

Primary Science

6

Primary Science has been written and developed by Ministry of General Education and Instruction, Republic of South Sudan in consultation with various experts. This course book provides a fun and practical approach to the subject of Science, and at the same time equipping students with skills to fit the future.

The book comprehensively covers the Primary 6 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 progression and explanation of learning points.
- A wide variety of practice exercises, often showing how Science can be applied to real-life situations.
- It provides opportunities for collaboration through group work activities.
- Stimulating illustrations.



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Teacher's Guide



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Science

Teacher's Guide 6

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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

Table of contents

Introduction	1
Unit 1 Keeping ourselves healthy	15
1.1 Drugs and drug abuse.....	17
1.2 Puberty and changes during puberty.....	19
1.3 Food and nutrition.....	21
Unit 2: Organisation and structure of living things	25
2.1 Parts of a plant and their function.....	27
2.2 Adaptation of different parts of a plant to their functions	29
2.3 Comparison between structures in animals and plants	31
2.4 Level of organisation of living things.....	31
Unit 3: Weather, Air and Diffusion	34
3.1 The water cycle.....	36
3.2 Components of air and their properties	39
3.4 Atoms, elements, molecules, compounds and mixtures.....	44
3.5 Metals and non-metals.....	46
Unit 4: The Earth and Space	48
4.1 The earth as part of the universe.....	50
4.2 Rotation of the earth	51
4.3 Revolution of the earth.....	52
Unit 5: Light, Heat and Sound	53
5.1 Light	56
5.2 Heat	60
5.3 Sound	62



Introduction

Book organisation

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

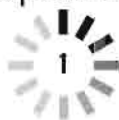
The main elements of Part 1 are:

- **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 students are expected to acquire, crosscutting issues to be addressed during learning and special needs education.
- **Basic requirements for an effective Science lesson** - It highlights the teacher's and learner's roles for effective teaching/learning of Science, teaching/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** – This gives the unit title as stated in the syllabus.
- **Topic heading** – The units have been subdivided (by the authors) into manageable topics.
- **Learning outcomes** – This section outlines **Knowledge and understanding, Skills, Attitude and values** the learner is expected to achieve through his/her interaction with the concepts and activities planned for the unit.
- **Contribution to learner's competences:** The section explains how the unit/topic will facilitate the student to acquire to the specified competences. These competences will be discussed in detail later in the next section.
- **Links to other subjects:** The section explains how the concepts in unit/topic link to other subject areas. This helps the teacher to understand how the unit will help the learner as he interact with facts or concepts in those subject areas, or how the students can transfer knowledge from those areas to help them understand concepts *in this unit*.



Cross cutting issues to be addressed

The section outlines the specific crosscutting 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 and be on the lookout for suitable opportunities throughout the teaching/learning process in the entire unit to address the cited crosscutting issues. These issues will be discussed in detail later in this section. Note that a unit/topic may not necessarily address all the crosscutting issues outlined in the curriculum.

Teaching methodologies

The section lists down the main teaching/learning methods that the teacher can employ in the unit/topic.

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 that the learners possess them before they start learning the concepts in this unit, and how to help learners in case they do not possess them.

Sub topics:

This is a list in tabular form of the structuring of the topic into subtopics.

Suggested teaching and learning activities

This section provides guidance to the teacher on how to facilitate students to learn by doing the activities outlined in the student'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 the 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 competencies to be attained

Competencies are statements of the characteristics that students 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 analyze 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 behavior to suit different situations.
- Negotiate, respect others' rights and responsibilities, and use strategies to resolve disputes and conflicts.
- 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 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 sensitize learners on the importance of conserving the environment. One way is by ensuring that the learners always dispose off 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 students 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.

Special needs education and exclusivity

All South Sudanese children have the right to access education regardless of their physical and physiological challenges. The Science teacher therefore is required to consider each learner's needs during the teaching and learning process. Assessment strategies and conditions should also be tailored to accommodate the needs of all learners.

The following are the most common categories of special needs in learners:

- Physical challenges
- Visual challenges
- Hearing challenges
- Mental challenges

You should identify such cases and help facilitate the affected learners in learning. For example, learners with visual and hearing difficulties should sit near the teacher's table for easy supervision and assistance. The following are some suggestions on how to support special needs children in your class.

(i) Learners with Physical challenges

These are learners, who have some of their body parts not able to function normally due to physical problems. For example, some learners have partial or total incapacitation in the use of limbs or hands. In such cases, the learners will need assistance during activities that involve movement. This could be during field excursions and other activities that learners have to stand for some reason. The teacher should organize for the learner's ease of movement. The learner should also be given time to catch up with the others. In case the hands are affected, the learners should be given more time to finish their work. In both cases, the learners should not be pressurized to do things that can cause injury or ridicule.

(ii) Learners with visual challenges

These learners have problems with their eyesight. They may be longsighted, short sighted or have some eye sicknesses. They should sit at a position where they are able to see the chalkboard without straining.

The material to be observed should be brought to appropriate location where these learners can be able to see. The magnifying glasses can be used where necessary. The teacher should use large diagrams, charts and labels. In some cases, learners can be allowed to touch and feel whatever they are looking at.

The teacher should read aloud most of the things he/she writes on the chalkboard. Other learners can also assist by reading aloud. The lighting system in the classroom should also be improved.

(iii) Learners with hearing challenges

The affected part in this case is the ear. The learner can have hearing aids. The teacher should use as many visual aids as possible. They should also project their voice and always talk while facing the learners. The teacher should also use gestures and signs while talking to such learners figure out what he/she is saying.

(iv) Learners with speech challenges

One of the most common speech challenges is stammering. Such learners speak with many difficulties. The teacher should be patient with them and encourage them to express themselves in their own way. Such learners should be given more written exercises.

