Contemporary Science

TEACHER'S GUIDE

For Junior High Schools

7

B.S Amu
J.K. Adoku

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Tel: 0302–325057/8, 0289540424 / 0573232344
Email: masterman48@yahoo.com
Website: www.mastermanpublications.com

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 B7.1.1.1 Recognise materials as important resources for providing human needs.

Indicator B7.1.1.1.1: Classifying materials into liquids, solids and gases

LESSON 1: THE THREE MAIN STATES OF MATTER

Teaching and Learning Resources:

- common solid materials, liquids such as water, cooking oil, kerosene, liquid soap, materials containing gas e.g. inflated balloons or footballs.

Learner's Book 7: Pages 1 - 9

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

- classify materials into the three states of matter.
- identify common properties of materials in each of the three states of matter.

Keywords: solids, liquid, gas, evaporate, condense, freeze, melt

Prior Preparation:

- Gather the resources listed above or ask learners to bring samples of the items to school.

INTRODUCTION
Matter is anything that has mass and volume. This means matter can be weighed and takes up space. Common examples of matter include water, air, sand, stone, clothes and books. These examples of matter exist in different states. We will learn about the states in which they exist.

Additional Information
There are three states of matter: solid; liquid and gas. They have different properties, which can be explained by looking at the arrangement of their particles. Solids contain particles arranged in a regular structure. The particles vibrate in their fixed positions. This explains properties of solids: They cannot be compressed (particles are already tightly packed together).

Liquids contain particles that roll around each other and settle on the bottom of their container. The particles are generally slightly further apart than in a solid. (Water is an exception – ice

particles are slightly further apart than liquid water, which is why ice floats.) This explains properties of liquids: They change shape when poured into a different container (particles roll over each other and settle on the bottom).

Gases contain particles that move around very quickly. The particles travel in straight lines until they bounce off another particle or a surface. Gas particles are widely spaced and tend to be only slightly attracted to each other.

This explains the properties of a gas: They fill available space (slight attraction between particles).

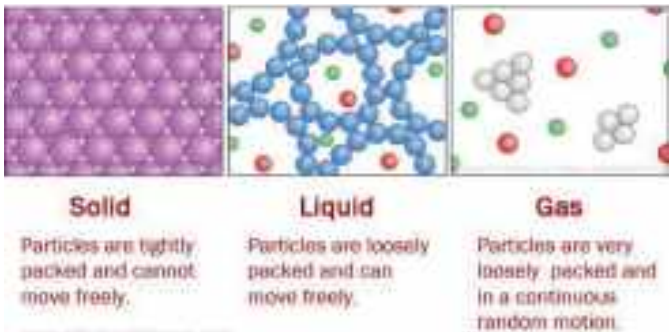


Fig. 1 - Three states of Matter

Progressive Assessment

- Engage learners to mention examples of some common materials and the state that each of them exists in.

Activity 1: Feedback from Home Task

- Engage learners in an activity to mention common materials they see or use in the home or school.
- Let learners work in pairs to identify the similarities and differences between the items mentioned.
- Introduce the concept of states of matter

Activity 2: Grouping Materials into Solid, Liquid and Gaseous States

- Form mixed ability groups of 6 learners per group
- Arrange the various items on a table and ask each group to sort the items into different groups based on their physical states.
- Ask each group to share their work with the rest of the class

Activity 3: Identifying The Properties of Each State of Matter

- Assist learners to work in pairs to identify properties of each state of matter using the table below as a guide.
- Provide them with the following items (Petrol, salt, clay, cooking oil, paper, inflated balloon).

S/N	Name of Material	Has mass	Occupies space	Has Fixed Shape	Fixed volume	Can be compressed	State of the material
1	**Petrol**	Yes	Yes	No	yes	Yes	Liquid
2	**Salt**						
3	**Clay**						
4	**Cooking Oil**						
5	**Paper**						
6	**Air**						

- Summarize the lesson based on the last activity stressing on the role of the forces between the particles in solids, liquid and gaseous molecules in determining the property of the material.

Skills and Competences: observing, analysing, evaluating, recording, communication and collaboration, critical thinking and problem solving, cultural identity and global citizenship.

Progressive Assessment

- Ask learners to briefly describe the differences between materials in the solid, liquid and gaseous states.

Diagnostic Self Assessment Questions for the teachers

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.

1. Can the learners explain potential misconceptions about the lesson?
2. Where assessment for learning and assessment as learning strategies well used in the lesson?
3. Did the learners understand the lesson through my resources?
4. Did the learners systematically follow the progressiveness of the lesson?
5. Did the learners understand the creative pedagogies I used?
6. What can I do to improve the lesson?
7. What was the reaction of the learners of my integration of ICT activities?

Main Points of the Lesson

- Substances exist in three main states namely solid, liquid and gas.
- Solids, liquids and gases are the three states of matter.
- All solids have definite shapes and volumes. They cannot be compressed into smaller volumes and their shapes does not change unless some force changes them.
- Liquids have no definite shape but have definite volume. Liquids such as water flow and they take the shape of the container.
- Gases do not have a definite shape or volumes. A gas fills up its container. It spreads in all directions and its volume can be compressed.

Reflection

Many learners face difficulties understanding the concept of states of matter, especially, the gaseous state. Find-out whether your learners understood the characteristics of gases. Identify any other aspects of the lesson which were not well understood and give further explanations.

Answers to Questions in the learner's book.

8. C. space and mass
9. D. Vacuum
10. A. Gaseous substance
11. D. Strength of attraction between the particles
12. A. Light
13. A. Condensation
14. C. Solid
15. B. By removing heat
16. A. gaseous state
17. C. Solid
18. B. Water
19. C. matter

Answers to Practical Questions

1. a. i. I represents molecules of a gaseous substance
   ii. II represents molecules of a liquid substance
   iii. III represents molecules of a solid substance

   b. i. I represents a gaseous substance because the molecules of a gas are loosely packed.
   ii. II represents a liquid substance because the molecules of a liquid substance are more tightly packed than gases.
   iii. III represents a solid substance, because the particles of a solid are very closely packed.

   c. Give three differences between the solid, liquid and gaseous states of matter.

Property	Solid	Liquid	Gas
1. Shape	Fixed	Variable (takes the shape of its container)	Variable (no fixed shape)
2. Volume	Fixed	Fixed	No fixed volume
3. Diffusion rate	Very slow	Slow	Rapid
4. Movement of particles	Vibrate and rotate around fixed point	Free to move. Particles move at random but still touch each other	Free to move. Particles move in any direction at high speed.
5. Ease of compression	Difficult to compress	Difficult to compress	Easy to compress
6. Attractive Forces	Very high	Relatively high	Very small
7. Molecular packing	Very close	Close	Spread out

d. Gas

e. It is least dense because there are wide spaces between the particles of a gas and because the particles of a gas are loosely-packed.

2. i. D: Gas;
E: liquid;
F: solid

ii. A: evaporation;
B: Deposition;
C: Freezing

iii. Heat must be applied to it.

iv. Heat must be lost.

v. All subatances can exist in the 3 states of matter.

Answers to Essay Type Questions

1. Refer to Learner's Book 7 page 4.
2. Refer to Learner's Book 7 page 4.
3. Refer to Learner's Book 7 page 6.
4. Refer to Learner's Book 7 page 2.
5. Refer to Learner's Book 7 page 2.

ICT: Direct learners to watch the videos on states of matter from the following link: https://www.youtube.com/watch?v=JQ4WduVp9k4

Inclusivity: Ensure there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

CONTENT STANDARD B7.1.1.2 Understand the periodic table as different elements made up of metals and non-metals and noble gases arranged in an order.

Indicator: B7.1.1.1.2 The Importance of Liquids in the Life of Humans

LESSON 2: IMPORTANCE OF LIQUIDS IN LIFE

Teaching and Learning Resources:

- Samples of different liquids such as water, palm oil, kerosene, liquid soap.

Learner's Book 7: Pages 10-16

Learning Expectations:

By the end of the lesson, the learner will:

1. some main properties of liquids
2. common examples of liquids and their uses

Prior Preparation:

- Ask learners to identify common liquids in their homes and state what those liquids have in common.
- Let learners also find-out the uses of the various liquid substances in their homes and communities.

Keywords: definite, volume, liquids, lubricants, petroleum

INTRODUCTION

Welcome to Lesson 2 of Strand 1. In the last lesson you learnt that matter is anything that has weight and occupies space. You also learnt that mater exists in three main states namely; solid, liquid and gas. In this lesson, you will learn about the liquid state of matter.

Additional Information

The liquid state is one of the three principal states of matter, intermediate between gas and solid.

The most obvious physical properties of a liquid are its retention of volume and its assumption of the shape of its container. When a liquid substance is poured into a vessel, it takes the shape of the vessel, and, as long as the substance stays in the liquid state, it will remain inside the vessel. Furthermore, when a liquid is poured from one vessel to another, it retains its volume (as long as there is no vaporization or change in temperature) but not its shape. These properties serve as convenient criteria for distinguishing the liquid state from the solid and gaseous states.

Fig. 2 - Liquids Around us

Progressive Assessment

- In pairs, learners must mention common liquids in their homes and communities and state their uses.

Activity 1: Reviewing The Properties of Liquids

- Ask learners to mention the substance they used to bath and also to brush their teeth in the morning before coming to school.
- Ask learners to recall the previous lesson on the three main states of matter.
- Learners must write down the main properties of liquids on sheets of paper.
- Display the various liquid substances on a table

Activity 2: Demonstrating That Liquids Assume the Shape of Their Containers

Engage the class in an activity to show that liquids assume the shape of their container. a cup, a saucer, a coffee flask, water

Steps

1. Ask a volunteer to fill a small cup with water.
2. Ask the class to observe the changes carefully
3. Let another volunteer to transfer the water into a tray or bowl, as all learners observe carefully.
4. Ask learners to share their observation.
5. Let learners brainstorm on the property of liquids being demonstrated in the activity.
6. Guide learners to mention other key properties of liquids

Activity 3: Identifying Common Liquids in The Community and Their Uses.

- Place learners in mixed ability groups of 5 learners per group.
- Based on the assignment given prior to the lesson, task each group to identify 5 liquid substances in the home, school or community.
- Each member of the group must the mention one use of the liquid.
- Finally, the group must discuss how to conserve liquids and share their ideas with the rest of the class.

Activity 4: Discussion On Water and Its Conservation

- Engage learners in an open discussion on the most important liquid in the world.
- Learners must provide reasons for their answer.
- In pairs learners must write down the things that humans will not be able to do in the absence of water.
- Help learners to know what can be done to conserve water at home and other places.

Skills and Competences: Observing, analysing, evaluating, recording, communication and collaboration, critical thinking and problem solving, cultural identity and global citizenship.

Progressive Assessment

- Let each learner construct a summary table on five (5) common liquids and their uses.

Diagnostic Self Assessment Questions for the teachers

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.

1. Can the learners explain potential misconceptions about the lesson?
2. Where assessment for learning and assessment as learning strategies well used in the lesson?
3. Did the learners understand the lesson through my resources?
4. Did the learners systematically follow the progressiveness of the lesson?
5. Did the learners understand the creative pedagogies I used?
6. What can I do to improve the lesson?
7. What was the reaction of the learners of my integration of ICT activities?

Main Points of the Lesson

- The liquid state is one of the three states of matter
- Common examples of liquids are water, petrol, cooking oil, milk and ethanol.
- Liquids are used for many purposes such as drinking, cooking, cleaning and as fuel.
- We need to preserve liquids in order to conserve human life and sustain the earth.

Reflection

Ask questions to find out whether learners understand the main difference between liquids and the other two main states of matter. Assign learners the assessment tasks in the learner's book and address any challenges based on the outcome of the assessment.

ANSWERS TO QUESTIONS IN LEARNER'S BOOK

Objectives

1. B. liquid.
2. D. more freely moving than a solid
3. B. assumes the shape of its container
4. D. boiling
5. A. Evaporation
6. C. Water conservation
7. A. Petrol
8. Methylated spirit
9. B. naphthalene
10. C. Solids can be converted to liquids after heating them

Answers to Practical Questions

1. The diagram below shows the arrangement of particles in the three states of matter

   A B C

   a. Identify the physical state of the particles labelled B?
      Answer: the particles in B are in the liquid state.
   b. Give reasons for your answer.
      Answer: The particles in B are less tightly packed compared to solids and less loosely packed than gases.
   c. Write three properties of substances in that state of matter.
   d. Mention any three substances that exist in that state
   e. Give one function of each of the substances you have mentioned.

2. The diagram below shows some common activities involving the use of liquids.
   i. Mention one liquid involved in each of the activities lettered A to D
      A – Petrol or diesel B. cooking oil C. water D. mercury or alcohol
   ii. Write down one other use of each of the liquids you have identified in I above.
      Refer to textbook for uses of each of the liquids
   iii. Which of the liquids in I above is the most important?
      Water
   iv. Give four reasons for your answer.
      Refer to Page 11 of textbook for uses of water (it must include its uses in photosynthesis and drinking)

v. Write three reasons why we need to protect liquids around us.
Refer to Pages 13 of textbook for answers.

Answers to Essay Type Question

1. Refer to Learner's Book 7 page 11.
2. Refer to Learner's Book 7 page 13.
3. Refer to Learner's Book 7 page 11.
4. Refer to Learner's Book 7 page 11.
5. Refer to Learner's Book 7 pages 13-14.
6. Refer to Learner's Book 7 pages 12-13.

ICT: Watch the video on different liquids from the link below:

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

Indicator: B7.1.1.1.3 Discuss the importance of specific solids to life

LESSON 3: THE IMPORTANCE OF SOLIDS TO LIFE

Teaching and Learning Resources:

- solid items such as stones, fabric, plastic, pieces of wood, papers, realia or pictures of different artefacts and items such as chairs, cars, cups, tables, pencils. Paper Glue, A4 Sheets,

Learner's Book 7: Pages 17-28

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

1. identify common solids and explain their importance to humans
2. model useful objects out of common solids in the environment

Prior Preparation:

- Ask learners to bring different solid materials from the home such as stones, fabric, plastic, pieces of wood, metals, paper, salt, sugar and an amount of clay.

Keywords: amorphous, crystalline, molecular, transparent opaque

INTRODUCTION

We learnt about the three states of matter. Solid is one of the three states of matter. The book you are reading currently and even the chair you are sitting on are all examples of materials in the solid state. We use solid materials for producing goods and services and making everyday objects.

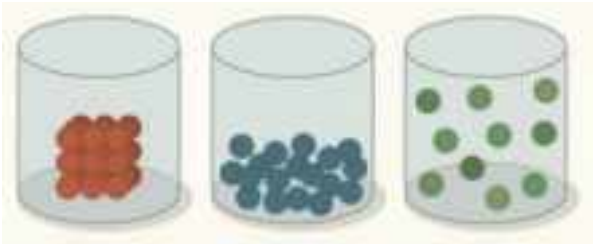
Additional Information

In a solid, the particles (ions, atoms or molecules) are closely packed together. The forces between the particles are strong so that the particles cannot move freely but can only vibrate. As a result, a solid has a stable, definite shape, and a definite volume. Solids can only change their shape by force, as when broken or cut.

Solids can be transformed into liquids by melting and can also change directly into gases through the process of sublimation.

Progressive Assessment

Ask learners to mention two key properties that solid materials have in common.



Solid Particles **Liquid Particles** **Gas Particles**

Fig. 3 - States of Matter

Activity 1: Finding Out the Properties of Different Solids

- Ask learners to assemble the different solid items they brought.
- Ask learners to write the properties common to all the solids.
- Afterwards, each person must write specific properties of the solid he brought, e.g. smooth, heavy, round, opaque, etc.

Activity 2: Creating an Album On Solid Materials

- In groups of 4 task learners to fix small samples of the solid items such as glass, metal, wood, plastic and straw on different A4 sheets and write the name of the solid under it.
- The group must then brainstorm and write 2 properties of each solid on the A4 sheets.
- Finally, each group must indicate two uses of each of the solids on the various sheets.

Activity 3: Designing Objects from Solids

Note: This activity must be done as a 2-week project.

Materials Required:

Clay, card board, A4 Sheets, blu tack, paper glue

Steps

- Learners must work in groups to mould different objects from solids such as play dough, paper, wood, clay and cardboard.
- Skills and Competences: Analysing, evaluating, predicting, communication and collaboration, critical thinking and problem solving, leadership and personal development.

Progressive Assessment

- Let learners work in groups to discuss the properties that make solids different from liquids and gases.
- Learners must mention some uses of solids based on the properties mentioned earlier.

Diagnostic Self Assessment Questions for the teachers

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.

1. Can the learners explain potential misconceptions about the lesson?
2. Where assessment for learning and assessment as learning strategies well used in the lesson?
3. Did the learners understand the lesson through my resources?
4. Did the learners systematically follow the progressiveness of the lesson?
5. Did the learners understand the creative pedagogies I used?
6. What can I do to improve the lesson?
7. What was the reaction of the learners of my integration of ICT activities?

Main Points from The Lesson

- Solids are one of the three states of matter
- Solids have fixed shapes and fixed volumes.
- There are two main types of solids namely, crystalline solids and amorphous solids.
- The uses of solids are based on their properties.
- Examples of solids include sugar, salt, ice, marbles, sand, clay, metal, wood and stones.

Reflection

Ensure learners are not injured by any sharp solids such as glass or metals. Evaluate to see whether learners are able to link the uses of solids with their properties.

Answers To Questions In Learner's Book.

1. A metal
2. C opaque
3. B Glass
4. A Wood
5. B They have a fixed shape
6. A. Flexible
7. B. Plastics
8. A. Flexibility
9. C. Mercury
10. D. Wiring of homes

Answers to Practical Questions.

1. A-Metal
   B-straw
   C-clay
   D-paper
   E-stone
   F-salt

i. See notes for uses of specific solids
ii. Refer to page 22 of learner's book for properties of specific solids
iii. Any two general properties of solids are applicable

a. Wood
b. Solid
c. Refer to textbook for any three general properties of solids
d. Refer to pages 23-25 of the textbook for uses of wood.
e. Refer to pages 23-25 of the textbook for properties of wood.

Answers to Essay Type Questions

1. Refer to Learner's Book 7 page 19.
2. Refer to Learner's Book 7 pages 19-22.
3. Refer to Learner's Book 7 pages 19-25
4. Refer to Learner's Book 7 pages 19-22.
5. Refer to Learner's Book 7 pages 19-22.

ICT: For more information about solids, watch the video below:

- https://www.youtube.com/watch?v=aHvJ5v0zhoQ

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

CONTENT STANDARD: B7.1.1.2 Understand the periodic table as different elements made up of metals and non-metals and noble gases arranged in an order.

Indicator: B7.1.1.2.1 Demonstrate the knowledge of the orderly arrangement of metals, non-metals and noble gases in the periodic table.

LESSON 4: THE PERIODIC TABLE OF ELEMENTS

Teaching and Learning Resources:

- Videos on properties of metals, semi metals and non-metals, metallic items such as wires, saucepans and nails, pictures of some common elements, chart on the periodic table.

Learner's Book 7: Pages 29-42

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

1. know the periodic table of elements and identify metals, non-metals and noble gases
2. know the first 20 elements

Prior Preparation:

- Design a chart of the periodic table showing the first twenty elements. Give learners a task to find out the building blocks of matter

Keywords: Atomic number, group, period, atom, electron, shell, metal, metalloid, noble gas

INTRODUCTION

The periodic table is an arrangement of all the elements in accordance with their increasing atomic number. The elements in the periodic table are grouped as metals, semi metal or non-metals.

Additional Information

The periodic table contains all of the known chemical elements in an informative array. Elements are arranged from left to right and top to bottom in order of increasing atomic numbers of the elements. The order generally coincides with increasing atomic mass.

The rows are called periods. The number of electrons in a period increases as one moves down the periodic table; therefore, as the energy level of the atom increases, the number of energy sub-levels per energy level increases. Elements that occupy the same column on the periodic table (called a "group") have identical valance electron configurations and consequently behave in a similar fashion chemically. For instance, all the group 18 elements are inert gases.

Progressive Assessment

- Ask learners to give examples of metals and non-metals
- Ask learners to state the differences between metals and non-metals
-

Diagnostic Self Assessment Questions for the teachers

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.

1. Can the learners explain potential misconceptions about the lesson?
2. Where assessment for learning and assessment as learning strategies well used in the lesson?
3. Did the learners understand the lesson through my resources?
4. Did the learners systematically follow the progressiveness of the lesson?
5. Did the learners understand the creative pedagogies I used?
6. What can I do to improve the lesson?
7. What was the reaction of the learners of my integration of ICT activities?

Building Blocks of matter

Refer to Learners Book Page 30

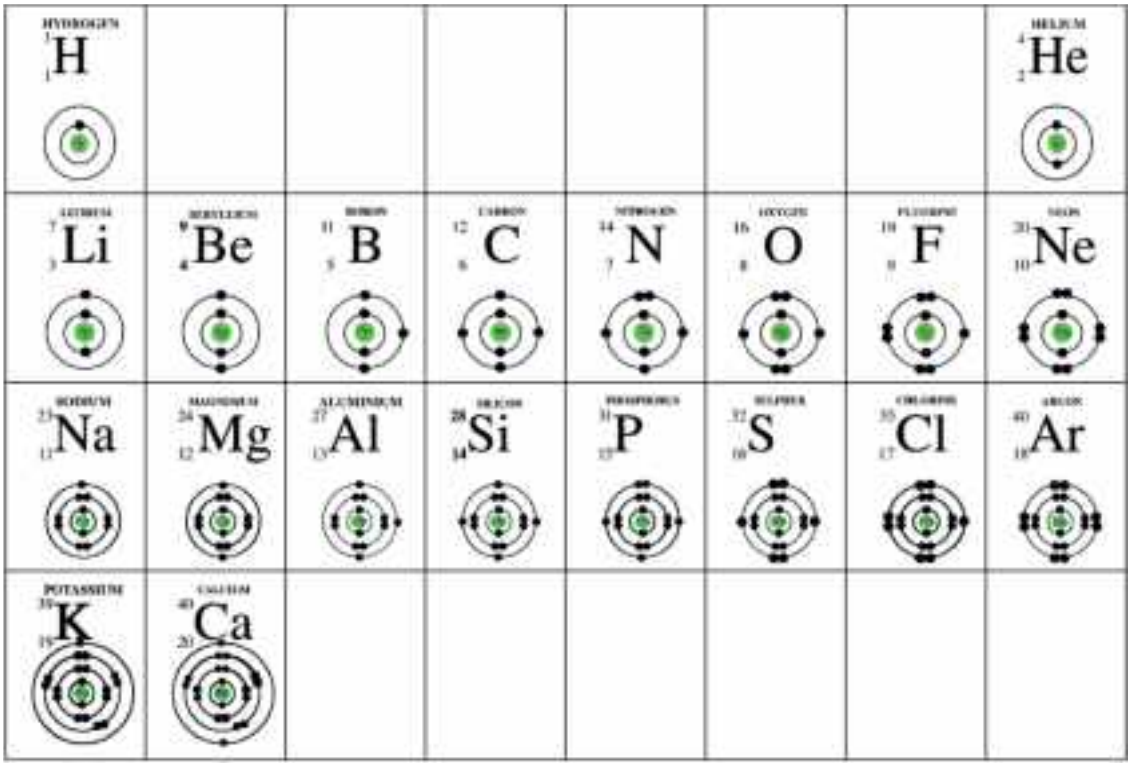


Fig. 4 - Electron configuration of the first 20 elements

Activity 1: Building Blocks of Matter

- Show learners a detailed chart showing the relationship between an atom, an ion and a molecule.
- Ask them to share the findings they made based on the pre-lesson task you gave them.
- With the aid of the chart, show learners the sub-atomic particles and the arrangement of electrons in shells.
- Assist learners to know the differences and similarities between the three building blocks of matter.

Activity 2: Understanding The Periodic Table

- Explain the term elements to learners, relating the definition to atoms.
- Based on atomic number and electronic configuration, show learners how elements are arranged on the periodic table.
- Explain the terms groups and periods, cite relevant examples in each case.
- Show learners the locations of metals, semi-metals and non-metals on the periodic table.

Activity 3: Properties of Metals, Semi-Metals and Non-Metals

- Place learners into three large groups
- Assign the groups a task to discuss the properties of metals, semi-metals and non-metals
- Each group must be assigned one category of elements to work on.
- After a ten-minute discussion, the groups must share their work with the entire class for questions and contributions.
- Summarise the discussion by stressing on the main properties of metals, semi-metals and non-metals.

Activity 4: Making Your Own Model of the Periodic Table

This must be done in the form of an after-class project. Learners must work in groups of 4 on this activity.

Materials: Cardboards, Markers, Rulers, Scissors

1. Each group must make a design of the periodic table for the first 20 elements.
2. They should colour the elements in each group with a different colour.
3. Afterwards the groups must post their work on the walls of the classroom.

Skills and Competences: Observing, evaluating, predicting, communication and collaboration, critical thinking and problem solving, creativity and innovation.

Progressive Assessment

- Learners must identify two members in each group of the periodic table.
- The learners must explain the difference between groups and periods on the periodic table.

Diagnostic Self Assessment Questions for the teachers

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.

1. Can the learners explain potential misconceptions about the lesson?
2. Where assessment for learning and assessment as learning strategies well used in the lesson?
3. Did the learners understand the lesson through my resources?
4. Did the learners systematically follow the progressiveness of the lesson?
5. Did the learners understand the creative pedagogies I used?
6. What can I do to improve the lesson?
7. What was the reaction of the learners of my integration of ICT activities?

Main Points of the Lesson

- The periodic table shows the arrangement of elements into groups and periods.
- Elements in the same group have the same number of electrons in their last shells
- Elements in the same period have the same number of electronic shells.
- All the elements in the periodic table are grouped into metals, semi-metals and non-metals.
- the atomic number of an element helps us to know whether it is a metal, semi-metal or a non-metal.

Reflection

Help learners to know the relation between the valence electrons and the position of the element on the periodic table. Guide learners to know why the noble gases are unreactive.

ANSWERS TO QUESTIONS IN LEARNER'S BOOK (Objectives)

1. C. Non-metals
2. B. it is brittle
3. C
4. B. Conductivity
5. A. Metal
6. A. Group 1
7. B. Aluminium
8. A. Ability of metals to produce shiny silvery surfaces
9. A. on the extreme left
10. A. Metal
11. A. Calcium
12. B. Metalloid
13. A. Electron
14. A. 8
15. D. Ca^{2+}
16. B -1

Answers to Practical Questions

1. a. The Periodic Table of elements
   b. I = Hydrogen
      II = Beryllium
      III = Oxygen
      IV = Neon
      V= Magnesium
      VI = Silicon
      VII = Sulphur
      VIII = Potassium
   c. Any 2 of the following (Beryllium, Magnesium and calcium)
   d. They are both in period 3
   e. i. Helium, Neon, Argon
      ii. Lithium, Beryllium, Sodium, Magnesium, Aluminium, Potassium and Calcium
      iii. Hydrogen, Oxygen, Sulphur, Phosphorus, chlorine, Fluorine, Carbon, Nitrogen

Answers to Essay Type Questions

1. Refer to Learner's Book 7 pages 31.
2. Refer to Learner's Book 7 pages 31.
3. Refer to Learner's Book 7 pages 32.
4. Refer to Learner's Book 7 pages 34.
5. Refer to Learner's Book 7 pages 34.
6. Refer to Learner's Book 7 pagess 35, 38.
7. Refer to Learner's Book 7 pages 38.
8. Refer to Learner's Book 7 pages 38.

ICT

Show learners a video on the periodic table from the link below: https://www.youtube.com/results?sp=mAEB&search_query=periodic+table+for+kids

Inclusivity: Ensure there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

1 Sub-Strand 2: Living Cells

CONTENT STANDARD: B7.1.2.1 Demonstrate understanding of the structure of organisms and functions of cells in living systems.

Indicator: B7.1.2.1.1 Describe the structure and function of living cells of an animal.

LESSON 1: PARTS OF AN ANIMAL CELL

Teaching And Learning Resources:

- Charts on an animal cell

Learner's Book 7: Pages 43-51.

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

1. explanation of a living cell
2. the main parts of an animal cell and their functions

Keywords: cell, mitochondrion, golgi body, cytoplasm. Nucleus,

INTRODUCTION

Have you ever thought what living organisms are composed of? Or rather what is it that makes us living beings? Here comes the introduction to the cell. The cell is the basic unit of life. So, everything that we are able to do is possible because of the cells present in our bodies. The number is huge and of course, the function performed by them is even bigger. This lesson introduces you to cells.

Additional Information

Animal cells are the basic units of life in organisms of the kingdom Animalia. They are eukaryotic cells, meaning that they have a true nucleus and specialized structures called organelles that carry out different functions. The main organelles in an animal cell include nucleus, ribosome, lysosome, mitochondrion, Golgi body and endoplasmic reticulum. Animal cells do not have plant-specific organelles like cell walls, which support the plant cell, or chloroplasts, the organelle that carries out photosynthesis.

Progressive Assessment

- Engage learners to share any ideas they have about a biological cell.

Diagnostic Self Assessment Questions for the teachers

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.

1. Can the learners explain potential misconceptions about the lesson?
2. Where assessment for learning and assessment as learning strategies well used in the lesson?
3. Did the learners understand the lesson through my resources?
4. Did the learners systematically follow the progressiveness of the lesson?
5. Did the learners understand the creative pedagogies I used?
6. What can I do to improve the lesson?
7. What was the reaction of the learners of my integration of ICT activities?

