



South Sudan

# Primary Science

# 7

Primary Science has been written and developed by Ministry of General Education and Instruction, Government of South Sudan in conjunction with Subjects experts. This course book provides a fun and practical approach to the subject of Science, and at the same time imparting life long skills to the pupils.

The book comprehensively covers the Primary 7 syllabus as developed by **Ministry of General Education and Instruction.**

Each year comprises of a Pupil's Book and teacher's Guide.

The Teacher's Guides provide:

- Full coverage of the national syllabus.
- A strong grounding in the basics of Science.
- Clear presentation and explanation of learning points.
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- It provides opportunities for collaboration through group work activities.
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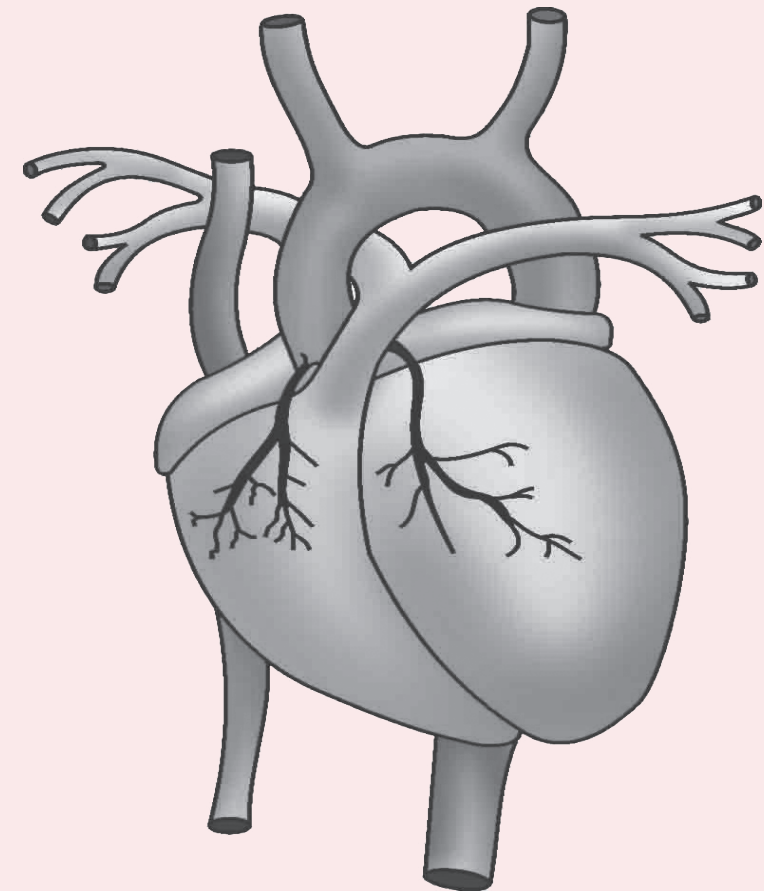
South Sudan

# Primary Science



# 7

Teacher's Guide



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# Science

## Teacher's Guide 7

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## FOREWORD

I am delighted to present to you this Teacher's Guide, which is developed by the Ministry of General Education and Instruction based on the new South Sudan National Curriculum. The National Curriculum is a learner-centered curriculum that aims to meet the needs and aspirations of the new nation. In particular, it aims to develop (a) Good citizens; (b) successful lifelong learners; (c) creative, active and productive individuals; and (d) Environmentally responsible members of our society. This textbook, like many others, has been designed to contribute to achievement of these noble aims. It has been revised thoroughly by our Subject Panels, is deemed to be fit for the purpose and has been recommended to me for approval. Therefore, I hereby grant my approval. This Teacher's Guide shall be used to facilitate learning for learners in all schools of the Republic of South Sudan, except international schools, with effect from 4th February, 2019.

I am deeply grateful to the staff of the Ministry of General Education and Instruction, especially Mr Michael Lopuke Lotyam Longolio, the Undersecretary of the Ministry, the staff of the Curriculum Development Centre, under the supervision of Mr Omot Okony Olok, the Director General for Quality Assurance and Standards, the Subject Panelists, the Curriculum Foundation (UK), under the able leadership of Dr Brian Male, for providing professional guidance throughout the process of the development of National Curriculum, school textbooks and Teachers' Guides for the Republic of South Sudan since 2013. I wish to thank UNICEF South Sudan for managing the project funded by the Global Partnership in Education so well and funding the development of the National Curriculum, the new textbooks and Teachers' Guides. I am equally grateful for the support provided by Mr Tony Calderbank, the former Country Director of the British Council, South Sudan; Sir Richard Arden, Senior Education Advisor of DfID, South Sudan. I thank Longhorn and Mountain Top publishers in Kenya for working closely with the Ministry, the Subject Panels, UNICEF and the Curriculum Foundation UK to write the new textbooks. Finally, I thank the former Ministers of Education, Hon. Joseph Ukel Abango and Hon. Dr John Gai Nyuot Yoh, for supporting me, in my role as the Undersecretary, to lead the Technical Committee to develop and complete the consultations on the new National Curriculum Framework by 29 November 2013.

The Ministry of General Education and Instruction, Republic of South Sudan, is most grateful to all these key stakeholders for their overwhelming support to the design and development of this historic South Sudan National Curriculum. This historic reform in South Sudan's education system is intended to benefit the people of South Sudan, especially the children and youth and the future generations. It shall enhance the quality of education in the country to promote peace, justice, liberty and prosperity for all. I urge all Teachers to put this textbook to good use.

May God bless South Sudan. May He help our Teachers to inspire, educate and transform the lives of all the children and youth of South Sudan.



Deng Deng Hoc Yai, (Hon.)

**Minister of General Education and Instruction, Republic of South Sudan**

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# Introduction

## Book organisation

This teacher's guide is organised into two main sections Part 1 which is the general introduction section detailing information on competence based curriculum and pedagogical issues.

The main elements of Part 1 are:

- **Background information** to the new curriculum - It gives a brief overview of the general requirements of the new South Sudan competence-based including the guiding principles, the competences the learners are expected to acquire, cross cutting issues to be addressed during learning.
- Basic requirements for an effective Science lesson - It highlights the teacher and learner's roles for effective teaching and learning of Science, teaching and learning resources, grouping learners for learning and teaching methods.

*Part 2 provides a topic -to - topic guide to the teacher on how to facilitate learners to acquire the knowledge, skills and attitudes envisaged in each unit. This part is therefore structured into units.*

The main elements of each unit guide are:

- Unit heading
- Unit syllabus
- Contribution to learner's competences: The section explains how the unit/topic will facilitate the learner to acquire the specified competences. These competences will be discussed in detail later in the next section.

## Cross cutting issues to be addressed

The section outlines the specific cross cutting issues that will be addressed through infusion as the learners do the activities and interacts with concepts planned for the unit. This is meant to make the teacher conscious on and be on the lookout for suitable opportunities throughout the teaching and learning process in the entire unit to address the cited cross cutting issues. These issues will be discussed in detail later in this section.

**Note:** a unit or topic may not necessarily address all the cross cutting issues outlined in the curriculum.

- **Background information** - This section outlines key knowledge, skills attitudes and values that learners need to have acquired earlier that will facilitate easier acquisition of the new knowledge, skills attitudes and values envisaged in this unit. It also guides the teacher on how to find out what the learners possess before they start learning the concepts in this unit, and how to help learners in case they do not possess them.

- **Suggested teaching and learning activities-** This section provides guidance to the teacher on how to facilitate learners to learn by doing the activities outlined in the learner's book. It also guides the teacher on how to assess the learning.

## **Background Information on the new curriculum**

The aim of the South Sudan Competence-based Curriculum is to develop learners competences that will enable them interact with the environment in more practical ways. It clearly defines the knowledge, skills and attitudes that the learner should acquire by doing the specified learning activities.

### **a. Learner's competences to be attained**

Competencies are statements of the characteristics that learners should demonstrate, which indicate they have the ability to do something to the required level of performance. The following are the four competencies envisaged in this curriculum:

#### **1. Critical and creative thinking**

Science lessons and activities facilitate learners to acquire these competences by giving them opportunities to:

- Plan and carry out investigations, using a range of sources to find information.
- Sort and analyse information and come to conclusions.
- Suggest and develop solutions to problems, using their imaginations to create new approaches.
- Evaluate different suggested solutions.

#### **2. Communication**

Science lessons and activities facilitate learners to acquire these competences by giving them opportunities to:

- Read and comprehend critically a variety of types and forms of texts during research activities.
- Write reports on scientific investigations and activities.
- Speak clearly and communicate ideas and science related information coherently.
- Listen and comprehend scientific facts presented by fellow classmates, group members, teachers and resources persons.
- Use a range of media, technologies and languages to communicate messages, ideas and opinions.



### 3. Cooperation

Science lessons and activities facilitate learners to acquire these competences by giving them opportunities to:

- Work collaboratively towards common objectives when doing activities.
- Be tolerant of others and respectful of differing views, when working together.
- Adapt behaviour to suit different situations.
- Negotiate, respect others' rights and responsibilities, and use strategies to resolve disputes and conflicts.

Σ Contribute to environmental sustainability.

### 4. Culture and identity

Science lessons and activities facilitate learners to acquire these competences by allowing them to:

- Take pride in South Sudanese identity and the diverse nature of South Sudanese society.
- Build understanding of South Sudanese heritage in relation to the wider world.
- Appreciate and contribute to the development of South Sudanese culture.
- Value diversity and respect people of different races, faiths, communities, cultures, and those with disabilities.

#### (b) Cross-cutting issues to be addressed during learning

These are issues that are of high national priority and hence have been incorporated in the learning process.

The three cross-cutting issues for that should be addressed through the teaching/learning process are:

##### i) **Environment and sustainability**

A well-conserved environment is obviously key to our health and survival. It is therefore important for the Science teacher to make use of the opportunities that arise in the process of teaching and learning Science through activities to sensitise learners on the importance of conserving the environment. One way is by ensuring that the learners always dispose of the waste materials at the end of an activity in ways that do not *pollute the environment*.

##### (ii) **Peace education**

Peace is critical for a society to flourish and for every individual to focus on personal and national development.

The Science teacher needs to be in the fore front in educating his/her learners on the need for peace, for example by encouraging group work in the learners

activities and showing them ways of solving peacefully interpersonal problems that occasionally arise during interactions and discussions.

### **(iii) Life Skills**

Learners need to progressively acquire some skills, abilities and behaviours that will help them effectively deal with the events and challenges of everyday life. Such skills include first aid, communication skills, conflict resolution, basic ICT skills etc. The Science teacher should as much as possible facilitate the learners to acquire these skills whenever an opportunity arises in the lesson execution.

## **Basic requirements for an effective Science lesson**

### ***Teacher's role and basic skills for effective Science lesson***

The teacher is the most important resource for an effective science lesson.

(a) Some of the key roles of the Science teacher include:

- Organising the classroom to create a suitable learning environment.
- Preparing appropriate materials for learning activities.
- Engaging learners in variety of learning activities.
- Encouraging and accepting learner autonomy and initiative.
- Allowing learner responses to drive lessons, shift instructional strategies.
- Familiarizing themselves with learner's understandings of concepts before sharing their own understandings of those concepts.
- Encouraging learners to engage in dialogue, both with the teacher and one another.
- Engaging learners in experiences that pose contradictions to their initial hypotheses and then encouraging discussion.
- Providing time for learners to construct relationships and create metaphors.
- Using a variety of teaching and assessment methods.
- Adjusting instructions to the level of the learner.
- Nurturing learners' natural curiosity.
- Motivating learners to make them ready for learning.
- Coordinate learners' activities so that the desired objectives can be achieved.
- Assessing learners' activities and suggest solutions to their problems.
- Assist learners to consolidate their activities by summarising the key points learnt.

(b) Some of the key skills that the Science teacher should have include:

- Creativity and innovation.
- Makes connections/relations with other subjects.

- A high level of knowledge of the content.
- Effective disciplining skills manage adequately the classroom.
- Good communicator.
- Guidance and counselling.

### **Learner's role in learning Science**

Learning takes place only when the learner acquires the intended knowledge, skills and attitudes. As such, learning is a highly personal and individual process. Thus, a learner must be actively engaged in the learning exercise.

For active participation in learning, the learner should:

- Raise questions about what is observed.
- Suggest solutions to the problems observed.
- Take part in planning investigations with appropriate controls to answer specific questions.
- Carry out investigations to search for answers with the help of materials in search of patterns and relationships while looking for solutions to problems.
- Working collaboratively with others, communicating their own ideas and considering others' ideas.
- Expressing themselves using an appropriate Science terms and representations in writing and talking.
- Engaging in lively public discussions in defence of their work and explanations.
- Applying their learning in real-life contexts.
- Reflecting critically about the processes and outcomes of their inquiries.

### **Teaching and learning resources**

These refer to things that the teacher requires during the teaching process. They include:

- The classroom
- Textbooks
- Wall charts and wall maps
- Materials and apparatus
- Various tools and equipment
- Science models
- Resource persons

### (a) Classroom as a learning environment

A classroom generally refers to the place where learning takes place. Learners learn from everything that happens around them, such as the things that they hear, see, touch, taste, smell and play with.

#### Classroom organisation

- It is important for the teacher to make the classroom attractive and stimulating environment. This can be done by:
- Carefully arranging the furniture in the classroom in an organised way to allow free movement of learners and the teacher.
- Putting up learning and teaching aids on the walls. Examples are wall charts, pictures and photographs.
- Displaying teaching models.
- Providing objects for play for example toys.
- Having a display corner in the classroom where learners display their work.
- Setting a corner for storing materials so as not to obstruct learners or distract them.
- Spreading out the learners evenly so that they do not interfere with one another's activities.
- Setting up the materials for the series of lessons or activities going on for a number of days or weeks in a location where they do not interfere with other daily activities.
- Organizing the sitting arrangement such that learners face the lighted areas of the room.
- Choosing the most appropriate location for the teacher and the chalkboard such that they are visible to all learners and the teacher has a good view of all learners in the class.

### (b) Apparatus and materials

For learners to study Science through the activity method, a number of materials and apparatus are required. The important role played by materials in learning has been felt for centuries. This is noted for instance in the old Chinese proverb that says:

*When I hear I forget*

*When I see I remember*

*When I do I understand*

Since Science is highly a practical subject, materials help the teacher to convey his/her points, information or develop skills simply and clearly, and to achieve desired results much faster.

Some of the materials that a teacher requires for Science activities and calculations can be collected from the local environment.

