fruits of plants grown in different seed beds and use the table below to record their findings.

- Engage the learners to discuss the differences and similarities in the heights, sizes, number of flowers and fruits of plants grown in different seed beds using tables and graphs.
- Ask them to present a report on the reasons by which for differences in the heights, sizes, number of flowers and fruits of plants grown in different seed beds.

Home Work/Project
Let learners:

- make a seed bed suitable for a particular type of crop in the backyard of the school or home.
- cultivate a crop on the seed bed and maintain it till harvest.
- present a report to class for discussion.

Think and Discuss
Learners in pairs should discuss the different seed beds for planting crops in their community. Learners in pairs should compare and contrast the differences in heights, sizes, and flowering of crops grown in different seed beds.
Take feedback from the various groups. Ensure that the less able learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

Objective

1. C
2. B
3. C
4. D
5. B
6. C

Answers to Essay Type Question
Refer to learners' book pages 67-70.

Answers to Test of Practicals

1. a. A - Sunken bed
   B - Raised bed

   b. Refer to page 62 of Learners' book
   c. Refer to page 62 of Learners' book.
   d. Refer to pages 60, 61 of Learners' book

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any reasons by which by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

CONTENT STANDARDS: B8.2.3.1 Demonstrate knowledge and skills in planting crops on different seed beds.

Indicators: B8.2.3.1.2 Plant different types of crops on different seed beds

LESSON 2: PLANT DIFFERENT TYPES OF CROPS ON DIFFERENT SEED BEDS

Teaching And Learning Resources

- Video clip on types of seed beds and crops planted on each.
- A picture or chart showing different types of seed beds.
- Samples of real crops for different seed beds.
- Seeds, seedlings, cuttings, leaves and roots of crops common in the community.
- Common crops in the locality, e.g. maize, onion. tomato, cassava tiger nuts.

Learner's Book 8: pages 73-75

Learning Expectations:

At the end of the lesson, the learner will:

- observe and discuss the practice of planting different crops in different seed beds.
- chose different plant parts, (seeds, seedlings, cuttings, leaves, roots) and plant them in different seed beds.

Learning Skills:

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Resources

Seeds, seedlings, cuttings, leaves and roots of crops common in the community.

Keywords: uttings, leaves, roots, planting, seeds, seedlings

Prior Preparation:

make arrangements for a visit to a nearby farm or the wchool farm for demonstrations on how to grow different crops on beds.

INTRODUCTION

One week, that is, four periods will be enough to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

A seedbed or seedling bed is the local soil environment in which seeds are planted. Often it comprises not only the soil but also a specially prepared cold frame, hotbed or raised bed used to grow the seedlings in a controlled environment into larger young plants before transplanting them into a garden or field. A seedling bed is used to increase the number of seeds that germinate.There are two types of beds used in planting vegetables; we have the Sunken bed and the Raised bed. These beds are used under different conditions. The sunken bed is that type of vegetable bed with a concave surface, that is, the edges are more prominent than the surface of the bed.

Main Points of the Lesson

Different crops are suitable for various seed beds.
It is important to practice the of planting different crops in different seed beds.

Progressive Assessment

Check prior knowledge by asking the learners of different seed beds. Ask the learners to think-pair -share on the following:

- Identify different seed beds
- State the crop suitable for such a seed bed.

Take feedback from around the room.

Activity

See Page 73 of learner's Books 8
The activities are designed to enable learners identify plant different types of crops on different seed beds.

- Guide learners to carry out the activity 1 in pages 73 of the Learner's Book 8 to plant of different crops on different seed beds.
- Engage the learners to prepare five sunken beds, five raised beds and five flat beds.
- On each bed let the learners plant or sow seeds, seedlings, cuttings, leaves and root crops.
- Engage them to perform all necessary cultural practices till harvest.

Think and Discuss

Learners in pairs should identify plant different types of crops on different seed beds.
Take feedback from the various groups. Ensure that the less abled learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

Reflection
At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Were they interesting and stimulating?
- Were the majority of the class responding as you would expect them to?
- Are there any reasons you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

CONTENT STANDARDS: B8.2.3.2 Demonstrate understanding of the differences in height, size, and flowering of crops grown in different seed beds

Indicator: B8.2.3.2.1 Compare and contrast the differences in height, size, and flowering of crops grown in different seed beds.

LESSON 3: COMPARING AND CONTRASTING THE DIFFERENCES IN HEIGHT, SIZE, AND FLOWERING OF CROPS GROWN IN DIFFERENT SEED BEDS

Learner's Book 8: Pages 76-78

Learning Expectations:
At the end of the lesson, the learner will:

- measure the heights, sizes, number of flowers, and number of fruits of plants grown in different seed beds.
- identify the differences and similarities in the heights, sizes, number of flowers and fruits of crops grown in different seed beds using tables and graphs.
- write and give presentations on the reasons for differences in the heights, sizes, number of flowers and number of fruits of plants grown in different seed beds.

Learning Skills:

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Resources
Common crops in the locality, e.g. maize, onion. tomato, cassava tiger nuts.

Keywords: heights, sizes, number of flowers, fruits

Prior Preparation:
make arrangement s for a visit to a nearby farm for observation of different crops on seed beds.

INTRODUCTION

One week, that is, four periods will be enough to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

Plant growth factors control or influence plant characteristics as well as adaptation. In general, there are two factors affecting plant growth and development : genetic and environmental. The genetic factor is also called internal factor because the basis of plant expression (the gene) is located within the cell. The environmental factor is considered external, and refers to all factors, biotic and abiotic, other than the genetic factor. Both plant growth factors interact in various ways. The genetic factor determines the character of a plant, but the extent to which this is expressed is influenced by the environment.

Main Points of the Lesson

There are differences and similarities in the heights, sizes, number of flowers and fruits of plants grown in different seed beds.
Different seed beds have different water conservation.

Progressive Assessment

Check prior knowledge by asking the learners of differences and similarities in the heights, sizes, number of flowers and fruits of plants grown in different seed beds.
Ask the learners to think-pair -share on the following:
Explain why different crops such as onions, tomatoes, cabbages, and pepper grown on different seed belts have different sizes are of different sizes.
Take feedback from around the room.

Activity

See Pages 76 and 77 of learner's Books 8
The activities are designed to enable learners compare and contrast the differences in height, size, and flowering of crops grown in different seed beds.

- Guide learners to carry out the activity 1 in pages 76 and 77 of the Learner's Book 8 to compare and contrasting the differences in height, size, and flowering of crops grown on different seed beds.
- Ask the learners to assemble different types of crops for cultivation.
- Engage them to cultivate the same type of crop on a sunken, raised and flat bed.
- Guide the learners to monitor the growth of the plants until they are matured.
- Engage them to measure the heights, sizes, number of flowers, and number of fruits of plants grown in different seed beds and use the table below to record their findings.

	Sunken bed	Raised bed	Flat bed
Height			
Size			
Number of flowers			
Number of fruits			

- Engage the learners to discuss the differences and similarities in the heights, sizes, number of flowers and fruits of plants grown in different seed beds using tables and graphs.
- Ask them to present a report on the reasons for differences in the heights, sizes, number of flowers and fruits of plants grown in different seed beds.

Think and Discuss

Learners in pairs should compare and contrast the differences in height, size, and flowering of crops grown in different seed beds.

Take feedback from the various groups. Ensure that the less abled learners participate in the discussion.

Diagnostic Assessment

Let learners provide answers to questions at the end of the lesson in their exercise books.

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Were they interesting and stimulating?
- Were the majority of the class responding as you would expect them to?
- Are there any reasons you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

2 Sub-Strand 4: Animal Production

CONTENT STANDARDS: B8.2.4.1 Recognise the different types of feed for different types of animals.

Indicator: B8.2.4.1.1 Compare and contrast the different types of feed for different types of animals.

LESSON 1: COMPARING AND CONTRASTING THE DIFFERENT TYPES OF FEED FOR DIFFERENT TYPES OF ANIMALS

Teaching and Learning Resources

- Different types of animal feed,
- A video clip on feed for animals based on the proportions of nutrients indicated on the package or labels
- A chart showing different types of feed for different types of farm animals,
- Samples of animal feeds.

Learner's Book 8: Pages 79-85

Learning Expectations:

At the end of the lesson, the learner will:

- match the different types of feed with different types of animals.
- discuss the types of nutrients and their sources in the different types of animal feed.
- select and discuss appropriate feed for animals based on the proportions of nutrients indicated on the package or labels.

Learning Skills:

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: nutrition, roughage, feed concentrate, carbohydrate, mineral salt, protein, water, fat, oil, vitamin.

INTRODUCTION

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Main Points of the Lesson

- There are different feeds for farm animals. These include hay, straw silage, compressed and pelleted feeds, oil and mixed rations, and sprouted grains.
- Farm animal feed nutrients can be classified as carbohydrates, proteins, fats and oil, vitamins, mineral salts and water and legumes.
- Carbohydrates are the energy giving feeds. They can be sub-divided into sugar, starch and cellulose.
- High quality proteins are obtained from animal sources, such as meat milk and eggs. Proteins from plant source are abundant in oil cakes, such as melon cake and groundnut cake and in groundnuts and beans.
- Fats belong to the energy producing group of feeds. They are produced by plants from simple sugars. Fat molecules consist of glycerol (glycerine) and fatty acid molecules combined chemically. Fats are found in both plants and animals.
- Vitamins are complex organic materials present in feedstuffs in very small amounts.
- The mineral salts play a key role in the maintenance of osmotic pressure, and thus regulate the exchange of water and solutes within the animal body. Mineral salts are also essential for the transmission of nerve impulses and muscle contraction.
- Water is an essential part of any diet.

Additional Information

Different animals eat different kinds of food. Animals that eat only plants: Some animals eat plants and plant products like grass, leaves and fodder. Goats, cows, horses and sheep eat only plants. Each farm is different, requiring its own specific animal feeds. As long as livestock remains an integral part of agricultural society, there will always be the demand for animal feeds on a large scale. With a large variety of livestock, from cows to chickens to horses to ducks, there must also be a large variety of different feed to accommodate their individual needs.

Fig. 5 - *Animals feeding on straw*

You may visit the following link for more information:

- https://www.youtube.com/watch?v=PDs2igwOdL0

Progressive Assessment

Check prior knowledge by asking the learners of the different types of feed for different types of animals.

Ask the learners to think-pair -share on the following:

- Discuss the different types of feed for different classes of farm animals.
- Discuss the importance of feeds for farm animals
- Search for the sources of feeds for farm animals.

Take feedback from each group.

Activity: Comparing and contrating different types of feed for different types of animals.

See Pages 79 and 80 of Learner's Book 8

The activities are designed to enable learners compare and contrast the different types of feed for different types of animals.

- Guide learners to carry out Activity 1 on page 67 of the Learner's Book 8 to investigate different types of feed of different types of animals.
- Ask the learners to watch a video clip on feeds for animals based on the proportions of nutrients indicated on the package or labels.
- Guide the learners to visit to nearby farms to identify the different types of feed for different types of farm animals.
- Whiles on the farm, ask the learners to observe sample feed for animals based on the proportions of nutrients indicated on the package or labels.
- Ask the learners to take note of how farm animal feeds are prepared and administered.
- Ask the learners to compare charts showing different types of feed for different types of animals.
- Engage each group of learners to discuss and list the different types of feed for different types of animals.

Think and Discuss

Learners in pairs should compare and contrast the different types of feed for different types of animals.

Take feedback from the various groups. Ensure that the less able learners participate in the discussion.

Diagnostic Assessment

Let learners provide answers to questions at the end of the lesson in their exercise books.

Objective Answers

1. D
2. B
3. B
4. D
5. D

Answers to Essay Type Questions

1. Refer to page 80 of Learners' Book
2. Refer to page 81 of Learners' Book
3. Refer to page 81 and 69 of Learners' Book
4. Refer to page 81 of Learners' Book
5. Refer to page 81 of Learners' Book

Answers to Test of Practical Answers

1. A. cow
   B. Peacock
   C. Goat
   D. Pig

2. Ruminant: cow, goat
   Non-ruminant: peacock, pig

3. i. Animal C: grass, grains
   ii. Animal B: grass, grains

4. Grass

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any reasons by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average.

CONTENT STANDARDS: B8.2.4.2 Demonstrate understanding of the importance of water and animal feed to the growth of animals.

Indicator: B8.2.4.2.1 Explain the importance of water and animal feed to the growth of animals.

LESSON 2: THE IMPORTANCE OF WATER AND ANIMAL FEED TO THE GROWTH OF ANIMALS

Teaching And Learning Resources:

- A video clip on farm animals drinking water and feeding on a pasture

Learner's Book 8: Pages 86-90

Learning Expectations:

At the end of the lesson, the learner will:

- list and discuss the usefulness of water to the growth of animals, and of different nutrients in different types of feed for the growth and reproduction of animals.
- predict what will happen to animals who are not provided with adequate water.

Learning Skills:

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: nutrients, survival, economic, dry matter, assimilate, pasture.

INTRODUCTION

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

Water is vital to both humans and animals. A livestock keeper or breeder is responsible for providing adequate, clean, and pathogen-free water to the animals. Water is essential for cattle because it influences animal performance. A laying hen which has not drank sufficient water, for example, may not lay eggs. This is due to the fact that water is required for the production of eggs. A dairy cow that has not had sufficient water will also produce less milk. This is due to the fact that water makes up the majority of the cow milk's ingredients. Streams, lakes, rivers, puddles, lagoons,

springs, and wells can all provide water for animals, but it must be fresh, clean, non-limiting, and easily accessible. An adequate amount of food had to be provided to the animals. The water must come from a safe and sanitary source, and it must be served in clean water troughs. If animals are denied water for an extended period of time, they will die, resulting in a loss to the farmer. Except in cases where it is necessary to take water from animals, water must always be provided for them.

Main Points of the Lesson

- Water is important for the survival, growth and reproduction of all animals.
- Water is essential for metabolic functions such as regulation of temperature, nutrient uptake, removal of waste products, live body weight and good health.
- Lack of water can result in tightening of the skin, loss of live weight and drying of mucous membrane and eyes.
- Farm animal feeds are specially prepared to provide all the essential nutrients to the animal so that their metabolic activities function well to maintain good health.
- Farm animals that do not drink sufficient water may suffer stress or dehydration

Fig. 6 - *Picture of Animals Taking in Water*

You may visit the following links for more information:

- https://www.youtube.com/watch?v=3bRlE7oKjyk

Progressive Assessment

Check prior knowledge by asking the learners of the importance of water and animal feed to the growth of animals.

Ask the learners to think-pair-share on the following:

- Discuss importance of water and different nutrients in different types of feed for the growth and reproduction of farm animals.

Take feedback from around the room.

Activity: Finding out the importance of water and different nutrients in different types of feed.
See Page 86 of Learner's Book 8
The activities are designed to enable learners explain the importance of water and animal feed to the growth of animals.

- Guide learners to find out the importance of water and of different nutrients in different types of feed for the growth and reproduction of animals.
- Ask the learners to watch a video clip on poultry farm and livestock farm where animals are given water and different feed.
- Engage the learners to visit to a poultry farm or a local livestock farms in their community to identify different feed given to farm animals.
- Engage the learners to observe the animals with adequate water and feed and those animals are not provided with adequate water and feed and comment on their findings.

Think and Discuss
Learners in pairs should explain the importance of water and animal feed to the growth of animals. Take feedback from the various groups. Ensure that the less abled learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

ANSWERS TO EXERCISES

Objectives Answers

1. A
2. D
3. B
4. C
5. A

Test of Practicals

i. A - Cows
   B - Turkey
   C - Sheep
   D - Pig
ii. Answers may vary.
iii. Healthy growth
   Protection against diseases
   Energy is gained
   a. Dehydration, tightening of skin, loss of weight.

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any reasons by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

STRAND
3

THE HUMAN BODY SYSTEM

Unit 1: The Mammalian Teeth

CONTENT STANDARD: B8.3.1.1 Demonstrate knowledge of parts of mammalian tooth and the functions of the different types of teeth in relation to feeding in man

Indicator: B8.3.1.1.1 Identify parts of a mammalian tooth

LESSON 1: THE MAMMALIAN TEETH

Teaching And Learning Resources:

- cardboard, scissors, pencil, poster colours, piece of fried meat, apple, chart on dentition of humans, fish and monkeys.

Learner's Book 8: Pages 91-94

Learning Expectations:

At the end of the lesson, the learner will:

- mention the main parts of the human tooth
- identify the different types of teeth and state their functions
- know common disorders of the teeth and explain how to prevent teeth disorders

Keywords: homodont, heterodont, canine, incisor, dentition, premolar, molar.

Prior Preparation

With the aid of cardboard design cut-out models on the four main types of teeth in humans.

INTRODUCTION

Human beings and many animals such as dogs, goats and lions have teeth. The teeth are located inside the mouth. They are used for many purposes such as biting or chewing food, seizing other animals or breaking hard bones.

Dentition

The structure and arrangement of teeth is called dentition. There are two (2) main types of dentition, namely heterodont and homodont dentition. Human beings and animals such as dogs, cattle, lions and goats have heterodont dentition. In heterodont dentition, the organism has different types of teeth that play different roles such as biting, chewing or tearing flesh.

Fish and reptiles such as crocodiles have homodont dentition. Organism with homodont dentition have the same type of teeth.

Though there are different types of teeth, all teeth have three main regions. These are the crown, neck and root.

Additional Information
Teeth are the hardest structures of the human body. The type, number, and arrangement of a set of teeth represent the dentition.

Humans have two sets of teeth:
Primary teeth
Primary teeth are also known as deciduous teeth, milk teeth, baby teeth or temporary teeth. Primary teeth start to form during the embryo phase and erupt during infancy (from 6 months to 3 years). Normally, there are 20 primary teeth, 10 on each dental arch: 4 incisors (2 central incisors and 2 lateral incisors), 2 canines and 4 molars.
Generally, by the age of 12 to 14 years, all primary teeth are replaced by permanent teeth but in the absence of permanent replacements, they can remain functional for many years.

Permanent teeth
Permanent teeth (or adult teeth) are the second set of teeth and normally consist of 32 teeth. The first permanent teeth appear around the age of 6 and are usually the first molars which erupt right behind the last "milk" molars of the primary dentition.
The permanent premolars will replace the milk molars of the primary dentition and all permanent molars will erupt behind the deciduous teeth.
Up to the age of thirteen years, twenty-eight of the thirty-two permanent teeth will appear. The four last permanent teeth, the third molars or the wisdom teeth, usually appear between the ages of 17 and 25 years.

Function of teeth
Chewing
Chewing is the main function of teeth. Teeth are part of the digestive system; chewing is the first stage of the process of digestion.
Food needs to be broken down and chewed before entering the digestive system so that the body can easily absorb nutrients from them. In the absence of teeth, digestion is hampered leading to significant disturbances in food absorption.
Depending on their position and type, teeth have a role in shearing, tearing or grinding food.

Aesthetics
Teeth, especially those located in visible areas, have an important aesthetic role. The position, shape, and shade of teeth have a pronounced impact in shaping each individual personality.