The Biological Cell

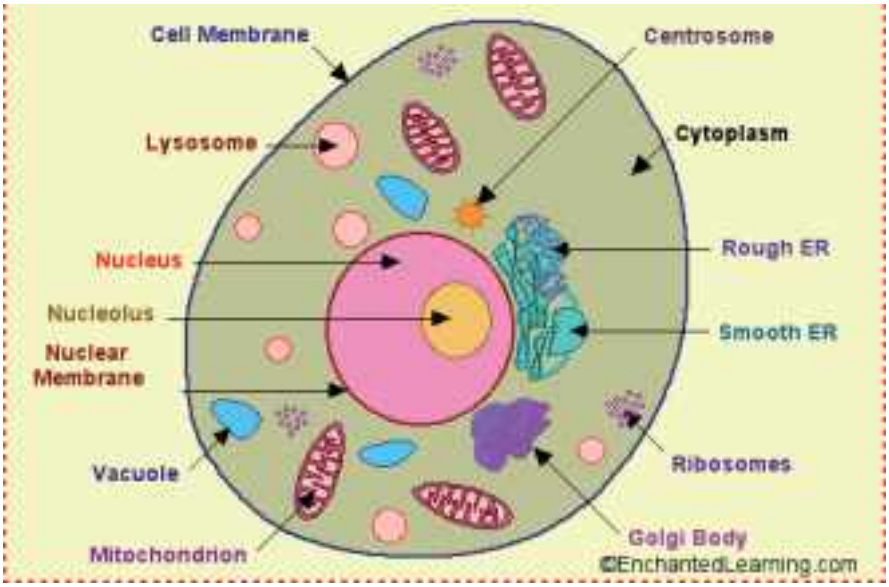


Fig. 5 - Cross-Section of an Animal Cell

Activity 1: Cell as a Basic Unit of Life.

- Show a Video on the Cell as the basic unit of life
- The video must focus on the main organelles in a cell and their functions.
- Ask learners to share what they learnt from the video.
- Help the learners to know the role of the cell as the basic unit of life

Activity 2: Identification of Organelles and Their Functions

- With the aid of a chart, assist learners to identify the organelles which they saw in the video.
- Ask other learners to state the function of the organelle
- Guide the learners to brainstorm on what will happen to the cell if organelles such as the nucleus, mitochondrion, ribosomes and vacuoles are absent.
- Ask the learners to match organelles with their functions within the animal cell.

Activity 3: Designing an Animal Cell

Materials: Card Board, Pencil, Scissors, Paper Glue, Poster colour

- With the aid of the materials, assist learners to make a design of an animal cell on a cardboard
- Learners are expected to draw different organelles, cut out the drawings and colour them nicely.
- Afterwards, fix the various organelles in the cell drawn on the cardboard; the chart must be labelled as "The Animal Cell".

Skills and Competencies: Evaluating, designing, generalising, communication and collaboration, critical thinking and problem solving, digital literacy.

Progress Assessment

- Learners must be able to explain what a biological cell is, and mention three main cell organelles and their functions.

Diagnostic Self Assessment Questions for the teachers

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.

1. Can the learners explain potential misconceptions about the lesson?
2. Where assessment for learning and assessment as learning strategies well used in the lesson?
3. Did the learners understand the lesson through my resources?
4. Did the learners systematically follow the progressiveness of the lesson?
5. Did the learners understand the creative pedagogies I used?
6. What can I do to improve the lesson?
7. What was the reaction of the learners of my integration of ICT activities?

Main Points of the Lesson

- A cell is the basic unit of life
- All living things including animals are made up of cells.

- There is a membrane bound structures called organelles that help cells to perform their functions.
- Nucleus, mitochondrion, ribosome and Golgi body are some of the main organelles in an animal cell.

Reflection

Learners must be able to relate the functions of a cell to everyday life processes such as production of energy, removal of waste substances, growth and circulation of substances within the body. Find-out whether this target was attained, at the end of your lesson.

ANSWERS TO QUESTIONS IN LEARNER'S BOOK.

Objectives

1. D. Mitochondria
2. D. Nucleus
3. C. Cell membrane
4. B. Ribosome
5. A. cytoplasm.
6. A. Mitochondria
7. D. vacuole
8. B. Ribosomes
9. B. Nucleus.
10. A. centrioles.
11. A. Do not possess chlorophyll to enable them prepare their own food
12. D. nucleus

Answers to Practical Questions

1. a. A biological cell/ An animal cell
   b. Animals
   c. A - mitochondrion
      B - Cell membrane
      C - Cytoplasm
      D - nucleus
      E - vacuole

   d. It produces energy within the cell
   e. D or nucleus
   f. B - Cell membrane

Answers to Essay Type Questions

1. Refer to Learner's Book 7 page 44.
2. Refer to Learner's Book 7 page 44.

3. Refer to Learner's Book 7 pages 44, 47 and 49.
4. Refer to Learner's Book 7 pages 44-49.
5. Refer to Learner's Book 7 page 45.
6. Refer to Learner's Book 7 page 45.

ICT: Watch a video on animal cells from the link below:

- https://www.youtube.com/watch?v=3nBtY6LR030

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

Indicator: B7.1.2.1.2 State the functions of each organelle in a plant cell.

LESSON 2: ORGANELLES IN A PLANT CELL AND THEIR FUNCTIONS

Teaching and Learning Resources:

- video, charts on plant and animal cells

Learner's Book 7: Pages 52-60

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

1. know the main organelles in a plant cell
2. identify the functions of the organelles in a plant cell

Prior Preparation: Design a chart on the plant cell, download a short internet video on plant cells.

Keywords: chloroplast, cell sap, chlorophyll, vacuole, cell wall

INTRODUCTION

The cell is the basic unit of life in all organisms. Like humans and animals, plants are also composed of many cells. The plant cell is surrounded by a cell wall which provides shape to the plant cell. Apart from the cell wall, there are other organelles that are associated with different cellular activities.

Let us have a detailed look at the plant cell. We shall focus on the structure, and functions of different plant cell organelles.

Additional Information

Plant cell, the basic unit of all plants. Plant cells, like animal cells, are eukaryotic, meaning they have a membrane-bound nucleus and organelles. Unlike animal cells, plant cells have a cell wall surrounding the cell membrane. Plant cell walls are composed of cellulose, which sets them apart from other organisms with cell walls, such as bacteria. Plant cells can be distinguished from most other cells by the presence of chloroplasts

Animal cells and plant cells are both eukaryotic. Thus, they both have a defined nucleus and other membrane-bound organelles. However, animal and plant cells also have some fundamental differences.

Animal cells, unlike plant and fungi cells, do not have a cell wall. Instead, multicellular animals have other structures that provide support to their tissues and organs, such as skeleton and cartilage.

Additionally, animal cells also lack chloroplasts found in plant cells. Chloroplasts are specialized organelles that trap energy from the sun and use it as fuel to produce sugars in a process called photosynthesis.
Additionally, while plant cells tend to have a large, central vacuole, animal cells lack this feature. Some animal cells do have small vacuoles, but their function is to assist in the storage and transport of large molecules.

Diagnostic Assessment

- Let learners mention differences between plants and animal based on various life processes.

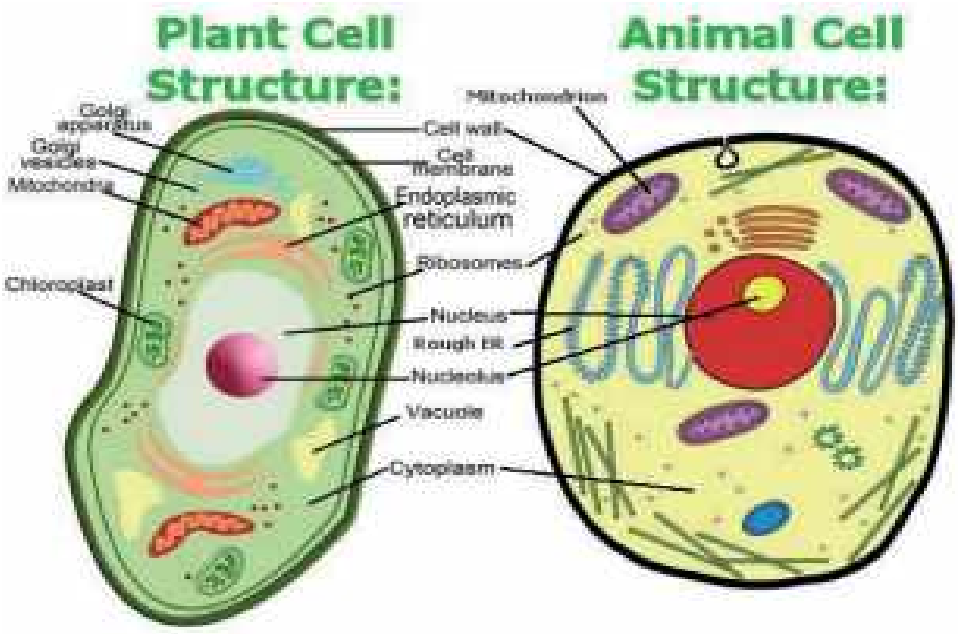


Fig. 6 - Structure of a plant cell Structure of animal cell

Activity 1: Plant Cell

- Show a Video on the plant cell
- The video must be one that focuses on the main organelles in the plant cell and their functions.
- Ask learners to share what they learnt from the video.

Activity 2: Identification of Organelles and Their Functions

- With the aid of a chart, assist learners to identify the organelles which they saw in the video.
- Ask other learners to state the function of each organelle in the plant cell
- Guide learners to brainstorm on the commonalities between plant cells and animal cells.

Activity 3: Differentiating Between the Plant Cell and The Animal Cell

- Paste charts of both the plant and animal cells on the board.
- Ask learners to individually study both charts critically.
- Each learner must tabulate at least three differences between the plant and animal cell.
- Summarise the lesson by talking about the differences in plant and animal cells in terms of shape of the cell, organelles, presence of cell wall etc.

Activity 4: Designing a Plant Cell

Materials: Card Board, Pencil, Scissors, Paper Glue, Poster colour

- With the aid of the materials above assist learners to make a design of an animal cell on a cardboard
- Learners are expected to draw different organelles, cut out the drawings and colour them nicely.
- Afterwards, they must fix the various organelles in the cell drawn on the cardboard, the chart must be labelled as "The Plant Cell"

Skills and Competences: Analysing, evaluating, comparing, interpreting, generalising, communication and collaboration, critical thinking and problem solving, leadership and personal development.

Progressive Assessment

Learners must be able to:

- Mention three organelles common to both plants and animals
- Tell you one main difference between plant and animal cells

Diagnostic Self Assessment Questions for the teachers

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.

1. Can the learners explain potential misconceptions about the lesson?
2. Where assessment for learning and assessment as learning strategies well used in the lesson?

3. Did the learners understand the lesson through my resources?
4. Did the learners systematically follow the progressiveness of the lesson?
5. Did the learners understand the creative pedagogies I used?
6. What can I do to improve the lesson?
7. What was the reaction of the learners of my integration of ICT activities?

Main Points of the Lesson

- A plant cell shares some similarities and differences with an animal cell
- Just like the animal cell, the plant cell has organelles such as nucleus, mitochondrion, ribosome and Golgi body.
- Unlike the animal cell, the plant cell has chloroplast and a permanent vacuole.
- The presence of chloroplast helps plants to prepare their own food.
- An organelle such as lysosome which is present in animal cells is missing in plant cells

Reflection

Find out which aspects of the lesson were not well understood. Go over the lesson with learners, where necessary.

ANSWERS TO QUESTIONS IN LEARNER'S BOOK

Objectives

1. B. Chloroplast
2. A. cell wall
3. A: Are there many tiny vacuoles?
4. C. All cells perform the same function.
5. A. Chloroplast
6. D. chloroplast
7. C. The cell membrane of a plant cell is surrounded by a cell wall.
8. B. Ribosomes.
9. A. Mitochondria.
10. C. Lysosome.
11. C. Cytoplasm.
12. C. Chloroplast.
13. A. Cell membrane.
14. C. Mitochondrion

Answers to Practical Questions

1. i. Identify the plant cell and the animal cell respectively.
   Diagram A is an animal cell.
   Diagram B shows a plant cell.

   ii. Diagram A is an animal cell because it has a spherical shape/irregular shape Or because it lacks a cell wall or because there is no chloroplast within the cell.

Diagram B is a plant cell because it has a regular shape or because it has a cell wall or because it has chloroplast.

iii. Refer to Learner's Book 7 page 58.
iv. Refer to Learner's Book 7 page 58.

Answers to Essay Type Questions

1. Refer to Learner's Book 7 pages 53-57.
2. Refer to Learner's Book 7 pages 54-57.
3. Refer to Learner's Book 7 page 58.
4. Refer to Learner's Book 7 pages 53-54.
5. Refer to Learner's Book 7 pages 53-57.

ICT: Watch a video on cells from the link below for further explanation.

- https://www.youtube.com/watch?v=ApvxVtBJxd0

Inclusivity: Ensure there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

STRAND
2

CYCLES

Unit 1: Earth Science

CONTENT STANDARD: B7.2.1.1 Recognise that the water cycle is an example of repeated patterns of change in nature and understand how it occur

Indicator:
B7.2.1.1.1. Explain how water cycle occurs as a repeated pattern in nature.
B7.2.1.1.1.2. The importance of water cycle in nature.

LESSON 1: HOW WATER CYCLE OCCURS
LESSON 2: THE IMPORTANCE OF THE WATER CYCLE

Teaching And Learning Resource:

- Pop bottles, Ice crystals, Charts/pictures and videos on natural sources of water

Learner's Book 7: Pages 61-69, 70-73

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

1. explain how water cycle occurs as a repeated pattern in nature
2. identify the natural sources of water
3. list the stages of the water cycle:
4. draw a flow chart to show the order of the stages in the water cycle and how they are linked to each other
5. explain why the water cycle is a repeated pattern in nature.

Keywords: evaporation, condensation, precipitation, transpiration, cycle, pattern

INTRODUCTION
Water is important in everyday life. It helps in building the immune system of humans and in the preparation of food by plants through photosynthesis. Water comes from different sources. It occurs in nature in a repeated pattern. Water cycle, also called hydrologic cycle, involves the continuous circulation of water in the Earth-atmosphere system. Of the many processes involved in the water cycle, the most important are evaporation, transpiration, condensation, precipitation

Additional Information
The water cycle, also known as the hydrologic cycle, is the continuous movement of water from the earth's surface to the atmosphere and then back to the ground. It is a continuous process. Hence, it does not have a starting or an ending point. Thus, the water present on earth has been in circulation since the evolution of the earth. There are many processes involved in the movement of

water. Listed below are different stages of the water cycle. 1. Evaporation The sun is the ultimate source of energy, and it powers most of the evaporation that occurs on earth. Evaporation generally happens when water molecules at the surface of water bodies become excited and rise into the air. There are several factors that assist the water cycle, the sun, air currents to name a few. The stages involved in a complete water cycle are: Stage I: Evaporation and Transpiration The sun's energy heats up the lakes, rivers, oceans, swamps and other water bodies which subsequently increase the temperature of the water present in them. it does not have a starting or an ending point. Thus, the water present on earth has been in circulation since the evolution of the earth. Water goes through all the three states, solid-liquid-gas, in the process.

Activity 1

- Guide learners to do the activity in the book, page 65.

Activity 2

- Let Learners do the activity on page 66 of their book

NATURAL SOURCES OF WATER

a. Surface Water

Sea

Rain

River

Lakes

Lagoons

Pond

Streams

b. Underground water

Springs

Wells

Bore-hole

Fig. 7

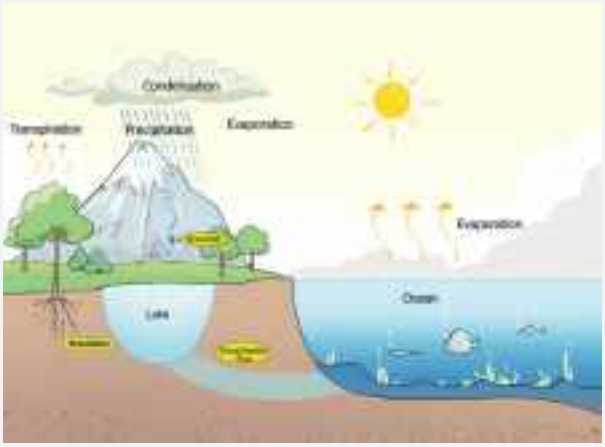


Fig. 8 - Water Cycle

Main Points of the Lesson

1. Transpiration by plants losing water vapour through their leaves.
2. collection into the water sources such as streams, rivers, sea and the use by plants and animals to start the cycle again condenses into clouds
3. Water on Earth is billions of years old.
4. The water cycle has no starting point
5. Water cycle supports life activities and processes.

Progressive Assessment

Use peer assessment to find out from learners what they have learnt about the lesson
Ask questions like

1. Explain the following terms:
   i. Transpiration ii. Evaporation iii. Condensation iv. Precipitation
2. Explain why the water cycle is a repeated pattern in nature.
3. What are the natural sources of water?
4. Mention the stages of the water cycle.

Diagnostic Assessment

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?

ANSWERS TO QUESTIONS IN LEARNER'S BOOK.

Objectives

1. b
2. c
3. d
4. b
5. c
6. d
7. c
8. d
9. c
10. b
11. a
12. c
13. b

Answers to Practical Questions

1. i. Water cycle
   ii. It can start from any point.
   iii. Evaporation is water changing into gas but condensation is water vapour changing to liquid water.
2. i. A-water vapour or evapouration
   B-Clouds
   C-Transpiration
   ii. Rain
   ii. Water cycle

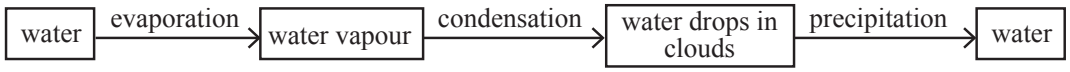
Answers to Essay Type Questions

1. Stages of the water cycle
   Evaporation → Condensation → Precipitation →Transpiration

2. a. The water cycle involves the exchange of energy, which leads to temperature changes. When water evaporates, it takes up energy from its surroundings and cools the environment. When it condenses, it releases energy and warms the environment.
   b. The evaporative phase of the cycle purifies water which then replenishes the land with freshwater.
   c. The water cycle is also essential for the maintenance of most life and ecosystems on the planet

3. Transpiration

4. a. Transpiration - Loss of water through leaves of plants.
   b. Evaporation - change of state of water from liquid to vapour st any temperaturee.
   c. Condensation - Change of state of gas to liquid.
   d. Precipitation - falling of rain, snow or hail.

5. 

6. a. Plants use water for photosynthesis to produce food.
   b. Animals need water for drinking and use plant food.
   c. Humans need water for drinking and use plant food.
      They also use water for washing and cooking engines.

ICT

- Advise the learners to use their parent phone to search the internet to find more information about water cycle.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

2 Sub-Strand 2: Life Cycle of Organisms

CONTENT STANDARD: B7.2.2.1 Demonstrate the skills of carrying out activities to show the stages of the life cycle of a housefly, the effects of its activities on humans and how to reduce them.

Indicators:
B7.2.2.1.1 Describe the life cycle of the housefly.
B7.2.2.1.2 Discuss the activities of housefly as a menace to humans and show to reduce the effects of those activities

LESSON 1: THE LIFE CYCLE OF THE HOUSEFLY

Teaching and Learning Resources:
- videos, Flash cards, Charts, Pictures, Cut-outs, Drawings, Models

Learner's Book 7: Pages 74-82

Learning Expectations:
By the end of the lesson, the learner will:
1. identify the stages of the life cycle of the housefly
2. describe the stages of the life cycle of the housefly.
3. show order of the stages of the life cycle of the housefly e.g. Eggs–Pupa-Larva-Adult.
4. draw each stage of the life cycle of the housefly and use arrows to link the stages to make the cycle complete.

Key words: metamorphosis, maggot, pupa, larvae, thorax, abdomen, Musca domestica, Class: Insecta, Kingdom: Animalia

INTRODUCTION
The housefly (Musca domestica) is a fly. It is the most common fly species found in houses. Adult flies are gray to black, with four dark, longitudinal lines on the thorax, slightly hairy bodies, and a single pair of membranous wings. They have red eyes, set farther apart in the slightly larger female. It is a common small fly occurring worldwide in and around human habitation. Its eggs are laid in decaying material, and the fly can be a health hazard due to its contamination of food.

The housefly (Musca domestica) is one of the most common and widely dispersed insects in the world. Appearing close to humans, the housefly is a major factor in the transmission of several serious diseases. Houseflies belong to the class Insecta and kingdom Animalia. The housefly is a commonly found insect all over the world. They rapidly breed and are not just adapted to urban

life, but prefer it. In this lesson we will learn about the mating and reproduction process of the housefly. The body of housefly is distinguished into head, thorax and abdomen.

Additional Information

Adult houseflies are medium -sized flies about 6mm(0.25inch) long. They are grayish -black in colour, with 4 dark bands running the length of the thorax and conspicuous bristles on the body. The abdomen is usually yellowish or gray with a dark midline. The large eyes are reddish-brown and there are silvery patches between the eyes on the face. There are two pairs of wings, but the hind wings are small and modified for balance during flight. Flies reproduce sexually like the other members of the insect family. Once the male fly has fertilized the ova of the female, she is ready to lay eggs. The female flies are capable of laying 75 to 100 eggs in a batch and around 500 eggs in 3 to 4 days.

Houseflies are of the suborder, Cyclorrhapha and Diptera order. They are the most common flies found in our homes, and they get located across the world. The adult flies are black to grey, with four dark lines across their thorax. They have little hair on their bodies and have a single pair of membranous wings to fly. Houseflies have red compound eyes and are set apart in females.

The housefly is a vector of about a hundred diseases. Some of the common ones being, Cholera, Typhoid Fever, Dysentery, Tuberculosis, Conjunctivitis (locally called Apollo), Escherichia coli, Shigellosis and food poisoning. Houseflies can carry more than one million bacteria on their bodies. Houseflies affect humans in terms of

a. The transfer of types of diseases (such as dysentery).
b. food poisoning.
c. nuisance in the environment

Activity 1: Identification of insects at home.

1. Encourage the learners to do this exercise in their jotters.
2. List any insects in your home.
    - Which of the listed insects:
    - Are the most worrying organisms?
    - Feed(s) on solid and liquid waste?
    - Transfer(s) germs?

Management of Houseflies

1. Guide learners to prepare a poster in their science journal on the ways to manage houseflies and reduce the spread of diseases and hang them on the walls in the school.
2. Let the learners compare their group work with the ones below.

Activity 2: Stages of A Life Cycle of a Housefly.

1. Guide learners to arrange flashcards or cut-outs to illustrate the stages of the life cycle of a house fly.
2. Draw each stage of the life cycle of the housefly and use arrows to link the stages to make the cycle complete.

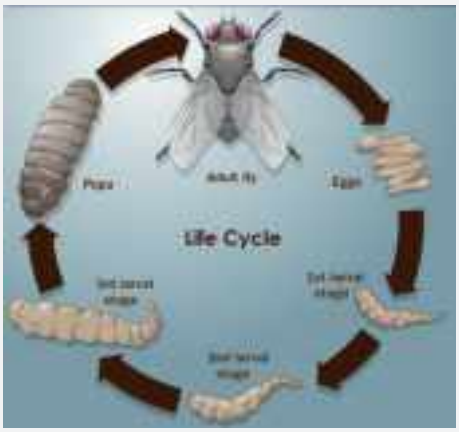


Fig. 9 - Stages of a Life Cycle of a Housefly

Main Points of the Lesson

1. About 90 percent of all flies occurring in human habitations are houseflies.
2. Houseflies cause major nuisance and hazard to public health in cities,
3. houseflies are still a problem wherever decomposing organic waste is.
4. Housefly eggs are white in colour measuring 1.2mm in length.
5. Molting is a process through which a growing insect sheds its skin and grows a new one.
6. Life cycle of the housefly.

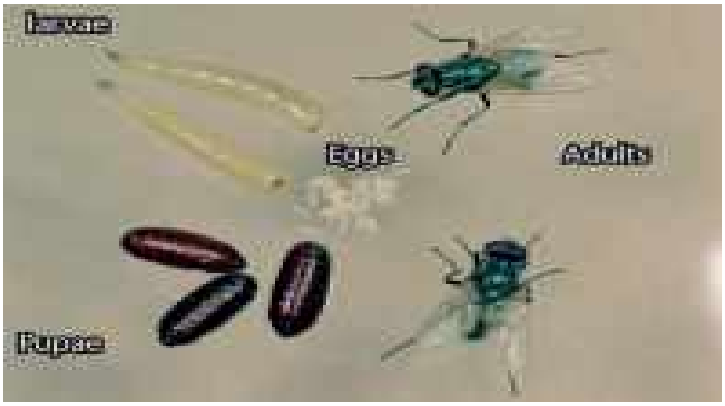


Fig. 10 - Housefly Molting Stages

7. Female houseflies mostly mate only once in their lifetime while the male mate several times. The females usually store the spermatic fluid in their bodies and use it to fertilize their eggs later. This phenomenon explains how a female can lay eggs five to six times in one lifetime.

Control Measures

1. Limit the entry of flies into homes by installing good windows and door screens with tight fits.
2. Houseflies can be controlled simply by practicing good food hygiene and keeping clean kitchens.
3. Remove garbage and animal wastes in a timely manner using garbage bags and garbage cans with tight-sealing lids.
4. Ensure that foods are stored in airtight containers and are thoroughly washed before cooking.
5. Introduce biological predators such as the Venus flytrap, parasitic wasp nests, spiders, fire ants, predatory beetles, mites, parasitic wasps (not harmful for human and animals), and birds.
6. Dead animals should be disposed of properly soon after death.
7. Practice good environmental sanitation.

Progressive Assessment

In pairs, let the learners discuss the activities of the housefly as a menace to humans and show how to reduce the effects of those activities.

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

Diagnostic Assessment

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?
- Are 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?

ANSWERS TO QUESTIONS IN THE LEARNERS BOOK

Objectives

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

Answers to Essay Type Questions

1. Refer to Learner's Book 7 pagess 75 and 78-79.
2. Refer to Learner's Book 7 pagess 80-81.
3. Refer to Learner's Book 7 pagess 80-81.
4. Refer to Learner's Book 7 pagess 78-79.

ICT

1. Guide the learners to find from the internet (www.kids science) stages of housefly.
2. Ask the learners to research and do a presentation about advantages and disadvantages of the housefly.
3. Educate people in your community about the intervention.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

Indicator: B7.2.2.1.2 Discuss the activities of the housefly as a menace to humans and show how to reduce the effects of those activities.

LESSON 2: THE ACTIVITIES OF THE HOUSEFLY

Teaching and Learning Resource:

- pictures and videos on activities of the housefly in terms of feeding and spreading of diseases, different types of foods and materials.

Learner's Book 7: pages 83-88

Learning Expectations:
Guide the learners to:

1. Describe with the aid of drawing, pictures and cartoon to demonstrate their knowledge of housefly feeding habit. e.g., feeding on dead animals, rotten food, manure, solid and liquid waste.
2. Discuss how the activities of the housefly affect humans in terms of
    i. transfer of types of diseases (such as dysentery).
    ii. food poisoning.
    iii. nuisance in the environment
3. Design an intervention that can reduce the effects of the activities of the housefly on humans and educate people of your community about the intervention.

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

Keywords: nuisance, disease, menace, food poison, skill, feeding, reproduction.

INTRODUCTION

Houseflies cause a lot of nuisance in our homes and communities. They normally rest on ceilings, walls, floors or near a source of human and animal food. They rest on plants, ground or trash cans. We do not see them as dangerous organisms. As they come into contact with our food, meat fish, fruits or vegetables they deposit germs which as humans we cannot see with our naked eyes. Houseflies poison our food and transfer diseases to us. Houseflies are however very dangerous organisms. In this lesson, we shall focus on why houseflies are a menace to the community.

Activity 1:
Guide learners to prepare a poster in their science journal on the ways to manage houseflies and reduce the spread of diseases and hung them on the walls in the school.
Let the learners compare their group work with the ones below

Control Measures

1. Limit the entry of flies into homes by installing good window and door screens with a tight fit.
2. Houseflies can be controlled simply by practicing good food hygiene and keeping a clean kitchen.
3. Remove garbage and animal waste in a timely manner using garbage bags and a garbage can with a tight-sealing lid.
4. Ensure that foods are stored in air tight containers and are thoroughly washed before cooking.
5. Introduce biological predators such as the Venus flytrap, parasitic wasp nests, spider, fire ants, predatory, beetles, mites, parasitic wasps (not harmful for human and animals), and birds.
6. Dead animals should be disposed of properly soon after death.
7. Practice good environmental sanitation.

Activity 2:

1. Let learners in their groups, use pictures, videos, models and charts to describe how and what a housefly feeds on. (E.g. feeding on dead animals, rotten food, manure, solid and liquid waste).
2. Discuss with the learners how the activities of the housefly affect humans in terms of:
    i. transfer of types of diseases (such as dysentery),
    ii. food poisoning,
    iii. nuisance in the environment
4. Explore and design an intervention that can reduce the effects of the activities of the housefly on humans.
5. Let learners educate people of their community about the intervention.

NB: Encourage learners to do group presentations in class, school and in the community.

Main Points of the Lesson

1. Typhoid Fever, Dysentery, Tuberculosis, Conjunctivitis (locally called Apollo), Escherichia coli, Shigellosis and food poisoning.

2. Biological, physical, chemical and environmental control measures have been outlined as methods used to control houseflies.
3. The World Health Organization (WHO Remove garbage and animal waste in a timely manner using garbage bags and a garbage can with a tight-sealing lid.
4. The housefly diseases such as Cholera) states that houseflies are carriers of diarrhoeal diseases, skin and eye infections. Unlike other insects such as mosquitoes, houseflies are not biting insects and are indirect rather than direct vectors of diseases.
5. Eating fly larvae infested food is dangerous. It can cause bacterial poisoning in your body. These things live in feaces and trash .

Progressive Assessment
The learners will use the skill to describe the activities of housefly.

Diagnostic Assessment
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?

ANSWERS TO QUESTIONS IN LEARNER'S BOOK

Objectives

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

ICT

1. Guide the learners to find from the internet (www.kids science) activities of housefly.
2. Design an intervention that can reduce the effects of the activities of the housefly on humans.
3. Educate people of your community about the intervention.

2 Sub-Strand 3: Crop Production

CONTENT STANDARD: B7.2.3.1 Demonstrate understanding of the different plant nutrients (organic, and inorganic fertilizers) and their application in school farming (school gardening).

Indicator: B7.2.3.1.1- Observe and list all plant nutrient sources available in the community and categorize them into organic and inorganic nutrient sources.

LESSON 1: PLANT NUTRIENTS AND SOURCES

Teaching And Learning Resources:

1. samples of organic and inorganic fertilizers
2. videos
3. charts
4. pictures

Learner's Book 7: Pages 89-96

Learning Expectation:
By the end of the lesson, the learner will:

1. differentiate between organic and inorganic plant nutrients.
2. compare the volumes of organic and inorganic nutrient source required by different plants.