Many others can be improvised while some have to be purchased. Whether collected, improvised or purchased, there are certain materials that are valuable to have around almost all the time.

These include:

**(i) Science Kit**

A science kit is a special box containing materials, apparatus and equipment necessary to conduct an array of experiments. The content of the Science kit depends on the curriculum requirements per level. Most science kits are commercially available and target particular levels of learners. However, the teacher is encouraged to come up with a kit based on the syllabus requirement.

**(ii) Models**

A model refers to a three-dimensional representation of an object and is usually much smaller than the object. Several models are available commercially in shops. Examples of Science models include models of electric motors, hydraulic systems among others. These models can be purchased by schools for use during Science activities.

**(iii) Resource persons**

A resource person refers to anybody with better knowledge on a given topic area. Examples include; health practitioners such as doctors, nurses and laboratory technologists, agricultural extension officers, environmental specialists among others. Depending on the topic under discussion, the teacher can organize to invite a resource person in that area to talk to learners about the topic. The learners should be encouraged to ask as many questions as possible to help clarify areas where they have problems.

**(iv) Improvisation**

If each learner is to have a chance of experimenting, cheap resources must be made available. Complicated apparatus may not always be available in most schools. Such sophisticated equipment made by commercial manufacturers are usually expensive and majority of schools cannot afford them.

The teacher is therefore advised to improvise using locally available materials as much as possible.

**(vi) Scheduling learning activities and venues**

Some of the activities suggested in the learner's book require good planning and scheduling in order to get accurate results.

## Grouping learners for learning activities

Most of the Science activities suggested in the learner's book are carried out in groups and therefore the teacher should place 2 or 3 desks against each other and then have a group of learners sitting around those desks.

In certain activities, the teacher may wish to carry out a demonstration. In this case, the learners should be sitting or standing in a semicircle, or arranged around an empty shape of letter "U" such that each learner can see what the teacher is doing clearly and without obstruction or pushing. If the learners are involved in individual work, each learner can work on the floor or on the desk or a portion of the desk if they are sharing. In this case, they need not face each other.

Grouping learners for learning has increasingly become popular in recent years. In fact, the shift from knowledge-based to competence based curriculum will make grouping the norm in the teaching process.

Learning groups can be formed based on one or a number of the following considerations:

- Similar ability grouping
- Mixed ability grouping
- Similar interests grouping
- Common needs grouping
- Friendship grouping
- Sex-based grouping

Grouping learners in a Science class has several advantages that include:

- The individual learner's progress and needs can easily be observed.
- The teacher-learner relationship is enhanced.
- A teacher can easily attend to the needs and problems of a small group.

Materials that were inadequate for individual work can now be easily shared.

- Learners can learn from one another.
- Cooperation among learners can easily be developed.
- Many learners accept correction from the teacher more readily and without feeling humiliated when they are in a small group rather than the whole class.
- Learners' creativity, responsibility and leadership skills can easily be developed.
- Learners can work at their own pace.

The type of "grouping" that a teacher may choose may be dictated by:

- The topic or task to be tackled.
- The materials available.
- Ability of learners in the class (fast, average, slow).

## **Class size**

There is no one method or approach to teaching that is appropriate to all lessons. A teacher should, therefore, choose wisely the method to use or a combination of methods depending on the nature of the topic or subtopic at hand.

## **Teaching methods**

There are a variety of possible methods in which a teacher can help the learners to learn.

These include:

- (a) Direct exposition
- (b) Discovery or practical activity
- (c) Group, class or pair discussion
- (d) Project method
- (e) Educational visit/ field trips
- (f) Teacher demonstration
- (g) Experimentation/Research

The particular technique that a teacher may choose to use is influenced by several factors such as the:

- Particular group of learners in the class.
- Skills, attitudes and knowledge to be learned.
- Learning and teaching aids available.
- Local environment.
- Teacher's personal preference.
- Prevailing weather condition.
- Requirements of Science syllabus.

### **(a) Direct exposition**

This is the traditional way of teaching whereby the teacher explains something while the learners listen. After the teacher has finished, the learners may ask questions. However, in a competence-based curriculum, this technique should be used very minimally.

### **(b) Guided Discovery**

In this technique, the teacher encourages learners to find out answers to problems by themselves. The teacher does this by:

- Giving learners specific tasks to do.
- Giving learners materials to work with.

- Asking structured or guided questions that lead learners to the desired outcome. Sometimes learners are given a problem to solve and then left to work in an open-ended manner until they find out for themselves.

This is the most preferred method of teaching in the implementation of competency- based curriculum.

**(c) Group/class discussion or pair work**

In this technique, the teacher and learners interact through question and answer sessions most of the time. The teacher carefully selects his/her questions so that learners are prompted to think and express their ideas freely, but along a desired line of thought. The method leads learners from the known to unknown in a logical sequence; and works well with small groups. The method boosts confidence in learners and improve interpersonal and communication skills.

The main disadvantage of this method is that some learners may be shy or afraid to air their opinions freely in front of the teacher or their peers. It may give more confident learners a chance to dominate over others.

**(d) Project method**

In this approach, the teacher organizes and guides a group of learners or the whole class to undertake a comprehensive study of something in real life over a period of time such as a week or several weeks.

Learners using the project method of studying encounter real life problems, which cannot be realistically brought into a normal classroom situation. A project captures learners' enthusiasm, stimulates their initiative and encourages independent enquiry. The teacher, using the project method, must ensure that the learners understand the problem to be solved and then provides them with the necessary materials and guidance to enable them carry out the study.

The main disadvantage of this method is that if a project is not closely supervised, learners easily get distracted and therefore lose track of the main objective of their study. Studying by the project method does not work well with learners who have little or no initiative.

**(e) Educational visits, trips and nature walks**

This is a lesson conducted outside the school compound during which a teacher and the learners visit a place relevant to the topic of study. An educational visit/nature walk enables learners to view their surroundings with a broader outlook that cannot be acquired in a classroom setting. It also allows them to learn practically through first- hand experience. In all “educational visit/nature walk lessons”, learners are likely to be highly motivated and the teacher should exploit this in ensuring effective learning. However, educational visits are time consuming and



require a lot of prior preparation for them to succeed. They can also be expensive to undertake especially when learners have to travel far from the school.

**(f) Demonstration lessons**

In a demonstration, the teacher shows the learners an experiment, an activity or a procedure to be followed when investigating or explaining a particular problem. The learners gather around the teacher where each learner can observe what the teacher is doing. It is necessary to involve the learners in a demonstration, for example by:

- Asking a few learners to assist you in setting up the activity.
- Requesting them to make observations.
- Asking them questions as you progress with the demonstration.

This will help to prevent the demonstration from becoming too teacher centred.

***When is a demonstration necessary?***

A teacher may have to use a demonstration, for example when:

- The experiment/procedure is too advanced for learners to perform.
- The experiment/ procedure is dangerous.
- The apparatus and materials involved are delicate for learners to handle.
- Apparatus are not enough for all learners or groups.

# Unit 1

## Human Systems and Reproductive Systems in Plants

Refer to learner's book page 1-45

Learn about		Key inquiry questions
<p>Learners should investigate the structures and functions of human excretory, respiratory, digestive and circulatory systems through discussion and group research. They should understand why complex organisms such as our bodies require these systems and processes.</p> <p>Learners should carry out practical investigations of the structure of flowers as reproduction systems and develop the notion of male and female gametes. They should observe and record their findings and explain the reproductive system of several flowering plants through investigation of the structure of the flowers and how pollination occurs through wind and insects, and understand how seeds and fruits develop.</p>		<ul style="list-style-type: none"> <li>Σ Why are the systems circulatory, respiratory, digestive and reproductive important to animals?</li> <li>Σ Why is reproduction important in flowering plants?</li> <li>Σ How does pollination and fertilisation occur in different plants?</li> </ul>
Learning outcomes		
Knowledge and understanding	Skills	Attitudes
<ul style="list-style-type: none"> <li>Σ Understand the structures and functions of circulatory, excretory, and respiratory in humans and reproductive system in flowering plants.</li> <li>Σ Understand how reproduction takes place in flowering plants.</li> <li>Σ Understand the structures and identify the different parts of the flower.</li> </ul>	<ul style="list-style-type: none"> <li>Σ Observe carefully using hand lenses.</li> <li>Σ Predict what might happen.</li> <li>Σ Collect and present results appropriately in writing or drawing.</li> <li>Σ Interpret results accurately.</li> <li>Σ Report findings appropriately.</li> </ul>	<ul style="list-style-type: none"> <li>Σ Appreciate why complex organisms require circulatory, excretory and respiratory systems.</li> </ul>

**Contribution to the competencies:**

Creative and Critical thinking: through investigations.

**Links to other subjects:**

Life Skills: reproduction.

Environment and Sustainability: diversity.

**Introduction to the unit**

This unit is about human system and reproductive system in flowering plants. Take advantage of work covered previously and link what they have learnt here with their past experiences about parts of the body. The concept in the unit is to enable learners take care of their bodies through appreciating why complex organisms require a circulatory, respiratory excretory and digestive systems. The systems are very important in the body and must be taken care of. Invite guest speakers as a role model to motivate learners. From the units covered in previous classes, learners know many things about plants. Try to link what they have learnt with their past experience about plants. The concept in this unit is to enable learners take care of plants. Plants have several uses to human beings. Let learners understand that as they continue and further their education they may become doctors, teachers, nurses, pharmacist's, botanists, agronomists, farmers and plant specialists. Invite an agricultural extension officer as a role model to motivate learners.

**Competencies to be attained****Communication**

During group discussions and practical activities assess how learners communicate in various groups and how they make presentation in class since this will improve on their language use.

**Critical and creative thinking**

Learners will perform quite a number of practical activities. The activities require logical thinking and you should guide learners on the procedure of carrying out the activities to achieve the desired results.

**Cross cutting issues****1. Peace education**

This is achieved by encouraging learners to share what they have learnt in class with friends and family members. The poems, songs, skits carried out can be presented during assembly and society gatherings. Field visits create a link between the learners and the community.

## 2. *Life skills*

The unit should equip learners with lifelong skills core values and gain requisite skills that will come in handy in their lives, if they were to become doctors, nurses, community workers, plant specialists, teachers and pharmacists.

Learners must be made to understand that they can grow crops from seeds. The crops once sold can make money.

## 3. *Environmental awareness and sustainability*

This unit entails reproduction in flowering plants. Emphasize to learners that it is important to take care of our plants. As they carry out practical activities involving flowers, caution them not to destroy plants. Encourage learners to also plant trees both at home and at school.

### Meaning of new words

Blood:	A red liquid that is the main transport agent in the body
Heart:	A muscular organ that pumps blood to all parts of the body.
Vessels:	Tubes that carry blood.
Blood circulation:	The path followed by blood as it moves around the body.
Oxygen:	A component of air used for breathing, germination and burning.
Carbon dioxide:	A component of air given out during breathing.
Arteries:	Tubes that carry blood away from the heart.
Veins:	Tubes that carry blood from all body parts to the heart.
Chambers:	Parts of the heart auricles the upper parts of the heart ventricles the lower parts of the heart.
Auricle:	The upper chambers of the heart (Singular atrium). It's the part that receives blood to the heart.
Ventricles:	The lower chamber of the heart where blood is received from auricles and pumped away from the heart. They have thicker walls than auricles.
Valves:	Prevent blood from flowing back.
Vena cava:	The largest vein that brings blood from all body parts back to the heart.
Aorta:	Largest artery.
Contraction:	Getting smaller in size.
Relaxation:	Getting back into normal shape.
Heartbeat:	Contraction and relaxation of the heart muscles. It is also known as pulse.

Pulse:	A normal regular beat felt when arteries are depressed, caused by the pumping action of the heart.
Capillaries:	Smallest blood vessels.
Plasma:	Pale yellow part of the blood that is mainly water.
Platelets:	The blood component that makes blood clot after an injury.
Red blood cells:	The red colour in blood.
White blood cells:	The blood component that fights diseases and germs.
Haemoglobin:	A blue pigment in blood made from iron which carries oxygen.
Trachea:	A tube made of a c shaped rings also known as wind pipe.
Lungs:	Two sponge like structure that help in breathing.
Bronchus:	One of the two branches of trachea.
Bronchiole:	Small tubes that branch from the bronchi.
Alveoli:	Blood filled capillaries that help in gaseous exchange.
Diaphragm:	A sheet of muscle that separates the chest from the abdomen.
Epiglottis:	Opening of the trachea that prevents food particles from entering the wind pipe.
Gaseous exchange:	The entry of oxygen into the blood and removal of carbon dioxide from the blood.
Kidney:	Two beans shaped organs at the back of the abdomen.
Lungs:	The two organs of respiration located in the chest cavity.
Waste product:	Unwanted materials removed from the body.
Excretory organs:	Structure used by the body to remove waste products from blood.
Skin:	The outer layer and largest organ in the body. It protects the body.
Pores:	Small openings on the skin, sweat leaves the body through them.
Sweat:	A mixture of water and salts that comes out of the body through skin.
Urethra:	A tube that connects the bladder. Urine leaves the body through it.
Ureter:	A tube that delivers urine from the kidneys to the bladder.
Sweat glands:	Sweat is made and stored here.

Urea:	Waste produced when proteins are broken down.
Urine:	A mixture of water and other nitrogenous wastes.
Nitrogenous wastes:	Wastes produced in form of nitrogen when proteins are broken down.
Digestion:	Breaking down of food into a form that can be easily absorbed into the blood.
Digestive system:	The tube followed by food that runs from the mouth to the anus.
Gullet:	Connects the mouth and the stomach also known as food pipe.
Pancreas:	One of the body organs that assists in digestion and controls the amount of sugar in blood.
Liver:	The most important organ in the body. It produces substances that help in digestion.
Digestive juices:	Chemical substances that help in the digestion of food.
Ileum:	Small intestines connect the stomach to the large intestine.
Colon:	Large intestine located at the lower part of the digestive system.
Rectum:	The last part of the large intestines that stores digestive wastes.
Balanced diet:	A diet that consist of carbohydrates, proteins, vitamins and minerals.
Bolus:	A mixture of chewed food, saliva and mucus. It is shaped like a ball.
Hygiene:	Cleanliness.
Sanitation:	Hygienic disposal or recycling of wastes.
Salivary glands:	Found in the mouth they produce saliva which is a digestive juice.
Indigestible:	Wastes that were not digested in the alimentary canal.
Faeces:	A mixture of water and indigestible wastes.
Stigma:	Receptive part of the flower. It receives the pollen grains.
Style:	Connects the stigma to the ovary.
Ovules:	Female reproductive cells in a flower.
Ovary:	Protects the ovules and develop into a fruit.
Sepal:	Protects the flower when it is in a bud stage.
Stalk:	Holds the flower on the stem.
Petal:	Protects the inner parts of the flower. It is brightly coloured to attract insects.