Pronunciation
Teeth can help us pronounce accurately as they have an important role in the pronunciation of consonants. When teeth are missing (especially upper front teeth), the normal speech can be severally affected.

Types of teeth
Typically, humans have 32 permanent teeth: 16 on the upper arch and 16 on the lower arch. Sometimes, due to genetic disorders, birth defects or eruption problems, more or fewer teeth are present.
Teeth are divided into four main groups, each with a well-defined position and function.

Incisors
Incisors are the most visible of all teeth and have a pronounced aesthetic role. They are divided into two subcategories:

Canines
Canines are one of the strongest of all teeth and are 4 in number: two upper and two lower. They are extremely important teeth from several points of view; therefore, canine extraction is only performed when no other alternatives are available.
The "V shape peak" from the top of the canines is called cusp.
Canines have a single root, very long and well implanted into the jawbone. In fact, the upper canine is the longest tooth in total length. They are extremely strong.

Premolars
The premolar teeth, or bicuspids, are transitional teeth located between the canine and molar teeth. Premolars have properties of both the anterior canines and posterior molars, and so food can be transferred from the canines to the premolars and finally to the molars for grinding, instead of directly from the canines to the molars.
Premolars have two cusps. Premolars function is for tearing and grinding food during chewing. Normally, the first upper premolar has 2 roots and the rest of the premolars a single root. However, there are variations on that.

Molars
Molars are the most posterior and most complicated kind of teeth. Normally, adults have 12 molars, in four groups of three at the back of the mouth.
The first molar located immediately behind (posterior) the second premolar. It erupts around the age of 6 right behind the last "milk" molars.
Molars have 4 or 5 cusps. The main function of all molars is grinding of food during mastication. Molars can have a various number of roots (from one to four, even five). Generally, the first upper molars have three roots while the lower molars have two roots.
Molars are extremely powerful and strong teeth.

Diagnostic Assessment
Ask learners to mention whether they know the teeth that are used for biting food, tearing food, chewing and crushing respectively. Afterwards let them talk about differences between the teeth in their mouths.

Activity 1: Demonstrate how foods are broken down into smaller forms using teeth
Ask learners to demonstrate how foods such as cooked meat and fruits such as apple are broken down into smaller forms using the teeth. Through questioning, assist students to identify the types of teeth used in biting, chewing and crushing food. Afterwards introduce the concept of types of teeth.

Activity 2: Identifying types of teeth in the mouth
With the aid of the chart on dentition in humans, engage learners to identify the types of teeth in their own mouths. Help them to know the number of each type of teeth in children and adults.

Activity 3: Brainstorming on how to keep teeth clean and strong
Guide the learners to brainstorm on how to keep the teeth clean and strong.

Activity 4: Using pictures to explain diseases that affect the teeth
Use pictures to explain diseases such as dental caries, gingivitis and periodontal disease. Let the learners work in groups of 5 to explain what they can do to prevent such teeth diseases.

Activity 5: Modelling four main types of teeth
Engage learners in group activities to model each of the four main types of teeth, using cardboards, pencils and pairs of scissors.

Activity 6: Identifying types of teeth and their functions, teeth disorder and how to prevent them
Find out whether learners can identify the types of teeth and their functions, teeth disorders and how they can be prevented.

Skills and Competences
Comparing, evaluating, manipulating, observing, cultural identity, collaboration, problem solving

Progressive Assessment
Ask students to complete a summary table on each type of teeth, and its function. Additionally, they should write down two teeth disorders and how they can be prevented.

Main Points of the Lesson

- The structure and arrangement of teeth is called dentition.
- There are two (2) main types of dentitions; namely heterodont and homodont dentition.
- The four main types of human teeth are incisors, canines, premolars and molars.
- Some diseases that affect the teeth include gingivitis, dental caries and periodontal disease.
- We must take good care of our teeth to avoid tooth decay and tooth diseases.

ANSWERS TO QUESTIONS IN LEARNER'S BOOK

Objectives

1. A
2. B
3. C
4. D
5. B
6. C
7. A
8. B

Answers to Essay Type Questions

1. Refer to page 91 of Learner's Book 8.

2. a. Refer to pages 91 of Learner's Book 8.
   b. Refer to page 91 of Learner's Book 8.

ICT: Visit the internet link below to learn more about dentition:

- https://teachmeanatomy.info/head/other/child-adult-dentition/

Reflecttion

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any reasons by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

Indicator: B8.3.1.1.2 Discuss the functions of the different types of teeth such as incisors, canines, premolars, and molars.

LESSON 2: FUNCTIONS OF DIFFERENT TYPES OF TEETH

Teaching and Learning Resources:

- cardboard, scissors, pencil, poster colours, piece of fried meat, apple, chart on dentition of humans, dogs lions etc.

Learner's Book 8: Pages 95-99

Learning Expectations:

At the end of the lesson, the learner will:

- identify the functions of each type of teeth.
- know common disorders of the teeth and explain how to prevent teeth disorders

Keywords: homodont, heterodont, canine, incisor, dentition, premolar, molar.

Prior Preparation

Ask learners to find out the functions of various types of teeth in humans and other mammals.

Background

The four main types of teeth are incisors, canines, molars and pre-molars. Each of them plays different roles within the mouth. Some of the functions of these teeth include biting or chewing of food, seizing other animals or breaking hard bones.

Additional Information

Function of teeth

Teeth are part of the digestive system; chewing is the first stage of the process of digestion. Food needs to be broken down and chewed before entering the digestive system so that the body can easily absorb nutrients from them.

Teeth, especially those located in visible areas, have an important aesthetic role. The position, shape, and shade of teeth have a pronounced impact in shaping each individual personality.

Pronunciation

Teeth can help us pronounce accurately as they have an important role in the pronunciation of consonants. When teeth are missing (especially upper front teeth), the normal speech can be severally affected.

Teeth are divided into four main groups, each with a well-defined position and function.

Incisors
Incisors are the most visible of all teeth and have a pronounced aesthetic role. They are used mainly for biting food.

Canines
Canines are one of the strongest teeth and are 4 in number. They are extremely strong and in carnivores such as lions they are used for tearing flesh.

Premolars
The premolar teeth, or bicuspids, are transitional teeth located between the canine and molar teeth. Premolars function is for tearing and grinding food during chewing.

Molars
The main function of all molars is grinding of food during mastication. Molars are extremely powerful and strong teeth.

Diagnostic Assessment
Ask learners to mention whether they know the teeth that are used for biting food, tearing food, chewing and crushing respectively. Afterwards let them talk about differences between the teeth in their mouths.

Activity 1: ask volunteer students to demonstrate how foods such as cooked meat and fruits such as apple are broken down into smaller forms using the teeth.

Activity 2: ask learners to demonstrate the function of each type of teeth, using samples of food items such as apple, a piece of meat, a slice of cooked yam.

Activity 3: ask learners to discuss the relation between the structure of each teeth and its associated functions.

Activity 4: Let learners work individually to create a table on each type of teeth and its main functions.

Skills and Competences
Comparing, evaluating, manipulating, observing, cultural identity, collaboration, problem solving

Progress Assessment

Ask students to complete a summary table on each type of teeth, and its function. Additionally, they should write down two teeth disorders and how they can be prevented.

Key Points of Lesson

- The four main types of teeth are incisors, canines, premolars and molars.
- They are used mainly for biting food.
- They are extremely strong and in carnivores such as lions they are used for tearing flesh.
- The Premolars work is tearing and grinding of food during chewing.
- The main function of all molars is grinding of food during mastication.

Reflection

Find-out whether students can identify the types of teeth and their functions.

Answers to Questions in learner's Book

1. D
2. D.
3. B
4. C

Answers to Practical Questions

1. (a) i: incisor
   ii: canine
   iii: Pre-Molar
   iv. Molar

   (b) Refer to learners' book page 96 for functions of each type of teeth.
   (c) Monkeys and humans.
   (d) Differences between canines and molars.

S/N	Canines	Molars
1	Canines have pointed triangular projections called cusps	The number of cusps on molars varies between 3 and 5.
2	Animals such as lions and tigers use the canine for seizing and piercing preys.	They are mainly for tearing, grinding and crushing food.

Indicator: B8.3.1.1.3 Explain the causes and prevention of tooth and gum decay.

LESSON 3: THE CAUSES AND PREVENTION OF TOOTH AND GUM DECAY

Teaching and Learning Resources:

- charts showing people suffering from different dental and gum infections.

Learner's Book 8: Pages 100-103

Learning Expectations:

At the end of the lesson, the learner will:

- know some common disorders of the teeth.
- explain how teeth disorders can be prevented.

Keywords: ental caries, periodontal disease, gingivitis, tooth decay.

Prior Preparation

Gather pictures on different types of dental infections.

Background

It is important to take good care of the teeth because they play different vital functions in humans. Bad oral hygiene can lead to bad effect such as tooth and gum disease, mouth odour and inability to chew food properly.

Additional Information

Dental Diseases are diseases that affect the teeth or gums. Examples of such diseases include tooth decay, gum disease and periodontal disease. These diseases are brought about when we eat foods that are too sugary and do not clean the teeth regularly. The failure to do so leads to tooth decay, that can result in severe toothache. Bacteria in the mouth help to erode the enamel of the teeth. In order to avoid teeth and gum related disease we need to brush the teeth regularly.

Diagnostic Assessment

Ask learners to share experiences of toothache.

Teaching and Learning Activities

Activity 1: show pictures of various teeth and gum conditions to learners

Activity 2: discuss with learners the causes of each type of teeth infection.

Activity 3: let learners work in pairs to talk about how they can prevent getting infected with these dental diseases.

Activity 4: engage learners in group activities to make a poster on each the main tooth infections discussed

Skills and Competences
Comparing, evaluating, manipulating, observing, cultural identity, collaboration, problem solving

Progress Assessment
Ask students to complete a summary table on each type of teeth infection, its causes and mod eof prevention.

Key Points of Lesson
Some diseases that affect the teeth include gingivitis, dental caries and periodontal disease.
Failure to brush the teeth regularly can lead to one teeth infection or the other.
We must take good care of our teeth to avoid tooth decay and tooth diseases.

Reflection
Find-out whether students can identify the types of teeth disorders and how they can be prevented.

Answers to Questions in learner's Book
1.D
2. C.
3. A

3 Sub-Strand 2: Solar System

CONTENT STANDARD: B8.3.2.1 Demonstrate knowledge of the outer planets of the solar system.

Indicator: B8.3.2.1.1 Identify the outer planets of the solar system and describe their properties.

LESSON: THE OUTER PLANETS

Teaching and Learning Resources:

- videos and charts on the outer planets, poster colours, A4 sheets, pencils, pairs of scissors.

Learner's Book 8: Pages 104-109

Learning Expectations:

At the end of the lesson, the learner will:

- identify the key characteristics of the outer planets
- create models of the outer planets

Keywords: outer planets, elliptical, galaxy, constellation, jupiter, saturn, neptune, uranus.

Prior Preparation:

Draw a model of the solar system showing the outer planets in their orbits on cardboards. Ask learners to bring materials (A4 sheets, pencils, poster colours) to be used for making posters on the outer planets.

INTRODUCTION

As we already know, there are a total of eight (8) planets in the solar system namely, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. The last four planets (Jupiter, Saturn, Uranus and Neptune) are known as the outer planets. They are also called gas giants. A gas giant is a large planet composed mostly of gases, such as hydrogen and helium, with a relatively small rocky core. The gas giants of our solar system are Jupiter, Saturn, Uranus and Neptune. These four large planets, also called jovian planets after Jupiter. These four planets are located in the outer part of the solar system past the orbits of Mars. Jupiter and Saturn are the two biggest planets. They are larger than Uranus and Neptune, and each pair of planets has a somewhat different composition.

Additional Information

The four outer planets, also called the Jovian, or giant, planets—Jupiter, Saturn, Uranus, and Neptune - are large objects; they are composed primarily of hydrogen and helium (Jupiter and Saturn) or of ice, rock, hydrogen, and helium (Uranus and Neptune).

The four giant outer planets are much more massive than the terrestrial planets and have immense atmospheres composed mainly of hydrogen and helium. They have no solid surfaces, however, and their densities are so low that one of them, Saturn, would actually float in water. Each of the outer planets has a magnetic field, a ring system, and many known moons, with more likely to be discovered.

Diagnostic Assessment
Let learners identify all the eight planets of the solar system. They must then identify those that are inner planets and are solid in nature.

Activity 1: Revieiwing basic 7 lesson on inner planets
Review the basic 7 lesson on inner planets with students and ask them to tell three common characteristics of the inner planets.

Activity 2: Watching videos on outer planets
With the aid of the video and chart introduce learners to the outer planets and help them to know the key characteristics of each of the 4 outer planets.

Activity 3: Finding our features that are common to four outer planets
Assist students to come out with the features that are common to all the four outer planets.

Activity 4: Finding our differences in planets
Focus on the differences in the planets with respect to their size, satellites, period of rotation around the sun, absence or presence of rings, length of day and surface temperatures.

Activity 5: Engaging in role play the movement of the outer planets in their orbits around the sun.
Engage learners to role play the movement of the outer planets in their orbits around the sun.

Activity 6: Creating Posters on each of four outer planets
With the aid of the resources, guide the learners to create posters on each of the four outer planets. The posters must focus on their sizes, length of year, length of day, surfaces, satellites and absence or presence of rings etc.

Skills and Competences
Comparing, evaluating, observing, analysing, critical thinking, collaboration, problem solving.

Progress Assessment
Let learners discuss and write down three differences between the outer planets and the inner planets.

Main Points of the Lesson
- The four outer planets Jupiter, Saturn, Uranus and Neptune.
- Jupiter is the largest planet within the solar system
- All of the outer planets are giant gases
- Because the outer planets are farther away from the sun, the temperature on these planets are very low.
- Humans cannot live on any of the outer planets because they lack water, food, air and suitable temperature.

Reflection
Find-out whether the learners are able to clearly distinguish between the features of inner and outer planets.

Answers to Questions in learner's Book
1. A
2. D
3. B
4. D
5. B

Answers to Essay Type Questions
1. Refer to pages 104-106 of Learner's Book 8.
2. Refer to pages 104-106 of Learner's Book 8.
3. Refer to pages 104-106 of Learner's Book 8.
4. Refer to pages 104-106 of Learner's Book 8.
5. Answers may vary.

Answers to Practical Questions

a. I - Sun
II - Mercury
III - Venus
IV - Earth
V - Mars
VI - Jupiter
VII - Saturn
VIII - Uranus
IX - Neptune

b. The Inner planets are Mercury;
III = Venus; IV = Earth; V = Mars; and the Outer planets are VI = Jupiter; VII = Saturn;
VIII = Uranus; IX = Neptune

c. Differences between the Inner and Outer Planets

Inner Planets	**Outer Planets**
Closer to the sun	Farther away from the sun
They are all solid in nature	They are all gases
Their surface temperatures are higher	Their surface temperatures are lower
None of them has rings and they have few moons	Two of them have rings and they have many moons compared to inner planets
They spend shorter durations to orbit the sun	They spend longer durations to orbit the sun

d. They are all gas giants.
Their surfaces have extremely low temperatures.
They have many moons.
They take longer times to orbit the sun. Any 2.

e. The earth

f. Other planets cannot support life because
i. they lack oxygen
ii. they do not have water
iii. the temperatures are extremely hot or cold

ICT: Visit the link below to watch a video on the outer planets:

- https://www.youtube.com/watch?v=edqSVYXjFAA

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any reasons by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

3 Sub-Strand 3: Ecosystem

CONTENT STANDARD: B8.3.3.1 Demonstrate an understanding of the interdependence of organisms in an ecosystem and their interaction

Indicator: B8.3.3.1.1 Explore the feeding relationships within an ecosystem

LESSON: THE FEEDING RELATIONSHIPS WITHIN AN ECOSYSTEM

Teaching and Learning Resources:

- Pictures showing different ecosystems with the various biotic and abiotic components.

Learner's Book 8: Pages 110-117

Learning Expectations:

At the end of the lesson, the learner will:

- discuss the important role of the sun in a given ecosystem
- explain how energy is transferred from one organism to another within an ecosystem

Keywords: biotic, abiotic, trophic level, producer, consumer, food chain, food web, saprophyte.

Prior Preparation

Take learners on a trip to visit any ecosystem such as a pond or bush.

INTRODUCTION

The main processes happening in an environment include feeding and the circulation of chemical elements, together with the energy flowing through the ecosystem.

An ecosystem is made up of three main components, the producers, the consumers, and the decomposers. All are concerned with the feeding processes, the flow of chemical elements, and the flow of energy.

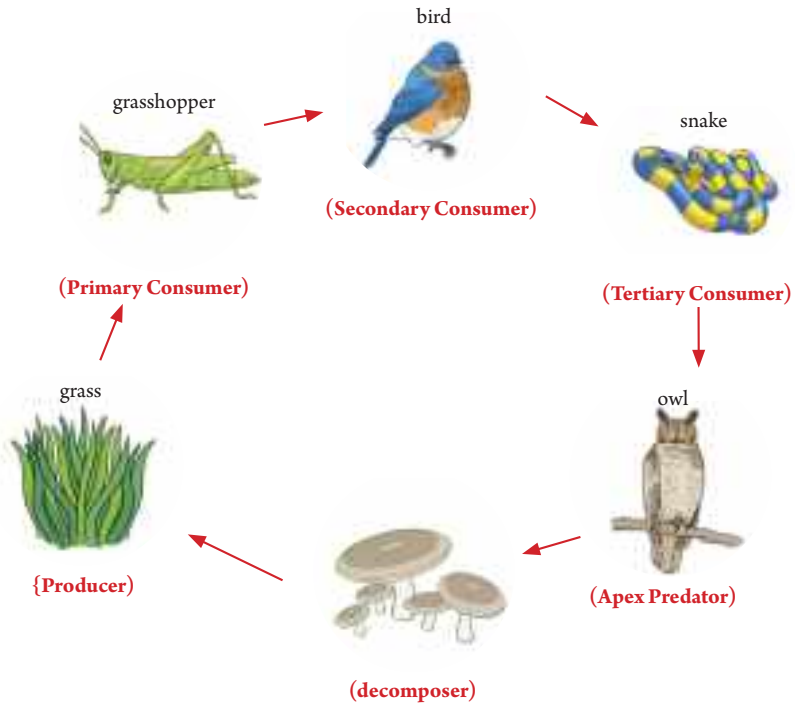


Fig. 1 - *An example of a food chain*

Producers

Producers are the organisms that are able to produce their own food. These are usually green plants, which make use of sunlight to produce their own food through photosynthesis. They are able to produce organic food from simple inorganic compounds. Organism that are able to produce their own food are known as autotrophic organisms.

Examples are Plants, Algae and Cyanobacteria. Other organisms depend on producers for food.

Consumers

Consumers are all the organisms, mainly animals, which obtain energy directly or indirectly from the producers (plants and algae) as ready-made organic food. They are generally called heterotrophic organisms. Heterotrophic organisms are organisms that cannot produce their own food.