Keywords: organic, inorganic, nutrient, fertilizer, plant nutrient s source.

INTRODUCTION

The total essential plant nutrients include different elements: carbon, oxygen and hydrogen which are absorbed from the air, whereas other nutrients including nitrogen are typically obtained from the soil (exceptions include some parasitic or carnivorous plants). The primary plant nutrients are nitrogen (N), phosphorus (P), and potassium (K).

In relatively large amounts, the soil supplies nitrogen, phosphorus, potassium, calcium, magnesium, and sulphur; these are often called the macronutrients. In relatively small amounts, the soil supplies iron, manganese, boron, molybdenum, copper, zinc, chlorine, and cobalt, the so-called micronutrients. Nutrients must be available not only in sufficient amounts but also in appropriate ratios. To fully understand how plants, grow and how we can help them grow better, we have to understand what they need to grow.

Both organic and inorganic fertilizers provide plants with the nutrients needed to grow healthy and strong. However, each contains different ingredients and supplies these nutrients in different ways. Organic fertilizers work over time to create a healthy growing environment, while inorganic fertilizers provide rapid nutrition. Determining which is better for your plants depends largely on the needs of your plants and your preferences in terms of cost and environmental impact.

In this lesson we will look at the various plant nutrients and their sources needed by plants, and to categorize them. Before you continue reading discuss the questions below in class.

Additional Information

Most of the nutrients required for plant growth are already present in traditional soil, although not always in the required volume or form organic fertilizers can be made from household biodegradable waste such as kitchen waste, plant leaves and other plant residues. Soils are major sources of nutrients needed by plants for growth. The three main nutrients are nitrogen (N), phosphorus (P) and potassium (K). Together they make up the trio known as NPK. Other important nutrients are calcium, magnesium and sulphur. As plants extract water, water moves toward the root and carries mobile nutrients with it. Mass flow allows plants to absorb mobile nutrients that are not initially close to the roots. Another factor affecting nutrient uptake by plants is root interception, or growing of roots into unexplored soil zones.

Activity 1: Plant Nutrients

Provide the following materials: cardboards, rules and markers

Guide the learners to do this activity in their group

1. Prepare a two column table with the captions macronutrient and micronutrients
2. Fill the table with the nutrients under the appropriate column
3. Compare your table with those of other groups

Organic and Inorganic Plant Nutrients Compared

Organic Nutrients	**Inorganic Nutrients**
1. They are made from natural sources,	They are made from artificial sources,
2. Continue to improve the soil long after the plants have taken the nutrients they need.	They are cheaper in the short term, it adds less to the soil in the long term.
3. No specific amount needed for application	Specific amounts needed to be applied for effectiveness
4. Slow release only and will cause no harm from over application	Immediate supply or slow release. But accidental over application will cause plants to burn

5. Promotes a healthy soil ecosystem and improves the structure of the soil	Contributes very little to the ecosystem or structure of the soil
6. Can only be guessed at without laboratory testing therefore an inexact application may or may not meet your plants' needs.	Applying inorganic fertilizers is simple, because the amount of a given element and the rate of application are known.
7. Release nutrients only when the soil is warm and moist	Provide this nutrition in plant-ready form immediately.

Activity 2: Sources of Plant Nutrients
Let learners in their groups to do this activity. Ask them to:

1. Make a list of 10 nutrients that plants need to grow properly in your science journal
2. Write down 3 differences between organic and inorganic plant nutrients
3. Identify by writing 4 sources of plant nutrients
4. Distinguish between inorganic and organic plant nutrients?

Main Points of the Lesson

1. Plants require only light, water and about 20 elements to support all their biochemical needs: these 20 elements are called essential nutrients. For an element to be regarded as essential, three criteria are required:
   a. a plant cannot complete its life cycle without the element;
   b. no other element can perform the function of that element; and
   c. the element is directly involved in plant nutrition

Progressive Assessment
The lesson will help the learner to know the importance of plant nutrients.

Diagnostic Assessment
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?
- Was the majority of the class responding as you would expect them to?
- Are 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 below average learners?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

1. a
2. d
3. b
4. d
5. b
6. d
7. b
8. b
9. a
10. a

Answers to Essay Type Questions

1. Refer to Learner's Book 7 pages 89.
2. Refer to Learner's Book 7 pages 89.
3. Refer to Learner's Book 7 pages 90.
4. Refer to Learner's Book 7 pagess 90-91.
5. Refer to Learner's Book 7 pages 90.

ICT

1. Guide the learners to find from the internet (www.kids science) plant nutrients.
2. Make a list of organic plants nutrient sources.
3. Write down how plants absorb plant nutrients to promote growth and development.
4. Find out the professions that use plant nutrients in their activities.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

Indicator: B7.2.3.1.2 Describe the physical characteristics of different plant nutrients (organic and inorganic) and how each is applied to plants in the field.

LESSON 2: THE PHYSICAL CHARACTERISTICS OF DIFFERENT PLANT FERTILIZERS

Teaching And Learning Resources:

- samples of fertilizers, Videos, Pictures, Charts.

Learner's Book 7: Pages 97-106

Learning Expectation:
By the end of the lesson, the learner will:

1. explain Plant nutrient source and explain how its physical structure and appearance affect its application.
2. demonstrate How each type of nutrient source may be applied to plants in the field (e.g. school garden).
3. demonstrate Practical application of each type of nutrient source to plants in the field (e.g. school garden)

Keywords: organic, inorganic, synthetic, natural, fertilizer

INTRODUCTION

Good crop yields can be expected over a rather wide range of nutrient levels in most soils. The most desirable level of each nutrient depends on such variables as the amount of rainfall, temperatures, amount of sunlight, soil texture, soil drainage, prevalence and severity of plant diseases, and the crop cultivar grown.

In our previous lesson, we compared organic plant nutrients and inorganic plant nutrients. In this lesson we will describe the characteristics of different plant nutrients and how they are applied on the field.

Additional Information

Potassium is depleted at slower rate than nitrogen from the soil. Clay soils generally have a higher potassium content than sandy soils. Inorganic phosphorus fertilizers such as rock phosphate stay in the soil years after the first application. Rock phosphate works only in acidic soils. Nutrients do not break down for plants in neutral or alkaline soils. The use of other sources of plant nutrients may be necessary to correct imbalances (for example, legume green manure crops that contribute nitrogen without increasing PH.

Activity

1. Ask the learners to identify each plant nutrient source and explain how its physical structure and appearance affect its application using pictures and real samples of fertilizers.
2. Let learners describe in groups how each type of nutrient source may be applied to plants in the field (e.g. school garden). Let learners share their experiences in class during group discussions.
3. Guide the learners to demonstrate practical application of each type of nutrient source to plants in the field (e.g. school garden). Engage them to share their ideas with each other.

Main Points of the Lesson

1. A fertilizer label on a package will have three numbers, such as 5-10-10. These numbers refer to the percentage of Nitrogen (N), Phosphorus (P), and Potassium (K), the three nutrients that plants need the most. If you add up the numbers, they are the percentage of the bag's total weight (the rest is simply filler to make it easy to handle). There may also be other nutrients, including calcium, magnesium, iron, and manganese.
2. Green manures, animal manures, liquid feeds and garden compost are good sources of nitrogen
3. Broadcasting, Placement, Foliar Application and Starter Solutions are all ways of applying fertilizer to plants.

Progressive Assessment

The lesson will help the learner to know the different types of organic and inorganic nutrients.

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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 below average learners?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

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

Answers to Essay Type Questions

1. Refer to Learner's Book 7 pages 97-98.
2. Refer to Learner's Book 7 pages 99.
3. Refer to Learner's Book 7 pages 100-102.
4. Refer to Learner's Book 7 pages 97-98.
5. Refer to Learner's Book 7 pages 100-102.

ICT/RESEARCH

1. Guide the learners to find from the internet (www.kids science) physical properties of plant nutrients.
2. Let learners use the internet/books/pictures/people in the community to find out more about plant nutrient sources.
3. Let learners visit other farm yard gardens to see how the plant nutrients are used and write a page report of the visit and them write a description of how the plant nutrients are used

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

2 Sub-Strand 4: Animal Production

CONTENT STANDARD: B7.2.4.1 Demonstrate an understanding of the differences among domestic animals such as ruminants, monogastrics and poultry (monogastric herbivore)

Indicator: B7.2.4.1.1 Examine and list domestic animals in the community.

LESSON 1: DOMESTIC ANIMALS IN THE COMMUNITY

Teaching and Learning Resources:

- video of different domestic animals, or pictures of domestic animals.

Learner's Book 7: Pages 107-116

Learning Expectations:

By the end of the lesson, the learner will:

1. identify different types of domestic animals in the community.
2. match different domestic animals with their breeds.
3. list and discuss the characteristics of the domestic animals such as shape, colour, size, food/feeding and others that can be used to classify them.

Keywords: ruminants, poultry, domestic, breeds, monogastrics, herbivore, species.

INTRODUCTION

You will find different domestic animals in your community. There may be one or two of such animals in your own house. In this lesson we will examine and list the types of domestic animal in our communities.

Additional Information

A breed is a variety of animals showing their special or distinctive characteristics by inheritance. It can also mean a group of domestic animals descended from common ancestors and having similar characteristics. The following are some breeds of domestic animals Guinea fowl used to be wild birds. However, people have managed to domesticate some of their species. There are six main breeds of Guinea fowls in nature. Three of them, which are the Crested Guinea Fowls, the Vulturine Guinea Fowl and the Helmeted Guinea Fowl were domesticated and can be found on many farms. The most common and popular domesticated Guinea fowl is the Helmeted Guinea Fowl.

Activity

1. Ask the learners to name some domestic animals found in the community as you accompany them on a nature walk.
2. Show video clips of different types of domestic animals.
3. Ask the learners to mention the names of the animals they see in the video clip. Which of them is common in their community?
4. Ask the learners to mention some types of breeds of domestic animals.
5. Let the learners discuss the characteristics of animals kept in the home, such as shape, colour, size, food/feeding and others.
6. Let learners discuss why animals are domesticated.

Main Points of the Lesson

- We can see different animals in our communities.
- Most of these animals are domesticated and are therefore called domestic animals.
- These domestic animals are of different breeds.
- Domestic animals in our communities can also be classified based on characteristics such as colour, shape, size, feeding and reproduction.

Progressive Assessment

- The lesson will help the learner to examine and list domestic animals in the community.

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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 below average learners?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

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

Answers to Essay Type Questions

1. Refer to Learner's Book 7 pages 107-110.
2. Refer to Learner's Book 7 pages 107-110.
3. Refer to Learner's Book 7 page 108.
4. Refer to Learner's Book 7 page 107.
5. Refer to Learner's Book 7 pages 107-110.
6. Refer to Learner's Book 7 page 108.
7. Refer to Learner's Book 7 pages 107-109.

Indicator: B7.2.4.1.2 Show the differences and similarities among domestic animals.

LESSON 2: DIFFERENCES AND SIMILARITIES AMONG DOMESTIC ANIMALS

Teaching and Learning Resources:

- a chart showing domestic animals.
- a chart showing domestic animals which are ruminants.
- a chart showing domestic animals which are monogastrics.
- a video clip on domestic animals.

Learner's Book 7: Pages 117-123

Learning Expectation:

By the end of the lesson, the learner will:

1. classify domestic animals into ruminants, monogastrics and poultry
2. give examples of animals classified as ruminants, monogastrics, and poultry
3. discuss and write the differences among ruminants, monogastrics and poultry
4. write similarities in the nature and characteristics of ruminants, monogastrics and poultry in Ghana and other countries.

Keywords: domestic, herbivores, ruminants, monogastrics, poultry, domestic.

INTRODUCTION

In our previous lesson we identify domestic animals in the community. There are different types of domestic animals. They can be classified based on their stomach compartment and other features. Thus domestic animals are classified as ruminants, monogastrics and poultry.

Additional Information

The differences between domestic animals and wild animals lies in the adaptation of their own functions, which are very distinct from one another. In any case, the ability to adapt--known as micro-evolution--is what defines any living being on the planet.

Most ruminants with the exception of goats are kept under the intensive system of management. The goat is not kept under the intensive system for they are naturally aggressive. Their growth rate reduces when they are confirmed. They are also highly selective in their feeding.

Monogastrics and poultry cannot digest cellulose. Since they feed on animal feed and vegetables they are described as omnivorous. Animals make up part of the chain of life, and that's why we see the different breeds and species that live alongside us on a daily basis.

Activity

1. Ask the learners to observe the charts showing domestic animals which are ruminants, monogastrics, and poultry.
2. Show a video clip of different types of domestic animals to the learners.
3. Ask the learners to make a list of domesticated animals.
4. Guide the learners to give examples of animals classified as ruminants, monogastrics, and poultry.
5. Ask the learners to discuss and write the differences among ruminants, monogastrics and poultry.
6. Ask the learners to discuss and write the similarities in the nature and characteristics of ruminants, monogastrics and poultry in Ghana and other countries.

Main Points of the Lesson

- A ruminant is a type of domestic animal with hooves and a complicated system of stomach compartments whose digestion work by chewing their cud. They therefore ruminate. Examples are sheep, goat and cattle.
- Domestic animals classified as monogastrics are those having only one stomach. They mostly feed on herbs, for example, rabbit, pig and grass cutter.
- Poultry are that class of domestic birds that are kept for food (meat and or eggs) feathers and entertainment (racing and cock fight). Examples are fowls, turkeys, ducks, geese and guinea fowl.
- Even though ruminants, monogastrics and poultry are all domestic animals, there are some differences and similarities among them.

Progressive Assessment

The lesson will help the learner to classify domestic animals as ruminants, monogastrics and poultry.

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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 below average learners?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

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

Answers to Essay Type Questions

1. Refer to Learner's Book 7 pages 117-118.
2. Refer to Learner's Book 7 pages 119.
3. Refer to Learner's Book 7 pages 119.
4. Refer to Learner's Book 7 pages 117.
5. Refer to Learner's Book 7 pages 117.

Answers To Answers to Practical Questions

1. i. A - Exoctic
   B - Helmeted Guinea fowl

   ii.

Exoctic	Local
Bigger	Smaller
One Colour	Multi-coloured
Grow faster	Grow slowly

   iii. Advantages of breed A
   - Produce more eggs
   - Larger in size
   - Produce larger eggs

   iv. Advantages of breed B
   - It is larger in size.
   - It lays more eggs
   - It grows at a faster rate than the local breed

2. i. A - Milk production
   B - Meat and Milk
   ii. Dairy cattle, Brown Swiss
   iii. Zebu, Abadeen

iv.

A	B
Reared for its meat. Beef cows are typically shorter and stockier feet. Beef cattle are more muscular and have a stouter shape.	Reared for its milk. Have long lanky legs. They are thinner and longer than beef cattle.

v. For work
For manure

CONTENT STANDARD: B7.2.4.2 Show an understanding of the usefulness of the different types of animals for domestic and commercial purposes.

Indicators:
B7.2.4.2.1 Discuss and write the domestic and commercial uses of different types of animals.
B7.2.4.2.2 Observe and compare the uses of the different types of animals.

LESSON 3: DOMESTIC AND COMMERCIAL USES OF DIFFERENT TYPES OF ANIMALS.

Teaching and Learning Materials:

- pictures of animals, charts of animals, drawings of animals, videos of animals, models of animals, cut-outs of animals.

Learner's Book 7: Pages 124-130

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

1. explain the domestic use and the commercial use of animals.
2. describe domestic uses of ruminants, monogastrics and poultry.
3. observe and discuss different uses of different animals found in the communities.
4. list and match the different domestic animals to their commercial uses including their by-products (such as animal waste).

Keywords: ruminants, monogastrics, animals waste, domestic, manure

INTRODUCTION

Humans use different types of animals in several ways to their benefits. These benefits can be grouped under: food, economic, religious, security, social, traction, transport, power, research, medicine, fuel, feed and manure. Most animals that are used are not sold on commercial bases for consumption.

In our previous lesson we identify domestic animals in our community. There are different types of domestic animals. They can be classified based on their stomach compartment and other features. Thus domestic animals are classified as ruminants, monogastrics and poultry.
In this lesson we shall discuss differences and similarities among domestic animals.
This lesson will introduce you to the general uses of different animals. Enjoy the lesson with smile!

Additional Information

Animals provide humans with a variety of basic materials. In some societies, hides are utilized to produce rudimentary protective garments and carpets for chiefs and common people.

Leather is created by removing the fur from hides. This leather is used to produce a wide range of products, including liquid and food storage containers, footwear, and musical instruments. Domesticated animals are mostly used for commercial purposes such as milk, meat, eggs, and other useful items. Milk is produced by cows, goats, buffaloes, and other animals. Hens, ducks, turkeys, and other poultry provide eggs and meat. Meat is raised on chickens, goats, ducks, cows, and other animals. Some individuals eat the meat of specific animals. Goats, sheep, pigs, fish, deer, and turkeys are among the animals. Eggs are laid by hens, ducks, and other birds. Eggs are high in protein and are considered a healthful food.

Uses of Animals

Bullocks are quite beneficial in agriculture. They're utilized for threshing crops and ploughing areas. 3. Safety and recreation: Dogs, cats, parrots, pigeons, and other animals and birds are kept as pets. Our home is guarded by a pet dog who is devoted to its master.

Activity

Let learners:

- Search for information from people in the community, pictures, videos, and other related resources describe how animals are used for domestic purposes.
- Explain the concepts of domestic use and commercial use of animals.
- Ask learners to describe domestic uses of ruminants, monogastrics and monogastrics herbivores.
- Ask the learners to list and match the different domestic animals to their commercial uses including their by-products (such as animal wastes).
- Use cut-outs and other alternatives to consolidate the learners understanding of domestic and commercial use of animals.

Main Points of the Lesson

- Humans derive benefits from different animals in several ways. These benefits can be grouped under: food, economic, religious, security, social, traction, power, transport, research, medicine, feed, fuel and manure.
- Ruminants, poultry and monogastrics are mainly raised for their meat and egg. They serve as income for the farmer. In general, they are used for food, economic, religious, security, social, traction, transport, power, research, medicine, fuel, feed and manure purposes.
- There are different animals in our community.
- Some are used as pets, for research and raw materials including their by-products.

Progressive Assessment

The lesson will help the learner to

1. Know the differences among the domestic animals.
2. Show the differences and similarities among domestic animals.
3. Classify domestic animals into ruminants and monogastrics.

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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 below average learners?

ANSWER TO QUESTIONS IN LEARNER'S BOOK

Objectives

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

Study Answers to Essay Type Questions

1. Refer to Learner's Book 7 pages 125.
2. Refer to Learner's Book 7 pages 125.
3. Refer to Learner's Book 7 pages 124-125.
4. Refer to Learner's Book 7 pages 122-123.
5. Refer to Learner's Book 7 pages 125-126.

Answers to Practical Questions

a. I - Turkey
   II - Pig
   III - Goat
   IV - Turkey
   V - Cow

b. Breeds of II.
   Breeds of III - West African dwarf goat, W.A long legged goat.
   Breeds of IV - N'dama. Brown Swiss.

c. Monogastric - II
   Poultry - I and IV
   Ruminats - III and V

d. Reasons for reariing V - to provide hide, biogas, milk, etc.

e. Difference between II and V

II is monogastric V is ruminant
II - Single stomach
V - 4-chambered stomach

ICT

1. Let learners use mobile phones to find from the internet (www.kids science) monogastric herbivores.
2. Guide learners to research and make a presentation on ruminants, monogastrics and monogastric herbivores.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

CONTENT STANDARDS: B7.2.4.2 Show an understanding of the usefulness of the different types of animals for domestic and commercial purposes

Indicator: B7.2.4.2.2 Observe and compare the uses of the different types of animals.

LESSON 4: OBSERVING AND COMPARING USES OF DIFFERENT TYPES OF ANIMALS

Teaching and Learning Resources:

- pictures of animals, charts of animals, drawings of animals, videos of animals, models of animals, cut-outs of animals.

Learner's Book 7: pages 131-137

Learning Expectations:
Guide learners to:

1. observe and discuss different uses of different animals found in the communities.
2. list and match the different domestic animals to their commercial uses including their by-products (such as animal waste).

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

Keywords: ruminants, monogastrics, animals waste, domestic, manure

INTRODUCTION

In our previous lesson we identify domestic animals in our community. There are different types of domestic animals. They can be classified based on their stomach compartment and other features. Thus domestic animals are classified as ruminants, monogastrics and poultry.
In this lesson we shall look at differences and similarities among these domestic animals.
This lesson will introduce you to the general uses of different types of animals. Enjoy the lesson with smile!

Activity

1. Engage learners to explore from nature walk to observe and discuss different uses of different animals found in the communities.
2. Let learners list and match the different domestic animals to their commercial uses including their by-products (such as animal waste).
3. Use cut-outs and other alternatives to consolidate the learners understanding of domestic and commercial use of animals.

Main Points of the Lesson

- There are different animals we find in our community.
- Some are used as pet, research and raw material including their by-products.

Progressive Assessment

The learners will use the skill of classifying, analyzing, communicating and collaborating with others to learn.

Diagonostic Assessment

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?

ANSWER TO QUESTIONS IN LEARNER'S BOOK

Objectives

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

ICT

- Guide the learners to find from the internet (www.kids science) animals that are not ruminants.

STRAND 3

SYSTEMS

Unit 1: Materials

CONTENT STANDARD: B7.2.4.2 Show an understanding of the usefulness of the different types of animals for domestic and commercial purposes

Indicator: B7.3.1.1.1 Explain the concept of food and the need for humans to eat.

LESSON 1: THE CONCEPT OF FOOD AND ITS IMPORTANCE

Teaching and Learning Resources:

- charts showing people suffering from deficiency diseases, chart on classes of food or real food items from the various food groups (proteins, carbohydrates, fats and oils)

Learner's Book 7: Pages 138-147

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

1. identify the different nutrients found in food
2. list the classes of food

Keywords: Carbohydrates, proteins, fats and oils, minerals, vitamins, diet, nutrition

INTRODUCTION

What is your favourite food? Do you know the nutrients in it? Is it part of a balanced diet? Food is one of the essential things all living things need in addition to air and water. The type of food you eat and the nutrients it contains helps to prevent diseases, makes you grow stronger and also helps you to recover from injuries. We need to know about what to eat, when to eat and the diseases associated with eating the wrong kind of food.

Additional Information

There are six (6) major classes of food based on their nutrient properties: Carbohydrates - These are energy-giving nutrients found in potatoes, rice, wheat, maize, and other starches. Proteins - These are bodybuilding nutrients found in meat, legumes and dairy products. Fats - These are found in nuts and fruits like avocados. Fibre - These are necessary for digestion and are found in fruits and vegetables. Minerals - These are necessary for improving bodily functions and are found in most foods, fruits, and vegetables Vitamins - These boost immunities and are found in fruits and vegetables.

Prior Preparation:

- Learn a song on the need to eat
- Gather food items from different classes of food.

Diagnostic Assessment

1. Learners must mention examples of food substances that:
   i. Give energy
   ii. Repair body cell and tissues
   iii. Keep humans strong and healthy

Fig. 11 - Classes of Food

Activity 1: Song on Food and the Need to Eat.

1. Teach learners a song on food and its importance.
2. Afterwards, ask them the food they ate in the morning and why we eat food.

Activity 2: Identifying The Various Classes of Food

1. Show learners the chart on different classes of food.
2. Ask them to sort the food items they brought from home into the classes of food.
3. Go round to inspect the activity and provide assistance where necessary.

Activity 3: Identifying The Components of a Balanced Diet

Steps

1. Based on the classes of food, explain the concept of balanced diet
2. Place learners into groups of five (5).
3. Each group must identify the nutrients (Classify them as carbohydrate, proteins, fats and oil, vitamins or mineral salts).

Activity 4: Identifying Deficiency Diseases

4. Ask learners to mention the causes of common deficiency diseases such as kwashiorkor, rickets and scurvy.
5. Show the chart on the deficiency diseases.
6. Engage learners to match deficiency diseases with their causes through think pair share.
7. Summarize the lesson by stressing on how deficiency diseases can be prevented.

Skills and Competences: Observing, analysing, evaluating, recording, communication and collaboration, critical thinking and problem solving, cultural identity and global citizenship.

Progressive Assessment

- Ask learners to mention balanced diets that they can eat at home
- Learners must write the nutrients in each meal they mention.

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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 below average learners?

Main Points of the Lesson

1. We need to eat food to gain energy and stay healthy
2. Food can be placed under six classes
3. The main classes of food are proteins, carbohydrates, fats and oils, vitamins, mineral salts and water.
4. We need to eat balanced diets to stay healthy and avoid deficiency diseases.

Reflection

The main purpose of this lesson is healthy eating and living. Find out whether learners are able to give examples of balanced diets. Help them to know how to eat healthy foods and avoid deficiency diseases.

ANSWERS TO QUESTIONS IN LEARNER'S BOOK.

Objectives

1. C
2. D
3. B
4. D
5. D
6. B
7. A
8. C
9. D
10. C
11. A
12. A
13. C
14. A
15. C
16. A

Answers to Practical Questions

A; proteins: B; fats and oils; C; carbohydrates

i. Refer to textbook for functions of each class of food.
ii. kwashiorkor
iii. Enlarged stomach, thin legs and arms, skin discoloration, diarrhoea, anaemia
iv. Palm oil, cod liver oil, margarine, butter, lard etc.

Answers to Essay Type Questions

1. Refer to Learner's Book 7 page 138.
2. Refer to Learner's Book 7 pages 138-140.
3. Refer to Learner's Book 7 pages 141-142.
4. Refer to Learner's Book 7 page 142.
5. Refer to Learner's Book 7 pages 138-139.
6. Refer to Learner's Book 7 page 142.
7. Refer to Learner's Book 7 page 147.
8. Refer to Learner's Book 7 page 143.

ICT: Direct learners to watch the video on the classes of food from the link below: https://www.youtube.com/watch?v=X96csq19L-A

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

Indicator: B7.3.1.1.2 Examine what happens to food at the stages of digestion in humans.

LESSON 2: DIGESTION OF FOOD IN HUMANS

Teaching and Learning Materials:

- video on the digestive system and digestion of food or chart on the digestive system, cardboard, A4 sheets, pencils, scissors, paper glue.

Learner's Book 7, Page 148-155

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

1. identify the parts of the digestive system
2. explain what happens to food at each stage of digestion

Prior Preparation
Assemble the resources and ensure the classroom is arranged to support group activities. Ask learners to find-out the parts of the alimentary canal and their roles in digestion of food.

Keywords: alimentary canal, digestion, oesophagus, intestines, rectum, enzymes

INTRODUCTION

Can you say what happens to the food you eat? The food we eat goes through various processes that help to break it down so that the body can make use of it. The unwanted parts of the food also need to be removed. The part of the body responsible for breaking down food is known as the digestive system.

Additional Information

Digestion is the breakdown of food into simpler absorbable forms. In humans the digestive system is responsible for this process. It starts in the mouth and ends in the anus. The organs in the digestive system include the mouth, oesophagus/gullet, stomach, small intestine, large intestine, rectum and the anus. The accessory organs of digestion include the liver and pancreas.

A large reservoir of microbes, such as bacteria, live within the large intestine and, in other parts of the digestive system. These bacteria play an important role in healthy digestion.

The Mouth and Oesophagus

Digestion begins in the mouth. The food is ground up by the teeth and moistened with saliva to make it easy to swallow. Saliva also has a special chemical, called an enzyme, which starts breaking down carbohydrates into sugars. Once swallowed, muscular contractions of the oesophagus massage the ball of food down into the stomach.

The Stomach
The food passes through a sphincter, or small muscle ring, into the stomach. Here it is mixed with gastric juices. The stomach is a muscular bag and it churns the food to help break it down mechanically as well as chemically. The food is then squeezed through a second sphincter into the first part of the small intestine, called the duodenum.

The Small Intestine
Once in the duodenum, the food is mixed with more digestive enzymes from the pancreas and bile from the liver. Food is then squeezed into the lower parts of the small intestine, called the jejunum and the ileum. Nutrients are absorbed from the ileum, which is lined with millions of finger-like projections called villi. Each villus is connected to a mesh of capillaries. This is how nutrients pass into the bloodstream.

Pancreas
The pancreas is one of the largest glands in the human body. As well as digestive juices, it secretes a hormone called insulin. Insulin helps to regulate the amount of sugar in the blood. Diabetes is a condition caused by problems with insulin production.

Liver
The liver has a number of different roles in the body, including: breaking down fats, using bile stored in the gall bladder, processing proteins and carbohydrates filtering and processing impurities, drugs and toxins, generation of glucose for short-term energy needs from other compounds like lactate and amino acids.

The Large Intestine
Once all the nutrients have been absorbed, the waste is moved into the large intestine, or bowel. Water is removed and the waste (faeces) is stored in the rectum. It can then be passed out of the body through the anus.

Progressive Assessment
Ask the learners to explain what happens to the food that we take in.

Diagnostic Assessment
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?
- Was the majority of the class responding as you would expect them to?
- Are 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 below average learners?

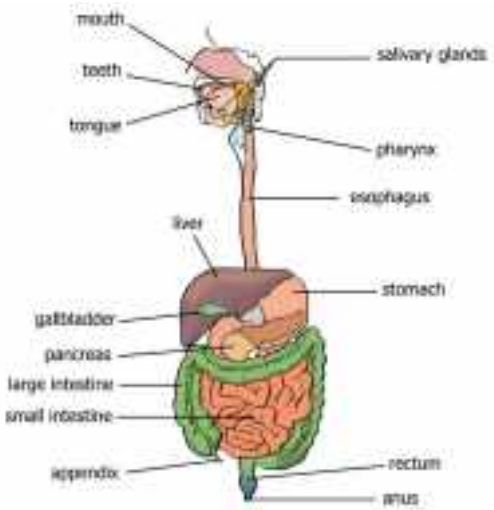


Fig. 12 - The Digestive System

Let the learners share any ideas they have about the digestive system.

Activity 1: Identifying The Parts of the Digestive System

- Ask a volunteer to come forward and eat a small piece of food
- Ask the class to share their views on what happens to the food that has just been eaten.
- Afterwards play the video or display the chart on the digestive system.
- Task learners to summarize the key aspects of the video they just watched.
- Assist learners to identify the main and accessory organs of digestion and the role each of them played.