Anthers;	Produce the male cells (Pollen).
Filaments:	Hold the anthers.
Calyx:	Many sepals together.
Stamen:	The male part of a flower.
Pistil:	The female part of a flower.
Pollination:	Transfer of pollen grains from the anthers to the stigma of a flower.
Fertilisation:	Fusing of the pollen grain with the ovule.
Fruit:	A fertilised ovary.
Seed:	A mature ovule.
Scar:	Part of attachment by the style to the ovary.
Reproduction:	Bringing forth to a new generation.

## 1.1 Circulatory system

### Activity 1.1 and 1.2

Learners have come across blood and have observed blood coming out of animals being slaughtered at home. Take advantage of learner's knowledge on blood and let them do activity 1.1 as you guide them where need arises. In activity 1.2, let learners observe the charts showing parts of the circulatory system of different animals such as cow, sheep, and goat and guide them in identifying different parts of the circulatory system. Let them relate the parts identified with the ones in humans. Ensure that learners work in pairs and are following instructions in each and every step within the activity.

### Assessment Opportunities

**Observation-** Observe as learners work in pairs. Are they able to identify the parts of a circulatory system? Are they able to explain the function of the circulatory system?

**Conversation-** As learners communicate with each other in pairs while performing the activities and as they respond to question and answers.

**Product-** achieved as learners give answers to question posed.

### The heart

#### Activity 1.3 and 1.4

Activity 1.3 involves learners observing the chart showing a mammalian heart. This is a class activity and you will arrange the class as need arises. Ensure that all the materials needed for this activity are available. Ask learner's to look at the picture provided and using their observation skills try to answer the questions asked in learner's book.

For activity 1.4, which involves recording heartbeat, let learners work in pairs and guide them through the steps in learner's book. Show learners how to use a stopwatch and a stethoscope and let them carry out the practical activity as they change role on their own. Ensure learners take notes and compare their findings with the rest of the class and do the fun corner activity on page 6 of the learner's book.

### **Assessment opportunities**

**Observation-** Observe how learner's record pulses, jump, and run around the school compound.

**Conversation-** Talk to learners while they undertake the activities in the book.

**Product-** Look at how they have recorded their heartbeats in their note book. Do they reflect the expected results after the activity?

### **Blood vessels**

Activity 1.5 is a practical activity involving observing blood vessels using different parts of the body such as the neck, wrist and the eye. Ensure learners work in pairs and that they are doing the activity as outlined in each and every step of the learners book. During the practical activity ensure that learners discuss and are challenging each other with questions when trying to identify the blood vessels.

### **Assessment opportunities**

**Observation-** as learners observe the blood vessels on the arm, neck and eyes in pairs. Are they able to name the blood vessels present in the eye? What about the blood vessel in the arm?

**Conversation-** as learners communicate in pairs. Ask them probing questions such as; which blood vessel is found in the eye? What do you think is the function of blood vessel found in the arm?

### **Blood components**

Activity 1.6 involves identifying blood components from a blood sample. Divide the class and let learners work in groups. Ensure learners observe the picture on page 9 and identify different blood components. Go round the class and observe how learners discuss in their respective groups and ask them challenging questions that will provoke critical thinking such as;

- a) What do you think is the blood component labelled A, B, C and D?
- b) Why is the blood component labelled A spherical in shape?

Give assistance to where need be, and ensure learners do the fun corner activity on page 11 of the learner's book and write notes in their notebooks.



### **Assessment opportunities**

**Observation-** listen to conversation between learners about the picture and pay attention to how they are able to observe different blood components from the picture. Are they able to identify different blood components from the picture?

**Conversation-** Talk to learners and respond to their question.

**Product-** Look at how different groups are identifying the blood components.

### **The flow of blood**

Activity 1.7 is about investigating the flow of blood in the body. Allow learners to be in groups and let them observe the picture on page 12 and identify different parts of the body from the picture. They should also discuss the flow of blood in different body organs and then compare their results with other groups before leading them to a class discussion. Ensure learners work as a team in their different groups and take notes in their notebooks.

### **Assessment opportunities**

**Observation-** observe as learners trace in groups the direction of blood flow from different organs in the picture.

**Conversation-** talk to learners in various groups as you challenge them with some questions.

**Product-** look at different types of models of blood components made by learners using clay or plasticine. Do they resemble the blood component?

### **Importance of blood circulation**

For activity 1.8, ask learners to be in pairs and discuss the key questions outlined on importance of blood circulation in human body. Go round the class and assess how learners discuss. Respond to some of their questions and ask them some challenging questions to strengthen their thinking and understanding such as; how are waste products eliminated from the body? How does carbon (IV) oxide reach the lungs? Let learners model the circulatory system **fun corner** in learner's book page 14 on their own using the locally available materials. Do their models resemble the one in the picture? Let them trace the flow of blood from the heart and back using the models made. Assess their models and award appropriately.

### **Assessment opportunities**

**Observation-** watch as learner's work in pairs. Are they able identifying some of the importance of blood in circulatory system?

**Conversation-** ask learners some question and respond to some of their questions.

**Product-** Look at learner's model of the circulatory system. Do their models depict the circulatory system in the picture?

## Answers to check your progress 1.1

Refer to learner's book page 15

1. Oxygen is necessary for the cell growth and production of energy in the body and cells.
2. Because it has a lot of oxygen that is being carried throughout the body to be used by tissues.
3. Vegetables, liver, spinach and lentils.
4. Avoid eating fatty foods, perform regular exercises, avoid smoking, avoid taking alcohol and eat a well-balanced diet.

5

Artery	Vein
Have a thick wall	Have thin walls
Have a narrow lumen	Have a wide lumen

6. To avoid higher risk of health problems in the future.
7. Burning charcoal in limited supply of air produces carbon (II) oxide which combines with haemoglobin to form Carboxyhaemoglobin which is a stable compound and does not dissociate easily resulting to reduced capacity of the haemoglobin to carry oxygen leading to suffocation hence death.

## 1.2 Respiratory system

### Activity 1.9 and 1.10

**Activity 1.9** is about identifying different parts of the respiratory system. Let learners work in pairs and using the chart provided, ensure learners demonstrate different parts of the respiratory system as shown in the picture on page 16 and change roles for better understanding of the parts of respiratory system. Move round the class to ascertain that learners are doing the activity and make sure they take notes and answer questions asked in the activity.

### Assessment opportunities

**Observation-** as learners demonstrate different parts of the respiratory system.

**Conversation-** talk to learners as they discuss the chart. Ask learners some probing questions such as where is the lungs located? Why is the respiratory system important to human body?

**Activity 1.10** is a practical activity and involves observing how lungs of different animals such as cow, sheep or goat look like. Let learners use the materials provided such as the hand lens to identify some of the components of the respiratory system. Allow them to touch and feel the lungs using clean hands and tell how they feel.

Perform a demonstration as learners observe and then give learners a similar experiment to do on their own as you assess them. Ensure learners take note of some structural adaptation of some parts of respiratory system in their note books.

### **Assessment opportunities**

**Observation-** observe at how learners identify the various parts of the respiratory system.

**Conversation-** talk to learners as they observe the lungs, trachea, bronchus and respond to their questions.

**Product-** look at how learners cut the lungs using a knife and opening it to observe various parts of respiratory system. Are they able to point out the lungs, bronchus and bronchioles?

### **Modelling a respiratory system**

**Activity 1.11** is a practical activity and involves making a model of a respiratory system. Divide the class into groups and provide them with the materials required as shown in learner's book page 19. Take them through the procedure and allow them to construct the model similar or close to the one shown in learner's book page 20. Move round the class while observing how learners discuss and make the model of the respiratory system. Confirm from each group if the set -up is working and ask some questions such as; which part of the respiratory system is represented by; balloon, rubber sheet, plastic bottle and Y- shaped tube? Let learners relate the model constructed with parts of the respiratory system and describe using a model what happens when one breathes in and out. Ensure learners do the activity in fun corner page 20. Assess their work and award appropriately.

### **Assessment opportunities**

**Observation-** observe as learners work in groups. Are they able to come up with a respiratory system model?

**Conversation-** talk to learners in various groups as they set up the model.

**Product-** look at each group's model. Do their models depict the respiratory system? How does it work when air is pumped in? How does it work when air is removed?

## Answers to check your progress 1.2

*Refer to learner's book page 21-22*

1. Just like a car needs fuel, human beings require oxygen for respiration that provides the body with energy. The energy enables obtained enables us to move and do different activities.
2. a) To increase the supply of oxygen to muscle tissues to meet increased oxygen demand.  
b) Our body tissues are starved of oxygen when we hold our breath.
3. a) Stem- trachea  
b) Branches-bronchus or bronchioles  
c) Fruits-alveoli
4. C
5. Smoke gets into the lungs and it interferes with or stain the lung tissues which makes them appear dark. This reduces efficiency of lungs in carrying out gaseous exchange.
6. Eat a balanced diet, avoid smoking and excessive consumption of alcohol, not inhaling poisonous gases and exercising regularly among other practices.

## 1.3 Human excretory system

There are many processes that take place in the body such as breathing and digestion. Several wastes are produced and some are poisonous. They are removed from the body by the skin, lungs and kidneys. The main excretory products are carbon dioxide, excess water, urea and excess salts.

In this sub unit, learners should learn what excretion is, the waste products excreted and the organs involved in excretion. Let learners know that excretion is important in the body since it cleans the body systems and gets rid of poisonous substances.

**Activity 1.12** is a practical activity and involves a visit to the slaughter house or a butchery. Prepare the class in advance and ensure that all the materials are available for the activity. Guide learners to the slaughter house and let them use observation skills to identify the shape, colour and size of different organs such as the kidney, skin and lungs. They should also use their sense of touch to feel the lungs and use a hand lens to observe the skin. Let learners ask the butcher some questions as they note down some of key features being described. Back in class you can challenge learners to answer the questions within the activity as you move round the class correcting them.

## Assessment opportunities

**Observation-** look at how learners observe different organs of the excretory system in the slaughter house. Are they able to identify the lungs, kidney and skin?

**Conversation-** Talk to learners as they observe different organs of the excretory system.

## The skin

### Activity 1.13 and 1.14

**Activity 1.13** involves observing the skin with a hand lens or magnifying glasses. Allow learners to be in pairs and provide them with the required materials for the activity. Let them conduct the experiment as you observe and correct them where need arises. Ensure that each learner has drawn the skin and labelled some parts. Assess their work and correct them before the start of the next lesson.

**Activity 1.14** is an activity that seeks to investigate how sweat is produced from the skin. Put learners into groups and guide them to the playing field. Let them run round the school field two times and allow them to discuss in their respective groups what is observed in their skin. Allow them to choose a leader in each group who will present on how sweat is produced on the skin as you moderate their time.

## Assessment opportunities

**Observation-** watch as learners work in pair's activity 1.13 and in groups' activity 1.14.

**Conversation-** talk to learners. Ask them what happens to one's body after playing or running?

**Product-**look at the drawings presented by learners. Do their diagrams depict the structure of a mammalian skin?

## The lungs

**Activity 1.15** involves tracing the flow of air in and out of the lungs. Let learners be in pairs and observe the picture in learner's book page 25. Provide them with the required materials for the experiment and guide them through what is to be done. Ensure that learners carry out the activity in pairs. Go round the class and assist learners who may need assistance on where they do not understand. Make sure learners take notes and do the activity in fun corner page 26. Assess their work and correct them in class during the next lesson.

## Assessment opportunities

**Observation-** observe as learners read the parts of the lungs aloud and feeling the lung of their partner.

**Conversation-** talk and respond to learners questions as they do the activity.

## The Kidney

**Activity 1.16** is about identifying parts of the kidney and the type of wastes it produces. Ensure learners are in groups. Let them observe the picture in learner's book page 26 and discuss the type of wastes removed from the kidneys. Move round the class as learners discuss and challenge them with questions such as;

- a) Why do most people have two kidneys?
- b) Are the kidneys in the same position in the human body? Why is this so?

These questions will enhance thinking and test their understanding of the organ under investigation. Allow learners do the fun corner in learner's book page 27.

### Assessment opportunities

**Observation-** watch as learners work in groups trying to identify parts of the kidney.

**Conversation-** Ask some learners to explain why do we have two kidneys?

**Product-** look at learner's drawings. Are their drawings similar to the one in learner's book page 27?

### Answers to check your progress 1.3

*Refer to learner's book page 28*

1. Wastes are formed in the body as by-products produced by the body in form of metabolic activities in the body.
2. If his or her urine contains blood, if the urine is cloudy in colour or dark in colour and if one feels pain when urinating.
3.
  - a) Respiratory wastes.
  - b) Nitrogenous wastes.
  - c) Bile pigments.
4. The left kidney is located slightly more superior than the right kidney due to the larger size of the liver on the right side of the body.
5.
  - a) It has a kidney which are bean like structures that filter blood continuously.
  - b) It has a bladder which is muscular, elastic organ that receives and stores urine from the kidneys.
  - c) It has a ureter which are tube like structures where urine passes.
  - d) It has the urethra (narrow tube) leaving the urinary bladder that carries urine during urination.

## 1.4 Digestive system

This sub unit will teach learners about the digestive system and some of its main parts, including the mouth, oesophagus, stomach, small and large intestines and their functions. Begin the lesson by asking learners to list what they ate during the day. What did they drink? When did they took the last meal? Remind them that our bodies need food in order to generate energy for daily activities, for growth and to keep our body healthy. Let them explain how does the body turn food into energy?

Remind learners that the digestive system performs a very vital role in human body hence it's important to care of it through eating nutritious foods. Foods that have high fibre, such as fruits, vegetables, and whole grains should be taken since it makes it easier for waste products to pass through the body and help “clean” the digestive system. Encourage learners to always drink eight glasses of water daily since it is used to produce gastric juices. It is therefore important for them to drink water when they are thirsty, and not sugary sodas and juices. Regular exercises also play an important role in ensuring that food substances move through the digestive system and also stimulates muscles in the digestive tract. Encourage them to always be more aware of the kind of food they take. They should also avoid fatty and oily foods since they may result to lifestyle diseases such as diabetes, high blood pressure, heart attack and hypertension which are very expensive to treat.

