NEW AGE SCIENCE

FOR BASIC SCHOOLS

TEACHER'S GUIDE BOOK

6

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Preface

The teacher's guide has been written to assist the facilitator to help learners to acquire the required skills and attitudes and also to help them understand the concepts as explained in the textbooks and workbooks.

The Teacher's Guides have been written to deliver the new curriculum for Basic Schools produced by the Ministry of Education for the National Council for Curriculum and Assessment (NaCCA). It has been developed by an expert team of Ghanaian teachers and educators and its aim is to achieve the content standards and indicators and exemplars of the curriculum and to support the teachers as they work with the learners throughout the six years.

The curriculum uses a learner-centered approach and works to develop the skills that the learner should acquire. The curriculum is designed to help learners acquire both scientific attitudes and process skills and cognitive ability and be able to apply them. The course is activity-based and proceeds on the knowledge that learners learn best when they are actively doing science and not just listening or reading about it.

The Teacher's Guide is designed to support facilitators as they create the facilitating and learning opportunities and activities through which the learners will develop their science skills, their attitudes and cognitive abilities.

For each indicator in the learner's book the guide provides a list of key words introduced in the indicator, advice on lesson planning, materials and resources required for the indicator to enable the facilitator achieve his or her aim. Local materials of low or no cost are suggested.

The facilitators are also provided with different kinds of assessments to enable them find out what the learners know already (diagnostic) and whether they are following the steps as the lesson progresses (progressive)

The answers to these assessment questions and those of study questions in the learners textbook as well as those in the workbook have all been provided in the teacher's guide. These will help the facilitator to do his or her work effectively.

School-based Assessment (SBA) is an important feature of the new curriculum. The study questions at the end of each indicator in the learner's book are written in the same line as the SBA. We hope that this will assist the facilitator in their assessment. We hope that you will enjoy using the guide and it will help in your work as a facilitator to help the learners develop their scientific abilities.

General Introduction

Science and Technology is the backbone of social, economic, political and physical development of a country. It is because of this realization that the Ministry of Education through the Ghana Education Service and the National Council for Curriculum and Assessment (NaCCA) has developed the curriculum for basic schools.

Aims and Objectives of Teaching Basic Science in the Primary School.

The curriculum is aimed at shaping individuals to become scientifically literate, good problem solvers, have the ability to think creatively and develop both the confidence and competencies to participate fully in Ghanaian society as responsible local and global citizens. The Science curriculum is designed to help learners to;

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

Rationale for teaching Basic School Science.

Science forms an integral part of our everyday life, and it is a universal truth that development is hinged on science. Science consists of a body of knowledge which attempts to explain and interpret phenomena and experiences in rational terms. Science has changed our lives and it is vital to Ghana's future development.

To provide quality science education, facilitators must facilitate learning in the science classroom. This will provide the foundation for discovering and understanding the world around us and lay the basis for science and science-related courses of study at higher levels of education. Learners should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave and analyse the origins, causes and effects of things in our environment.

Science is also concerned with the development of attitudes, and therefore, it is important for all citizens to be scientifically and technologically literate for sustainable development. Science has to be taught using hands-on and minds-on approaches, which learners will find as fun and adopt as a culture.

Philosophy

i. Teaching

Ghana believes that an effective science education needed for sustainable development should be inquiry-based. Thus science education must provide learners with opportunities to expand, change, enhance and modify the ways in which they view the world. It should be pivoted on learner-centred methodology and learning approaches that engage learners physically and cognitively in the knowledge-acquiring process in a niche and vigorous inquiry-driven environment.

ii. Learning

Science Learning is an active contextualized process of constructing knowledge based on learner's experiences rather than acquiring it. Learners are information constitutors who operate as researchers. Facilitators serve as facilitators by providing the enabling environment that promote the continuation of learners own knowledge based on their previous experiences. This makes learning more relevant to the learner and leads to the development of critical thinkers and problem solvers.

Instructional Expectation(Role of the Facilitator)

1. Guide and facilitate learning by generating discourse among learners and challenging them to accept and share responsibility for their own learning based on their unique individual differences.
2. Select science content, adapt and plan lessons to meet the interests, knowledge, understanding abilities and experiences of learners.
3. Work together as colleagues within and across disciplines and grade levels to develop communities of science learners who exhibit the skills of scientific inquiry and the attitudes and social values conducive to science learning.
4. Use multiple methods and systematically gather data about learners' understanding and ability, to guide science teaching and learning with an arrangement to provide feedback to both learners and parents.
5. Design and manage learning environments that provide learners with time, space and resources needed for learning science.

Core Competencies

These describe a body of skills that teachers at all levels should seek to develop in the learners. There are ways in which teachers and learners engage with the subject matter as they learn the subject. The competencies presented here describe a connected body of core skills that are acquired throughout the process of teaching and learning.

Critical Thinking

This skill helps to develop learners' cognitive and reasoning abilities to enable them analyse and solve problems. This skill enables learners to draw their own experiences to analyse situations and choose the most appropriate out of possible solutions. It requires the learners embrace the problem at hand and persevere and take responsibility for their own learning.

Creativity and Innovation
This skill promotes the development of entrepreneur skills in learners, through their ability to think of new ways of solving problems and developing technologies for addressing the problem at hand. It requires ingenuity of ideas, arts, technology and enterprise. Learners having this skills are also able to think independently and creatively.

Communication and Collaboration.
The competence promotes in learners the skills to make use of language, symbols and texts to exchange information about themselves and their life experiences. Learners actively participate in sharing their ideas. They engage in dialogue with others by listening to and learning from them. They also respect and value the views of others.

Cultural Identity and Global Citizenship
This competence involves developing learners to put country and service foremost through an understanding of what it means to be active citizens. This is done by inculcating in learners a strong sense of social and economic awareness. Learners make use of the knowledge, skills competencies and attitudes acquired to contribute effectively towards the socio economic development of the country and in the global stage. Learners build skills to critically identify and analyse cultural and global trends that enable them to contribute to the global community.

Personal Development and Leadership
This competence involves improving self-awareness and building self-esteem. It also entails identifying and developing talents, fulfilling dreams and aspirations. Learners are able to learn from mistakes and failures of the past. They acquire skills to develop other people to meet their needs. It involves recognising the importance of values such as honesty and empathy and seeking the well-being of others. Personal development and leadership enables learners to distinguish between right and wrong. The skill helps them to foster perseverance, resilience and self-confidence. This skill (PL) helps learners to acquire the skill of leadership, Self-regulation and responsibility necessary for lifelong learning.

Digital Literacy(DL)
The skill develops learners to discover, acquire knowledge and communicate through ICT to support their learning. It also makes them use digital media responsibly.

Scope of Content
The content standards in the curriculum have been carefully selected to introduce learners to the inquiry process of science as well as the basic ideas in science.

The Teacher's Guide are series of books written in a simple easy to read and understand language. Almost every scientific term used is simplified as much as possible. There are simple illustrations, examples, hands-on minds and eyes-on activities which are very necessary in teaching science.

Organisation of the Teacher's Guide

The Teacher's Guide has been organised to confirm with the Learners Text Book. It is made of strands, sub-strands, content standards, Indicators and examples. A unique annotation is used for numbering the learning indicators in the curriculum for the purpose of referencing. An example is shown in the table below.

Annotation	Meaning/Representation
B3	Year or class
2	Strand Number
4	Sub-Strand Number
1	Content Standard Number
2	Indicator Number

Strands – the broad areas/sections of the science content to be studied.

Sub-strand – the topics within each strand under which the content is organised.

Content Standard – the predetermined level of knowledge, skill and attitude that a learner attains by a set stage of education.

Indicator – a clear outcome or milestone that learners have to exhibit in each year to meet the content standard expectation. The indicators represent the minimum expected standard in a year.

Exemplar - support and guidance which clearly explains the expected outcomes of an indicator and suggests what teaching and learning activities could take to support the facilitators/teachers in the delivery of the curriculum.

The Teacher's Guide has also been organized along the same line. In addition it has an introduction , key words, materials and resources, additional information, diagnostic and progressive assessment and their answers as well as answers to text book study questions.

Role of the Facilitator (Before A Lesson)

- Collect materials around the school environment with the help of learners
- Plan the best way to teach the lesson.
- With the help of indicators and exemplars select and plan activities for the learners.
- Try out the activity to find out its suitability to the achievement of the indicators.

The Role of the Facilitator/Teacher (during the lesson)

- Introduce the lesson and give out the materials
- Supervise and guide learners as they perform the activity
- Move round and ask questions or provide clues at times
- Evaluate learners' work

- Act as a co-learner
- Encourage learners when the need arises.

The Role of the Facilitator/Teacher (After the lesson)

- Organize a general class discussion with learners to concretize concepts, skills, attitudes and correct misconception.
- Assess learners by giving them assignment, exercises and quizzes.
- Work assignment, quizzes and exercises

The Role of the Learners.

1. Before the lesson.
    - They may be involved in the collection and gathering of materials necessary for the lesson.
    - They may be involved in the planning of the activities.

2. During the Lesson
    - Learners interact with the materials as they try to find out answers to their own questions and that of the facilitator through the use of the materials.

Special Attention Learners

A class may consist of learners of different physical problems and mental abilities. Some of the learners may have high abilities whiles others may be slow learners, some may be dyslexic and not able to read or spell well as the others in the class. All these are special needs – learners and need special attention.

Ensure that you give equal attention to all leaners in the class to provide each of the equal opportunities for learning. Learners with disabilities may have hidden talents that can only come to light if you provide them with the necessary encouragement and support in class.

In the classroom, learners should

- Communicate among their group members and with the facilitator.
- Record their findings and observation by making models, sketches and drawings and writing.

After the lesson

- Learners participate in general class discussion with the facilitator
- Tidy up the classroom

Assessment

The facilitator must continuously assess himself or herself as well as the learners. This is a process of collecting and evaluating information about learners and using the information to improve their learning.

In this curriculum, it is suggested that the facilitator uses assessment to promote learning and so identifies the strengths and weaknesses of learners to enable him or her ascertain the learners response to instructions.

Assessment is both formative and summative. Formative assessment is viewed in terms of assessment as learning and Assessment for learning.

Assessment as Learning:
It relates to engaging learners to reflect on the expectations of their learning. Information that learners provide the facilitators form the basis for refining teaching-learning strategies.

Learners are assisted to play their roles and to take responsibility of their own learning to improve performance. Learners are assisted to set their own goals and monitor their progress.

Assessment For Learning
This is an approach used to monitor learners' progress and achievement. This occurs throughout the learning process. The facilitator employs assessment for learning to seek and interpret evidence which serves as timely feedback to refine their teaching strategies and improve learners' performance. Learners become actively involved in the learning process and gain confidence in what they are expected to learn.

Assessment of Learning
This is summative assessment. It describes the level learners have attained in the learning, what they know and can do over a period of time. The emphasis is to evaluate the learners' cumulative progress and achievement.

Which assessment the facilitator uses depends on its purpose. Try to select indicators in such a way that you will be able to assess a representative sample from a given strand. Each indicator in the curriculum is considered a criterion to be achieved by the learner. When you develop assessment items based on a representative sample of the indicator taught the assessment is referred to as a 'Criterion-Referenced Assessment'. A facilitator cannot assess all indicators taught in a term. The assessment procedure you use i.e. class assessment, homework, projects etc. must be developed in such a way that the various procedures complement one another to provide a representative sample of indicators taught over a period.

CONTENTS

STRAND 1: DIVERSITY OF MATTER

SUB-STRAND 1: LIVING AND NON-LIVING THINGS

LESSON 1: TYPES OF ROOT SYSTEMS IN PLANTS

Reference: Learner's Book pages 2 - 6

Expected Learning Outcomes

- Know the main types of plant roots
- Explain the difference between the tap root and fibrous root systems
- Give examples of plants having the fibrous root systems and those having the tap root systems

Content Standards: Show understanding of the physical features and life processes of living things and use this understanding to classify them.

Indicator: B6.1.1.1.1 Classify plants based on their root system.

Core Competencies: Critical thinking and Problem solving, Communication and Collaberation, Creativity and Innovation.

Subject Specific Competencies: Observing, Communicating, Planning, Analysis, Designing, interpreting

Introduction

With the exception of simple plants such as algae, fungi, mosses and liver words, all plants are vascular plants, that is they all have a complex system of special fluid – carrying tissue called vascular tissue.

The stem and roots of a plant are its main supporting structures as well as being important in transporting fluids.

Key Words: Tap root, fibrous root.

Additional Information

Plants have four main parts which perform different functions for the plant. These include the root, the stem, the leaves and the flowers.

Root

- it holds the plant firmly in the soil.
- It absorbs water and minerals salts for the plant.

Stem

- it holds the leaves
- It transports water and mineral salts to the leaves.

Leaves

- they manufacture food for the plant.

Flowers

- it produces fruits and seeds.

The Root System

A root is part of the plant that develops from part of the embryo of the seed of a plant called the radicle. When a seed germinates, the radicle develops into a primary root and the plumule which also part of the embryo of the seed develop into the shoot (stem and leaves. The primary root develops into the taproot or fibrous root.

The root generally have different size, colour and appearance. A first root (also called primary root, which is larger than the small roots is called tap root). Many vegetables are swollen tap roots. A system made up of a large number of equal sized roots, all producing smaller lateral roots is called fibrous root. The first fibrous root is not prominent as it is in a tap root system.

A root system is a network of all roots of a plant
There are three main root systems. They are

1. Taproot system: the main root grows larger and faster than the branched roots,
2. Fibrous root system: All roots are about the same size

Roots of maize

Root of carrot.

Teaching the lesson

Reviews previous lesson on parts of a plant with leaners (stem, root, leaves and flowers)

Ask learners, in groups (4 or 5 in a group), to uproot young plants (e.g. Grass, beans, mango, cassava and sweet potato) and bring to the classroom. Show to leaners pictures of the root system of different plants.

Learners observe and identify the similarities and differences between the roots of the various plants.

Task leaners to put the plants into two main groups based on similarities in their root system.

Ask learners to give reasons for their classifications.

Help learners to build vocabulary by explaining to them the two main roots systems of plants, namely; tap roots and fibrous roots.
Instruct leaners to mould tap root and fibrous root using blue tack and display for discussion.

Summary

- Plants have different types of root systems namely the fibrous root system and the tap root system.
- Fibrous root system are made up of many roots that are all similar. Examples of plants having fibrous root systems are maize plant, coconut plant and oil palm plant
- Plants with tap root systems usually have one large root, which has smaller roots.
- Many vegetables have swollen tap roots.

Diagnostic assessment questions

1. Write down the main parts of a plants.
2. There are two main types of roots. Write down the two main types.

Progressive assessment questions.

1. Write down the differences between the root of Mango and the root of grass.
2. The stem and roots of a plant are its main supporting structures as well as being important in transporting fluids. True / False

Answers to diagnostic assessment questions.

1. Stem, root leaves and flowers
2. Tab roots and fibrous rots

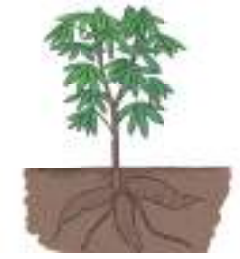
Answer to progressive assessment questions

1. Mango has taproot system. Grass has fibrous root system
2. True.

Answers to Study Questions (Refer to LB page 5 - 6)

1. Complete the following sentence with the correct word: A root is described as Fibrous root where all roots are similar and Tap root where there is one large root with smaller branches.
2. A tap root will be one large root with smaller roots but fibrous will be a root that is small and similar to many other roots.
3. Draw and label fibrous root system and taproot system.

4. Fibrous root system is made up of many roots that are all similar. Plants with tap root systems usually have one large root, which has smaller roots.
5. Complete the table below by identifying the type of root.

Plant	Type of root
	Fibrous root
	Tap root
	Tap root
	Tap root

Diagnostic assessment for facilitator

1. Did every learner classify living plants based on their root systems?
2. Were there some learners who could not classify plants based on their root systems?
3. What did you do to help such learners

STRAND 1: DIVERSITY OF MATTER

SUB-STRAND 2: MATERIALS

LESSON 2: PROPERTIES OF METALS

Reference: Learner's Book pages 7 - 12

Expected Learning Outcomes

- identify everyday uses of metals
- mention some properties of metals

Content Standards: B6.1.2.1 Recognise materials as important resources for providing human needs

Indicators: B6.1.2.1.1 Know the general properties of metals such as lustre, malleability, conductivity and ductility

Core Competencies: Critical thinking and Problem Solving, Digital Literacy, Communication & Collaboration

Subject Specific Practices: Observing Communicating Analysing Generalising

Introduction

It is important to know that materials surrounding you can be used for many things in your daily life. One main example of materials that we use for making everyday objects are metals. Can you mention some uses of metals? Metals have various properties that help us to use them for making important objects.

Key Words: lustre, malleability, conductivity and ductility

Additional Information

It is important to know that materials surrounding you can be used for many things in your daily life. You need to know the properties of these materials to enable you know what they can be used for to meet human needs.

Properties of metals

There are certain physical properties exhibited by metals. Some of these properties include lustre, malleability, conductivity and ductility. Though the metals have general properties you cannot use the for certain general purpose. For example, though metals conduct electricity, you cannot use any metal to make electrical cables. Sodium and potassium metals cannot be used to make electrical cables. Metals are malleable but you cannot use potassium or sodium metals to make roofing sheets.

Lustre

When metals are polished, they shine. This is described as lustre. When a carpenter buys new nails they look shiny. They are therefore said to be lustrous.

Malleability

Malleability refers to the ability to be hammered into different shapes. Metals are malleable because when you apply pressure on them, especially when you hit them with hammer the original shape changes into another shape without breaking.

Heat and electrical conductivity

Conductivity means the ability of a material to allow heat or electric current to pass through it. Metals are able to able to allow the transfer heat from one part of the metal to the other parts. This makes metals good conductors of heat. They also allow electric current to pass through them. This makes them also conduct electricity.

Ductility

Ductility refers to the ability of a material to be drawn into wires. Metals are ductile because when you apply pressure on them to stretch them they can be pulled into wires.

Starting the lesson

Ask learners to organise themselves into groups of four or five.

Ask each group of learners to gather different objects such as ruler, erasers, exercise books, comb, plastic bowls, connecting wires, cups, plates, cooking pans, roofing sheets, iron nails, pins and as many other materials that they can.

Ask learners to look at the materials they have gathered critically and classify them as metals or non-metals based on the following properties: lustre, malleability, conductivity and ductility.

Ask learners to give reasons for their classification.

Ask learners to mention everyday activities that involve the use of metals.

A woman frying fish

A wielder hitting a dented car body to straighten it

Carpenter using saw to cut wood

A man fixing gold ring on the finger of a woman

Give to each group of learners a piece of aluminium foil and a drinking straw . Ask learners to describe how they will use conductivity to classify them as metals or non-metals.
Give to learners a pair of scissors and a hammer.

Then tell learners to design and make simple machines with metals by using milk tin or any metal in their design

Summary

- It is important to know that materials surrounding you can be used for many things in your daily life.
- Metals have various properties that help us to use them for making important objects.
- The physical properties exhibited by metals include lustre, malleability, conductivity and ductility

Diagnostic assessment questions

What do the following properties mean?

i. Ductile
ii. Lustrous
iii. malleable

Answers to diagnostic assessment questions

i. Ductile: Can be drawn into thin wires
ii. Lustrous: Surface looks shinny when polished
iii. malleable: Can be hammered into different shapes

Progressive assessment questions

Write down three properties of the material used to make gold ring

Answers to progressive assessment questions

Ductile, Lustrous, malleable

Answers to Study Questions (Refer to LB page 12)

1. energy, good, heat, hot, electricity, of electricity malleable, shape.
2. a. i) Lustrous ii) malleable iii) good conductors of electricity.
   b. i) it is not a good conductor of electricity.
   ii) Asbestos roofing sheets are poor conductors of electricity but aluminium roofing sheets conduct electricity.
   iii) Becuase they are poor conductor of heat.
3.

Metals	**Non-metals**
Bread knife	Ruler
conneting wire	eraser
cooking pan	exercise book
roofing sheet	plastic bowl
Iron nails	plastic cup
pin	wind screen

Diagnostic assessment for facilitator

1. How did you start the lesson?
2. Were learners able to state the general properties of metals?
3. Were the learners able to link the general properties of metals with their uses?
4. Which subject specific practices did you focus on mostly during the lesson?

STRAND 1: DIVERSITY OF MATTER
SUB-STRAND 2: MATERIALS

LESSON 3: THE USES OF METALS BASED ON THEIR PROPERTIES

Reference: Learner's Book pages 13 - 19

Expected Learning Outcomes

- identify and write names of objects upon seeing them.
- State the uses of metals by observing objects upon seeing them.
- Link the use of the metals to their properties

Content Standards: B6.1.2.1 Recognise materials as important resources for providing human needs

Indicators: B6.1.2.1.2 Investigate the uses of metals in everyday life and link the uses to their properties

Introduction

There many objects around you. Some of these objects are made of metals. These metals have different properties which enable them to be used for makes certain objects for our everyday use. Ask learners to look at the different objects in the picture and those that you will show you. Ask them what these materials are made of? Ask them whether they are made of metals or non-metals?

Additional Information

Properties of metals and their uses

The properties of metals determine their uses.

1. Aluminium
   i. It is used for making pots and pans because it is a good conductor of heat.
   ii. It is used in making high tension cables because of its lightness and electrical conductivity.
   iii. It is malleable (soft enough to be easily moulded into shapes). It cannot also corrode easily. Because of these properties it is therefore used for making roofing sheets.
2. Iron (and Steel) is used for construction work, bodies of cars, engines and tolls because of its high tensile strength.
3. Gold is an unreactive metal. It does not corrode or tarnish easily in air. It is a shiny metal with attractive yellow colour. These properties make it a precious metal for ornaments and jewellery. Because of its high electrical conductivity, it is used in electrical and electronic equipment.
4. Copper is used to make electric wires and electrical fittings since it is a good conductor of electricity. It is also used to make pipes for conveying water and hydrocarbon gases since it does not react with water and hydrocarbon gases.
5. Chromium has a high resistance to corrosion and a high refractive index (it has high ability to reflect and refract light), hence used in the electroplating of steel.

Copper *copper cables* *chromium* *iron rods* *Gold bars*

Figure 1.1.1 Metals

Think of many other objects that you see around you in everyday lives that are made of metals. What do you say about coins, earrings, wedding rings, metal keys, nails and hammer? Are they made of metals?