Examples are humans, sheep, fowls, dogs and fish.

Decomposers

Decomposers are very important within an ecosystem. The decomposers are organisms that get their energy from dead and decaying plants and animals. Within an ecosystem, the main decomposers are fungi and bacteria. They release chemical elements for breaking down the remains of dead plants and animals.

Additional Information

An ecosystem can be categorized into its abiotic constituents, including minerals, climate, soil, water, sunlight, and all other non-living elements, and its biotic constituents, consisting of all its living members. Linking these constituents together are two major forces: the flow of energy through the ecosystem and the cycling of nutrients within the ecosystem. Ecosystems vary in size: some are small enough to be contained within single water droplets while others are large enough to encompass entire landscapes and regions (see biome).
Organic matter generated by autotrophs directly or indirectly sustains heterotrophic organisms.

Heterotrophs are the consumers of the ecosystem; they cannot make their own food. They use, rearrange, and ultimately decompose the complex organic materials built up by the autotrophs. All animals and fungi are heterotrophs, as are most bacteria and many other microorganisms.
Together, the autotrophs and heterotrophs form various trophic (feeding) levels in the ecosystem: the producer level (which is made up of autotrophs), the primary consumer level (which is composed of those organisms that feed on producers), the secondary consumer level (which is composed of those organisms that feed on primary consumers), and so on. The movement of organic matter and energy from the producer level through various consumer levels makes up a food chain.

For example, a typical food chain in a grassland might be grass (producer) → mouse (primary consumer) → snake (secondary consumer) → hawk (tertiary consumer). Actually, in many cases the food chains of the ecosystem's biological community overlap and interconnect, forming what ecologists call a food web.
The final link in all food chains is made up of decomposers, those heterotrophs (such as scavenging birds and mammals, insects, fungi, and bacteria) that break down dead organisms and organic wastes into smaller and smaller components, which can later be used by producers as nutrients.

A food chain in which the primary consumer feeds on living plants is called a grazing pathway, and a food chain in which the primary consumer feeds on dead plant matter is known as a detritus pathway. Both pathways are important in accounting for the energy budget of the ecosystem.
A food chain in the ocean begins with tiny one-celled organisms called diatoms. They make their own food from sunlight. Shrimplike creatures eat the diatoms. Small fish eat the shrimplike creatures, and bigger fish eat the small fish.

Diagnostic Assessment

Ask learners to mention the components of the ecosystem they went to visit and explain why it can be classified as an ecosystem.

Activity 1: Identify various components of an ecosystem previously visited.
Engage learners in a whole class activity to discuss their observations in the field trip to a nearby ecosystem. Assist learners to know the various components of the ecosystem.

Activity 2: Classifying different ecosystem.
Show learners pictures of different ecosystems and help them to classify them as aquatic or terrestrial. Assist learners to know the biotic and abiotic components of each ecosystem.

Activity 3: Brainstorming on the role of the sun in each ecosystem and the effect of its absence.
Lead learners to brainstorm on the role of the sun in each ecosystem and the effect that the absence of the sun will have on the ecosystem.

Activity 4: Naming different organisms and draining food chain.
Provide names of different organisms such as plants, herbivores, omnivores and carnivores and let students work in pairs to construct food chains based on the names of the living things provided.

Activity 5: Making food chain and food web.
Take learners through the activities on making of food webs and food chains in the learner's book.

Activity 6: Finding out ht e role of non-living component in an ecosystem.
Learners are expected to know that each component of an ecosystem plays an important role in the ecosystem. With the aid of questions, find-out whether the learners can mention the role of non-living components such as sunlight, temperature and water within an ecosystem.

Skills and Competences
Observing, analysing, manipulating, evaluating, critical thinking, digital literacy, communication, collaboration, creativity and innovation.

Progressive Assessment
Let learners construct food chains and webs showing producers, consumers and decomposers.

Main Points of the Lesson

- All animals depend on plants for their food.
- A food chain is a linear feeding relationship that shows the transfer of energy from one organism to another.
- All food chains start with a producer, which is mainly a green plant.
- Consumers are animals that depend on plants or other animals for their food.
- The combination of different food chains forms a food web.

Answers to Questions in learner's Book

1. B
2. D
3. A
4. C
5. A
6. C
7. D

Answers to Essay Type questions

1. a. Primary consumers obtain energy directly from primary producers. Secondary consumers obtain energy from primary consumers.
   b. Food chain is linear feeding relationship but food web is interconnected food chain.

2. Maize → grass cutter → wild dog → lion

3. a. Cassava plant, maize plant
   b. grasscutter, goat
   c. fungi, bacteria

4. Refer to pages 111 and 112 of Learner's Book 8.

Answers to Practical Questions

1. a. Food chain
   b. It serves as a producer or the main source of food in the food chain
   c. Frog
   d. Grasshopper
   e. Secondary consumer (or just consumer)
   f. Any food chain involving at least three trophic levels, beginning with a producer. Refer to page 115 of Learner's Book 8.

ICT: The internet link below contains further ideas on how to teach food chain and food web:

- https://www.weareteachers.com/food-webs/

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any reasons by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

3 Sub-Strand 4: Farming System

CONTENT STANDARD: B8.3.4.1 Demonstrate understanding of the different crop, animal and land combinations under various farming systems.

Indicator: B8.3.4.1.1 Identify and describe the types of crops, animals and land combinations for the different farming systems.

LESSON 1: COMMON FARMING SYSTEMS

Teaching and Learning Resources:

- videos and pictures showing different systems of farming.

Learner's Book 8: Pages 118-126

Learning Expectations:

At the end of the lesson, the learner will:

- identify and describe the types of crops, animals and land combinations for the different farming systems.
- discuss the advantages and disadvantages of each farming system identified.
- describe the benefits of the crops and animals in each farming system

Keywords: subsistence farming, shifting cultivation, crop rotation, extensive farming, intensive farming, pastoral farming.

Prior Preparation

Ask the learners to describe how animals are reared or crops are grown within the local community. Give them a task to also find out from the farmers the reasons they practice such farming systems.

INTRODUCTION

Farming systems is explained as the way or manner in which crops are cultivated and/or animals are reared. Farming systems are also known as agricultural systems. In a given area, the farming system that is practiced depends on factors such as:

- Availability of land
- Availability of skilled labour
- Climate and weather patterns within the area
- Nearness to sources of water
- Availability of ready markets
- Access to capital

- Availability of farming equipment such as tractors, combine harvesters etc.
- Access to agricultural extension officers to help in farm management

Additional Information
The different systems of farming can be classified under two main forms, namely subsistence farming and commercial farming.

Farming systems involving only rearing of animals;
- Pastoral Farming
- Nomadic farming

Farming systems involving only the growing of crops
- Mixed Cropping
- Mono-cropping
- Mono-culture
- Crop Rotation

Farming systems involving both crops and Animals
- Mixed Farming

Different Systems of Farming based on land Usage
- Land Rotation
- Shifting cultivation

Diagnostic Assessment
Let learners mention the common systems of farming within the local community and the advantages of each system.

Activity 1: Discussing common systems of farming practiced within the community.
Put learners into groups and ask them to share ideas on the common systems of farming practiced within the local community.

Activity 2: Identifying different farming systems.
Show pictures of different farming systems and ask learners to identify them.

Activity 3: Brainstorming to find out factors that account for the choice of a particular farming system over the others.
Initiate a brainstorming session with the class to identify the factors that account for the choice of a particular farming system over the other.

Activity 4: Exploring the merits and demerits of key farming systems.
Explain and give the merits and demerits of key farming systems such as crop rotation, land rotation, pastoral farming, mixed farming, mixed cropping and extensive farming.

Activity 5: Finding out by questioning whether learners know the advantages and disadvantages of farming systems.
With the aid of questions determine whether learners know the advantages and disadvantages associated with each farming system and the factors to consider in practicing a giving system of farming.

Skills and Competences
Comparing, evaluating, manipulating, observing, cultural identity, collaboration, problem solving

Progressive Assessment
Ask learners to state with reasons the farming systems that are most suitable to be practiced in the local community.

Main Points of the Lesson

- Farming systems is explained as the way or manner in which crops are cultivated and/or animals are reared.
- Factors influencing the choice of a farming system include: Availability of land, availability of skilled labour, climate and weather patterns within the area, nearness to source of water and access to capital.
- Examples of farming systems are Mixed Cropping, Mono-cropping, Mono-culture, Crop Rotation, Land Rotation, Mixed Farming and Shifting Cultivation
- Crops serve as source of food, help to generate income and provide other benefits to the farmer.
- Animals serve as source of meat, labour, milk, manure etc.

ICT: Visit the YouTube page below to watch a video on different farming systems:

- https://www.youtube.com/watch?v=uiwhI4opqqU

Answers to Essay Type Questions

1. i. Refer to pages 121, 122 of Learners book 8.
   ii. Refer to pages 123, 124 of learners book 8.
   iii. Refer to pages 123 of learners book 8.

2. Answers may vary.

3. i. Refer to pages 120 of learners book 8.
   ii. Refer to pages 123, 124 of Learners Book 8.

Answers to Questions in learner's Book

1. B
2. C
3. C
4. A
5. D

Answers to Practical Questions

Question One:

a. Maize/corn
b. Mono-cropping
c. Refer to learner's book for notes on advantages and disadvantage of mono-cropping
d. Refer to learner's book for notes on differences between mono-cropping and mixed cropping
e. Crop rotation, land rotation, mixed cropping, shifting cultivation, mixed farming etc.

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any reasons by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

Indicator: B8.3.4.1.2 Describe the benefits of the crops and animals in each farming system.

LESSON 2: THE USEFULNESS OF THE DIFFERENT CROPS AND ANIMALS INVOLVED IN THE DIFFERENT FARMING SYSTEMS

Learner's Book 8: pages 127-129

Keywords: subsistence farming, shifting cultivation, crop rotation, extensive farming, intensive farming, pastoral farming.

Prior Preparation
Give learners a task to find out from farmers within the locality the reasons they practice various farming systems as well as the associated benefits.

Background
Farming systems is explained as the way or manner in which crops are cultivated and/or animals are reared. In a nutshell, farming involves the rearing of animals or the cultivation of crops or both. There are various reasons why a farmer chooses one farming system over the other. These include reasons of proximity to source of feed and fertilizer, nearness to market, etc.

Additional Information
A farming system may involve:

- Rearing of animals only
- growing of crops only
- both cultivation of crops and rearing of animals

The crops in a farm serve many function such as

- Source of food
- Source of income
- Source of feed for farm animals
- Source of waste materials for making manure
- Source of raw materials for making clothes, furniture etc

On the other hand, the animals kept in a given farming system play various roles including:

- Source of labour
- Source of raw materials such as leather
- Source of income
- Source of raw materials for making manure
- Source of food.

Diagnostic Assessment
Let learners mention the common systems of farming within the local community

Teacher-learner Activities

Activity 1: ask a group of learners to work together to identify examples of farming systems that involve the cultivation of crops only.

Activity 2: ask another group of learners to write down farming systems that involve keeping of animals only.

Activity 3: let a third group of learners work together to identify a farming system that involves keeping both plants and animals.

Activity 4: initiate a brainstorming session with the class to identify the factors that account for the choice of a particular farming system over the other.

Activity 5: let learners individually write down the benefits of plants and animals in each of the farming systems they identified.

Skills and Competences
Comparing, evaluating, manipulating, observing, cultural identity, collaboration, problem solving

Progress Assessment
Ask learners to state with reasons the farming systems that are most suitable to be practiced in the local community.

Key Points of Lesson

- Examples of farming systems are Mixed Cropping, Monocropping, Monoculture, Crop Rotation, Land Rotation, Mixed Farming and Shifting Cultivation.
- Crops serve as source of food, help to generate income and provide other uses to the farmer.
- Animals serve as source of meat, labour, milk, manure etc.

Reflection
With the aid of questions determine whether students know the benefits of plants and animals in the various farming systems and the factors to consider in practicing a giving system of farming.

Answers to Questions in learner's Book
1. A
2. A.
3. C
4. A.
5. D

STRAND 4

FORCES AND ENERGY

Unit 1: Energy

CONTENT STANDARDS: B8.4.1.1 Demonstrate the skill to evaluate the conversion of energy from one form to another.

Indicator: B8.4.1.1.1 Describe energy conversion.

LESSON 1: ENERGY CONVERSION

Teaching and Learning Resources:

- Video clips on energy transformations, visit to a waterfall, pictures/charts of waterfalls, source of heat, matches, candle, flashlight, simple pendulum set-up, electric pressing iron.

Learner's Book 8: pages 130-135

Learning Expectations:

At the end of the lesson, the learner will:

- describe how energy is converted from one form to another

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: energy conversion, energy transformation.

INTRODUCTION

One week, that is, four periods will be enough to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

Energy occurs in many forms. Energy can be changed from one form to another form. This change of energy from one form to another is termed energy conversion, or energy transformation. Energy conversion, also termed as energy transformation, is the process of changing one form of energy into another. Energy conversion occurs everywhere and every minute of the day. There are

numerous forms of energy like thermal energy, electrical energy, nuclear energy, electromagnetic energy, mechanical energy, chemical energy, sound energy, etc. On the other hand, the term Energy Transformation is used when energy changes forms from one form to another. Whether the energy is transferred or transformed, the total amount of energy doesn't change and this is known as the Law of Conservation of Energy.

Main Points of the Lesson

There are different forms of energy.

- One form of energy can be changed to another form. This change is referred to as energy conversion, or an energy transformation.
- A microphone transforms sound energy into electrical energy.
- A loudspeaker transforms electrical energy into sound energy.
- In a simple electric circuit involving a battery, switch and a bulb or LED, chemical energy in the battery is changed to electric energy and then to light energy and heat in the bulb or LED.

ICT: You may visit the following links for more information:

- https://www.youtube.com/watch?v=ftj23FRS2LI

Progressive Assessment

Check prior knowledge by asking the learners to describe how energy is converted from one form to another.

Ask the learners to think-pair -share on the following:

- What energy changes takes place when an electric iron connected to a source of electricity is switched on?
- What happens to the food we eat in terms of energy transfer?

Take feedback from around the room.

Activity: Investigating how energy is converted from one form to the other.

See Pages 130 of Learner's Book 8

The activities are designed to enable learners describe how energy is converted from one form to another.

- Guide learners to carry out Activity 1 in pages 130 of the Learner's Book 8 to investigate how energy is converted from one form to another,
- Ask the learners to name some forms of energy and explain energy conversion with examples.
- Ask the learners to watch video clips on energy conversion.
- Engage the learners to explain the energy conversions in the following activities:
- A book raised high above a table and later allowed to fall
- Energy transformation that takes place at a waterfall.

- Lighted candle stick.
- Energy transformation that takes place at a waterfall.
- Lighted candle stick.
- A flashlight with a battery which is switched on.
- The motion of a simple pendulum.

Think and Discuss
Learners in pairs should describe how energy is converted from one form to another.
Take feedback from the various groups. Ensure that the less abled learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

ANSWERS TO EXERCISES

Objective
1. D
2. B
3. A
4. A

Answers to Essay Type Questions
1. Refer to pages 131, 133 of the learner's book 8.
2. Chemical energy ⟶ heat energy ⟶ light energy
3. Potential energy ⟶ kinetic energy ⟶ sound energy
4. Chemical energy ⟶ potential energy ⟶ kinetic energy
5. i. Chemical energy ⟶ electrical energy ⟶ sound energy
   ii. Chemical energy ⟶ electrical energy ⟶ sound energy

Answers to Test of Practicals
i. I - Hammering nail
   II - Mango /fruit falling from a tree

ii. I - Chemical ⟶ potential energy ⟶ kinetic energy ⟶ sound energy
   II - Potential energy ⟶ kinetic energy ⟶ sound energy

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Were they interesting and stimulating?
- Were the majority of the class responding as you would expect them to?
- Are there any reasons you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

CONTENT STANDARDS: B8.4.1.1 Demonstrate the skill to evaluate the conversion of energy from one form to another.

Indicator: B8.4.1.1.2 Discuss the importance of conversion of energy.

LESSON 2: IMPORTANCE OF CONVERSION OF ENERGY

Teaching and Learning Resources:

- Video clips of generation of electricity from moving water,
- Videos and pictures of waterfalls, wind mills, solar panels and solar cells

Learner's Book 8: pages 136-142

Learning Expectations:

At the end of the lesson, the learner will:

- explain the processes that a dammed river goes through to produce electricity.
- describe how to harness natural forms of energy into other forms.

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: hydroelectric dam, waterfalls, wind mills, biomass, solar panels and solar cells

INTRODUCTION

One week, that is, four periods will be enough to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

The foremost reason behind the necessity of energy conservation is related to our environment. The more fossil fuels are burned, the more our environment is hit by pollution. Even switching off a bulb when not in use, helps in reducing the consumption of some fuel source, which is burnt to produce that kilowatt-hour of energy. Now this fuel source may be fossil fuels, nuclear power, coal plants, or alternative energy. Fans, televisions, refrigerators, and several other electronic equipment when powered off, not only do a great deal in conserving energy, but also in protecting the environment. Energy conservation is important even with regard to social impact on countries and

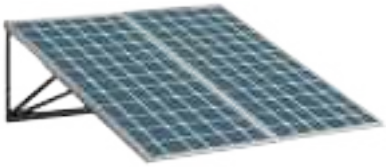
communities. It is certain that countries and communities which have better economic standards are the ones which tend to utilize more energy than others. So, being conscious and wise in the use of energy proves helpful to other countries and communities for accessing the same.

Main Points of the Lesson

There are several natural energy sources.
These include energy from the sun (solar energy), energy from the wind (wind energy), energy from moving water (hydro-power), energy from tides (tidal energy), energy from the interior of the earth's crust (geothermal energy), and fuels made from plant or animal matter (biomass).
Moving or flowing water can be harnessed to generate electricity.
The other natural sources of energy can be harnessed into other forms of energy such as heat energy and electrical energy.

Hydro dam

Wind turbine



Solar Panel

Fig. 2 - Sources of Energy

ICT: You may visit the following links for more information:

- https://www.eia.gov/energyexplained/hydropower/
- https://www.acciona.com/renewable-energy/wind-power/

Progressive Assessment

Check prior knowledge by asking the learners of the importance of conversion of energy.
Ask the learners to think-pair -share on the following:

- What is the significance of Akosombo dam in terms of energy supply in Ghana?
- How is the energy from the Sun used for the supply of electricity to homes in Ghana?

Take feedback from around the room.

Activity: Investigating the generation of electricity from moving water, wind, solar and heat (thermal) sources.
See Page 115 of Learner's Book 8
The activities are designed to enable learners discuss the importance of conversion of energy.

- Guide learners to investigate the generation of electricity from moving water, wind, solar energy and heat (thermal) sources.
- Engage the learners to discuss conversion of energy and give examples.
- Engage them to discuss how flowing water from waterfall can be utilized to generate electricity.
- Show the learners video clips on energy conversions.
- Engage the learners to discuss the processes involved in the transformation of the energy of flowing water into electrical energy.
- Ask the learners to find out how wind energy is utilized to generate electricity.
- Engage the learners to investigate how solar energy can be used to generate electricity using solar cells or solar panel.