(v) Learners with mental challenges

The teacher should identify the nature and level of the mental difficulty with such learners. Such learners should then be given special assistance and attention at individual levels. They can be given special tests or assessments.

In general, all the learners with difficulties should be well facilitated. This encourages and motivates them. The teacher and the rest of the class should never ridicule learners with any of the difficulties. Note that generally, people with any kind of disability can be very sensitive to any kind of negative comments or criticism.

Remind them that 'Disability is not inability'.

Treat them fairly but not with undue favors.

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 students in variety of learning activities.
- Encouraging and accepting student autonomy and initiative.
- Allowing student responses to drive lessons, shift instructional strategies.
- Familiarizing themselves with students' understandings of concepts before sharing their own understandings of those concepts.
- Encouraging students to engage in dialogue, both with the teacher and one another.
- Engaging students in experiences that pose contradictions to their initial hypotheses and then encouraging discussion.
- Providing time for students to construct relationships and create metaphors.
- Using a variety of teaching and assessment methods.

- Adjusting instructions to the level of the learner.
- Nurturing students' 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 summarizing 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 counseling.

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.
- Considering others' ideas.
- Expressing themselves using appropriate Science terms and representations in writing and talk.
- Engaging in lively public discussions in defense 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
- Firms such as hydroelectric power stations, engineering firms among others

(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 organization

- It is important for the teacher to make the classroom an attractive and stimulating environment. This can be done by:
- Carefully arranging the furniture in the classroom in an organized 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.

(c) 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 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.

(v) Scheduling learning activities and venues

Some of the activities suggested in the student's book good require planning and scheduling in order to get accurate results. An example is investigating how light travels as illustrated in Unit 5.

Grouping learners for learning activities

Most of the Science activities suggested in the student'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 curriculum will make grouping the norm in the teaching process.

Learning grouping can be formed based on 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 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 maybe 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 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 this 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 and trips/nature walks

This is a lesson conducted outside the school compound during which a teacher and the learners visit a place relevant to their 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 few.

Unit 1 Keeping ourselves healthy

Refer to learner's book page 1 to 25

Learn about		Key inquiry questions
<p>Learners should discuss, explain, investigate in groups the causes of drug abuse and its impact on life and produce group and individual written work. Some chemicals do specific things to our bodies such as Aspirin relieves pain. However other chemicals can be harmful and children need be to be aware of their dangers.</p> <p>Learners should understand the nature of changes occurring in humans at puberty, (sexual relationships, sexual intercourse, conception, pregnancy, child birth, and contraception). Through observation, measurement, and discussions they should identify the physical changes that take place within young people as they become sexually mature and how changes differ between boys and girls. They must know about the reproductive parts of both males and females. They should also understand when married people have sexual intercourse, fertilization takes place, conception follows and the woman is pregnant. They should know how the woman carries the pregnancy and when the child is expected to be born. During puberty their bodies are active and energetic and produce sweat to help cooling. Therefore special personal hygiene is important.</p> <p>Learners should investigate the types of food and understand the importance of a balanced diet. They should understand that a balanced diet of carbohydrates, fats, proteins, minerals, and vitamins is essential.</p>		<ul style="list-style-type: none"> • Why are cases of drug abuse common in youth? • How can we identify the impacts of drug abuse in our lives? • How can drug abuse be controlled? • Why are there physical changes between boys and girls at puberty? • Why should the boys and girls at puberty require special personal hygiene? • How would you know if a food contains necessary nutrients for health? • Why is balanced diet important in life?
Learning outcomes		
Knowledge and understanding	Skills	Attitudes
<ul style="list-style-type: none"> • Understand the nature of changes occurring in humans at puberty. 	<ul style="list-style-type: none"> • Investigate the causes of drug abuse and its impacts on life. 	<ul style="list-style-type: none"> • Appreciate the proper use of drugs.

<ul style="list-style-type: none"> • Explain the causes of drug abuse and its impacts on life. • Know the food types and understand the importance of balance diet. 	<ul style="list-style-type: none"> • Observe the physical changes at puberty • Investigate the importance of a balanced diet 	<ul style="list-style-type: none"> • Show the curiosity when conducting the investigation on drug abuse. • Appreciate the changes that occur in their bodies. • Enjoy feeding on a balanced diet.
<p>Contribution to the competencies:</p> <p>Critical and Creative thinking: by conducting investigations on drug abuse.</p> <p>Co-operation and Communication: team work.</p>		
<p>Links to other subjects:</p> <p>Life Skills: avoiding early pregnancies, drug abuse and risky behaviours..</p>		

Background information

Illicit use of drugs among teenagers has increased steadily since the early 1990s. Children and teens in today's society have easier access to different types of drugs such as alcohol, tobacco, cigarettes, shisha and other drugs. This has led to most teenagers and children to abandon school and even involve themselves in criminal activities. This sub-unit aims to teach and encourage learners to know the different types of drugs, their effects and how to control drug and drug abuse.

Contribution to the competencies:

Critical and Creative thinking:

Learners will conduct investigations on drug abuse, they can come up with campaign slogans and walks to sensitize the community on dangers of drug and drug abuse. Learners can also design posters to caution young people to avoid indulgence on drugs, which may lead to early school dropouts and teenage pregnancies.

Co-operation and Communication

Learners share their ideas and discussing ways of running effective campaigns on drugs abuse and how they can involve the community to support their course.

Cross- cutting issues to be addressed

Life skills

Drug abuse can lead to addiction. Once one is addicted he or she can spend all the income on drugs or misuse all the income. This can result into poverty.

1.1 Drugs and drug abuse

Activity 1.1 *Refer to learner's book page 1*

This activity aims to familiarize learners with different types of drugs they have come across at some point in their lives. Divide the class into groups and allow them to look at the picture shown on page 1 of the learner's book. Let them discuss and try to identify the different types of drugs shown in the picture. Ask them probing questions such as where do we find such types of drugs? Are they good for our health? Are they legal in the country? Why do you think some of them are banned in the country? This will enhance critical thinking among learners. Allow learners to also carry out a research from the internet and try to identify other different types of drugs and medicines with their warnings.