Activity 2: Role Playing the Parts of the Digestive System

- Form groups of 8 learners
- Engage each group to write the parts of the digestive system on separate A4 sheets.
- The groups must assign each member the role of one of the organs of the digestive system.
- The 8 learners must be arranged in the order by which the organs of the digestive system are located from the mouth to the rectum.
- Starting from the mouth, each member of the group must tell the role he or she plays in the digestion of food.
- Summarize the lesson by talking about some diseases that affect the digestive system and their prevention.

Skills and Competences: Observing, analysing, evaluating, recording, communication and collaboration, critical thinking and problem solving, cultural identity and global citizenship

Progressive Assessment

- Learners must identify the main organs of the digestive system and their functions.
- Ask them to write down what happens to food at each stage in the digestion process.

Main Points of the Lesson

1. Digestion is the breaking down of food into simpler forms that can easily be absorbed by the body.
2. The part of the human body that breaks down the food we eat is known as the digestive system.
3. The parts of the digestive system include the mouth, oesophagus, stomach, small intestine, large intestine, rectum and anus.

Reflection

Many learners face difficulties understanding the digestive system. Find-out whether your learners understood the lesson. Identify any other aspects of the lesson which were not well understood and give further explanations.

ANSWERS TO QUESTIONS IN LEARNER'S BOOK.

Objectives

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

Answers to Practical Questions

1. i. The digestive system/ the alimentary canal
   ii. A: mouth
   B: epiglottis
   C; gullet/oesophagus;
   D: stomach;
   E: small intestine;
   F: large intestine;
   G: rectum;
   H: Anus

iii. A or mouth/buccal cavity
iv. E or small intestine
v. J (liver) and K (gall bladder)
vi. Rectum

Answers to Essay Type Questions

1. Refer to Learner's Book 7 page 148.
2. Refer to Learner's Book 7 pages 149-150.
3. Refer to Learner's Book 7 page 150.
4. Refer to Learner's Book 7 page 150.
5. Refer to Learner's Book 7 page 150.

ICT: Direct learners to watch the video on the digestive system of humans from the following link: https://www.youtube.com/watch?v=zr4onA2k_LY

Inclusivity: Avoid discriminating against any group of learners in the distribution of questions and during group activities. Take time to explain the concept to the slow learners in the class.

Indicator: B7.3.1.1.3 Identify the end product of digestion of starchy, protein and oily foods and explain how absorption of the digested food occurs in humans.

LESSON 3: THE END PRODUCTS OF DIGESTION AND TESTS FOR FOOD.

Teaching and Learning Resources:

- videos on tests for food, A4 sheets, samples of proteins, carbohydrates and fatty foods, reagents for testing for food (Iodine Solution, Fehling's solution, Benedict's solution)

Learner's Book 7: Pages 156-165

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

1. know the end product of digestion of carbohydrates, proteins and fats and oils
2. perform tests to identify starch, proteins and fats and oils

Keywords: Absorption, assimilation, translucent, Millon's Test

INTRODUCTION

After you eat your food, how does the body extract the ingredients that it requires? Would you be surprised to know that this function actually happens in your small intestine? The process is known as Absorption and Assimilation. Let us learn about it here.

Additional Information

Whatever we consume comprises different quantities of carbohydrates, proteins and fats. They all get digested into different components. Carbohydrates get digested into galactose, glucose, fructose. Fats get digested into fatty acids and glycerols. Protein component of our food takes the form of amino acids once digested.

Food tests are conducted to identify the nutrients present in a given sample of food. Starch is detected using iodine solution. This turns blue-black in the presence of starch.
Reducing Sugars are tested for using benedict's solution. Benedict's solution gradually turns from blue to cloudy orange or brick red when heated with a reducing sugar.

Proteins are detected using Biuret reagent. This turns a mauve or purple colour when mixed with protein.

Fats are detected using the emulsion test. This is what happens: The test substance is mixed with 2 cm^3 of ethanol. An equal volume of distilled water is added. A milky-white emulsion forms if the test substance contains fats. Fats can also be tested for through the translucent spot test.

Prior Preparation:

- Ask learners to bring samples of food items (egg, cassava/yam, groundnut)
- Arrange your set-up to be used for testing the different food items

Diagnostic Assessment

Learners must mention any food tests they have previously heard of

Activity 1: Test for Starch

1. Take a small quantity of the food items to be tested.
2. Put 2-3 drops of iodine solution on it.
3. Observe the colour of the food item.

Observation

The presence of a blue-black colour indicates the presence of starch in the tested food item.

Activity 2: Test for Sucrose

- Take a clean and dried test-tube and pour sugar cane extract into it.
- Now carefully add a few drops of concentrated HCl using a dropper to the test tube.
- Hold the test tube securely with the help of a test tube holder.
- Place the test tube near the Bunsen burner and allow the solution to boil for two minutes.
- While boiling, the hydrolysis of sucrose occurs and the fructose converts to glucose.
- With the help of a dropper, add a few drops of NaOH solution to the test tube so as the solution turns alkaline.
- Now add a few drops of Benedict's reagent with the help of a dropper into the test tube.
- With the help of a test tube holder, place the test tube near the Bunsen burner and allow the solution to boil for a few minutes.
- The colour of the solution changes from blur to green. From green colour, it finally changes to brick red or orange colour. This indicates that the solution contains glucose.

Activity 3: Test for Proteins
Procedure

- Take a clean and dried test-tube and place egg albumin in it.
- Now add a few drops of 40% NaOH solution with the help of a dropper into the test tube containing the egg albumin.
- With the help of a dropper, add 2 to 3 drops of 1% $CuSO^4$ solution into the same test tube containing the egg albumin.
- Now shake the test tube slowly in order to mix the solution completely.
- Keep the test tube undisturbed and allow the mixtures to stand for 5 minutes. After a few minutes, observe the changes.
- The colour of the solution in the test tube changes to violet. This indicates that the sample that is tested contains proteins.

1. **Millon's Test**
   - Take a clean and dried test-tube and add egg albumin to it.
   - With the help of a dropper, add a few drops of the Million's reagent to the test tube containing the egg albumin.
   - Keep the test tube undisturbed and allow the mixtures to stand for 5 minutes.
   - The colour of the sample changes to pink, indicating the presence of proteins.

Test for Fats
Materials Required: Sudan III Solution, Oil, Test tube, Dropper, Egg Albumin

Procedure

i. Take a clean and dried test-tube and place a few drops of oil in it.
ii. Now to the same test tube, add five to six drops of the Sudan III reagent with the help of a dropper.
iii. Stir the test tube continuously and allow the solution to stand for a while.
iv. After a few seconds, observe the changes.
v. The presence of fat in the sample is indicated when pink droplets appear in the test tube.

2. **Paper Spot Test**
   Materials Required: A piece of white paper, groundnut, Watch glass, Paper spot test for fats and oils

Procedure

i. Place groundnut on a piece of white paper.
ii. Crush and rub the groundnut in the white paper.
iii. Remove the groundnuts from the paper. Observe the changes in the paper.
iv. The spot where the groundnut was rubbed turns translucent. This indicates the presence of fats in the sample.

Activity 4: Constructing A Table On Food Tests
Steps

- After demonstrating the food tests, engage your learners in an individual activity to summarize what they have learnt.
- Each learner must follow the following instructions:
- Draw a table with three columns and three rows.
- Label the columns as nutrient, name of test and observation.
- In the first row write the name of the food item.
- In the second row, indicate the name of the test (e.g. Millon's test, Iodine Test)
- Finally write the expected observation of the food test in the third row)

Skills and Competences: Observing, analysing, evaluating, recording, communication and collaboration, critical thinking and problem solving, cultural identity and global citizenship

Progressive Assessment
Ask the learners to construct a table summarizing the various tests for food, the reagents involved and the expected results.

Main Points of the Lesson

1. The end products of food are absorbed in the small intestine
2. Glucose is the end product of digestion of carbohydrates
3. The end product of the digestion of fats and oils is fatty acids and glycerol
4. Amino acid is the end product of the digestion of proteins.
5. Food tests are conducted to identify different classes of food.
6. The presence of proteins can be tested through the Millon's test or the Biuret Test.
7. The presence of starch is tested using the Iodine test.
8. Fats and Oils are tested through the Sudan III test or the Paper Spot test.

Reflection
Based on the use of different reagents, learners sometimes find it difficult to distinguish between the tests for the various foods. Ask yourself, was the lesson as practical as possible? Will learners be able to undertake the tests for food on their own, based on the lesson?

ANSWERS TO QUESTIONS

Objectives

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

Answers to Practical Questions

1. i. A; test tube
   B; beaker;
   C: tripod stand;
   D: Bunsen burner;
   E: dropper

   ii. Benedict's reagent

   iii. The colour of the reagent changes from blur to green.

   iv. It helps in heating the sample.

   v. Refer to Textbook pages 157-158.

2. i. Translucent Spot Test

   ii. Fats and oils

   iii. Through the osmic acid test or through the use of Sudan III.

   iv. Place the sample of food on the piece of white paper
   Crush and rub the food sample in the white paper.
   Remove the crushed sample from the piece of paper and observe the changes on the piece of white paper.
   This indicates the presence of fats in the sample
   The spot where the groundnut was rubbed turns translucent.

   v. Any three fatty foods.

Answers to Essay Type Questions

1. Refer to Learner's Book 7 pages 156-157.
2. Refer to Learner's Book 7 page 160.
3. Refer to Learner's Book 7 pages 160-161.
4. Refer to Learner's Book 7 page 156.
5. Refer to Learner's Book 7 page 156.

ICT: follow the link below to watch a helpful video on tests for food.
https://www.youtube.com/watch?v=tsG2e9gPOqw

3 Sub-Strand 2: The Solar System

CONTENT STANDARD: B7.3.2.1 Demonstrate knowledge of the inner planets of the solar system and understand their movement in the system.

Indicator: B7.3.2.1.1 Identify the inner planets of the solar system and describe their properties.

LESSON 1: THE INNER PLANETS OF THE SOLAR SYSTEM

Teaching and Learning Resources:

- Chart on the solar system, chalk or any other material for marking the floor.

Learner's Book 7: Pages 166-173

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

1. the four inner planets of the solar system
2. the main features of Mercury, Venus, Earth and Mars

Prior Preparation:
Identify a convenient place within or near the school compound where learners can draw a model of the solar system. Prepare or print posters on each of the four inner planets.

Keywords: Terrestrial, Milky Way Galaxy, elliptical, inner planets, nickel

INTRODUCTION

The four inner planets are called terrestrial planets because their surfaces are solid. The term however can be misleading because each of the four planets has vastly different environments. Some are made up mostly of heavy metals such as iron and nickel, and have either no moons or few moons. Below are brief descriptions of each of these planets.

Additional Information

The planets Mercury, Venus, Earth, and Mars, are called terrestrial because they have a compact, rocky surfaces. The terrestrial planets are the four innermost planets in the solar system. None of the terrestrial planets have rings. Among the terrestrials, only Earth has a substantial planetary magnetic field.

Of the terrestrial planets, Venus, Earth, and Mars have significant atmospheres. The gases present in a planetary atmosphere are related to a planet's size, mass, temperature, how the planet was formed, and whether life is present.

The presence of life on Earth causes oxygen to be abundant in the atmosphere, and in this Earth is unique in our solar system. Without life, most of the oxygen would soon become part of the compounds on the planet's surface.

Diagnostic Assessment

- Ask the learners to list the eight planets of the solar system.
- The learners must write the first four planets of the solar system.

Fig. 13 - From left, Mercury, Venus, Earth and Mars.

Activity 1: Identifying The Components of the Solar System

1. Ask the learners to share their previous knowledge about the solar system from primary school.
2. Show them an unlabelled chart of the solar system for learners to identify the parts.
3. Assist the learners to brainstorm to come-out with the meaning of inner planets.

Activity 2: Discussions On Similarities and Differences Between the Inner Planets

1. With the aid of the posters, assist learners to know about the main characteristics of Mercury, Venus, Earth and Mars.
2. Through a think-pair-share activity, the learners must write down three things that are common to all the inner planets.
3. Assist the learners to come-out with the differences between the inner planets through a whole class discussion.

Activity 3: Role play the movement of the inner planets around the sun

Steps

1. Assist the learners to undertake the activity below on a convenient place around the school:
2. Draw a small circle on the floor
3. Draw four bigger circles around the smaller one
4. Place a chair at the centre of the small circle you drew first.
5. The small circle represents the sun
6. One learner should stand on each of the four bigger circles, representing Mercury, Venus, Earth and Mars respectively.
7. Let the four learner's role play how the four inner planets move in their orbits around the sun.

Activity 4: Design and Construct a Model of the Solar System

Materials Required: Card board, A4 Sheets, pencils, scissors, paper glue

1. Let learners do this activity as a project to be submitted the following week.
2. Draw a sketch of the solar system on a cardboard, showing the sun at the centre.
3. Draw 8 circles around the sun to show the orbits of the eight planets.
4. Draw the shapes of the sun and eight planets on A4 sheets.
5. Carefully cut-out each shape with the scissors.
6. Colour the shapes beautifully, using a different colour for each body.
7. Fix the sun and the planets at the right position on the cardboard, with the aid of the glue.

Skills and Competences: observing, analysing, evaluating, recording, communication and collaborative, critical thinking and problem solving, cultural identity and global citizenship

Progressive Assessment

Learners must write down two (2) differences between the inner planets.

Main Points of the Lesson

- The inner planets consist of Mercury, Venus, Earth and Mars.
- The inner planets are the four closest planets to the sun and are all solid.
- A group of stars is called a galaxy.
- Our sun is part of a galaxy called the Milky Way galaxy.

Reflection

The key focus of the lesson is the ability of learners to distinguish between the inner planets and the outer planets. With the aid of questions, find out whether learners know the characteristics common to all inner planets. If the answer is no, repeat the lesson, stressing on differences between the inner and outer planets as well as the commonalities of all inner planets.

ANSWERS TO QUESTIONS IN LEARNER'S BOOK.

Objectives

1. C
2. B
3. B
4. B
5. B
6. C
7. A
8. B
9. C
10. A
11. A
12. B
13. C
14. B
15. B
16. C

Answers to Practical Question

i. A - Mercury
   B - Venus
   C - Earth
   D - Mars

ii. C - Earth

iii. D - Mars

iv. A - Mercury

v. B - Venus

vi. B - Venus

Answers to Essay Type Questions

1. Refer to Learner's Book 7 page 166.
2. Refer to Learner's Book 7 page 166.
3. Refer to Learner's Book 7 pages 167-168.
4. Refer to Learner's Book 7 pages 167-168.
5. Refer to Learner's Book 7 page 167.
6. Refer to Learner's Book 7 page 166.

ICT: Direct learners to watch the video on the inner planets, using the link below: https://www.youtube.com/watch?v=joq-IUFNkrw

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

Indicator: B7.3.2.1.2 Discuss the properties and the relative motions of the planets Mercury and Venus.

LESSON 2: THE PROPERTIES AND RELATIVE MOTIONS OF MERCURY AND VENUS

Teaching and Learning Resources:

- posters on Mercury and Venus

Learner's Book 7: Pages 174-181

Learners Expectations:
By the end of the lesson, the learner will:

1. outline properties peculiar to each of the planets Mercury and Venus.
2. describe the movement of the planets Mercury and Venus around the Sun.

Prior Preparation:
Make sure you have prepared a detailed poster on mercury and venue focusing on their size, length of day, length of year, surface temperature, movement around the sun.

Keywords: rotation, orbit, elliptical, clockwise, axis

INTRODUCTION

When you look into the sky just before sunrise or right after sunset, you may see a bright object in the sky. That is actually the planet Venus. Venus and Mercury are the next brightest objects you see in the sky after the sun and moon. But how long does it take for a day to be formed on each of them? Let us learn more about the first two planets in the solar system.

Additional Information

Venus and Mercury are the two planets that orbit closest to the Sun. Mercury orbits at an average distance of 58 million km, while Venus orbits at a distance of 108 million km. Mercury takes 88 Earth days to complete an orbit, and Venus takes 225 days to orbit the Earth.

And as you'd probably guess, Venus and Mercury are the two hottest planets in the Solar System, but not in the order that you'd think. Even though Mercury orbits closer to the Sun than Venus, it lacks an atmosphere. The side facing the Sun is baked, with a temperature of 425 degrees Celsius, the side facing away from the Sun cools down to -193 degrees Celsius. Venus, on the other hand, has an incredibly thick atmosphere and traps the heat from the Sun. No matter where you go on the planet, the temperature on the surface of Venus is always 462 degrees Celsius.

The composition of Venus and Mercury is similar, they're both terrestrial planets made of rock and metal. Mercury is denser than Venus and is thought to consist of 60-70% metal, with the rest rock.

As mentioned above, Mercury lacks an atmosphere, while Venus has the thickest atmosphere of all the terrestrial planets. The temperatures and pressures are so extreme on the surface of Venus that spacecraft only last a few hours before being crushed and baked.

Diagnostic Assessment

- Let learners mention the first two planets in the solar system and talk about some of their features.

Fig. 14 - Solar system showing sun, mercury and venus

Activity 1: Comparing Mercury and Venus

1. Show learners the posters on Mercury and Venus
2. Ask them to work in groups of 5 to identify the similarities between the two planets.
3. Each group must tabulate four differences between the two planets
4. Focus must be placed on their movements around the sun, length of a day, surface temperatures and

Activity 2: Make A Poster On Similarities Between Mercury and Venus

Materials Required: A4 sheet, pencil, poster colours/crayon

1. Guide each learner to undertake the following activity
2. Use a pencil to draw a nice picture of the planets Mercury and Venus on the A4 sheet.
3. Write three common characteristics of the planets on the sheet
4. Colour the poster nicely.

Activity 3: Guiding Learners to Observe Venus in The Sky
Venus is always the third-brightest object in the sky behind the sun and the moon, and it's always brighter than the brightest stars. However, because it orbits relatively close to the sun, it's only ever visible for a short time after sunset or before sunrise.

1. Ask the learners to observe the sky right after sunset or just before sunrise for two or three days.
2. Engage them to share their experiences on the observation of Venus in the sky with the class.

Activity 4: Role Play the Movement of the Planets Venus and Mercury Around the Sun
Guide learners to role-play the movements of the planets Mercury and Venus around the sun through the following steps:

1. Draw a small circle on the floor
2. Draw two bigger circles around the smaller one
3. Place a chair at the centre of the small circle you drew first.
4. The small circle represents the sun
5. One learner should stand on each of the two bigger circles, representing Mercury and Venus respectively.
6. The learner representing Mercury must move in his circle in an anti-clockwise direction around the sun, whilst the one representing Venus spins in a clockwise direction.

Skills and Competences: Observing, analysing, evaluating, recording, communication and collaboration, critical thinking and problem solving, cultural identity and global citizenship

Progressive Assessment

- Let learners tabulate the differences between Mercury and Venus in terms of their size, relative motions around the sun and their surface temperatures.

Diagnostic Assessment
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?
- Was the majority of the class responding as you would expect them to?
- Are 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 below average learners?

Main Points of the Lesson

- The planet Venus is the hottest planet in the solar system.
- Mercury is the closest planet to the sun.
- Mercury has no moon and takes 88 days to move around the sun.
- It takes Venus 225 days to make one rotation around the sun.

Reflection

By the end of the lesson, it is important for learners to identify differences between Mercury and Venus in terms of their size, relative motion around the sun, surface temperature etc. With the aid of oral questions and written assessments, find-out whether this outcome has been achieved.

ANSWERS TO QUESTIONS IN LEARNER'S BOOK.

1. D
2. C
3. A
4. A
5. C
6. D
7. A
8. A
9. D
10. A
11. C
12. A
13. D

Answers to Practical Questions

1. ▪ 1 represents the planet Mercury
   • 2 represents the planet Venus

2. ▪ Mercury is the closest planet to the sun
   • Venus is the second closest planet to the sun

3. Refer to textbook for similarities between Mercury and Venus

4. Refer to textbook for differences between Mercury and Venus

5. Mercury

6. Venus

ICT: Direct learners to watch the video on Venus and Mercury from the following link:

- https://www.youtube.com/watch?v=sU9NQTaUR90

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

3 Sub-Strand 3: The Ecosystem

CONTENT STANDARD: B7.3.3.1 Recognise the components of and interdependences in an ecosystem, and appreciate their interactions.

Indicator: B7.3.3.1.1 Analyse the components of ecosystems and identify the interactions within.

LESSON: COMPONENTS OF AN ECOSYSTEM

Teaching and Learning Resources:

- video or charts on different ecosystems

Learner's Book 7: Pages 182-194

Learners Expectations:
By the end of the lesson, the learner will:

1. group ecosystems into terrestrial, aquatic and arboreal categories and talk about the interactions within them.

Prior Preparation
Task learners to identify common plants and animals around the community, where they live and where they get their food from.

Keywords: Arboreal, aquatic, terrestrial, abiotic, biotic

INTRODUCTION

In primary school, we learnt about ecosystems. In this lesson we shall focus on the components of ecosystems and identify the interactions therein.

Additional Information
An ecosystem consists of a community of organisms together with their physical environment. Ecosystems can be of different sizes and can be marine, aquatic, or terrestrial. Ecosystems contain biotic or living, parts, as well as abiotic factors, or non-living parts. Biotic factors include plants, animals, and other organisms. Abiotic factors include rocks, temperature, and humidity.

Every factor in an ecosystem depends on every other factor, either directly or indirectly. A change in the temperature of an ecosystem will often affect what plants will grow there, for instance. Animals that depend on plants for food and shelter will have to adapt to the changes, move to another ecosystem, or perish.

Ecosystems can be very large or very small. Tide pools, the ponds left by the ocean as the tide goes out, are complete, tiny ecosystems.
In ecosystems, both matter and energy are conserved. Energy flows through the system—usually from light to heat—while matter is recycled.

Diagnostic Assessment
Engage learners to identify examples of plants and animals in a given locality and how they benefit from each other.

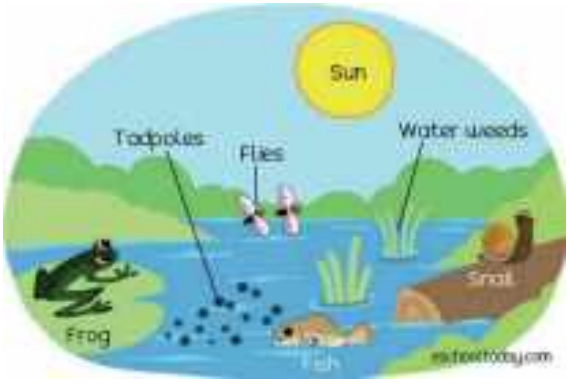


Fig. 15 - Different organisms within an ecosystem

Activity 1: Feedback from Home Task

1. Ask learners to mention the animals and plants around them, where they can be found and the source of food and water for these animals and plants.
2. Ask learners to predict what will happen if there was no source of water for these plants or animals.
3. Let learners brainstorm on what will happen if there were no plants or grass for animals to feed on.
4. Introduce the concept of ecosystem to the learners.

Activity 2: Observing Ecosystems Around the Home and School

1. Embark on a nature walk with learners around the school or community to observe ponds, trees or bushes.
2. Assist learners to observe plants and animals in each of the places visited.
3. Let the learners group what they observed into living and non-living things
4. Discuss with learners how the plants and animals in the ecosystem depend on each other to live successfully
5. Based on the term interdependency, explain to learners the meaning of the terms producers, consumers (primary, secondary and tertiary), decomposers.
6. Engage learners to draw the ecosystem they observed

Activity 3: Identifying The Components of an Ecosystem in a Pond or River

1. Using the think –pair –share approach, let the learners list and discuss the components of different ecosystems in ponds and rivers.
2. Sort the components into biotic and abiotic components
3. Group the biotic components into producers and consumers
4. Identify one omnivore and one herbivore among the consumers

Activity 4: Identifying Adaptation of Specific Organisms from Different Habitats
Materials needed: internet connectivity, fishing nets, collecting jars or containers, reference books, mathematical sets, pencils and pens

Procedure:

1. Show a short video on the various types of ecosystem.
2. In groups learners should use the internet to find the names of some organisms. This should be limited to those that they can find in their locality.
3. Learners should collect samples of organisms and bring them to the classroom.
4. Learners should identify each of the sample organisms, draw its features and identify the functions of the parts with emphasis on how those parts enable it to live in its habitat.
5. Ask the learners to place their findings in an album for assessment.

Activity 2: Creating Food Chain Links
Materials needed: Cardboards, white board markers, rulers, and scissors

Steps

1. In groups, learners select four organisms from each of the types of ecosystem and prepare flash cards with the selection using the manila card.
2. Ask the learners to cut enough arrows to present a food chain link clearly identifying producers, primary consumers, secondary and tertiary consumers.
3. Ask a member from the group to remove one of the links. Example the primary consumer.
4. The other members should discuss what would happen as that member is removed from the food chain.
5. Members should discuss the importance of maintaining the links/bonds.

Skills and Competences: observing, analysing, evaluating, recording, communication and collaboration, critical thinking and problem solving, cultural identity and global citizenship.

Progressive Assessment

- Ask the learners to explain the role of producers, consumers and decomposers in an ecosystem.
- The learners must be able to identify biotic and abiotic factors in any given ecosystem.

Main Points of the Lesson

1. An ecosystem is made up of a group of living organisms interacting with each other and their environment to form a stable unit.
2. There are two main components of an ecosystem, namely biotic component and abiotic components.
3. The biotic components are the living things mainly plants, animals, decomposers and some other microorganisms.
4. The abiotic components are the non-living part of the ecosystem such as soil, water, rocks and sunlight.
5. The living things in an ecosystem can be classified under producers, consumers and decomposers.

Reflection

Many learners face difficulties understanding the concept of ecosystems. Identify any aspects of the lesson which were not well understood and give further explanations.

ANSWERS TO QUESTIONS IN LEARNER'S BOOK.

Objectives

1. D
2. B
3. A
4. C
5. D
6. C
7. D
8. D
9. B
10. C
11. C
12. B
13. B
14. B

Answers to Practical Questions

1. i. Aquatic ecosystem
   ii. It is an aquatic ecosystem because it is based in water.
   iii. The plankton or green plant
   iv. Fish or snails
   v. Green plant $\longrightarrow$ Fish $\longrightarrow$ bird
   vi. Biotic: phytoplankton, frog, snail
   Abiotic: water, soil, sunlight.

2. i. Biotic - rodents, sheep
   Abiotic - rain, sunlight
   ii. Squirrel, bird
   iii. Refer to Learner's Book 7 pages 182.
   iv. Herbivores: Squirrel, antelope, tortoise
   Omnivore: Wild cat
   v. The tree

Answers to Essay Type Questions

1. Refer to Learner's Book 7 page 185.
2. Refer to Learner's Book 7 page 185.
3. Refer to Learner's Book 7 pages 182-183.
4. Refer to Learner's Book 7 pages 182-183.
5. Refer to Learner's Book 7 pages 182-183.

ICT: Ask learners to watch the video on the ecosystem from the following link:

- https://www.youtube.com/watch?v=sKJoXdrOT70

Inclusivity: Place learners into mixed ability groups during the activities on the ecosystem. Avoid bias based on background or abilities of learners.

3 Sub-Strand 4: Farming Systems

CONTENT STANDARD: B7.3.4.1 Demonstrate an understanding of the differences among the various farming systems: Land Rotation, Crop Rotation, Mixed Cropping, Mixed Farming, and Organic Farming.

Indicator: B7.3.4.1.1 Examine and discuss the differences among the various farming systems.

LESSON 1: EXAMINE AND DISCUSS THE DIFFERENCES AMONG THE VARIOUS FARMING SYSTEMS.

Teaching and Learning Resources:

- charts on various farming systems

Learner's Book 7: Pages 195-203

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

1. outline the different farming systems in Ghana.
2. compare and contrast the characteristics of different farming systems.

Prior Preparation:

- Take learners on a trip to nearby farms, backyard gardens and poultry farming.

Keywords: Farming system, shifting cultivation, mono-cropping, crop rotation, ecological farming

INTRODUCTION
Farmers use different methods of farming to cultivate crops and raise or rear animals. The selection of a particular farming method in an area depends on several factors. The methods of farming that is practised in your community falls under these farming systems that we will learn about.

Additional Information
Farming systems are the ways 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 source of water

- Availability of ready markets
- Access to capital

Availability of farming equipment such as tractors and combine harvesters
Access to agricultural extension officers to help in farm management
The different systems of farming can be classified under two main forms, namely subsistence farming and commercial farming. Common farming systems include mixed cropping, mixed farming, pastoral farming, crop rotation, monoculture, mono-cropping, cash crop farming, intensive farming and extensive farming.

Diagnostic Assessment

- Learners must talk about how crops are grown and animals are reared within the community.
- They must give reasons why farming is done in that manner within the community.

Activity 1: Review of How Farming Is Done Within the Community

1. Ask learners to share their experiences on the animals that are reared and the crops that are grown in the home or community.
2. Ask the learners to find out whether only one kind of crop is grown or different crops are grown together, or plants and animals are kept on the same farm at the same time etc.
3. Based on their responses, explain the term farming system.

Activity 2: Identifying Common Farming Systems in The Community

1. Explain the various farming systems
2. Ask the learners to work in groups of four to identify 2 or 3 different farming systems which are being practised in the community.

Activity 3: Field Trip to a Nearby Farm

1. Take learners on a visit to the school farm or any nearby farm
2. Assist them to write the names of the crops they see on the farm.
3. In pairs, learners must place the crops into two groups [deep-rooted and shallow –rooted crops.
4. Ask the learners to find out which crops need a lot of nutrients and those that need less plant nutrients to grow well.
5. Ask the learners to make use of the crops grown in the farm to draw up a three-year crop rotation programme.

Skills and Competences: Observing, analysing, evaluating, recording, communication and collaboration, critical thinking and problem solving, cultural identity and global citizenship activity.

Progressive Assessment
Ask the learners to work in pairs to place the farming systems practiced within the community under the various farming systems learnt in the lesson.

Main Points of the Lesson

- A system of farming refers to the different methods through which humans plant crops or rear animals or both.
- Common systems of farming include mixed farming, mixed cropping, crop rotation and land rotation.
- Each farming system has some characteristics or principles that make it unique from others.

Reflection
Through questioning, find-out which aspects of the lesson on farming systems were not understood and provide further explanations.