Home Work/Project
Let learners carry out a project using solar cells or panels to construct a simple circuit to light a torchlight bulb or LED or operate a radio set.

Think and Discuss
Learners in pairs should discuss the importance of conversion of energy. Take feedback from the various groups. Ensure that the less abled learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

ANSWERS TO EXERCISES

Objectives

1. B
2. C
3. D
4. A

Answers to Test of Practicals

i. I - solar
II - Tidal
III - Thermal

Answers to Essay Type Questions

1. Solar energy, wind energy, hydro energy
2. Refer to page 137 of Learner's Book.
3. Refer to page 137 of Learner's Book.
4. Refer to pages 136, 137 of Learner's Book.

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Were they interesting and stimulating?
- Were the majority of the class responding as you would expect them to?
- Are there any reasons you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

CONTENT STANDARDS: B8.4.1.2 Show an understanding of the sources of renewable energy and how to manage these sources in a sustainable manner.

Indicators: B8.4.1.2.1 Describe renewable and non-renewable forms of energy.

LESSON 3: RENEWABLE AND NON-RENEWABLE FORMS OF ENERGY

Teaching and Learning Resources:

- Pictures/charts of renewable and non-renewable energy sources,
- Video clips on renewable and non-renewable sources of energy such as Hydro, Crude oil, Coal, Natural gas, Wind, Solar and Biogas.
- Solar panel (6-volt output), connecting wires, torchlight bulb, LED, radio set.
- Books, journals, the internet

Learner's Book 8: pages 143-148

Learning Expectations:

At the end of the lesson, the learner will:

- explain renewable and non-renewable sources of energy.
- identify the various sources of renewable and non-renewable forms of energy and classify them e.g. wind, coal, hydro, crude oil, natural gas, solar and biogas.
- describe how to produce energy from a renewable source.
- research about information on the stages involved in managing renewable energy sources.
- create a table to describe challenges associated with the management of different sources of renewable energy.

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: renewable energy source, non-renewable energy source.

INTRODUCTION

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

Fossil fuels are non-renewable energy sources. This means that they will eventually run out, which is why energy prices are rising. Fossil fuels include coal, oil, and natural gas. They're burned to generate power, but they release carbon dioxide in the process. Carbon dioxide is a greenhouse gas, which means it contributes to global warming by enhancing the greenhouse effect. Using oil as a source of energy has additional environmental repercussions, as oil spills occur often, destroying marine life. Oil is currently refined to produce transportation fuels such as gasoline and diesel. This emits carbon dioxide into the atmosphere once more. In 2010 global investment in new renewable energy projects exceeded investment in new fossil fuel fired plants for the first time, largely driven by a mix of renewable energy incentives and political pressure to invest in less emission-intensive energy production. Yet although investments in renewable energy plants are growing, so are the risks.

Main Points of the Lesson

- Renewable energy sources are energy sources that cannot be exhausted and can be replenished or replaced by natural means after they have been used up.
- Examples of renewable resources are solar energy, wind, falling water, the heat of the earth (geothermal), plant materials (biomass), waves, ocean currents, temperature differences in the oceans and the energy of the tides.
- Non-renewable energy sources are energy resources that cannot be replenished or renewed once they are used up.
- Examples of non-renewable energy sources are: fossil fuels and nuclear energy

ICT: You may visit the following links for more information:

- https://news.energysage.com/five-types-of-renewable-energy-sources/
- The concept of 'sustainable energy' refers to production of energy and its uses in a way that it meets the needs of the present generation and the future generations.
- Awareness must be created in the society to managing renewable energy sources sustainably.
- Managing renewable energy sources sustainably can affect the environment, economy, and society. The following factors are considered in managing energy sources sustainably:
- **Environmental factors** include waste and toxic emissions, greenhouse gases emissions and the associated impact on biodiversity.
- **Economic factors** include the cost of energy produced, its reliability and effects on jobs associated with energy production.
- **Socio-cultural factors** include the wars land disputes, cultural practices and long-term availability of energy.
- https://www.intechopen.com/books/energy-management-for-sustainable-development/clean-energy-management

Progressive Assessment

- Check the learners' prior knowledge by asking them of renewable and non-renewable forms of energy. Ask the learners to think-pair -share on the following:

- Brainstorm to bring about the meaning of the terms renewable energy sources and non-renewable sources and give examples of each source of energy.
- Take feedback from each group.
- Check the learners' prior knowledge by asking them how to manage sources of renewable energy sustainably. Ask the learners to think-pair -share on the following:
- What are the challenges associated with the use of renewable energy sources in generating electricity for domestic and commercial use?

Activity: Describing and identifying renewable and non-renewable sources of energy.
See Pages 143 of Learner's Book 8

- The activities are designed to enable learners describe renewable and non-renewable forms of energy.
- Guide learners to carry out Activity 1 on page 143 of the Learner's Book 8 identify renewable and non-renewable sources of energy.
- Ask the learners to list some sources of energy.
- Engage the learners to discuss to come out with the meaning of renewable and non-renewable sources of energy.
- Ask the learners to group the energy sources into renewable and non-renewable sources of energy. Engage the learners to watch a video clip on renewable and non-renewable sources of energy.
- Engage the learners to describe how to produce energy from renewable energy sources.
- Guide learners to carry out Activity 2 on page 146 of the Learner's Book 8 to investigate the use of simple solar cells to generate electrical energy. Engage the learners to use solar cells or panels to construct a simple circuit to light a flashlight bulb or LED or operate a radio set.
- Guide learners to carry out Activity 2 on pages 146 of the Learner's Book 8 to find out information on the stages involved in managing renewable energy sources.
- Ask the learners to list some renewable energy sources.
- Guide the learners to discuss the use of renewable sources in Ghana.
- Engage the learners to discuss to find out the limitations in the use of each of the renewable sources in terms of availability, cost, storage, effect on environment, advantages and disadvantages in relation to non-renewable energy sources.
- Ask the learners to use the internet or any available resource, to research for more information on the stages involved in managing renewable energy sources.
- Engage the learners to watch video clips on stages involved in managing renewable energy sources.
- Ask the learners to discuss the limitations associated with the management of different sources of renewable energy.
- Encourage learners to do group presentations.

Think and Discuss

- Learners in pairs should discuss renewable and non-renewable forms of energy. Take feedback from the various groups. Ensure that the less abled learners participate in the discussion.
- Learners in pairs should discuss how to manage sources of renewable energy sustainably. Take feedback from the various groups. Ensure that the less able learners participate in the discussion.

Diagnostic Assessment

Let learners provide answers to questions at the end of the lesson in their exercise books.

Answers to Exercises

1. A
2. D
3. C
4. D

Answers to Essay Type Questions

1. Answers may vary.
2. Refer to page 144 of Learner's Book 8.
3. Refer to page 144 of Learner's Book 8.
4. Refer to page 144 of Learner's Book 8.
5. Refer to page 144 of Learner's Book 8.

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Were the majority of the class responding as you would expect them to?
- Were there any means by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

Indicator: B8.4.1.2.2 Demonstrate how to manage sources of renewable energy sustainably.

LESSON 4: DEMONSTRATING HOW TO MANAGE SOURCES OF RENEWABLE ENERGY SUSTAINABLY.

Learner's Book 8: Pages 149-154

Learning Expectations:
At the end of the lesson, the learner will:

- research about information on the stages involved in managing renewable energy sources.
- create a table to describe challenges associated with the management of different sources of renewable energy

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Resources
Books, journals, pictures, the internet

Keywords: renewable energy source, non-renewable energy source.

Prior Preparation:
Gather pictures on renewable and non-renewable sources of energy

INTRODUCTION

One week, that is, four periods will be enough to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information
In 2010 global investment in new renewable energy projects exceeded investment in new fossil fuelfired plants for the first time, largely driven by a mix of renewable energy incentives and political pressure to invest in less emission-intensive energy production. Yet although investments in renewable energy plants are growing, so are the risks. Political/regulatory risk and financial risk

are on the rise against a backdrop of macro-economic uncertainty, while weather-related volume risk is rising up the agenda as investments in offshore wind farms accelerate. At the same time, the availability of risk management resources—including risk expertise, industry data and insurance cover - in the renewable energy sector remains limited, potentially restricting the sector's access to development capital.

Main Points of the Lesson

The concept of 'sustainable energy' refers to production of energy and its uses in a way that it meets the needs of the present generation and the future generations.

Awareness must be created in the society to managing renewable energy sources sustainably.

Managing renewable energy sources sustainably can affect the environment, economy, and society.

The following factors are considered in manging energy sources sustainably:

i. Environmental factors include waste and toxic emissions, greenhouse gases emissions and the associated impact on biodiversity.
ii. Economic factors include the cost of energy produced, its reliability and effects on jobs associated with energy production.
iii. Socio-cultural factors include the wars land disputes, cultural practices and long-term availability of energy.

You may visit the following links for more information:

- https://www.intechopen.com/books/energy-management-for-sustainable-development/clean-energy-management

Progressive Assessment

Check prior knowledge by asking the learners how to manage sources of renewable energy sustainably. Ask the learners to think-pair -share on the following:

A. What are the challenges associated with the use of renewable energy sources in generating electricity for domestic and commercial use?

Take feedback from around the room.

Activity

See Page 149 of learner's Books 8

The activities are designed to enable learners demonstrate how to manage sources of renewable energy sustainably.

- Guide learners to carry out the activity 1 in pages 149 of the Learner's Book 8 to find out information on the stages involved in managing renewable energy sources.
- Ask the learners to list some renewable energy sources.
- Guide the learners to discuss the use of renewable sources in Ghana.

- Engage the learners to discuss to find out the limitations in the use of each of the renewable sources in terms of availability, cost, storage, effect on environment, advantages and disadvantages in relation to non-renewable energy sources.
- Ask the learners to use the internet or any available resource, to research for more information on the stages involved in managing renewable energy sources.
- Engage the learners to watch video clips on stages involved in managing renewable energy sources.
- Ask the learners to discuss the limitations associated with the management of different sources of renewable energy.

Homework/Project
Let learners carry out a project as outlined in in pages xx of the Learner's Book 8 to investigate the challenges associated with the management of different sources of renewable energy.

Think and Discuss
Learners in pairs should discuss how to manage sources of renewable energy sustainably. Take feedback from the various groups. Ensure that the less abled learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

Answers To Exercises

1. B
2. A
3. B
4. B
5. B
6. False
7. False
8. False
9. False

Reflection
At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Were they interesting and stimulating?
- Were the majority of the class responding as you would expect them to?
- Are there any reasons you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

CONTENT STANDARDS: B8.4.1.3 Demonstrate an understanding of the relationship between heat and temperature.

Indicator: B8.4.1.3.1 Discuss the differences and the relationship between heat and temperature in the environment.

LESSON 5: THE RELATIONSHIP BETWEEN HEAT AND TEMPERATURE

Teaching and Learning Resources:

- A source of heat, a cup of ice water, a cup of cup of hot tea, cup of cold water, a spoon.

Learner's Book 8: pages 155-157

Learning Expectations:

At the end of the lesson, the learner will:

- create a table to show the distinguishing features of temperature and heat.
- discuss the relationship between temperature and heat.

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: temperature, heat, thermal energy, internal energy

INTRODUCTION

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

The temperature of an object is a measure of the intensity of heat in it, whereas heat is the total energy of the molecule of the object or material. The relationship could be that the higher the temperature of a thing, the more heated it is. Radiation, conduction, and convection are the most common methods for transferring heat between two things. When examined through the lens of physics, temperature is one of those components of everyday life that appears very abstract. Temperature is measured with thermometers by a variety of methods, including the expansion of a liquid such as mercury or alcohol.

Main Points of the Lesson

- Temperature is the degree of hotness of a body.
- Heat is the energy that travels from a body at a higher temperature to one at a lower temperature.
- Heat and temperature are two different quantities. The basic difference between heat and temperature is that heat is a form of energy that travels from a hot body to a cold body. Its unit is the joule, Temperature is the degree of hotness of a body. It is measured in degree Celsius or kelvin.

ICT: You may visit the following links for more information:

- https://keydifferences.com/difference-between-heat-and-temperature.html

Progressive Assessment

Check the learners' prior knowledge by asking them to discuss the differences and the relationship between heat and temperature in the environment.

Ask the learners to think-pair -share on the following:

- A cup of water and a bucket of water all at the same temperature carry the same quantity of heat. True or False?

Take feedback from all the groups.

Activity: Discussion on the difference between the relation between heat and temperature in the environment.

See Page 155 of Learner's Book 8

- The activities are designed to enable learners discuss the differences and the relationship between heat and temperature in the environment.
- Guide learners to carry out Activity 1 in page 155 of the Learner's Book 8 to sort out differences between temperature and heat in the environment.
- Engage the learners to discuss to find out the meaning of temperature, heat and find out the differences between heat and temperature.
- Engage the learners to watch a video clip on the differences between temperature and heat.
- Ask the learners to touch a cup of iced water and touch the water and state how it feels.
- Ask the learners to take the cup of hot water/tea, touch the water/tea and state how it feels.
- Ask the learners to allow the iced water and hot water to stay for one hour and touch both.
- Engage the learners to record their observations after touching both and state which one gains energy and which one loses energy.

Think and Discuss
Learners in pairs should discuss the differences and the relationship between heat and temperature in the environment. Take feedback from the various groups. Ensure that the less able learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

Answers to Essay Type Questions

1. a. Refer to page 156 of Learners' Book 8.
   b. Refer to page 156 of Learners' Book 8.

2. Refer to pages 155 and 156 of Learners' Book 8.

3. Refer to page 156 of Learners' Book 8.

4. Refer to page 156 of Learners' Book 8.

5. a. Answers will vary.
   b. Answers will vary.
   c. Answers will vary.

Answers to Exercises
Objectives

1. B
2. C
3. C
4. True
5. C

Answers to Test of Practical Questions

a. You will feel "hot sensation" in your hand.
b. Heat
c. To add cold water to it.

Reflection
At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any means by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?

To what extent did you cater for learners with disability and the below average learners?

CONTENT STANDARDS: B8.4.2.1 Demonstrate knowledge of electricity transmission.

Indicator: B8.4.2.1.1 Explain how electricity transmission occurs.

LESSON 6: TRANSMISSION OF ELECTRICITY

Teaching and Learning Resources:

- Video clips on electricity transmission, pictures of transmission of electricity

Learner's Book 8: pages 158-161

Learning Expectations:

At the end of the lesson, the learner will:

- identify different stages of electricity transmission.
- draw a flow chart to show the stages of electricity transmission from the point of generation to the point of consumption.

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: turbine, generator, transformer, voltage, thermal plant, power plant

INTRODUCTION

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

Electrical transmission is the process of sending generated power to the distribution grid in inhabited areas over long distances. Transformers, which are used to raise voltage levels to allow for long-distance transmission, are a crucial aspect of this process.

The electrical grid was created by combining the electrical transmission system with power plants, distribution networks, and substations. The grid serves society's electricity needs and transports electricity from its source to its final destination. Because power facilities are typically located outside of densely inhabited areas, a substantial transmission line is required. Transmission lines, often known as power lines, carry electricity from one location to another. Step-up transformers

can raise the voltage by converting alternating current to direct current. This enhanced voltage enables for efficient transmission for distances of up to 500 kilometres. There are three different types of lines. The majority of long-distance transmission is done using overhead lines, which have voltages ranging from 100 kV to 800 kV. To reduce power losses due to resistance, they must be high voltage. Underground lines are used to deliver electricity through densely populated regions, underwater, and anywhere else where overhead lines aren't feasible. Due to heat-related losses and higher costs, they are less prevalent than overhead lines. Sub transmission lines, which can be overhead or subterranean, carry lower voltages (26 kV - 69 kV) to distribution stations.

Main Points of the Lesson

- A power distribution system is used for the transmission.
- The electricity goes through high voltage transmission lines that stretch across the country.
- It reaches substations, where the voltage is lowered so it can be sent on smaller power lines. It travels through distribution lines to our neighbourhoods.
- Transformers are devices for stepping up or stepping down alternating voltages.

ICT: You may visit the following links for more information:

- https://www.instituteforenergyresearch.org/electricity-transmission/

Progressive Assessment

Check the learners' prior knowledge by asking them to explain how electricity transmission occurs. Ask the learners to think-pair -share on the following:

- Explain how electricity is produced from a thermal power station.
- Explain the use of a transformer?

Take feedback from all the groups.

Activity: Finding out how electricity is transmitted from power station.

See Page 158 of Learner's Book 8

The activities are designed to enable learners explain how electricity transmission occurs.

- Guide learners to carry out Activity 1 in pages 158 of the Learner's Book 8 to find out how electricity is transmitted from power stations.
- Engage the learners to go on a walk round the school compound and surroundings and observe overhead cables.
- Guide the learners to watch a video clip on the transmission of electricity from a power plant station to far places.
- Engage the learners to take a trip to a power plant or electricity company to study the transmission of electricity from the point of generation.
- Engage the learners to discuss how electricity is transmitted from power stations to other places.

Home Work/Project
Let learners carry out a project to design a flow chart or poster on the distribution of electricity from a power plant to their homes and label all the components of the chart or poster.

Think and Discuss
Learners in pairs should explain how electricity transmission occurs. Take feedback from the various groups. Ensure that the less able learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

Answers to Exercises
Objective Questions

1. b
2. a
3. b
4. c
5. b

Answers to Essay Type Questions

1. Refer to page 159 of Learners' Book 8.
2. Answers will vary.
3. Answers will vary.

Answers to Test of Practicals

a. Transformer
b. It steps up or steps down voltage or current.
c. Refer to pages 159 and 160 of Learners' Book 8.

Reflection
At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any means by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

CONTENT STANDARDS: B8.4.2.2 Demonstrate understanding of the functions of capacitors in relation to LEDs, Diodes and resistors in electronic circuits.

Indicator: B8.4.2.2.1 Demonstrate the charging and discharging action of a capacitor in a dc electronic circuit.

LESSON 7: THE CHARGING AND DISCHARGING ACTION OF A CAPACITOR IN A DC ELECTRONIC CIRCUIT

Teaching and Learning Resources

- Research information about capacitors in electronic circuits and explain their functions when connected with direct current (d.c).
- Describe the charging and discharging actions of a capacitor and explain the role of LEDs, diodes and resistors in an electronic circuit.

Learner's Book 8: Pages 162-165

Learning Expectations:

At the end of the lesson, the learner will:

- research information about capacitors in electronic circuits and explain their functions when connected with direct current (d.c).
- describe the charging and discharging actions of a capacitor and explain the role of LEDs, Diodes and resistors in an electronic circuit.