Activity 1.2 *Refer to learner's book page 3*

Carry out a class discussion with learners on the effect of drugs in one's health. Let learners brainstorm and provide some of the effects of drugs they have witnessed from people who are victims of alcohols, bhang, cigarettes, miraa, cocaine, and glue among other types of drugs in South Sudan. You can also group learners into several groups and allow them to act a drama or skit on some of the effects of drugs in one's health. Pay close attention at how they are bringing the aspect of drugs and ask them to write down the effects of drugs from the drama or skit they performed. You can then summarize the lesson by having a general discussion with learners.

Activity 1.3 *Refer to learner's book page 4*

Lead learners in discussing how drug and drug abuse can be controlled. Allow learners to be in groups and write different types of drugs on the black board. You can then assign each group a specific drug and allow them to discuss some of the measures needed to avoid drug and drug abuse. Allow each group to present in class as you moderate their time and then summarize the lesson by telling learners that drug abuse affects people's social life and health. It also affects the economy of the nation and family and so it's important for them to avoid drugs. Encourage them to take notes and answer the questions in check your progress 1.1 in learner's book page 5.

You can also allow learners to debate on this motion;

Drug and drug abuse is a major cause of school dropout among learners in South Sudan.

Additional information for the teacher

- Drugs can be useful and also harmful. When drugs are used for medicinal purposes under a doctor's prescription, they help cure diseases. Drugs that are taken for pleasure can be very dangerous. Misuse of drugs can lead to drug abuse. The abuse of drugs generally reveals the presence of unmet physiological and/or psychological needs and mal-adjustment to stress. It alerts us of deeper

underlying problems affecting the drug abuser. Some of the common causes of drug abuse are insecurity, lack of self-respect, lack of love, frustrated drives, for power among others. Drug abusers tend to escape from reality by using drugs. Some teenagers (the age group that the standard seven learners fall in) use drugs out of curiosity, just to experiment and to be 'one of the gang' due to peer pressure. Other people may take drugs to feel secure, to gain self-esteem, to relax or to withdraw from reality. With time, the drug users become addicted.

- Drug dependence (addiction) means the continued need for mood-altering drug. The dependence can be:
 - Physical - this is where the body needs the drug for it to feel normal for example, some alcoholics keep

Assessment opportunities

Observation

Observe as learners work in groups. Are the learners able to identify the types of drugs shown in the picture? Are they able to discuss the cause and effects of drug abuse?

Communication

Listen to learners as they discuss and work in groups. Are they enhancing teamwork and communication skills. When conducting investigations on drug abuse, ask learners probing questions such as; What are the major causes of drug and drug abuse? How can drug abuse be prevented?

Answers to check you progress 1.1

Refer to learner's book page 5

1. Avoid negative peer influence.
Sensitization on the dangers of drug abuse.
Avoid idleness among the youths and any other relevant answer.
2. (a) True
(b) True
(c) False
(d) True
3. B
4. B
5. Alcoholism, loss of consciousness, lack of concentration and accident when driving.

1.2 Puberty and changes during puberty

Activities 1.4, 1.5 and 1.6 Refer to learner's book page 6,8 and 9

In activity 1.4, allow learners to work in pairs. Let them observe the pictures shown on page 6 and point out some of the physical difference they can observe from the picture. Move round the class to ensure that each pair are discussing and pointing out the changes in the picture.

Ask them probing questions such as; what makes the picture look different? Use the points given by learners to initiate a discussion. Summarize the lesson by asking learners to copy notes in their notebooks.

Carry out a general discussion with learners on other changes that occur to both girls and boys during adolescence.

You can group learners into two groups in activity 1.5 i.e. girls on one side and boys on one side. Allow them to discuss some of the changes that occur in their bodies during adolescence and note their points on the Manila paper provided. You can then allocate them 10 minutes to present their findings in class. As they present encourage learners not to be shy and that they should feel free to share other points not mentioned. You can then summarize the lesson by encouraging learners to take notes in their notebooks.

Activity 1.6 aims at teaching learners more about menstruation. Ensure that learners work as a class and allow them to carry out a small research before the arrival of the nurse or doctor. During the lesson, ensure that learners are seated on time before the nurse or doctor start talking to them. Challenge learners to ask question related to the topic and that they should feel free and air out some of the challenges they do face during adolescence

Assessment opportunities

Observation

Observe as learners work in pairs. Are they able to point out from the picture some changes that occur in the body during puberty? Observe and listen as learners ask questions regarding the topic being talked about by the nurse or doctor.

Communication

Ask learners probing questions concerning puberty in both boys and girls, and menstruation? Are the learners able to respond to question freely? Are they able to discuss in groups effectively.

Activities 1.7 and 1.8 Refer to learner's book pages 11 and 12

The activities talk about special personal hygiene for boys and girls during puberty. Divide the class into pairs and let them observe the pictures in **Activity 1.7**. Let them point out some differences they can observe from the picture. After looking at the picture, ask learners to discuss and do the activities as suggested in the learners book.

Let them identify ways on how they can ensure they are clean during puberty? They should list different types of materials that they use to make themselves clean? From this you can then initiate a discussion about personal hygiene at puberty. Let learners know that personal hygiene involves, brushing teeth, cutting long fingernails short, using a handkerchief while blowing the nose, removing wax from the ear using ear buds and washing hands after visiting the toilet and during eating. Summarize the lesson by stressing to learners that boys and girls should always ensure proper hygiene of the body by proper washing of the body and shaving for boys and girls should always ensure proper menstrual hygiene by bathing regularly and using absorbent sanitary towels /pads when undergoing menstruation.