ANSWERS TO QUESTIONS IN LEARNER'S BOOK.

Objectives

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

Answers to Essay Type Questions

1. Refer to Learner's Book 7 page 195.
2. Refer to Learner's Book 7 page 195.
3. Refer to Learner's Book 7 pages 195-196.
4. Refer to Learner's Book 7 page 195.
5. Refer to Learner's Book 7 page 195.
6. Refer to Learner's Book 7 pages 195-197.
7. Refer to Learner's Book 7 page 195.

Answers to Practical Questions

Four Year Crop-Rotational Programme

1. i. A: beans;
   B: millet;
   C: Yam;
   D: Carrot;
   E: beans
   F: Millet

   ii. Refer to learner's textbook pages 188 for principles to be followed in crop rotation.

   iii. Because under crop rotation, deep rooted crops must follow shallow rooted crops. Or under crop rotation crops that require much nutrient must be followed by crops that require less nutrient.

   iv. Refer to textbook for benefits of leguminous cover crops in a crop rotation programme.

   v. To help the crop regain its nutrient.

   vi. Refer to textbook for disadvantages of crop rotation.

ICT: Direct learners to watch the video on farming systems from the following link: https://www.youtube.com/watch?v=uiwhI4opqqU

Inclusivity: form mixed ability groups for all activities. Lesson activities must be devoid of gender, ethnic and other biases.

CONTENT STANDARDS: B7.3.4.1 Demonstrate an understanding of the differences among the various farming systems: Land Rotation, Crop Rotation, Mixed Cropping, Mixed Farming, and Organic Farming

Indicator: B7.3.4.1.2 Categorise different farming systems

LESSON 2: USEFULNESS OF DIFFERENT FARMING SYSTEMS

Teaching and Learning Resources:

- model farms describing the various farming systems.
- flash cards containing descriptions of the different farming systems.
- pictures of different types of crops.
- a chart showing different farming system.
- a chart showing the characteristics of different farming system.
- a video clip on different farming systems practiced in Ghana.

Learner's Book 7: pages 204-212

Learning Expectations:
After studying this lesson, the learners will be able to:

1. Classify different descriptions of farming systems under Land Rotation, Crop Rotation, Mixed Cropping, Mixed Farming and Organic Farming.
2. Group farming systems prevailing in their community under Land Rotation, Crop Rotation, Mixed Cropping, Mixed Farming and Organic Farming.

Learning Skills

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

Keywords: Land Rotation, Crop Rotation, Mixed Cropping, Mixed Farming and Organic Farming.

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

INTRODUCTION

We can group farming systems prevailing in their community under Land Rotation, Crop Rotation, Mixed Cropping, Mixed Farming and Organic Farming.

These farming systems have certain characteristics.

Land rotation is a type of farming system whereby the farmer cultivates on a piece of land for some time and leaves it to cultivate on a new land when the old one has lost its fertility.

Crop rotation is a systematic arrangement for growing of two or more crops in an orderly sequence and pattern on the same piece of land over a period of time.

Mixed farming is a system of farming whereby livestock are reared on a farm where crops are cultivated It involves the integration of crop production and rearing of farm animals

Mixed cropping is a type of farming system whereby two or more different crops are grown on the same piece of land at the same time.

Organic farming is a kind of farming system in which natural processes are used to produce food and maintain soil fertility and control pest and weeds

You may visit the following links for more information:

- https://peda.net/kenya/ass/subjects2/agriculture/form-one/ita/methods-of-farming
- https://sari.csir.org.gh/divisions/nrfsrg/

Diagnostic Assessment

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 that are 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?

Main Point of the Lesson

Check prior knowledge by asking the learners to categorise different farming systems: Land Rotation, Crop Rotation, Mixed Cropping, Mixed Farming, and Organic Farming

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

1. What are some of the farming systems practiced by the farmers in your community?

Take feedback from around the room.

Activity 1:
See Page 205 of learner's Books 7
The activities are designed to enable learners categorise different farming systems: Land Rotation, Crop Rotation, Mixed Cropping, Mixed Farming, and Organic Farming.

- Guide learners to carry out the activity 1 in pages 205 of the Learner's Book 7 to observe different farming systems.
- Engage the learners to observe a chart showing different farming systems and their characteristics.
- Show the learners videos on different farming systems in Ghana farming systems in Ghana and elsewhere.

Guide the learners to classify the different farming systems under the following:

- Land rotation
- Crop rotation
- Mixed cropping
- Mixed cropping

ANSWERS TO QUESTIONS IN LEARNER'S BOOK.

Objectives

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

STRAND
4

FORCE AND ENERGY

Unit 1: Energy

CONTENT STANDARD: B7.4.1.1 Demonstrate an understanding of forms of energy and their daily applications.

Indicator: B7.4.1.1.1 Identify the various forms of energy and show how they are related

LESSON 1: FORMS OF ENERGY.

Teaching and Learning Resources:

- cardboards, pencils, markers, ruler

Learner's Book 7: Pages 213-227

Learning Expectation:
By the end of the lesson, the learner will:

1. list forms of energy in terms of Potential, Kinetic, Heat, Sound, Solar, Electrical, Nuclear, Chemical and Light.
2. demonstrate and show by diagrams how Potential Energy (P.E) is related to Kinetic Energy (K.E); (Mechanical Energy= PE+ KE).

Keywords: energy, kinetic energy, potential energy, heat energy, gravitational potential energy, sound energy, nuclear energy, forms of energy, mechanical energy, electrical energy, chemical energy.

INTRODUCTION
The concept of energy is one of the most important topics in science.
In everyday life, we think of energy in terms of fuel for transportation, heating, electricity for lights and appliances and food for consumption. However, these ideas do not really define energy. They merely tell us that fuels are needed to do a job and that those fuels provide us with something we call energy.

Without fuel, a vehicle cannot move unless otherwise pushed. Even that, those who push can also not make any impact if they do not have energy.

Additional Information
Identify the various forms of energy and show how they are related

- Thomas Edison built the first power plant, and in 1882 his Pearl Street Power Station sent electricity to 85 buildings.

- Albert Einstein defined energy as mass multiplied by the speed of light squared, or $E = mc^2$.
- A "watt" is a unit of power that measures the rate of producing or using energy.
- Energy cannot be destroyed or created—only transformed.
- Food contains energy, which is measured in or joules.
- If a person yelled for 8 years, 7 months, and 6 days, he or she would produce enough energy to heat one cup of coffee.

Study the pictures below carefully

Fig. 16 - Forms of Energy

Let learners discuss their observations with a friend or their group members.

Activity 1: Sources of Energy

1. Guide learners to work in groups.
2. Provide the following materials for the learners: Cardboards, pencils, markers, and ruler
3. Engage learners to list various sources of energy and the forms of energy and present them in a table.
4. Guide learners to group all the forms of energy into potential and kinetic energy.
5. Ask the learners to compare and discuss their answers with the class.

Activity 2: Investigating Gravitational Potential Energy

With the help from the learners assemble the following materials needed:
Bricks, palm nuts, two 1.5L plastic water bottles, nails, sticky tape, two tables of different heights, water.

1. Ask the learners to work in pairs and take the two bricks of the same size. One learner should hold one brick in hand while standing and place the other brick on the floor.

Fig. 17 - A boy holding a brick

2. Guide learners to discuss which of the two bricks will better crush a palm nut from its position.

Fig. 18 - Using a brick to crush a nut

3. Ask the learners to write and discuss their observations.
4. Ask the learners to drill a hole of the same size at the bottom of each of the plastic bottles.
5. Let learners cover the hole with a sticky tape and fill the bottle with water to the brim.
6. Let them put all the bottles on a table.
7. Let learners guess which of the bottles will show a greater drop of water when the sticky tape is removed. [Illustration: two plastic bottles (1.5 L) with a hole drilled at the base and filled with water. Put each bottle on a table of different height.]
8. In pairs, let learners remove the sticky tape at the same time and write their observations as the water drops to the floor.

Activity 3: Exploring Kinetic Energy

1. With the help of learners, assemble the following materials:
2. A tennis ball and a football, two bowls/buckets with water half full, a table.
3. Guide the learners to set up the experiment as shown in the illustration

Fig. 19 - Kinetic Energy Setup

4. In groups, let the learners discuss what they think will happen when both balls are released into the bowls of water.
5. Guide learners to release the balls one at a time and write and discuss their observations.

Fig. 20 - Result from pushing balls

Main Points of the Lesson

1. Energy is the ability or capacity to do work.
2. There are several forms of energy including potential, kinetic, chemical, nuclear, mechanical.
3. Potential energy has three major forms namely: gravitational potential energy, elastic potential energy and chemical potential energy
4. There are two major categories of energy. Potential energy and Kinetic energy
5. Mechanical energy is the sum of Potential energy and Kinetic energy

Progressive Assessment

The learners will use the skill they acquired to identify the various forms of energy and show how they are related.

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

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

Answers to Test of Practical

1. i. Mechanical energy
   ii. Potential energy
   iii. Kinetic energy
   iv. Sound energy, kinetic energy, potential energy, heat energy

2. i. As she moves she uses kinetic energy
   ii. Potential and kinetic energy
   iii. Potential energy and kinetic energy
   iv. Potential energy
   v. Because the girl stops at a point before she moves

Answers to Essay Type Questions

1. A. P. E = mgh
   = 100 × 300
   = 30000 J

   B. Refer to leaner's book pages 213-214.

   C. Refer to learner's book pages 215-216.
   P. E + k. E

2. A. Refer to Learner's Book 7 pagess 213 and 215.
   B. Refer to Learner's Book 7 page 213.
   C. Refer to Learner's Book 7 page 213.

ICT/RESEARCH

1. Guide the learners to find from the internet different types of energy.
2. Engage the learners to research and do a group presentation on how potential energy is related to kinetic energy

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

Indicator: B7.4.1.1.2 Explain daily applications of forms of energy.

LESSON 2: DAILY APPLICATIONS OF FORMS OF ENERGY

Teaching and Learning Resources:

- sources of heat, electric iron, water, cooking utensil, Sources of electricity, electric iron, electric fan, battery charger, television set, radio, refrigerator, a room, dark curtains, table and books, flashlight.

Learner's Book 7: Pages 228-237

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

1. discuss how forms of energy are used in daily life.
2. match forms of energy to appliances (gadgets) used daily at school, in the home and the community.
3. explain factors that affect Potential and Kinetic energy in their application in daily life.
4. use mathematical expressions for both Potential energy (P.E = mgh) and Kinetic energy $\left(K.E = \frac{1}{2}mv^2\right)$ and use the expressions to solve problems involving mechanical energy.

Keywords: potential energy, kinetic energy, mechanical energy, heat energy, sound energy, solar energy, electrical energy, nuclear energy, chemical energy and light energy

INTRODUCTION

In the previous lesson, you learnt that energy is the capacity to do work. You also learnt that when applied force moves matter and the matter moves in the direction of the force, work have been done. The two broad categories of all forms of energy are potential and kinetic energy. In this lesson, you will learn to explain the application of the various forms of energy in everyday life.
Look at the pictures below.
Think about them, pair with a partner and discuss, then share your views with the whole class.

Fig. 21 - Application of some forms of energy

Additional Information

We use energy every day—to move, talk, cook, and create music, light or heat. Energy use in the schools include heating, cooling and lighting of the school buildings, laboratories, libraries, power used for computers, fax machines, copiers just to name but a few.

Mechanical energy also known as motion energy, is how an object moves based on its position and motion. If an object is moving, it is using mechanical energy. Mechanical energy is one of the only types of energy that is easy to see. If something is moving, it is using mechanical energy!

Activity 1: Use of Forms of Energy at Home

Let learners help you to get the following materials needed; Notebooks, ruler and pen.

1. Ask learners to share ideas on the evidence of forms of energy in their homes.
2. Let them write examples for each of the categories.
   a. Sound energy _____
   b. Chemical energy _____
   c. Radiant (light) energy _____
   d. Electrical energy _____
   e. Mechanical energy _____
   f. Thermal (heat) energy _____
3. Let them present their answers to the class for discussion.

Activity 2: Uses of Energy at School and in The Community

Ask learners to help you to get the following materials needed; Notebooks, ruler and pen

1. Take the learners on a nature walk in the school community.
2. Let them look around for evidence of various forms of energy.
3. Guide them to write examples for each of the categories.
   a. Sound energy _____
   b. Chemical energy _____
   c. Radiant (light) energy _____
   d. Electrical energy _____
   e. Mechanical energy _____
   f. Thermal (heat) energy _____
4. Let them present their answers to the class for discussion

Main Points of the Lesson

- The various forms of energy are applied in our daily activities like cooking, exercising, sweeping etc.
- Appliances such as the television set is associated with light energy, electrical energy, sound energy and thermal energy. Fan is associated with electrical energy. Blender is associated to electrical and mechanical energy. Microphone is associated with sound and electrical energy, etc.
- Factors affecting potential energy are mass and height.
- Factors affecting kinetic energy are mass and velocity
- Total mechanical energy is the sum of potential energy and kinetic energy

Progressive Assessment

- The learners will use the skills they acquired to demonstrate the applications of different forms of energy.

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

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

Answers to Test of Practical

1. Frictional
2. Energy is conserved

Answers to Essay Type Questions

1. a. Refer to Learner's Book 7 pages 228.
   b. Refer to Learner's Book 7 pages 228.
   c. Refer to Learner's Book 7 pages 228.
2. Refer to Learner's Book 7 pages 228-229.

ICT/RESEARCH

1. Guide the learners to use search engine to investigate the demonstration of the use of heat energy and solar energy.
2. Engage the learners to assemble materials such as solar panels and sources of heat to demonstrate the use of heat energy and solar energy as an exhibition in the school

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

CONTENT STANDARD: B7.4.1.2 Demonstrate an understanding of the concept of heat transfer and its applications in life.

Indicator: B7.4.1.2.1 Explain and demonstrate how heat is transferred in various media.

LESSON 3: HOW HEAT IS TRANSFERED IN VARIOUS MEDIA

Teaching and Learning Resources:

- candle sticks, Bunsen burners/source of heat, hot water, steel rod (about 20 cm); metal spoons, glass rods, drinking straws, a beaker, water, tripod stands, crystals of potassium permanganate or copper sulphate (or blue ink), a candle in a holder, metal spoon or metal rods, matches.

Learner's Book 7: Pages 238-247

Learning Expectation:
By the end of the lesson, the learner will:

1. explain how heat is transferred through different media (gas, plastic, metal, liquid).
2. carry out an activity to show how heat is transferred through different media.

Keywords: thermal energy, temperature, conductor, insulator, convection, radiation, fluid

INTRODUCTION

Heat describes something that feels warm. However, in science heat is the flow of energy between two bodies due to temperature difference. This can take the form of transferring energy from a hot object to a colder object. More simply put heat (thermal) energy or simply heat, moves from one location to another by particles bouncing into each other. All matter contains heat energy. The more heat energy present in an item or area, the hotter the item or area will be.

Fire as a source of heat

Sun as a source of heat

Fig. 22 - Sources of Heat

Additional Information

The difference between heat and temperature is delicate but very important. Heat refers to the transfer of energy between systems (or bodies), whereas temperature is verified by the energy enclosed within a singular system (or body). In other words, heat is energy, while temperature is a measure of how hot or cold something is. Adding heat will increase a body's temperature while removing heat will lower the temperature. Therefore, changes in temperature are the result of the presence of heat, or equally, the lack of heat. A calorimeter is an instrument used to measure heat. A thermometer on the other hand measures temperature. The SI unit for heat is the joule (J). The better the conductor, the more quickly the heat moves. Good conductors are materials that allow heat to pass through them. Metals are good conductors of heat. Bad or poor conductors also called insulators do not allow heat to pass through them. Examples of heat insulators include wood, glass, and paper, wool, rubber, liquids, plastics, cork, Styrofoam, vacuum and the gases especially air.

Activity 1: Investigating Heat Conduction

Provide the following materials for the experiment
Regular latex balloons, A candle, and some water.

Fig. 23 - Regular latex balloons, A candle, and some water.

Let learners work in a group of four but in gender balanced.

1. Guide them to light their candle with a match and then blow up one of your balloons. Not too small or large. The size does not particularly matter for this experiment.
2. Guide them to hold the balloon about three (cm) above the candle flame.
3. Caution them to be sure to keep their fingers out of the way.
4. Let them write their observations.

Fig. 24 - Balloon held about 3 cm above the candle flame

5. Guide them to take their second balloon and fill it halfway full with water at room temperature. Let them hold it over the candle flame.
6. Advise them to let the candle flame touch the balloon but watch their hands.
7. Guide them to write their observations.
8. Discuss their observations.

Activity 2: Heat Convection Experiment
Provide the following materials for the experiment

Clear plastic bag or water bottle, drinking straw, washing blue crystals or potassium permanganate, lighted candle or any other heat source.

Procedure:

1. Let learners half fill the plastic bag or bottle with water.
2. Let learners gently drop blue crystals at the bottom of the bag/bottle with the aid of the straw.
3. Let them place directly on flame of candle or any heat source.
4. Let them write your observations and discuss with the class.

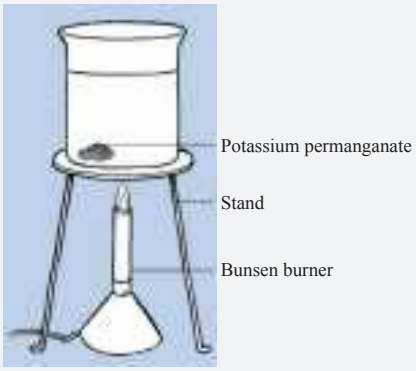


Fig. 25 - Heat Convection Experiment Setup

Activity 3
In groups, let learners study the diagram carefully and discuss their observation and the link between the diagram and the modes of heat transfer.

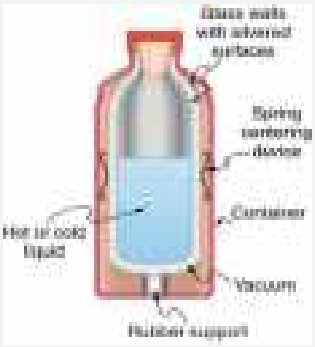


Fig. 26 - Vaccum Flask

Main Points of the Lesson

- Heat is a form of energy, which moves from one place to another due to temperature difference between the two places.
- Heat will always move from the area of high temperature to the area of low temperature.
- Conduction and convection are two of the three modes of heat transfer, which deals with contact with the heat source and a material medium.
- Convection has to do with liquids and gases collectively called fluids as the medium of movement.
- The third mode of heat transfer is through vacuum (empty space) known as radiation.

Progressive Assessment
The learners will the skills acquired to demonstrate the applications of different forms of energy.

Diagnostic Assessment
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.

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

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objective

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

Answers to Practical Questions

1. Thermos flask

2. 1 - Plastic/Cork cover
   2 - Outer Case
   3 - Outer polished wall
   4 - vacuum
   5 - Inner polished wall

3. To keep hot things hot, and cold things cold.
4. Conduction - Use of poor conduction such as cork or plastic.
   Convection - Vacuum
   Conduction - Vacuum

Answers to Essay Type Questions

1. Refer to Learner's Book 7 page 238.
2. Refer to Learner's Book 7 pages 240-243.
3. Refer to Learner's Book 7 page 242.
4. Refer to Learner's Book 7 page 242.

ICT/RESEARCH

1. Let learners use the internet to find more information on heat transfer.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

CONTENT STANDARD: B7.4.1.3 Demonstrate understanding of characteristics of light, such as travelling in a straight line, reflection, refraction and dispersion

Indicator: B7.4.1.3.1 Demonstrate how light travels in a straight line.

LESSON 4: HOW LIGHT TRAVELS IN A STRAIGHT LINE

Teaching and Learning Resources

- Three cardboards A, B and C and make a pinhole at their centres, a burning candle stick or a flashlight.
- Ruler, paper, protractor, ray box or light source that can be made into a single 1 mm wide slit source.
- A transparent rectangular glass prism, ruler, paper, protractor, ray box or light source in the form of a laser pointer, video clip on refraction.
- An equilateral triangular prism, a beam of white light from a ray box.

Learner's Book 7: Pages 248-258

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

1. perform experiments to show that light travels in a straight line and can be reflected and refracted and produce reports, posters or diagrams.
2. perform an experiment to show the dispersion of light into colours.

Keywords: Rays, electromagnetic radiation, wavelength, photons, waves, rectilinear, beam, propagation, bioluminescence, umbra, penumbra

INTRODUCTION

Some children scream in the middle of the night when all of a sudden, there is an electric power cut and all lights go off. All activities come to a halt for some time with people staggering to find their way to a light source. A minute light is enough to bring a huge relief. This lesson focuses on how light travels. Before we begin our discussion observe the pictures below and discuss your observations with the class.

The city of Sydney

Lasers

Stars

Fig. 27 - Sources of Light

Additional Information

Light travels in straight lines primarily due to the fact that light is a wave. However, light can change its path (away from a straight line) when it is incident on certain obstacles. This effect is commonly referred to as diffraction. Since diffraction is very small effect, light is generally assumed to travel in straight line. Light is an essential part of your day. It allows you to see objects, shapes, and colours. In fact, the pupils in your eyes filter in light to help you see everything around you. This is because the light gets blocked. If the light had the ability to curve and travel, we could have seen the light wave. But since light travels in a straight line, we are unable to see the flame of the candle when the CD is displaced. This proves that light travels along a straight line. through an optically transparent medium, light travels in what we would call a straight line because the electrons in the material are at an energy state tuned perfectly to the wavelengths of visible light, so when they absorb photons of visible light, they carry that energy for a unit number of "orbits" around their orbital.

Main Points of the Lesson

- Light travels in a straight line
- A shadow is formed when an opaque object blocks the path of light
- Light bounces back (reflects) when it hits a shiny surface
- There are real images and virtual images
- Images formed by plane mirrors are virtual
- Light bends (refracts) when there is a change in the medium through which it travels
- Optical instruments such as lenses, glasses, telescopes, microscopes are all based on the refraction of light
- Refraction results in the dispersion of white light into its component colours known as the rainbow.

Progressive Assessment

- The learners will acquire the knowledge that light travels in a straight line and that it can be reflected on refracted, and also undergo dispersion.
- Let learners provide answers to questions at the end of the lesson in their exercise books.

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

Activity 1: Sources of Light

1. Let learners group all the sources of light mentioned in the text into luminous and non-luminous bodies with reasons.
2. Let the learners find out about incandescent, bioluminescent, florescent lights with examples from the internet.
3. Let them present their findings to the class.

Activity 2: Demonstrating the Rectilinear Propagation of Light.

Guide learners to help you to assemble the following materials
Lighted candle, two pipe tubes (PVC) of the same length.

Procedure:

1. Guide learners to Take one pipe tube, fill with sand and heat the middle to soften it and bend it into a curve.
2. Guide learners to pour out the sand.
3. Let them now use each tube in turns and look at the candle flame from one end.

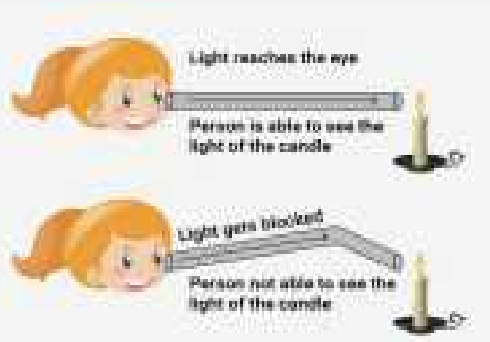


Fig. 28 - Demonstrating the Rectilinear Propagation of Light

4. Engage learners to write and discuss their observations with the class.

Activity 3
Materials needed:
Three pieces of cardboard of the same size, candle, thread, needle or small sized nail.

Procedure

1. Guide learners to make a pinhole in the centre of each cardboard of the same diameter and pass a thread through it.
2. Let them arrange the cardboards with supports so that the holes are in a straight line in front of the lighted candle.
3. Let them observe the flame from the back of the third cardboard whiles pulling the thread tight and write their observations
4. Guide them to shift the middle card slightly out of line and look through the hole again.
5. Discuss with the learners their observations.

Activity 4
See page 242

1. Ask the learners to demonstrate progressive assessment on light.
2. Ask the learners to demonstrate refraction of light.
3. Ask the learners to demonstrate diffraction of light.

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objective

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

Answers to Practical Questions

a. The burning bulb.
b. The observer will not see the light again.
c. The observer will see the light again.
d. Rectilinear propagation of light.
e. Pinhole camera.
f. Eclipse of the moon, shadow formation.

Answers to Essay Type Questions

1. Refer to Learner's Book 7 page 248.
2. Refer to Learner's Book 7 pages 250-252.
3. Refer to Learner's Book 7 pages 248-249.
4. Refer to Learner's Book 7 pages 250-251.
5. Refer to Learner's Book 7 pages 248-245.
6. Refer to Learner's Book 7 pages 245-246.

ICT

Using the internet and working in groups, find out about more about parallel beam, convergent beam and divergent beam. Present your findings on a cardboard for exhibition.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

4 Sub-Strand 2: Electricity and Electronics

CONTENT STANDARD: B7.4.2.1 Demonstrate understanding of forms of electricity, its generation and effects on the environment.

Indicator: B7.4.2.1.1 Describe various forms of electricity generation

LESSON 1: FORMS OF ELECTRICITY GENERATION

Teaching and Learning Resources:

- pictures, charts and video clips of generation of electricity.

Learner's Book 7: Pages 259-265

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

1. search for and discuss information about the nature and generation of thermal and nuclear electricity and produce reports, posters, diagrams and charts about your findings.

Keywords: electrical energy, electrolyte, electric fields, potential energy, electricity, geothermal, nuclear, nuclide, protons, electrons, neutrons, fission.

INTRODUCTION

In our previous lesson we learnt that energy is the ability to do work. We looked at various forms of energy and mentioned electrical energy as energy due to the flow of electrons. In this lesson we shall describe various forms of electricity generation.

Additional Information

We learnt about various forms of energy and mentioned electrical energy as energy due to the flow of electrons.

Electricity is commonly used in our daily lives for so many things. It is derived from Electrical energy. It is often discovered as energy that is stored in charged particles within an electric field. Charged particles carry either positive or negative charges. In an atom, electrons carry negative charges while protons carry positive charges.

Fig. 29 - Generating Electricity using potatoes

Main Points of the Lesson

- There are many ways of generating electricity, which includes the use of thermal power, geothermal and nuclear power.
- Geothermal power exploits heat from the core of the Earth.
- By splitting atomic nucleus to form two nuclei, a very large energy is released which is used to heat water to steam and used to generate electricity in nuclear reactors. This is known as nuclear power.
- Water, wind and chemical sources are also used to generate electricity.

Activity 1: Generating Electricity

1. Encourage group work among the learners
2. Ask the learners to gather the following materials: Wood ash, salt, potatoes, cassava, lemon, tomatoes, vinegar, baking soda, iron nails, copper wires, aluminium roofing sheets, disposable cups and plastic water bottles, connecting wires, LED/bulb and Multimeter.

Procedure

1. Ask the learners to study the diagram below carefully. They shall connect the circuit using the lemon and write their observations.

Fig. 30 - Generating Electricity using lemon

2. Ask the learners to remove the LED/ bulb and connect the probes of the multimeter and read the voltage across the lemon. Ask them to record their observations.

Fig. 31 - Reading voltage across a lemon

3. Ask the learners to compare their observations in steps one and two.
4. Let them remove the probes and add two more lemons and reconnect the probes of the multimeter.
5. Let the learners record the voltage and replace the multimeter with the LED/bulb.
6. Guide the learners to record the new observations.

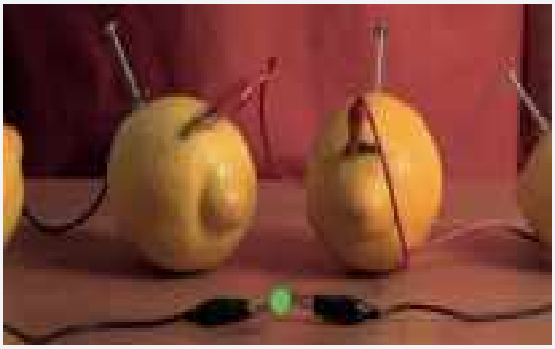


Fig. 32 - LED switched on

7. Let the learners repeat steps 1, 2 and 3 with all the selected fruits and food stuffs.
8. Guide the learners to prepare solutions of wood ash, table salt and baking soda. Pour 100ml samples of each in clearly labelled disposable cups.
9. Let them add a fourth cup containing vinegar.
10. Guide the learners to place an iron nail and a copper wire in each cup.
11. Let them make sure that the iron nail and copper wire never touch.
12. Guide them to attach the probes of the multimeter and read the voltage generated by each of the solutions and record the results.

13. Ask the learners: Is the voltage recorded by each enough to light an LED?
14. Discuss the learners' observations with them.
15. Guide the learners to add more cups and connect them in series.
16. Guide them to read and record the voltage generated by your batteries.
17. Let the learners note the differences in each of the solutions.

Fig. 33 - Solutions of wood ash, table salt and baking soda

18. Let learners compare the batteries they created in the activity and present their findings in a class science fair.
19. Guide the learners to explore generating electricity from other renewable energy sources and present your findings in the school science fair.

Progressive Assessment
Can learners use the knowledge of the lesson to distinguish nuclear energy from thermal energy?

Diagnostic Assessment
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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

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

Answers to Essay Type Questions

1. Refer to Learner's Book 7 page 261.
2. Refer to Learner's Book 7 pages 259-261.
3. Refer to Learner's Book 7 pages 260-261.
4. Refer to Learner's Book 7 page 262.
5. Refer to Learner's Book 7 pages 259-261
6. Refer to Learner's Book 7 page 260-264.

Answers to Practical Questions

i. A - Nuclear Reactor
   B - Hydroelectric powwer
   C - Thermal Power

ii. They are plants in which electricity is generated.

iii. They produce CO_2 which is a greenhouse gas which causes global warming and climate change.
   They degrade the environment.
   Falls as acid rain.

iv. Adapting proper waste disposal practice.
   Use environmentally friendly ways of generating electricity.