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: capacitor, charge, discharge

INTRODUCTION

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

A capacitor is a device that stores electrical energy in an electric field. It is a passive electronic component with two terminals. The effect of a capacitor is known as capacitance. While some

capacitance exists between any two electrical conductors in proximity in a circuit, a capacitor is a component designed to add capacitance to a circuit. The capacitor was originally known as a condenser or condensator. This name and its cognates are still widely used in many languages, but rarely in English, one notable exception being condenser microphones, also called capacitor microphones. A capacitor is charged when we supply a voltage with current running through the capacitor, in the process the capacitor accumulates charges.

Main Points of the Lesson

- A capacitor is an electronic device used for storing electrical charges.
- A charged capacitor acts as a battery.
- A charged capacitor discharges current through an LED to light it up.
- When a capacitor in a circuit is charged, the flow of current in the circuit ceases.

ICT: You may visit the following links for more information:

- https://www.makerspaces.com/basic-electronics/
- https://www.youtube.com/watch?v=w8Dq8blTmSA
- https://blog.mide.com/how-electronic-components- work#:~:text=Electronic%20Circuit%20Overview, capacitors%2C%20inductors%2C%20and%20diodes

Progressive Assessment

Check the learners' prior knowledge by asking them to explain the charging and discharging action of a capacitor in a dc electronic circuit.

Ask the learners to think-pair -share on the following:

- What is the function of a capacitor in an electronic circuit?

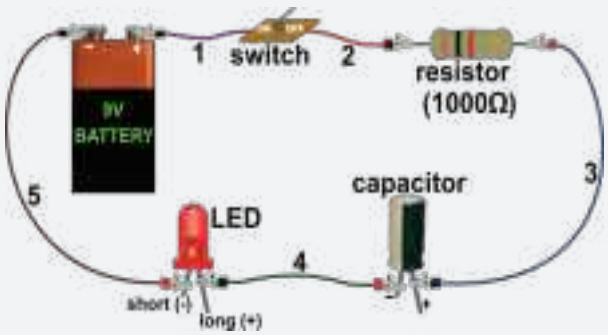
Take feedback from all the groups.

Activity: Demonstrating charging and discharging of a capacitor in a d.c electronic.

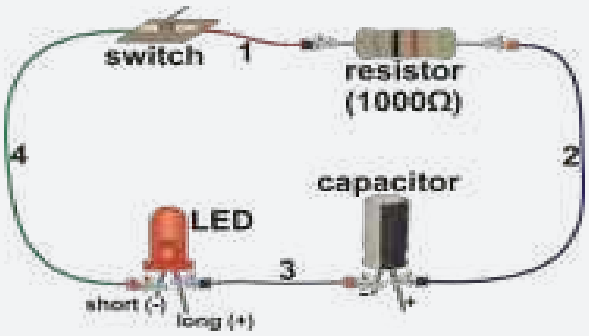
Refer to Pages 163 and 164 of Learner's Book 8.

The activities are designed to enable learners demonstrate the charging and discharging action of a capacitor in a d.c electronic circuit.

- Guide learners to carry out Activity 1 to demonstrate the charging and discharging action of a capacitor.
- Guide the learners to identify electric components such as LED, resistors, capacitors and batteries from an assembly of electronic components and examine the features of a capacitor, such as capacitance in the unit of farad, F, or micro farad, μF, and the different lengths of the leads of a capacitor.
- Ask the learners to watch a video clip on the behaviour of capacitor in an electronic circuit.
- Engage the learners to connect the circuit shown involving a battery, switch, resistor, a capacitor and LED.



- Ask the learners to close the switch and quickly observe what happens to the LED for some time.
- Ask the learners to open the switch and observe what happens to the LED.
- Ask the learners to carefully disconnect the battery, and reverse the capacitor's position in the circuit as shown below.



- Ask the learners to close the switch again and observe what happens to the LED.
- Engage the learners to discuss the charging and discharging action of the capacitor.

Home Work/Project
Let learners carry out a project to investigate electronic devices in the home that use capacitors.

Think and Discuss
Learners in pairs should discuss the charging and discharging action of a capacitor in a d.c electronic circuit. Take feedback from the various groups. Ensure that the less abled learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

Answers to Essay Type Questions

1. It stores electric charges.
2. It converts electrical energy into light energy.

Answers to Exercises
Objectives

1. TRUE
2. D
3. C
4. C

Answers to Test of Practical Questions

a. A - switch
   B - resistor
   C - capacitor
   D - light emitting diode
   E - source of electricity

b. It regulates the current in the circuit.
c. It converts electric energy into light energy.
d. It stores electric charges.

Reflection
At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any means by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

4 Sub-Strand 2: Conversion and Conservation of Energy

CONTENT STANDARDS: B8.4.3.1 Evaluate the impact of conversion of energy and energy conservation on the environment.

Indicator: B8.4.3.1.1 Explain the importance of conversion of energy and energy conservation in daily life.

LESSON: THE IMPORTANCE OF CONVERSION OF ENERGY AND ENERGY CONSERVATION IN DAILY LIFE

Teaching and Learning Resources:

- Internet, journals

Learner's Book 8: pages 166-171

Learning Expectations:

At the end of the lesson, the learner will:

- classify the importance of energy conversion and energy conservation in daily life.
- search from multimedia sources, books, internet for information on the impact of energy conversion and conservation in their environment, and make a poster presentation on their findings.

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: energy conversion, energy conservation

INTRODUCTION

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

The most important reason for energy conservation is to protect our ecosystem. The more fossil fuels are consumed; the more pollution is released into our environment. Even turning off a light

bulb when it is not in use helps to reduce the amount of fuel used to generate that kilowatt-hour of energy. This fuel could come from fossil fuels, nuclear power, coal plants, or alternative energy sources. When fans, televisions, refrigerators, and other electrical devices are turned off, they not only save energy but also help to safeguard the environment. Even in terms of societal impact on countries and communities, energy conservation is critical. It is undeniable that countries and communities with higher economic standards use more energy than those with lower standards. As a result, being careful and sensible in the use of energy aids other countries and people in gaining access to the same.

Main Points of the Lesson

- Energy conversion or energy transformation, is the process of changing one form of energy into another.
- Energy conservation is the practice of reducing the quantity of energy used or the reduction of unnecessary or unwanted energy use.
- It is important to conserve energy since energy resources are limited.

A person ironing clothes

Solar powered house

Fig. 3

ICT: You may visit the following links for more information:

- https://vikaspedia.in/energy/energy-conservation/energy-conservation.

Progressive Assessment

Check the learners' prior knowledge by asking them to explain the importance of conversion of energy and energy conservation in daily life.

Ask the learners to think-pair -share on the following:

- What is meant by energy conversion? Give examples.
- What is meant by energy conservation?

Take feedback from all the groups.

Activity: Investigating the importance of conversion of energy and energy conservation.
The activities are designed to enable learners explain the importance of conversion of energy and energy conservation in daily life:

- Guide learners to investigate the importance of energy conversion and energy conservation in daily life.
- Engage the learners to discuss energy conversions and give examples.
- Engage the learners to discuss what is meant by energy conservation.
- Ask the learners to discuss energy conservation practices in various homes and the need to conserve energy.
- Engage the learners to watch a video clip on energy conversion and energy conservation.
- Ask the learners to design a poster on energy conservation and present bit to class for exhibition.

Home Work/Project
Let learners carry out a project using the internet, multimedia sources, books or any available resource, to search for information on the impact of energy conversion and energy conservation on their environment.

Think and Discuss
Learners in pairs should discuss the importance of conversion of energy and energy conservation in daily life. Take feedback from the various groups. Ensure that the less able learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

ANSWERS TO EXERCISES

Objectives

1. B
2. A
3. C
4. B

Answers to Essay Type Questions

1. Refer to page 166 of Learners' Book 8.
2. Refer to page 166 and 167 of Learners' Book 8.

3. Refer to pages 167 and 168 of Learners' Book 8.
4. Refer to page 168 of Learners' Book 8.
5. Refer to page 168 of Learners' Book 8.
6. More energy is used.
7. More renewable sources of energy are used. This leads to environmental degradation and climate change. Global warming occurs when people engage in deforestation.

Answers to Test of Practical Questions

a. Energy conversion and conservation.
b. i. A - Potential
   ii. D - Kinetic and Potential
   iii. Kinetic

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any means by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?

To what extent did you cater for learners with disability and the below average learners?

4 Sub-Strand 3: Force and Motion

CONTENT STANDARDS: B8.4.4.1 Demonstrate the production of magnet, domestic and industrial application of Magnetic force and its relationship with Newton's Second law of motion and in everyday life.

Indicator: B8.4.4.1.1 Demonstrate simple ways of making magnets and show how magnetic force can be applied in domestic and industrial activities.

LESSON 1: SIMPLE WAYS OF MAKING MAGNETS

Teaching and Learning Resources:

- Bar magnets, iron nails, steel nails/bars, glass, wood, plastic, copper plate, aluminium plate.
- A solenoid of about 300 turns, a steel bar or nail and iron bar or nail, each 6 cm long, small needles or iron pins, 3 V battery, 9 V battery, a switch, connecting wires.

Learner's Book 8: Pages 172-182

Learning Expectations:

At the end of the lesson, the learner will:

- produce magnets (using magnetic materials such as pieces of iron and bar magnet; and electricity).
- demonstrate some application of magnetic force in domestic and industrial activities (E.g. Compass, alarms, loud speakers etc.).
- explore other industrial and domestic applications of magnetic force and present findings.

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: magnet, magnetic substance, non-magnetic substance, magnetic force, magnetic field

INTRODUCTION

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

A magnet is an object or material that generates a magnetic field. This magnetic field is invisible, but it is responsible for a magnet's most notable property: a force that attracts or repels other ferromagnetic materials such as iron, steel, nickel, cobalt, and others. The rest of the magnets on the market today are man-made. The term "ferromagnetic materials" refers to a class of materials. Iron, cobalt, nickel, and some rare earth element alloys are included in this group (mainly neodymium and samarium). By exposing these ferromagnetic materials to a magnetic field created by an electric current, they can be made magnetic. Magnets are a lot of fun. They will stick to anything that is magnetic. They also form an undetectable magnetic field around themselves.

Main Points of the Lesson

- A magnet is a device that attracts certain metals and their alloys.
- Magnetic materials are substances that can be attracted by a magnet and can be made to become magnets.
- Examples of magnetic substances are steel, iron, cobalt, nickel and certain alloys.
- Non-magnetic materials are substances which are not attracted by magnets.
- Examples are copper, brass, wood, and glass.
- Non-magnetic substances, however, have a very feeble magnetic strength.
- Magnets are used in the home and in the industry.

Fig. 4 - *A bar magnet*

ICT: You may visit the following links for more information:

- https://www.youtube.com/watch?v=ai1q0K3TvDU

Progressive Assessment

Check the learners' prior knowledge by asking them of simple ways of making magnets and how magnetic force can be applied in domestic and industrial activities.

Ask the learners to think-pair -share on the following:

- Name four appliances in the home having magnets in them.
- Describe how they will separate a mixture of iron filings and sand into their components?

Take feedback from all the room.

Activity: Demonstrating simple ways of making magnets and how magnetic force can be applied.
Refer to Page 174 of Learner's Book 8
The activities are designed to enable learners demonstrate simple ways of making magnets and show how magnetic force can be applied in domestic and industrial activities.

- Guide learners to carry out Activity 1 in page 174 of the Learner's Book 8 to investigate properties of magnets, magnetic and non-magnetic substances.
- Guide learners to carry out Activity 2 in page 175 of the Learner's Book 8 to make magnets using single stroke and double stroke methods.
- Guide learners to carry out the Activity 2 in page 175 of the Learner's Book 8 to demonstrate magnetization by electrical method.
- Guide learners to carry out the Activity 3 in page 176 of the Learner's Book 8 to demonstrate some application of magnetic force in domestic and industrial activities.

Think and Discuss
Learners in pairs should discuss simple ways of making magnets and show how magnetic force can be applied in domestic and industrial activities. Take feedback from the various groups. Ensure that the less able learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

ANSWERS TO EXERCISES

Objective Test

1. A
2. A
3. B
4. B
5. C
6. B

Answers to Test of Practicals

a. A - North pole,
   B - South pole

b. Dip it in iron filings or nails and it will attract them.
c. The north pole for the stroking should be lifted high above the steel bar.
d. Permanent magnet.

Answers to Essay Type Questions.

1. Refer to page 172 of Learners' Book 8.
2. Refer to page 174 of Learners' Book 8.
3. Refer to page 175 of Learners' Book 8.
4. a. Refer to page 172 of Learners' Book 8.
   b. Refer to page 172 of Learners' Book 8.

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any means by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

INDICATOR: B8.4.4.1.2 Explain the relationship between magnetic force and Newton's Second Law of motion; and show the law's application to life.

LESSON 2: THE RELATIONSHIP BETWEEN MAGNETIC FORCE AND NEWTON'S SECOND LAW OF MOTION

Teaching and Learning Resources:

- Books, boxes, baby's court or small wagon, or trolley, toy cars, loads of different masses, bicycle, football, a strong bar magnet, a weak bar magnet, office pins, iron nails.

Learner's Book 8: pages 183-187

Learning Expectations:

At the end of the lesson, the learner will:

- explain Newton's Second Law of motion with examples from daily life.
- perform an experiment to show the relationship between force and motion using magnetic force, and the principle of Newton's Second Law of Motion.

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: Newton's second law of motion, magnetic force, momentum, magnetic force

INTRODUCTION

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

Consider two balls, one weighing one kilogram and the other weighing ten kilograms. If both balls were kicked with the same force, which one would suffer the bigger change in motion? Obviously, the smaller ball would undergo more motion change. The state of motion of an object can be represented by its velocity, which is the speed of an item in relation to its direction. Objects that are at rest, such as the balls on the screen, have zero velocity. The state of motion of the ball changes when it is kicked. To put it another way, its velocity changes. The term "acceleration" refers to the change in velocity of an object.

The behaviour of objects when forces are applied is explained by Newton's second law of motion. External forces cause objects to accelerate, according to the law, and the amount of acceleration is directly proportional to the net force exerted on the objects and inversely proportional to their mass. The velocity of charged particles is influenced by both electric and magnetic forces. The ensuing shift in particle trajectory will, however, differ fundamentally between the two forces.

Main Points of the Lesson

- Momentum is the product of mass and velocity.
- Newton's Second Law of motion states that the rate of change of momentum with respect to time of a body is directly proportional to the applied force and takes place in the direction of the force.
- From Newton's second law of motion, force, mass and acceleration are related.
- The net force of an object is equal to the product of its mass and acceleration. This can be expressed by the equation: Force = mass × acceleration.

  That is, …..... (1)
  The force of attraction by magnet on a magnetic substance is called a magnetic force.

ICT: You may visit the following links for more information:

- https://www.physicsclassroom.com/class/newtlaws/Lesson-3/Newton-s-Second-Law

Progressive Assessment

Check prior knowledge by asking the learners of the relationship between magnetic force and Newton's Second Law of motion; and show the law's application to life.
Ask the learners to think-pair -share on the following:

- What is momentum?
- What is the effect of a force on the motion of an object?

Take feedback from all the groups.

Activity: Investigating magnetic force and Newton's 2nd law of motion.
See Page 183 of Learner's Book 8

- The activities are designed to enable learners explain the relationship between magnetic force and Newton's Second Law of motion; and show the law's application to life.
- Guide learners to carry out Activity 1 in pages 183 of the Learner's Book 8 to demonstrate the effect of force on and object and investigating magnetic force.
- Engage learners to use the motion of a bicycle, and football to show applications of Newton's second law of motion.
- Engage the learners to use a bar magnet to demonstrate the attractive force of a magnet when brought close to iron and steel nails.

Think and Discuss
Learners in pairs should discuss the relationship between magnetic force and Newton's Second Law of motion, and the law's application to life. Take feedback from the various groups. Ensure that the less able learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

Answers to Exercises
Objective Test

1. D
2. A
3. B
4. C
5. B

Answers to Essay Type Questions.

1. Refer to pages 184-185 of Learners' Book.
2. a. Refer to page 185 of Learners' Book.
   b. Refer to page 185 of Learners' Book.
3. Refer to page 184 of Learners' Book.
4. Refer to page 184 of Learners' Book.
5. Answers may vary.

TEST OF PRACTICALS

- Place a weak bar magnet on a flat table.
- Place a piece of iron nail a distance away from the nail
- Observe what happens.
- Move the magnet slowly towards the nail and tell what happens when the distance is a bit close.

Does the nail move, and in what direction?

- Increase the size of the nail.
- Bring the weak magnet towards the bigger nail.
- Observe what happens.
- Compare the distance between the magnet and the nail when the attraction took place.
- Repeat the activity with a strong bar magnet.
- Compare the attraction between the strong magnet and the weak magnet.

When a nail is brought closer to iron nails or iron filings, the nails will accelerate towards the bar magnet because of the magnetic force. The stronger the magnet, the greater the attraction.

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any means by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

CONTENT STANDARDS: B8.4.4.2 Demonstrate understanding of complex machines and how they work.

Indicator: B8.4.4.2.1 Identify complex machines and describe their functions in life.

LESSON 3: COMPLEX MACHINES AND THEIR FUNCTIONS IN LIFE

Teaching and Learning Resources

- Scissors, pliers, lid opener, claw hammer, crow bar, inclined plane, simple pulley, gears of a wrist watch, sewing machine, bicycle, tractor, saloon car, mower, pictures of simple and complex machines, video clips on simple and complex machines.

Learner's Book 8: pages 188-199

Learning Expectations:

At the end of the lesson, the learner will:

- recap what simple machines are from B7.4.4.2.1
- explain what complex machines are and show how different they are from simple machines.
- identify simple machine in complex machines.
- explain how the functions of a complex machine can improve the quality of life.

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: simple machine, complex machine

INTRODUCTION

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

A complex machine is a combination of two or more simple machines that work together, such as when a lever and a wheel and axle are combined to form a cart. There are many different possible iterations of complex machines, from staplers to wheelbarrows and skateboards.

Simple machines are a group of six items (wheel and axle, pulley, screw, lever, wedge, and inclined plane) that can be combined to form a complex machine. A bicycle is an example of a complex machine because it involves the use of two wheels and axles. A dolly, or handcart, is another example, with a lever and wheel and axle being combined to help lift and move heavy loads. The term "complex machine" may be used interchangeably with "compound machine," which also refers to a group of multiple simple machines working together to make a more complicated mechanism.

Main Points of the Lesson

- A machine is any device which helps to make work easier for us.
- There are two types of machines. These are: simple machines and complex machines.
- Examples of simple machines are a pair of tongs, a pair of scissors, levers and wheelbarrows.
- A complex machine is a combination of simple machines.
- Examples of complex machines are a car, a bicycle, a mower and a tractor.
- A complex machine therefore consists of interrelated parts of simple machines with separate functions, used in the performance of some kind of work.

Car *Bicycle* *Tractor* *Sewing Machine*

Fig. 5

ICT: You may visit the following links for more information:

- https://www.toppr.com/content/concept/simple-and-complex-machines-208465/

Progressive Assessment

Check prior knowledge by asking the learners identify complex machines and describe their functions in life.