Starting the lesson

Ask learners to organise themselves into groups of four or five.
Show to learners some materials displayed on your table.
Show to learners pictures from page……of pupils book six
Ask learners to write the names of the objects they have seen in the picture and those that you have shown to them.
Ask each group of learners to present their answers to the other groups in the class.
Ask learners to discuss among their group members and come out with the uses of metals by observing the objects in the picture or those displayed in class or from a video you have shown to them.

Summary

- Metals have different properties which enable them to be used for makes certain objects for our everyday use
- Aluminium is used for making pots and pans because it is a good conductor of heat.
- Copper is used to make electric wires and electrical fittings since it is a good conductor of electricity.
- Iron (and Steel) is used for construction work, bodies of cars, engines and tolls because of its high tensile strength.

Diagnostic assessment

1. Name the metal that is used to make the following objects
   i. (i) Cutlass
   ii. (ii) Engagement ring
   iii. (iii) The body of articulated truck

Progressive assessment

1. Why do you think
2. gold is used to make roofing sheets?
3. iron is not used to make wedding rings?

Answers to Diagnostic assessment

i. Cutlass: Iron
ii. Engagement ring: Gold
iii. The body of articulated truck: Iron

Answers to Progressive assessment

1. It is expensive
2. It easily rust and it is not attractive

Answers to Study Questions (Refer to LB page 18 - 19)

1. Gold is an unreactive metal. It does not corrode or tarnish easily in air. It is a shiny metal with attractive yellow colour. These properties make it a precious metal for ornaments and jewellery. Because of its high electrical conductivity, it is used in electrical and electronic equipment.
2. They malleable. They are ductile. They are good conductors of heat and electricity
3. No, it is not advisable. This is because iron reactive, can easily rust and is also not attractive.
4. The table below shows certain objects, the metal from which they are made and the properties of the metal. Copy and complete the table.

Object	Metal	Property
	Copper	It is ductile, conducts electricity well
	Gold	Malleable, unreactive, does not corrode or tarnish easily in air, shiny and attractive.
	Aluminium	Malleable, conducts heat well
	Gold	Malleable, unreactive, does not corrode or tarnish easily in air, shiny and attractive.
	Aluminium	Malleable, not corrosive
	Aluminium	Light, has good tensile strength

5. Aluminium

Diagnostic assessment for facilitator

1. Did you show to the learners samples of metals rather than pictures?
2. How did you start the lesson?
3. Were the learners able to state the uses of metals just by observing some object shown to them?
4. Were learners also able to state the properties of metals upon seeing an object made of it?
5. Were the learners able to link the general properties of metals with their uses?

STRAND 1: DIVERSITY OF MATTER
SUB-STRAND 2: MATERIALS

LESSON 4: USES OF MIXTURES

Reference: Learner's Book pages 20 - 24

Expected Learning Outcomes

- produce mixtures such as salt solution, sugar solution, concrete, sand and water.
- investigate the daily uses and applications of mixtures
- write the names of the components of the mixtures stated.

Content Standards: B6.1.2.2 Understand mixtures, the types of formation, uses and ways of separating them into their components

Indicators: B6.1.2.2.1 Examine some uses of mixtures in everyday life

Core Competencies: Critical thinking and Problem-Solving, Digital Literacy, Communication and Collaboration

Subject Specific Competencies: Observing, Communicating, Analysing

Introduction

The leaners will continue to lean about materials. This time they will lean about mixtures that the encounter in their daily lives. The leaners ma not know that some products the use every day are mixtures. Teaching this topic will enable them appreciates these product

Key words: mixtures, separation

Additional Information

There are different types of mixtures. The different types of mixture have different uses in daily lives. There are different ways of separating them into their components

In Basic five, B5.1.2.3.1, you learnt about formation and separation of mixtures. Here are some examples of mixtures that you have already studied.

- Common salt dissolved in water: Solid – liquid mixture: The solid (common salt) dissolves in the water and does not settle when left for some time.
- Vinegar in water: liquid– liquid mixture in which the vinegar dissolves in the water.
- Oil in water: Liquid – liquid mixture in which the oil does not dissolve but settles on the water because the oil is lighter than the water.
- A bottle of fizzy drink (coca cola, Fanta or sprite): Liquid – gas mixture: The gas dissolves in the liquid.

- Smoke rising from burning substance: this is solid gas mixture.

Starting the lesson
Let learners watch the videos and pictures of different types of mixtures.

Provide samples of materials to learners and guide them to produce mixtures such as salt solution, sugar solution, concrete, sand and water.

In groups of four or five, let learners investigate the daily uses and applications of mixtures, for example, salt solution, sugar solution, concrete, gari and beans.

Ask leaners to write the names of the components of the mixtures they have investigated.

Other examples of mixtures and their uses
There are many uses of mixtures in everyday life. These uses include:

- Soaps production: Oil, salt, perfumes, water can be found in soap
- Alcoholic beverages production: Water, ethanol, carbon dioxide can be found in alcoholic beverages(alcoholic beverages are not good for children)
- Soft drinks: Soft drinks contain water, sugar, carbon dioxide and some substances which can preserve it
- Medicines: Different substances are mixed to produce medicine. Antacids for example may contain a mixture of a weak acid and calcium carbonate
- Creams (body and hair)

Uses of mixtures in industry include:

- Manufacture of paints: Paints contain water and oil, and some chemicals that give them colour and some other chemicals that make them stick to surfaces during painting.
- Manufacture of medicines
- Crude oil: Petrol, diesel, paraffin, bitumen, LPG are found in crude oil
- Manufacture of soft drinks
- Manufacture of alcoholic beverages

Summary
The different types of mixtures have different uses in daily lives. There are different ways of separating them into their components. Iron filings in sand is an example of a solid – solid mixture, Powered chalk in water is an example of solid – liquid mixture. In this case, the solid particles do not dissolve. They settle at the bottom of the water when left for some time.

Diagnostic assessment
Write down the components of the following mixtures

a. Salt solution
b. Crude oil

Progressive assessment

Name one mixture each used by the following people

a. Pharmacists
b. Farmers
c. Caterers

Answers to Diagnostic assessment

a. Salt and water
b. Petrol, diesel, paraffin, bitumen, LPG

Answers to Progressive assessment

Pharmacists: cough mixture
Farmers: Fertilisers, insecticides,
Caterers: salad cream

Answers to Study Questions (Refer to LB page 24)

1. Complete the following sentences by filling in blank spaces with the correct word.
   When common **salt** is dissolved in **water** it forms a solid-**liquid** mixture. This is because the common **salt** dissolves in the **water** and does not settle when left for some time. But when vinegar is dissolved in **water**, it forms liquid–**liquid** mixture.
2. Soaps: They contain oil, salt, perfumes and water
   Soft drinks: They contain water, sugar, carbon dioxide and some substances which can preserve it
3. We cannot prepare medicine, for example, chemicals are dissolve in water to form the medicine which is a mixture.
   We cannot prepare soup, for example in preparing soup we add salt to the soup which contains water.
4. Rice water = Solid-liquid (rice and water, rice and milk, sugar and water), Fufu = solid-liquid(boiled cassava and water), Yam and groundnut soup = solid-liquid, Groundnut soup = liquid-liquid(water and oil), solid-liquid(water and salt, water and fish), Jollof rice = Solid-liquid(rice and oil, rice and water), solid-solid(rice and salt)

Diagnostic assessment for facilitator

1. In what ways did you engage the learners in critical thinking?
2. Were the learners able to display observations skills during the lesson?
3. How did your lesson delivery cater for different learner abilities?
4. Did every learner benefit from the lesson?

STRAND 2: CYCLES

SUB-STRAND 1: EARTH SCIENCE

LESSON 5: THE RELATIVE SIZES OF THE EARTH AND SUN

Reference: Learner's Book pages 26 - 29

Expected Learning Outcomes

- Describe the size of the earth in relation to the sun
- Describe the size of the sun in relation to the earth
- Explain how the size of the sun helps in the formation of day and night and seasons.

Content Standard: B6.2.1.1.1. Recognise the relationship between the earth and the sun.

Indicator: B6.2.1.1.1 Describe the relative sizes of the earth and sun and their importance

Core Competencies: Critical thinking and Problem Solving, Communication and Collaboration.

Subject Specific Practices: Designing Experiment, Planning, Communicating, Observing, Analysing

Introduction

The solar system is made up of the sun at the centre and the planets moving in their orbits round the sun which does not move. The planets obtain radiation from the sun. The sun also holds the planets in their individual orbits by the gravitational attraction between them. Without this force of attraction, the planets including the earth cannot remain in its orbit and there will be no life on earth. The sun is very big compared to the earth. Due to its size and for that matter its ability to produce energy, other planets are attracted and the enormous energy is available for use by all animals and plants.

Key Words: sun, earth, planets, moons, size, solar system, relative size, length of day, length of night.

Additional Information

The energy produced by the sun enables life to exist on earth. Heat energy warms the earth which otherwise would have been too cold for living things. Ice is still found at the poles and ice caps even though the sun radiates heat energy. If there was no heat energy the situation would have been unbearable. Similarly, without light energy plants cannot photosynthesize and there wouldn't be any food. Knowing that from photosynthesis, oxygen is also produced, and without oxygen, living things would not exist. If the sun were smaller than the earth, days would be shorter than we know now since the part of the earth facing the sun is what we call day time.

Teaching the lesson
Materials and Resources (Low or no cost): a chat of heavenly bodies

Procedure
Introduce lesson by asking learners what they see in the day sky and in the night sky. Learners mention clouds and sun in the day sky and clouds, moon and stars in the night sky.

Refer to the illustration of the solar system in their books or on a chart. Lead learners to see that the biggest heavenly body is the sun. The sun is fixed but the other bodies called planets revolve round the sun in their individual orbits.

Explain that the sun is bigger than all and performs different functions. It holds the planets by attracting them and also radiates energy to the planets. The earth is a planet and it is also held in orbit by the sun.

Activity 2.1.1.1 (a): Relative size of the sun in relation to its function in the solar system.

- Lead learners to discuss the functions of the sun in the solar system in their groups. Move from group to group to listen and guide the learners as they discuss.
- Lead learners to distinguish between rotation and revolution of the earth.
- Learners should explain what rotation and revolution of the earth result in.
- Introduce scenario of the earth being bigger than the sun and lead learners to discuss what could be the effect.
- Listen as learners discuss this.

Assessment Questions

1. Diagnostic
    i. What is meant by the day?
    ii. What do we see during the night?

2. Progressive
    i. Give two reasons why the sun is very important to life on earth.
    ii. The sun and the earth, which is bigger?

Answers to Assessment Questions

1. Diagnostic
    i. The day is when part of the earth is facing the sun and therefore receiving light.
    ii. During the night there is no light and therefore we do not see anything since there is darkness.

2. Progressive
    i. The sun holds the earth in orbit.
    The sun radiates energy to earth.
    ii. The sun is bigger.

Answers to Study Question (Refer to LB page 29)

1. (a) sun (b) earth (c) planet (d) solar
2. (a) bigger
   (b) (i) Supplies energy
   (ii) Holds the earth in orbit.
3. (a) False
   (b) True
4. (a) planets
   (b) moons
   (c) rotation
   (d) shorter

Diagnostic assessment for facilitator

1. Were you able to present the lesson in order?
2. Did you discuss diagnostic and progressive assessment meant for learners?
3. Were you able to use any relevant teaching/learning material?
4. How did to make sure that the lesson did not look abstract?

STRAND 2: CYCLES
SUB-STRAND 1: EARTH SCIENCE

LESSON 6: HOW RAINFALL IS FORMED

Reference: Learner's Book pages 30 - 36

Expected Learning Outcomes
- Explain how the water cycle occurs
- Identify some key stages within the water cycle
- Distinguish between evaporation and condensation within the water cycle

Content Standard: B6.2.1.2 Show understanding of the roles of condensation, evaporation, transpiration and precipitation in the hydrological (water) cycle

Indicators: B6.2.1.2.1 Explain how rain falls from clouds

Core Competencies: Communication and Collaboration, Personal Development and Leadership

Subject Specific Practices: Observing Planning

Introduction
Processes such as condensation, evaporation, transpiration and precipitation play important role in the hydrological (water) cycle. The learners learnt in basic five that the differences in the amount of heat at different places enable the wind to blow. This also enables water in rivers, seas and lakes to evaporate and condense to form clouds.

Key Words: evaporation, transpiration, condensation, hydrological, precipitation

Additional Information
A lot of water vapour in the atmosphere produced by evaporation form water bodies such as the pool of water referred to previously from rivers, lakes and seas, contribute to the water vapour in the atmosphere. This water vapour rises up and at higher cooler areas of the atmosphere condenses and becomes liquid water droplets which form clouds in the atmosphere.

When the clouds become heavy the water droplets fall back to Earth in the form of rain, ice or snow. It can also come in the form of dew when the weather becomes very cold especially at night or fog which we have learnt about.

All the different ways by which water returns to the Earth are referred to as precipitation. All that has been described above form what is referred to as the hydrological or water cycle. Water is returned into the atmosphere in the form of water vapour by evaporation and transpiration. It cools and condenses to form droplets of water which also returns to the Earth by precipitation.

Evaporation

Water exists in three states namely solid (ice) liquid water and water vapour.

Water in the form of vapour is all around you. You cannot see it with your physical eyes. The air around you contains water vapour. How does water vapour form? When liquid water molecules gain energy, they break away from the liquid form to the gaseous form. This can happen at any temperature or when temperature increases. It is the gaseous form of water that is called water vapour. The process by which liquid water changes into water vapour is called evaporation.

Condensation

Water molecules in the vapour form can lose energy and change to the liquid state. This usually takes place when temperature decreases. When water vapour changes into liquid, the process is called condensation.

Transpiration

Plants and animals need water. Plants absorb water from the soil. Animals drink or absorb water into their body. During the day, water evaporates from water bodies (rivers, lakes, ponds, ocean) and from the bodies of plants and animals. When water in the form of vapour escapes from the body of plants through their leaves or stems, it is known as transpiration. When water in the form of vapour escapes the body of animals it is known as perspiration.

Dew and dew point

In the evening, the air cools due to lowering of temperature and hence cannot hold much water vapour. When there is no wind blowing, the air becomes saturated with the water vapour and

the excess water condenses into water droplets. These small water droplets collect on any cold surfaces near the ground. This is called dew. It is just like water droplets which form on the outside of a bottle of ice water, simply because the ice water inside the bottle cools the bottle and the air around it causing water droplets to condense on it (the bottle). The temperature at which air is cooled and the water vapour condenses to form water droplets on colder surfaces on the ground is referred to as dew point.

Ice and cloud formation

When the temperature increases, air expands and becomes lighter and rises up together with the water molecules in it (water vapour). As the air rises up, it encounters lower temperature up there in the atmosphere which cools it. The water vapour in the air cools and condenses into tiny liquid water droplets. These liquid droplets of water collide with and stick to particles in the air. As these accumulate in the atmosphere and grow bigger and become visible as it floats in the atmosphere they form the cloud that you see. The water droplets as they cool further form crystals of ice in the atmosphere.

Gravity and Precipitation

When water droplets in the clouds cool further to form crystals of ice in the atmosphere, they grow bigger and bigger till they become too heavy to stay up there in the sky. They therefore fall to the ground by the force of gravity acting on them to pull them down. If it falls in the form of liquid, it is called rain. If the water falling from the sky is in the form tiny crystals of ice, it is called snow. When the rain contains small ice crystals, it is called sleet. When pellets of ice fall from the sky during rain, it is called hail. All this is called precipitation. Precipitation is therefore the different forms of water that falls from the clouds to the ground.

Teaching the lesson

Begin the lesson b asking leaners the last time they have seen rain falling. Guide leaners to brainstorm to find out how ain falls. Ask leaners to find out certain occurrences that are similar to rainfall in their daily lives.

Activity 2.1.2.1(a): Designing a model showing the formation of raindrops around tiny spots of dust or smoke and falling from high parts of a cloud.
Materials/Resources (Low or no cost):
Procedure

- Give to learners the following items: glass jar, ceramic plate, saw dust and ice cubes
- Ask learners to pour hot water into the gas jar to 1/3 of its volume
- Ask learners to moisten the under surface of the ceramic plate and sprinkle saw dust on it
- Ask learners to cover the jar with ceramic plate face up and wait three minutes before they continue the next step
- Ask learners to place ice cubes on the plate and observe what happens
- Ask learners to write down what they have observed and discuss their observation with their group members
- Ask learners whether what they have observed look looked like rain.

Note
The cold plate causes water in the warm air, which is inside the jar to condense and form water droplets

Clouds that result in rainfall
Not all clouds result in rainfall. There are different types of clouds. The clouds that produce rain include nimbostratus or cumulonimbus clouds which become heavy with water droplets and as they bump into each other and form bigger droplets they fall as rain. Nimbostratus clouds can cause rainfall which could last for many hours.

Demonstrating Evaporation and Condensation

Class Activity 2.1.2.1(b): Demonstrating Evaporation and Condensation
Materials/Resources (Low or no cost):
Procedure

- Give to learners the following items: source of heat, container in which water can be boiled, transparent glass cover, water.
- Ask learners to pour some water into the container.
- Ask learners to place the container on the source of heat.
- Ask learners to cover the container with transparent glass cover.
- Ask learners to heat the water until it boils.
- Ask learners to record and explain their observation.
- Ask the whether they see water droplets on the surface of the transparent glass cover

Show to learners video on evaporation and condensation.

Note: As the water boils, it forms water vapour which evaporates.

When it hits the transparent glass cover which is relatively cold, it condenses and forms droplets of water.

Summary

Rain is drops of liquid water that fall from the clouds when water vapour condenses to from liquid. Wind blows from hotter to colder places. The differences in the amount of heat at different places enable the wind to blow. This enables water in rivers, seas, lakes, leaf surfaces and the body of other living things to evaporate and condense to form clouds. Clouds gather to form bigger water droplets which result in rainfall.

Diagnostic assessment Question

a. When water molecules in the vapour form loses energy and change to the liquid state, it is called……...
b. When the rain contains small ice crystals it is called……..
c. When pellets of ice fall from the sky during rain, it is called……. hail.

Progressive assessment Question

Write down what the phenomenon you will observe when

a. dew is falling
b. a plant is withering
c. a bottle half-filled with water, closed and placed horizontal on the floor under the hot sun

Answers to Diagnostic assessment Question

a. condensation.
b. Sleet
c. hail.

Answers to Diagnostic assessment Question

a. condensation with droplets of water on surfaces close to the earth
b. transpiration
c. evaporation and condensation with water droplets found in the upper portion of the bottle

Answers to Study Questions (Refer to LB page 35 - 36)

1. When cooking soup, my mother covers the saucepan with a lid. When she removes the lid, drops of water falls from the lid back into the soup. This looks like rain.
2. Dew is the water droplets formed on cold surfaces on the ground when air is cooled and the water vapour in it condenses. Rain on the other hand is drops of liquid water that fall from the clouds when water vapour condenses to from liquid.
3. i. Dew
   ii. At night
   iii. Transpiration
4. i. Dew
   ii. Condensation
5. i. Drops of liquid water can fall from the clouds when water vapour condenses to from liquid. Wind blows from hotter to colder places. The differences in the amount of heat at different places enable the wind to blow. This enables water in rivers, seas, lakes, leaf

surfaces and the body of other living things to evaporate and condense to form clouds. Clouds gather to form bigger water droplets which become too heavy to continue staying up there in the clouds. They therefore fell as rain the following day.

ii. In the previous day the rain drops in the sky were not heavy enough to fall as rain

6. False
7. False
8. As the soup in X is heated, the water evaporates. In Y the soup is covered with a lid which provides a cold surface which causes the vapour to condense to form water droplets.

Diagnostic assessment for facilitator

1. Did every learner show good observation skills during the activities to demonstrate how rainfalls from the clouds?
2. Were the learners able to carry out instructions given to them during the activities to your satisfaction?
3. Did the pedagogy you used help you present the lesson?

STRAND 2: CYCLES
SUB-STRAND 1: EARTH SCIENCE

LESSON 7: FUNCTIONS OF CARBON IN THE ENVIRONMENT

Reference: Learner's Book pages 37 - 43

Expected Learning Outcomes

- Identify common materials in the environment that contain carbon
- List some uses of carbon in these materials

Content Standard: B6.2.1.3 Demonstrate understanding of how carbon and nitrogen are cycled in nature

Indicators: B6. 2.1.3.1 Know the functions of carbon within the environment

Core Competencies: Communication and Collaboration Personal Development and Leadership Subject Specific Practices: Observing and Planning

Introduction

You have been hearing about carbon dioxide. Carbon dioxide contains carbon. You have also been hearing about protein and fertilisers. They contain nitrogen. You need to understand how carbon and nitrogen are cycled in nature.

In basic five you learnt about the fact that carbon dioxide has some effects on humans and life on earth. You learnt about the fact that living things give out carbon dioxide when they respire. Plants take in carbon dioxide to help them make their own food in a process called photosynthesis. Carbon dioxide contains an important element called carbon. Carbon play important role in our environment. Every living thing contain carbon in different forms.

Key words: carbon, environment, photosynthesis, graphite, diamond, charcoal, carbohydrates, protein, calcareous

Additional Information

Materials in the environment that contain carbon

Carbon is an important element. There are many other elements. There many materials in the environment that contains carbon. Carbon combines with other elements to form those materials in the environment. Graphite, charcoal, food items(such cassava, yam, rice, coco yam, beans, bread, banku), table, paper, wood, cement, pencil, birds, insects, bones, calcareous shells, plastics, rubber, trees, kerosene, diesel petrol, bitumen, smoke and many others are materials in the environment that contains carbon.

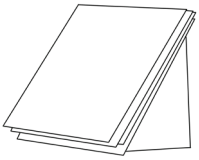
charcoal

cassava

yam

rice

table



paper

wood

cement

pencil

birds

insects

bones

calcareous shells

plastics

rubber

trees

kerosene

diesel petrol

bitumen

smoke

(2) the role of carbon in those materials.