### Activity 1.17 and 1.18

**Activity 1.17** involves identifying parts of the digestive system from the picture shown in learner's book page 28. Ensure learners are in pairs and are discussing the picture while identifying the various parts. Let them trace the path taken by food during digestion from the mouth to the anus. **For activity 1.18**, learners are to work as a class. Bring the digestive system models, charts or pictures and let them observe the parts of the digestive system. Allow them to give some of the adaptation of parts of the digestive system to their functions. Ensure that they do the activity in fun corner in learner's book page 32 using the locally available materials. Remind them to take notes and answer the questions in check your progress 1.4.

### Assessment opportunities

**Observation-** watch as learners work in pair's activity 1.17 and as a class in activity 1.18. Are they able to identify the parts of the digestive system? How do they function?

**Conversation-** talk to learners whilst they discuss on various parts of the digestive system and their function.

### Answers to check your progress 1.4

1. Distinguish between small intestine and large intestine.

Small intestine	Large intestine
It's very long in length i.e. 4.5 m-7 m.	Comparatively shorter i.e. 1.5 m.
Narrow in diameter.	Broader in diameter.
Absorbs digested nutrients.	Absorbs water from indigestible residues.
Villi are usually present.	Villi are absent.

2. Look at learner's crossword and award appropriately.

**Across**

Mouth

Liver

Tongue

Stomach

Sanitation

**Down**

Digestion

Ileum

Bolus

Saliva

Oesophagus

Ileum or small intestine

3. B

### 1.5 Reproductive system in flowering plants

From work done in the previous classes, learners already know many things about plants in their locality such as different parts of plants, edible plants and their uses. They have also learnt about classification of plants and functions of external parts of plant. In this sub unit, you are expected to guide learners about how reproduction takes place in plants. Remind learners that before fruits and seeds develop, pollination followed by fertilisation must take place. Emphasize to them that pollination is the transfer of pollen grains from the anther to the stigma and there are two types of pollination i.e. self-pollination and cross pollination.

#### Activity 1.19, 1.20 and 1.21

**Activity 1.19** involves dissection of a flower and examining different parts of a flower. Ensure that the pairs have the required materials for the activity. Move round the class



as you observe how the pairs carry out the activity and guide them where need arises. Caution learners to handle razor blade with care. **Activity 1.20** is about identifying the male parts of a flower. Let learners be in pairs and provide them with the required materials for the activity. Let them carry out the activity on their own as you observe and allow them to share their findings in class. For **activity 1.21**, learners are to work in pairs. Let them go through the procedure as outlined in learner's book page 36 and carry out the activity on their own. Ensure that they draw a well labelled diagram of the female part of a flower.

### **Assessment opportunities**

**Observation-** watch as learners work in pair's activity 1.19, 1.20 and 1.21. Are they able to name parts of the flower? Can they dissect the flower into two halves? Are they able to identify and draw the male and female parts of a flower?

**Conversation-** talk to learners as you guide them to dissect the flower into two halves and help them identify the male and female parts of the flower.

**Product-** look at any drawings drawn by learners. Do they resemble the flower under investigation? Have they drawn the male and female parts of the flower activity 1.20 and 1.21?

## **1.6 Pollination in flowering plants**

Activity 1.22 and 1.23 deals with pollination. Let learners work in group's activity 1.22 and as a class in activity 1.23. Learners are to observe the pictures in the learner's book page 37 and 38. Let them discuss and seek to find answers for the questions asked in each activity. Go round the class as you observe learners work and ask questions as learners seek to find answers. Explain to them the two types of pollination in activity 1.23 before taking learners for a nature walk within the school and allow them to observe how pollination takes place in different types of plants. Make sure learners take notes in their notebooks and do the fun corner in learner's book page 40. They should also write a report of their findings and present to the class as you moderate their time.

### **Assessment opportunities**

**Observation-** observe as learners look at the pictures in groups. Are they able to explain what is going on in the two pictures?

**Conversation-** talk to learners as you guide them on what to do in the activities. Ask learners questions such as, what is going on in the picture? How do plants and animals benefit from the process in the picture?

**Product-** do the processes taking place in the picture important to plants?

## Agents of pollination

### Activity 1.24 and 1.25

Activity 1.24 deals with identifying agents of pollination. Allow learners to work in groups and collect different kinds of flowers. Let them follow the instructions in the learner's book page 39 to classify the flowers collected into groups. Allow them to discuss some of the characteristics they have based to classify flowers and provide some of the possible agents of pollination. Ensure learners carry out activity 1.25 in their groups using the flowers collected in activity 1.24.

You can also guide them for a nature walk and allow them to name some of the animals and insects that visits the flower for pollination. Allow them to explore other agents of pollination during the nature walk and then discuss before presenting their findings in class.

### Assessment opportunities

**Observation-** observe as learners look at the flowers in groups and identify their different characteristics.

**Conversation-** talk to learners as you guide them on what to do in the activities. Ask learner's questions such as why is the flower brightly coloured? Why does the flower have large amount of pollen grains?

**Product-**Look at each groups drawing. Are their drawings correct?

### Fertilisation

**Activity 1.26** seeks to investigate how fertilisation takes place in flowering plants. Allow learners to work in pairs and let them observe the picture in learner's book page 42. Are they able to predict what is going on in the picture? Ask them probing questions to trigger their thinking such as; which process takes place before a fruit is formed? How does the pollen grain reach the ovary? Explain to learners how fertilisation finally takes place in flowers as they take notes.

### Assessment opportunities

**Observation-** observe as learners work in pairs. Are they able to trace from the picture how pollen grain germinates down the pollen tube?

**Conversation-** talk to learners as they carry out the activity. Ask the pairs, what do you understand by the term fertilisation?

**Activity 1.27** deals with identification of scars in a fruit. Let learners know that immediately after fertilisation, fruit is formed. Explain to them the process involved. Provide learners with different types of fruit. Ask them to point out the likely position of the scar in the fruit provided. They should then discuss in their respective groups how the scars are formed in a fruit. Guide them through the subsequent steps as they perform the experiment on their own as you observe. Ensure that learners take notes and make a presentation on their findings as you moderate their time.

### Assessment opportunities

**Observation-** observe as learners in different groups look at the pictures and relating it to the fruits provided.

**Conversation-** talk to groups. Are they capable of identifying the scars in a fruit?

### Answers to check your progress 1.5

*Refer to learner's book page 44-45*

1. The diagram below shows a flower.
  - a) C- Stamen, D- Pistil
  - b) It is brightly coloured to attract insects for pollination.
  - c) E-to produce pollen grains, F- to hold the anther.
  - d) A-Sepal, J- ovule and H- style.
  - e) From E (anther) to G (stigma).
2. C -Fertilisation.
3. Use a table to distinguish between wind and insect pollinated flowers.

Wind pollinated flower	Insect pollinated flower
Flowers are small with green bracts.	Flowers have petals that are large and brightly coloured.
Have no scent.	Are scented.
Anthers are large and are loosely attached to the filaments.	Anthers are small and are firmly attached to the filaments.
Stigma often hang outside the flower.	Stigmas located inside the flower.

4. It has two scars while a seed has one scar.
5. To ensure that at least some pollen grains will reach the stigma of other flowers.

## Unit

## 2

**Diseases and Hygiene**

*(Refer to learner's book page 46-73)*

<b>Learn about</b>	<b>Key inquiry questions</b>
<p>Learners should share their experiences about disease in their homes and locality. They should work in pairs and groups to name some common water and air borne diseases, describe their causes, investigate their effects, how they are spread and prevention. They should discuss the nature of stress and depression, how it can be managed, and the importance of home nursing.</p> <p>Learners should build on their prior learning and experience to develop their understanding about germs and hygienic food preparation techniques. They should investigate the nutrition needs necessary for good health and for social groups.</p> <p>Learners should link the above to the importance of clean water, the causes and impact of pollution, how water is obtained and how it is purified.</p>	<ul style="list-style-type: none"> <li>Σ How are water borne diseases spread?</li> <li>Σ How do you control water borne diseases and reduce water pollution?</li> <li>Σ Why is stress and depression common in patients?</li> <li>Σ Why encourage home nursing?</li> <li>Σ Why is it necessary to know nutritional need for good health and for special groups?</li> <li>Σ How do we practice hygienic food preparation?</li> </ul>

<b>Learning outcomes</b>		
<b>Knowledge and understanding</b>	<b>Skills</b>	<b>Attitudes</b>
<ul style="list-style-type: none"> <li>Σ Name some common water and air-borne diseases, describe their causes, effects and prevention; stress and depression; home nursing.</li> <li>Σ Understand hygienic food preparation techniques; nutrition needs for good health and for special groups.</li> <li>Σ Outline the sources of water, methods of collection &amp; purification; pollution and its impact.</li> </ul>	<ul style="list-style-type: none"> <li>Σ Observe carefully</li> <li>Σ Predict what might happen.</li> <li>Σ Collect and present results appropriate in writing or drawing.</li> <li>Σ Interpret results accurately.</li> <li>Σ Report findings appropriately.</li> </ul>	<ul style="list-style-type: none"> <li>Σ Appreciate hygiene food preparation.</li> <li>Σ Appreciate control of water-borne diseases.</li> </ul>
<p><b>Contribution to the competencies:</b></p> <p><u>Critical and Creative thinking</u>: as they investigate water borne diseases.</p> <p><u>Communication and Co-operation</u>: group working.</p>		
<p><b>Links to other subjects:</b></p> <p><u>Life Skills</u>: disease and polluting.</p>		

## **Introduction to the unit**

This unit is about disease and hygiene. Take advantage of work covered previously and link what they learnt here with their past experiences about keeping ourselves healthy. The concept in the unit is to enable learners take care of their bodies by keeping them clean and disease free. They should appreciate the importance of a balanced diet and understand that when they further their education in this area they become doctors, teachers, nutritionists, nurses, midwives and psychiatrists. Invite guest speaker as role models to motivate learners. Learners should also be able to take care of their body systems by ensuring that they eat well, observe hygiene, drink clean water, manage stress and depression as well as appreciate nutrition needs for good health and for special groups.

## **Competencies to be attained**

### **Communication**

During group, class discussions and practical activities learners will improve on language use. This will be noted in the manner they will be discussing their ideas and presentation. The teacher should ensure that all learners are participating in the activities by taking part in answering questions and asking probing questions in their groups.

### **Critical thinking and creative thinking**

Learners will perform quite a number of practical activities. The activities require logical thinking to make logical judgement. Challenge learners to come up with innovative ways of solving problems. The fun corner activities also require critical and creativity thinking. The teacher should challenge learners to create new ideas and form them into reality.

### **Culture and identity**

Learners should understand that personal respect and respect of others is important as they work in groups or pairs. They should respect each and everyone's opinion regardless of gender, race or culture.

## **Cross cutting issues**

### **Environmental awareness and sustainability**

Make the learner's understand that drinking contaminated water can lead to waterborne diseases. Emphasize that living over crowded homes can lead to contraction of airborne diseases as well as other communicable diseases.

### **Life skills**

This unit should equip learners with lifelong skills, core values and gain requisite skills that will come in handy in their lives if they were to become nutritionists, doctors, social workers, nurses, teachers and other health workers.

Learners should be made to understand that they must not eat expensive foods to provide them with nutrients. Simple basic and cheap foods have most of the nutrients. Home care is not expensive and the family can make a saving.

### **Meaning of new words**

**Waterborne diseases-** micro-organisms that are transmitted in water that cause an illness.

**Effects-** cause something to happen.

**Spread-** cover or reach a wider area.

**Prevention-** stopping something from happening.

**Water pollution-** contamination of water bodies e.g., lakes, rivers, oceans and groundwater.

**Airborne diseases-** illnesses spread by tiny pathogens in the air through coughing or sneezing.

**Tuberculosis-** a dangerous bacterial infection that attacks the lungs.

**Germs-** very tiny organisms that cause disease.

**Bacteria-** tiny living organisms that can be found everywhere.

**Water treatment-** process of making water suitable for its use.

**Disposal-** process of getting rid of something.

### **Diseases and pollution**

Contaminated water contains germs which serves as the major cause of many waterborne diseases. Diseases such as cholera, typhoid, dysentery, hepatitis and bilharzia are all waterborne diseases and may also arise as a result of water pollution.

## **2.1 Sources of water, methods of water collection and purification**

Learners have learnt how important water is to us and animals. This precious resource is becoming more scarce and not all of what is available is clean for human consumption. In this sub-unit, learners will learn more about sources of water, methods of water collection and purification.

### **Sources of water**

**Activity 2.1** is about sources of water. Put learners in groups and let them observe the pictures shown in learner's book page 46. Ensure that learners discuss in their respective groups and let them give reasons for the answers suggested. Ask them to state the type of water source commonly used at home and at school. Ask them probing questions such as is tap water a water source? Why? This will enhance critical thinking among learners. Remind learners to take notes in their notebooks.

### **Assessment opportunities**

**Observation-** observe as learners look at the pictures and discuss in groups.

**Conversation-** Ask learners to identify the different sources of water in the picture. Talk to them in pairs as they try to identify the different sources of water.

**Product-** Look at each groups drawing and award marks appropriately.

### **Methods of water collection**

**Activity 2.2** is about methods of water collection. Allow learners to be in pairs and let them look at the picture in learners book page 48. Let them name and identify the method of water collection. Provide a platform for at least three learners to present on the method of water collection they mostly use at home as others listen and ask questions. Let them also state why they prefer some methods of water collection compared to others. Ensure learners take notes, answer the questions asked within the activity and do the fun corner activity in learner's book page 49.

### **Assessment opportunities**

**Observation** - observe as learners look at the pictures and discuss in groups.

**Conversation** - Ask some learners to identify different types of containers used at home to collect water.

### **Purification of water**

**For activity 2.3** learners are to work in groups. Let them observe the pictures given within the activity and state the type of water purification. In their respective groups, let them discuss other methods of making water safe and clean for use. Go round the class as you observe learners discuss and provide assistance where learners seek for help. Guide learners to practise the song in learner's book page 50-51 and ensure they present during the school assembly.

### **Assessment opportunities**

**Observation-** observe as learners look at the pictures on different types of water purification and as they discuss in groups. Are they able to point out other methods of water purification?

**Conversation-** Ask learners to identify the type of water purification they commonly use at home from the picture. Ask them why do they prefer using the method suggested?

**Product-** look at how learners present the song on water at the school assembly. How does the song help other learners within the school.

## **2.2 Water pollution**

**In Activity 2.4**, learners are to work in pairs. Ensure learners are participating and exchanging ideas as they identify some activities from the picture that lead to water pollution. As you go round the class pose some challenging questions such as; how can water be polluted? This will trigger learners to think as they provide their responses.