Ask the learners to think-pair -share on the following:

- Name four simple machines found in the home.
- What is a complex machine? Give two examples of complex machines.

Take feedback from all the groups.

Activity: Identifying complex machines and describing their functions in life.
Refer to Pages 192 and 193 of Learner's Book 8
The activities are designed to enable learners identify complex machines and describe their functions in life.

- Guide learners to carry out Activity 1 in pages 192 and 193 of the Learner's Book 8 to examine components of complex machines.
- Task learners to work cooperatively in mixed ability groups to identify the simple machines in the assembly of tools and name the use of the simple tools identified.
- Engage the learners to identify the complex machines and mention their uses.
- Show the learners a complex machine and ask the learners to identify the simple machines that make up the complex machine.
- Operate a complex machine such as a sewing machine or a bicycle and ask the learners to observe how the simple machines in the complex machine are interrelated as the complex machine is in operation.
- Let the learners watch a video clip on complex machine and how each simple machine is interrelated with separate functions.
- Engage the learners to find out what makes the complex machines different from simple machines.

Home Work/Project
Let learners carry out a project to design a complex machine involving three simple machine to lift a load upwards.

Think and Discuss
Learners in pairs should discuss complex machines and describe their functions in life. Take feedback from the various groups. Ensure that the less able learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

ANSWERS TO EXERCISES

Objective Test

1. A
2. B
3. B
4. C
5. A

Answers to Essay Type Questions

1. Refer to learners' book, page 194.
2. Refer to learners' book, pages 193-194.
3. Refer to learners' book, pages 193-194.
4. Refer to learners' book, page 188.

Answers to Test of Practical Questions on Page 199 of Learners' Book 8.

i. Bicycle
ii. Complex Machine
iii. It consists of many simple machines which include lever, screw, pulley and wheel and axle.
iv. They are all made up of different kinds of simple machines.
v. Lever, screw pulley.

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any means by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?

To what extent did you cater for learners with disability and the below average learners?

4 Sub-Strand 4: Agricultural Tools

CONTENT STANDARDS: B8.4.5.1 Demonstrate knowledge and skills in the use of basic and simple agricultural tools for basic on-farm activities.

Indicator: B8.4.5.1.1 Show and discuss the use of basic and simple agricultural tools for basic on-farm activities.

LESSON 1: THE USE OF SIMPLE AGRICULTURAL TOOLS

Teaching and Learning Resources

- Some agricultural tools (such as cutlass, hoes, wheel barrows, hand forks, and hand trowel).

Learner's Book 8: Pages 200-205

Learning Expectations:

At the end of the lesson, the learner will:

- list five different types of agricultural tools each use for crop production and rearing of animals.
- match each tool with the familiar type of agricultural activity it is used for and create an album of the tools.

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: agricultural tools

INTRODUCTION

Agriculture is a time-consuming operation that cannot be completed by hand. As a result, agricultural procedures must be carried out with the aid of tools and machines. Agricultural implements or tools are used for farm work. Agricultural technology refers to the technology utilized in the manufacture of farm machines. The machines are made to make work easier and to complete every phase of the farming process.

Irrigation machinery is one of the most significant agricultural implements.

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

- **Implements for soil cultivation**
- **Planting equipment**
- **Implements for harvesting**

The following are some basic agricultural tools:

- **Plough**
- **Hoe**
- **Cultivator**
- **Drill for seeds**

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

Land preparation is one of the cultural practices involved in crop production. Using farm tools to prepare the area for various crops necessitates the use of instruments. Tools for the Hand These are hand-held instruments built of lightweight materials. The agricultural equipment industry produces massive amounts of this type of equipment. On farms and in agricultural holdings, this type of equipment is the most common. Tractors are commonly employed in agriculture. Caterpillar and wheeled machines of this type might be included in farm funding. Agricultural tools are instruments that are used in the fields to help with the agricultural process, making it more efficient and less time demanding.

Main Points of the Lesson

- Basic and simple agricultural tools are used to perform basic on-farm activities such as weeding, planting and harvesting.
- Some of these tools are used for crop production while others are used for the production of farm animals.

Cutlass

Spade

Axe

Hoe

Rake

Watering Can

Head Pan

Secateur

Shears

Hand Fork

Pick Axe

Hand Trowel

Fig. 6 - Simple Agricultural Tools

Progressive Assessment

Check the learners' prior knowledge by asking them about the use of basic and simple agricultural tools for basic on-farm activities.

Ask the learners to think-pair -share on the following:

- List two common agricultural tools each use for growing of crops and rearing of animals in your community.
- Name three basic agricultural tools and their uses.

Take feedback from all the groups.

Activity: Identifying the use of basic and simple agricultural tools for basic on-farm activities.
Refer to Page 200 of Learner's Book 8
The activities are designed to enable learners identify and discuss the use of basic and simple agricultural tools for basic on-farm activities.

- Guide learners to carry out Activity 1 in page 200 of the Learner's Book 8 to discuss the use of basic agricultural tools and creating and album of agricultural tools.
- Assemble different types of agricultural tools each use for growing crops and rearing of animals.
- Ask the learners to pick some tools from the collection of tools exhibited and mention their names and uses.

Home Work/Project
Task the learners to make a photo album of agricultural tools.

Think and Discuss
Learners in pairs should discuss the use of basic and simple agricultural tools for basic on-farm activities. Take feedback from the various groups. Ensure that the less able learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

ANSWERS TO EXERCISES

Objectives

1. B
2. D
3. C
4. D
5. C
6. B
7. B
8. D

Answers to Essay Type Questions

1. Refer to page 202 of Learners' Book.
2. i. Refer to page 202 of Learners' Book.
   ii. Refer to page 202 of Learners' Book.
   iii. Refer to page 202 of Learners' Book.
   iv. Refer to page 202 of Learners' Book.
   v. Refer to page 202 of Learners' Book.

3. Refer to page 201 of Learners' Book.

Answers to Test of Practical Questions

1. A - Shovel
   B - Garden Fork
   C - pickaxe
   D - Hoe
   E - Cutlass
   F - Rake

2. Refer to page 201 of Learners' Book 8nd also use the internet.

3. a. I - rake
      II - handle

   b. Rake
   c. Leveling soil, breaking large soil crumps, removing weeds.

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any means by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

CONTENT STANDARDS: B8.4.5.1 Demonstrate knowledge and skills in the use of basic and simple agricultural tools for basic on-farm activities.

Indicator: B8.4.5.1.2 Engage in the use of basic and simple agricultural tools for basic farm activities.

LESSON 2: DEMONSTRATING THE USE OF BASIC AND SIMPLE AGRICULTURAL TOOLS FOR BASIC FARM ACTIVITIES

Learner's Book 8: Pages 206-208

Learning Expectations:
At the end of the lesson, the learner will:

- explain how the different agricultural tools are used on a farm or school garden to perform specific agricultural activities.
- practice the use of different agricultural tools for specific activities on a farm or school garden.
- select appropriate tools for specific agriculture tasks.

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Resources
Knapsack sprayer, axe, cutlass, hand fork, hand trowel, hoe, secateurs, sickle, pair of shears, rake, mattock, watering can.

Keywords: basic agricultural tools

Prior Preparation:
Arrange for a visit to a nearby farm for demonstrations on use of tools

INTRODUCTION

One week, that is, four periods will be enough to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

Land preparation is one of the cultural practices involved in crop production. Using farm tools to prepare the area for various crops necessitates the use of farm tools. Tools for the Hand These are hand-held instruments built of lightweight materials. The agricultural equipment industry produces massive amounts of this type of equipment. On farms and in agricultural holdings, this type of equipment is the most common. Tractors are commonly employed in agriculture. Caterpillar and wheeled machines of this type might be included in farm funding. Agricultural tools are instruments that are used in the fields to help with the agricultural process, making it more efficient and less time demanding.

Main Points of the Lesson

Agricultural tools enable work to be done easier and faster on farmlands.

			
Knapsack Sprayer	Axe	Cutlass	Hand Fork
			
Hand Trowel	Hoe	Secateurs	Sickle
			
Pair of Shears	Rake	Mattock	Watering Can

Progressive Assessment

Check prior knowledge by asking the learners of the use of basic and simple agricultural tools for basic farm activities.

Ask the learners to think-pair -share on the following:

Name three basic agricultural tools and their uses.

Take feedback from around the room.

Activity:
Refer to Page 206 of learner's Books 8
The activities are designed to enable learners demonstrate the use of basic and simple agricultural tools for basic farm activities.

- Guide learners to carry out the activity 1 in pages 206 of the Learner's Book 8 to demonstrate the use of basic agricultural tools.
- Organise a visit for the learners to a nearby farm within the community.
- Engage the learners to observe and discuss the use of basic and simple agricultural tools on the farm visited.
- Engage the learners to assemble basic agricultural tools, identify and practice the use of all of them to perform basic farm activities on either the school farm or a farm close to the school.

Homework/Project
Let learners carry out a project as outlined in in pages 207 of the Learner's Book 8 to practice using some basic agricultural tools in your backyard garden.

Think and Discuss
Learners in pairs practice the use of basic and simple agricultural tools for basic farm activities. Take feedback from the various groups. Ensure that the less abled learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

Answers to Exercises

1. B
2. D
3. C
4. D
5. C.
6. C
7. B
8. D

Practical Questions

(1) i. A – Spade B – hand fork C – Pickaxe D – Hoe E – Cutlass F – Rake
ii. Spade: for piling soil Hand -fork – for stirring the soil
iii. Pick axe : for digging the ground
iv. Hoe : for weeding
v. Cutlass: for weeding
vi. Rake: for gathering weeds after weeding

(2) A sketch of each of the items stated is required with its function written underneath
(3) a. I – head II – handle
b. Rake
c. for gathering weeds after weeding

Reflection
At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.
Were they interesting and stimulating?
Were the majority of the class responding as you would expect them to?
Are there any reasons you could identify the cause of this response?
If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?To what extent did you cater for learners with disability and the below average learners?

STRAND 5

HUMANS AND THE ENVIRONMENET

Unit 1: Waste Management

CONTENT STANDARDS: B8.5.1.1 Demonstrate knowledge of waste management systems and apply it in an environment.

Indicators: B8.5.1.1.1 Explain sustainable waste management practices.

LESSON 1: SUSTAINABLE WASTE MANAGEMENT PRACTICES

Teaching and Learning resources:

- Chart and pictures of waste management methods, video clips on waste management
- Wheelbarrow, shovel, rake, gloves, and video clip on waste disposal

Learner's Book 8: Pages 209-216

Learning Expectations:

At the end of the lesson, the learner will:

- outline approaches to waste management in promoting sustainable management.
- conduct a survey in a community's waste management practices and present a report.

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: sustainable waste management, waste disposal toxic chemicals, action plan.

INTRODUCTION

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

Collecting, sorting, treating, recycling, and, when correctly enable, providing a source of energy and resources are all part of sustainable waste management. As a result, it creates jobs, improves waste management systems, and reduces the environmental impact of human activities,

consequently improving air and water quality. Sustainable management combines the principles of sustainability with the principles of management. The environment, current and future generations' needs, and the economy are the three pillars of sustainability. It develops the potential of a system to thrive by sustaining economic viability while also nourishing the needs of the present and future through these branches.

The processes and actions necessary to manage trash from its inception to its final disposal are referred to as waste management (or waste disposal). This comprises waste collection, transportation, treatment, disposal, as well as waste management process monitoring and control, waste-related laws, technologies, and economic systems. This has altered since the government partnered with private enterprises to provide garbage management services. Waste in cities is now usually disposed of in landfills. However, waste in villages and rural regions are still burned. For the time being, recycling and composting are part of the solution to Ghana's waste management concerns.

Main Points of the Lesson

Waste management is defined as the collection, transportation and disposal of garbage, sewage, and other waste products.

Some major groups of waste management methods include the following: source reduction, reuse, animal feeding, recycling, composting, landfills, incineration and land application.

In general, sustainable waste management practice should increase circulation of mass and energy in nature.

The most easier method of waste management is to reduce the creation of waste materials thereby reducing the amount of waste going to landfills. Communities and community organizations are in a perfect position to make a major impact on the amount of waste that is generated in their localities Education campaigns can inform the citizenry to change their values and lifestyles so that urban wastes can be reduced.

Fig. 1 - *Picture of landfill*

ICT: You may visit the following links for more information:

- https://www.hindawi.com/journals/jwm/2014/823752/
- https://blogs.worldbank.org/sustainablecities/here-s-what-everyone-should-know-about-waste

Progressive Assessment

Check prior knowledge by asking the learners to explain sustainable waste management practices. Ask the learners to think-pair -share on the following:

- What types of wastes are generated in their homes?
- How do you manage these wastes?
- How is solid waste disposed of in your community?

Take feedback from all the groups.

Activity: Investigating waste management in the community.

Refer to Pages 209, 210, 212 and 213 of Learner's Book 8

The activities are designed to enable learners explain sustainable waste management practices.

- Guide learners to carry out Activity 1 in pages 209 of the Learner's Book 8 to investigate waste management in the community.
- Engage the learners to take a nature walk to the school refuse dump and observe the waste products there.
- Guide the learners in a discussion on the types of wastes and how waste is generated in the community and how waste is managed in your community.
- Show the learners a video clip on sustainable waste management.
- Engage the learners to discuss how waste management is sustained in their community.
- Guide learners to carry out Activity 2 in pages 210 of the Learner's Book 8 to demonstrate waste management practices in the community.
- Ask the learners to watch videos on how waste is disposed.
- Use wheelbarrows and rakes to demonstrate how waste is disposed of or manage.
- Engage the learners to discuss methods of waste management for sustainable development.
- Engage the learners to discuss methods of waste management for sustainable development.
- Take the learners on a visit to a waste management company to observe how they manage waste in the community.
- Instruct the learners to go round the surrounding community where their school is situated, and guide them to find out the waste management practices carried out in the community they visited.
- Engage the learners to discuss the effect of the waste management practices on the cleanliness of the community.

- Ask the learners to suggest better ways of managing the wastes in the community.
- Assign the learners to carry out activities on the school compound to demonstrate waste management practices such as recovery, recycling, re-use, and reduction of wastes.
- Ask the learners to write a report on your evaluation of the waste management practices in the school and present it to the class for discussion.

Home Work/Project

Let learners:

- conduct a survey in their community's waste management practices and present a report.
- evaluate the waste management practices carried out in their community.
- organize education campaigns through media or posters or even going door-to-door to inform the citizenry to change its values and lifestyles so that urban wastes can be reduced.

Think and Discuss

Learners in pairs should discuss

- Sustainable waste management practices.
- waste management practices to manage wastes in a community.
- Take feedback from the various groups. Ensure that the less able learners participate in the discussion.

Diagnostic Assessment

Let learners provide answers to questions at the end of the lesson in their exercise books.

Answers to Exercises

1. Sustainable waste management relies on the waste management hierarchy, a system that focuses on avoidance, reduction, reuse, recycling, energy recovery, and finally, treatment or disposal.

2. It aims to prioritize actions for the most sufficient use of resources, placing renewable and less wasteful practices at the top of the pyramid.
   - reduced manpower requirements for waste handling and disposal
   - protection from insect and rodent infestations
   - reduction of fire hazards
   - improved community

3. ▪ Reduction of wastes
   - Recycling of wastes
   - Treatment of wastes
   - Disposal of wastes

4. ▪ Place dustbins at vantage positions.
   - Empty dustbins regularly at appropriate dumping sites to avoid spillovers and polluting the community again.
   - To appoint sanitary officers at various zones of the community and supervise them.

Answers to Test of Practicals A

1. Refer to page 210 of Learners' Book 8.
2. Answers will vary.
3. To be recycled.
4. Reduction of waste, composting, incineration. (Any 3)
5. Refer to page 213 of Learners' Book 8.
6. Pollution occurs, outbreak of disease, bad odour.

Answers to Test of Practicals B

1. Lack of sanitary supervision, improper refuse disposal, poor waste management.
2. a. Refer to page 210 of Learners' Book 8.
   b. Refer to page 210 of Learners' Book 8.
   c. Refer to page 210 of Learners' Book 8.
3. Answers will vary..

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Were the majority of the class responding as you would expect them to?
- Are there any reasons by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?

To what extent did you cater for learners with disability and the below average learners?

CONTENT STANDARDS: B8.5.1.1 Demonstrate knowledge of waste management systems and apply it in an environment

Indicator: B8.5.1.1.2 Apply Knowledge of waste management practices to manage waste in a community.

LESSON 2: APPLYING KNOWLEDGE OF WASTE MANAGEMENT PRACTICES TO MANAGE WASTE IN A COMMUNITY

Learner's Book 8: Pages 217-219

Learning Expectations:
At the end of the lesson, the learner will:

- carry out an activity to manage waste using knowledge acquired in indicator B8.5.1.1.1 in their communities.
- evaluate the waste management practices carried out in a community and present a report.

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Resources
Wheelbarrow, shovel, rake, gloves, and video clip on waste disposal

Keywords: waste, waste management, waste disposal toxic chemicals, action plan.

Prior Preparation:
Organise a talk by a resource person on waste management

INTRODUCTION
One week, that is, four periods will be enough to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

The processes and actions necessary to manage trash from its inception to its final disposal are referred to as waste management (or waste disposal). This comprises waste collection, transportation, treatment, and disposal, as well as waste management process monitoring and control, as well as waste-related laws, technologies, and economic systems. This has altered since the government partnered with private enterprises to provide garbage management services. Waste in cities is now usually disposed off in landfills. However, waste in villages and rural regions are still burned. For the time being, recycling and composting are part of the solution to Ghana's waste management concerns.

Main Points of the Lesson

Communities and community organizations are in a perfect position to make a major impact on the amount of waste that is generated in their societies.

Education campaigns can inform the citizenry to change its values and lifestyles so that urban wastes can be reduced.

ICT

You may visit the following links for more information:

- https://blogs.worldbank.org/sustainablecities/here-s-what-everyone-should-know-about-waste

Progressive Assessment

Check prior knowledge by asking the learners of waste management practices to manage waste in a community.

Ask the learners to think-pair -share on the following:

How is solid waste disposed of in your community?

Take feedback from around the room.

Activity

Refer to Page 218 of learner's Books 8

The activities are designed to enable learners apply knowledge of waste management practices to manage waste in a community.

- Guide learners to carry out the activity 1 in pages 218 of the Learner's Book 8 to demonstrate waste management practices in the community.
- Ask the learners to watch videos on how waste is disposed.
- Use wheelbarrow and rake to demonstrate how waste is disposed or manage.
- Engage the learners to discuss methods of waste management for sustainable development.
- Take the learners for a visit to waste management company to observe how they manage waste in the community.

- Engage the learners to go round the surrounding community where their school is situated, and guide them to find out the waste management practices carried out in the community they visited.
- Engage the learners to discuss the effect of the waste management practices on the cleanliness of the community.
- Ask the learners to suggest better ways of managing the waste in the community.
- Task the learners to carry out activities on the school compound to demonstrate waste management practices such as recovery, recycling, re-use, and reduction of waste.
- Ask the learners to write a report on your evaluation of the waste management practices in the school and present it to the class for discussion.