Asamoah Gyan is one of the key players in the Black Stars football team of Ghana. His presence in any football team has great impact on its performance. He has great skills as an individual but cannot play alone to score goals. He needs to play in a team to score. In the same way, carbon

is a single element that can be found in our environment. As a single element, it only exists in the form of graphite which is used in the pencil you use to write. It also exists in the form of diamond which is making jewelleries. Charcoal and coal are mainly carbon. They are used as fuel. Some people put charcoal in their refrigerators to remove odour.

Carbon can combine with many elements to form different substances. Depending on which element carbon combines with, it can perform many functions within the environment. Carbon can combine with oxygen to form a gas called carbon dioxide.

Carbon + Oxygen ⟶ Carbon dioxide

Plants use the carbon dioxide with water, sunlight which is absorbed by chlorophyll to make food substances.

Carbon dioxide + water $\xrightarrow{\textit{Sunlight / Chlorophyll}}$ Glucose + Oxygen

The presence of carbon in any material makes the material unique and behaves in a particular manner. When carbon atom combines with other carbon atoms to form a long chain and each one of them also combines with hydrogen, it forms hydrocarbon compounds which are used to make many products for daily use. Carbon is also found in rubber and mineral oil. Gasoline, natural gas, polythene and some plastic materials are hydrocarbons.

Our bodies and the plants and animals around us contain carbon. Carbohydrates, proteins, fats and oil in our food substances contain carbon. As stated earlier, plants use carbon dioxide to make carbohydrates by a process called photosynthesis. Animals get the carbon by eating plants and other animals. Carbon compounds are burnt in fuels for heat in daily life. Energy is obtained by eating foods containing carbon in the form of carbohydrates. Steel used in many products contains iron and carbon. It is the presence of carbon in steel that makes it strong and not break easily. Iron alone can break easily. In the absence of carbon, we cannot get many substances to use. The bones and teeth of animals contain carbon in the form calcium carbonate (calcium trioxocarbonate(IV)

Using role-play to understand the function of carbon within the environment, e.g. the function of carbon in relation to pencils, charcoal, food and carbon dioxide.
Guide learners in their groups of four or five to role play the functions of carbon within the environment, e.g. the function of carbon in relation to pencils, charcoal, LPG gas, food and carbon dioxide.

There is a finite amount of carbon on earth. The carbon moves around in the environment, from one place to another. A carbon atom in carbon dioxide today can found in yam at another time which can find its way in the body of animals including humans. Human beings influence the movement of carbon in the environment. They burn fossil fuels and which include petrol and diesel for energy. The carbon in these fuels come from dead and decomposed living things

buried in sediments and rocks. The carbon atoms in these fuels are released into the atmosphere when they are burnt. When they cut and burn trees to use land for farming, ranching, or building the carbon atoms in them move from the plants into the atmosphere.

When you use pencil to write in an exercise book which is burnt later, the carbon in it move to the atmosphere in the form of carbon dioxide

Starting the lesson

Activity 2.1.3.1: Using Role-Play to understand the function of carbon within the environment
Materials/Resources (Low or no cost):
Procedure

- Ask learners to organise themselves into seven groups
- Help learners to assign a letter to each group, namely A, B, C, D, E, F or G
- Ask learners to write down in their note book what letter has been given to their group.
- Give role-play card which will also assign each group to materials in the environment which the group represents. The materials will include pencils, charcoal, food, fuel, trees, exercise book, LPG and carbon dioxide.
- Ask learners in each group that they form a team of actors that will play a certain part of the carbon cycle in the environment.
  Ask learners that each person in a group represent carbon atom.
- Ask learners to read the role play card to figure out their role in the carbon movement and function.
- Ask learners to discuss with their group members
  i. the role that the material their group represent play in the environment
  ii. how they are going to move and who is going to move first.
- When the role play starts, Ask learners to let one person move to another group at a time, or if they are many in a group more than one person can move.

Ask learners to note that

- their group represents something which contains carbon atoms (pencils, charcoal, food, fuel, trees, exercise book, LPG or carbon dioxide groups) and they individually represent carbon atoms.
- carbon exists in all of these things at the same time and only a portion of the carbon in each thing moves.

Ask learners that when they move to another group they should make sure that

- some of the are still left.
- they write down their role in whichever group they move to.
- They run the role-play a number of times, and make different choices about who should move and where to move to each time.

Ask learners to move their members at the same time: This is a more chaotic, but more realistic acting out of the carbon cycle, since in the real world carbon moves between all these areas at the same time.

Let the leader of each original group write the journey on the board or a piece of paper. Do this multiple times so that you can compare the journeys of several individual atoms through the different places and see how the carbon does not move in one direction, but moves in lots of different directions at the same time.

Summary

Materials in the environment contain carbon. There is a finite amount of carbon on earth. The carbon moves around in the environment, from one place to another. Human beings influence the movement of carbon in the environment.

Diagnostic assessment

1. Name two substances each in your school environment that
    i. contains carbon
    ii. do not contain carbon

Progressive assessment

Mention any three forms in which carbon exist in the body of human beings

Answers to Diagnostic assessment

i. Contains carbon: petrol, kenkey, pencil (any 2 or any other correct)
ii. Do not contain carbon: water, salt

Answers to Progressive assessment

Protein, carbohydrate, fat

Answers to Study Questions (Refer to LB page 43)

1. Sugar, kenkey, rubber, pencils, charcoal, fuel, trees, exercise book, LPG and carbon dioxide ((any 5).
2. water, glass
3. Photosynthesis
4. Copy and complete the table below by using a tick to indicate the presence of carbon or a cross to indicate its absence in the materials given.

Material in the environment	Carbon present	No carbon present
	✓	X
	✓	X
	X	✓
	✓	X
	X	✓

Diagnostic assessment for facilitator

1. What did you do to make sure every learner benefit from the lesson
2. Were all the learners able to engage in hands-on activity?
3. Were you able to deliver the full content of the lesson within the stipulated time ?
4. How did you conclude the lesson?

STRAND 2: CYCLES
SUB-STRAND 1: EARTH SCIENCE

LESSON 8: WAYS OF CONSERVING WATER

Reference: Learner's Book pages 44 - 50

Expected Learning Outcomes
- Describe some qualities of good drinking water
- Recall some uses of water
- Mention ways of using water safely and wisely

Content Standard: B6.2.1.4 Recognise water and air as important natural resources

Indicators: B6.2.1.4.1 Investigate ways of conserving water in the home, school and community

Core Competencies: Communication and Collaboration Personal Development and Leadership Subject Specific Practices: Observing Planning

Introduction
Once again you need to know that water and air are important natural resources. Water has very unique qualities which must be preserved. Before you can derive maximum benefit from water, you must make sure that it is the state in which it should be.

Key Words: Potable, conservation, sedimentation, filtration, harvesting

Additional Information
Qualities of good drinking water and ways of making water safe for use
Look at water from any source in a transparent glass cup or container. Some of the water may appear to be clear but may not be good for drinking. You could instead use such water either for washing clothing or for other things apart from drinking. What are some of the things you have to look for before you conclude that water from a particular source is good for drinking? Let leaners discuss this among their classmates and write down their idea.

Qualities of good drinking water are:
- It must be tasteless
- It must be odourless
- It must be free from particles
- It must be colourless

If you are certain that water from a particular source is not clean, then discuss among your classmates how you can make such water clean for use.

Note that you can make water safe for use. You can do this by the following ways:

- sedimentation
- boiling
- filtration
- filtering
- addition of iodine tablets
- use of chlorine
- use of water filters
- addition of alum and many more.

Identifying activities in the home that require the use of water

You use water in the home every day. Identify activities in your home that require the use of water. When you wake up in the morning, what is the first thing you do that require the use of water? Before you put on your school uniform to come to school do you use water? What does your water use water for in the kitchen? Do you have a garden or potted plants in your home? Do you use water form them? During weekends, what do you use water for?

Activities which portray the right use of water in the home

- Using just enough water to wash dishes.
- Flushing toilets with less water.
- Watering your outdoor plants early in the morning when temperatures are low to reduce evaporation of the water.
- Using just enough water to bath or wash your clothes.
- Turning off the tap when you are washing your hand and open it only when you are ready.
- Not letting the tap be running whilst you are brushing your teeth.
- Repairing leaking and broken down pipes which carry water into homes.

Other activities that show the wastage of water

- Using too much enough water to wash dishes.
- Flushing toilets with too much water.
- Watering your outdoor plants early in the hot weather when temperatures are high to increase evaporation of the water.
- Using just enough water to bath or wash your clothes.
- Leaving the tap on when you are washing your hand without closing when not needed.
- Letting the tap running whilst you are brushing your teeth.
- Leaving leaking and broken down pipes which carry water into homes without repairing them.

Ways of using water wisely and efficiently in the home and community

- Not using too much water to wash dishes.
- Flushing toilets with less water.
- Watering your outdoor plants early in the morning when temperatures are low to reduce evaporation of the water.
- Not using too much water to bath or wash your clothes.
- Turning off the tap when you are washing your hand and open it only when you are ready.
- Not letting the tap be running whilst you are brushing your teeth.
- Repairing leaking and broken down pipes which carry water into homes.

A worker repairing a leaking pipeline

A gutter in a roofing sheet to harvest rain water

Polytank used to store water

Harvesting Rain Water

Storing Water in Containers

Water can be kept in large tanks, for example tanks made of cement, polytanks, plastic containers, drums and large containers for long periods. These containers must be well covered.

Starting the lesson

You can begin the lesson by asking learners whether their harvest rain water in their homes when it is raining. Ask them if it is good to harvest rain water in their home. Ask them also how they harvest rain water in their home.

This should include placing gutters at the end of roofing sheets to direct water into large containers.

Discuss qualities of good drinking water and ways of making water safe for use with learners, e.g. sedimentation, boiling, filtration, adding alum, etc.
Ask learners to identify activities in the home that require the use of water.
Ask learners to write various activities which portray the right use of water in the home and

other activities that show the wastage of water.
In groups of four or five let learners discuss ways of using water wisely and efficiently in the home and community as you guide them to do so

Ask leaners why is it necessary to
(i) repair leaking pipelines?
(ii) water potted plant early in the morning or in the evening?

Let learners create a flyer or posters on water conservation with cut-out pictures and phrases on how to conserve water.

Show them an example of poster

Summary
You can make water safe for use by sedimentation, boiling, filtration, addition of iodine tablets, use of chlorine, use of water filters, addition of alum and many more.

Diagnostic assessment
Identify three ways that you think people in your community waste water

Progressive assessment
If you were to suggest three ways of conserving water in your home, which ones will you suggest

Answers to Diagnostic assessment
- Using too much enough water to wash dishes.
- Flushing toilets with too much water.
- Watering your outdoor plants in the hot weather when temperatures are high to increase evaporation of the water.
- Leaving the tap on when you are washing your hand without closing when not needed.
- Letting the tap running whilst you are brushing your teeth.
- Leaving leaking and broken down pipes which carry water into homes without repairing them. (Any 3)

Answers to Progressive assessment

- Not using too much water to wash dishes.
- Flushing toilets with less water.
- Watering outdoor plants early in the morning when temperatures are low to reduce evaporation of the water.
- Not using too much water to bath or wash clothes.
- Turning off the tap when washing hands and open it only when are ready.
- Not letting the tap be running whilst you are brushing your teeth.
- Repairing leaking and broken down pipes which carry water into homes.

Any 3

Answers to Study Questions (Refer to LB page 50)

1. i. to avoid water being wasted
   ii. it prevents water being wasted by excessive evaporation
2. i. Not using too much water to wash dishes.
   ii. Not using too much water to bath or wash your clothes.
3. i. Kofi
   ii. They should avoid using too much water to bath
4. i. The water will be wasted and the homes to which the pipeline supplies water will no longer gets water.
   ii. To report the situation to Ghana water company to repair it.
5. Water

Diagnostic assessment for facilitator

1. Were the exemplars used relevant to the lesson?
2. Did you present the lesson in order?
3. Did you discuss diagnostic and progressive assessment meant for learners?
4. Were there more hands-on to make use of resources

STRAND 2: CYCLES
SUB-STRAND 1: EARTH SCIENCE

LESSON 9: DEMONSTRATING THAT AIR SUPPORTS BURNING

Reference: Learner's Book pages 51 - 56

Expected Learning Outcomes
- Mention the components of air
- List some uses of air
- Describe an experiment to show that air supports burning

Content Standard: B6.2.1.4 Recognise water and air as important natural resources

Indicators: B6.2.1.5.2 Demonstrate that air supports burning

Core Competencies: Communication and Collaboration Personal Development and Leadership

Subject Specific Practices: Observing Planning

Introduction
Air is an important natural resource. This is because it is used for man things. Without air ou cannot breathe, burn things and inflate lorry tyres

Key words: combustion, composition, glass jar

Additional Information
Composition of air and the uses of the components
The atmosphere is the area surrounding the Earth. It contains a mixture of gases. This mixture of gases is called air. It is this air that supports plant and animal life.

It is made up of the following gases:
- Nitrogen
- Oxygen
- Carbon dioxide
- Rare gases (Argon, Neon, Xenon and others)
- Water vapour
- Dust particles

Table …… shows the percentage composition of the various gases that make up air.

Part of air	% composition
Nitrogen	78
Oxygen	21
Carbon dioxide	0.03
Rare	1.0
Water vapour	variable (depending on the area and temperature)
Dust particles	variable (depending on the area)

Uses of Air

Air is used for the following purposes:

- Burning
- Sailing
- Hoovering
- Winnowing
- Breathing
- Ventilation
- Inflating tyres and footballs

Question: in which of the diagrams is the pupil breathing?

sailing

winnowing

inflating footballs

burning of leaves

All diagrams above show various ways by which air is used

Teaching the lesson
Review composition of air and the uses of the components as shown in the note above
In groups of four o five let learners, use simple experiments in the activity below to show that air supports burning, using a lighted candle and a glass jar (or an improvised jar).

Activity 2.1.5.2, use simple experiments to show that air supports burning, using a lighted candle and a glass jar (or an improvised jar).
Materials/Resources (Low or no cost): candle sticks, matches and transparent container (glass gas jar)
Procedure
You should demonstrate this activity

Give two candle sticks, matches and transparent container (glass gas jar) to each group of learners. Ask learners to

- stick the two candles sticks on a table about 30cm apart.
- light the two candle sticks
- cover one candle stick with the transparent container (glass gas jar)
- observe and discuss what happens with the classmates

Note: The covered candle stick burnt for some time and extinguished (went off).

This happened because the part of air (oxygen) which helps in burning was used up.

The other candle stick continued to burn because the air around it still contained oxygen.

Summary:

- Air is a mixture which consists of nitrogen, oxygen, carbon dioxide, rare gases (argon, neon, xenon and others), water vapour and dust particles.
- The percentage composition of the various gases that make up air are; Nitrogen(78%), Oxygen(21%), Carbon dioxide(0.03%), Rare(1.0%), Water vapour(variable), Dust particles(variable)
- Air has mass and occupies space and exerts pressure.

- Air is used for burning, sailing, hovering, winnowing, breathing, ventilation and inflating tyres and footballs

Diagnostic assessment

1. Which component of air is used for breathing?
2. Can air which lacks the component needed for breathing be used for winnowing? Give reason

Progressive assessment

1. Why do you need to
   i. open the windows of your room?
   ii. use sail when traveling in a canoe?
2. Name two properties of air that drivers use

Answers to Diagnostic assessment

i. Oxygen
ii. Yes. This is because any gas blown into a mixture can separate lighter particles from it

Answers to Progressive assessment

1. i. To improve ventilation
   ii. the force of the wind pushes the sail which makes the canoe move fast

The air causes the fuel in the engine to burn. The air is used to inflate the tyres

Answers to Study Questions (Refer to LB page 55 - 56)

1. Nitrogen, hydrogen, carbon dioxide, water vapour
2. Nitrogen
3. State two main properties of the air that you breathe.
4. How will you show that air exerts pressure?
5. List four uses of air to human in everyday life.
   - Burning
   - Sailing
   - Winnowing
   - Breathing
   - Ventilation
   - Inflating tyres and footballs

   (any 4)
6.
   i. Air helps things to burn.
   ii. Oxygen
   iii. To prevent air from getting to the fire
   iv. Oxygen

Diagnostic assessment for facilitator

1. How did you start the lesson?
2. Did you vary your methodology in the course of the lesson?
3. Were the exemplars used relevant to the lesson?
4. What did you do to create the atmosphere for creativity and critical thinking in the course of the lesson?
5. Were learners able to do the assessment task for their workbooks or learner's book?

STRAND 2: CYCLES

SUB- STRAND 2: LIFE CYCLES OF ORGANISMS

LESSON 10: MATERIALS NEEDED FOR PLANTS GROWTH

Reference: Learner's Book pages 57 - 62

Expected Learning Outcomes

- Identify the effect of sunlight, water and air on the growth of plants
- Conduct an experiment to prove the conditions needed for plants to grow well

Content Standard: B6.2.2.1.1. Demonstrate understanding of the life cycle of a plant.

Indicator: B6.2.2.1.1 Know the materials needed for the survival of plants in the environment (water, carbon dioxide, oxygen, sunlight)s

Core Competencies: Communication and Collaboration, Critical thinking and Problem solving.

Subject Specific Practices: Observing, Recording, Analysis, Planning, Designing, Manipulating, Measuring, Evaluating.

Introduction

In basic 5, the leaners learnt about the conditions needed for plant seeds to germinate. The factors include water, and air. They also learnt that sunlight helps plants to prepare their own food through the process of photosynthesis. Without these conditions, plants will not grow well and they will not be able to produce food.

Key Words: Survival, water, carbon dioxide, oxygen, sunlight, photosynthesis

Additional information

Conditions needed for plant Growth

Plants are living things. They need certain things to continue staying alive. Plants need water, carbon dioxide, oxygen, sunlight in order to grow well.

Water

Plants obtain water and mineral salts from the soil through their roots. They need the mineral salts for normal growth and development. The plants can only absorb the mineral salts when it dissolves in water.

Water is used to transport the mineral salts and other nutrients throughout the plant and its cells. Water also helps plants to undergo the process of photosynthesis to create their own food. Plants also use water to cool down themselves through the process called transpiration. This process prevents plants from getting dehydrated. Nectar in the flower of plants also contains water.

Carbon dioxide
Plants use carbon dioxide to prepare their own food. The carbon dioxide is used together with water and energy from the sun to undergo the process called photosynthesis. The sunlight is tapped b chlorophyll in the leaves of the plant. The carbon dioxide gas enters the leaves of the plant through tiny pores on the surface of leaves called the stomata.

Oxygen
Plants as living things also undergo respiration using oxygen. Parts of the plant such as leaves, roots and seeds all use oxygen to undergo respiration. This is because all living things need energy to do work.

Sunlight
It is the energy from the sun that helps plants to undergo photosynthesis.

Teaching the lesson
Begin this lesson by asking learners whether the need something to make them gow. Based on their response ask them if plants also need some things to make them grow. Proceed with the activities below

Activity: Demonstrating that plants require water to grow
Materials/Resources (Low or no cost): Two potted plants for each group of learners
Procedure

- Let leaners obtain two potted plants
- Let them water one of the potted plants daily for 5 days
- Do not allow them to water the other potted plant
- Let them compare the two plants after one week
- Leaners will observe that the potted plant that was watered grows healthy and it leaves remain green
- The plant which was not watered looks unhealthy and its leaves may begin to whither.

Activity: Experiment to show that sunlight helps plants to grow
Materials/Resources (Low or no cost): Two potted plants for each group of learners
Procedure

- In groups of four or five let leaners place one of the potted plants in a part of the school where it will be exposed to sunlight
- Let each group place another potted plant under a table in the classroom
- Let leaners observe the plants daily for a week

- Let leaners write their observation down for discussion
- The will observe that the potted plant that is exposed to the sun grows tall and healthy and it leaves remain green
- The plant which was kept away from the sun becomes stunted and it leaves become brownish in colour

Summary

There are some important materials that are required by all plants for proper growth. These materials are water, carbon dioxide, sunlight and oxygen.

Diagnostic assessment

1. Write down what will happen to plants if the lack the following things
   i. water
   ii. carbon dioxide
   iii. oxygen

Progressive assessment

What will the appearance of a potted plant placed in our teaches cone and the doo and widows locked during the holiday which last for four week?

Answers to Diagnostic assessment

i. It will not photosynthesize, it can also not be able to absorb nutrients
ii. It will not photosynthesize and cannot get food and will die
iii. It will not be able to respire and it will die

Answers to Progressive assessment

It will becomes stunted and its leaves will become brownish in colour

Answers to Study Questions (Refer to LB page 62)

1. i. carbon dioxide, sunlight, water
   ii. carbon dioxide – helps plant to make food
   Sunlight – supplies energy to make food
   Water – helps in making food.
2. i. oxygen
   ii. water
   iii. sunlight
   iv. carbon dioxide
3. i. c
   ii. b
   iii. a
   iv. d
   v. b

Diagnostic assessment for facilitator

1. What did you do to kindle learners' interest in the lesson?
2. How did you make sure every learner demonstrate creativity during the lesson?
3. Were the learners yearning for the lesson to continue even though you have ended it?
4. How did you conclude the lesson?

STRAND 2: CYCLES
SUB- STRAND 2: LIFE CYCLES OF ORGANISMS

LESSON 11: LIFE CYCLE OF PLANTS

Reference: Learner's Book pages 63 - 68

Expected Learning Outcomes

- explain the term life cycle of plants
- identify the key stages in the life cycles of okro and maize plants
- plant seeds of maize and okro and observe as they go through the various stages of the life cycle.

Content Standard: B6.2.2.1. Demonstrate understanding of the Life Cycle of a plant.

Indicators: B6.2.2.1.2 Observe the life cycle of plant (okra or maize plant)

Core Competencies: Communication and Collaboration, Critical Thinking and Problem Solvng.

Subject Specific Practices: Observing, Recording, Analysing, Planning, Designing, Manipulating, Measuring, Evaluating

Introduction

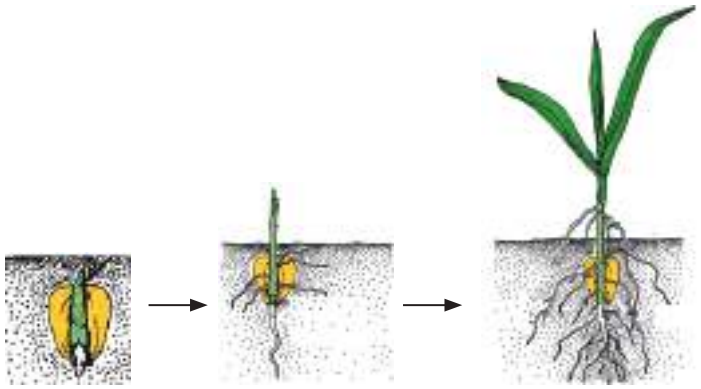
We have already learnt that the atmosphere is the area surrounding the Earth. It contains a mixture of gases. This mixture of gases is called air. It is this air that supports plant and animal life.