ICT/RESEARCH

- Guide the learners to find from the internet (www.kids science) generation of electricity.
- Engage the learners to make a model of a thermal power plant.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

LESSON 2: THE IMPACT OF ELECTRICITY GENERATION ON THE ENVIRONMENT

Teaching and Learning Resources:

- video clips on the effects of electricity generation from nuclear plant, and thermal power station

Learner's Book 7: Pages 266-260

Learning Expectations:
By the end of the lesson, the learner will:
Guide learners to:

1. debate the negative effects of both thermal and nuclear electricity generation on the environment and how to reduce the effects. Create posters leaflets of the outcome of the debate

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

Keywords: thermal, nuclear, fossil fuel, greenhouse, nuclear

INTRODUCTION

In the previous lesson, we learnt that thermal energy and nuclear energy are clean and efficient sources of energy that are used to generate electricity. In this lesson we will learn to describe the negative effects of both thermal and nuclear electricity generation on the environment and how to reduce the effects.

Additional Information

Largely, with the building of power plants, and their successive processes, the habitats that do remain are altered in a negative way and the discharges from the power plant can have a significant impact on the local ecosystem. From a worldwide viewpoint, many greenhouse gases are now released into the atmosphere and have become a major man-made contributor of climate change and global warming. Also regular exposure to the high noise levels emanating from power plants from the usage of equipment like boilers, turbines and crushers, affect people working in the plants. The land size required to build a thermal power plant has a major effect on the local habitats before the power plant processes even begin. Many habitats can be destroyed, likewise local ecosystems and local food chains, without even releasing any pollutants.

Main Points of the Lesson

- Both nuclear and thermal power electricity generation has immense benefits to the world as well as some negative effects.

- Some of the negative effects of thermal and nuclear power on the environment are: pollution, destruction of aquatic (water) habitat, destruction of land, destruction of habitats and local ecosystems, emission of greenhouse gases leading to climate change and global warming, respiratory diseases and other health issues for people leaving around the power plants.
- Some ways to reduce the negative effects on the environment include: adopting proper waste disposal strategies, intensifying rules on safety and adopting better environmentally friendly technologies.

Group Activity

1. Ask the learners to carry out the activity as outlined in page 260 of the learner's book to investigate the effect of electricity generation on the environment.
2. Engage the learners to use a search engine to watch a video on the effect of electricity generation on the environment.
3. Engage the learners to discuss the effects of electricity generation from various sources.
4. Engage the learners to carry out activity as outlined in page xxx of the learner's book to debate on the Pros and Cons of thermal power generation of electricity.
5. Engage the learners to carry out the activity as outlined on page xxx of the learner's book to debate on the pros and cons of the generation of electricity from nuclear power.

Progressive Assessment

Use group discussion to help learners retain what they have learnt about the effect of generation of electricity on the environment.

Can learners use the knowledge of the lesson to distinguish nuclear energy from thermal energy?

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Is there any mean 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

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

ICT/RESEARCH

Ask the learners to create posters and leaflets on the environmental impact of electricity generation from nuclear power station.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

CONTENT STANDARD: B7.4.2.2 Demonstrate knowledge of how to assemble and explain the functions of basic electronic components and their interdependence in an electronic circuit.

Indicators:
B7.4.2.2.1 Demonstrate how to assemble basic electronic components in an electronic circuit.

LESSON 3: ASSEMBLING BASIC ELECTRONIC COMPONENTS IN AN ELECTRONIC CIRCUIT

Teaching and Learning Resources:

- samples of resistors, P-N junction diodes, light emitting diodes, capacitors, inductors, discarded radio set, television set electronic board, and energy saving bulbs.

Learner's Book 7: Pages 271-274

Learning Expectation:
By the end of the lesson, the learner will:

1. examine electronic components such as types of LEDs, P-N Junction diodes, colour code resistors and capacitors, and arrange them in an electronic circuit.

Keywords: Light Emitting Diode, P-N Junction diodes, resistors, capacitors, conductors, insulators, resistance, capacitance

INTRODUCTION

Today electronics is used to do things that are unimaginable. Some of the basic things that involve the application of electronics may include; microphones, loud speakers, flashlights, television sets, remote controls, radios, mobile phones, and computers. In this lesson we are going to assemble basic electronic components in an electronic circuit.

Fig. 34 - Electronic circuit boards

Additional Information
A diode is forward bias when the positive lead of the diode is connected to the positive terminal

of the battery and negative lead of the diode is connected to the negative terminal of the battery. This allows current to flow through the circuit. A reverse bias however is when the positive lead of the diode is connected to the negative terminal of a battery and the negative lead of the diode is connected to the positive terminal of the battery. Capacitors are widely used in electronic circuits for blocking direct current while allowing alternating current to pass. The difference between a capacitor and a battery is that a capacitor can dump its entire charge in a tiny fraction of a second, whereas a battery would take some time to completely discharge. That's why the electronic flash on a camera uses a capacitor.

Activity 1: Lighting a Led

With the help of the learners assemble the following materials: Different colours of LED, battery (two 1.5V dry cells), 9.0V battery, connecting wires

Procedure:

1. Guide the learners to connect one dry cell to one LED as shown below.
2. Let learners write and discuss their observation.

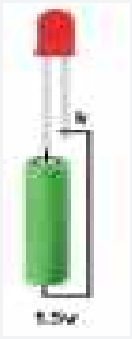


Fig. 35 - Connection of one dry cell to one LED

3. Guide the learners to remove the LED and reconnect with the short lead to the positive side of the dry cell and the long lead to the negative side of the LED.
4. Let learners note their observation.
5. Guide the learners in their groups to add one dry cell to the circuit and connect.
6. Let them discuss their observations and state the total voltage applied across the LED.

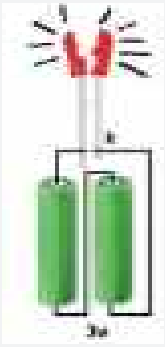


Fig. 36 - Connection of two dry cells to one LED

7. Let them repeat step 2 above and discuss their observations.
8. Let them repeat step 2 above and discuss their observations.
9. Let them replace the 1.5V dry cells with a 9.0V battery and discuss their observations after 2 minutes.
10. Let learners replace the LED with another one and observe again within the same time as the first.
11. Discuss observations made by learners with them.

Activity 2: Biasing Diodes

Materials needed: p-n junction diodes, LED, 2 (1.5V) dry cells, connecting wires.

Procedure:

1. Guide the learners connect the circuit as shown and state their observations.

Fig. 37 - Reverse bias connection

2. Guide the learners connect the circuit as shown below and discuss their observations.

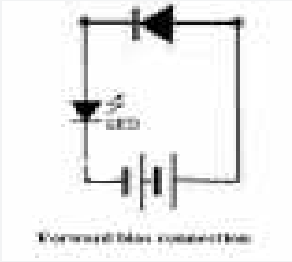


Fig. 38 - Forward bias connection

3. Let learners compare the two circuits and discuss their observations.

Activity 3: Investigating The Action of Resistors in a Dc Circuit
Materials needed: 3.0V battery, 4 resistors (100Ω, 470 Ω, 1000 Ω, 10 000 Ω), connecting wires, LED

Procedure:

1. Let learners work in groups of four.
2. First, guide the learners to connect the battery and LED with connecting wires in series as shown below and note their observations.

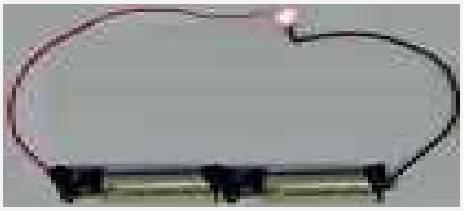


Fig. 39 - Circuit connection in series

3. Guide the learners to connect the circuit with the 100 Ω resistor as shown below. Write your observations.

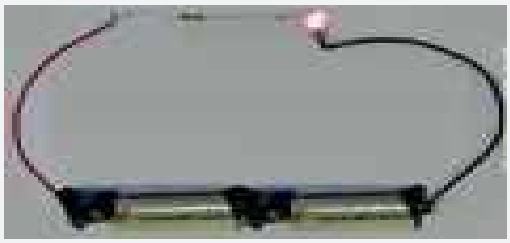


Fig. 40 - Series circuit connected with a 100 Ω resistor

4. Guide the learners to replace the resistor with the 470 Ω, resistor.
5. Guide them to close the circuit and write your observations.
6. Guide the learners to replace the 470 Ω resistor with 1000 Ω, and 10 000 Ω, resistors respectively and record their observations in each case.
7. Let the learners use their observations to state the conclusion on the action of resistors in circuits.

Activity 4: Investigating The Action of Capacitors in a Dc Circuit
Materials needed: connecting wires, LED, capacitors (10uF, 100uF, and 1000uF), 470 Ω, 560 Ω, 1000 Ω and 2200 Ω resistors, 3.0V battery

Procedure:

1. Guide learners to connect the circuit as shown below with the smaller resistor and capacitor.
2. Let the learners discuss their observations after three minutes.

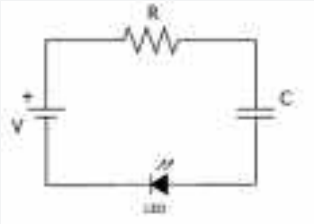


Fig. 41 - Circuit with a small resistor and capacitor

3. Guide the learners to remove the battery and the resistor from the circuit, reverse the capacitor and reconnect them carefully to the LED. Let them write your observations.

4. Guide the learners to repeat the procedure without a resistor and note their observations.
5. Guide the learners to repeat the procedure with the other values of resistors and capacitors. Let them record their observations in each case.
6. Discuss the learner's observations in all cases.

Activity 5: Investigating Inductors in a Dc Circuit
Materials: 9.0V battery, LED, 560 Ω and 1000Ω resistors, connecting wires, coil (inductor), switch

Procedure

1. Guide the learners to connect the 9.0V battery to an inductor, 560 Ω resistor and an LED in series as shown in the diagram.

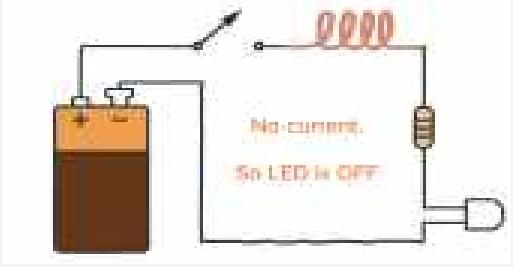


Fig. 42 - Circuit with a 9.0V battery, inductor, 560 Ω resistor and LED in series

2. Guide the learners to close the circuit by turning on the switch and turn it off after three minutes and note the observations
3. Guide the learners to repeat the step two several times and take note of the observations in each case.
4. Guide the learners to replace the resistor with the 1000 Ω and continue the process of turning on and off the switch and take note of the observations.
5. Ask the groups to discuss their observations and state their conclusions

Main Points of the Lesson

1. Most of the devices we use are based on electronics. Examples are; flashlights, television sets, microphones, loud speakers, and remote controls.
2. Light emitting diode, capacitor, inductors, P-N Junction diode and resistors are examples of basic electronic components.
3. Resistors control the flow of current in the circuit.
4. Diodes allow electric current to flow through them in only one direction.

5. Capacitors store electric charges temporarily.
6. Inductors control circuits by resisting changes in the current flowing through the circuit.

Progressive Assessment

1. Use group discussion to help learners retain what they have learnt about the basic components of electronic circuits.
2. Can learners use the knowledge of the lesson to distinguish nuclear energy from thermal energy?

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

1. A
2. A
3. A
4. A
5. C
6. A
7. A
8. B
9. C
10. A
11. A
12. B
13. D
14. B
15. C
16. C
17. C

Test of Practical

1. A - Resistor
   B - Diode
   C - Light emitting diodes
   D - Capacitor

   i. A Resistor controls flow of current in a circuit
   Diodes allow flow of current in one direction only in a circuit
   A Light emitting diode gives off light when current flows through it
   A Capacitor stores electric charges

2. Battery, Resistor, P-N Junction diode
   i. It is reverse biased. Because the negative terminal of the battery is connected to he p-type diode.
   ii. There will be no light produced.

3. i. I - Switch
      II - p-n junction diode
      III - Light emitting diode
      IV - Resistor
      V - Inductor

   ii. III - converts electric current into light.
      V - stores a magnetic field.

   iii. The light emitting diode will light up

   iv. 

   v. The light emitting diode will light up.

4. a. It will light up.
   b. Forward bias
   c. It will not light up.
   d. Reverse bias
   e. To allow current to flow in one direction.

Answers to Essay Type Questions

1. Refer to Learner's Book 7 pages 272.
2. Refer to Learner's Book 7 page 271.
3. Refer to Learner's Book 7 page 271.

ICT/ RESEARCH

Engage the learners to assemble some basic electronic components from a discarded radio or television sets.

1. Ask the learners to build simple electronic circuits involving batteries, switches, and LEDs.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

Indicator: B7.4.2.2.2 Discuss the function of each electronic component and their interdependence with each other.

LESSON 4: THE FUNCTIONS OF EACH ELECTRONIC COMPONENT AND THEIR INTERDEPENDENCE WITH EACH OTHER

Teaching and Learning Resources:

- samples of resistors, P-N junction diodes, light emitting diodes, capacitors, inductors, discarded radio set, television set electronic board, and energy saving bulbs.

Learner's Book 7: Pages 275-289

Learning Expectation:
By the end of the lesson, the learner will:

1. resistors regulate the flow of electric current in the circuit.
2. there are fixed resistors and variable resistors.
3. capacitors are components that store electric charges temporarily. they are used to remove noise from circuits
4. p-n junction diodes are two terminal semiconductor components that allow electric current to flow through them in only one direction.
5. light emitting diodes convert electrical energy to light energy and allow electric current to flow through them in only one direction.

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

Keywords: Light Emitting Diode (LEDs), P-N Junction diodes, colour code resistors and capacitors.

INTRODUCTION

The learners in their previous lesson learnt how to assemble basic electronic components in electronic circuits. In this lesson, discuss with the learners the functions of each of the electronic components and their interdependence with each other. Ask the learners to look at the electronic components shown in their book on page xxx. Ask them to identify the components and discuss their functions with your peers.

Additional Information
When building electronic circuits, you will work with a number of basic electronic components, including resistors, capacitors, diodes, transistors, inductors and integrated circuits. Below is a brief overview of the components and their functions.

Fig. 43 - Basic Electronic Components for Circuit Designing

Resistors: A resistor is one of the components you will come across in an integrated circuit. Like the name suggests, the device resists the flow of current. Resistors are graded based on their power ratings (amount of power they can handle without exploding) and resistance values (capacity to resist current). The measurement is done in units know as ohms. The electronic symbol of the unit is O.

Capacitors: These components can store electric charge temporarily. The components come in different varieties, with the most common ones being electrolytic and ceramic disk. The capacity of a component is usually measured in microfarads (ÂµF).

Diodes: Diodes allow electric current to flow in a single direction only. Each diode has two terminals known as the anode and cathode. When the anode is charged with positive voltage and the cathode with a negative one, electric current can flow. Reversing these voltages will prevent the current from flowing.

Transistors: These components are easy to identify through their three terminals. For the components to work, voltage has to be applied to one of them; the base terminal. The base can then control current flow in the two other terminals (the emitter and collector).

Inductors: These are passive components that store energy in form of a magnetic field. An inductor simply consists of a coil of wire wound around some kind of core. The core could be a magnet or air. When current passes through the inductor, a magnetic field is created around it. The magnetic field is stronger if a magnet is used as the core.

Main Points of the Lesson

- Resistors regulate the flow of electric current in the circuit.
- There are fixed resistors and variable resistors.

- Capacitors are components that store electric charges temporarily. They are used to remove noise from circuits
- P-N Junction Diodes are two terminal semiconductor components that allow electric current to flow through them in only one direction.
- Light emitting diodes convert electrical energy to light energy and allow electric current to flow through them in only one direction.

Activity 1
Dismantle and assemble basic electronic components from TVs or radios and other electronic gadgets
Material needed: Motherboard of spoilt TVs/radios/computer/DVD players, gaming boards etc.

Procedure

1. Work in group
2. Guide learners to dismantle and assemble discrete electronic components from spoilt electronic gadgets such as radio, TV, mobile phones, electronic watches and others that can be found in the home and at school and name the parts.
3. With special attention to safety, let learners share their experience with the class on discoveries made on easy ways of dismantling the components from the motherboard.

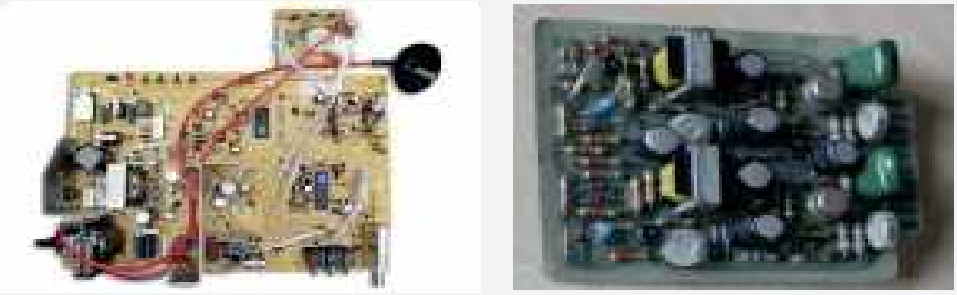


Fig. 44 - TV Motherboard and Radio Motherboard (1970 model)

Group Activity

1. Engage the learners to carry out activity 1 as outlined in page xxx of the learner's book to investigate the functions of the components of electronic circuits and how they are interdependence on each other.
2. Engage the learners to examine and identify as many basic electronic components as possible found in the circuit boards of television and radio sets.
3. Guide the learners to take a P-N junction diode and identify the Positive (P) region and Negative (N) region of the P-N junction diode.
4. Guide the learners to take an LED and identify the Positive (P) region and Negative (N) region of the light emitting diode (LED).
5. Engage the learners to carry out activity 2 as outlined in page xxx of the learner's book to investigate the behaviour of an LED in an electronic circuit.

Progressive Assessment

Use group discussion to help learners retain what they have learnt about the behaviour of an LED in an electronic circuit.

Can learners use the knowledge of the lesson to distinguish nuclear energy from thermal energy?

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

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

Test of Practical

1. Resistor, battery and diode.
2. Reverse bias because the positive side of the diode is connected to the negative terminal of

the battery and the negative side of the diode is connected to the positive terminal of the battery.

3. There will be no flow of current for LED to produce light.

ICT/ RESEARCH/PROJECT WORK

Engage the learners to build some of the basic electronic circuits involving the use of LEDs, switch, connecting wires and batteries.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

LESSON 5: THE FUNCTIONS OF ELECTRONIC COMPONENT SUCH AS RESISTOR, DIODE, AND INDUCTOR, AND THEIR INTERDEPENDENCE FOR THE FUNCTIONING OF AN ELECTRONIC GADGET.

Teaching and Learning Resources:

- samples of resistors, P-N junction diodes, light emitting diodes, capacitors, inductors, discarded radio set, television set electronic board, and energy saving bulbs.

Learner's Book 7: Pages 290-297

Learning Expectation:
By the end of the lesson, the learner will:

1. discuss the roles and the significance of electronic components: [i. LEDs, ii. resistor, iii. diode, and iv. inductors] in a circuit and how they affect each other.
2. explain changes in brightness in an LED in relation to the addition of resistors, diodes, and inductors in an electronic circuit

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

Keywords: capacitor, resistor, diodes, inductor, switch, compact fluorescent light

INTRODUCTION

In the previous lessons we learnt of basic electronic components and their functions in circuits. We shall continue to discuss the functions and the significance of electronic components such as LEDs, resistors, diodes, and inductors in electronic circuit and how they affect each other. We will also explain changes in the brightness in an LED in relation to the addition of resistors, diodes, and inductors in an electronic circuit. Identify the electronic components below.

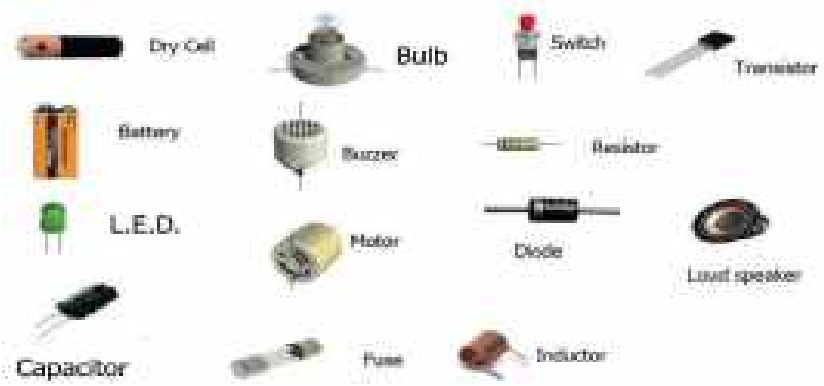


Fig. 45 - Basic Electronic Components

Additional Information

An inductor called coil, choke or reactor is a two terminal electrical component that stores energy in a magnetic field when electric current flows through it. It is very easy to make. Just make some loops with a wire. However, connecting wires create magnetic fields when current flows through them. So you will soon see that it can do some interesting things. In a circuit an inductor will resist changes in current. Conductors (example metals) allow electricity to flow through them freely; semiconductors (example Silicon and Germanium) lie between conductors and insulators; insulators (example rubber, cotton, and wood) do not allow electricity to flow through them. This behaviour is due to resistance, which is the ease with which a material will allow electricity to flow through it. A conductor has low resistance, while an insulator has much higher resistance. Resistors offer specific controlled amounts of resistance into electric circuits. The function of a resistor is to oppose the flow of electric current and regulate the flow of electrons through it. Resistance is measured in ohms (Ω). Resistance can be calculated with Ohm's law, when the current is known and the voltage drop is measured

Activity

1. Ask the learners to carry out the Activity 1 to investigate the functions of some basic electronic components
2. Ask the learners to investigate the behaviour of an LED in an electronic circuit.
3. Engage the learners to investigate the behaviour of a P-N junction diode in an electronic circuit.
4. Guide the learners to discuss what is meant by forward bias and reverse bias.
5. Guide the learners to investigate the behaviour of a P-N junction diode in an electronic circuit.
6. Guide the learners to investigate the behaviour of a resistor in an electronic circuit.
7. Guide the learners to investigate the behaviour of an inductor in an electronic circuit.

Main Points of the Lesson

- Although each electronic component has specific functions and significance in the electronic circuits, their interdependence is worth noting.
- LED produce light which is more energy efficient, economical and lasts longer.
- Capacitors make current flow smoothly through the circuit.
- Inductors prevent changes in the current flow through the circuit.
- Diodes allow current to flow through them in only one direction.
- All these effects can easily be seen when the components are connected together with an LED.

Progressive Assessment

Use group discussion to help learners retain what they have learnt about the behaviour of some basic components in an electronic circuit.
Can learners use the knowledge of the lesson to distinguish nuclear energy from thermal energy?

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE LEARNER'S BOOK

Objective

1. C
2. B
3. C

Test of Practical

1. I – key
   II – Diode
   III- Light emitting diode
   IV - Resistor
   V- Inductor

2. III - LED Produces light when current flows through it
   V – Key is used to turn on and off the circuits

3. Current flows for the LED to light up

4. Accept appropriate drawing

5. Current flows

Test of Practical

a. There will be no flow of current for LED to give light
b. Reverse bias
c. The LED give light
d. Forward bias
e. It allows flow of current in one direction

ICT/ RESEARCH/PROJECT WORK

1. Ask the learners to design and build an electronic circuit involving the basic electronic components.
2. Let learners find out from the internet to learn more about the lesson.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

4 Sub-Strand 3: Conservation and Conversion of Energy

CONTENT STANDARD: B7.4.3.1. Demonstrate an understanding of the principle of conservation and conversion of energy and their application in real life situations.

Indicator:
B7.4.3.1.1 Explain the principle underlying conservation and conversion of energy.
B7.4.3.1.2 Demonstrate the conversion of energy into useable forms.

LESSON 1: PRINCIPLE UNDERLYING CONSERVATION AND CONVERSION OF ENERGY.

Teaching and Learning Materials:

- Batteries, Torch, Switch, Radio, Charts and drawings showing energy conversion.

Learner's Book 7: Pages 298-303

Learning Expectation:
By the end of the lesson, the learner will:

1. explain the law of conservation of energy by using a diagram to show that in a closed system the value of chemical energy, for example in a dry cell which changes into electrical, heat and light energy will remain the same.
2. explain energy conversion and its application to life

Keywords: Law of conservation of energy, chemical energy, closed system, open system

INTRODUCTION

Energy is the ability to do work. Energy is needed by all living things in order to carry out life processes such as feeding, growth, movement, respiration, excretion and reproduction. Energy cannot be created or destroyed. Energy changes from one for to another in several ways.
In this lesson you learn more about energy conservation.

Additional Information

The law of the conservation of energy states that, energy can neither be created nor destroyed but can only converted from one form to another. This means that the energy in a system always remain the same, unless energy is added from outside the system. For example, in a dry cell where chemical energy changes into electrical, heat and light. The energy will remain the same.
Energy conversion is change in energy from one form to another such as the conversion of nuclear energy into heat and light energy, the conversion of light energy into heat, thermal energy into work. The law of conservation of energy states that, energy can neither be created nor destroyed but only converted from one form of energy to another.

Activity

1. Engage the learners to carry out activity 1 as outlined in page xxx of the learner's book to examine the principle underlying conservation and conversion of energy.
2. Engage the learners to brainstorm to bring about the meaning of conservation of energy and give examples.
3. Guide the learners to discuss what is meant by conversion of energy.
4. Show a video on energy conversion and energy conservation.
5. Engage the learners to make a simple series circuit involving a battery, a bulb or LED, and a switch and explain the energy conversions in an electrical circuit.
6. Guide the learners to explain the energy conversion in a radio set operated by a battery and the energy conversions in a flashlight.

Main Points of the Lesson

- Energy is the ability to do work.
- Energy conversion is change in energy from one form to another such as the conversion of nuclear energy into heat and light energy, the conversion of light energy into heat, thermal energy into work.
- The law of conservation of energy states that, energy can neither be created nor destroyed but only converted from one form of energy to another
- Progressive Assessment
- Use group discussion to help learners explain what they have learnt about the law of conservation of energy.
- Can learners use the knowledge of the lesson to distinguish nuclear energy from thermal energy?

Progressive Assessment

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?
-

ANSWERS TO QUESTIONS FROM THE TEXT BOOK QUESTIONS

Objectives

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

Answers to Essay Type Questions

1. Refer to Learner's Book 7 page 299.
2. Refer to Learner's Book 7 page 298.
3. Refer to Learner's Book 7 page 299.
4. Refer to Learner's Book 7 pages 298.
5. Refer to Learner's Book 7 page 299.
6. Refer to Learner's Book 7 pages 299.
7. Refer to Learner's Book 7 pages 299.
8. Refer to Learner's Book 7 pages 298.
9. Refer to Learner's Book 7 pages 298.
10. Refer to Learner's Book 7 page 299.

ICT RESEARCH/ PROJECT WORK

Ask the learners do the following task as homework:

1. Find information from the internet about energy conservation and energy conversion, and explain the scientific principle underlying them.
2. Engage their family and community members to collect their views on how they can conserve energy for future use. Let them develop a write up on the views collected.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

LESSON 2: DEMONSTRATING THE CONVERSION OF ENERGY INTO USEABLE FORMS

Learner's Book 7: Pages 304-308

Learning Expectations:
By the end of the lesson, the learner will:
1. explain energy conversion
2. illustrate everyday use of conversion of energy and show diagrammatically the conversion of energy to other forms.

Keywords: conversion of energy, useable, thermal, kinetic, potential

INTRODUCTION

Energy conversion is present in many forms all around us such as electrical to sound, chemical to heat, potential to kinetic, sound to electrical and chemical to light. There is also energy transfer from one body to another in the form of heat and work. Once energy is transferred it's always designated according to its nature. Therefore, thermal energy may result from the transfer of heat and work done may take the shape of mechanical energy. In today's lesson, we shall focus on energy conversion and its everyday use with diagrams.

Additional Information

Environmental degradation; people who depend on charcoal for fuel will cut more trees for charcoal production and will eventually degrade the environment (i.e., forest depletion)
Cutting more trees will lead to soil erosion and famine.
Depletion of other sources of energy like petroleum fields. It is therefore important to find various ways to conserve energy.

Activity
1. Engage the learners to carry out the activity outlined on page xxx of the learner's book to demonstrate the conversion of energy into useable forms, for example, using heat energy to cook food, using chemical energy stored in a battery to produce light in a bulb or produce sound in a radio.
2. Engage the learners in convenient groups to discuss their observations and findings

Main Points of the Lesson

- Energy conversion is present in many forms all around us such as electrical, kinetic, thermal, potential, and various other forms.

- Energy conversion also termed as the energy transformation.

Progressive Assessment
Use assessment as learning strategies to find out the progress of the learners through effective questions and answers about the lesson.
Can learners use the knowledge of the lesson to distinguish nuclear energy from thermal energy?

Diagnostic Assessment
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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK QUESTIONS

Objectives

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

ICT/RESEARCH/ PROJECT WORK
Ask the learners to use the internet, books and journal to find information about the use of technology to conversion of solar energy into useable forms and submit a report.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

LESSON 3: CONSERVATION OF ENERGY FOR FUTURE USE IN LIFE

Learner's Book 7: Pages 308-311

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

1. explain energy
2. state how energy could be conserved.
3. explain why we should conserve energy
4. describe how energy is conserved and explain how it can be done for the benefit of humans and other life forms.

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

Keywords: energy conservation, eco-sufficiency, energy resource, efficiency, LED, lighting

INTRODUCTION

Energy can be produced through proper application of energy resources. This involves several important aspects to make sure that the resources are not depleted Energy conservation is the effort made to reduce the consumption of energy by using less of an energy source. This can be achieved either by using energy more efficiently or by reducing the amount of service used. Energy conservation is part of the concept of Eco-sufficiency. Energy conservation reduces the need for energy services and can result in increased environmental quality.
In this lesson we shall look at how energy can be conserved for future use.

Additional Information
Conserving energy is the effort made to reduce the consumption of energy by using less energy. This can be achieved either by using energy more efficiently (using less energy for a constant service) or by reducing the amount of service used (for example, by driving less). Energy conservation is a part of the concept of Eco-sufficiency. Energy conservation reduces the need for energy services and can result in increased environmental quality. It also lowers energy costs by preventing future resource exhaustion.