### Assessment opportunities

**Observation**- observe as learners discuss in pairs different activities that make water dirty.

**Conversation**- Ask learners to identify different ways in which water is being polluted from the picture. Ask them if they can identify other methods of water pollution they have come across.

**Product**-Look at each groups drawing. Do they depict how water gets polluted?

### Reducing (prevention) of water pollution

**Activity 2.5** involves identifying different ways in which water pollution can be reduced. Provide learners with reference materials and allow them to work in groups. Let them carry out a research on ways in which water pollution can be reduced or prevented. You can also guide learners in a nature walk outside the school or within the school surrounding to identify different ways which result to water pollution. Learners should note down various methods that cause water pollution and think of ways to reduce water pollution. You can also use the following video link: <http://www.youtube.com/watch?v=h198sZXP7fU> to play a video for learners to learn more on ways to reduce or prevent water pollution. Let some learners present their finding to the class on ways to reduce water pollution as you moderate them. Ensure learners do the fun corner in learner's book page 53.

### Assessment opportunities

**Observation** - observe as learners explore the school environment. Are they able to identify measures to reduce water pollution?

**Conversation** - Ask learners to identify different ways to reduce water pollution. Discuss with learners short term and long term measures to prevent water pollution.

## 2.3 Waterborne diseases

**Activity 2.6** involves reading a story. Divide the class in pairs and let them read the story. Go round the class to ascertain that learners are reading the story. From the story pose some questions such as; what can lead to a running stomach? What are the causes of waterborne diseases? Allow some learners to narrate an incidence in which they became sick and let them tell the class the disease they were diagnosed with. Ensure learners take notes and provide answers to some of the questions in the activity.

### Assessment opportunities

**Observation** - observe as learners read the story in pairs.

**Conversation** - talk to learners in pairs on some of the lessons they can learn from the story.

## Common waterborne diseases

**Activity 2.7** is a practical activity. Allow learners to work in groups and provide them with the materials needed for the experiment. Take them through the steps in the activity and allow them to do the practical activity on their own. You may go round the class and observe how learners carry out the practical activity. You can also ask some probing questions such; what are the causes of common waterborne diseases? This will trigger learners to think critically.

### Assessment opportunities

**Observation-** watch as learners do the activity in groups. Are they able to set up the experiment on their own?

**Conversation-** Ask learners to share in groups their experiences on some of the common waterborne diseases as you listen.

## Causes, effects and spread of waterborne diseases

In **activity 2.8** divide the class into groups of five and provide each group with the following materials; Manila paper, felt pen, cellotape, metre rule and reference materials. Let them read through the procedure in learner's book page 54-55 and carry out the activity on their own. Go round the class and observe how each group brainstorm and discuss. Ask each group to present their results i.e. name of the disease, its cause, signs/ symptoms, method of spread, prevention and treatment in form of a table on a Manila paper. Allow each group to choose a group leader who will present on their behalf as you moderate their time.

### Assessment opportunities

**Observation-** observe as learners work in groups. Are they able to identify some of the waterborne diseases and how they spread?

**Conversation-** Ask learners to narrate an incident where they witnessed patient suffering from a waterborne disease. Ask learners to explain how waterborne diseases come about? What are their effects? How can waterborne diseases be prevented?

**Product-**look at how each group present their work. Are they able to tabulate their results?

## Answers to check your progress 2.1

*Refer to learner's book page 56*

1. Improved water quality results to; reduced cases of waterborne diseases such as cholera and typhoid.

It also saves our finances which could be used to treat diseases.

Improved water quality enables us to live well.

2. Industrial wastes.

Sewage and waste water.

Mining activities.

Chemical fertilizers and pesticides.

Animal wastes.

Dumping of wastes by people to water sources.

3. Do not dump waste along a river.

Clean up rivers that have a lot of wastes around it.

Maintain septic systems appropriately.

Dispose chemicals and other pesticides appropriately.

Community sensitisation against water pollution.

4. a) Bilharzia

b) Avoid walking or playing in contaminated or stagnant water.

## 2.4 Airborne diseases

Activity 2.9 is about airborne diseases. Ensure learners work in pairs. Let them observe the pictures and tell what is going on in the pictures. Ask them to give some of the dangers that may arise when one blows his nose or coughs without using a handkerchief. Use their responses to initiate a discussion and explain to learners what airborne diseases entails. Allow learners to think and give different ways in which airborne diseases can be spread. Make sure learners take notes in their notebooks.

### Assessment opportunities

**Observation-** observe as learners look at the pictures in pairs. Are they able to tell what's taking place in each picture?

**Conversation-**ask learners to give the dangers of coughing and sneezing without covering their mouth.

### Common airborne diseases

**Activity 2.10** is a practical activity and it involves investigating how common airborne diseases spread. Allow learners to work as a class. Let them go through the procedure as outlined in the activity. Provide one learner with a balloon and let him or her demonstrate to the class what is expected of the activity. You can also guide him or her where need arises. Ask learners probing questions such as; what are other common airborne diseases that you know? List them down. Ensure that learners take notes in their notebooks.

### Assessment opportunities

**Observation-** observe as learners do the activity as a class. Are they capable of carrying out the activity on their own?

**Conversation-** talk to learners as they carry out the activity. Ask them to list some of the common airborne diseases.

**Product-** Look at the common airborne diseases listed by learners. Are they correct?

### **Control and prevention of airborne diseases**

**Activity 2.11** is a group activity and it involves investigating different ways of controlling and preventing the spread of airborne diseases. Divide the class into groups and let them discuss the pictures in learner's book page 58. You can also provide each group with reference materials and allow learners to discuss and compare their results with the ones shown in table 2.2 in learner's book page 59-60. Ensure that learners are actively participating and communicating as they do the activity. Ensure that learners take notes in their notebooks.

### **Assessment opportunities**

**Observation-** observe as learners work as a class and as they look at the pictures in groups activity 2.11. Are they able to point out what is going on in the pictures

**Conversation-** talk to learners on causes of airborne diseases, their effects and how they can be prevented.

### **Answers to check your progress 2.2**

*Refer to learner's book page 60*

1. Tuberculosis, measles, influenza or flu.
2. Look at how each learner designs his poster and award appropriately. The picture below is a sample of a poster on prevention of flu.



3. If a person shows the following signs; fever, sweating at night, pain in the chest, coughing blood and loss of weight.
4. An airborne disease is caused by droplets of pathogens which are expelled into the air by sneezing, coughing or talking for example tuberculosis or flu while waterborne diseases are caused by pathogenic microorganisms which are most commonly transmitted through contaminated fresh water for example typhoid and bilharzia.

## 2.5 Stress and depression

Learners should be introduced to the sub unit by emphasizing that stress is anything that causes bodily or mental tension while depression is a medical illness that negatively affects how you feel and think. Let learners know that stress affects the brain, muscles, joints, heart, stomach, pancreas, reproductive and digestive systems and that if stress is not managed, it can lead to medical illness called **depression**. If depression is not treated it can lead to emotional, behavioral and health problems.

In **activity 2.12** let learners observe the pictures and try to think what could be taking place in the pictures. They should use the questions within the activity to discuss in pairs as they try to seek the likely cause of the problem. Go round the class as you listen at how learners discuss while answering some of the questions they may be having.

**Activity 2.13** is a research activity on stress and depression. Allow learners to be in groups and provide them with reference materials such as textbooks, journals, encyclopaedia and magazines. Let them carry out research on the common cause of stress and depression and how the two conditions can be managed. Let them also think and discuss in groups the reason as to why stress and depression is more common in patients admitted to hospital. Guide learners to carry out a debate based on the motion; *Exam failure is a major cause of stress and depression among learners* in learner's book page 62. Observe how learners debate and award points based on the side that argues the motion effectively and correct. Conclude the lesson by telling learners that stress is manageable and treatable. Emphasize to them that positive stress plays an important role in motivation and reaction to the environment while excessive amounts of stress can harm the body and increase the risk of mental illness, ulcers, stroke and heart attack which may result to depression.

### Assessment opportunities

**Observation** - observe as learners use the reference materials in groups to research on stress and depression.

**Conversation** - ask learners to debate the motion, exam failure is a major cause of failure among learners.

**Product** - look at how learners present their report on ways of managing stress and depression. Are their findings correct? Look at how they act a play in fun corner page 62. Does the play capture aspects of stress and depression?

### Answers to check your progress 2.3

*Refer to learner's book page 63*

1. Stress is anything that causes bodily or mental tension while depression is a medical illness that negatively affects how you feel, think and act.

2. When one shows the following signs; feeling sad or empty, decreased interest or pleasure in activities, decreased or increased sleeping, change in appetite, weight loss or weight gain, loss of energy or fatigue, feeling worthless or guilty, being either agitated or slowed down, difficulty thinking or concentrating and recurrent thoughts of death or suicide.
3. Observe how learners write their own questions and exchange in class e.g how can we manage stress and depression?
4.
  - a) Loss of a family member or close friend.
  - b) Increased responsibility.
  - c) Exam failure.
  - d) Intense pressure from the fellow peers.
  - e) Intimate relationship and finances.

## 2.6 Home nursing

Some learners have practised home nursing at home or have witnessed how their parents do take care of the elderly or the sick at home. Take advantage of this and ensure learners work as a class in **Activity 2.14**. Invite a guest speaker most preferably a nurse or a doctor. Let him or her talk to learners on home nursing as he or she answers questions asked by learners. Encourage learners to feel free and ask question during the session and let them do a skit or play in fun corner page 64. Ensure that learners take notes and provide answers to the questions in check your progress 2.4 in learner's book page 64.

You may also provide a video clip <https://www.youtube.com/watch?v=bVqUQ0JhIDY> if possible for learners to watch on how home nursing is practised. This will enhance their understanding. Emphasize to them that, with the rising cost of hospitalisation and the stigma in hospital most families opt for home nursing.

### Assessment opportunities

**Observation-** observe as learners listen to the guest speaker and ask questions.

**Conversation-** talk to learners. Ask them why is home nursing important? Is home nursing only for patients?

### Answers to check your progress 2.4

*Refer to learner's book page 64*

1. People living with HIV/AIDS require much attention and care since it is a long time illness.
2. There is a lot of privacy, less stress and depression, one on one attention, security and easy access to resources.
3. Toileting, bathing, medication, grooming, feeding and exercises.

## 2.7 Nutritional needs for good health and for special groups

To be healthy and strong, we all need to eat a well-balanced diet. Lack of a balanced diet especially in young children, leads to nutrient deficiency diseases such as marasmus, kwashiorkor, anaemia and rickets. It is therefore important for learners to learn about foods and nutrition for them to have a healthy living. In these activities, guide learners about the nutritional needs for good health **activity 2.15**, nutrition need for special group's **activity 2.16** and identifying food groups for special group's **activity 2.17**. You may invite a nutritionist to talk to learners on nutritional needs for special groups.

**For Activity 2.15**, divide the class and let learners work in pairs. Ensure learners observe the pictures in learner's book page 65 and identify the different types of foods in the picture. Let them draw the table on page 66 and guide them on how they will fill in relation to the type of food identified from the pictures. Allow the pairs to share their work and provide an opportunity for some learners to present their findings in class as other learners listen and correct where need arises. Ensure that learners take notes in their notebooks.

**Activity 2.16** is on nutritional needs for special groups. Ensure learners are working in groups. They should observe the pictures in learner's book page 67 as they try to discuss and identify what is going on in the pictures. Let them also name other categories of people that require special dietary needs and the type of nutrient their diet should contain.

**Activity 2.17** is a class activity. Provide learners with the required materials and let them go through the procedure and do the activity on their own. Go round the class as you observe how learners fill the table on page 69 and provide a platform for each group to present their results in class as you moderate their time. Award each group and correct them where necessary. Ensure learners do the fun corner in learner's book page 70.

### Assessment opportunities

**Observation-** listen as learners discuss in pairs. Are they able to identify different types of food for special groups?

**Conversation-** talk to learners as they carry out the activity. Are they able to identify some of the uses of different classes of food for special groups?

**Product-** Check that the table learners have filled in activity 2.16 and 2.17 are correct.

### Answers to check your progress 2.5

*Refer to learner's book page 70*

1. Feeding babies, pregnant mothers, the elderly and the disable, breast feeding infants, feeding people suffering from HIV/AIDS.

## 2. Infants- milk.

Pregnant mothers- proteins, carbohydrates, vitamins and minerals.

Breast feeding mothers- proteins, vitamins, carbohydrates.

People living with HIV/AIDS- proteins, vitamins, carbohydrates, minerals and fibre.

Ensure learners give examples of food and assess if the food given fall in the groups above.

## 2.8 Hygienic food preparation

This sub unit is aimed at teaching learners about the hygienic food practices when handling food. Take learners through the new words to learn. Encourage learners to always take care of their food so that they prevent food contamination that may lead to diseases which require finances to treat.

**Activity 2.18** is a class activity. Invite the guest speaker to talk to learners and encourage learners to ask questions. Immediately after the talk, you may allow learners to work in pairs. Let learners brainstorm regarding what was said by the guest speaker and answer the question in learner's book page 71. Allow some learners to present and narrate an incidence in which they suffered from food poisoning. Give them opportunity to share their experiences and some of the remedies for food poisoning.

### Assessment opportunities

**Observation-** observe as learners work in pairs. Are they able to identify some of the hygienic food practices?

**Conversation-** talk to learners as they discuss. Are they able to identify the type of diseases that may arise as a result of unhygienic food handling practices?

### Answers to check your progress 2.6

*Refer to learner's book page 72-73*

1. Vitamins - Oranges
2. a) Proteins  
b) Protective  
c) Protective  
d) Protein  
e) Protein  
f) Carbohydrate



3.
  - a) True
  - b) True
  - c) False
  - d) False
  - e) True
4. For proper development of the foetus.
5. Breast milk
6. B- Boost the immunity

## Unit

## 3

## The Earth and the Solar System

(Refer to learner's book page 74-84)

Learn about		Key inquiry questions	
<p>This unit provides an opportunity to learners to talk about their experiences at home and about their previous lesson and they should be encouraged to work in small groups and produce group and individual written work.</p> <p>Learners should understand the components of the solar system, orbits of the planets (and satellites) and the moons as part of the wider solar system, and develop their thinking about the gravitational forces on planets and moons.</p> <p>They should discuss, identify, investigate, model the solar system and draw on information from text books, film and the internet.</p>		<ul style="list-style-type: none"> <li>Σ Why is it important for us to study the components of the solar system, orbits of the planets and the moons?</li> <li>Σ How are the planets arranged in relation to the sun?</li> </ul>	
Learning outcomes			
Knowledge and understanding		Skills	Attitudes
<ul style="list-style-type: none"> <li>Σ Explain the importance of why we study the components of the solar system, orbits of the planets and moons.</li> <li>Σ Understand and identify the components of the solar system.</li> <li>Σ Describe the arrangement of the planets in relation to the sun.</li> </ul>		<ul style="list-style-type: none"> <li>Σ Observe diagrams and models of the solar system.</li> <li>Σ Draw conclusions from their observations.</li> </ul>	<ul style="list-style-type: none"> <li>Σ Appreciate the wonder of the solar system.</li> <li>Σ Show genuine interest as they work in groups.</li> </ul>

**Contribution to the competencies:**

Creative thinking: as they investigate the orbits of the planets and moons.