Key words: germination, tassel

Additional Information

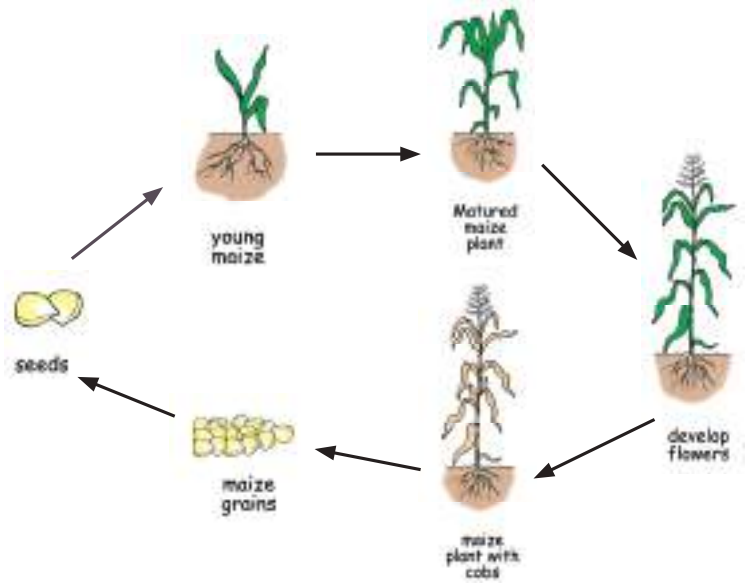
Even though we cannot see air, it can be used in several situation and ways. Air is one of the important materials required for plant survival. Conditions necessary for seed germination include:

- presence of air
- presence of moisture or water
- suitable temperature (not too low or too high to kill the seed).
- Viability of the seed



Note: If any one of the conditions listed above is not met, the seed would not germinate.

Activity: Life cycle of Maize plant



Teaching the lesson

Let learners, in their groups discuss the diagram above. Let them note carefully all the stages of the life cycle of the maize plant.

Give viable maize seeds to each group of learners. Help learners to locate a suitable area in your school environment. .

Let them plant the maize seeds and observe the growing plants weekly and record the changes that take place until other viable seeds are produced.

Let them write a report based on their observation.

Summary

Conditions necessary for seed germination include presence of air, presence of moisture or water, suitable temperature (not too low or too high to kill the seed) and viability of the seed.

Diagnostic assessment

1. When maize grain begins to germinate
   i. Which part grows out of the gain first?
   ii. Which part comes out of the grain last?
   iii. Which part obtains water and nutrients for the growing plant?

Progressive assessment

When you are given five or six maize gains, outline at least four things you will do to obtain the maize grain again but in large quantities

Answers to Diagnostic assessment

i. roots
ii. shoot
iii. root

Answers to Progressive assessment

- A minimum of 2-3 seeds are placed in a hole of 4-5cm deep in a soil.
- Observe the seeds as they germinate after about 6 to 9 days
- After about 8 weeks the maize plant begins to develop tassels and silks.
- After an additional 3 weeks the maize fruits called kernels are ready for harvest.

Answers to Study Questions (Refer to LB page 67 - 68)

1. i. Maize seed
   ii. maize seed begins to geminate
   iii. maize seed germination
   iv, maize seedling
   iv. flowering maize
   vi. mature maize plant
   vi. Maize fruit with seeds
2. i. soak the okro seeds in water for 12 to 18 hours to soften its hard seed coat.
   ii. 2-3 seeds are placed in a hole of 4-5cm deep
   iii. water the seeds regularly
3. - presence of air,
   - presence of moisture or water,
   - suitable temperature (not too low or too high to kill the seed)
   - viability of the seed.

4.

- A minimum of 2-3 seeds are placed in a hole of 4-5cm deep.
- After about 8 weeks the maize plant begins to develop tassels and silks.
- After an additional 3 weeks the maize fruits called kernels are ready for harvest.
- The seeds germinate after about 6 to 9 days
- The appearance of tassels show that the plant will produce maize grains.

Diagnostic assessment for facilitator

1. Did you draw the attention of learners to a previous knowledge?
2. Did the learners realise the relevance of this lesson to crop production in Ghana?
3. Did you disclose learning expectations with learners?
4. Did your pedagogy enable you to deliver the lesson successfully?

LESSON 12: HUMAN EXCRETORY SYSTEM

Reference: Learner's Book pages 70 - 75

Expected Learning Outcomes

- know the parts of the human excretory system
- identify the products that the excretory organs remove

Content Standards: B6.3.1.1. Recognite that different parts of the human body work independently to perform a specific function.

Indicators: B6.3.1.1.1 Explain the functions of organs in the excretory system of humans.

Core Competencies: Communication and Collaboration, Personal Development and Leadership, Creativity and Innovation

Subject Specific Practices: Planning, Observing, Communicating, Recording, Analysing, Evaluating.

Introduction

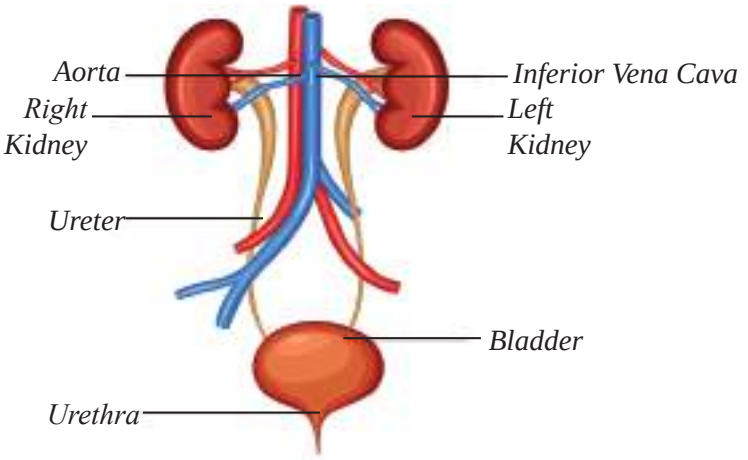
A living thing which is able to exist on its own is called organism. All organisms are made up of cells. the basic unit of life, which carry out important chemical processes. The simplest organism has just one cell. They are unicellular or cellular, but very complex ones for example, human have many billions of cells. they are multicellular and their cells are of many different types. Each type is specially adapted for its own particular function. Groups of cells of the same type – together with nom – living materials, make up the different tissue. Several different types of tissues together form an organ. For example, the stomach, and a number of organs together form a system kwon as the digestive system.

Key words: multicellular

Additional Information

A living thing capable of a separate existence is called an organism. All organisms are made up of cells – the basic unit of life, which carry out all the vital chemical processes. The simplest organisms have just one cell (they are unicellular) but very complex ones, e.g. humans have many billions. They are multicellular and their cells are of many different types, each type specially adapted for its own particular job. Groups of cells of the same type (together with non-living material) make up the different tissues of the organism, e.g. a stomach, and a number of organs together form a system e.g. a digestive system.

The digestive system consists of certain organs. These include mouth, stomach, small intestines and large intestines.



The digestive system of humans is made up of the following parts:- organs

- Mouth
- Stomach
- Small intestine
- Large intestine

Just like digestive system, there are other systems, example sensory system which make us aware of the world around us. There are five sense organs.

i. Eyes – used to see
ii. Tongue – used to taste
iii. Nose – used to smell
iv. Skin – used to touch and feel
v. Ear – used for hearing

There are the five sense organs in the human body. They all are co-functioning. They work together to make us aware of the things in the environment.

Teaching the lesson

Lead learners to explain

a. the need for breathing
b. the need for urinating
c. the need for sweating

Let leaners understand the body has excretory systems which should include kidneys, lungs, skin and liver and explain to them why the are considered as such.

- Engage leaners to review the functions of some organs.

- Leaners explain the need for activities such as breathing, urinating and sweating.
- With the aid of videos, charts or models, assist leaners to identify the organs of the excretory systems (kidneys, lungs, skin, Liver).
- Leaners in an activity, match the parts of the excretory system with their excretory products.
- Build vocabulary of leaners by explaining key biological terms such as urea, kidney, lungs and excretion.
- Leaners are provided with materials such as blue tack or clay to mold the kidney of humans.

NB: The lesson should mainly focus on the kidneys, lungs skin and their excretory products.

Lead learners to explain

i. what kidneys excrete – urine
ii. what the lungs excrete – gases (CO_2)
iii. what the liver excrete – sweat
iv. what the liver excrete – bile

In an activity match the excretory system with their excretory products.
Lead learners to explain the biological terms such as:

1. Urea-nitrogen-containing waste substance which is a product of the breakdown of excess amino acids in the lever.
2. Kidneys – Two organs at the back of the body just below the ribs. They are the main organs of excretion, filtering out unwanted substances from the blood and regulating the level and contents of body fluids.
3. Lungs – The two main breathing organs, inside which gases are exchanged. They contain many tubes (bronchi and bronchioles) and air sacs.
4. Excretion – The expulsion of waste fluid. It is vital to life as it gets rid of harmful substances. It is also vital to the maintenance of a balanced level of body fluids.

Provide learners with materials – blu tack or clay to mould the kidney of humans.

Summary

- All organisms are made up of cells – the basic unit of life. Group of cells of the same type make up the different tissues of the organism – e.g. muscle tissue. Several different types of tissue together form an organ, e.g. a stomach, and a number of organs together form a system, e.g. digestive system.
- The body has excretory systems which include kidneys, lungs, skin and liver. Each excretory system excretes different products.

Diagnostic assessment question.

1. Briefly write down what an organism is
2. The simplest organisms have just one cell, they are called (a…….. or (b…….
   Human have many billions of cells they are called (c……..

Progressive assessment questions

1. How many organs are in the excretory system of humans?
2. Write down the names of the organs.

Answers to diagnostic assessment questions

1. A Living thing which is able to exist on its own is called on organism.
2. (a) unicellular or (b) acellular (c) multicellular

Answer to progressive assessment questions

1. Four (4)
2. Kidneys. (ii) lungs. (iii) Skin (iv) liver

Answers to Study Questions (Refer to LB page 75)

1. skin, lungs, stomach, kidney, liver
2.

Product	**Organ**
i. Sweat	Skin
ii. Bile	Liver
iii. Urine	Kidney
iv. Carbon dioxide	Lungs

3. The **Kidneys** are the main organs of the human excretory system. Everybody is born with **two** kidneys. The functional unit of a kidney is called the **nephron** it excretes **urine** from the body. The **urinary bladder** stores urine till it is expelled from the body.
4.

Diagnostic assessment for facilitator

1. Did every learner show interest in the lesson?
2. What did you do to make learners realise the importance of this lesson to our daily lives?
3. What pedagogy did you use to deliver your lesson ?
4. Did you discuss home learning assignment with the learners?

LESSON 13: STAR, PLANET AND SATELLITE

Reference: Learner's Book pages 76 - 85

Expected Learning Outcomes

- know the meaning of the terms Star, planet and satellite
- give common examples of stars, planets and satellites
- differentiate between a star and a planet
- identify the differences between natural and artificial satellite

Content Standard: B6.3.2.1.1. Show understanding of the motion of bodies in the solar system.

Indicator: B6.3.2.1.1 Explain the difference between a star, a planet and a satellite.

Core Competencies: Digital Literacy, Personal development and Leadership, Communication and Collaboration

Subject Specific Practices: Observing, Analysing, Evaluating, Generalising

Introduction

The solar system is made up of the sun, planets and satellites. The sun holds the other bodies in their orbits such that none collides with the other. The sun being the biggest does not move but the others move. The order of the movement shows that the sun is attracting and keeping the planets in a certain order. Similarly, the planets although they move hold the satellites around them. The satellites do not produce any energy but reflect the sun's light to the planet. The stars that are seen in the night sky produce their own light.

Key Words: solar, sun, star, planet, satellite, earth

Additional Information

The sun is a star just as we see other stars at night. The earth is very close to the sun so it is seen during the day. The sun is the closest star and so it is very bright and prevents the other far away stars from being seen. In the night when our part of the earth turns away from the sun and there is darkness, the other stars which are very far away become visible. We therefore see the other stars at night. All the components mentioned form the solar system.

Materials or Resources (Low or no cost)

Video, chart of the solar system, chair, learners, tape measure, tags of the 8 planets.

Procedure

Introduce the lesson by asking learners simple questions such as follows;

- What do we walk on?
- Where do we grow our crops?
- How do we get light in the day?

Name a heavenly body that produces light in the night sky.
In answering the questions learners will mention the earth, the sun and the moon.
Lead learners to see that there are components of the solar system.
Lead learners to review lesson on the benefits of the sun to the earth.
Show learners a video on the components of the solar system.

Activity 3.2.1.1 (a) Components of the solar system

- Lead learners out of the classroom in the morning and ask them to look up in the sky. Ask them to name the bodies they see in the morning sky.
- Ask learners to do a similar thing at night in their homes and report to the class the following day.
- Lead learners to compare what they observed in the day and night sky and list the components of the solar system.
- Lead learners to mention the components of the solar system. The sun, stars, planets and satellites.
- Explain that satellites are smaller heavenly bodies which move round bigger heavenly bodies. Give the example of the moon moving round the earth. The moon is a smaller object and therefore it is a satellite.

Assessment Questions

1. Diagnostic
   i. The object seen in the morning sky which produce light is called ……..
   ii. How do plants benefit directly from the sun?

2. Progressive
   i. The component of the solar system which produces light for plant use is ……
   ii. The component of the solar system which reflects light to the earth is …….

Answers to Assessment Questions

1. Diagnostic
   i. sun
   ii. They get light for photosynthesis in which they make food.
2. Progressive
   i. sun
   ii. moon

Activity 3.2.1.1 (b)

Lead the activity by selecting a learner in the class. The biggest member of the class represents the sun and eight other members to represent the planets. Lead learners to place a chair at the centre of the playing ground or field. Help learners to measure distances 2, 3, 5, 7, 9, 11, 13 and 15 meters from the chair using the tape measure. The learners with the tags of the planets stand at the distances from the chair. They then move at different speeds around the chair. This represents the solar system. They can also rotate round on their axis as they revolve round the chair.

Answers to Study Questions (Refer to LB page 84 - 85)

1. i. A glowing ball of burning gases.
   ii. A heavenly body that moves round the sun.
   iii. A body that moves round a bigger body in space
2.

Star	Planet
• made up of burning gases	• made of rocks
• do not move	• move round a star or on its axis

3. i. Satellites
   moon, communication satellies, weather satellites etc.
   ii. Earth, venus, mars etc.
   iii. sun, any other star.
4. communcation, navigaion, weather, astronumical
5. a. F
   b. F
   c. T
   d. T
   e. F
6. i, A ii. B iii. C iv. A v. B
7. a. galaxy
   b. inner
   c. saturn
   d. sun
   e. bigger bodies such as planets

Diagnostic assessment for facilitator

1. Did the learners feel that the lesson was abstract?
2. What did you do in your lesson presentation to make sure the lesson did not look abstract?
3. What did you do to make the learners appreciate the relevance of studying this topic
4. Did you use assessment for learning strategies well during the lesson?

STRAND 3: SYSTEMS

SUB-STRAND 3: ECOSYSTEM

LESSON 14: INTERACTIONS IN AN ECOSYSTEM AND THE EFFECTS ON HUMANS

Reference: Learner's Book pages 86 - 96

Expected Learning Outcomes

- Know the main components within an ecosystem
- Give examples of living and non-living parts of an ecosystem
- Know the importance of various living and non-living things in an ecosystem
- Identify the feeding relationships in an ecosystem
- Explain some common interactions within

Content Standards: B6.3.3.1. Show understanding of ecosystems interdependency of organisms in an ecosystem and appreciate the interactions.

Indicators: B6.3.3.1.1 Investigate various interactions in an ecosystem and the effect on humans.

Core Competencies: Critical Thinking and Problem solving, Communication and Collaboration, Personal Development and Leadership.

Subject Specific Practices: Designing, Planning, Observing, Analysing

Introduction

An ecosystem consists of a group (community) of animals and plants which interact with each other and with their environment to produce a self-contained ecological unit. The complex network of food chains in an ecosystem is called food-web.

A food chain is a linked series of living things, each of which is the food for the next in line. Plants make their foods from non living matter by photosynthesis and are always the first members of a chain. Animals cannot make their own food and so rely on the food making activities of plants. The places where living things live include land, air and water.

Key Words: ecosystem

Additional Information

Explain the concept of ecosystem.

Habitat: the natural home of a group of living things or a single living thing is called Habitat. Small habitats can be within large habitats, e.g. a waterhole in savanna biome.

Community: the group of plants and animals found in one habitat is called community. They all interact with each other and their environment.

Ecosystem: The community of plants and animals in a given habitat, together with the non-living parts of environment e.g. air or water is called Ecosystem. An ecosystem is a self-contained unit, i.e. the plants and animals interact to produce all the materials they need.

There is a complex network of food chains in an Ecosystem. A food chain is a linked series of living things, each of which is the food for the next in line. Plants make their food from non-living matter by a process called photosynthesis, and are always the first members of a chain. Animals cannot make their own food and rely on the food making activities of plants.

Starting the lesson

Show learner's pictures of different ecosystems.

Let learners observe different ecosystems in the field such as a small bush or pond.

- Engage the leaners to Drain Storm to come out with possible interactions that occur in a giving ecosystem.
- Let the learners work in groups of four or five in the ecosystems allocated to them and identify some possible interactions that can take place within each ecosystem they have designed.
- Guide leaners to discuss the effects of interactions (hunting, Farming and predation) on humans and other living things within given ecosystem. you can select ecosystems in the school community.

- Let learners daw the ecosystem they have studied and let them discuss what they have drawn above.
- Let them mention the role of each member in the ecosystem.

Note, everything is interdependent.

In their groups let leaners compare the ecosystem with the family structure to see how mother, father and siblings are linked like an ecosystem. Draw their attention to the fact that everybody in the group is important and depend on one another just like ecosystem.

- Show to learners pictures and videos of forest settings, having trees, grass, a stream, soil, fishes, rodents, frogs to explain what an ecosystem looks like.
- Lead learners, in their groups go out and observe different ecosystems in the field such as a small bush or pond.
- Lead learners to brainstorm to come out with possible interactions that occur in the ecosystem you have visited.
- In their groups, let them draw or design different ecosystems in the classroom.
- In their groups let them observe each ecosystem and identify some possible interactions that can take place within each ecosystem you have designed.

Lead learners to discuss the effects of the following interactions on humans and other living things within a given ecosystem:

i. hunting
ii. farming
iii. predation

Note that the removal of a member causes imbalance in the ecosystem.

Example, note that destruction of the forest through Galamsey and felling of trees bring about imbalances in the environment.

Summary

- An ecosystem consists of living and non-living things

- The living things are plants, animals, fungi, bacteria and other micro organisms
- The non-living things consist of rocks, sunlight, temperature and rainfall
- There are different levels of organisms which are mainly producers and consumers
- A food chain shows how different animals get food within the ecosystem.
- There are different feeding relationships such as commensalism, mutualism and parasitism.

Diagnostic assessment questions

1. Write and explain briefly what food web means in an ecosystem.
2. Write and explain why plants are so important in an ecosystem.

Progressive assessment questions.

1. Write and explain briefly what ecosystem is.
2. Write down two things which will happen to human being when bush fire occurs in ecosystem.

Answer to diagnostic assessment questions

1. In an ecosystem, some animals feed on other animals, but the animals feed on plants. Thus there is complex network of food chains in an ecosystem. This complex network of food chains is called food web.
2. Plants make their foods from non- living matter by photosynthesis. Animal cannot make their own food, and so rely on food making activities of plants. This make plants so important in an ecosystem.

Answer to progressive assessment questions

1. A group of animals (community) and plants which interact with each other and with environment to produce a self-contained ecological unit is called an ecosystem
2. i. Human beings depend on plants for food. If bush fire occurs the plants will die and hunger will occur.
   ii. Human beings use plants and animals for economic development. If bush fire occurs the plants and animals will perish and the human beings will suffer.

Answers to Study Questions (Refer to LB page 95 - 96)

1.

Living	Non-living
Trees	dead logs
bird	river
lion	sunshine
monkey	temperature
	rocks
	maintain

	rainfall

2. i. maize plant
   ii. grasscutter
   iii. lion
   iv. grasscutter, dog, lion, fungi
   v. fungi
3. a. cassava → rat → fox
   b. green grass → grasshopper → fowl → dog
4. i. parasitism
   ii. mutualism
   iii. parasitism
   iv. commensatism
   v. Parasitism
5. a. Living things (Biotic factor)
   b. Plants
   c. Parasitism
   d. Food chain
   e. i) Obtain food
   ii) obtain oxygen
   iii) obtain water

Diagnostic assessment for facilitator

1. Did you use the environment of actual habitat to present this lesson?
2. Were the learners able to identify the organisms in the habitats correctly?
3. Did the learners appreciate the relevance of studying this topic ?
4. What could you have done better for a better delivery of the content of this lesson?

SUB-STRAND 1: SOURCES AND FORMS OF ENERGY

LESSON 15: RENEWABLE AND NON RENEWABLE SOURCES OF ENERGY

Reference: Learner's Book pages 98 - 101

Expected Learning Outcomes

- Explain the difference between renewable and non-renewable sources of energy
- Give examples each of renewable and non-renewable sources of energy

Content Standard: B6.4.1.1.1. Demonstrate understanding of the concept of energy, its various forms and sources and the ways in which it can be transformed and conserved.

Indicator: B6.4.1.1 Compare renewable and non-renewable sources of energy

Core Competencies: Critical Thinking and Problem Solving, Communication and Collaboration

Subject Specific Practices: Planning, Observing, Analysing, Synthesising, Generating

Introduction

Energy is defined as the ability to do work. Anything that can do work has energy. Work is the product of force and distance moved in the direction of the force. Force causes objects to move. When a force acts on a body, the body moves. This implies that force acting causes work to be done. There are many kinds of forces and therefore there are different ways by which work can be done. Therefore, there are different forms of energy. Some forms of energy include chemical, potential, kinetic, light, sound, electrical, magnetic, heat and others. All these have the ability to do work and are obtained from different sources.