Assessment opportunities

Observation-observe as learners discuss in pairs. Are they able to point out some of the distinction in the pictures shown in **Activity 1.7**? Are they able to identify the materials used for personal hygiene during puberty?

Communication-talk to learners in pairs as they carry out the activity. Ask them probing questions such as why do we bath regularly? What do girls use when undergoing menstruation? How do we take care of our bodies during puberty?

Answers to Check your progress 1.2

Refer to learner's book page 13

1. (i) Male:

- Hair growing under the armpits and pubic area
- Growth of beards
- Deep voice
- Pimples appears on the face

(ii) Female:

- Enlargement of breast
- Hips increase in size
- Hairs grow under the armpit and pubic area
- Pimples appear on the face

2. So as to be able to manage emotions, depression, loneliness and feeling of self-rejection.

3. Personal hygiene helps one to feel comfortable especially with friends, it makes one smell nice and it also ensures that one is healthy.

1.3 Food and nutrition

To be healthy and strong, we all need to eat a well-balanced diet especially in young children. This helps to prevent nutrient deficiency diseases such as anaemia, rickets and kwashiorkor. It is therefore important for learners to learn about food and nutrition for a healthy living. In this unit you are expected to carry out several activities that seeks to teach learners how different types of foods are classified and their importance in their body.

Activity 1.9 *Refer to learner's book page 13*

Activity 1.9 involves a visit to the market near the school. Arrange the class into groups of not more than 5 learners. Consider which group may need extra supervision according to their learning or behaviour needs. As they move round the market, accompany them and observe at how they identify different types of food being sold in the market.

Observe at how learners ask questions to the grocer. Ask learners to write different types of food they observe at the market and try to classify them into three major groups. Back in class, you can then assist learners to classify food into different groups. Ensure learners take notes in their notebooks.

Activities 1.10, 1.11 and 1.12 *Refer to learner's book pages 14, 15 and 17*

The above activities involves classifying different types of foods into three major groups i.e. Body building foods, Energy giving foods and protective foods. Divide the class into pairs and let them observe the pictures. Ask them if they are familiar with the foods shown in the pictures.

Let them discuss in pairs and write down the names of different types of food shown in the picture. Go round the class and observe at how learners list down the different types of food. Ask them to classify the foods listed in their books into three major groups. Allow them to compare their results with those of other pairs. After this you can then initiate a discussion on the importance of different types of food to our bodies. Ensure learners take notes in their notebooks.

Additional information to the teacher

You can bring charts containing different types of foods and allow learners to classify the different types of foods shown in the pictures.

Assessment opportunities

Observation-observe as learners work in pairs. Are they able to classify different types of food into different groups? Are they able to state the importance the food in the body?

Communication- ask learners probing questions such as; how are following foods important to the body? Rice, meat, water, kales, milk, bread, mango, pineapple and kisra.

Product-Check at their work. Are they able to group the different types of foods correctly?

Activity 1.13 Refer to learner's book page 17

This activity involves classifying locally available foods. Allow learners to be in groups. Provide them with a Manila paper and a felt pen and let them discuss and list down all the foods that people eat in their home area. Let them also brainstorm and identify the different types of foods found in the market near their home and school.

They should then tabulate their work in the Manila paper provided. Go round the class and observe at how learners fill the table. Ask them probing questions such as, why do you classify eggs in this column? After the activity allocate each group 5 minutes to present their findings in class as you moderate their time.

Assessment opportunities

Observation; look at how learners work in groups. Are they able to fill the table correctly?

Communication-talk to learners as they carry out the activity.

Product-look at their tables. Have they completed the table correctly?

Answers to check your progress 1.3

Refer to learner's book page 18

1. Food is important because it helps us to grow and develop; to replace worn out and damaged tissues and to protect our bodies against diseases.
2. Good. Carbohydrates provide the body with energy. This energy helps us do different activities such as playing.
3. Yes. Eating soy beans in moderate amounts is important for a healthy diet because it's high in sodium and contains a higher-than-healthy level of fat. Beans, lentils and legumes.
4. Carrots, kale and spinach. They contain vitamin A which is one of the most crucial nutrients necessary for protecting eye health and vision.
5. Rice, kiswa- Energy giving foods.
Eggs, beans- Body building food.
Fruits, vegetable-Protective foods.
6. Eggs, milk and meat.
7. Protective.
8. C

9. Rice

10. C

Balanced diet

Activities 1.14, 1.15 and 1.16 Refer to learner's book pages 20, 21 and 22

Taking a balanced diet is a key to proper development of the body and having a good health. When we eat a balanced meal every day, we say that we are taking a balanced diet. In activity 1.14, arrange learners into different groups and have them look at the pictures. Let them try to point out what the picture seeks to explain. Let learners brainstorm in their respective groups and come up with different suggestions. You can then ask learners to design a similar table and write down what they ate the previous day. Allow learners to compare their work and let them point out the type of food that contain a balanced diet from their meal. For activity 1.15, let learners carry out the activity in pairs. Ensure they use the list provided to plan a well-balanced diet. You can then allow them to compare their work and then carry out a general class discussion.

Let learners be in pairs for activity 1.6. Let them observe the pictures and identify the deficiencies shown. Allow the pairs to discuss and suggest the likely cause of the deficiencies shown in the pictures. Let them then compare their results and after that you can then lead learners in having a general discussion. Summarize the lesson by encouraging learners to always take a well-balanced diet and exercise regularly for them to have a healthy body.

Assessment opportunities

Observation-look at how learners work in pairs. Are they able to identify the deficiencies shown in the picture? Are they able to discuss the cause of the deficiencies shown in the pictures.

Communication-ask learners probing questions such as how can obesity be controlled? Let learners brainstorm in pairs and produce a response.