Communication and Co-operation: group working.

**Links to other subjects:**

Social Studies:

## Introduction to the unit

This unit is about the earth and the solar system. Remember learners have come across this topic in primary 6 where they learnt about the solar system. Take advantage of this and explore further on the solar system, its orbits and the number of moons in each planet. Let them understand how the planets are arranged in relation to the sun as they deepen their understanding on the causes of rotation and revolution of the earth. Let learner's appreciate and understand the earth and how it is related to other components of the solar system. Encourage them that as they further their education in this area they may become astronauts, meteorologists or weather forecasters.

### Competencies to be attained

#### Communications

Encourage learners to discuss in English during group discussions and presentation of their findings in class. Let them exchange and share opinions irrespective of their abilities when answering questions. Encourage learner's to ask questions and provide answers where need be. This way, they will build on their confidence and soon develop the love and passion for the subject.

#### Critical thinking and creative thinking

As the learners write down the procedures for modelling the solar system model, they should be encouraged to think critically and carry out the activity. Encourage learners to also compose songs for planets and modelling the solar system using different locally available materials. Learners should be encouraged to be creative and imaginative as they purpose to complete the activities successfully.

#### Co-operation

Encourage learners to work as a team when modelling the solar system in their groups in order to achieve a common goal. Ensure that learners are also tolerant to each other and develop respect when working in pairs, in groups and as a class.

## **Cross- cutting issues**

### **Environment and sustainability**

Sensitise the learners on the need to take good care of the planet earth by planting more trees. They should avoid the use of substances that will destroy the ozone layer that protects us from harmful rays that result to skin cancer.

### **Life skills**

This topic should equip the learners with the skills of modelling the solar system, using locally available materials as stated in the learner's book. The learners should be equipped with skills that will enable them look for substances that they can use to observe a solar eclipse safely.

### **Meaning of new words**

Solar system – Another name for the sun.

Component – One of the many things that make up something.

Orbit – It is the path that a planet follows as it moves around the sun.

Planets – One of the parts that make up the solar system.

Rotation- is the movement of planet Earth around its own axis.

Astronaut – Is a person who visits the space outside of the earth's atmosphere.

Satellite- is a moon, planet or machine that orbits a planet or star and is used for collecting information on weather.

Comets- a bright object with a long tail that travels around the sun.

Meteors- a piece of rock or other matter that produces a bright light as it travels through the atmosphere.

Meteorites- a piece of rock or other matter from space that lands on earth.

Ozone layer – A blanket like layer between the earth and the sun that absorbs and prevents harmful rays from the sun reaching the earth surface.

Solar eclipse – A shadow formed on earth when the moon comes between the earth and the sun.

## 3.1 Reasons for studying the solar system, orbits and the moon

**Activity 3.1** Learners should be able to recall what they learnt in science learner's book 6 about the earth and the solar system and build the knowledge acquired in order to integrate with the one in this unit. Allow learners to be in pairs and allow them to observe the picture shown in this activity. Let them give the reasons for studying the solar system, orbits and the moon. You can provide them with a chart or a video clip showing the solar system. Let learners watch as you ask them probing questions such as; what do you understand by the term the solar system? What are the components of the solar system? Summarize the lesson by asking learners to take notes in their notebooks.

### Assessment opportunities

**Observation-** observe as learners discuss in pairs. Are they able to identify components of the solar system?

**Conversation-** talk to learners as they work in pairs. Ask them probing questions such as; which planet has rings around it? How many planets are in the solar system? Which planets have moons? What are meteors, meteorites and comets?

### Answers to check your progress 3.1

*Refer to learner's book page 76*

1. The sun, planets and other heavenly bodies.
2. True.
3. Orbit.
4. Huge masses of rocks called asteroids.
5. Mercury.
6. Jupiter, Venus, Mars, Mercury.
7. The sun.
8. Saturn.
9. Neptune- it is the furthest planet from the sun.

**In activity 3.2**, allow learners to work as a class and read the conversation loudly as others listen. Ensure that learners chosen to read the conversation are audible and they should also act so that learners can easily recall what they learnt in class. At the end of the conversation let learners ask question as other learners prepare to answer and correct them where necessary. Pose challenging questions to learners to test their understanding and their ability to think critically. Ensure learners take notes.

### Assessment opportunities

**Observation-** observe as learners read the conversation loudly in class.

**Conversation-** talk to learners after reading the conversation. Are they able to explain why planets are suspended in space? Are they able to account for the different weights in planets?

### Answers to check your progress 3.2

*Refer to learner's book page 79*

1. Gravitational force.
2. The sun i.e., when it's hot, air becomes light and starts moving.
3. During full moon, there are very high tides and one may die.
4. a) Comet      b) Meteors      c) Meteorite
5. Due to different force of gravity in different planets.

## 3.2 Arrangement of planets in relation to the sun

**Activity 3.3**, this activity extends learners knowledge on the solar system. Organise learners in groups and allow them to look at the picture shown in learner's book. Let them practise singing the song in learner's book page 81 and relate the song sang to the eight planets in the solar system. Allow them to discuss some of the features observed from the chart provided and list the features observed from the picture on the table provided. Challenge every group to compose their own song about the planets and let them present in class. Ensure that learners take notes in their notebooks.

### Assessment opportunities

**Observation-** observe as learners sing the song in groups. Are they able to relate the song with the planets in the solar system?

**Conversation-** talk to learners as they discuss in groups. Are they able to compose a song with their own words that will help them remember the planets in the solar system? Are they able to identify features of different planets in the solar system?

### Answers to check your progress 3.3

*Refer to learner's book page 83*

1. Neptune is far away from the sun and it will take long to revolve round the sun compared to mercury which is close to the sun.
2. Jupiter has more mass to maintain a stronger gravitational field and space in which its satellite can orbit than Earth. As a result, Jupiter has greater influence on its satellites and the weaker influence of the Sun's gravitational field at that distance allows Jupiter to have many more moons than planets earth.
3. Due to its large water bodies covering the surface.
4. It's the sixth planet from the sun.  
It has 3 rings around it.

5. Venus, this is because it has a very thick atmosphere of carbon dioxide which makes the surface of Venus hotter because the heat doesn't escape back into the atmosphere.

**Activity 3.4** is a practical activity and it involves modelling the solar system. Let learners be in groups and ensure each group has the required materials for the activity. Guide them through the steps involved and allow them to model on their own. During modelling, go round the class as you monitor how learners work. Ensure that team work is enhanced as they carry out the activity. Encourage learners to take notes in their notebooks and answer the questions in check your progress 3.4.

### Assessment opportunities

**Observation-** observe as learner's model the solar system in groups. Are they able to come up with the solar system model?

**Conversation-** talk to learners as they model the solar system. Ask them which planet is near the sun in their model? Why is one planet in the model having rings around it?

**Product-** look at each groups model. Do their models depict the solar system?

### Answers to check your progress 3.4

*Refer to learner's book page 84*

1. Clay, candle wax, paper Mache, manila papers, strings, thorns, barbed wires and pins.
2. Mars, Venus, Neptune, Jupiter.
3.
  - i) Model the sun and the 8 planets using clay.
  - ii) Paste the Manila paper on a soft board.
  - iii) Draw circles to represent the orbits.
  - iv) Put the models of sun at the centre using pins and then planets on their orbits.
  - v) Write name tags and label the planets.
  - vi) Fix small pebbles between mars and Jupiter to represent the asteroid belt.
4.
  - a) To collect information about weather, mineral deposits.
  - b) It also helps to explore and map the Earth and other planets.
  - c) To relay radio and television signals from the broadcast point to stations around the country.
5. P- Earth, Q – Jupiter, R- Neptune.

## Unit

## 4

## Energy Changes

Refer to learner's book page 85-94

Learn about		Key inquiry questions	
<p>Learners should draw on their prior learning about water to understand that water, as a liquid, changes to vapour (a gas) when energy (heat) is added. The reverse is true when heat is removed. Learners should explore these ideas through simple tests with boiling water and mirrors. This forms the basis for learners to carry out practical investigations on common chemicals to help them describe the result of adding energy as heat to create a chemical reaction.</p>		<ul style="list-style-type: none"> <li>Σ Why do we study humidity and its measurement?</li> <li>Σ How do chemical reactions take place and how does it involve energy change?</li> </ul>	
Learning outcomes			
Knowledge and understanding	Skills	Attitudes	
<ul style="list-style-type: none"> <li>Σ Understand humidity and how to measure it.</li> <li>Σ Explain the term 'chemical reaction' and describe how reactions involve energy changes.</li> </ul>	<ul style="list-style-type: none"> <li>Σ Predicting how energy change causes water to change state.</li> <li>Σ Investigate the effect of heat on common chemicals.</li> <li>Σ Record results appropriately.</li> <li>Σ Draw conclusions.</li> </ul>	<ul style="list-style-type: none"> <li>Σ Appreciate chemical reactions.</li> <li>Σ Co-operation and team work spirit while working in groups.</li> <li>Σ Show genuine interest as they construct an improvised hygrometer.</li> </ul>	
<p><b>Contribution to the competencies:</b></p> <p><u>Critical and Creative thinking:</u> as they investigate chemical reactions.</p> <p><u>Co-operation and Communication:</u> group working.</p>			
<p><b>Links to other subjects:</b></p> <p>Social Studies.</p>			



## **Introduction to the unit**

This unit is about energy change. Note that learners in this unit have learnt about several forms of energy. In class 4 they learnt light, heat and electricity. They also learnt how water changes from one form to another. In class 5 they learnt how to measure different weather conditions. In class 6 they also learnt about heat, light and sound. Take advantage of their past experience and link it to what they are learning in this unit. This unit will enable learners to understand humidity and also how to measure it. They will know the importance of humidity in their daily lives. The knowledge of physical and chemical reactions will enable learners to understand how matter changes from one state to another due to energy change.

### **Competencies to be attained**

#### **Communication**

Communication skills of learners both oral and written will be enhanced through discussions and presentations as they work in groups or as a class. Encourage learners to use correct grammar and pronounce words well as they participate in the discussions.

#### **Critical and creative thinking**

The assignments and exercises are aimed at triggering the minds of the learners to think creatively. Learners will use their intuition to perform some activities such as the fun corner exercises. Encourage learners to find out better ways of carrying out certain investigations. Challenge the learners to be innovative in performing tasks in order to invent new methods.

#### **Cooperation**

During practical activities, learners are encouraged to work as a team in order to achieve a common goal. Ensure that all learners participate effectively during group and class discussions.

#### **Cross-cutting issues**

##### **Environmental awareness and sustainability**

Water conservation entails protection, proper use and care of water and water sources. Emphasize to the learners the need to care for water sources such as rivers, lakes and oceans.

Let them understand that the water in the water bodies is the one which evaporates to form clouds and consequently rainfall that sustain our crops and animals. Encourage them to conserve water.

##### **Life skills**

In carrying out practical activities let the learners use locally available materials or improvise. By improvising or using cheaper materials learner will understand the

importance of cutting costs. Encourage learners to practice ways of cutting costs in their daily life.

### **Peace values**

Throughout this unit, learners will be actively involved in discussing issues in pairs, in groups and as a class. Make them aware of the need to accommodate everyone's ideas and opinions. Through discussions they will at times agree or disagree on issues at hand. They should be made to embrace the views of others and treat them as a learning process.

### **Meaning of new words**

Water vapour – Water in form of a gas.

Humidity – Amount of water vapour in the air.

Evaporation – A process of changing a liquid to gas.

Physical change – A reversible change.

Chemical change – An irreversible change.

Hygrometer – A weather instrument that is used to measure humidity.

## **4.1 Physical changes**

### **Activity 4.1 and 4.2**

Learners should draw on their prior learning about energy change. Let them know that when liquid water changes to vapour and back to liquid the process involved is a physical change and it is a reversible reaction activity 4.1 and 4.2. Ensure learners work in groups in activity 4.1 and in pairs for activity 4.2. Provide them with the required materials and take them through the steps in the procedure.

Demonstrate to them activity 4.1 as they observe and let them do activity 4.2 on their own. Encourage them to take notes in their notebooks and let them do the fun corner activity on page 87.

## **4.2 Chemical changes**

**In activity 4.3**, most learners have come across burning of papers, rusting and other chemical process. Let them know that when the process cannot be reversed, the process is referred to as a **chemical process** and it's usually an **irreversible** reaction for example burning and rusting. Ensure that learners are working in groups and that they are following the instructions carefully. Ensure that discussions are promoted between learners. Do not provide them with answers, instead let them think critically and come up with the solution. Use key questions to develop their knowledge and ensure that the assignment given are cleared on time, assessed and corrected where necessary.

## Assessment opportunities

**Observation-** watch as learners work in groups and in pairs. Are they able to show how chemical process takes place using the materials provided?

**Conversation-** talk to learners as they carry out the activity. Are they able to explain what happens when water is heated? Are they able to account for the formation of water droplets in grass in the morning?

**Product-** look at their experiments in the fun corner activity. Do their experiments reflect chemical process?

## 4.3 Humidity

### Activity 4.4

This activity seeks to teach learners what happens when water is heated and allowed to cool for some time. Allow learners to be in groups of four and provide them with the required materials for the experiment. Move round the class and observe as the groups work. Allow them to make mistakes since mistakes is part of learning. At the end of the activity allow the groups to share their findings. You can then proceed to allow each group to present their findings as you moderate their time. Ensure learners take notes in their notebooks.

## 4.4 Evaporation

**Activity 4.5** is on investigating how evaporation takes place. Let learners work in groups and provide them with the materials required for the activity. Allow learners to go through the procedure and set up the experiment on their own. Move round the class as you observe how each group proceed with the activity and correct where necessary. Encourage learners to come up with other ideas on how the above experiment can be set up. Encourage learners to take notes at the end of the activity in their notebooks.