Key Words: Renewable, Non-renewable

Additional Information

Energy as stated above is the ability to do work. There are different forms of energy and therefore different sources. Some sources remain forever but others get depleted. Those that continue to exist are called renewable sources. They include the sun, wind, geothermal and hydroelectric power. All other forms of energy get finished after some time. They said to be non-renewable. They include firewood, charcoal, petroleum products (kerosene, diesel, petrol), etc. and all sources that are obtained from the earth. They get exhausted as they continue to be used.

Dry cell

food

water

Sun

Teaching the lesson

Materials and Resources (Low or no cost): 2 batteries, food, firewood, charts of hydroelectric power station, thermal plant, video.

Procedure

Show learners a video on different sources of energy. They should include thermal and hydroelectric power. Explain the video and leads learners to observe the sources.

Show learners charts showing other sources which are not readily obtainable. Firewood, battery, and food can easily be obtained.

The chart can have sources such as petrol, LPG, diesel and kerosene.

Help to prepare flash cards and leads learners to classify the sources into two groups. Learners discuss the different sources in their groups.

Lead learners to classify the sources into renewable and non-renewable sources. Renewable sources do not get exhausted but non-renewable sources get exhausted.

Using flashcards, learners separate the sources into renewable and non-renewable ones by placing the flashcards by them.

They should note that, solar, wind, hydroelectric power are renewables whilst firewood, food, batteries, petrol, diesel, kerosene, LPG are all non-renewable because they can easily get finished.

Assessment Questions

1. Diagnostic
    i. Define energy
    ii. Name one source of renewable energy.

2. Progressive
    i. Explain the term non-renewable source of energy.

ii. Explain briefly the statement; the sun is a renewable source of energy.

Answers to Assessment Questions

1. Diagnostic
   i. Energy is the ability to do work.
   ii. sun, wind, hydroelectric power

2. Progressive
   i. Non-renewable source of energy is the source that gets depleted after it has been used and does not generate itself again.
   ii. The sun does not get used up. It remains and can be used over and over again.

Answers to Study Questions (Refer to LB page 101)

1. sun
2. wind, sun
3. She should be advised that gas is meant for all since our forests are getting depleted. She should use the gas instead of firewood. She will be taught how to use it.
4. (a) False (b) True(c) True(d) False

Diagnostic assessment for facilitator

1. Did you share learning expectations with learners?
2. Did you vary your pedagogy in the course of the lesson ?
3. Did you use assessment for learning strategies well during the lesson?
4. Did every learner participate in all activities?
5. How did you manage class control for effective delivery of the lesson?

STRAND 4: FORCES AND ENERGY
SUB-STRAND 1: SOURCES AND FORMS OF ENERGY

LESSON 16: MEASURING TEMAPERATURE OF A BODY USING A THERMOMETER

Reference: Learner's Book pages 102 - 107

Expected Learning Outcomes
- Know how to use the laboratory and clinical thermometers
- Demonstrate how to measure body temperature and temperature of water

Content Standard: B6.4.1.2.1. Show understanding of the concept of heat energy in terms of its importance, effects, sources and transfer from one medium to another.

Indicator: B6.4.1.2.1 Measure the temperature of a body using a thermometer

Core Competencies: Critical Thinking and Problem Solving, Communication and Collaboration, Personal Development and Leadership

Subject Specific Practices: Planning, Observing, Recording, Measuring, Generating

Introduction
Heat is a form of energy. Heat makes things hot. Hot things have high temperature. Cold things have a low temperature. Things that make things hot include fire, sun, friction. Refrigerators take heat from materials and make them cold. The heat is however deposited at the back of the refrigerator and makes things there hot. How hot a body is cannot be determined by human senses. It can however be measured using a human invention known as a thermometer. A thermometer measures the degree of hotness of a body. There are several kinds of thermometers.

Materials and Resources: Laboratory thermometer, clinical thermometer, plastic bottle, plastic straws, dyes, water, warm water.

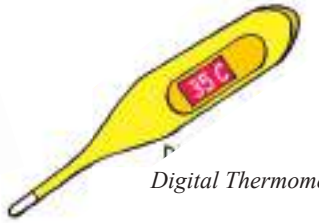
Key Words: clinical, laboratory

Additional Information
The thermometer is the instrument used to measure temperature. There are several types of thermometers. The type used depends on the temperature to be measured. In this lesson, we shall look at two types of thermometers. These are the laboratory and clinical thermometers. The laboratory thermometer is mainly used in the laboratory to measure day to day temperatures. It is graduated from -10°C to about 110°C. It can measure the temperature of melting ice and that of boiling water. It cannot be used to measure the temperature of human beings. To measure the body temperature, we use another type of called the clinical thermometer. It has a short

range since human temperatures do not vary too much. It normally ranges from 35°C to about 43°C. It also has a kink or constriction which prevents the liquid from running back into the bulb immediately the temperature is taken to enable the nurse to read the temperature. It is then shaken to return the mercury into the bulb.

Lab Thermometer

Clinical Thermometer



Digital Thermometer

Teaching the lesson

Begin lesson by asking learners to state what they know about the word temperature. Some may say when they are hot. Lead learners to understand that temperature is the degree of hotness of a body. A cold body also has some degree of hotness. Lead learners to see the relationship between hotness and coldness of a body and its temperature.

A hot body has a higher temperature than a cold body. Explain that the human senses can only determine whether a body is cold or hot but cannot determine the degree of hotness. Explain the need of the instrument called thermometer.

Show real thermometers to learners or their diagrams. Learners compare the two types of thermometers. Lead them to find out the differences between the laboratory and clinical thermometers.

Activity 4.1.2.1 (a) Obtain the two types of thermometers, clinical and laboratory.

- Learners look at them and find out the differences between them.
- Draw attention of learners to the graduation on them and the kink on the clinical thermometer.

Activity 4.1.2.1 (b) To produce an improvised thermometer.

- Lead learners to produce their own thermometer with the use of plastic bottle, dye, water and plastic straw.
- They should follow the instructions in their books.
- Move round and observes as learners perform the activity. Guide learners.

Activity 4.1.2.1 (c)

- Lead learners to discuss their experiences on their visits to the clinic or hospital. Listen as the learners narrate their experiences.
- Ask them to answer the questions in their books on their experiences. These will lead them to understand how the clinical thermometer works.

Activity 4.1.2.1 (d) To measure body temperature with a clinical thermometer.

- Obtain clinical thermometer from the school nurse or a nearby medical facility.
- Lead learners to sterilize them using methylated spirit. Learners measure their body temperatures in their groups and record them.
- Caution learners on the need to sterilize thermometers after use.

Activity 4.1.2.1 (e) To use a laboratory thermometer

- Obtain laboratory thermometers from a nearby SHS. In their groups, learners measure the temperatures of cold water. Place the water on a heat source and record the temperature after every 2 minutes until the water starts to boil.
- Learners record all the temperatures and discuss among themselves.
- Lead the discussion on the recorded values.

Assessment Questions

1. Diagnostic
    i. Give two structures on the clinical thermometer that are not found on the laboratory thermometer.
    ii. Where is the clinical thermometer used?

2. Progressive
    i. Can a clinical thermometer be used to measure the temperature of boiling water?
    ii. Can a model thermometer be used to measure temperature?

Answers to Assessment Questions

1. Diagnostic
    i. The clinical thermometer has a kink or constriction but the laboratory thermometer has more.
    The clinical thermometer has a short range but the laboratory thermometer has a wider range.
    ii. At health facilities.

2. Progressive
    i. No, since it has a short range.
    ii. No, because water does not expand normally.

Answers to Study Questions (Refer to LB page 106 - 107)

1. (a) laboratory thermometer
   (b) clinical thermometer
   (ii) temperature
   (iii) (a) laboratory – school labs, industry, etc.
   (b) clinical – health facilities
   (iv) the clinical thermometer has a kink or constriction but the laboratory thermometer does not have.
   The clinical thermometer has a short range but the laboratory thermometer has a wide range.
2. (a) temperature (b) 0°C (c) 100°C (d) 37°C
3. (a) True (b) False (c) True
4. It has a short range and boiling water is at a temperature of 100°C. This will cause the mercury to expand and break the tube containing the mercury.

Diagnostic assessment for facilitator

1. Did you discuss diagnostic and progressive assessment meant for learners
2. Did you provide opportunity for each learners to carry out more hands-on to make use of resources
3. Did you use assessment for learning strategies well during the lesson?

STRAND 4: FORCES AND ENERGY

SUB-STRAND 2: ELECTRICITY AND ELECTRONICS

LESSON 17: HOW TO CONSTRUCT AN ELECTRIC CIRCUIT

Reference: Learner's Book pages 108 -

Expected Learning Outcomes

- Know the components of an electric circuit
- Describe how to build an electric circuit

Content Standard: B6.4.2.1.1. Demonstrate knowledge of electricity, its transmission and transformation into other forms.

Indicator: B6.4.2.1.1 Construct an electric circuit and know the functions of its components

Core Competencies: Critical Thinking and Problem Solving, Communication and Collaboration

Subject Specific Practices: Planning, Observing, Manipulating, Generating.

Introduction

An electric circuit is made of a source where electricity is produced and a load where electricity is used up. Between these two points, there are several parts. Some carry the electric current and some play roles to protect the user. Electric conductors in form of metallic wires are safe ways to carry the energy from the source to the load where it is used. The wires carry electrical energy which if not covered can pose danger to a user. They are therefore covered by non-conducting material. In this case, users are protected. In the loads, electrical energy is transformed into other forms of energy such as heat, light and sound depending on the appliance being used.

Key Words: connecting wire, key, circuit, components, battery, dry cell

Materials and Resources (Low or no cost): 2 dry cells or battery, video, bulb, connecting wires, switch or key.

dry cells or battery

bulb

connecting wires

switch or key

Additional Information

There are several components which make up an electric circuit. Each component has a specific role it plays in the circuit. The source is any component in which any form of energy is converted into electrical energy. The load is any component in which electrical energy is converted into other forms for example, light, heat and sound. Cells are sources of electrical energy. In cells, solar energy or chemical energy is converted into electrical energy. Two or more cells make a battery. Another source is a generator.

Just like cells, other forms of energy are converted into electrical energy. The electrical energy is carried by conducting wires to the loads. The loads are components such as electric bulbs, light emitting diodes, radios, television sets. A simple electric circuit is therefore made up of a source, connecting wires, a switch or key and a load.

Teaching the lesson

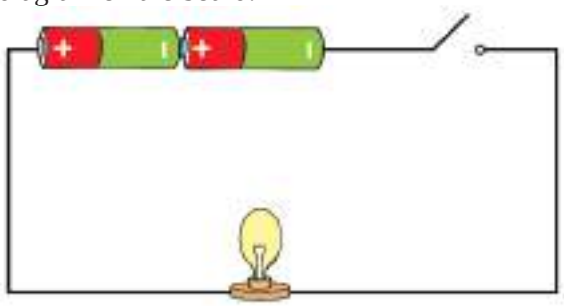
Begin by asking learners to discuss among themselves what electricity means to them. Without electricity they cannot iron their clothes. They cannot do their homework at night.
Show learners a video of basic electric circuit. Lead learners to identify the components. Lead learners to take note of the source that is a cell, connecting wires, a switch and a bulb.
Lead learners to discuss among themselves the functions of each component.

- The cell supplies the electrical energy
- The wires carry the electric energy.
- The switch or key opens or closes the circuit.
- The bulb converts the electrical energy to light energy.

This forms a complete circuit.
Refers to the components in the learners' textbook.

Activity 4.2.1.1 (b) Construction of a complete circuit

- Obtain the components as listed above. Each group is given two cells, a bulb, a switch and connecting wires.
- Draw the diagram on the board.



- Lead learners to connect the circuit as shown with the components given to them.
- Go round and help learners to do the connection for the bulb to come on.
- Lead learners to draw the circuit they have connected.

Assessment Questions

1. Diagnostic
   i. Name two components of an electric circuit.
   ii. Why is a cell an important component of a simple electric circuit?

2. Progressive
   i. State the function of a switch in an electric circuit.
   ii. State the energy conversion that takes place in a chemical cell.

Answers to Assessment Questions

1. Diagnostic
   i. cell or battery, bulb, connecting wires, switch or key.
   ii. It is the source of electrical energy.

2. Progressive
   i. It makes or breaks the circuit.
   ii. chemical to electrical

Answers to Study Questions (Refer to LB page 112)

1. (a) cell (b) key (c) circuit (d) bulb
2. (a) cell (b) connecting wires (c) bulb
3. (a) supplies electric energy
   (b) conducts electricity from one point to another.
   (c) converts electrical energy to light energy.

Diagnostic assessment for facilitator

1. Did you engage all the learners in hands-on activity to make them acquire manipulative skills?
2. Did you explain to learners the precautionary measures to be taken when handling electrical circuits?
3. Did you take notice of learners that were outstanding in manipulative skills?
4. Did the learners exhibit good innovation during the lesson?
5. Did every learner benefit from the lesson?

STRAND 4: FORCES AND ENERGY
SUB-STRAND 2: ELECTRICITY AND ELECTRONICS

LESSON 18: SYMBOLS USED IN REPRESENTING VARIOUS COMPONENTS IN A GIVEN CIRCUIT DIAGRAMT

Reference: Learner's Book pages 113 - 116

Expected Learning Outcomes

- Recall the main parts of an electric circuit
- Know the symbol for each part of the circuit

Content Standard: B6.4.2.1.2. Demonstrate knowledge of electricity, its transmission and transformation into other forms.

Indicator: B6.4.2.1.2 Identify the symbols used in representing various components in a given circuit diagram.

Core Competencies: Critical Thinking and Problem Solving, Communication and Collaboration

Subject Specific Practices: Planning, Observing, Manipulating, Generating

Introduction

Symbols are a short hand form of representing things in nature. In science several symbols are used for example to represent chemical elements. In electricity, symbols are used to represent the components. Each symbol represents a particular component. Symbols are used because in drawing the actual components too much space will be used and it will be clumsy. Using symbols makes use of little space and since they are unique, circuits can easily be drawn. Anyone with the knowledge can easily read and interpret the circuit symbols.

Key Words: symbols, connecting wires, circuit diagram

Cell	
Resistor	
Switch	
Bulb	

Connecting wires	

Materials or Resources (Low or no cost): Chart of electrical symbols

Additional Information
There are several electric circuit symbols. No two components are represented by the same symbols. There are rules regarding the use of the symbols. For example, two lines drawn with one longer than the second one as shown **SYMBOL OF A CELL** represents a cell. Two of these cells are shown with two long lines and two short lines **SYMBOL OF A BATTERY** represents a battery. Two lines of the same length on the other hand **SYMBOL OF A CAPACITOR** represents a capacitor. We have to learn and understand these circuit symbols and we can build our knowledge.

Teaching the lesson
Begin lesson by showing learners a chart of symbols. The symbols are used to construct appliances and for wiring of buildings. Ask learners to identify symbols as they are shown on the chart,

Lead the learners in identifying the symbols, e.g.
SYMBOL OF CELL, BATTERY, CAPACITOR and others

Activity 4.2.1.2 To identify and draw circuit symbols
Lead the activity by drawing the circuit symbols of
(i) cell (ii) battery (iii) switch (iv) bulb and (v) connecting wires

Learners are then instructed to draw them in their notebooks.

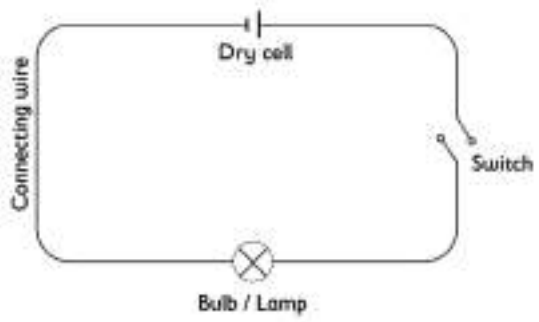
Assessment Questions
1. Diagnostic
    i. What are symbols?
    ii. What are circuit symbols?

2. Progressive
    i. Draw the circuit symbol of a cell.
    ii. What name is given to two or more cells?

Answers to Assessment Questions
1. Diagnostic
    i. short form of representing information
    ii. short form of representing electrical components

2. Progressive
    i. CIRCUIT SYMBOLS OF A CELL
    ii. battery

Answers to Study Questions (Refer to LB page 115 - 116)

1. (i) cell (ii) battery (iii) switch (iv) bulb
2. (ii)
3. 

Diagnostic assessment for facilitator

1. Are you sure that you have presented the lesson in the right order?
2. Could you say that you managed the time well?
3. Did the learners exhibit creativity during the lesson?
4. What aspect of your lesson engaged the learners in critical thinking?

STRAND 4: FORCES AND ENERGY
SUB-STRAND 2: ELECTRICITY AND ELECTRONICS

LESSON 19: CONDUCTORS, SEMI CONDUCTORS AND INSULATORS

Reference: Learner's Book page 117 - 123

Expected Learning Outcomes

- Explain the difference between conductors, semi-conductors and insulators
- Give examples each of conductors, semi-conductors and insulators

Content Standard: Demonstrate knowledge of electricity, its transmission and transformation into other forms.

Indicator: B6.4.2.1.3 Know conductors, semi-conductors and insulators

Core Competencies: Critical Thinking and Problem Solving, Communication and Collaboration

Subject Specific Practices: Planning, Observing, Manipulating, Communicating, Generating

Introduction

Electric current has different effects on materials. The different effects come about due to the structure of the materials. Basically, electricity is transported from one end to another by charges. The different materials have their electrons which carry electric current arranged in different ways. Carrying electric current is done by the outermost electrons of atoms of elements. Some elements have free electrons in their outermost shells and can easily move when made to do so.

Others have their electrons held in strong bonds which can be made to move when heated or at a high temperature. Some also are held in stronger bonds are not easily removed. They therefore cannot carry any electric charges. Materials are therefore classified according to whether they can carry or be made to carry or cannot carry electricity.

Key Words: semi conductors, insulators, conductors

Materials or Resources: Copper wire, aluminium wire, rubber, paper, light emitting diode, spoon, drinking straw, plastic material, cell, connecting wires.

Additional Information

In our homes and streets, metallic conductors are used. They are made of good conductors of electricity. The wires used in carrying electricity in our rooms are however covered with plastic

material. Good conductors are metals. They have free electrons and can therefore transport electricity with very little resistance. When they are close to where humans are, they are covered with non-conductors or insulators. The human body is a good conductor and can easily get injured if exposed to the conductors. The conductors are therefore covered with non-conductors for protection. The semi-conductors are those materials that can be made to conduct when their temperature is increased.

batteries

electric wire

bulb

Teaching the lesson

Start this lesson by asking learners what carries electricity from the source of production, Brainstorms with learners how the current is easily carried by electric wires.

Lead a discussion on why plastic materials are used to cover the carriers of electricity. Lead learners to identify carriers of electricity and what is used to cover them. Brainstorms with learners to bring out the terms conductors and non-conductors.

Lead learners to see that there is a third category of materials called semi-conductors used to make light emitting diodes.

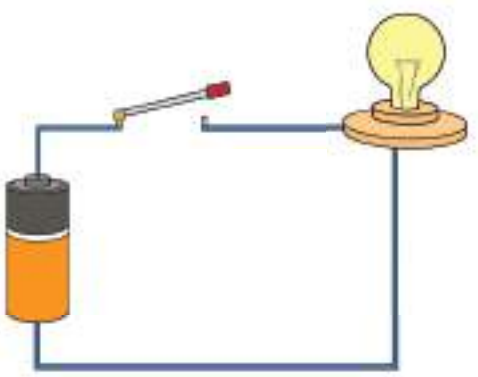
Lead learners to name the conductors such as Aluminium, copper, gold, silver and iron.

Explain that semi-conductors cannot easily carry electricity but can be made to do so by doping them. They are used to produce appliances such as light emitting diodes and diodes.

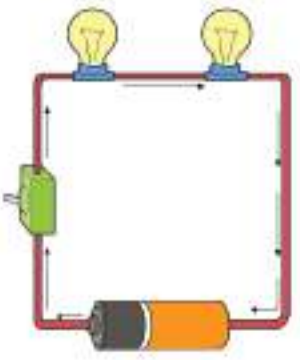
Explain that since conductors can be dangerous when touched they are covered with plastics called insulators. Lead learners to name some of them such as rubber, plastic, cotton, paper and wood.

Activity 4.2.1.3 Classification of materials into conductors, semi-conductors and insulators

- Give the following materials to learners in their groups.
- Spoon, foil, drinking straw, plastic material, piece of wood, glass rod, leather, nails, keys, pencil, pens, light emitting diode and diode.
- Guide learners to connect the circuit as shown



- Guide them to observe what happens when the switch is closed. When the switch is closed the light emitting diode lights up.
- Guide learners to remove one of the connecting wires and in its place, place the materials one by one as shown in the diagram below.



Move from group to group to see how learners go about the activity.

Lead learners to classify the materials into conductors – cause the light emitting diode to light up. Insulators – do not cause the light emitting diode to light up.

Semi-conductors are the diode and light emitting diode.

Guide learners to note that insulators are plastic materials used to cover conductors in the home to prevent shock.

Radio and TV sets are covered by insulators for protection of humans who use them.

Assessment Questions

1. Diagnostic
   i. What are conductors of electricity?
   ii. Name one semi-conductor

2. Progressive
   i. Explain why wires are covered with plastic material.
   ii. Why are radios covered by insulators?

Answers to Assessment Questions

1. Diagnostic
   i. Materials that carry electricity
   ii. Light emitting diode

2. Progressive
   i. They do not conduct electricity so they are protective
   ii. Radios contain conducting parts so in order to protect the user they are placed in insulating material.

Answers to Study Questions (Refer to LB page 123)

1. (i) conductors (ii) insulators (iii) semi-conductors
2. (i) conductor – copper, gold
   (ii) insulator – cotton, dry wood
   (iii) semi-conductor – silicon
3. (i) False (ii) True (iii) False
4. (i) They have free electrons (charges) which can carry electric current.
   (ii) They are non-conductors and can prevent shock when handled by humans.