Answers to Check your progress 1.4

Refer to learner's book page 24

1. (i) Kwashiorkor, marasmus and rickets.
 - (ii) Kwashiorkor- Swelling of the belly, reduced weight.
Marasmus- Thin face and / ribs clearly visible through the skin.
Rickets- bow legs
 - (iii) To always eat a balanced diet.

2. To eat food rich in fibers and to always drink a lot of water.
3. When a person eats a meal containing the right amounts of body-building, energy giving and protective foods. It makes a person strong, healthy and resistant to diseases.
4. (a) Scurvy
(b) Vitamin C
(c) To eat fruits such as oranges and pineapples.

Unit 2: Organisation and structure of living things

(Refer to learner's book page 26-45)

Learn about		Key inquiry questions
<p>Learners should observe the physical structure of local plants in pairs or groups, record their observations, relate the parts to their functions, and compare similarities and differences between plants e.g. comparing shapes and sizes of leaves and relate these to habitat.</p> <p>Learners should investigate the levels of organisation of living things (cells, tissues, organs and systems) and through first hand using hand lenses to examine the parts of plants such as onion cells and stems compare these to animal structures such as bones. They should understand how area increases by the square but volume increases by the cube and therefore multicellular organisms require specialised transport systems. They should use reference books and the internet to supplement their observations and records.</p> <p>This unit provides an opportunity for learners to talk about their prior learning and they should learn both in groups and through individual written work.</p>		<ul style="list-style-type: none"> • How does the structure of different parts of the plants relate to their function? • How do the structures in plants compare with those in animals? • Why do simple plants and animals have less specialised structures than larger plants and animals?
Learning outcomes		
Knowledge and understanding	Skills	Attitudes
<ul style="list-style-type: none"> • Understand structures of plants and their functions. • Understand the levels of organization of living things: cells, tissues, organs and systems. 	<ul style="list-style-type: none"> • Observe and measure structures of plants. • Accurately record the different levels of plant organisation. • Investigate the level of organisation in living things. 	<ul style="list-style-type: none"> • Co-operation and team work. • Enjoy observing the structures of plants. • Appreciate the levels of organization of living things. • Open mindedness. • Self confidence.

Contribution to the competencies:

Critical and Creative thinking: investigating the functions of different parts of the plants and the level of organisation in living things.

Co-operation and Communication: group work.

Links to other subjects:

Environment and Sustainability: plant growth.

Introduction to the Unit

Living organisms have lots of parts and those parts combine together to form a whole that works seemingly as one. It's an amazing system, especially in the case of plants and animals. Plants and animals are structured into cells, tissues, organs, and organ systems. Those organ systems together form the whole organism. **Cells** are the basic unit of life - they are the smallest functional units of an organism and are microscopic objects which contain cytoplasm and a nucleus surrounded by a cell membrane. Microscopic organisms are often just a single cell: in that case that's the whole organism. But humans have trillions of cells. **Tissues** are groups of cells of the same type or from the same place that accomplish a particular task. For example, humans have muscle tissue, connective tissue, nervous tissue and others.

Organs are part of an organism that's usually self-contained and has a specific purpose. **Organ systems** are group of organs that work together to carry out a particular task.

Competencies to be attained

Co-operation

Encourage learners to work as a team through group discussions. Allow learners to freely interact with one another. Let them associate with one's culture and abilities through resources sharing and exchange of ideas. The principle of cooperation should be listening to understand but not listening to respond. All learners should be given equal opportunities irrespective of their abilities. Ensure every learner enjoys the sense of work regardless of their skin color or physical fitness.

Communication

During group discussion, encourage learners to discuss in English. This way they will build on the command for the language as well as ability to participate in other discussions. Ask them questions and give them a chance to attempt answering in the simplest way possible. This will enable them build confidence and soon develop the love and passion for the subject. Allow some room for learners to make mistakes and then correct them in nice way lest they will feel demoralized.

Critical and creative thinking

Introduce the unit by posing general questions to the learners. Let them try to look for the answers to these questions. This will enable them develop a thinking culture as they try to relate the unit with the questions given to them. These questions should however trigger the idea of what they should expect from the unit. Present photographs and make learners discuss the activities in the photographs.

Culture and identity

Allow learners to research on ways in which they can use the knowledge acquired from the unit in improving the living conditions of their communities. The greatness of a nation lies in the ability of its people to integrate skills and knowledge with national development and growth. Learners should know that knowledge and culture are mutually inclusive.

Cross cutting issues to be incorporated

Environmental awareness and sustainability

Learners should be encouraged to plant more trees. Learners should not uproot the whole plant in case they need part of a plant for the practical.

Peace and values of education

Throughout the unit, learners are actively involved in discussing issues as a group. Learners should be made aware of the need to accommodate everyone's ideas and opinions. Through the 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. Any form of intolerance should be highly condemned.

Life skills

A well-maintained atmosphere equals a fulfilling life. Learners should be sensitized on the need to conserve the environment. They should actively participate in activities such as: National tree planting day, National cleaning day. Learners should be made to understand the need to embrace one another regardless of their cultural background or nationality. Involve them in activities that foster coherence, respect, gender exclusivity and patriotism.

2.1 Parts of a plant and their function

Activity 2.1 *Refer to learner's book page 26*

Involves identifying different parts of plants from the pictures. Divide the class into groups and allow learners to observe different types of plants within the school compound. Let each group uproot a young plant and look at different parts of the plant. Let them point out the different parts of the plant and give their function.

Back in class, let them observe the picture shown in page 26 and try identifying the different parts shown. Ask them to complete the table and answer questions asked in step three of the procedure. You can also display a chart and ask learners to identify the parts of the plant on the chart. Remind learners to take notes in their notebooks and summarize the lesson by telling learners that external parts of a plant include roots, stem, leaves, flowers, fruits and stem.