Activity

1. Engage the learners to carry out activity 1 as outlined in page xxx of the learner's book to investigate ways of conserving energy for future use.
2. Guide the learners to brainstorm to come out with the meaning of energy conservation.
3. Let the learners watch a video on energy conservation.
4. Guide the learners to discuss in groups various ways of conserving various forms of energy for future use.

Main Points of the Lesson

- Installing LED lighting, fluorescent lighting, or natural skylight windows reduces the amount of energy required to attain the same level of brightness compared to using traditional glowing light bulbs
- Efficient energy use, sometimes simply called energy efficiency.
- Conserving energy for future use is the effort made to reduce the consumption of energy by using less of an energy service.

Progressive Assessment

Use group discussion to help learners retain what they have learnt about the conservation of energy for future use.
Can learners use the knowledge of the lesson to distinguish nuclear energy from thermal energy?

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

1. A
2. A

ICT/PROJECT/RESEARCH

Ask the learners to engage their family to collect their views on how they can conserve the energy

obtained from fossil fuels and hydropower for future use and present a report.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

4 Sub-Strand 4: Force and Motion

CONTENT STANDARD: B7.4.4.1 Examine the concept of motion, Newton's first law of motion, magnetic force in relation to motion and understand their applications to life.

Indicator: B7.4.4.1.1 Understand that unbalanced forces acting on an object cause it to move.

LESSON 1: UNBALANCED FORCE AND MOTION

Teaching and Learning Resources:

- A piece of smooth paper, a fifty pesewa coin, a bottle, small objects, big objects.
- A rope for a tug-of-war, a table.

Learner's Book 7: Pages 312-316

Learning Expectations:

1. Explain inertia as tendency of a body to resist motion.
2. Demonstrate how unbalanced forces cause motion.

Keywords: Unbalanced force, inertia, motion, resists motion, acceleration, and velocity

INTRODUCTION

A force is needed to keep a stationary object moving. Once the object is in motion, no push or pull is needed to keep it moving. Force is needed only to change the motion of an object. But whether it is moving or at rest, every object resist any change in its motion.

Additional Information

- When there is a net force acting on an object, the force is said to be unbalanced. An unbalanced force can cause an object to start moving, move faster (or accelerate), or stop moving, or change direction.
- An unbalanced force acting on an object will change the object's motion. In other words, an unbalanced force will cause an object to accelerate. For example, if two unequal forces acting in opposite directions are applied to an object, the object will accelerate in the direction of the greater force.
- When there is a net force acting on an object, the force is said to be unbalanced. An unbalanced force can cause an object to start moving, move faster (or accelerate), or stop moving, or change direction.
- An unbalanced force acting on an object will change the object's motion. In other words, an unbalanced force will cause an object to accelerate. For example, if two unequal forces action in opposite directions are applied to an object, the object will accelerate in the direction of the greater force.

Activity

1. Engage the learners to carry out Activity 1 as outlined in page 295 of the learner's book to demonstrate the reluctance of a body at rest to remain at rest or to stop when in motion.
2. Discuss the concept of inertia with the learners.
3. Engage the learners to explain what is meant by an unbalanced force.
4. Engage the learners to carry out Activity 2 as outlined in page 296 of the learner's book to demonstrate an unbalanced force.

Main Points of the Lesson

1. Inertia is the reluctance of a body to move if it is at rest or to stop when it is already in motion.
2. An unbalanced force can cause an object to start moving, move faster (or accelerate), or stop moving, or change direction.
3. An unbalanced force acting on an object will change the object's motion.

Progressive Assessment

Use group discussion to help learners retain what they have learnt about inertia and unbalanced force.

Can learners use the knowledge of the lesson to distinguish nuclear energy from thermal energy?

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

1. D
2. A

Answers to Essay Type Questions

1. Refer to Learners' Book 7 pages 312-315.
2. Refer to Learners' Book 7 page 312.
3. i. The mate will fall down.
   ii. He must jump again. This will help to reduce the impact of inertia.

ICT/PROJECT/RESEARCH

1. Guide the learners to find information from the Internet about unbalanced forces (www.kids science).
2. Ask the learners to set a toy car in motion on a smooth floor and describe what happens if a constant force is exerted on the toy car.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

Indicator:
B7.4.4.1.2 State and explain Newton's First Law of motion.
B7.4.4.1.3 Examine the application of Newton's First Law of motion in life.

LESSON 2: NEWTON'S FIRST LAW OF MOTION

Teaching and Learning Resources:

- A book, table, metal balls, a football, round objects, smooth floor, rough floor

Learner's Book 7: Pages 317-320

Learning Expectation:
By the end of the lesson, the learner will:

1. research to find what Newton's first law is and discuss it.

Keywords: Newton's first law of motion, inertia, force

INTRODUCTION

In the previous lesson, we learnt about unbalanced force. An object remains in uniform motion with constant velocity if no unbalanced force acts on it. In this lesson, we shall learn about one of the three laws of motion proposed by Sir Isaac Newton.

Additional Information

Newton's First Law The first law of motion states that everybody continues to be in its state of rest, or of uniform motion in a straight line unless it is compelled by some external force to change that state. A body which is at rest continues to be in that state. In order to make it move, an external force has to be applied to it
Sir Isaac Newton (1642-1727), an English physicist who studied forces and the motion of objects and came up with three laws of motion and the law of gravitation.

The first law of motion states that everybody continues to be in its state of rest, or of uniform motion in a straight line unless it is compelled by some external force to change that state.

- A body which is at rest continues to be in that state. In order to make it move, an external force has to be applied to it.
- A body in motion continues to be in a straight line motion. However, this statement may seem a bit contrary to our daily-life experience of when we see a ball rolling on a rough ground coming to rest abruptly. What happens is that the external force, which acts on the rolling ball, is in an opposite direction, i.e., friction, and hence, retards it.
- It takes force to change the original state as well as the motion of an object

Activity: Investigating Newons first law of motion.

1. Engage the learners to carry out the Activity 1 as outlined in page 300 of the learner's book to investigate Newton's first law of motion
2. Engage the learners to discuss Newton's first law of motion.
3. Show a video on Newton's first law of motion.
4. Demonstrate Newton's first law of motion by causing an object to move on a frictionless floor and observe its motion.

Main Points of the Lesson

- Newton's First Law of Motion states that everybody continues in its state of rest, or once in motion, continues to move with a constant speed in a straight line unless an unbalanced (or net) force acts on it.

Progressive Assessment

Use group discussion to help learners what they have learnt about Newton's first law of motion. Can learners use the knowledge of the lesson to distinguish nuclear energy from thermal energy?

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

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

ICT/HOMEWORK TASK

Ask the learners to apply their knowledge of Newton's first law of motion to explain the movement of things that are happening around their environment.

LESSON 3: APPLICATION OF NEWTON'S FIRST LAW OF MOTION IN LIFE.

Teaching and Learning Resources:

- A saloon car with seat belt, metal balls, a football, round objects, smooth floor, rough floor

Learner's Book 7: Pages 321-324

Learning Expectation:

By the end of the lesson, the learner will:

1. examine the applications of Newton's First Law of motion in life.

Keywords: Newton's first law of motion, net force.

INTRODUCTION

in the previous lesson, we learnt about Newton's first law of motion. Newton's First Law of Motion states that everybody continues in its state of rest, or once in motion, continues to move with a constant speed in a straight line unless an unbalanced (or net) force acts on it. In this lesson, we shall learn about examples of Newton's first law of motion.

Additional Information

Sir Isaac Newton

If we are going to talk about classical mechanics and applications of Newton's laws of motion in daily life, we must first shed light on the founder of these laws and the one who has the credit for bringing them out to us, Sir Isaac Newton.

Real Life Examples of Newton's First Law (inertia)

- An electric fan continues to move for a period after the electricity is turned off.
- Passenger fall backwards when a stationary bus starts to move.
- A book on the table stays in place unless it is dislodged.
- Blood rushes from your head to your feet as it quickly stops when you ride the descending elevator.
- A hammer head can be tightened against the wooden handle by striking the bottom of the handle against a hard surface.

Activity

1. Engage the learners to carry out Activity 1 as outlined in page 302 of the learner's book to investigate applications of Newton's first law of motion.
2. Engage the learners to discuss what happens if the brakes of a moving car are suddenly applied.
3. Show the learners a video on Newton's first law of motion.
4. Engage the learners to observe the motion of a metal ball on a smooth surface and discuss its motion.

Main Points of the Lesson

1. Newton's First Law of Motion states that everybody continues in its state of rest, or once in motion, continues to move with a constant speed in a straight line unless an unbalanced (or net) force acts on it.

Progressive Assessment

Use group discussion to help learners retain what they have learnt about the applications of Newton's first law of motion.

Ask learners the following question:

1. Why should passengers in a moving vehicle fasten their seat belt?

Can learners use the knowledge of the lesson to distinguish nuclear energy from thermal energy?

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ICT/HOMEWORK

1. Engage the learners to carry out the tasks as outlined in page xxx of the learner's book to research using the internet or You Tube to find out applications of Newton's First Law of Motion in everyday life.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

Indicator: B7.4.4.1.4 Demonstrate the behaviour of magnet and its use to life.

LESSON 4: THE BEHAVIOUR OF MAGNET AND ITS USE TO LIFE

Teaching and Learning Resources:

- two bar magnets, iron nails, iron filings, copper plate, aluminium plate, paper, plastic.

Learner's Book 7: Pages 325-332

Learning Expectations:

By the end of the lesson, the learner will:

1. discuss what magnets are and describe the types of magnets that exist.
2. demonstrate the characteristics (Repulsive, attractive, and orientation N-S direction) of a magnet.
3. discuss the uses of magnet in everyday life.

Keywords: magnet, permanent magnet, temporary magnet, magnetic substances, non-magnetic substances, magnetic field.

INTRODUCTION

A magnet is a solid material that has the property of attracting certain metals and indicating directions. Magnets have many uses. Magnets are used in electric motors, loudspeakers, TV picture tubes, microwave ovens, disc drives and many other gadgets. In this lesson, we shall explore the properties and the uses of magnets.

Additional Information

- Like poles of two magnets repel each other.
- Opposite poles (or unlike poles) of two magnets attract each other.
- If a bar magnet is suspended by a thread and if it is free to rotate, it will settle with its North Pole pointing in the direction of the Geographic North.
- Permanent magnets produce a magnetic field due to their internal structure. They do not lose their magnetism easily. Permanent magnets are made of ferromagnetic materials that do not stop producing their magnetic field regardless of external influence. Thus, they are stable against demagnetising forces.

Group Activity

1. Engage the learners to carry out Activity 1 as outlined in page 308 of the learner's book to investigate the characteristics of a bar magnet.
2. Guide the learners to sort out magnetic and non-magnetic materials.
3. Engage the learners to discuss the uses of magnets.

Main Points of the Lesson

- A magnet is a solid material that has the property of attracting certain metals and indicating directions.
- There are two types of magnets. These are: Permanent magnets and Temporary magnets.
- Permanent magnets are magnets that retain their magnetism once magnetized. They are made of steel and other alloys of iron, cobalt and nickel.
- Temporary magnets are any material that behaves like a permanent magnet when in the presence of a magnetic field.
- Like poles of two magnets repel each other.
- Opposite poles (or unlike poles) of two magnets attract each other.
- If a bar magnet is suspended by a thread and if it is free to rotate, it will settle with its North Pole pointing in the direction of the Geographic North.
- Magnets have many uses.

Progressive Assessment

Use group discussion to the help learners retain what they have learnt about the properties and uses of magnets.

Ask learners the following question.

- Can a magnet attract any other material?
- Can the learners use the knowledge from the lesson to distinguish magnetic and non-magnetic materials?

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

1. D
2. D
3. A

Answers to Essay Type Questions

1. Answers may vary.
2. a. Refer to Learners' Book 7 page 325.
   b. Refer to Learners' Book 7 page 325.
3. Refer to Learners' Book 7 pages 329-330.

ICT/PROJECT/RESEARCH

Instruct the learners to carry out the task to build a simple electric motor using a coil of wire, a rod, bar magnets and use it to operate the move a toy car or turn a fan on.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

CONTENT STANDARD: B7.4.4.2 Recognise some simple machines, and show understanding of their efficiency in doing work.

Indicator: B7.4.4.2.1 Identify simple machines.

LESSON 5: SIMPLE MACHINES

Teaching and Learning Resources:

- pliers, wheelbarrow, ice tongs, long broom see-saw, scissors, inclined plane, pulleys.

Learner's Book 7: Pages 333-339

Learning Expectation:
By the end of the lesson, the learner will:

1. list examples of simple machines

Keywords: simple machine, load, effort, pivot

INTRODUCTION

We use simple tools such as hoe to do work. Devices which helps to make work easier for us are called machines. There are simple machines and complex machines. In this lesson, we shall learn about some simple machines.

Additional Information

A mechanical device that changes its motion or position or magnitude by the movement of few parts or no parts to achieve the required task is known as a simple machine. Simple machines have few or no moving parts. Just like the stick, they use energy to work with one movement. Work is the amount of energy that is needed to move an object across a distance. Basically, when you pull, push or move something, you are performing work. The further you push, pull or move an object, the greater amount of work is needed. There are different types of simple machines: the inclined plane, the wedge, the screw, the lever, the pulley, and the wheel and axle. Each simple machine has a special way to make work easier for humans. The main advantage of using simple machines is to make work easier. They allow us to use less effort to move an object. While you are technically doing the same amount of work, simple machines make it feel a lot easier because it takes less effort. Effort is the force used to move an object, which is not the same thing as work.

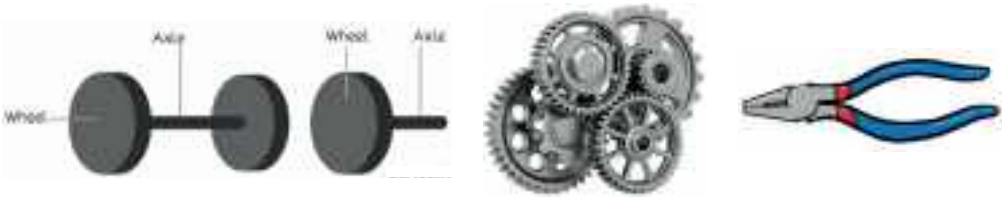


Fig. 47 - Some simple machines

Group Activity

1. Ask the learners to find out examples of simple machines in the home and their uses.
2. Guide the learners to mention simple tools or devices which enable work to be done easily and faster.
3. Show a video on simple machines and their uses.
4. Guide the learners to assemble simple machines and practice the use of the machines.
5. Engage the learners to compare the use of simple machines with that of using bare hands.

Main Points of the Lesson

1. A simple machine is any device which helps to make work easier and faster.
2. Tools such as a screwdriver, a pair of tongs, a pair of scissors, levers and wheelbarrows are examples of simple machines.

Progressive Assessment

- Use group discussion to help learners retain what they have learnt about simple machines and their uses.
- Ask learners the following question.
- What device will you use to drive a nail into a piece of wood?

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

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

Answers to Essay Type Questions

1. Refer to Learners' Book 7 pages 333

2. a. Refer to Learners' Book 7 page 333.
   b. Refer to Learners' Book 7 pages 333-334
   c. Refer to Learners' Book 7 pages 334-335

3. i. Refer to Learners' Book 7 page 334.
   ii. Refer to Learners' Book 7 page 334.
   iii. Refer to Learners' Book 7 page 334.

4. Refer to Learners' Book 7 page 335.

Answers to Practical Questions

i. A - wedge
   B - lever
   C - Screw
   D - Pulley
   E - Wheel and axle

ii. A - axe
   B - wheel barrow
   C - screw pump, drill machine, car jack
   D - Staircase
   E - Bicycle, Car tires, Ferris wheel, Electric fan, Analogue clock

iii. a.

Inclined plane	**Screw**
• The inclined plane is defined as the surface having some slope which is used to make our work easier. • The inclined plane is used to raise or lower the objects up to a certain height or depth.	• A screw is a simple machine that looks like a nail but it has grooves on its surface. • A screw is used to fasten two metal pieces or wood pieces.

b. A pulley uses a flexible rope or a cable across a wheel to lift the load. A lever uses force on a pivot or fulcrum to accomplish the work.

iv. They can do work easily and fast.

v. washing after use.
drying
oiling/greasing

ICT/PROJECT/RESEARCH
Engage the learners to design a simple machine of their choice and demonstrate the use of such a machine.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

Indicator: B7.4.4.2.2 Describe the types and functions of levers.

LESSON 6: TYPES AND FUNCTIONS OF LEVER

Teaching and Learning Resources:

- See-saw, scissors, pliers, lid opener, claw hammer, crow bars, bottle opener, wheelbarrows, nut cracker and paper cutter, the long broom, ice or sugar tongs, arm, and staplers.

Learner's Book 7: Pages 340-347

Learning Expectations:

By the end of the lesson, the learner will:

1. name the types of levers and explain their general functions.
2. classify levers into First, Second and Third classes and demonstrate the principles involved in each class of levers make work easier in everyday life.

Keywords: classes of levers, load, effort, pivot, fulcrum.

INTRODUCTION

In the previous lesson, we learnt about simple machines. Example of such simple machines are the levers.

Additional Information

According to where the load and effort are located with respect to the fulcrum, there are three types or classes of lever:

First-Class Lever

Example:

- Seesaws and crowbars.
- Using scissors represents the use first-class levers.
- A wheel and axle is also an example.
- A claw hammer

Fig. 48 - First-Class Lever

Second Class Lever

Example:

- Wheelbarrow
- Staplers
- Doors or gates
- Bottle openers
- Nutcracker
- Nail clippers

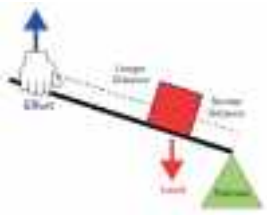


Fig. 49 - Second-Class Lever

Third Class Lever

Example:

- Fishing rod
- A broom
- A baseball bat
- A bow and arrow
- Human jaw

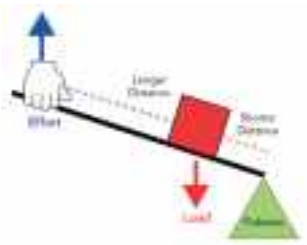


Fig. 50 - Third-Class Lever

In This Lesson, Learners Will:

1. Name the types of levers and explain their general functions.
2. Classify levers into First, Second and Third classes and demonstrate how the principles involved in each class make work easier in everyday life.

Activity

1. Engage the learners to carry out Activity 1 outlined on page 323 of the learner's book to demonstrate the use of first class, second class and third class levers.
2. Show the learners a video/You Tube on the use of classes of levers.
3. Guide the learners to identify and separate the three classes of levers from the devices assembled.
4. Ask the learners to observe the features of examples of first class levers, second class levers and third class levers.
5. Engage the learners to practice the use of all the classes of levers to do work.

Main Points of the Lesson

1. A lever is a simple machine, which turns about a fixed point called the fulcrum (F), or pivot, where a force called Effort (E) is applied to overcome a resisting force known as the Load (L).
2. There are three types or classes of levers. These classes of levers are based on the positions of the fulcrum, F, the load L, and the effort E.
3. The classes of levers are: First class lever, Second class lever, and Third class lever.
4. Each of these classes of levers has special features.

Progressive Assessment

Use group discussion to help the learners retain what they have learnt about the three classes of levers and their uses.

Ask the learners the following questions

1. Name a lever used:
   a. To separate pieces of wood stuck together
   b. To carry a load at a construction site
   c. To collect ice cubes

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

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

Answers to Essay Type Questions

1. Refer to Learner's Book 7 pages 340-343.
2. Refer to Learner's Book 7 page 340.
3. Refer to Learner's Book 7 page 342.
4. Refer to Learner's Book 7 page 340.
5. Refer to Learner's Book 7 pages 340-343.

Answers to Practical Questions

1. i. A - Pair of scissors
   B - Ice tongs
   C - bottle top opener

   ii. Levers

   iii. A - for cutting
   B - for melting ice cubes
   C - for opening bottles

   iv. A is first class and B is third class

   v. B is third class whilst C is second class

   vi. washing
   drying
   oiling
   storing in cool dry place

2. i. 3rd class

   ii. Ice tong
   broom
   staples

   iii. work is done on load but effort does not work

   iv. cutter, nut cracker

   v. They all have effort, pivot and load.

ICT/PROJECT/RESEARCH
Engage the learners to carry out the task outlined on page xxx of the learner's book to design and construct a simple machine in the form of any of the classes of levers.
Let learners demonstrate the use of constructed simple machine.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

Indicator: B7.4.4.2.3 Know work input, and output and efficiency as they apply to machines.

LESSON 7: WORK INPUT, WORK OUTPUT AND EFFICIENCY OF MACHINES.

Teaching and Learning Resources: Video clip on machines.
Learner's Book 7: Pages 348-353

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

1. explain the terms work input, work output and efficiency.
2. explain efficiency of a machine as the ratio of work output to work input expressed as a percentage.
3. explain the concept of efficiency of a machine.
4. describe how the efficiency of simple machines can be improved (e.g. by oiling its parts to reduce friction).

Keywords: work, work input, and work output and efficiency

INTRODUCTION

Work is made easier by using machines. Machines use energy to work. In the previous lesson, we learnt about examples of simple machines and how they are used. In this lesson, we shall about terms associated with machines.
In this lesson, learners will:

1. Explain the terms work input, work output and efficiency.
2. Explain efficiency of a machine as the ratio of work output to work input expressed as a percentage.
3. Explain the concept of efficiency of a machine.
4. Describe how efficiency of simple machines can be improved (e.g. by oiling its parts to reduce friction).

Additional Information

Machines can be maintained, clean and well lubricated as outlined. If this is done, you can increase the machine's efficiency and make work easier and faster. The more efficient a machine is, the closer the actual or ideal the machine is. Friction is one of the factors that reduces the efficiency of machines. The higher the percent, the more efficient the machine is. If the tight scissors described above have an efficiency of 70 %, a little more than half of the work you do goes into cutting the paper. The rest is wasted overcoming the friction in the scissors. A machine that has an efficiency of 95 % loses very little work. An ideal machine would have an efficiency of 100.

Activity

1. Engage the learners to explain the following terms associated with simple machines: work, work input, work output, effort, effort distance, load, load distance, and efficiency.
2. Guide the learners to discuss ways of increasing the efficiency of machines.

Main Points of the Lesson

1. The product of the force you exert on the machine and the distance through which the force moves is called the work input.
2. The product of the force exerted by the machine and the distance through which the machine moves is called work output.
3. The Efficiency of a machine is defined by the expression:
4. Efficiency, $\eta = \times 100\ \%$

Progressive Assessment

Use group discussion to help learners what they have learnt about the conservation of energy for future use.

Ask learners the following question.

Explain the effect of friction on machines.

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

1. A
2. D
3. B
4. A
5. A
6. A
7. A
8. C
9. D
10. B
11. D
12. B
13. A
14. A

Answers to Essay Type Questions

1. Refer to Learner's Book 7 page 348.
   i. Refer to Learner's Book 7 pages 350.
   ii. Refer to Learner's Book 7 page 351.
   iii. Refer to Learner's Book 7 page 349.

ICT/PROJECT/RESEARCH

Engage the learners to carry out a research using internet, books and interviews to find out why efficiency of a machine is not 100 .

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

4 Sub-Strand 5: Agricultural Tools

CONTENT STANDARD: B7.4.5.1 Demonstrate knowledge and skills in handling and maintenance of basic and simple agricultural tools.

Indicator:
B7.4.5.1.1 Explain the basic rules in handling and maintaining simple agricultural tools.
B7.4.5.1.2 Apply the handling and maintenance of basic and simple agricultural tools in their community.

LESSON 1: THE BASIC RULES IN HANDLING AND MAINTAINING SIMPLE AGRICULTURAL TOOLS.

Teaching and Learning Resources:

- simple agricultural tools used in the community e.g. cutlass, hoe, axe, spade and mattock

Learner's Book 7: Pages 354-360, 361-363

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

1. list some simple or basic farm tools in agriculture (give examples found in animal and crop farms).
2. discuss the meaning and importance of handling and maintenance of agricultural tools
3. list and match the basic rules in handling and maintenance of tools with specific simple tools used in agriculture.
4. describe how handling and maintenance of simple and basic agricultural tools are done.
5. observe and discuss the handling and maintenance of basic and simple agricultural tools used on farms visited in the community and write a report.
6. assemble agricultural tools from the community and practice handling the tools to perform simple agricultural operations.
7. write down the operational rules of handling agricultural tools.
8. assemble agricultural tools from the community and practice the basic rules in tools maintenance and list the rules used.

Keywords: maintenance, community, tools, skill, small-scale farmer

INTRODUCTION

Most simple Agricultural tools used by farmers are designed to help the hand to apply force in farm operations. These simple tools are mainly used by the small-scale farmer. Some are designed mainly for crop production, or mainly for animal production or both operations.

The maintenance and handling of basic and simple agricultural tools are a skill and have to be learnt. As we discussed in our previous lesson, when agricultural tools are not handled or maintained properly, they can cause injuries to the user or get damaged in a short time.

Hoe

Axe

Rake

Spade

Garden fork

Mattock

Watering can

Cutlass

Pick axe

Fig. 51 - Simple Farm Tools

Additional Information

Young farmers especially should be trained on safe procedures for handling of farm tools. Farm tools can pose a risk when they are misplaced or improperly handled by farmers. The following are the ways of handling some agricultural tools: Farmers carrying tools on their heads or shoulders should pay close attention to people nearby when turning or manoeuvring around them. Tools should always be carefully handed from one farmer to another. Sharpened or pointed tools should be handed with the handles towards the receiver. Tool should always be put away when not in use.

Maintenance of Simple Farm Tools

1. The following maintenance practices or precautions are to be adopted to prolong the life span and effective use of farm tools
2. Tools should be washed or cleaned after use.
3. Oil, grease or lubricate movable parts to reduce friction.
4. Sharpen tools with blunt edges or blades regularly. e.g. cutlass
5. Paint, oil or grease metallic parts to prevent rusting if they are to be kept for a long time
6. Store tools in a cool dry place.
7. Replace worn-out or damaged parts of farm tools.
8. Check and tighten loose nuts and bolts daily or periodically.
9. Remove tools with wooden parts away from the sun to avoid cracking.
10. Keep metallic tools away from rain or moist places to avoid rusting.
11. Keep tools with wooden handles away from termites and fire.
12. Handle tools with care and use them for the right farm operations.

Activity

1. Engage the learners to carry out activity 1 outlined on page xxx of the learner's book to investigate the importance of handling and maintenance of agricultural tools
2. Engage the learners to list some simple or basic farm tools in agriculture (give examples found in animal and crop farms).
3. Let learners watch a video on farm tools used in crops and animal farm and how they are maintained.
4. Guide the learners to discuss the importance of handling and maintenance of agricultural tools.
5. Let learners watch a video on farm tools used in crops and animal farm and how they are maintained.
6. Engage the learners to list and match the basic rules in handling and maintenance of tools with specific simple tools used in agriculture.
7. Engage the learners in a discussion to describe how handling and maintenance of simple and basic agricultural tools are done.
8. Visit a nearby farm within the community with the learners.
9. Guide the learners to observe and discuss the handling and maintenance of basic and simple agricultural tools used in the farm visit.
10. Guide the learners to write the operational rules of handling agricultural tools.

Main Points of the Lesson

- Handling of agricultural tools means taking good care and using them correctly.
- It is important to handle them well so that they can last longer.
- Farm tools can pose a risk when they are misplaced or improperly handled by farmers.

- When agriculture tools are well maintained they last longer and offer maximum efficiency during use.
- Simple agricultural tools are mainly used by the small-scale farmer.
- Some tools are designed mainly for crop production, or mainly for animal production or both operations.
- When agriculture tools are well maintained they last longer and offer maximum efficiency during use.

Progressive Assessment

The study of agricultural tools will help learners to apply the knowledge of basic handling and maintenance of simple agricultural tools at home a school and in their communities.

- Do learners misconceive simple agricultural tools as sophisticated implements?

Ask learners the following question.

- Describe ways of caring and maintaining a cutlass.

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

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

Answers to Essay Type Questions

1. Refer to Learner's Book 7 pages 354-355.
2. Refer to Learner's Book 7 pages 357.
3. Refer to Learner's Book 7 page 357.
4. Refer to Learner's Book 7 page 357.
5. Refer to Learner's Book 7 pages 354-357.

Answers to Exercise

1. a. All tools must be cleaned after used.
   b. Replace faulty parts before use.

c. Do not use wrong tools for the right job.
d. Cutlass, hoe and tape measure

Answers to Practical Questions

1. i. A - hoe
B - sickle
C - mattock
D - rake
E - spade

ii. hoe - shape the soil.
sickle - harvesting grain
nattock - breaking up hard surfaces.
rake - gathering weeds
spade - lifting bulk material.

iii. must be used for correct purpose
they must be taken and good care of.
must be well maintained.

iv. wash them
oil them
store them in a cool dry place.

ICT/PROJECT/RESEARCH

Engage the learners to carry out the following:

1. Using flash cards, write ten simple farm tools and rules for handling and maintaining them on cut-out flash cards.
2. Match the cards with simple farm tools with their corresponding rules for handling and maintaining them.
3. Use the flashcards to educate the farmers in their community.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

STRAND 5

HUMANS AND THE ENVIRONMENT

Unit 1: Waste Management

CONTENT STANDARD: B7.5.1.1 Exhibit knowledge and skill of scientific basis for management practices of types of waste in the environment.

Indicator: B7.5.1.1.1 Apply information from research on good management practices of waste to make the environment clean.

LESSON: APPLICATION OF GOOD WASTE MANAGEMENT PRACTICES

Teaching and Learning Resources:

- Internet search Environmental Science Textbooks Environmental Protection Agency (EPA) websites Non-Governmental Organizations in environmental research. Projector

Learner's Book 7: Pages 364-373

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

1. research for information on good waste management practices and use it to carry out a project to make the environment clean.
2. write a report for presentation on the outcome of the project carried out in exemplar 1.
3. discuss how to manage types of waste and explain the science underlying it.

Keywords: Sustainable waste management, waste disposal, refuse, residue, metal scraps, septic tank sludge.

INTRODUCTION

Waste management involves the collection, transport, treatment and disposal of waste, together with monitoring and regulation of the waste management process.
Waste can be solid, liquid, or gas and each type has different methods of disposal and management. Waste management deals with all types of waste, including industrial, biological and household. In some cases, waste can pose a threat to human health. Waste is produced by human activity, for example, the extraction and processing of raw materials. Waste management is intended to reduce the adverse effects of waste on human health, the environment or aesthetics.