Diagnostic assessment for facilitator

1. Did you share learning expectations with learners?
2. Did the learners realise the importance of the lesson?
3. What did you do to make sure that the learners display creative skills?
4. Did you create the atmosphere for the learners to discuss among themselves?

STRAND 4: FORCES AND ENERGY
SUB-STRAND 2: ELECTRICITY AND ELECTRONICS

LESSON 20: HOW TO CONSTRUCT AN ELECTRONIC CIRCUIT

Reference: Learner's Book page 124 - 129

Expected Learning Outcomes
- Know the components of an electronic circuit
- Know how to construct an electronic circuit

Content Standard: B6.4.2.2.1. Know the functions and assemblages of basic electronic components.

Indicator: B6.4.2.2.1 Construct an electronic circuit using battery, connecting wires and LED

Core Competencies: Critical Thinking and Problem Solving, Communication and Collaboration, Personal Development and Leadership

Subject Specific Practices: Planning, Observing, Manipulating, Evaluating, Communicating, Generating

Introduction
A circuit is arrangement of electric or electronic components in an orderly manner. A circuit has a source where electric energy is produced to power the circuit components. It also has loads where electrical energy is transformed into other forms such as light, sound, heat and others. The circuit has controls in the form of switches or keys which open or close the circuit. An electronic circuit will be made of a source which is normally a battery, connecting wires and a light emitting diode. A switch is placed in the circuit to control the current.

Key Words: electronic, circuit, battery, connecting wires, light emitting diode

Materials or Resources (Low or no cost): Battery of 3V, switch, light emitting diode, discarded electronic parts of radio and TV sets such as resistors, inductors, capacitors, diodes, transistors.

Additional Information
When a light emitting diode is connected in a circuit with a battery and a switch, the light emitting diode will light up when the switch is closed. This connection should be such that the light emitting diode will be forward biased. To forward bias it, the terminals of the battery as well as those of the light emitting diode should be considered. To forward bias a light emitting diode, the positive terminal of the battery should be connected to the p-type of the light emitting

diode and the negative terminal of the battery connected to the switch and then to the n-type of light emitting diode. To identify the terminals of the light emitting diode, look at the two leads. The longer lead is the p-type and the shorter lead is the n-type. If the connection as described above is reversed, the light emitting diode will not light up.

Teaching the lesson

Begin lesson by putting learners in groups of mixed ability. Provide learners the following components. A battery of 3V, a light emitting diode, connecting wires and a switch.

Lead learners to connect a series circuit using the components given them.

Learners close their circuits and observe what happens. Move from group to group to see what they are doing. Learners discuss how they made the light emitting diode to light up.

Learners are asked to draw the circuit diagrams and label the components.

Learners would have brought discarded electronic gadgets such as radio and TV sets, phone charges and flashlights.

These should be assembled on a large table in one corner of the classroom to serve as a stock of electronic components.

Assessment Questions

1. Diagnostic
    i. What is the source of energy in an electronic circuit?
    ii. What energy conversion takes place in a light emitting diode?

2. Progressive
    i. To which terminal of the light emitting diode should the positive terminal of the battery be connected to produce light?
    ii. What does a switch do in a circuit?

Answers to Assessment Questions

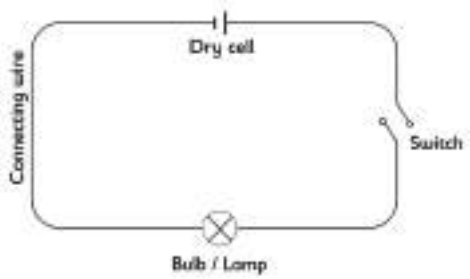
1. Diagnostic
    i. A cell or battery

ii. Electric to light

2. Progressive
   i. Longer lead or the p-type
   ii. It makes or breaks the circuit

Answers to Study Questions (Refer to LB page 129)

1.



2. (i) chemical to electrical
   (ii) electrical to light
3. (i) True (ii) False (iii) True
4. (i) Symbol of a cell
   (ii) Symbol of light emitting diode

Diagnostic assessment for facilitator

1. Did you observe any of the learners showing some outstanding skills in handling a components of electronic components?
2. Did you notice any special skills shown by the learners which can be improved upon?
3. How did you conclude the lesson?

LESSON 21: RELATIONSHIP BETWEEN ENERGY AND FORCES.

Reference: Learner's Book page 128 - 133

Expected Learning Outcomes

- Know that energy is needed to apply a force
- Explain that both energy and force are needed to do work.

Content Standard: B6.4.3.1.1. Know that movement is caused by applied forces due to the release of stored energy.

Indicator: B6.4.3.1.1 Recognise the relationship between energy and force.

Core Competencies: Critical Thinking and Problem Solving, Communication and Collaboration, Creativity and Innovation

Subject Specific Practices: Planning, Observing, Manipulating, Communicating, Generating

Introduction

Force is a push or pull which causes a stationary body to start moving, a moving body to move faster or slow down or change direction and even stop the body from moving. When a force causes an object to move in the direction of the force, work is said to have been done. For a body to do work, it should store energy. Energy is therefore the ability to do work. The greater the force applied in moving a body, the more work is done and therefore the more energy the body has stored.

Key Words: Force, energy, pulling, lifting, loads, cutlass, tree, cutting, lighter, heavier.

Materials or Resources

Table, learners science book, diagram of a boy cutting a tree, diagram of a girl cutting grass.

Additional Information

Forces are used in most activities. Force causes motion. In order to do work, you need to apply a force. The more force exerted, the greater the work to be done. To do work, one needs energy. The more energy stored the more work one can do and therefore the greater the force one can exert. To lift a table, you need to do work against gravitational attraction of the earth on the table.

Since the earth attracts all bodies towards its centre, the attraction of a book is less than the attraction of a table and therefore the weight of a book is less than that of a table. More work has to be done in lifting a table than a book. One needs more stored energy to lift a table than a book.

People playing football

A girl squeezing a plastic bottle.

Teaching the lesson

Begin lesson by asking learners to define force and work. Lead learners to see the relationship between work and force. The harder the force applied, the more the work one can do.

Activity 4.3.1.1 (a) Pulling a table

In their groups, each group selects one member to perform the activity. A member pulls a table across some distance in the classroom. Another member sits on the table and the same member as the first tries to pull the table again across the same distance. The learner shares his experience with the group members. The group discusses the experience. Move from group to group to listen to their experiences.

Activity 4.3.1.1 (b) Lifting

In the groups, one member lifts a table and then lifts the science textbook. The experimenter discuss with the group his or her observations. In which one did he or she use more energy. It is the table because the table is heavier. A force is applied to lift each of them against the force of gravity but since the table is attracted more to the centre of the earth more energy is needed to lift it.

Lead the discussion on the relationship between force and energy. The greater the force to be overcomed, the more stored energy is needed.

Learners lead discussion on where more energy is required. Cutting down a tree or weeding with a cutlass. Lead learners to see that weeding requires less energy than cutting a tree so less force is applied in weeding with a cutlass than cutting a tree.

Assessment Questions

1. Diagnostic
   i. When is work said to be done?
   ii. What enables work to be done?

2. Progressive
   i. State the relationship between force and energy
   ii. Which is easier to pull; a table or table with someone sitting on it?

Answers to Assessment Questions

1. Diagnostic
   i. When a force moves a distance in the direction of the force.
   ii. Energy

2. Progressive
   i. The more energy exerted, the more the force overcome.
   ii. A table is easier to pull.

Answers to Study Questions (Refer to LB page 133)

1. (i) moves (ii) work (iii) work (iv) force (v) force
2. (i) True (ii) False (iii) True
3. Force
4. (i) energy (ii) move a greater distance (iii) move

Diagnostic assessment for facilitator

1. Which relevant previous knowledge helped you to present this lesson?
2. Was the interest of learners in the lesson sustained during the lesson?
3. Was there a better way you could have presented the lesson?
4. Did you vary your pedagogy in the course of the lesson?

STRAND 4: FORCES AND ENERGY
SUB-STRAND 3: FORCES AND MOVEMENT

LESSON 22: TYPES OF SIMPLE MACHINES

Reference: Learner's Book page 134 - 143

Expected Learning Outcomes

- Explain the term simple machines
- Identify some common simple machines
- Distinguish between pulleys, inclined plane and levers

Content Standard: B6.4.3.2.1. Recognise some simple machines used for making work easier. Analyze their advantages and know their uses.

Indicator: B6.4.3.2.1 Identify levers, pulleys, inclined planes as classes of simple machines and cite some common examples.

Core Competencies: Personal Development and Leadership, Communication and Collaboration, Creativity and Innovation

Subject Specific Practices: Planning, Observing, Manipulating

Introdcution

Humans use their hands to work. They can use them to lift objects, to push and pull objects. They therefore exert forces on bodies and cause them to move. However, the hands are not efficient enough to perform some activities. The hands cannot for example, cut grass efficiently. They cannot stay on the ground and raise a heavy load up a storey building without moving or carrying the load up the building. Humans knowing their handicap, developed tools which can help them to do their work faster and easier. These tools are called simple machines.

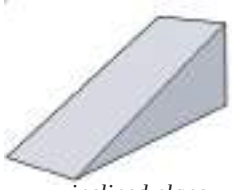
Key Words: Inclined Planes, Pulley, Lever, effort

bottle top opener

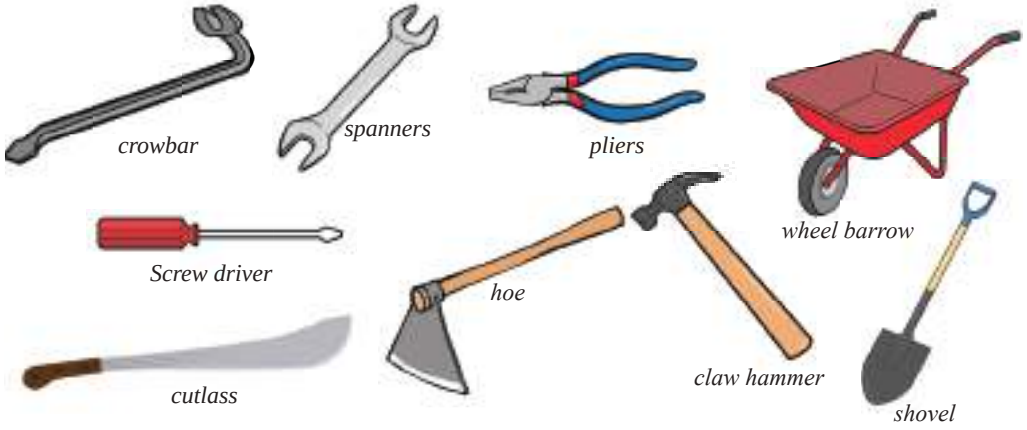
pair of scissors

broom

pulley



inclined plane



Materials or Resources (Low or no cost)
Chart showing simple machines, piece of wood with nail stuck in it, screw driver, claw hammer, stone (heavy), plank of wood, container or bucket, staircase, spool of thread.

Additional Information
Tools also called simple machines enable humans to work easier and faster. There are different types of simple machines. They include levers, pulleys and inclined planes. Tools such as the broom, knife, bottle opener, screw driver and others are used everyday. This is because the hands cannot perform efficiently. To climb up a storey building, one cannot move up vertically. It is easier to move up the staircase which is a form of inclined plane. To hoist the school flag in the morning, a pulley will make it easier. You can stand on the ground and by pulling a rope downwards the flag can move up. It thus makes work easier and faster.

Teaching the lesson
Begin lesson by showing learners a chart of some simple machines. Learners might have seen most of them before.

Ask learners what they are used for one after the other.

Lead learners to identify the different classes of simple machines.
If there is a nearby workplace where some simple machines are used such as tailor's shop (pair of scissors), a fitting shop (pair of pliers, screwdriver, spanner, etc.) can be seen.

You can obtain the tools from nearby workshop to be brought to the class for observation or ask learners to bring them to class. The following machines could be obtained from learners' homes; pair of scissors, knife, broom, cutlass, bottle opener, hammer, wheel barrow. Learners should bring them to class for the lesson. These are classified as levers. You can use a ladder or a plank of wood or a staircase as examples of a class of simple machines called inclined planes.

The pulley is used to hoist a flag. It is a grooved wheel with a rope round it. The spool of thread can be used. It enables a user to stand on the ground and raise a load up. It is used in cranes to lift very heavy loads.

Lead learners to classify the simple machines into different classes; levers, inclined planes and pulleys. The screw and axe are examples of wedges which could be inclined planes.

Activity 4.3.2.1 (b) Ways of using simple machines

- In their groups, supply learners with a bottle of Fanta or any other mineral.
- Learners are guided to use their bare hands to open them. They should then use the bottle top opener to open the drink. They should discuss among themselves why a bottle top opener is a simple machine.

Activity 4.3.2.1 (b) (i) Use of a pair of scissors

- In their groups, learners should bring pieces of cloth obtained from a seamstress shop to class. They should also bring a pair of scissors to the class. Lead them to try to tear the cloth with their bare hands and compare with cutting with a pair of scissors. It will be easier if they use a pair of scissors to cut. The scissors is a simple machine.

Activity 4.3.2.1.(b) (ii) Use of screw driver

- In their groups, lead them to use the screw driver to remove a screw and compare with using their bare hands.

Activity 4.3.2.1 (b) (iii) Use of claw hammer

Guide learners to use the claw part of the claw hammer to remove the nail from the wood.

Activity 4.3.2.1 (b) (iv) Use of inclined plane

- Directs learners to perform the activity as shown in their textbooks using the plank of wood inclined to the teacher's table.
- They should discuss their observation among themselves.

Activity 4.3.2.1 (b) (v) Use of pulley (spool of thread)

- Lead learners out of the classroom to observe hoisting of the school flag. One learner pulls the rope downwards as the flag moves upwards.
- Lead class to discuss places where simple machines are used. Use of ladders for climbing and rolling of drums of oil up a building and climbing by the use of a staircase.

Project: Learners are guided to design and make simple machines with materials such as bamboo, wood, cardboard, plastics, paper and straw.
Learners choose the simple machine they want to design and make.

Assessment Questions

1. Diagnostic
   i. Name one class of simple machines
   ii. Give one example of the class of simple machines named in (i)

2. Progressive
   i. What are simple machines?
   ii. Which simple machine is used to hoist a flag in your school?

Answers to Assessment Questions

1. Diagnostic
   i. lever, inclined plane, pulley
   ii. lever – pair of scissors, claw hammer, etc.
   iii. Inclined plane – stair case, ladder, etc.
   iv. Pulley – grooved wheel with a rope round it.

2. Progressive
   i. They are devices used to make work easier and faster.
   ii. pulley

Answers to Study Questions (Refer to LB page 143)

1. (i) pulley (ii) lever
2. (i) levers (ii) (a) wheel barrow (b) pair of scissors (c) cutlass
   (iii) They do work easier and faster
3. (i) a – inclined plane (b) pulley
   (ii) Yes (iii) Yes
4. (i) axe (ii) screw driver (iii) rake

Diagnostic assessment for facilitator

1. What core competences can you identify being developed in the learners?
2. Were there more hands-on to make use of resources?
3. Did the learners Identify some common simple machines?
4. Did the learners realise the difference between pulleys, inclined plane and levers?

STRAND 5: HUMANS AND THE ENVIRONMENT

SUB-STRAND 1: PERSONAL HYGIENE AND SANITATION

LESSON 23: PERSONAL HYGIENE: HOW TO CONTROL FOUL BODY ODOUR

Reference: Learner's Book page 145 - 149

Expected Learning Outcomes

- Identify the causes of foul body odour
- Know how foul body odour can be prevented

Content Standards: B6.5.1.1 Recognise the importance of personal hygiene

Indicators: B6.5.1.1.1 Identify the causes and effects of foul body odour on humans and how it can be prevented.

Core Competencies: Critical thinking and Problem Solving, Collaboration and communication, Personal Development and Leadership, Digital literacy

Subject Specific Practices: Designing, Experiment, Planning, Observing, Manipulating, Evaluating, Communicating, Generating

Introduction

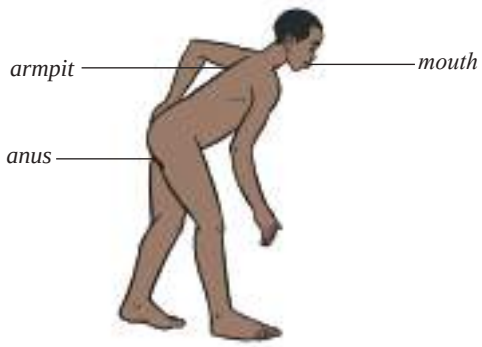
What happens when we do not wash our school uniform for some days? It becomes dirty. This may cause us to smell bad. We have to know the causes of foul body odour and how to prevent it.

Key words: Personal Hygiene

Additional Information

In human beings several activities take place in the body. We eat food to get energy from it. When the good nutrients are taken for energy, the rest is brought out through the anus as faeces. We run and play about. This causes the body to sweat.

The sweat contains water and other materials as waste substances. These materials produce odour (scent). There are particular parts of the body that produce the odour (scent). This odour is not pleasant to the nose.



The parts of the body that usually give odour: Armpit, Anus, Mouth, in between toes.
The diagram above shows a human being with the body parts which usually give body odour.

- In their groups, let them discuss the causes of odour coming from the various parts of the body:
  - Mouth
  - Anus
  - Armpit
  - In between toes
- Prepare personal hygiene card for each of the learners in a groups. Let each learner write one cause of foul body odour and how it can be prevented.
- Lead the learners in a “pair-share” activity on what they have written and present to the whole class.

Activity: Let each learner select a friend. Let them tell the friend what they have written. Let the friend also tell the other what he or she has written.

How to prevent foul body odour
Present items or materials that can be used to prevent foul body odour t learners: The materials include- lime, lemon, deodorant and others.

Demonstrate the correct way of using the items provided to learners.

Removing Body Odour
We learnt that different parts of the human body produce odour. Body odour can be unpleasant and make your friends dislike you. It smells badly. We therefore have to make sure it is removed from our bodies. We should note that odour will be produced anyhow but whether it will be bad or not depends on how we keep ourselves.

Since we know the parts of the body that produce odour, we have to make sure that we clean those parts very well every day.

5.

The diagram shows different ways of removing body odour.

1. A girl using toothbrush to paste.
2. A boy chewing stick.
3. A man bathing under shower
4. A girl bathing from a bucket.
5. A woman cleaning in between her toes using water.

Evaluation

In their groups, let learners design a project on how to eliminate foul body odour.

Summary

Sweat produces water and other materials as waste substances. These materials produce odour (scent). There are particular parts of the body that produce the odour (scent): mouth, anus, armpit, in between toes

Diagnostic assessment

Name three parts of the body that smells if you do not take good care of it

Progressive assessment

Your friend always travels a long distance to come to school in the morning and he smells. Write down one reason why you think he or she smells

Answers to Diagnostic assessment

Armpit, Anus, Mouth, in between toes
Any 2

Answers to Progressive assessment

Sweat which produce bad odour

Answers to Study Questions (Refer to LB page 149

1. Body odour can be unpleasant and make your friends dislike you. It smells badly. We therefore have to make sure it is removed from our bodies.
2. i. armpit: clean with water, soap and sponge during bathing
   ii. mouth: brushing the teeth and chewing stick
   iii. in between toes: clean with water, soap and sponge during bathing
3. Explain three causes of body odour
   Sweat, not bathing regularly
4. It will smell. You can also get skin diseases
5.
   i. armpit
   ii. mouth
   iii. in between toes
   iv. anus
6. Soap, water, sponge, towel
7. Accept any appropriate drawing.

Diagnostic assessment for facilitator

1. Did every learner show keen interest in the lesson?
2. Did you observe any good communication and collaboration among each group members during their discussion on ways to prevent body odour?
3. What pedagogy did you use during this lesson?

STRAND 5: HUMANS AND THE ENVIRONMENT
SUB-STRAND 1: PERSONAL HYGIENE AND SANITATION

LESSON 24: WAYS OF MINIMIZING WASTE

Reference: Learner's Book page 150 - 153

Expected Learning Outcomes
- Identify human activities that cause waste to be generated
- Explain how we can avoid generating waste
- Mention ways of removing waste from the environment

Content Standard: B6.5.1.1. Recognise the importance of personal hygiene

Indicators: B6.5.1.1.2 Describe ways of minimizing waste

Core Competencies: Critical thinking and Problem-Solving, Collaboration and Communication, Personal Development and Leadership, Digital Literacy

Subject Specific Practices: Designing Experiment, Planning, Observing, Manipulating, Evaluating, Communicating, Generating

Introduction
Waste management has become a very important issue in our national development. This is because if it is not managed well it can create serious problems which include flooding. This is what make this lesson very important

Key words: waste

Additional Information
In our daily activities we generate waste materials. For example, when we buy sachet water, the empty sachet has to be discarded. How do we discard the empty sachet? When we discard it anyhow, the environment becomes dirty. When we keep ourselves clean, it reflects on our environment. Good habits, e.g. not dropping litter, wiping up spills, and placing rubbish in bins and making sure that bins and making sure that bins are covered to help in minimizing waste. In fact, good habits practice brings about ways of minimizing waste.

Teaching the lesson
Begin this lesson b letting learners copy the rhyme and recite it:
Cleanliness is next to holiness
The Bible teaches us so
Keep yourself clean

Keep your home clean
And your environment will be clean
Cleanliness is next to holiness
The Bible teaches us so
When you keep yourself clean
Your environment will be clean
And your community will be clean too.

- Let leaners watch pictures and videos showing and describing ways of minimizing waste in the environment.
- In their groups, ask learners to discuss and come out with ideas to minimize waste in the classroom, school environment, homes and the communities. Let them discuss good habits such as
  a. not dropping litter
  b. wiping up spills
  c. placing rubbish in bins and making sure that bins are covered.
- In their groups, let them discuss measures of minimizing waste in the classroom, school environment, home, market, at the bus station, hospitals, church, mosque, beach, etc.
- Let leaners understand that there are different ways of keeping our environment clean and mention them.

- Let learners discuss different ways of keeping the compound clean as shown in the diagram above.
- In their groups, let them present their findings and ideas to the class.
- Ask each group of learners to design a poster on ways of minimizing waste.

Project:
In their groups, let the learners plan, design and make litterbins for use in their class and school community.