Assessment opportunities

Observation- observes as learners work in groups. Are they able to identify different parts of the plants?

Conversation- ask learners to identify different parts of the plant from the picture?

Product- look at how learners have completed their table. Are there results correct?

Activity 2.2 *Refer to learner's book page 27*

In this activity, allow learners to be in groups and provide them with the materials. Let them choose in their respective groups the material that may likely to be used during the activity. Take them outside the class and let them observe different types of plants within the school. Let each group choose a group leader who will uproot a young plant on behalf of the group members. This will help minimize destruction of plants. Caution learners not to destroy plants by stepping on them and ensure that they plant some seedlings after the activity to replace the uprooted plants. Take them through the remaining part of the procedure and let them carry out the remaining activity on their own. At the end of the activity, have them compare their results with those of other groups and allow them to present their findings in class.

Assessment opportunities

Observation- observe as learners work in groups. Are they able to uproot young plants correctly? Are they able to determine the length of the roots and stems correctly?

Conversation- asks learners probing questions such as; what are the functions of the roots in a plant?

Product- look at diagrams drawn by learners. Do their diagrams depict the actual plant uprooted? Are their measurements correct?

Answers to check your progress 2.1

Refer to learner's book page 29

1. (a) The coloured water was observed on roots and stems.
(b) Roots absorb water while stem transports water to leaves.
2. Refer to learner's book page 29 – 36.

2.2 Adaptation of different parts of a plant to their functions

Activities 2.3, 2.4, 2.5 and 2.6 Refer to learner's book pages 29 – 36

This activities above involves investigating different parts of a plant to their functions. Introduce the lesson by asking learners to name various parts of a plant. You can then organize them into groups and take them for a short nature walk to observe and collect samples of leaves, stem and roots from the school surrounding without destroying plants. Take the learners back to classroom with collected leaves, stem and roots and ask them to get to their groups. Guide the learners in observing and studying the parts of the plants they collected. For activity 2.3, divided the glass into groups and have them study the leaves, identify different parts of the leaf and compare different types of leaves based on their habitats.

Allow learners to tabulate their results based on the adaptation of the leaf to different habitats found.

Stem

For activity 2.4 and 2.5 provide learners with the materials required for the activity and have them use the stems collected to carry out the experiment as shown in the picture. Let learners cut the stem after sometime and observe how the coloured ink moved along the stem. After the activity, you can lead learners in a class discussion

Let learners discuss their results based on; the habitat the plant was obtained from and the adaptation of the stem to its function.

Roots

Activity 2.6 involves investigating the types of roots found in different types of plants and their adaptation to their function. Ensure learners are in their former groups. Let them use the roots collected during the nature walk to carry out the activity on their own. Go round the class and observe how they discuss. Ask them probing questions such as; what's the function of roots in plants? How are the roots adapted to their functions? This will enhance critical thinking among learners. Make sure that learners participate effectively during their discussion. You can also allow some learners to give a short presentation regarding what they have learnt in class. Summarize the lesson by highlighting the functions of the leaf, stem and leaves as follows;

- (a) The leaf is part of plant that is attached to the stems or branches and is green in color. Different plants have different types of leaves.
- (b) Functions of stem are; transport; connects leaves and branches to the roots and storage of food in different plants. Different plants have different types of stem depending on the habitat.

- (c) Roots absorb dissolved mineral salts in the soil. Taproot:-Has main root and sub roots. Fibrous root:-Hair like roots growing from the base of the stem. Functions of roots are Absorption; Support (Anchorage) and storage.

Additional information for the teacher

You can bring to class charts, photographs and pictures having different types of leaves, stems and roots.

Leaves classification are done according to:

- (a) The number of leaflets present i.e. simple and compound.
- (b) Size of the leaf whether broad and narrow.
- (c) The arrangement of veins in a leaf i.e. Network and Parallel veins.

Functions of a leaf are; Gas exchange, Vegetative reproduction and photosynthesis.

Transpiration is the loss of water from the plant through the leaves. Factors that increase the rate of transpiration are:

- Temperature
- Size of stomata
- Wind

Assessment opportunities

Observation- talk to learners as they carry out the activities. Look at how they are observing the leaf, stem and roots. Are they able to point out some of the structural adaptation of the leaf to its functions? Are they able to relate how different leaves, roots and stems from different habitats are adapted to their functions?

Conversation-ask learners some questions such as; what are some of the functions of the leaves, stems and roots? As they discuss in their respective groups.

Answer to Check your progress 2.2

Refer to learner's book page 37

1. Check for correct modelling.
2. B
3. (a) Tap root and fibrous
 - (b) A- carrots, beet root, pine.
 - B- grass, wheat, rice.
- (c). Anchorage, absorb water and mineral salts.

2.3 Comparison between structures in animals and plants

Activity 2.7 Refer to learner's book page 38

This activity aims at helping learners understand some of the similarities and differences that are in plants and animals. Introduce the lesson by asking learners to name parts of plants and animals they know. You can then divide the class into groups and guide the learners in identify different parts of plants and animals. In Activity 2.7 Let them draw an animal of their choice and discuss in groups some of the parts of the animal and relate it to the plants. Show learners how to represent the information in a Venn diagram and ask them to tabulate the differences observed in form of a table. Summarize the lesson by highlighting the major similarities and differences between animals and plants. Ensure learners take notes in their notebooks and answer the questions in Check your progress 2.3.

Assessment opportunities

Observation-watch as learners work in groups. Are they able to identify some differences between plants and animals?

Conversation-talk to learners as they discuss in their groups. Ask them to represent the information in a table form or in form of a Venn diagram.

Product-look at their diagrams. Are they able to represent the information correctly? Are they able to tabulate the similarities and differences between plants and animals correctly?