Waste management practices are not uniform among countries (developed and developing nations), regions (urban and rural areas), and residential and industrial sectors can all take different approaches.
A large portion of waste management practices deal with municipal solid waste (MSW) which is the bulk of the waste that is created by household, industrial, and commercial activities.

Additional Information

Waste management practices differ for developed and developing nations, for urban and rural areas, and for residential and industrial producers. Management for non-hazardous residential and institutional waste in metropolitan areas is usually the responsibility of local government authorities, while management for non-hazardous commercial and industrial waste is usually the responsibility of the generator. Waste management (or waste disposal) includes the processes and actions required to manage waste from its inception to its final disposal.

Activity

1. Ask the learners to carry out Activity 1 outlined on page 344 of the learner's book to investigate waste management practices.
2. Ask the learners to research for information from books, and internet on good waste management practices and use it to carry out a project to make their environment clean.
3. Ask the learners to discuss the types of waste generated in communities.
4. Ask learners to discuss how to manage types of waste and explain the science underlying it.
5. Ask the learners to discussion on vocations associated with the lesson.
6. Ask the learners to carry out Activity 2 outlined on page 345 of the learner's book to list down four solids or liquids that can be reused.
7. Ask the learners to analyse the waste management practices employed in their school and work on the waste management practices employed in the community.
8. Ask the learners to explain the scientific basis of those practices.

Main Points of the Lesson

- Waste management comprises the activities and actions required to manage waste from its inception to its final disposal. It can also be called waste disposal.
- Sustainable waste management practices include activities such as reducing the amount of waste produced, the reuse of waste products, recycling, minimizing waste creation, and the reduction of the consumption of natural resources. In general, sustainable waste management practice should increase circulation of mass and energy in nature. It is important to observe sustainability in this aspect so that every bit of waste can be managed in an efficient manner rather than just dumping it all in landfills.

Progressive Assessment

Use group discussion to help learners retain what they have learnt about waste management practices.

Ask learners the following questions:

- What vocation is associated with this lesson?

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

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

Answers to Essay Type Questions

1. Refer to Learner's Book 7 page 364.
2. Refer to Learner's Book 7 page 365.
3. Refer to Learner's Book 7 page 366.
4. Refer to Learner's Book 7 page 368.
5. Refer to Learner's Book 7 page 369.

Answers to Practical Questions

i. A - Incineration
   B - Composting
   C - Landfill
   D - Disposal into ocean

ii. B

iii. D

iv. a. Consider the volume of waste to be disposed
   b. The place must not be water logged
   c. If must be away from human settlement
   d. The kind of waste to be disposed

v. it is expensive to implement

vi.
- Prevents pollution
- Minimises air borne diseases
- Saves money
- Keeps the environment clean
- Provides compost for fertilizing the land

ICT/PROJECT/RESEARCH

Ask the learners to carry out the task as outlined on page xxx of the learner's book to:

1. Research for information from books, and internet on good waste management practices and use it to carry out a project to make their environment clean.
2. Write a report for presentation on the outcome of the project carried out.
3. Make a poster to show waste management practices they can adopt to keep their environments clean.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

5 Sub-Strand 2: Human Health

CONTENT STANDARD: B7.5.2.1 Demonstrate knowledge of common deficiency diseases of humans, their causes, symptoms, effects and prevention.

Indicator: B7.5.2.1.1 Explain the relationship between food nutrients and common deficiency diseases and how they affect humans.

LESSON 1: THE RELATIONSHIP BETWEEN FOOD NUTRIENTS AND COMMON DEFICIENCY DISEASES

Teaching and Learning Resources:

- Food samples: (rice, gari, groundnuts, beans, fish, water) Projector. Videos Pictures, Internet searchesr

Learner's Book 7: Pages 374-381

Learning Expectations:

By the end of the lesson, the learner will:

1. name and analyse food nutrients such as carbohydrates, proteins, fatty acids, and their functions in the human body.
2. discuss and make presentations on deficiency diseases associated with lack of food nutrients such as carbohydrates, proteins, fatty acids, vitamins and others in the human body.
3. relate the nutrients they gain or lack to the foods they normally eat e.g. lack of protein leads to kwashiorkor, lack of iron lead to anaemia, etc.
4. describe symptoms, effects and prevention of common deficiency diseases such as night blindness, rickets, scurvy, kwashiorkor and others.

Keywords: food nutrients, deficiency disease, symptoms, kwashiorkor, night blindness, rickets, scurvy, kwashiorko

INTRODUCTION

Food nutrients are necessary for growth, repair of worn out tissues, provision of energy, and other metabolic activities. Another function of food nutrients is to prevent diseases. Lack of certain nutrients in our food results in some diseases which are termed deficiency diseases. In this lesson we will discuss some common deficiency diseases and how they affect humans.

Additional Information

Nutrients	Food Sources	Deficiency Diseases
Carbohydrates	Cereal, whole grains, legumes, potatoes, cheese, pasta, etc.	Hypoglycaemia and Ketoacidosis.
Proteins	Almonds, eggs, chicken, yoghurt, cottage cheese, oats, seafood, beans and pulses, milk and other dairy products.	Kwashiorkor and Marasmus.
Iodine	Eggs, nuts, bread, seaweed, dairy products, and iodized table salt.	Goitre, anaemia, hypothyroidism.
Calcium	Dates, spinach, almonds, soybeans eggs, beans, lentils milk, and all other dairy products.	Muscle spasms, low bone density, and hypocalcaemia.
Sodium	Onions, cabbage, sweet potatoes, broccoli, pumpkin seeds, eggs and milk	Gastrointestinal diseases, the Improper functioning of nerves and muscles.
Phosphorous	Milk, yoghurt, soy products, beans, whole grain food products, potatoes, peas, etc.	Weak bones and muscles, joint pains, nervous system disorders, obesity, etc.
Vitamin – A	Green leafy vegetables, yellow coloured fruits, milk, nuts, tomatoes, carrots, broccoli, etc.	Night blindness and other vision problems.
Vitamin –B	Whole-grain foods, legumes eggs, green leafy vegetables milk and milk products, etc.	Beriberi.
Vitamin –C	Citrus fruits, broccoli, milk, and chestnuts.	Gum bleeding and scurvy.
Vitamin –D	Fish, liver, egg yolks, cheese, citrus fruit juices, soy milk, cereals, etc.	Improper growth of bones and rickets.
Vitamin –E	Potatoes, turnip, pumpkins, avocado, guava, olives, mango, olives, milk, nuts, seeds etc.	Heart problems and Haemolysis.
Vitamin –K	Tomatoes, chestnuts, broccoli, beef, cashew nuts, lamb, mangoes, etc.	Haemorrhage.

Activity

1. Ask the learners to carry out the Activity 1 outlined on page 353 of the learner's book to identify food nutrients and associated deficiency diseases.
2. Ask the learners in a think-pair-share to name foods they eat and analyse food nutrients such as carbohydrates, proteins, fatty acids, and their uses in the human body.
3. Let the learners discuss and make presentations in groups on deficiency diseases associated with lack of food nutrients such as carbohydrates, proteins, fatty acids, vitamins and others in the human body.
4. Let the learners relate the nutrients they gain or lack from the foods they normally eat.
5. Let the learners explain symptoms, effects and prevention of common deficiency diseases such as night blindness, rickets, scurvy, kwashiorkor and others in group.
6. Ask the learners relate the lesson to everyday life to understand why children or people suffer from food/nutritional diseases.
7. Ask the learners to discuss food nutrients and their relationship to deficiency diseases.
8. Discuss vocations that are associated with the lesson.

Main Points of the Lesson

1. Food nutrients are needed by the body for proper growth and functioning of other metabolic activities.
2. These nutrients are proteins, carbohydrate, fats and oil (lipids), vitamins, mineral salts and water.
3. Lack of one or more of these nutrients can result in certain diseases.
4. A deficiency disease is a disease caused by the lack of a particular nutrient in the diet.
5. Eating a balanced diet every day will help to prevent deficiency diseases.

Progressive Assessment

Use peer assessment to find out from learners what they have learnt about the lesson. Engage leaners with effective questions and answers.
Ask learners the following questions.
Name some diseases associated with deficiencies of certain food nutrients.

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

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

Answers to Essay Type Questions

1. Refer to Learner's Book 7 page 374.
2. Refer to Learner's Book 7 page 375.
3. Refer to Learner's Book 7 page 376.
4. Refer to Learner's Book 7 page 376.
5. Refer to Learner's Book 7 page 376.
6. Refer to Learner's Book 7 pages 375.

Answers to Practical Questions

1. Goitre
   Cause - Lack of Iodine in diet.
   Effect - Enlarged thyroid gland.

   Night Blindnesss
   Symptom - Burning or cloudy vision in low light.
   Prevention - Eating red palm oil, green vegetable, egg yolk.

   Kwashiorkor

ICTPROJECT/RESEARCH

Ask the learners to carry out the task as outlined on page xxx of the learner's book:

1. Design a Pocket Guide to promote healthier choices when eating fast food with a goal to select menu items that have nutritional values appealing to the youth.
2. Design the project in a format that could be printed as a small pamphlet.
3. Present their pocket guide on the menu to class for discussion.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

CONTENT STANDARD: B7.5.2.2 Demonstrate knowledge of the nature of selected viral, diseases of humans, their causes, symptoms, effects and management.

Indicator: B7.5.2.2.1 Explain the nature of viral diseases with special emphasis on corona virus (COVID-19) /Ebola/H1N1 disease its causes, symptoms, effects on humans and its prevention.

LESSON 2: THE NATURE OF VIRAL DISEASES.

Teaching and Learning Resources:

- audio visual reports from the media (E.g. national and international TV stations), projector, videos, pictures, internet searches

Learner's Book 7: Pages 382-389

Learning Expectations:

By the end of the lesson, the learner will:

1. discuss the nature of viral diseases.
2. search for information and make presentations on the corona virus disease (COVID -19), Ebola, and H1N1 diseases their mode of transmission from person to person, community to community and from country to country.
3. describe the symptoms, effects and prevention of COVID-19), Ebola, and H1N1 diseases and why they are declared pandemic.
4. describe the role of individuals, community members and government in managing COVID-19 Ebola, and H1N1 diseases.
5. design and produce a poster to educate their community members on the incidence and control of named viral diseases: COVID-19, Ebola, and H1N1.

Keywords: Ebola, corona, viral disease, H1N1 disease

INTRODUCTION

In previous lessons, we learnt about the relationship between food nutrients and common deficiency diseases and how they affect humans. In this lesson, we shall discuss some selected viral diseases of humans. Viruses are very microscopic organisms that live almost everywhere on earth. Even though there are some viruses that are beneficial to humans, many others cause various diseases to humans.

Additional Information

Viruses are microscopic organisms that exist almost everywhere on earth. They can infect animals, plants, fungi, and even bacteria. Almost every ecosystem on Earth contains viruses.
Before entering a cell, viruses exist in a form known as virions.

Viruses cause many human diseases. These include: Small pox, the common cold and different types of flu, measles, chicken pox, shingles, polio, rabies, Ebola, HIV - the virus that causes AIDS, severe acute respiratory syndrome (SARS), corona virus (COVID -19), H1N1. According to the Ministry of Health, the disease is probably most contagious when people are the most symptomatic. However, it is also possible for coronavirus to spread before a person shows any symptoms of COVID-19.

The Ministry of Health recommends that people wear cloth face masks in public places where it is difficult to maintain physical distancing. This will help slow the spread of the virus from people who do not know that they have contracted it, including those who are asymptomatic. People should wear cloth face masks while continuing to practice physical distancing. Instructions for making masks at home are available here.

Activity

1. Ask the learners to carry out Activity 1 outlined on page 361 of the learner's book to listen to a talk on viral diseases.
2. Ask learners in a think-pair-share to discuss the nature of viral diseases.
3. Let learners search for information and make presentations on the corona virus disease (COVID -19), Ebola, and H1N1 diseases their mode of transmission from person to person, community to community and from country to country.
4. Ask the learners to describe the symptoms, effects and prevention of covid-19), Ebola, and H1N1 diseases and why they are declared pandemic and epidemic.
5. Have learners describe the role of individuals, community members and government in managing covid-19, Ebola, and H1N1 diseases.
6. Engage the learners to design and produce a poster to educate their community members on the incidence and control of named viral diseases: covid-19, Ebola, and H1N1.
7. Let learners discuss in their convenient groups vocations that are related to the lesson and present their findings.

Main Points of the Lesson

- Viruses are living organisms that cannot replicate without a host cell.
- They are considered the most abundant biological entity on the planet.
- Diseases caused by viruses include rashes, herpes, Ebola, corona virus (COVID -19), HINI.
- There is no cure for a virus, but vaccination can prevent them from spreading.

Progressive Assessment

Use peer discussion and effective questioning to find out from learners what they have learnt during the lesson. Take feedback from learners and summarize the lesson. Ask learners how the lesson will

benefit them in their daily lives.
Ask learners the following question.

- What is the difference between epidemic and pandemic?

Diagnostic Assessment
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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

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

Answers to Essay Type Questions

1. Refer to Learner's Book 7 page 384-386.
2. Refer to Learner's Book 7 page 384.
3. Refer to Learner's Book 7 page 384-386.
4. Refer to Learner's Book 7 page 387.
5. Refer to Learner's Book 7 pages 384-385.

Answers to Practical Questions

1. Corona Virus
2. COVID - 19
3. Cough, fever, pneumonia
4. Contact tracing
   social distancing
   washing of hands
   cleaning hands with 60% alcohol sanitizer.
5. Ebola, H1N1, small pox, HIV-AIDS, etc.

ICT/PROJECT/RESEARCH

Let learners do the homework and project below:

1. Write down the viral diseases that are pandemic in nature.
2. Write the name of the viral disease that is epidemic in nature.
3. Describe the symptoms, effects and prevention of covid-19), Ebola, and H1N1 diseases and write why they are declared pandemic and epidemic.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

5 Sub-Strand 3: Science and Industry

CONTENT STANDARD: B7.5.3.1 Realise how careers in science can improve human life, and research about Ghanaian and internationally recognised scientists and science educators and model after them.

Indicator: B.7. 5.3.1.1 Discover and explain how careers in science can improve human conditions and relate these careers to the work of great national and international scientists and science educators.

LESSON: CAREERS IN SCIENCE

Teaching and Learning Resources:

- videos, pictures, internet search

Learner's Book 7: Pages 393-398

Learning Expectations:

By the end of the lesson, the learner will:

1. describe various careers in science and relate them to the work of national scientists.
2. describe various careers in science and relate them to the work of international scientists.
3. research, and build portfolio on the impact of science and technology and innovation in homes, schools, communities, and the universe and make a presentation.
4. identify the science and technology careers that Ghana must focus on and give reasons.

Keywords: career, scientists, science educators, technology

INTRODUCTION

Thousands of job opportunities from around the world and free career development tools and resources make Science Careers a one-stop site for scientists looking to advance their careers.

Additional Information

A science career is a great option if you are looking for a role that is varied, rewarding and challenging. A career in science allows you to improve people's lives and help to develop your knowledge and understanding of people, nature and the world around us. Finding the right science career can take time and research. In this lesson, we will explore a variety of science careers, including the primary responsibilities for each role and the average salary to make it easier for you to find the right job offer.

Activity

1. Ask the learners to carry out Activity outlined on page 373 of the learner's book to find out the various careers in science and the work of Ghanaian scientists.
2. Encourage the learners to mention the type of career they wish to take up in future.
3. Let learners describe the various careers in science and relate them to the work of national scientist e.g. Prof. Ibok Nsa Oduro, Prof. Francis Allotey Professor Ewurama Addy, and science educationists: Professor Anamuah-Mensah, Professor Theophilus Ossei-Anto, Professor Christian Anthony-Krueger and others in groups.
4. Let learners describe various careers in science and relate them to the work of international scientists: Albert Einstein, Alexander Fleming, Charles Darwin, Paul Ratnei, Stephen Hawkins etc. through group presentation.
5. Let learners explain the impact of science, technology and innovation in homes, schools, communities and the universe and create interest for learners to research for information to build portfolios.
6. Let the learners identify the science and technology careers that Ghana must focus on and explain their reasons in groups.
7. Let the learners relate the lesson to everyday life to understand why Ghana should focus on specific science and technology careers.
8. Let learners discuss how careers can improve human conditions.

Main Points of the Lesson

Can you imagine a world without scientists? People who work in science careers are responsible for many of the things we, as a society, benefit from every day—ways to prevent and cure diseases, new technology, and strategies to help control climate change. To prepare for a science career you have to study the life or physical sciences. Life sciences involve learning about living organisms and include subjects like biology, biochemistry, microbiology, zoology, and ecology. Physics, chemistry, astronomy, and geology are all physical sciences, which deal with the study of non-living matter.

Progressive Assessment

1. Use peer discussion and effective questioning to find out from learners what they have learnt during the lesson. Ask learners this question:
2. Do you want to be become a scientist in Ghana and beyond? Take feedback from the learners and summarize the lesson.
3. Ask learners the following question.
4. Name one scientist who has inspired you to study science.

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Answers to Essay Type Questions

1. Refer to Learner's Book 7 pages 397.
2. Refer to Learner's Book 7 pages 397.
3. Answer may differ.
4. Refer to Learner's Book 7 pages 396.

ICT/PROJECT/RESEARCH

Engage the learners to carry out the task as outlined on page xxx of the learner's book to research, and build portfolio on the impact of science and technology and innovation in homes, schools, communities, and the universe.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

5 Sub-Strand 4: Climate Change and Green Economy

CONTENT STANDARD: B7.5.4.1 Demonstrate understanding of sustainable energy choices and their impact on the environment.

Indicator: B7.5.4.1.1 Search for information on ways sustainable energy choices and scientific ideas are used to protect the environment.

LESSON: SUSTAINABLE ENERGY CHOICES

Teaching and Learning Resources:

- journals, internet, video and pictures on energy choices

Learner's Book 7: Pages 399-409

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

1. describe how people use sustainable energy choices and scientific ideas to protect the environment.
2. design a project to show how energy can be locally sustained through the use of scientific processes to protect the environment.

Keywords: renewable energy source, non-renewable energy source, sustainable energy. Greenhouse effect, weather, climate, climate change, sustainable energy, scientific process, climate change

INTRODUCTION

The use of fossil fuels is the major cause of rising levels of carbon dioxide in the atmosphere. This is because during combustion carbon dioxide is released with water vapour. The high carbon dioxide levels are a major contributor to climate change. Thus, there is the need for energy sources with lower environmental effect, with attention focusing on renewable energy sources such as wind, water, wave, solar, biomass, etc. In this lesson, we shall look at sustainable energy choices and how to use scientific ideas to protect the environment. Look at the pictures below and discuss them.

Hydroelectric Dam

Wind energy

Solar Panels

Geothermal Energy Plant

Biomass

Fig.1 - Sustainable energy choices

WAYS BY WHICH SUSTAINABLE ENERGY CHOICES AND SCIENTIFIC IDEAS ARE USED TO PROTECT THE ENVIRONMENT.

Additional Information

Most of us appreciate nature, the forest, animals, and rivers, but if you are not protecting the environment, you are harming it. Various materials such as sewage, plastics, and domestic waste pollute the environment.

It is very good to use renewable energy sources. They are cleaner and less polluting than traditional forms of energy, like coal, crude oil and gas. “Renewable” means they can be replenished, so their supply is endless. They are resources that can be mismanaged, too, and the result is damage to the environment. Greenhouses gases are gases in the Earth’s atmosphere that trap heat. They let sunlight pass through the atmosphere to the Earth, but prevent the heat from the sunlight from leaving the atmosphere. The main greenhouse gases are: Water vapour (H_2O), Carbon dioxide (CO_2), Methane (CH_4), Ozone (O_3), Nitrous oxide (N_2O), Chlorofluorocarbons (CFCs)

Activity

1. Ask the learners to carry out Activity 1 outlined on pages 378-379 of the learner’s book to investigate sustainable energy sources.
2. Engage leaners in groups to describe and discuss how people use sustainable energy choices and scientific ideas to protect the environment.

3. Let learners in groups use information from the internet, people in the community and other relevant learning resources to analyse the greenhouse effects and climate change on the environment and show how their effects can be minimized.
4. Let learners in groups explain concepts such as weather and climate and relate them to the current changes in weather.
5. Let learners discuss "greenhouse effect" to show linkages to the roles they need to play to sustain the environment.
6. Let learners discuss ways sustainable energy choices and scientific ideas are used to protect the environment.

Main Points of the Lesson

1. Sustainable energy is the practice of using energy in a way that "meets the needs of the present-day without compromising the ability of future generations to meet their own needs."
2. Renewable energy sources such as wind power, hydroelectric, solar and biomass are sustainable and reliable.
3. Renewable energy is also known as green energy when misused could damage the environment.
4. There are gases in the atmosphere which prevent heat from escaping from the Earth into space thereby keeping a suitable temperature for the continuity of life. These gases are known as greenhouse gases.
5. The greenhouse has disturbing effects on the Earth.
6. Reducing the emission of greenhouse gases and public education are some suggested ways to curb the overwhelming effects of the greenhouse gases.

Progressive Assessment

Sustainable energy choices will reduce energy consumption and challenge the youth to look out for innovative and alternative energy choices that can serve the environment.

Ask the learners to explain of the following terms:

- Sustainable energy choice
- Greenhouse effect
- Climate change

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

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

Answers to Essay Type Questions

1. Refer to Learner's Book 7 pages 400.
2. Refer to Learner's Book 7 page 400.
3. Refer to Learner's Book 7 pages 403-404.
4. Refer to Learner's Book 7 page 403-404.

Answers to Practicals Questions

1. i. Greenhouse
   ii. Glass, translucent palstic
   iii. So that light can enter from any source.
   iv. Evaporation - change of water into vapour and rising up.
   Condensation - change of vapour into water at a definite temperature.

2. i. I - windmill generating electricity.
   II - solar panel generating electricity.
   III - Electricity generated from the soil.
   IV - Biomass generating electricity.
   V - Hydroelectric dam

   ii. Renewable sources of energy.

   iii. a. I - tall towers oppose the appearance of landscape.
   b. II - buildings affect wildlife and human habitation.
   c. III - uses large land which may cuase shifting of the earth.

   iv. They do not get exhausted.
   They are clean

   v. Yes, because they do not cause pollution.

ICT/PROJECT/RESEARCH

Ask the learners to carry out a design project to show how energy can be locally sustained through the use of scientific processes to protect the environment.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

5 Sub-Strand 5: Understanding the Environment

CONTENT STANDARD: B7.5.5.1 Demonstrate understanding of different plants and animals found in different land forms and how they survive (with emphasis land forms in Ghana).

Indicator: B7.5.5.1.1 List and describe the different types of plants and animals that live in different land forms such as plateau plain, mountain valley and others (with emphasis on land forms in Ghana).

LESSON 1: THE DIFFERENT TYPES OF PLANTS AND ANIMALS THAT LIVE IN DIFFERENT LAND FORMS.

Teaching and Learning Resources:

- a video clip on animals and plants that live in the land forms, a field trip to some nearby land forms in the community.

Learner's Book 7: Pages 410-420

Learning Expectations:

By the end of the lesson, the learner will:

1. identify different types of plants and animals found in different land forms (plateau plain, mountain valley and others).
2. describe the characteristics that enable different types of animals to live in different land forms (plateau plain, mountain valley and others).
3. describe the characteristics that enable different types of plants to survive in different land forms (plateau plain, mountain valley and others).
4. make an album of different types of plants and animals that live in different land forms (plateau plain, mountain valley and others).

Keywords: land forms, coastland plateau plain, mountain, valley

INTRODUCTION

There are so many things you would see around you now. These include various forms and kinds of plants, diverse kinds of animals and numerous land forms. This lesson will focus on plants and animals in the main land forms in Ghana.

Additional Information

A landform is a feature of the solid surface of the Earth. Landforms together make up a given land or region. Typical land forms include hills, mountains, plateaus, valleys, seas, volcanoes, and the great ocean basins. A swamp is a low land that is always soaked with water. Different plants and

animals live on different land forms. Many kinds of large trees grow in the mountains. Monkeys live in the mountains, too. Grasses grow on the plains, and much of the plains have been turned into farmland to grow crops.

Fig. 2 - Land forms

Activities

1. Ask the learners to carry out the Activities outlined on pages 395 and 396 of the learner's book to investigate land forms and the characteristics of the plants and animals found in them.
2. Encourage the learners to study charts and land forms and watch video clip and study charts on land forms, animals and plant that live in the land forms.
3. Ask the learners to identify the type of landform and the animals and plants in a particular landform.
4. Let them describe the characteristic of the different land forms (mountains, valleys, plateau, coastlines) based on their observations.

Main Points of the Lesson

- A landform is a natural or artificial feature of the solid surface of the Earth.
- Landforms together make up a given land.
- Common land forms in Ghana are the Akwapim-Togo mountain ranges, the Volta Delta, Accra Plains, and the Akan Lowlands.
- The special features developed by plants and animals that enable them to successfully live and breed in their habitat is termed adaptation.
- Plants and animals from the various land forms have similar general features that enable them to survive in their respective land forms

Progressive Assessment

Knowledge of animals and plants found in different land forms are linked to career technology and social studies. In career technology plants that are edible can be studied and used in the food industry to make new species. Before the lesson is taught, the teacher should contact the social studies teacher to check if important of plants have been taught, if not use what learners already know about it.

Ask learners the following question.

Can you link the lesson to a particular career development and social studies?

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

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

Answers to Essay Type Questions

1. Refer to Learner's Book 7 page 410-415.
2. Refer to Learner's Book 7 pages 410-415.
3. Refer to Learner's Book 7 pages 410-415.
4. Refer to Learner's Book 7 pages 410-415.

Answers to Practical Question

1. A - Mountain
   B - Valley
   C - Plane
   D - Island and penisular

2. A - high and rocky land
   B - low land between two hills

C - large areas of low land
D - land surrounded by water

3. A - hgh land with rocks whilst
   C - low land covered with plants

4. B - corn, cassava
   D - banana, coconut

ICT/PROJECT/RESEARCH
Ask the learners to carry out the task outlined on page xxx of the learner's book to:
List the type of landform that found in their community.
Find from elders or farmers the type of plants and animals that are found in the land forms.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

Indicator: B7.5.5.1.2 Explain the nature of associations that exist among plants and animals in different land forms and their mechanisms for survival.

LESSON 2: THE NATURE OF ASSOCIATIONS THAT EXIST AMONG PLANTS AND ANIMALS IN DIFFERENT LAND FORMS.

Teaching and Learning Resources:

- A nearby farm, video clips and pictures on associations between animals and plants and their mechanisms for survival.

Learner's Book 7: Pages 421-431

Learning Expectations:

By the end of the lesson, the learner will:

1. describe the nature of associations such as mutualism, parasitism, commensalism among plants and animals and explain the effects on their habitats.
2. carry out research about the different ways that different plants and animals survive in the land forms in which they are found.

Keywords: predators, mutualism, commercialism, parasitism, symbiosis.

INTRODUCTION

The natural environment encompasses all living and non-living things occurring naturally. This environment encompasses the interaction of all living species, climate, weather and natural resources that affect human survival and economic activity. The living things do not live in isolation. There is a long term relationship (symbiotic relationship between two different species. In this lesson, we shall learn about different types of long-term relationship among different species.

Additional Information

The environment is enriched with plants and animals. Dead plants and animals rot away and give energy, minerals and fertilizers to the environment. These types of relationships among plants, animals and the environment are called interrelationships. All animals must depend on other animals, plants and their environments to survive in this world. How plants depend on other plants, animals and the environment? Plants also depend on other plants, animals and their environments.

1. Some plants attach to another plant and grow.
2. Animals help some plants to disperse their seeds (seed dispersal) θ Ecology is the study of the interrelations of organisms and environment θ Interrelationships or animal associations either direct or indirect, exist among members within a species (Intra specific) or between members of different groups (Inter specific).

3. Symbiosis
4. Commensalisms
5. Parasitism
6. Natural selection
7. Artificial selection
8. Prey – predator relationship
9. Host - parasitic relationship

Activity

1. Ask the learners to carry out Activity 1 outlined on page 400 of the learner's book to find out the relationships that exist among plants and animals and their mechanisms for survival.
2. Organise the learners to discuss associations such as such as mutualism, parasitism, commensalism among plants and animals.
3. Show them a video clip or pictures of association such as mutualism, parasitism, commensalism among plants and animals.
4. Let them observe how plants and animals interact, and how animals interact with other animals.
5. Guide them to visit a nearby farm to observe and record the behaviour of animals (insects, spider, birds, amphibians, mammals) in their immediate environment.
6. Let them observe how animals interact with plants and other animals.

Main Points of the Lesson

- Mutualism is interaction between organisms of two different species in which each organism benefits from the interaction in some way.
- Commensalism is another type of symbiotic relationship where one organism benefits while the other organism does not gain or lose.
- Parasitism is a type of relationship where one organism (parasite) benefits and the other organism (the host) is harmed in some way, and it is structurally adapted to this way of life.
- Mutualism is where both organisms benefit, commensalism is where one benefits and the other is unaffected, and parasitism is where one benefits and the other is harmed.

Progressive Assessment

Use group discussion to help learners to find out the relationships that exist among plants and animals and their mechanisms for survival.

Ask learners the following question.

- How are birds adapted to fly?

Diagnostic Assessment

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?
- Was the majority of the class responding as you would expect them to?
- Are 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?

ANSWERS TO QUESTIONS FROM THE TEXT BOOK

Objectives

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

Answers to Essay Type Questions

1. Refer to Learner's Book 7 pages 422-424.
2. Refer to Learner's Book 7 pages 426 & 428.
3. Refer to Learner's Book 7 page 427.

Answers to Practical Questions

i. A - Insect
   B - bird
   C - fish

ii. hollow bones, wings
iii. colouration, exoskeleton
iv. laterl line, fins foe swimming, gills for breathing
v. lateral line

ICT/PROJECT/RESEARCH

Ask the learners to identify an ecosystem in their environment and determine the associations that exist between plants and animals in it.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

Inclusivity: Ensure that there is no discrimination during lesson delivery, based on gender, ability levels or background of learners. Form mixed ability groups for all group activities.

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