## Assessment opportunities

**Observation-** observe as learners set up the experiments in groups. Are they able to set up the experiment on their own?

**Conversation-** talking to learners in groups as they set up the experiment. Are they capable of relating evaporation with humidity?

## 4.5 Measuring humidity

**Activity 4.6** is a practical activity. Provide learners with all the required materials such as an A4 piece of card, a cup, and pile of textbooks, a small piece of cotton bandage, two thermometers, a sticky tape and water. Ensure learners work in pairs and follow the steps provided by the teacher to construct a hygrometer similar to the one shown in learner's book page 91. Ensure learners take readings from the constructed hygrometer. Allow them to compare their readings with other learners.

Take them through the learning points in the learner's book and ask them how else can a hygrometer be constructed?

**Observation-** observe as learners discuss and set up the experiment. Are they capable of constructing a hygrometer?

**Conversation-** talk to learners in groups as they construct a hygrometer. Are they capable of taking the readings from the hygrometer?

**Product-** look at the simple hygrometers constructed by learners'. Are they working?

## 4.6 Importance of humidity and its measurements

**In activity 4.7**, allow learners to work in pairs and appreciate the importance of humidity in our daily life activities. Let learners observe the picture and discuss the processes involved in rain formation and practise singing the water cycle song on page 92 of the learners book. Allow learners to also brainstorm the importance of humidity and its measurements and come out with various points as they note them in their notebooks. Let learners present in class as you moderate their responses.

### Assessment opportunities

**Observation-** observe as learners sing the water cycle song in pairs. Are they capable of relating the song to cloud formation that leads to rain?

**Conversation-** talk to learners as they carry out the activity. Are they able to explain the process of rain formation?

For **activity 4.8**, let learners practise washing their handkerchief in groups and air dry them in different places within the school. Allow them to dry their handkerchief on sun or under the shade. Challenge them to suggest in which condition did the handkerchief take the shortest time to dry and why? Ensure learners take notes in summary form in their notebooks.

**Observation-** observe as learners work in groups. Are they able to account for the observations made from the experiment?

**Conversation-** talk to learners on importance of humidity. Ask learners to suggest other importance of humidity and its measurements.

### Answers to check your progress 4.1

*Refer to learner's book page 94*

1.

Physical change	Chemical change
No new substance is formed e.g. boiling water.	A new substance is formed e.g. burning paper.
It is easily reversible e.g. melting of ice.	Irreversible e.g. rusting of an iron nail.

2.
  - a) Q – the dew point and air temperature are closest.
  - b) P- the difference between the dew point and air temperature is greatest.
  - c) P- it has the largest dew point.
  - d) Q-it has the least dew point.
3. When air is heated, it becomes hot and less dense compared to cool air. Once the air rises it releases its energy will eventually sink back down.
4.
  - a) Psychrometer.
  - b) Hygrometer.
  - c) Thermometer.
  - d) Anemometer.
5. It enables plants to grow.

## Unit

## 5

## Using Energy

*(Refer to learner's book page 95-131)*

Learn about	Key inquiry questions
<p>Learners should discuss how the mass of an astronaut remains constant but the force of gravity means that the weight reduces when orbiting the Earth. This important distinction should be consolidated through practical investigations using force meters. Students should investigate through practical activity the use of gears, and multiple pulleys to change the force required to move objects of the same mass and explore different forms of energy and energy transformations. These may touch on different forms of energy and how energy can be released for our use (burning wood), and the notion of energy efficiency and how energy can be lost at each transformation.</p> <p>This unit provides an opportunity for learners to consolidate their experiences from prior learning and exposes them to more practical investigations work. They should be encouraged to work in small groups and produce group and individual written work.</p>	<ul style="list-style-type: none"> <li>Σ How does force and mass differ and why?</li> <li>Σ How do we measure force?</li> <li>Σ How is energy transformed from one form to other?</li> <li>Σ What forms of energy are there?</li> <li>Σ Why is the study of energy and energy transformation important in our daily life?</li> <li>Σ How do gears and multiple pulleys make work easier?</li> </ul>

Learning outcomes		
Knowledge and understanding	Skills	Attitudes
<ul style="list-style-type: none"> <li>Σ Recognise difference between mass and weight and their measurement.</li> <li>Σ Understand forces and the different types of forces and units for measuring force.</li> <li>Σ Identify different forms of energy, describe energy transformations.</li> <li>Σ Understand the use of gears and multiple pulleys in making work easier.</li> </ul>	<ul style="list-style-type: none"> <li>Σ Observe carefully.</li> <li>Σ Predict what might happen.</li> <li>Σ Use appropriate measures.</li> <li>Σ Collect and present results appropriate in writing or drawing.</li> <li>Σ Interpret results accurately.</li> <li>Σ Report findings appropriately.</li> </ul>	<ul style="list-style-type: none"> <li>Σ Appreciate usefulness of force and its effects in our daily life.</li> <li>Σ Appreciate the use of energy and energy transformation at homes and in industries.</li> <li>Σ Co-operation and team work.</li> <li>Σ Opened mindedness.</li> </ul>
<p><b>Contribution to the competencies:</b></p> <p><u>Critical and Creative thinking:</u> constructing improvised gears and pulleys and using them to demonstrate how they work.</p> <p><u>Communication and Co-operation:</u> group work.</p>		
<p><b>Links to other subjects:</b></p> <p>Mathematics</p>		

## Introduction to the unit

This unit is about using energy. Remember learners at this level have learnt about energy in the previous classes. In class 4, they learnt about light and heat. They integrated how light and heat travel and their uses. In class 6 they investigated reflection and refraction of light and also learnt about how sound energy travels. Take advantage of their past experience with energy and let them know that energy is the ability to do work. When energy is available in the required form then we are able to do any kind of work.

This unit will help the learners to become responsible with available energy. They will know how to conserve energy by using energy efficient devices. They will understand that energy can neither be created nor destroyed but can be lost in the process of transformation from one form to another. The unit therefore will make the learners appreciate energy and take care of energy and energy resources. Let learners

understand that by gathering knowledge and skills about energy they may become engineers, teachers or conservationists of energy. Give them an example of a well-known engineer or conservationist to motivate them as they learn this unit.

### **Competencies to be attained**

#### **Critical and creative thinking**

Practical activities like constructing improvised gears and pulleys and using them to demonstrate how they work triggers the minds of learners to think beyond the skills gained. This will help learners to develop new ways of doing things and hence come up with solutions to problems facing them in lives. Challenge learners to come up with innovative ways of doing such tasks.

#### **Communication**

Encourage learners to discuss in English during group discussions and presentations. Let them exchange and share opinions irrespective of their abilities when answering questions. Through this, learners will highly build their command in language, build on their confidence, love and passion for the subject.

#### **Cooperation**

Encourage learners to work as a team during group discussions. They should freely interact with one another as they brain storm and exchange ideas in their group work activities. Encourage them to share their results, tools and apparatus as they carry out their practical activities.

#### **Cross- cutting issues**

##### **Environmental awareness and sustainability**

The environment is the source of all resources that we need in order to live comfortable lives. For this reason there is need to control environmental degradation and keep the resources sustainable. Let learners know that when air is polluted, the Ozone layer gets depleted hence need to control air pollution. Encourage learners to plant more trees when at home and at school.

##### **Life skills**

Learners should be made aware of the fact that they need to save energy. They can do by switching of energy utilizing equipment when not in use. Also, buying quality equipment, using energy efficient devices and renewable sources of energy will enable them save money and in the long run save cost of repair and maintenance.

##### **Peace values**

In this unit, learners will be actively involved in discussion either in pairs, groups or as a class. They should be made aware of the need to accommodate everyone's ideas and opinions. As they discuss they will at times agree or disagree on issues at hand. They should be made to embrace the views of others and treat them as a learning process.



## Meaning of new words

**Force** – A pull, push or lift.

**Mass** – The quantity of matter in an object.

**Weight** – The total amount of downward pull on an object.

**Newton**- A unit used to measure force.

**Energy** – Ability to do work.

## 5.1 Force mass and weight

### Force

#### Activity 5.1 and 5.2

In **activity 5.1**, ensure learners are in pairs. Allow the pairs to observe the pictures and try to relate what is taking place in relation to force. Allow learners to practise doing the activity shown in the picture in an open field under your guidance. Back in class explain to learners what force is and allow learners to describe other types of force they have come across. Let them also give some advantages and disadvantages of force they have come across.

In **activity 5.2**, provide learners with the materials needed for the activity and take them through the procedure. Allow them to work in pairs and move round the class and observe how the pairs do the activity. Let them measure force of different objects using a spring balance provided and then record the readings in their notebooks. Summarize the lesson by taking learners through the learning points as outlined in learner's book page 97.

**Activity 5.3**, is about types and effects of force. Allow learners to work in groups of five. Let them discuss the pictures shown in the book in relation to the type of force shown. Allow each group to share their findings and provide them with an opportunity to present in class as you moderate their time. Seek to know from learners what are the other types of forces not mentioned in the book and their effects. Encourage them to take short notes in their notebooks.

### Assessment opportunities

**Observation**-Observe as learners discuss throughout the activity. Are they able to identify the type of force shown in the pictures?

**Conversation**- talk to the groups as they do the activity. Are they able to identify some effects of force?

## Mass and weight

### Activity 5.4 & 5.5

**Activity 5.4** involves a practical activity. Let learners be in groups and ensure that each group has the materials needed to conduct the experiment. Explain to learners that the experiment entails determination of mass of different objects and ask learners to conduct the experiment in their respective groups. Go round the class as you monitor learners taking the experiment and correcting them where need arises. In **activity 5.5**, let learners observe the pictures in pairs and try to think where the apparatus provided are mostly used and which type of items they measure. If possible you may come to class with some of the apparatus for learners to observe and relate with the ones in the picture. Show them how readings are usually taken from the balances and provide them with the materials to weigh and record their readings. Move round the class and observe how learners take the readings of different items. Encourage learners to always be careful when determining masses and weight of different items especially when they are helping their parents in the shop, market or hardware.

### Assessment opportunities

**Observation**-Observe as learners discuss the activity. Are they able to differentiate between mass and weight? How is mass related to weight?

**Conversation**- talk to learners as they carry out the experiment. Are they able to identify some of the instruments used to measure mass and weight?

**Product**-look at how the pairs take readings from the balances provided. Are their readings correct?

### Answers to check your progress 5.1

*Refer to learner's book page 100*

1. Frictional force.
2. From the energy in the person riding the bicycle.
3. Because there will be little friction between the tyre and the ground.
4. In order to produce enough friction. For the car to stop, it should be rough.
5. Mass refers to quantity of matter in an object while weight refers to the total downward pull of an object. Mass is measured in grams while weight is measured in Newton.

## 5.2 Forms of energy

This topic mainly deals with the various forms of energy, their sources and the various transformations that they undergo. Emphasize the fact that at this level, learners will be restricted to mechanical, chemical, thermal, electrical, magnetic and elastic forms of energy. Learners should be made aware of the sources of these forms of

energy and how to convert them from one form to another. Finally, the unit winds up by emphasizing the various renewable sources of energy and how to install and maintain a biogas plant. The concept in the following activities is to enable learners identify different forms of energy and their application in daily lives. Learners should appreciate the diverse forms of energy and know where each is applicable.

## Heat energy

### Activity 5.6, 5.7, 5.8 and 5.9

**For activity 5.6**, divide the class into groups and provide them with the required materials for them to carry out the activity demonstrated in learner's book page 100. Caution learners to be keen when dealing with fire and guide them appropriately. Challenge learners to come up with some uses of heat energy in their lives. Summarise the lesson by taking learners through the learning points in learner's book page 101.

## Chemical energy

**In activity 5.7**, allow learners to be in groups and provide them with the required materials needed for the experiment. Take them through the procedure outlined in learner's book page 102. Demonstrate to them what is expected from the experiment and allow them to do the activity on their own as you pay close attention. Move round the class as you observe how the groups work. Allow them to make mistakes since mistakes is part of learning and correct them where need arises. Encourage learners to take notes in their notebooks.

### Assessment opportunities

**Observation**-observe as learners do the activity in groups. Are they able to demonstrate how chemical energy occurs?

**Conversation**- talk to learners as they do the activity. Are they able to design another experiment showing how chemical energy takes place?

**Product**-look at learner's experiments. Are they portraying the form of energy in question?

## Electrical energy

**Activity 5.8**, seeks to enlighten learners on some of the electrical appliances normally used at homes. Divide the class into pairs and let learners observe the pictures and relate with some of the equipment's used at home. Let learners name some of the electrical appliances they use at home and explain how they normally use them. Pose some of the challenging questions to enable learners think critically as you provide answers where they fail to answer. Caution learners against playing with electrical sockets since one may get shock. Encourage them to always switch off lights when not in use so as to save cost of electrical bills. Ensure learners take notes in their notebooks and conclude the lesson by taking learners through the learning points in learner's book page 103.

## Magnetic energy

**Activity 5.9**, seeks to test learners knowledge on magnets. Bring some magnets to class and allow learners to work in pairs. Let learners first observe the picture in learner's book page 104 and relate the type of magnets in the picture with the ones provided by the teacher. Learners should try to use the magnet to attract different types of materials such as pieces of paper, nail, coin, wood, keys and sticks. Let them present their findings in form of a table. Allow them to share their findings in class and let them do the fun corner activity. Conclude the lesson by taking learners through the learning points in learner's book page 105.

### Assessment opportunities

**Observation**-Observe as learners discuss in pairs. Are they able to identify magnetic and non-magnetic materials?

**Conversation**- talk to learners as they discuss in pairs. Are they able to identify other magnetic and non-magnetic materials?

**Product**- look at how the pairs have presented their work in form of a table. Are their results correct?

## Mechanical energy

### Activity 5.10

For **activity 5.10**, divide the class into pairs and ensure that all the materials needed for the activity are all available. Take learners through the procedure and caution them to handle the materials provided with a lot of care so as to avoid injuries that arise during the experiment. Allow learners to use the set of materials provided to do the activity on their own. Move round the class and observe how the pairs work. Allow them to make mistakes since mistakes is part of learning. Summarise the lesson by taking learners through the learning points in learner's book.

## Static energy

**Activity 5.11** is a practical activity involving Static energy. Divide the class into several groups and allow learners to use locally available materials such as a pen, ruler and pieces of papers to carry out the activity. Let them read the procedure and carry out the activity on their own. After the activity allow the groups to share their findings. Summarise the lesson by taking learners through the learning points provided in learner's book.