Answers to Check your progress 2.3

Refer to learner's book page 39

1. They both have reproductive structures i.e. Ovary.
2. Plants are stationary while animals move.
Plants make their own food while animals feed on other organisms to get food.
Plants reproduce by seeds or spores while animals reproduce by giving birth.

2.4 Level of organisation of living things

Activity 2.8 Refer to learner's book page 39

The term "levels of biological organisation" may confuse most learners. Begin the lesson by asking learners what they understand by the term level of organisation. Allow learners to then express what they think and let them know that biological organisation refers to the way of classifying living things from the smallest to the largest. You can then proceed and group learners into groups. Provide each group with the reference materials such as textbooks and allow them to carry out research

activity on cells, tissues, organs and organ systems. You may also provide them with pictures or photographs for them to look at and identify cells, organs and tissues. As they carry out the research activity, you may go round the class and observe how they work. Pay close attention at how they discuss and note down their findings. Allocate each group 5 minutes to present their findings in class as you moderate their time. Allow each group to compare their findings.

Summarize the lesson by going through all the levels of organisation in animals as learners take points i.e Cells –Tissues – Organs – Organ System. Let them know that human beings are made up of billions of tiny units called cells. For example blood cells, muscle cells and nerve cells etc. Various types of cells are different in their shape and kind of work they perform. Cells of the same kind make a tissue. A collection of muscle cells makes up a muscle tissue. A tissue performs a particular work e.g. nerve tissues carries message to and from the brain. Different tissues make up an organ. Each organ performs separate task e.g. ear is an organ which performs the function of hearing.

Assessment opportunities

Observation-observe at how learners use the reference materials provided to discuss. Various levels of organisation in an organism. Are they able to identify the differences between cells and tissues?

Conversation-talk to learners as they discuss in their groups. Are they able to distinguish between unicellular and multicellular organisms?

Are they able to differentiate between cells, tissues, organ and organ system? Are they able to point out examples of cells, tissues, organs and organ system in a living organism?

Activity 2.9 Refer to learner's book page 43

This is a practical activity and it's aimed at teaching learners the need for transport system in multicellular organisms. Divide the class into groups and allow learners to choose from the materials provided the right material that they think may help them in investigating this activity. Let them go through the procedure and observe as they carry out the experiment on their own. You may go round the class and pay close attention at how they discuss and set up the activity.

Allow them to make mistakes as you correct them. Ask them probing questions such as what's the significance of surface area to volume ratio in multicellular organisms? Remind learners to take notes in their notebooks and answer questions in check your progress 2.4.

Assessment opportunities

Observation-observe as learners set up the experiment. Are they able to identify the right materials for the activity?

Conversation-talk to learners as they carry out the activity. Are they able to calculate the surface area and volume of the potato cubes provided?

Answers to Check your progress 2.4

Refer to learner's book page 45

1. (a) Unicellular organisms for example amoeba and paramecium.
(b) Multicellular organisms for example man, lion, elephant.
2. Cell- white blood cells, root hair cell, nerve cell, red blood cell.
Tissue-muscle tissue, blood tissue.
Organs-heart, lungs, leaf, flowers.
Organ system-Circulatory, excretory, breathing, digestive system.
3. (a) Food and oxygen are transported to all cells of the body so that they can generate energy. The energy enables animal to move and do daily activities.
(b) Waste products generated need to be transported to excretory organs for removal outside the body.
(c) Both plants and animals need food, water and oxygen to perform various functions and survival hence need for a transport system.
4. Rats have a larger surface area to volume ratio while elephants have a smaller surface area to volume ratio. Therefore, gases such as carbon (IV) oxide and oxygen will diffuse faster in rats than in elephants.

Unit 3: Weather, Air and Diffusion

Refer to learner's book page 46-81

Learn about:		Key inquiry questions
<p>Learners should investigate, using dyes, how water moves in plants to introduce the idea of diffusion and mass flow where liquids and gases move from high to low concentrations. This links to the water cycle and learners should understand how weather involves the mass flow of air and how this effects human activities. They should design simple practical activities to identify carbon dioxide and oxygen in the air and understand how air supports burning. They should learn about the states of matter and changes of states, the concepts of atoms, elements, mixtures and compounds, and how water molecules are held together by weak hydrogen bonds resulting in the cohesion of bubbles which aid water flow along tubes such as blood vessels, and how water vapour condenses in clouds prior to falling as rain.</p> <p>Learners should investigate the properties of metals and non-metals and classify them according to their physical characteristics and effect of water on them.</p>		<ul style="list-style-type: none"> • Why is water cycle important in our daily life? • How does weather affect human activities? • How does air support burning? • Why does matter exist in different states? • How can you differentiate atoms, elements, mixtures and compounds? • Why is understanding mass flow and diffusion important? • How can we determine the properties of metal and non metals.
Learning outcomes		
Knowledge and understanding	Skills	Attitudes
<ul style="list-style-type: none"> • Describe water cycle and understand the effects of weather on human activities. • Describe the components of air and their properties and understand that air supports burning. • Explain properties of metals and non metals. 	<ul style="list-style-type: none"> • Observe and explain the changes in state of water, and diffusion. • Test how air supports burning and explain the results. • Test how water diffuses up a plant stem. 	<ul style="list-style-type: none"> • Develop analytical thinking about mass flow and the water cycle. • Co-operation and team work spirit as they work in groups.