Homework/Project

Let learners carry out a project as outlined in pages 218 of the Learner's Book 8 to

1. Evaluate the waste management practices carried out in their community.
2. Organize education campaigns through media or posters or even going door-to-door to inform the citizenry to change its values and lifestyles so that urban wastes can be reduced.

Think and Discuss

Learners in pairs should discuss waste management practices to manage waste in a community. Take feedback from the various groups. Ensure that the less abled learners participate in the discussion.

Diagnostic Assessment

Let learners provide answers to questions at the end of the lesson in their exercise books.

Answers to Exercises

1. C
2. D
3. C
4. A

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Were they interesting and stimulating?
- Were the majority of the class responding as you would expect them to?
- Are there any reasons you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

5 Sub-Strand 2: Human Health

CONTENT STANDARDS: B8.5.2.1 Demonstrate knowledge of common communicable diseases, such as Hepatitis, of humans, causes, symptoms, effects and their prevention.

Indicator:

- B8. 5.2.1.1 Explain the symptoms, effects and prevention of common communicable diseases.
- B8. 5.2.1.2 Analyse the risk factors of communicable diseases.

LESSON 1: COMMON COMMUNICABLE DISEASES

Teaching and Learning Resources:

- A video clip on some communicable diseases, charts and pictures on some common communicable diseases, Health resource personnel or an excursion to a medical centre
- Video clips on risk factors associated with communicable diseases, pictures or charts showing risk factors

Learner's Book 8: Pages 220-224, 225-228

Learning Expectations:

At the end of the lesson, the learner will:

- compile data on the number of males and females who suffer from common communicable diseases such as hepatitis, from a medical centre and determine the possible causes of these diseases
- identify causes, symptoms, effects and prevention of hepatitis, hiv, measles and others and make a presentation.
- search for the causes, symptoms and prevention of hepatitis and develop a plan to minimize the disease.
- search for information that is associated with communicable diseases.
- create awareness about risk factors of communicable diseases such as hepatitis, hiv, measles and others in order to prevent the diseases in their schools and communities.
- compile data on the number of males and females who suffer from common communicable diseases such as hepatitis, from a medical centre and determine the possible causes of these diseases.
- identify causes, symptoms, effects and prevention of hepatitis, hiv, measles and others and make a presentation.
- search for the causes, symptoms and prevention of Hepatitis and develop a plan to minimize the disease.

- search for information that is associated with communicable diseases.
- create awareness about risk factors of communicable diseases such as Hepatitis, HIV, measles and others in order to prevent the diseases in their schools and communities.

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: communicable, diseases, pathogens, virus, bacteria,

INTRODUCTION

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

In emergency situations, the factors that influence exposure to communicable diseases and facilitate transmission are well-documented. The amount and availability of safe water and functioning latrines, the nutritional status of the displaced population, the level of immunity to vaccine-preventable diseases like measles, and the level of access to health care services are all factors that influence the risk of communicable diseases. Risk factors are divided into categories in general: Psychological, Physiological, Demographic, Environmental, Genetic and Behavioural.

NB: Bites wound exposed to dust or rusted item should be replaced with mosquito bite

Main Points of the Lesson

Communicable diseases are diseases that are spread from person to person.
Communicable diseases are illnesses that result from the infection, presence and growth of pathogenic (capable of causing disease), biologic agents in an individual human or other animal host.

Four main types of pathogens that because infection are viruses, bacteria, fungi, and protists.
A risk factor is anything that increases people's chances of developing or contracting diseases.
There are several risk factors that are associated to communicable diseases, which include factors related to:

- sanitation
- access to clean and treated water,
- access to health care
- vaccination,
- Political will
- nutrition,

Some risk factors associated with some communicable diseases are as follows:

- For corona virus (COVID-19), the risk factors are
- Overcrowding,
- Not practicing social distancing
- Not washing hands
- Hand-shaking people
- Not wearing nose mask
- Avoiding the use of hand sanitizer
- Not vaccinating against COVID-19

For HIV, the risk factors are:

- Having unprotected sex
- Having sexually transmitted infections that produce open sores on the genitals.
- Having multiple sexual partners
- Sharing of injections or vaccination needles

For Hepatitis, some risk factors are as follows:

- Traveling to places where hepatitis is prevalent or common
- Use of illegal intravenous drugs
- Handling pets that may be carrying the hepatitis virus
- Engaging in high-risk sexual activity
- Receiving treatment from untreated blood products.

ICT: You may visit the following links for more information:

- https://protect.iu.edu/environmental-health/public-health/communicable-diseases/index.html
- https://gh.bmj.com/content/3/4/e000647

Progressive Assessment

Check the learner's prior knowledge by asking them about the symptoms, effects and prevention of common communicable diseases.

Ask the learners to think-pair -share on the following:

- List four communicable diseases prevalent in their community.

Take feedback from all the groups.

ICT: You may visit the following links for more information:

- https://protect.iu.edu/environmental-health/public-health/communicable-diseases/index.html

Progressive Assessment

Check the learner's prior knowledge by asking them about the symptoms, effects and prevention of common communicable diseases.

Ask the learners to think-pair -share on the following:

- List four communicable diseases prevalent in their community.
- What is meant by risk factors?
- Name a risk factor associated with HIV and COVID-19

Take feedback from all the groups.

Activities: Investigating risk factors associated with common communicable disease in the community.

- Guide learners to carry out Activities in pages 220, 221, 222 and 223 of the Learner's Book 8 to investigate risk factors associated with common communicable diseases in my community.
- Engage the learners to find out what is meant by risk factors.
- Ask the learners to watch a video clip on the risk factors associated with communicable diseases.
- Give the learners a talk about the risk factors of communicable diseases such as tuberculosis, malaria, HIV, Hepatitis, measles, COVID-19, and Typhoid fever.

Think and Discuss

Learners in pairs should discuss the symptoms, effects and prevention of common communicable diseases. Learners in pairs should discuss the risk factors of communicable diseases. Take feedback from the various groups. Ensure that the less able learners participate in the discussion Take feedback from the various groups.

Home Work

Let learners carry out a task as outlined in the Learner's Book 8 to consult their parents and identify the risk factors for the following diseases:

- Cholera
- Typhoid fever
- Tuberculosis
- Measles

Ask them to present their reports to the class.

Project
Let learners carry out a project to make a poster on risk factors associated with communicable diseases and use it to create awareness in the school and community and to prevent the spread of diseases.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

ANSWERS TO QUESTIONS

Objective

1. D
2. C
3. B
4. A
5. A

Answers to Essay Type Questions

1. • **Lymph glands** - you may have a swollen gland or glands anywhere in the body. If the swollen glands are in the neck, armpit or groin then you may see or feel them.
   - **Gut and tummy (abdomen)** - the TB may cause tummy pain or swelling, or poor digestion of food with diarrhoea and weight loss.
   - Causing bone pain (for example, in the spine) or pain and swelling in the joints
   - TB sometimes causes inflammation around the heart, with chest pain or shortness of breath.
   - **Kidneys and bladder** - if these are infected, you may have pain in the side (loin), or pain when passing urine.
   - **TB** can cause certain rashes, including erythema nodosum - a red, lumpy rash on the legs - or lupus vulgaris which gives lumps or ulcers.
   - Shortness of breath or difficulty in breathing, sore throat, chills, muscle, aches, running nose, chest, pain, headache, nausea, vomiting, diarrhoea, rash.

2. • Practice social distancing • Wear a nose mask • Do not touch your eyes, nose, or mouth
   - Stay at home if you are sick • Cover your nose and mouth while sneezing or cough into a tissue • Go to the hospital if you have a fever, cough, or difficulty breathing
   - Using blood products (unclean needles or unscreened bloods), by means of animal or insect bites, by contaminated surfaces such as doorknobs and Through saliva via kissing or shaking hands
   - Avoid contact with blood and body fluids (such as urine, faeces, saliva, sweat, vomit, breast milk, amniotic fluid, semen, and vaginal fluids) of people who are sick. Avoid

contact with items that may have come in contact with an infected person's blood or body fluids (such as clothes, bedding, needles, and medical equipment)
- Wash hands frequently or use an alcohol-based hand sanitizer.
- Avoid contact with blood and body fluids of any person, particularly someone who is sick.
  Do not handle items that may have come in contact with an infected person's blood or body fluids.
  Do not touch the body of someone who has died from Ebola.
  Do not touch bats and nonhuman primates or their blood and fluids and do not touch or eat raw meat prepared from these animals.
- Seek medical care immediately if you develop fever headache, muscle pain, diarrhoea, vomiting, stomach pain, or unexplained bruising or bleeding.

3. **Hepatitis A** form eating or drinking something that has been contaminated with a small amount of the virus, sometimes contained in faecal matter. Hepatitis B; infection through sexual transmission or intravenous drug use. Hepatitis C; can be contracted only through direct blood contact.

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any reasons by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?

To what extent did you cater for learners with disability and the below average learners?

CONTENT STANDARDS: B8.5.2.2 Demonstrate knowledge of the nature of selected bacterial diseases of humans, their causes, symptoms, effects and prevention.

Indicator: B8.5.2.2.1 Explain the nature of bacterial diseases with special emphasis on food poisoning/gonorrhoea/meningitis their causes, symptoms, effects on humans and prevention.

LESSON 2: NATURE OF BACTERIA DISEASES

Teaching and Learning Resources:

- Pictures/charts of bacterial diseases, video clips on bacterial diseases.

Learner's Book 8: pages 229-234

Learning Expectations:

At the end of the lesson, the learner will:

- discuss the nature of bacterial diseases
- search for information and make presentations on food poisoning, gonorrhoea, and meningitis diseases their mode of transmission from person to person, community to community and from country to country.
- describe the symptoms, effects and prevention of food poisoning, gonorrhoea, and meningitis diseases
- describe the role of individuals, community members and government in managing food poisoning, gonorrhoea, and meningitis diseases
- design and produce a poster to educate their community members on the incidence and control of named bacterial diseases: food poisoning, gonorrhoea, and meningitis

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: bacteria, food poisoning, meningitis

INTRODUCTION

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

Bacteria are common, largely free-living organisms that are often made up of only one biological cell. They make up a broad group of prokaryotic organisms. Bacteria, which are typically a few micrometres in length, were among the first life forms to appear on Earth and can be found in nearly all of its environments. Bacteria can be found in soil, water, acidic hot springs, radioactive waste, and the Earth's crust's deep biosphere. Bacteria play important roles in making stages of the nutrient cycle, such as the fixation of nitrogen from the atmosphere. The decomposition of dead bodies is part of the nutrition cycle, and microorganisms are responsible for the putrefaction stage. Extremophile bacteria offer the nutrients needed to support life in the biological communities surrounding hydrothermal vents and cold seeps by converting dissolved chemicals like hydrogen sulphide and methane unto energy.

Bacteria also coexist with plants and animals in symbiotic and parasitic interactions. The majority of bacteria have not been identified, and many species cannot be cultured in the laboratory. Bacteriology is a field of microbiology that studies bacteria. Some of these are characterized as "healthy bacteria" since they do not cause infections. "Harmful bacteria" are bacteria that cause diseases in humans. Continue reading to learn about the bacterial diseases that are caused by harmful bacteria in humans, as well as the causes and symptoms. Severe headache is one of the most prevalent symptoms of this bacterial disease in humans, and additional symptoms include high temperature and neck stiffness. Antibiotics are commonly used to treat this disease, but it is critical to begin treatment as soon as possible to avoid mortality.

Main Points of the Lesson

Bacteria are a type of microorganism, which are tiny forms of life that can only be seen with a microscope. Bacteria play important roles in the global ecosystem. Bacterial diseases include any type of illness caused by bacteria. Bacteria cause many common infections such as pneumonia, wound infections, bloodstream infections (sepsis) and sexually transmitted diseases like gonorrhoea, and have also been responsible for several major disease epidemics.

- Food poisoning, also called food-borne illness, is illness caused by eating contaminated food or drinking contaminated drinks. Infectious organisms including bacteria, viruses and parasites or their toxins are the most common causes of food poisoning.

- Gonorrhoea is a sexually transmitted disease (STD). It is caused by infections with the bacterium Neisseria gonorrhoea.
  Gonorrhoea passes from person to person through unprotected oral, anal, or vaginal sex.

- Meningitis is an inflammation (swelling) of the protective membrane of the brain and spinal cord. It is caused by bacteria or virus.
  The most effective way to prevent meningitis is to get vaccinated against the disease.

ICT: You may visit the following links for more information:

- https://www.youtube.com/watch?v=Z5c8lVXDiqc

Progressive Assessment

Check the learner's prior knowledge by asking the them to explain the nature of bacterial diseases with special emphasis on food poisoning/gonorrhoea/meningitis their causes, symptoms, prevention and effects on humans.

Ask the learners to think-pair -share on the following:

- What is bacteria?
- Name two diseases caused by bacteria.

Take feedback from all the groups.

Activity: Finding out more about bacterial diseases.

Refer to Pages 229, 230 and 231 of the learner's Books 8

The activities are designed to enable learners explain the nature of bacterial diseases with special emphasis on food poisoning/gonorrhoea/meningitis their causes, symptoms, effects on humans and prevention

- Guide learners to carry out Activities in pages 229, 230 and 231 of the Learner's Book 8 to find out more about bacterial diseases.
- Engage the learners to discuss the effect of bacteria in the environment.
- Ask the learners to find out some bacterial diseases.
- Engage the learners to discuss the nature of some bacterial diseases.
- Ask the learners to watch a video clip on bacterial diseases.
- Engage the learners to discuss some bacterial diseases, their causes, symptoms, prevention and effects on humans.
- Engage the learners to listen to a talk on some bacterial diseases, their causes, symptoms, effects on humans and prevention by some health personnel.
- Ask the learners to discuss the roles of individuals, community members and government in managing food poisoning, gonorrhoea, and meningitis.

Home Work/Project

Let learners carry out a project to design and produce a poster to educate their community members on the incidence and control of named bacterial diseases: food poisoning, gonorrhoea, and meningitis.

Think and Discuss

Learners in pairs should discuss the nature of bacterial diseases with special emphasis on food poisoning/gonorrhoea/meningitis their causes, symptoms, effects on humans and prevention. Take feedback from the various groups. Ensure that the less able learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

Answers to Objective questions

1. B
2. B
3. B
4. B
5. C
6. D
7. A

Answers to Essay Type Questions
They offer benefits such as assisting in:

1. ▪ Digestion and consumption of food
   - Absorption of nutrients
   - Immunity development
   - Prevention of allergies
   - Production of vitamin K and other vital vitamins
   - Blocking pathogenic bacteria from inhibiting the body

2. a. Food poisoning, is illness caused by eating contaminated food.
   b. It is caused by the bacterium Neisseria gonorrhoea.
   c. It spreads through unprotected sex.

3. i. Refer to page 230 of Learners' Book 8.
   ii. Refer to page 232 of Learners' Book 8.

4. Refer to page 229 of Learners' Book 8.

Answers to Test of Practical Questions

1. Create posters about bacterial diseases and post them at vantage points in the community.
2. Air-borne bacteria ⟶ How it is spread ⟶ How to avoid it ⟶ How to cure it.
   Food/water borne bacteria ⟶ How it is spread ⟶ How to avoid it ⟶ How to cure it.
3. Answer will depend on the learners community.

Reflection
At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any reasons by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?

To what extent did you cater for learners with disability and the below average learners?

5 Sub-Strand 3: Science and Industry

CONTENT STANDARDS: B8.5.3. 1 Demonstrate an understanding of connections among science, technology, innovation, society and the environment.

Indicator: B8.5.3.1.1 Examine the relationship among science, technology, innovation and society.

LESSON 1: SCIENCE, TECHNOLOGY AND INNOVATION

Teaching and Learning Resources:

- Products of science and technology (example, mobile phone, computer, television), video clip on science and technology and innovation.

Learner's Book 8: pages 235-239

Learning Expectations:
At the end of the lesson, the learner will:

- explain the interrelationship of science and technology and innovation.
- discuss technological advancements in the world and its impact on the Ghanaian environment.

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: technology, innovation

INTRODUCTION
One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information
The key reason for any country's progress, which contributes to global development, is a healthy link between science, technology, and society. Technology is now present in all aspects of society. The need for technical advancement is also a driving force in society. Frequently, a technology originates as a result of someone seeing a need for it. Science aids in the resolution of societal problems, much as technology often arises in response to a need.

Main Points of the Lesson

- Science and technology and innovation have helped in the transformation of the economy and the evolution of the new social classes.
- Science and technology and innovation have helped in the advancement in Medicine and Health.
- Science and technology and innovation have helped in the development of the means of transport and communication.
- Science and technology and innovation have helped in the technological advancements in Agriculture: Agricultural technological advancement has played a big role in changing the face of agriculture.

ICT: You may visit the following links for more information:

- https://www.nap.edu/read/9481/chapter/3#12

Progressive Assessment

Check prior knowledge by asking the learners of the relationship among science, technology, innovation and society.

Ask the learners to think-pair -share on the following:

- What is science?
- What is technology?
- What is the difference between science and technology?

Take feedback from all the groups.

Activity: Investigating the relationship among science, technology, innovation and society.

Reefer to Page 236 of Learner's Book 8

The activities are designed to enable learners examine the relationship among science, technology, innovation and society.

- Guide learners to carry out Activity 1 in page 204 of the Learner's Book 8 to investigate the relationship among science, technology, innovation and society.
- Show the learners a video clip on science and technology and innovations.
- Engage the learners to discuss in their groups what is meant by science, technology and innovation.
- Engage learners to discuss the science and technological advancements in the world.
- Guide the learners to discuss the impact of science and technology and innovation on the people of Ghana or the Ghanaian environment.

Think and Discuss

Learners in pairs should discuss the relationship among science, technology, innovation and society.

Take feedback from the various groups. Ensure that the less able learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

Answers to Essay Type Questions

1. Refer to page 235 of Learners' Book 8.
2. Refer to pages 236-237 of Learners' Book 8.
3. Refer to page 238 of Learners' Book 8.

Answers to Test of Practical Questions

1. Answers will vary.
2. Refer to page 235 of Learners' Book 8.
3. Answers will vary.

Reflection
At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any reasons by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?

To what extent did you cater for learners with disability and the below average learners?

5 Sub-Strand 4: Climate Change and Green Economy

CONTENT STANDARDS: B8.5.4.1 Demonstrate an understanding of the effects of climate change in the world and greening of other tropical countries including Ghana.

Indicator:
B8.5.4.1.1 Explain the concept of climate change and its effect on the environment.
B8.5.4.1.2 Describe climate change and green economy actions.

LESSON 1: CLIMATE CHANGE AND ITS IMPACT ON THE ENVIRONMENT

Teaching and Learning Resources

- Pictures and charts of climate change, video clip on climate change and a resource person on climate change.

Learner's Book 8: pages 240-243

Learning Expectations:
At the end of the lesson, the learner will:

- describe the signs of climate change.
- search for causes and effects of climate change and present a report.
- explain how countries in the continents are adapting to climate change for example tree planting and legislation on bush burning.