Summary

When we keep ourselves clean, it reflects on our environment. Good habits, e.g. not dropping litter, wiping up spills, and placing rubbish in bins and making sure that bins and making sure

that bins are covered to help in minimizing waste. In fact, good habits practice brings about ways of minimizing waste.

Diagnostic assessment

Write down three was of minimising waste in your school canteen

Progressive assessment

What advice will you give one friend in another school whose compound is dirty?

Answers to Diagnostic assessment

a. not dropping litter
b. wiping up spills
c. placing rubbish in bins and making sure that bins are covered.

Answers to Progressive assessment

a. sweep compound regularly
b. not dropping litter
c. placing rubbish in bins and making sure that bins are covered.

Answers to Study Questions (Refer to LB page 153)

1. Complete the following sentence by putting in the correct word.
   Cleanliness is next to holiness
2. (i) at home: not dropping litter, wiping up spills, and placing rubbish in bins and making sure that bins and making sure that bins are covered
   (ii) at school: not dropping litter, wiping up spills, and placing rubbish in bins and making sure that bins and making sure that bins are covered
   (iii) in the hospital: wiping up spills, and placing rubbish in bins and making sure that bins and making sure that bins are covered
3.
   i. dropping litter
   ii. sweeping your compound neat and putting the rubbish into the gutter
   iii. clearing your gutter every Saturday and putting the rubbish by the side
4. What role does Zoomlion play in communities in Ghana

Diagnostic assessment for facilitator

1. Before you started this lesson how did you assess your school environment with respect to waste generation?
2. After the nature's walk how did you assess your school environment with respect to waste generation?
3. Were the learners able to establish the link between environmental cleanliness and air-borne diseases?
4. What was the impression of the learners after the nature's walk with respect to cleanliness?

SUB-STRAND 2: DISEASES

LESSON 25: HOW TO CONTROL ECZEMA

Reference: Learner's Book page 154 - 156

Expected Learning Outcomes

- identify the causes and symptoms of eczema
- know how eczema can be prevented

Content Standards: B6.5.2.1 Demonstrate knowledge of common diseases of humans; causes, symptoms, effects and prevention

Indicators: B6.5.2.1.1 Explain the causes, symptoms and prevention of Eczema.

Core Competencies: Critical thinking and Problem Solving, Collaboration and communication, Personal Development and Leadership, Digital literacy

Subject Specific Practices: Observing Communicating Generating

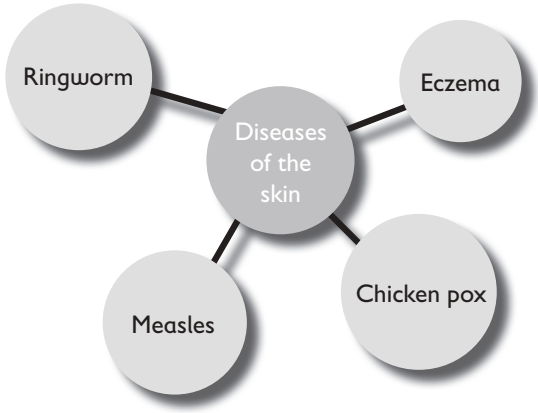
Introduction

The skin is the organ that covers our body. It helps to protective organ of the human body. It therefore always needs to be kept clean. To keep the body clean, it needs to be washed with clean water and soap regularly. If this is not done some diseases can attack the bod. Typical example of such disease is what will be discussed in this lesson.

Key Words: symptoms, eczema

Additional Information

The skin is the protective organ of the human body. It needs to be kept clean so that it can perform its protective functions effectively. It needs to be washed with clean water and soap regularly. If not washed properly, different diseases can attack different parts of the skin.



Look at the chart above. It shows the names of some skin diseases. They are

- Ring worm
- Chicken pox
- Eczema
- Measles

Causes of skin diseases: Eczema

Eczema is caused by fungus. The spores of fungus are always in the air. When they fall on the skin which is not clean (a condition for their growth) they start growing and spreading.
Eczema causes colouring of the skin and leaves spots on the skin.

Teaching the lesson

- Show to learners pictures of people suffering from eczema.
- In their groups, let learners discuss possible causes, symptoms and prevention of eczema.
- Let them write the result of their discussion on paper and present it to you.Write the result of ideas on the board for class discussion.
- Invite health personnel to give a talk on eczema and other common skin diseases.

Summary

Eczema is a skin disease which is caused by fungus. The spores of the fungus are always in the air. When they fall on the skin which is not clean, they start growing and spreading eczema causes colouring of the skin and leaves spots on the skin.

Diagnostic assessment

i. How is eczema able to affect the skin of human beings?
ii. What should you do so that eczema will not affect your skin?

Progressive assessment

Write down two symptoms of eczema

Answers to Diagnostic assessment

i. Fungus is a living thing which can grow. The spores of the fungus in the air falls on the skin which is not kept clean, they start growing and penetrating the skin and also spreading. This causes colouring of the skin and leaves spots on the skin.
ii. Take good care of the skin

Answers to Progressive assessment

i. Rashes which might look like dry, thickened, scaly skin
ii. Scratching also cause thickened, darkened, or scarred skin over time.

Answers to Study Questions (Refer to LB page 156)

1.
   - By wearing clean clothes and changing frequently
   - keeping finger nails short and clean
   - bathing regularly
2. True
3. eczema
4. eating three times a day
5. False

Diagnostic assessment for facilitator

1. How were you able to establish a link between the previous lesson and the current lesson?
2. Are you sure that you have presented the lesson in the right order?
3. What aspect of your lesson is of great importance in personal development and leadership in the learners?

STRAND 5: HUMANS AND THE ENVIRONMENT
SUB-STRAND 2: DISEASES

LESSON 26: HOW TO PREVENT MENINGITIS

Reference: Learner's Book page 157 - 159

Expected Learning Outcomes
- Identify the causes of meningitis
- Explain how meningitis can be prevented

Content Standards: B6.5.2.1. Demonstrating, Knowledge of Common diseases of humans, causes, symptoms, effects and prevention.

Indicators: B6.5.2.1.2 Know how to prevent meningitis

Core Competencies: Critical Thinking and Problem Solving, Collaborating and Communication, Personal Development and Leadership, Digital Literacy.

Subject Specific Practices: Observing, Communicating, Generating

Introduction
There are different diseases that affect different parts of the body. It is important to know the diseases that affect the different parts of the bod and how to prevent them. Meningitis is one of such diseases

Key words: meninges, cerebrospinal

Additional Information
Meningitis is a disease that affects the membranes covering the brain and spinal cord. The membranes are called meninges.

The disease also affects the cerebrospinal fluid which surrounds the brain and spinal cord. Meningitis results from infection by bacteria, viruses, fungi or other microbes.

Meningitis can attack people of all ages, but it most frequently strikes infants and children. Most victims recover completely from the disease. However, bacterial meningitis can cause severe brain damage and even death. In Ghana the disease is commonly referred to as Cerebro-spinal meningitis (CSM).

Prevention
A patient who has meningitis should be under the care of a doctor. No specific treatment is

effective against viral meningitis. Bacterial meningitis is treated with antibiotics. Such treatment greatly reduces the risk of dying from the disease. Some forms of Meningitis can be prevented by vaccination. Since the disease can be spread by air-borne respiratory droplets, affected people are isolated from the public. Avoiding contact with affected people also help prevent the disease.

Someone being vaccinated

Teaching the lesson

- Show videos or pictures on the causes and prevention of meningitis.
- Gather relevant charts on meningitis from health centre and engage learners in a presentation on how to prevent it.
- Invite health personnel to give a presentation on meningitis.

Summary

Meningitis is a disease that affects the membranes (meninges) covering the brain and spinal cord. It results from infection by bacteria, viruses, fungi or other microbes. Bacterial meningitis is treated with antibiotics.

Diagnostic assessment

i. What is meninges?.
ii. Name the parts of the body that cerebro-spinal meningitis affect

Progressive assessment

i. Rafiatu and Memuna lived in the same room. Rafiatu had cerebrospinal meningitis
ii. Can Memuna also contact the diseases?
iii. What should Memuna do to avoid the disease?

Answers to Diagnostic assessment

i. They are the membranes covering the brain and the spinal cord.
ii. The membranes covering the brain and spinal cord.

Answers to Progressive assessment

i. Yes
ii. by vaccination and isolating himself from Rafiatu

Answers to Study Questions (Refer to LB page 159)

1. Meningitis is a disease that affects the membranes (meninges) covering the brain and spinal cord. It results from infection by bacteria, viruses, fungi or other microbes.
2. the brain and spinal cord
3.
    i. meningitis
    ii. Bacteria, viruses, fungi
    iii. Avoiding contact with infected people, vaccination

Diagnostic assessment for facilitator

1. Did you discuss diagnostic and progressive assessment meant for learners
2. Did you find out whether any of the learners have heard of anyone had been affected by meningitis?
3. Were the learners curious to learn more about meningitis?
4. Did you use assessment for learning strategies well during the lesson?

SUB-STRAND 3: SCIENCE AND INDUSTRY

LESSON 27: SCIENTIFIC CONCEPTS AND PRINCIPLES UNDERLYING THE OPERATION OF SOME INDUSTRIES

Reference: Learner's Book page 160 - 165

Expected Learner Expectations

- Understand the importance of science and technology
- Identify the scientific principles underlying production of some items in some local industries

Content Standards: B6.5.3.1 Recognise the impact of science and technology on society

Indicators: 5.3.1.1 Identify the scientific concepts and principles underlying the operation of some industries

Core Competencies: Digital literacy Critical thinking and ProblemSolving Cultural identity and global citizenship Collaboration and communication

Subject Specific Practices: Designing Experiment Planning Observing Generating

Introduction

The impact of science and technology on society cannot be overemphasised. This is made clear in your lessons from Basic one to basic five except in Basic four. You will explore further to see this reality.

Key words: Salts, kenkey, soap, gari, saponification, evaporation, fermentation

Additional Information

There are scientific concepts underlying the operation of every industry, for example, there is the concept of fermentation in kenkey production. It is possible to identify scientific concept when you visit any industry. In man pats of Ghana kenke production is common. The scientific concept involved in kenkey production is fermentation. There are two types of kenkey namely Ga kenkey and Fanti kenkey. Each of these has the same concept of fermentation in common.

Teaching the lesson
Let the learners watch a video of kenkey and salt production processes.

Lead learners to go on a study visit to a local business venture such as kenkey, soap, salt production, cooking oil, or gari production centre.

Let them observe the activities and interact with people at these workplaces.

In groups of four or five, let the learners discuss and identify the key scientific principles underlying the operations of the industries they visited.

Help the learners to build vocabulary for themselves as you explain key terms such as evaporation, salting-out, fermentation and saponification to you.

> *Project: Ask learners, in groups of four or five, to produce yoghurt, kenkey or soap based on the experiences they acquire from their study visits. They can use the flow chart in figure…. to help them in kenkey production*

Flow chart on kenkey production

Summary

There are scientific concepts underlying the operation of every industry, for example, there is the concept of fermentation in kenkey production.

Diagnostic assessment

Name one scientific concept involved in each of the following:

i. Soap production
ii. Kenkey production

Progressive assessment

Name two processes in your home that involves a scientific concept

Answers to Diagnostic assessment

i. saponification
ii. fermentation

Answers to Progressive assessment

- Production of kenkey
- Production of pito
- Production of cassava dough

Any 2 or an correct 2

Answers to Study Questions (Refer to LB page 165)

1.

Industry	**Scientific concept**
Soap	Saponification and salting-out
Salt	Evaporation
Pito	Brewery
Gari	Evaporation
Fanti kenkey	Fermentation

2. Consider the items in the picture below

			
A	B	C	D

i. Identify the items A= soap, B=kenkey, C=gari and D= malta guiness
ii. Write down the name of the industry that produces item A= soap industry, B= kenkey industry, C= gari processing industry and D= Brewery industry
iii. What is the scientific concept underlying the production of items A= saponification and salting-out, B= fermentation, C= evaporation and D=fermentation

3.
    i. Table salt
    ii. Soap
    iii. ethanol
    iv. Soap

Diagnostic assessment for facilitator

1. Were you able to present the lesson in order?
2. Did you discuss diagnostic and progressive assessment meant for learners?
3. Were there more hands-on to make use of resources?
4. Did you make the effort to explore the locality where your school is located to find out some local industries before presenting the lesson?

STRAND 5: HUMANS AND THE ENVIRONMENT

SUB-STRAND 4: CLIMATE CHANGE

LESSON 28: EFFECTS OF CLIMATE CHANGE IN HUMANS

Reference: Learner's Book page 166 - 170

Expected Learning Outcomes

- Know the meaning of climate change
- Identify some causes of climate change
- Explain the effect of climate change

Core Competencies: Digital Literacy, Critical Thinking and Problem Solving, Communication and Collaboration, Personal Development and Leadership

Indicator: B6.5.4.1 Know the effects of climate change on humans.

Content Standard: Know that climate change is one of the most important environmental issue facing the world today.

Subject Specific Practices: Designing Experiments, Planning, Observing, Communicating, Generating, Analysing, Evaluating

Introduction

The world has different types of climates. In the temperature lands, they have different seasons. The seasons change according to the position of the earth relative to that of the sun at any given time.

They therefore have winter when the earth is covered with snow, summer when the earth appears closer to the sun and therefore there is a little heat. Between these two extreme weather conditions, they experience autumn and spring.

In Africa or generally the tropics, the weather remains relatively the same throughout the year but with two relatively different seasons, the dry season and the wet season.

During the dry season, dry winds blow, rain does not fall often but during the wet season, rain falls often, temperatures become low and humidity is high. This is the way climate patterns in Tropical Africa and the temperate lands have been over the years.

Key Words: Climate Change

Materials and Resources (Low or no cost): Chart showing different factors which cause climate change. E.g. bush fire, smoke from vehicles, dusty road, etc.
Video show of the above activities such as flooding, drought and areas where land is being reclaimed.

Additional Information
Climate is the average atmospheric condition of a place over a long period of time. Atmospheric conditions such as rainfall, humidity, temperature, wind speed and direction, sunshine do not remain the same daily. They change. The average conditions of a place over a period of time describes the climate.

However, these conditions of the atmosphere do not remain constant. Humans are contributing to the change in climatic conditions. The world has become a global village. Industrialization in an area produces gases. Vehicles especially old fashioned ones produce a lot of smoke. Smoke and some gases are less dense than air and are carried above air by air masses. They are carried all over the world. Some of the gases such as carbon dioxide are causing a cover in the atmosphere and preventing the escape of heat radiations. This is known as the greenhouse effect. Greenhouse effect is causing global warming which results in climate change. The high temperatures are causing ice to melt at the poles and ice caps. The water flows into the sea and causes flooding on low lands. Drought is so common these days. There are short rainy seasons followed by long periods of drought. Grasslands are turning into deserts while forests are becoming grasslands.

Procedure
Begin lesson by asking learners to explain weather and climate. Ask them whether they have observed any change in weather during the previous week. Was there rainfall or sunny conditions?

Ask them whether they know the climate of the environment where their school is. Have their parents discuss anything about the climate over the last decade with them? If not they should find out the climatic conditions since the year 2000 from their parents and grandparents and report to the class the next day.

Activity 5.4.1.1 Discussion on weather situation since the year 2000
In their groups, learners should discuss what their parents and grandparents had told them about the climate patterns since the year 2000.
Lead the discussion with all learners. Lists the possible causes of climate change as shown below.

- Bush fires
- smoke from aged vehicles
- depletion of forests
- dusty roads
- smoke from factories

bush fire

smoke from vehicles

cutting down of trees

dust from the road

smoke from factory

Shows a video of the activities where it is available.

Lead the discussion of the consequences of climate change. Atmosphere is becoming warmer, ice is melting at the poles and ice caps, temperatures are rising, the oceans are becoming flooded with rising water causing the sea to wash away the land on the coast. There are poor patterns of rainfall resulting in droughts. Deserts are forming because trees are being cut down and therefore increase in carbon dioxide levels. Acid rains are falling and causing havoc to green plants.

Guide learners to form think-pairs to discuss ways of controlling the causes of climate change. Programmes such as campaigns to stop bush burning, tree planting, planting cover crops to keep moisture in the soil and ways of protecting the natural environment can be organized and executed.

Activity 5.4.1.1 (a) Awareness campaign on climate change

Ask learners to bring cardboards and cloth so that they can write posters and banners in the school and the community on how to stop activities that lead to climate change. The learners can carry the posters and banners and go on a walk in the environment.

Activity 5.4.1.1 (b) Tree planting

Lead learners on a tree planting project on the compound and the immediate community. Learners take care of them by watering and protecting them from animals.

Assessment Questions

1. Diagnostic
    i. What is climate?
    ii. List two activities that lead to climate change

2. Progressive
    i. State two effects of climate change
    ii. How can the effects stated in (i) be overcome?

Answers to Assessment Questions

1. Diagnostic
    i. Climate is the average atmospheric conditions of a place over a long period of time.
    ii. bush burning, cutting down of trees, burning refuse

2. Progressive
    i. flooding, desertification, increase in temperature, etc.
    ii. stop the emission of greenhouse gases.
    Plant more trees and grow cover crops

Answers to Study Questions (Refer to LB page 170)

1. (i) climate (ii) weather (iii) climate
2. (i) True (ii) False (iii) True (iv) True
3. Green trees or crops
4. bush fire, smoke from old vehicles, dusty roads, cutting down trees, smoke from factories (any 4)

Diagnostic assessment for facilitator

1. Did every learner realise the importance of environmental issues facing the world?
2. Did the learners realise they can also contribute positively or negatively to environmental issues?
3. Did the learners show curiosity to know more about issues of the environment when they watched the video or chart about the environment?

APPENDIX

ANSWERS TO WORKBOOK

STRAND 1 : DIVERSITY OF MATTER
SUB-STRAND 1: LIVING AND NON-LIVING THINGS

LESSON 1: TYPES OF ROOT SYSTEMS IN PLANTS (Refer to Workbook Pages 2 - 5)

B6.1.1.1.1 Classify plants based on their root system.

PART A

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

PART B

1.
   i. tap root system.
   ii. fibrous root system .
2.
   i. tap root system= Dandelions, carrots, and beetroots (any 2)
   ii. fibrous root system= wheat, rice, banana, onion, corn and grass(any 2) .
3.

		
A	B	C

   i. True
   ii. Tap
   iii. i. They both have the main function absorption of water and nutrients from the soil
   ii. Both **A** and **B** roots are true root types

STRAND 1 : DIVERSITY OF MATTER
SUB-STRAND 2: MATERIALS

LESSON 2: PROPERTIES OF METALS (Refer to Workbook Pages 6 - 9)

B6.1.2.1.1 Know the general properties of metals such as lustre, malleability, conductivity and ductility.

PART A

1. c
2. d
3. c
4. d
5. c

PART B

1.
   i. They are malleable
   ii. They are ductile
   iii. They conduct heat and electricity
   iv. They are lustrous
2. 3 examples of metals= Sodium, potassium, Iron, aluminium, sodium, copper, gold(any 3 or any other correct 3 metals)
3.
   i. Lustre = They shine when they are polished
   ii. Malleability = That is to say when we hit them with hammer, the original shape changes into another shape without breaking.
   iii. Conductivity = They allow heat and electric current to pass through them.
   iv. Ductility = They can be pulled into a wire

LESSON 3: THE USES OF METALS BASED ON THEIR PROPERTIES (Refer to Workbook Pages 10 - 14)

B6.1.2.1.2 Investigate the uses of metals in everyday life and link the uses to their properties

PART A

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

PART B

1.
   i. iron.
   ii. Aluminium
2. the blacksmith make the metal easier to be shaped by heating them to become red-hot
3. a) things that a blacksmith can make in his workshop = hoe, cutlass, shovel, spade, knife (any3 or any other correct 3 things).
4.

Use of metal	Property being applied
For making electric cables	Ductility and electrical conductivity
For making car bodies	Malleability
For making cooking utensils	Heat conductivity
For making jewellery	Lustrous and unreactive

b) Activity

1. Collect a nail, a piece of wire, a milk tin, and a piece of iron rod from your school compound. In each case name the property of the metals applied in its use.Note: You can get one or more properties in each case.
2. .

Object	Property applied
Nail	Malleability
Piece of wire	Ductility
Milk tin	Malleability
Irom rod	Malleability

LESSON 4: USES OF MIXTURES (Refer to Workbook Pages 15 - 20)

B6.1.2.2.1 Examine some uses of mixtures in everyday life.

PART A

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

PART B

1. A mixture is a physical combination of two or more substances.
2.
   i. Solid-solid such as corn dough and cassava dough, gari and sugar,
   ii. Solid-liquid such as sugar solution, salt solution, soup
   iii. Liquid-liquid such as vinegar in water,
3. uses of mixtures in our everyday lives.
   - Soaps production: Oil, salt, perfumes, water can be found in soap
   - Construction of homes: Concrete is a mixture made by adding cement, water and sand. This is used in building houses.
   - Medicines: Different substances are mixed to produce medicine. Antacids for example may contain a mixture of a weak acid and calcium carbonate.
   - Food preparation: Soups such as palm nut soup or light soup are made by mixing different substances such as oil, fish, vegetable sand water.

   (Any 3 or any other correct 3)

4. sugar solution, salt solution, soup (any2 or any other correct2)
5. .
   i. sugar solution=Pour water in a container, add sugar to the water and stir
   ii. salt solution= Pour water in a container, add salt to the water and stir
   iii. Soup= Pour water in a container, add tomato, pepper, okro, fish, salt and heat and stir
6. State the materials required to prepare the mixture in question (1) above.
   i. sugar solution=water , sugar, stirrer
   ii. salt solution= water , salt, stirrer
   iii. Soup= water , tomato, pepper, okro, fish, salt and heat source, laddle
7. No. in some cases the solid does not dissolve in the liquid
8. NOTE: provide pictures of a bowl, a spoon and a beaker.

9. Four examples of mixtures used in our everyday life.
    i. salt solution.
    ii. Sugar solution
    iii. soup.
    iv. perfume.

    Note: provide a drawing of equipments for preparation of mixture for learners to label. Name them i, ii,iii, iv, and vi.

STRAND 2: CYCLES
SUB-STRAND 1: EARTH SCIENCE

LESSON 5: THE RELATIVE SIZES OF THE EARTH AND SUN (Refer to Workbook Pages 22 - 25)

B6. 2.1.1.1 Describe the relative sizes of the earth and sun and their importance.