## Elastic energy

**For activity 5.12**, allow learners to demonstrate how elastic energy works using locally available materials. Let learners come with rubber bands, old bicycle tyres, catapults and springs they mostly use at home. Divide the class into groups and let learners use

the materials to show how elasticity can be demonstrated using the pictures on page 107 of the learners books. Ask learners to identify some advantages of elastic energy and where they are usually applicable. Ensure learners take notes in their note books.

## Sound energy

**Activity 5.13** is on sound energy. Allow learners to work in groups. Let them go through the procedure and use the materials provided to demonstrate sound energy. Allow each group to share their findings and come up with other ways which can be used to demonstrate sound energy. Ensure learners do the fun corner activity in learner's book page 109. Summarize the lesson by taking learners through the learning points in learner's book.

### Assessment opportunities

**Observation**-Observe as learners discuss in pairs. Are they able to demonstrate how sound energy, electrical, elastic and static energy takes place?

**Conversation**- talk to learners as they carry out the activity. Are they able to identify application of different forms of energy discussed?

**Product**-look at learner's models e.g. catapult, string phone at the end of the activity. Do they work?

## 5.3 Energy transformation

Energy can be changed or converted from one type to another. Conversion of energy from one form to another is called **energy transformation**. Let learners know that energy is rarely found and hence the need to transform or change it into the form we need.

## Mechanical energy

### Activity 5.14, 5.15

**Activity 5.14** is on transforming mechanical energy to heat energy. Divide the class into pairs and let learners demonstrate how mechanical energy can be transformed to heat energy using the steps outlined in learner's book page 110 using the materials provided. Ensure all learners participate effectively in their various groups and are answering all the questions asked in the procedure in their notebooks. **Activity 5.15** explains how mechanical energy can be transformed to electrical energy. Let learners work in pairs and do the activity as stated in the learner's book. Challenge learners with some questions related to the activity to test their understanding and their critical thinking ability. Encourage learners to come up with different ways in which the experiments can be designed. Ensure that learners take notes in their notebooks.

### Assessment opportunities

**Observation**-listen to learner's conversation as they work in pairs. Pay attention on how they closely discuss transformation of mechanical energy to heat energy and transformation of mechanical energy to electrical energy. Are they able to bring out the differences in energy transformation?

**Conversation**- Ask learners to think and give another example that involves transformation of mechanical energy to heat and electrical energy.

**Product**-look at learner's experiments. Do they depict the energy transformation in question? Are they able to write down the energy transformation taking place?

### Chemical energy

**In activity 5.16**, divide the class into groups and provide them with the required materials for the activity. Take learners through the steps as outlined in learner's book and allow them to do the activity on their own as you observe them carefully. Caution them against playing with fire. During the activity challenge learners with some questions and also allow them to ask questions as other learners also seek to find solutions in their respective groups. **Activity 5.17** deals with transformation of chemical energy to electrical energy. Learners are required to work in groups and set up the experiment using the materials provided. Go round the class as you observe how learners set up the apparatus. Allow learners to discuss in their respective groups the type of energy transformation taking place in the experiment and present their findings in class as you moderate their time. Encourage learners to also come up with other ideas in which chemical energy can be converted to electrical energy. Summarize the lesson by taking learners through the learning points in learner's book. Ensure learners take notes in their notebooks.

### Assessment opportunities

**Observation**- observe as learners work in groups. Are they able to set up the experiment using the materials provided?

**Conversation**- talk to learners as they perform the activities. Are they able to: a) Describe the energy transformation taking place when water boils in a kettle? b) Describe the energy transformation when a torch lights at night?

**Product**-look at learner's experiments. Do they depict the energy transformation in question? Are they able to write down the energy transformation taking place?

### Solar energy

#### Activity 5.18

**Activity 5.18** seeks to demonstrate how solar energy can be transformed to electrical energy. Allow learners to work in pairs and let them observe the picture in learner's book page 113 and try to find out the energy transformation taking place before the

bulb lights in the house. Ask learners to come up with other ways in which such an experiment can be designed. Encourage learners to do the fun corner activity in learner's book page 114 and identify the energy transformation taking place. Make sure learners take notes in their notebooks.

## Electrical energy

**Activity 5.19** is a practical activity. Divide the class in groups and ask them to set up the apparatus as in the picture in learners book page 114 using the materials provided. Observe their set up if it's working. Let them brainstorm in their respective groups as they seek to come out with the energy transformation taking place before the set up works. Ensure learners take notes in their notebooks and do the activity in the fun corner page 115.

### Assessment opportunities

**Observation-** observe as learners work in pairs activity 5.18 and in groups activity 5.19. Are they able to observe the pictures and set up the experiments? in question on their own?

**Conversation-** talk to learners as they carry out the activity. Are they able to give examples that involve transformation of electrical energy to mechanical energy?

**Product-** look at learner's experiments. Do they depict the energy transformation in question? Are they able to set up the experiment? Can the set up work if tested?

## 5.4 Importance of energy and energy conservation

**Activity 5.20** deals with importance of energy. Learners are to work in groups and find out the importance of energy in their daily live activities. Allow learners to brainstorm in their respective groups and come up with different points on importance of energy. Let each group appoint a leader and allow them to make a presentation as other learners listen and take notes. Go round the class as you observe how learners discuss and ask some questions to test learners understanding about the activity. Encourage learners to conserve energy while at home or at school. Tell learner's that to conserve energy, is to use our present energy resources well and that they do not get worn out or finished.

### Assessment opportunities

**Conversation-** talk to learners in groups. Are they able to identify importance of energy in their daily lives?

### How can energy be lost?

#### Activity 5.21, 5.22 and 5.23

**In activity 5.21**, allow learners to be in pairs and observe the picture in learner's book page 116. Let learners think and explain in which cooking vessel can the energy be lost and why? Provide learners with the materials needed and demonstrate to them how



the activity can be done practically. During the set-up, ask some questions for learners to answer. This will enhance their critical thinking. **For activity 5.22**, provide learners with the materials needed and allow them to work in groups. Let them first observe the pictures in learner's book page 117, and brainstorm on how energy can be lost faster in the two cooking vessels being compared. Guide them through the procedure as outlined in the learner's book and observe as learners carry out the experiment. Ensure learners take notes and provide answer to the questions asked.

### **Using energy efficient devices**

**Activity 5.23** demonstrates how energy can be used efficiently. Let learners work in pairs. Allow them to look at the pictures in learner's book page 118. Bring in class a charcoal stove and an improvised charcoal stove. Let learners observe physically and even touch if possible. Let them compare the charcoal stoves brought in class and the ones they normally use at home.

Challenge them by asking questions and wait for their responses after discussing in pairs. Ensure learners take notes in their notebooks.

### **Assessment opportunities**

**Observation**-listen to learner's conversation as they work in pair's activity 5.21, 5.23 and in groups' activity 5.22. Observe as they look at the pictures and how they perform the same activities using the materials provided.

**Conversation**- talk to learners as they do the activity. Are they able to identify in which cooking vessel will food cook fast? Are they able to suggest other ways of minimising loss of energy during cooking?

### **Renewable sources of energy**

#### **Activity 5.24, 5.25 and 5.26**

**Activity 5.24**; in this activity, divide the class into groups. Allow learners to look at the picture and try to point out different types of energy. Go round the class as you pay close attention at how the groups discuss. Ask them probing questions such as; what evidence from the picture makes you identify wind, solar or biogas as a source of energy? This will enhance their critical thinking and observation skills. Summarize the lesson by asking learners to take notes and answer questions in their notebooks.

**Activity 5.25**; arrange for learners to visit a biogas plant. During the visit, guide learners to engage the officer in charge or the owner in a question and answer session using the questions in this activity. Guide them to come up with summary notes and a sketch diagram of a biogas digester. Allow learners to list down some of the components of a biogas digester.

**Activity 5.26**; this is a practical activity that involves constructing a biogas using the locally available materials. Begin this exercise by showing learners a demonstration video of how biogas digester is made. Use the link: <https://www.youtube.com/>



*watch=mWefbc1spd0* or a chart showing how to construct a biogas digester. Let learners assemble a biogas digester as highlighted in this activity. Allow them to monitor biogas production from this installation. You can also bring charts and pictures of a biogas plant for learners to observe.

**Note:** You may recommend use of this facility for cooking purposes in school as learners oversee the maintenance as per what they learnt during the field visit. Encourage learners to set up the biogas plant and let them observe how it works after one week. Ask learners to set up a similar project at home under guidance of their guardians. Wind up this lesson by highlighting the various uses of biogas energy and the advantages of using biogas as a renewable source of energy.

### Assessment opportunities

**Observation**-look at how learners discuss in their groups. Are they able to identify the different sources of energy from the picture? Are they able to explain how different sources of renewable energy from the picture comes about?

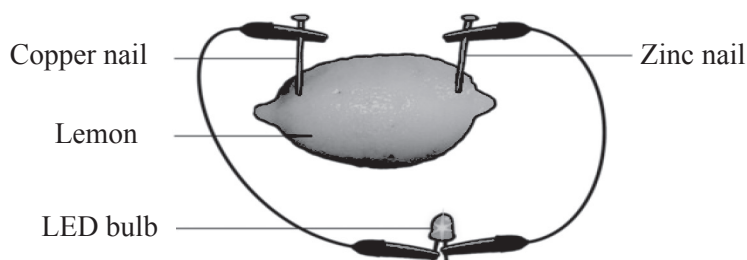
**Conversation**; talk to learners as they carry out the activities. Are they able to identify the components of the biogas plant? Are they able to set up the experiment on their own?

**Product**-look at each groups work. Are they able to draw a well labelled diagram of a biogas plant? Do their experiments of constructing a biogas work?

### Answers to check your progress 5.2

*Refer to learner's book page 124*

1. Chemical energy.
2. Chemical energy stored in fuel is released during burning and converted to mechanical energy which is used to propel the vehicle.
3. a)



- b) Chemical energy (Lemon)  $\longrightarrow$  Electrical energy (bulb)
4. Trees are sources of renewable energy, they are sources of rain as well ( through transpiration), sources of timber used to make furniture, prevent soil erosion, are medicines, animals use some as sources of food ( fruits, seeds, stems, leaves and roots), etc.

5. Let learners plan and execute the project under the guidance of their parents/guardians at home. Ensure that the parent/guardian gives a report on the project progress. Evaluate and award marks to individual learners.
6. When you rub your hands against one another, you feel warm. This shows existence of thermal energy.
7.
  - a) Static is caused by charged particles and is immobile, current electricity is electricity in motion.
  - b) Rub a comb or ruler against your hair, and use it to pick small pieces of paper.
8. Using energy sparingly.  
Using energy efficient devices e.g. improved charcoal stove.  
Prioritizing using renewable sources of energy.  
Emphasizing on the 3Rs of conservation that is, Reduce, Recycle and Re- use.
9. Renewable sources of energy cannot be exhausted while non-renewable sources of energy can be exhausted.
10. Black colour absorbs maximum amount of heat.
11. Biogas, making charcoal balls, drying and burning directly.

## 5.5 Gears and Pulleys

In primary science 1, learners learnt about wheels. They were making wheels from locally available resources such as clay, maize cob or old slippers. In this sub unit, learners will investigate how gears and different types of pulleys make work easier.

### Understanding the use of gears and multiple pulleys

#### Activity 5.27

Activity 5.27 is about gears. Most learners have come across bicycles and have observed different machines making use of gears. Divide the class into pairs and provide them with the materials needed for them to carry out the activity on their own as observed in the picture in learner's book page 125. Let them rotate one of the bottles tops from the set up they have constructed and ask them to give the direction of the other bottles. Explain to learners how gears work and ask them to give other applications where gears are mostly used in life. Ensure learners take notes in their notebooks. Summarise the lesson by taking learners through the learning points in learner's book page 126.

## Assessment opportunities

**Observation**-observe as learners work in pairs. Are they able to construct a simple gear using the materials provided?

**Conversation**- talk to learners about some examples of gears they have come across at home. Are they able to name them? Can they briefly explain how they work?

**Product**-look at learner's experiments. Are they working? In which directions do the bottle top move?

## Pulleys

### a) Single fixed pulleys

**Activity 5.28 and 5.29** is about pulleys. Let learners know that pulleys are simple machine that make work easier. Take them through activity 5.28 and allow them to observe the pictures in learner's book page 126. Let them explain how the machines make work easier. Ask learners to differentiate the two types of single fixed pulley and let them think in pairs where these machines are mostly used. You may take learners to the school's flag post or a well and explain to learners how a single fixed pulley works. Let learners practise raising and lowering the flag or drawing water from a well. Guide learners to make a single fixed pulley in the fun corner in learner's book page 128. Ensure learner's take notes in their notebooks.

### Assessment opportunities

**Observation**-observe as learners carry out the activities in pair's activity 5.28 and as a group in activity 5.29. Are they capable of designing the experiment in the fun corner?

**Conversation**- talk to learners as they carry out the activities in groups. Are they able to identify areas where single fixed pulleys work best?

### b) Multiple pulleys

**Activity 5.30** is on multiple pulleys. Ensure learners work in pairs. Let them observe the pictures on page 128 and relate some of the differences they observe in relation to the single fixed pulley in the previous activity. Allow them to discuss in pairs and try to find out which pulley carries a heavy load. If possible show learners pictures of different pulleys and let them identify the movable and fixed pulleys. Give learners a variety of loads and let them think and try to find out the type of pulley to be used to carry the load. Ensure learners do the fun corner in groups on page 130 of the learner's book using the materials provided. Encourage them to take notes in their notebooks and do the questions in check your progress 5.3 in learner's book page 130.

### Assessment opportunities

**Observation**-observe as learners work in pairs. Are they able to distinguish between multiple pulleys and single fixed pulley?

**Conversation-** talk to learner's as they carry out the fun corner activity. Are they able to construct multiple pulleys using the materials provided?

**Product-**look at the multiple pulley constructed by learners in groups. Are they working?

### **Answers to check your progress 5.3**

*Refer to learner's book page 130 to 131*

1. B – Weight B requires a force equal to 5 Kg whereas A requires a force equal to 10 Kg.
2. A- requires a least force i.e. 5 Kg whereas weight B requires a force equal to 10 Kg. Remember to divide the weight by the number of sections of rope supporting it to get the force needed to lift the weight.
3. C – The weight is 300 Kg and there are 6 sections of rope supporting it. Divide 300 by 6 to get 50 Kg. In all cases, just divide the weight by the number of sections of rope supporting it to get the force needed to lift the weight.
4. It help us to lift heavy objects with less effort. Drawing water from a well, construction and raising a flag.
5. Bottle tops locked together.
6. a) Two pulley man