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: climate change, global warming

INTRODUCTION
One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

The variations we see and feel outside from day to day are referred to as weather. One day it may rain, and the next it may be bright. It becomes frigid at times. It can get quite heated at times. The weather varies from location to area as well. In one location, people may be wearing shorts and playing outside. People far away may be shoveling snow at the same moment.

Climate refers to a location's typical weather. Seasonal climates can be rather different. In the summer, a location may be primarily warm and dry. In the winter, the same location may be cold and rainy. Climates differ depending on where you are. It's possible that you live somewhere where it snows all the time. And some people live in climates where swimming is constantly possible outside.

There's also the Earth's climate to consider. The climate of the Earth is the result of combination all of the world's climates. The climate of the Earth is always changing. The Earth's climate had been warmer in the past than it is currently. There have been cooler days in the past. Thousands or millions of years can pass during these periods. Scientists see that the planet's climate is warming up in the previous 100 years, the Earth's temperature had risen by around one degree Fahrenheit. This may not appear to be significant amount of money. Small variations in the Earth's temperature, on the other hand, can have significant consequences. Some impacts have already begun to manifest. Some snow and ice have melted as the Earth's climate has warmed. Oceans have also risen as a result of global warming. It has also shifted the time of certain plants' growth.

The way our economic systems function and are structured is largely responsible for climate change and many other environmental and social consequences of unsustainable development. In order to achieve sustainable growth and effectively combat and adapt to climate change and other consequences, our economic systems must be "greened." This would imply a transition to a green economy from the current unsustainable economic systems.

A Green economy is to give out as few greenhouse gases as feasible while maximizing resource efficiency and minimizing or even eliminating waste.

It is a socially inclusive product.

Fights against future climate change while adjusting to current and/or impending climate change effects based on sustainable economic activity for long-term development.

The green economy is critical for mainstreaming sustainable development and climate change resilience into our global and local economic systems, and assuring a bright future for people and the planet as a result.

Main Points of the Lesson

- Change of climate that is attributed directly or indirectly to human activity, altering the composition of the global atmosphere.
- Climate change is one of the biggest crises facing humanity.
- Climate change means the change in the climatic activities and in atmospheric levels.
- Increase in temperature due to global warming is not only about heat increases that can

be felt by humans or glacial ice melting and mud cracks – it has the potential to affect the planet's entire ecosystem.

- At the same time, the regulating capacity of oceans is also being affected by an increase in temperatures. If global temperatures increase dramatically, ocean levels will not only increase but there will also be some ecological challenges. These include acidification of the oceans as well the deoxygenation of sea water.

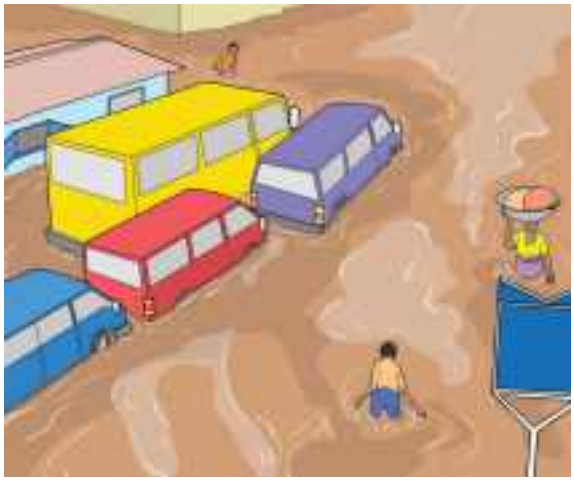


Fig. 2 - *Picture of flood*

ICT: You may visit the following links for more information:

- https://climatekids.nasa.gov/climate-change-meaning/
- https://royalsociety.org/topics-policy/projects/climate-change-evidence-causes/basics-of-climate-change/

Progressive Assessment

Check the learner's prior knowledge by asking them about the concept of climate change and its effect on the environment.

Ask the learners to think-pair -share on the following:

- The meaning of the term "climate and weather"

Take feedback from all the groups.

Activity 1: Investigating climate changes, its cause and effects
Refer to Page 246 of Learner's Book 8
The activities are designed to enable learners explain the concept of climate change and its effect on the environment

- Guide learners to carry out Activity 1 on page 246 of the Learner's Book 8 to investigate climate change, its causes and effects.
- Engage the learners to watch a video clip on climate change and its effects.
- Invite a person from the local meteorological station to talk to the learners about climate change.
- Guide the learners to discuss the causes and effects of climate change.
- Engage the learners to discuss how different countries are adapting to climate changes. The focus could be on tree planting and legislation on bush burning.
- Engage the learners in groups to find out some of the ways Ghana can adapt and help reduce the effects of climate change and present a report on it.
- Guide learners to carry out investigations on climate change and green economy actions.
- Engage the learners to watch videos green economy.
- Ask the learners to discuss what green economy is in relation to climate change.
- Show the learners a video clip on green economy and climate change adaptations measures.
- Engage the learners to discuss climate change adaptation measures in your group and present a report to the class.
- Ask the learners to discuss mitigation strategies that their community can adapt to reduce the effects of climate change and present a report to class.

Home Work/Project
Let learners carry out a project to describe climate change adaptation measures that can be applied in the community.

Think and Discuss
Learners in pairs should discuss the concept of climate change and its effect on the environment Take feedback from the various groups. Ensure that the less able learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

ANSWERS TO EXERCISES

Objectives

1. b
2. b
3. a
4. a
5. d
6. d

Answers to Essay Type Questions

1. Climate change is a term that refers to major changes in temperature, rainfall, snow, or wind patterns lasting for decades or longer

2. Refer to page 244 of Learners' Book 8.

3. Refer to pages 246 and 247 of Learners' Book 8.

4. Human causes include burning fossil fuels, cutting down forests, and developing land for farms, cities, and roads. These activities release greenhouse gases into the atmosphere. Natural causes include changes in the Earth's orbit, the sun's intensity, the circulation of the ocean and the atmosphere, and volcanic activity
   Climate change adaptation is the process of adjusting to current or expected climate change and its effects.

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any reasons by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

5 Sub-Strand 5: Understanding the Environment

CONTENT STANDARDS: B8.5.5.1 Demonstrate understanding of the differences among soils, plant roots, stems, leaves, flowers, and fruits of plants in the different environments.

Indicators:

- B8.5.5.1 Demonstrate understanding of the differences among soils, plant roots, stems, leaves, flowers, and fruits of plants in the different environments.
- B8.5.5.1.2 Analyse the physical properties of soils and soil water content and demonstrate their importance in crop production

LESSON 1: PHYSICAL PROPERTIES OF SOILS

Teaching and Learning Resources:

- Different samples of soils (sandy soil, loamy soil, clayey soil) from the school garden and the community, and video on some properties of the different types of soil, pictures or charts of soil types.
- 3 funnels, 3 measuring cylinders, cotton wool, water, dry sand, dry clay, dry loam with high percentage of organic matter, stopwatch.
- Sandy soil, clayey soil, loamy soil, microscope
- Different type of crops grown in the locality, clayey soil, sandy soil, clayey soil in separate containers

Learner's Book 8: Pages 249-253

Learning Expectations:

At the end of the lesson, the learner will:

- collect and describe different samples of soils (sandy soil, loamy soil, clay soil, etc.) from the school garden and the community.
- discuss how each soil type retains water and supports the root system of plants.
- conduct an experiment to demonstrate how different soil types retain water to support the root system of crops.
- examine and discuss the different physical properties of each soil type and how these properties help supports crop production.
- observe and describe the growth of different plants on different soil types.
- demonstrate how plants absorb water and nutrients from the soil (Osmosis).

Learning Skills

- Making observations
- Communicating information

- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: sandy soil, loamy soil, clay soil, pore spaces, porosity texture, plough, humus, slippery

INTRODUCTION

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

Sand, silt, and clay are the three types of soil particles that are classified by size. The largest particles are sand, while the tiniest are clay particles. The majority of soils are a mix of the three. The proportions of sand, silt, and clay in soil determine its texture. For example, a clay loam texture soil contains about equal amounts of sand, silt, and clay. The weathering process causes these textural separations.

The organization of soil particles into small clumps, known as peds or aggregates, is known as soil structure. Sand, silt, clay, and organic materials in the soil come together to create peds. The peds have a specific shape depending on its content and the conditions under which it originated (becoming wet and drying out, or freezing and thawing, foot traffic, farming, etc.)

Granular (like gardening soil), blocky, columnar, platy, huge (like modelling clay), or single-grained are all possibilities (like beach sand). The pore space in the soil promotes root growth as well as air and water circulation, therefore structure is related to it.

Soil colour is mostly controlled by soil mineralogy, which tells us what is in a particular soil. Iron-rich soils are deep orange-brown to yellowish-brown in colour. Organic matter-rich soils are dark brown or black in colour. A brilliantly coloured soil that drains well will have a mottled pattern of grays, reds, and yellows, but a soil that is frequently damp and soggy will have a mottled pattern of grays, reds, and yellows. Rhizic water is another name for soil water. Gravitational water, capillary water, and hygroscopic water are the three primary forms of soil water, and these names are defined based on the function of the water in the soil. Gravitational water is free water that moves through the soil due to gravity. Capillary water is the main source of water for plants since it is trapped in the soil solution directly adjacent to the plant's roots. Water that is hygroscopic. Hygroscopic water forms a very thin coating around soil particles and is not readily available to plants. The following words are crucial to understand how much water is stored in soil: field capacity—the amount of water kept in the soil when it has been completely saturated and free drainage has ceased. Water sprayed above this level will saturate the soil, but it will soon drain. Permanent wilting point—the

soil moisture condition at which the plant could not obtain water and has wilted and died. The crop cannot be revived by an irrigation or rainfall event.
Plant available water capacity (PAWC) is the quantity of water available to a plant between field capacity and permanent wilting point. This necessitates meticulous management and is dependent on the soil texture, structure, and organic matter content

Main Points of the Lesson

- There are three main types of soils. These are sandy soil, loamy soil and clayey soil.
- A soil with a high proportion of coarse particles is known as known as a sandy soil.
- A soil containing a mixture of particles of different sizes is generally known as loamy soil.
- A soil with a high proportion of fine particles is clayey soil.
- Clayey soils retain more water than sand and loam soils.
- Sandy soils allow more water to pass through it than loamy and clayey soils.
- The root system of plants growing in loamy soils can absorb adequate amount of water and nutrients from to soil to support plant life.
- Soil is formed from mixtures of minerals and decaying organic matter which covers the surface the Earth in a thin layer. It consists of different soil particles that give rise to different types of soils, namely sand, clay and loamy soil.
- A soil with a high proportion of coarse particles is known as known as a sandy soil.
- A soil containing a mixture of particles of different sizes is generally known as loamy soil.
- A soil with a high proportion of fine particles is clayey soil.
- Each of these soils has their own physical properties such as porosity, water retention and organic matter content.

Sandy Soil

Loamy Soil

Clay Soil

Fig. 3 - Types of Soil

Progressive Assessment

Check the learner's prior knowledge by asking them about the differences among soils, plant roots, stems, leaves, flowers, and fruits of plants in the different environments.
Ask the learners to think-pair -share on the following:

- Name the three main types of soils.

Take feedback from all the groups
Check the learner's prior knowledge by asking them about the physical properties of soils and soil water content and demonstrate their importance in crop production.

Ask the learners to think-pair -share on the following:

- List the physical properties of sandy soil.

Take feedback from all the groups

Activity: To demonstrate differences among soils, plant roots, stems, leaves, flowers and friuts of plants

Refer to Page 250 of Learner's Book 8

The activities are designed to enable learners demonstrate understanding of the differences among soils, plant roots, stems, leaves, flowers, and fruits of plants in the different environments.

- Guide learners to carry out Activity 1 on page 250 of the Learner's Book 8 to observe physical properties of different types of soils.
- Guide learners to carry out activity to compare the porosity and water-holding-capacity of three soil types.
- Engage the learners to discuss how each soil type retains water and supports the root system of plants.
- Guide learners to carry out to examine the physical properties of types of soils.
- Guide learners to carry out Activity to observe the growth of different crops on different soil types.
- Engage the learners to demonstrate how plants absorb water and nutrients from the soil and explain the concept of osmosis.
- Assign the learners to watch a video clip demonstrating how plants absorb water and nutrients from the soil through osmosis.
- Let learners do group presentations on the activities.

Think and Discuss

- Learners in pairs should discuss the differences among soils, plant roots, stems, leaves, flowers, and fruits of plants in the different environments. Take feedback from the various groups. Ensure that the less able learners participate in the discussion.
- Learners in pairs should discuss the physical properties of soils and soil water content and demonstrate their importance in crop production.
- Take feedback from the various groups. Ensure that the less able learners participate in the discussion.

Diagnostic Assessment

Let learners provide answers to study questions at the end of the lesson in their exercise books.

ANSWERS TO EXERCISES

Objective

1. a
2. d
3. a
4. c
5. a

Answers to Test of Practicals

1. A. Sandy soil
   B. Loamy soil
   C. Clay soil

2. Loamy soil
3. Loamy
4. Loamy soil

5. Characteristics of sandy soil:
   Sandy soils are often dry, nutrient deficient and fast-draining. They have little (or no) ability to transport water from deeper layers

   Characteristics of loamy soil:
   Retains more water, supports plant growth, rich in plant nutrients

Answers to Essay Type Questions

1. a. Loamy soil: Refer to pages 250-251 of Learner's Book.
   b. Clayed soil: Refer to page 251 of Learner's Book.
   c. Sandy soil: Refer to pages 249-250 of Learner's Book.

2. Refer to page 249 and 251 of Learner's Book.

3. Refer to page 250 and 251 of Learner's Book.

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any reasons by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

CONTENT STANDARD: B8.5.5.1 Recognise the different types of rocks as origin of different types of soils.

Indicator: B8.5.5.1.1 Observe and describe different types of rocks as origins of soils.

LESSON 2: TYPES OF ROCKS

Teaching and Learning Resources:

- Different samples of rocks (igneous, metamorphic and sedimentary) from the school garden and the community, chisel, and hammer.
- Video on some properties of the different types of rocks, pictures or chats of rock types.

Learner's Book 8: pages 259-265

Learning Expectations:

At the end of the lesson, the learner will:

- identify different labelled samples of rocks presented in the classroom/laboratory.
- describe the visible characteristics of each rock.
- collect samples of rocks from around the community and label them rock identification guide and compare them with the labelled laboratory samples in.
- research and report the stages of weathering of rocks to form soil.

Learning Skills

- Making observations
- Communicating information
- Grouping objects
- Carrying out investigations
- Making comparisons
- Making and using simple models

Keywords: geologist, mineral, weathering, igneous, sedimentary, metamorphic

INTRODUCTION

One week, that is, four periods will be sufficient to teach this lesson. Ensure that all the materials for the practical activities are available.

Additional Information

Rocks change as a result of natural processes that occur on a continuous basis. The majority of changes occur slowly, and many take place beneath the Earth's surface, so we may not see them. The physical and chemical features of rocks are constantly changing in a natural, never-ending cycle known as the rock cycle, even if we don't see it.

The rock cycle was initially proposed by James Hutton, a scientist known as the "Father of Geology" in the seventeenth century. "There is no [evidence] of a beginning, and no sight of an end," Hutton said of geologic processes. The processes that make up the rock cycle can take millions of years to complete. On the scale of a human lifetime, rocks appear to be "rock solid" and unchanging, although change is always occurring in the long run. Weathering wears rocks down to smaller fragments near the Earth's surface. Sediments are minute particles of rock. Erosion transports these materials from one location to another thanks to running water, ice, and gravity. Sedimentation is the process of laying down or depositing sediments. The accumulating sediment must be crushed and bonded together in order to produce sedimentary rocks.

Main Points of the Lesson

- There are mainly three types of rocks. These are. Igneous rocks, Sedimentary rocks and Metamorphic rocks.
- Weathering of rocks is the gradual process whereby rocks breakdown, disintegrate, decompose or crumble into smaller rock particles (units) by agents such as water, changes in temperature, pressure, atmospheric oxygen, wind and roots of plants.
- Weathering of rocks results in the formation of soils.
- Weathering types include physical, chemical and biological

Igneous rocks

Sedimentary rocks

Metamophic rocks

Fig. 4 - Types of rocks

ICT: You may visit the following links for more information:

- https://www.amnh.org/explore/ology/earth/if-rocks-could-talk2/three-types-of-rock
- https://www.youtube.com/watch?v=CeuYx-AbZdo

Progressive Assessment

Check the learner's prior knowledge by asking them to describe different types of rocks and the origins of soils.

Ask the learners to think-pair -share on the following:

- Write down the names of the 3 main types of rocks.
- Are rocks the same as stones?

Take feedback from all the groups.

Activity: Observing and describing different types of rocks.
Refer to Page 259, 261 and 262 of Learner's Book 8
The activities are designed to enable learners observe and describe different types of rocks as origins of soils.

- Guide learners to carry out Activity 1 on page 259 of the Learner's Book 8 to observe and identifying different types of rocks.
- Guide learners to carry out Activity 2 on page 261 of the Learner's Book 8 to demonstrate formation of soils.

Home Work/Project
Let learners carry out a project to construct a rock garden on the school compound.

Think and Discuss
Learners in pairs should describe different types of rocks and how rocks are origins of soils. Take feedback from the various groups. Ensure that the less able learners participate in the discussion.

Diagnostic Assessment
Let learners provide answers to questions at the end of the lesson in their exercise books.

ANSWERS TO QUESTIONS

Objectives

1. d
2. d
3. a
4. b
5. c
6. b

Answers to Essay Type Questions

1. Minerals are found in rocks. A rock can contain many minerals. A mineral cannot contain rock.
2. Refer to pages 259 to 260 of Learners' Book 8.
3. Answers will differ.
4. Answers will differ.
5. Answers will differ.

Answers to Test of Practical's

1. Characteristics each of
   A - Igneous
   B - Sedimentary
   C - Metamorphic

2. a. The igneous form of rocks does not include any fossil deposits.
   b. Most of the igneous forms include more than one mineral deposit.
   c. They can be either glassy or coarse.
   d. Sedimentary rocks
   e. Maximum sedimentary rocks are found in the form of Shale, Sandstone, and Limestone

3. ▪ Sedimentary rocks are layered metamorphic rocks
   - These types of rocks are the hardest among the three types of rocks.
   - These types of rocks do not contain fossils.
   - These types of rocks are formed from all three types of rocks
   - These rock types are generally found at the core of the various mountain ranges.

4. Weathering is the process that changes solid rock into sediments.

Reflection

At the end of the lesson make a self-assessment to see if the teaching was effective and how you can improve in later delivery.

- Was the lesson interesting and stimulating?
- Was the majority of the class responding as you would expect them to?
- Were there any reasons by which you could identify the cause of this response?
- If you were to facilitate this lesson again, what measures will you take to improve upon the learners understanding of the topic?
- To what extent did you cater for learners with disability and the below average learners?

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