PART A

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

PART B

1. the sun
2.
    i. The rotation of the earth about its axis
    ii. The side facing the sun is day and the side away from the sun is night
3. orbit
4.
    i. moon
    ii. earth
    iii. sun
5. The days will be shorter and the nights will be longer than we experience now.
6.
    i. The earth moves but the sun does not move
    ii. The sun produces light and heat but the earth does not.

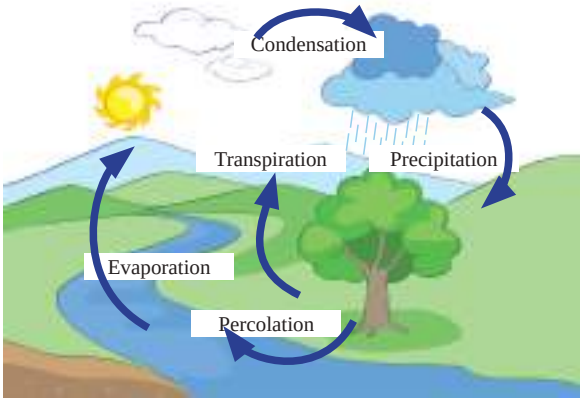
LESSON 6: HOW RAINFALL IS FORMED

B6.2.1.2.1 Explain how rain falls from clouds

PART A

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

PART B

1. True
2. The processes involved in the formation of clouds:
   Water from the sea, rivers, lakes and other sources, the soil, and the body of living things evaporates into the atmosphere. When the water vapour gets into the sky, it cools down and changes into tiny water droplets in a process called condensation. These tiny droplets combine together to become bigger droplets.which are suspended in the air form clouds.
3. Evaporation is the loss of water in the form of vapour into the atmosphere
4. Recount the steps involved in the water cycle process.
   Trees absorb water from the soil and also lose the water through their leaves through transpiration. All other living things take in water and also lose it through evaporation from their body. The soil and water bodies also lose water through evaporation. When the water vapour gets into the sky, it cools down and changes into tiny water droplets in a process called condensation. These tiny droplets combine together to become bigger droplets. As the size of the droplets increases, they become so heavy that they can no longer be suspended in the air. They therefore fall to the ground as rain or precipitation.
5. 

6. i. Water vapour in the atmosphere condense to form tiny water droplets.

ii. The tiny droplets of water combine together to become bigger droplets.
iii. As the size of the droplets increases, they become so heavy that they can no longer be suspended in the air.
iv. They therefore fall to the ground as rain or precipitation.

LESSON 7: FUNCTIONS OF CARBON IN THE ENVIRONMENT (Refer to Workbook Pages 30 - 33)

B6. 2.1.3.1 Know the functions of carbon within the environment.

PART A

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

PART B

1. Plants, animals, food items, petrol kerosene etc.
2. True
3. i. graphite in pencil
   ii. diamond
4. carbon dioxide
5. Carbohydrate, proteins, fats and oils
6. Petrol, kerosene, LPG, coal, charcoal, firewood (any 4)

LESSON 8: WAYS OF CONSERVING WATER (Refer to Workbook Pages 34 - 37)

B6.2.1.4.1 Investigate ways of conserving water in the home, school and community.

PART A

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

PART B

1. Two ways by which water can be conserved.
   i. Not using too much water to wash dishes.
   ii. Flushing toilets with less water.
   iii. Watering your outdoor plants early in the morning when temperatures are low to reduce evaporation of the water.
   iv. Not using too much water to bath or wash your clothes.
   v. Turning off the tap when you are washing your hand and open it only when you are ready.
   vi. Not letting the tap be running whilst you are brushing your teeth.
   vii. Repairing leaking and broken down pipes which carry water into homes.
   (Any 2)
2. State 3 qualities of good drinking water
   i. colourles
   ii. odourless
   iii. Tasteless.
3. 3 ways of making water safe for use.
   i. sedimentation
   ii. boiling
   iii. filtration
   iv. filtering
   v. addition of iodine tablets
   vi. use of chlorine
   vii. use of water filters
   viii. addition of alum
   (Any 3)
4. State 3 activities that show the wastage of water.
   i. Using too much water to wash dishes.
   ii. Flushing toilets with too much water.
   iii. Watering your outdoor plants early in the hot weather when temperatures are high to increase evaporation of the water.
   iv. Using just enough water to bath or wash your clothes.
   v. Leaving the tap on when you are washing your hand without closing when not needed.
   vi. letting the tap running whilst you are brushing your teeth.
   vii. leaving leaking and broken down pipes which carry water into homes without repairing them.
   (Any 3)

LESSON 9: DEMONSTRATING THAT AIR SUPPORTS BURNING (Refer to Workbook Pages 38 - 41)

B6.2.1.5.2 Demonstrate that air supports burning.

PART A

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

PART B

1. To show that air supports combustion
2. Label the I and II.
   i. Burning materials producing fire
   ii. Blanket covering fire which has gone off
3. Nitrogen, oxygen, carbon dioxide

STRAND 2: CYCLES
SUB-STRAND 2: LIFE CYCLES OF ORGANISMS

LESSON 10: MATERIALS NEEDED FOR PLANTS GROWTH (Refer to Workbook Pages 42 - 46)

B6.2.2.1.1 Know the materials needed for the survival of plants in the environment (water, carbon dioxide, oxygen, sunlight)

PART A

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

PART B

1.
   i. seeds
   ii. seedlings
   iii. matured plant
   iv. flowering
   v. fruit formation
2. 3 materials needed for plants to survive.
   i. Carbon dioxide,
   ii. water
   iii. oxygen
   iv. sunlight
   (any 3)
3.
   i. Water = root.
   ii. carbon dioxide = through stomata in leaves
   iii. sunlight = leaves.
4. State the specific functions of the following in the survival of plants.
   a. Oxygen
      i. Plants use it in respiration to release energy. …….
   b. Carbon dioxide
      i. Plants use it together with water and sunlight to make their own food.
   c. Water:
      i. Plants use it together with carbon dioxide and sunlight to make their own food.
   d. Sunlight
      i. Plants use it together with water and carbon dioxide to make their own food.

LESSON 11: LIFE CYCLE OF PLANTS (Refer to Workbook Pages 47 - 49)

B6.2.2.1.2 Observe the life cycle of plant (okra or maize plant).

PART A

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

PART B

1. True
2. Abeimoscus Esculentus
3. To water it regularly
4. i) Laposta, ii) Obatanpa iii) Dobidi
5. 45 to 75days (up to 11 weeks)

STRAND 3: SYSTEMS
SUB-STRAND 1: THE HUMAN BODY SYSTEMS

LESSON 12: HUMAN EXCRETORY SYSTEM (Refer to Workbook Pages 51 - 54)

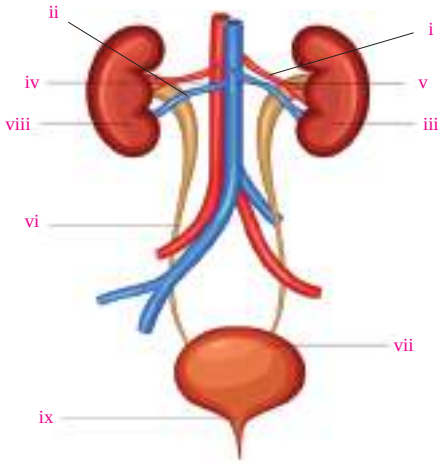
B6.3.1.1.1: Knowing the parts of the human excretory system.

PART A

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

PART B

1.
   i. unicellular organisms? =An organism that consists of only one cell
   ii. multicellular organisms?= An organism that consists of many cell
2. excretory system
3. skin
4. To remove excretory products from the body in the form of urine
5.



i. renal artery
ii. Renal vein
iii. Kidney
iv. Aorta
v. vena cava
vi. Ureta
vii. Bladde

STRAND 3: SYSTEMS
SUB-STRAND 2: SOLAR SYSTEM

LESSON 13: STAR, PLANET AND SATELLITE (Refer to Workbook Pages 55 - 57)

B6.3.2.1.1: Explain the difference between a star, a planet and a satellite.

PART A

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

PART B

1. The sun, the planet in their orbits round the sun and the satellites which orbit the planets.
2.
   i. clouds
   ii. stars
   iii. planets

3.

Star	Planet	Satellite
Produces it own light	Does not produce light	Does not produce light
Does not move	Moves round a star and on its axis.	Moves round a planet
Very big	Bigger than sallletie but smaller than the star	smallest

STRAND 3: SYSTEMS
SUB-STRAND 3: ECOSYSTEM

LESSON 14: INTERACTIONS IN AN ECOSYSTEM AND THE EFFECTS ON HUMANS (Refer to Workbook Pages 58 - 62)

B6.3.3.1.1 Investigate various interactions in an ecosystem and the effect on humans

PART A

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

PART B

1. A food chain comprises a sequence of organisms through which energy and nutrients are taken in and used up. One organism feeds on another organism and it is also fed on by another oranism
2.
   i. Plants which are producers.
   ii. .animals which are consumers
3.
   i. Primary consumers
   ii. Secondary Consumers
   iii. Tertiary and higher level Consumers
4. A simple food chain diagram indicating clearly the different categories of organisms in the Chain.
   I = grass(producer) ⟶ II = mouse(primary consumer) ⟶ III = Dog(secondary consumer)

5.
    i. Biotic components such as plants and animals
    ii. Abiotic components such as soil, air water and light
6. .
    i. Water
    ii. Air
    iii. Temperature
    iv. Light
7.
    i. Producers
    ii. consumers
    iii. Decomposers …
8. Photosynthesis is the process by which plants use water, carbon dioxide and sunlight which is trapped by chlorophyll to make their own food
9. It provides us with things like food, timber, and raw materials. We get other benefits from such as:
    i. lumber, organic matter, fodder, and fertilizer
    ii. water
    iii. fresh air
    iv. Firewood
10. Discuss the effects of the following on humans and other living things within a given ecosystem.
    i. **Hunting**. It destroys animals which are consumers. Too much hunting makes some important animals become extinct. Some hunters set bush on fire and thereby destroying them. The bush fires destroy microorganism and slow-moving animals which cannot escape from the fire. He bush fires also pollute the air which affect our lungs and worsened the condition of people who already have respiratory diseases.
    ii. **Farming** = Farming provides food for us to eat. During farming some important trees are destroyed. Excessive cultivation of the land make the soil lose its nutrients. It also exposes the soil to the atmosphere which causes excessive evaporation
    iii. **Predation** = Predators destroy other animals which are called their prey. This affects the ecosystem

STRAND 4: FORCES AND ENERGY
STRAND 1: SOURCES AND FORMS OF ENERGY

LESSON 15: RENEWABLE AND NON RENEWABLE SOURCES OF ENERGY (Refer to Workbook Pages 64 - 68)

B6. 4.1.1.1. Compare renewable and non-renewable sources of energy.

PART A

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

PART B

1.
   i. Light
   ii. Heat
   iii. Potential
   iv. Kinetic
   v. Sound
   vi. Electricity
   vii. Chemical (any 3)
2.
   i. Food
   ii. Electricity
   iii. Sun
3. The way energy is changed from one from into another form.
4. Sunlight → (photosynthesis) Chemical energy inplants → (feeding) energy fo a goat
5. Renewable source of energy is that source which does not get exhausted and can be used continuisly but non-renewable source get used u p and cannot be used again.
6.

Renewable	Non-renewable
Sun	Petrol
Wind	Charcoal
Biomass	Firewood

7.

Renewable	Non-renewable
a solar panel	Firewood
Hydroelectric power station	Bowl of rice

LESSON 16: MEASURING TEMAPERATURE OF A BODY USING A THERMOMETER (Refer to Workbook Pages 69 - 72)

B6. 4.1.2.1. Measure the temperature of a body using a thermometer.

PART A

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

PART B

1. the energy that causes a rise in temperature of a body and makes things hot.
2. True
3.
   i. For ironing clothes
   ii. for cooking
   iii. melting metals
   iv. boiling water
4. Thermometer
5.
   i. Laboratory thermometer
   ii. Clinical thermometer
6.

STRAND 4: FORCES AND ENERGY
SUB-STRAND 2: ELECTRICITY AND ELECTRONICS

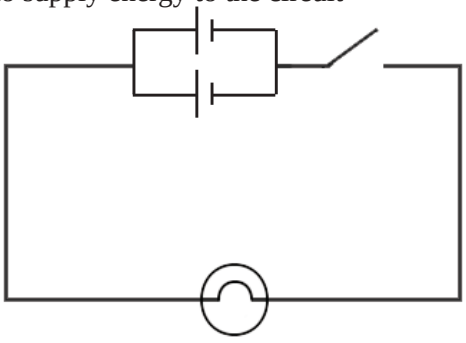
LESSON 17: HOW TO CONSTRUCT AN ELECTRIC CIRCUIT (Refer to Workbook Pages 73 - 76)

B6. 4.2.1.1 Construct an electric circuit and know the functions of its components.

PART A

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

PART B

1. Connecting wire
2.
   i. Cell or battery
   ii. Switch
   iii. Connecting wire
3. to supply energy to the cireuit
4. 
5. The bulb will light up

LESSON 18: SYMBOLS USED IN REPRESENTING VARIOUS COMPONENTS IN A GIVEN CIRCUIT DIAGRAM (Refer to Workbook Pages 77 - 80)

B6. 4.2.1.2: Identify the symbols used in representing various components in a given circuit diagram.

PART A

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

PART B

1.
   i. cell
   ii. battery
   iii. switch
   iv. bulb
2.
   i. False
   ii. False
   iii. True
3. Cell
4. connecting wire
5. battery

LESSON 19: CONDUCTORS, SEMI CONDUCTORS AND INSULATORS (Refer to Workbook Pages 81 - 84)

B6. 4.2.1.3. Know conductors, semi conductors and insulators

PART A

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

PART B

1.
    i. Dry wood
    ii. Plastic
    iii. rubber
    iv. paper
2. Materials which allow elctric charges to move easily through them.
3.
    i. Iron
    ii. Spoon
    iii. Aluminium foil
4. True
5. True

LESSON 20: HOW TO CONSTRUCT AN ELECTRONIC CIRCUIT (Refer to Workbook Pages 85 - 88)

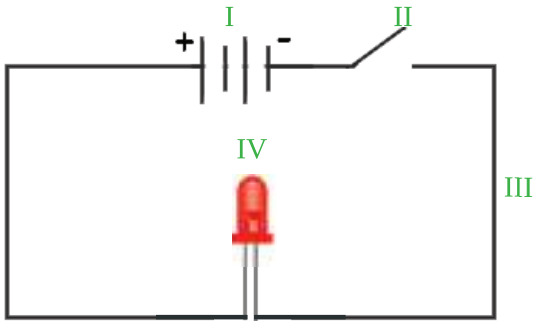
B6. 4.2.2.1 Construct an electronic circuit using battery, connecting wires and light emitting diodes.

PART A

1. d
2. c
3. c
4. c
5. c

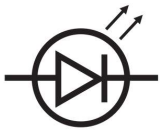
PART B

1.



i. I = battery
II = switch
III = connecting wire
IV = light emitting diode

ii. I ii) IV iii) carrries electric charges along the circuit

2. 

3. Copper, aluminium, silver etc.

STRAND 4: FORCES AND ENERGY
SUB-STRAND 3: FORCES AND MOVEMENT

LESSON 21: RELATIONSHIP BETWEEN ENERGY AND FORCES. (Refer to Workbook Pages 89 - 91)

B6. 4.3.1.1 Recognise the relationship between energy and forces.

PART A

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

PART B

1.
   a. Work: The product of force and distance moved by its point of application in the direction of the force.
   b. Energy: It is the ability to do work.
2. The force with which the table is pulled toward the centre of the earth(weight) is greater than that of the book.
3. True
4. False
5. True

LESSON 22: TYPES OF SIMPLE MACHINES (Refer to Workbook Pages 92 - 95)

B6. 4.3.2.1 Identify levers, pulleys, inclined planes as classes of simple machines and cite some common examples.

PART A

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

PART B

1. A machine is **a device used to make work easier and faster**
2.
   i. Weeding
   ii. prune hedges and trees
   iii. cut finger nails
   iv. carry loads (any other use)
3. Machine
4.
   i. I = inclined plane
   ii. II = wheel barrow
   iii. III = pulley
   iv. IV = pair of scissors
5.
   i. pliers
   ii. scissors
   iii. shovel
   iv. hammer
   v. cutlass etc. (any 2)

STRAND 5: HUMANS AND THE ENVIRONMENT.
SUB-STRAND 1: PERSONAL HYGIENE AND SANITATION.

LESSON 23: PERSONAL HYGIENE: HOW TO CONTROL FOUL BODY ODOUR
(Refer to Workbook Pages 97 - 101)

B6.5.1.1.1 Identify the causes and effects of foul body odour on humans and how it can be prevented.

PART A

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

PART B

1. Personal hygiene is the practice of keeping oneself clean always
2.
   i. Bathing with soap and water at least twice a day
   ii. Cutting your nails and hair short regularly
   iii. Washing your clothes regularly
   iv. Cleaning your teeth everyday
3.
   i. To prevent you from contracting diseases.
   ii. It prevent you from spreading diseases to other people
4.
   i. armpit ii. mouth iii. Anus
5.
   i. sweat.
   ii. Dirty clothes also produce foul odour.
   iii. Particular parts of the body such as armpit and in-between our legs that produce the odour (scent).
6. .
   i. Bath twice everyday. .
   ii. We have to wash our school uniforms regularly with soap and water.
   iii. Our hair and nails must be kept neat at all times.
   iv. We must use lime, lemon or deodorant to clean our armpits.
   v. brush the teeth with toothpaste and brush or use chewing stick to clean the teeth every morning and evening. Any 3

7.
   i. Body odour can be unpleasant to people
   ii. make your friends dislike you.
   iii. It makes you dislike your friends

LESSON 24: WAYS OF MINIMIZING WASTE (Refer to Workbook Pages 102 - 105)

B6.5.1.1.2 Describe ways of minimizing waste

PART A

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

PART B

1. Managing waste in such a way that makes sure it does not accumulate anywhere in the community by reducing, recycling and reusing the waste.
2.
   i. Recycle
   ii. Reuse
   iii. Reduce
3.
   - We must drop litter in litter bins
   - We have to desilt gutters and drains regularly
   - We must place Litter bins at vintage points within the school environment. The litter bins must be emptied as soon as they become full.
   - Each one of us must help to sweep our school and classroom everyday. (Any 3)
4. Accept any appropriate chart from the learners'
5.
   - Sweep the market everyday.
   - Place Litter bins at vintage points within the community.
   - Drop litter in litter bins
   - The litter bins must be emptied as soon as they become full.
     (Any 3)

STRAND 5: HUMANS AND THE ENVIRONMENT.
SUB-STRAND 2: DISEASES

LESSON 25: HOW TO CONTROL ECZEMA (Refer to Workbook Pages 106 - 109)

B6.5.2.1.1 Explain the causes, symptoms and prevention of Eczema.

PART A

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

PART B

1.

Diseases	**Symptoms**	**Prevention**
Meningitis	Neck pain, Fever, Vomitting	vaccination, isolation
HIV/AIDS	Rashes on skin, loss of weight	use of condoms, screening blood before transfusion, not using sharp instruments with infected person.
Malaria	Headache, fever, high temperature	Use of drugs, avoid mosquito bites

2. protect the body
3. An organism that causes disease
4.
   i. chicken pox
   ii. ringworm
   iii. eczema
5.

Disease	**Disease causing organism**	**Ways of preventing the disease**	**Signs of the disease**
Ringworm	fungus	Wash body and clothes with clean water and soap regularly.	Ring patches on the skin
Eczema	Fungus	Wash body and clothes with clean water ans soap regularly	colouring of the skin and leaves spots on the skin

6. horny layer.

LESSON 26: HOW TO PREVENT MENINGITIS (Refer to Workbook Pages 110 - 114)

B6.5.2.1.2 Know how to prevent meningitis

PART A

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

PART B

1. Meningitis is caused by
   i. bacteria
   ii. viruses
   iii. fungi
   iv. other microbes
2. The ability to fight diseases in the body
3. i. By contact
   ii. By Air-borne
4. i. People with meningitis can have severe brain damage
   ii. People can suffer death when they have meningitis
   iii. People may not be able to go to work.

STRAND 5: HUMANS AND THE ENVIRONMENT.
SUB-STRAND 3: SCIENCE AND INDUSTRY

LESSON 27: SCIENTIFIC CONCEPTS AND PRINCIPLES UNDERLYING THE OPERATION OF SOME INDUSTRIES (Refer to Workbook Pages 115 - 118)

B6. 5.3.1.1 Identify the scientific concepts and principles underlying the operation of some industries

PART A

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

PART B

1. A micro-organism is a living thing which is either useful or harmful which is too small for our naked eyes to see
2. fermentation process
3. Yoghurt is made from = milk and microorganism
4. the processes involved in the production or yoghurt.
    i. Heat the milk to about 76-82ºC to kill any other bacteria that might be in the milk that would compete against the bacteria that convert milk to yogurt.
    ii. Sterilize the containers
    iii. Cool the milk and inoculate
    iv. Pour the inoculated milk into the containers
    v. Load into cooler and put in heat sources
    vi. Check yogurt to see if done
    vii. Cover and refrigerate.
5. Saponification is a process of soap production in which a fat molecule is broken down by sodium hydroxide (lye) into four smaller molecules; three of the new molecules are soap and one is glycerol.

STRAND 5: HUMANS AND THE ENVIRONMENT.
SUB-STRAND 4: CLIMATE CHANGE

LESSON 28: EFFECTS OF CLIMATE CHANGE IN HUMANS (Refer to Workbook Pages 119 - 123)

B5. 5.4.1.1 Know the effects of climate change in humans.

PART A

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

PART B

1.
    i. Higher temperature
    ii. Less rainfall leading to droughts
    iii. Increase in carbon dioxide levels
    iv. Floodin

2.
    i. Bush burning
    ii. Deforestation
    iii. Smoke from burning and factories
    iv. Illega mining
3.
    i. Stop bush burning
    ii. Plant more trees
    iii. Stop indiscriminate burning
    iv. Mine with care
4.
    i. Education of the citizens
    ii. Use LPG instead of fireword
    iii. Plant trees along water bodies
    iv. Stop using over agedd vechicle and Stop large volumes of carbon dioxide production.