<ul style="list-style-type: none"> • Understand the concepts of mass flow and diffusion. 	<ul style="list-style-type: none"> • Predict how water could flow in tubes of different sizes. 	
<p>Contribution to the competencies:</p> <p>Critical and Creative thinking: investigate and conduct simple activities.</p> <p>Co-operation and Communication: group work.</p>		
<p>Links to other subjects:</p> <p>Social Studies: study of the water cycle.</p> <p>Environment and Sustainability: climate change.</p>		

Introduction to the Unit

Learners should investigate, using dyes, how water moves in plants to introduce the idea of diffusion and mass flow where liquids and gases move from high to low concentrations. This links to the water cycle and learners should understand how weather involves the mass flow of air and how this effects human activities. They should design simple practical activities to identify carbon dioxide and oxygen in the air and understand how air supports burning. They should learn about the states of matter and changes of states, the concepts of atoms, elements, mixtures and compounds, and how water molecules are held together by weak hydrogen bonds resulting in the cohesion of bubbles which aid water flow along tubes such as blood vessels, and how water vapour condenses in clouds prior to falling as rain.

Let them investigate the properties of metals and non-metals and classify them according to their physical characteristics.

Competencies to be attained

Co-operation

The principle of cooperation should be listening to understand but not listening to respond. All learners should be given equal opportunities irrespective of their abilities. Ensure every learner enjoys the sense of work regardless of their skin color or physical fitness.

Communication

During group discussion and presentation in class, encourage learners to discuss in English. This will build on the command for the language as well as ability to participate in other discussions. Ask them questions and give them a chance to attempt answering in the simplest way possible. Allow some room for learners to make mistakes and then correct them in a nice way lest they will feel demoralized.

Critical and creative thinking

Introduce the unit by posing general questions to the learners. Let them try to look for answers to these questions. You will make them develop a thinking culture as they try to relate the unit with the questions given to them. These questions should however trigger the idea of what they should expect from the unit. Present photographs and make learners discuss the activities in that photograph. Let them give out their findings, as this will build a thinking habit in them.

Culture and identity

Make learners to research on ways in which they can use the knowledge acquired from the unit in improving the living conditions of their communities. The greatness of a nation lies in the ability of its people to integrate skills and knowledge with national development and growth. Learners should know that knowledge and culture are mutually inclusive.

Cross cutting issues to be incorporated

Environmental awareness and sustainability

Learners should be encouraged to plant more trees. Trees attract rain which affects weather of an area.

Peace and values of education

Throughout the unit, learners are actively involved in discussing issues as a group. Learners should be made 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. Any form of intolerance should be highly condemned.

Life skills

A well-maintained atmosphere equals a fulfilling life. Learners should be sensitized on the need to conserve our environment. They should actively participate in activities such as: National tree planting day, National cleaning day. Learners should be made to understand the need to embrace one another regardless of their cultural background or nationality. Involve them in activities that foster coherence, respect, gender inclusivity and patriotism.

3.1 The water cycle

Activity 3.1 Refer to learner's book page 46

The water cycle describes movement of water, above, and below the earth's surface. Let learners know that the water cycle includes evaporation, condensation, and precipitation. Precipitation is water that falls from the sky, such as snow, rain and hail.

Let them know that water from precipitation adds to groundwater and creates runoff into our rivers, streams, seas, lakes, and oceans. You may then divide the class into pairs and ask the pairs to discuss activity 3.1 in pairs. Let them brain storm and note down their findings. Allow them pairs to compare their findings before leading them in carrying out a general class discussion. Encourage learners to always conserve water which is an important natural resource. Ensure that learners take notes in their notebooks.

Assessment opportunities

Observation-observe the pairs as they discuss.Are they able to explain the processes that takes place in the water cycle?

Conversation- talks to learners as they carry out the activity. Ask them probing questions such as what do you understand by the term transpiration? What is precipitation?

Additional information for the teacher

The **water cycle** is an example of a cycle in nature because it impacts our lives in various ways. Parts of the water cycle include the weather, the amount of water in the atmosphere, the water that we store and use in recreation purposes.

Mass flow and diffusion

Activities 3.2 and 3.3 Refer to learner's book pages 47 and 48

The following activities will involve learners in carrying out practical activities aimed at investigating how mass flow takes place in stems of plant and diffusion. In **Activity 3.2**, introduce the lesson by reviewing the previous lesson on water cycle. You can then allow learners to be in groups and use the materials provided to carry out the activity on their own. Move round the class and observe as learners work in groups. After the activity allow groups to compare their findings and make a short presentation as you moderate their time. You may ask them probing questions such as what can you see when a plant stem is cut? What does this experiment show? Ensure learners take notes at the end of the lesson. For **Activity 3.3**, start the lesson by trying to seek from learners the definition of the term diffusion. Take them through the procedure and let them choose from the materials provided the materials that can be used to set up the experiment. Let them do the activity on their own as you move round the class observing. Ask them probing questions such as; which sates of matter do you think diffusion takes place? Why? Explain. This will enhance critical thinking among learners. Summarize the lesson by telling learner's diffusion is the movement of particles from a region of high concentration to a region of low concentration and it only takes place in liquids and gases.

Assessment opportunities

Observation- look at how learners set up the experiment. Are they able to use the materials correctly?

Conversation- talk to learners as they carry out the experiment. Encourage them to ask questions as you respond to them.

Effects of weather on human activities

Activity 3.4 Refer to learner's book page 49

Most learners come have across the term weather. Introduce the lesson by asking learners to define the term weather and to identify some of the factors that affect weather condition of a given place. You can then proceed further and divide the class into groups. Provide them with reference materials such as textbooks, encyclopedias, journals and newspapers. Let them discuss in their respective groups and compile a report on effects of weather on human activities. Allocate each group 5 minutes to present in class as you moderate their time. You can award each group some points as they present. After the presentation have a general discussion with learners as you point out some of the points that they may have left out. Remind learners to take notes and answer questions in check your progress 3.1.

Assessment opportunities

Observation- observe as learners discuss in groups the effects of weather on human activities.

Conversation - talk to learners as they present in class. Are they able to point out some of the effects of weather on human activities?

Product - look at their reports. Are they able to compile a good report?

Additional information for the teacher

You can bring charts, photographs and pictures in class showing some effects of weather on human activities such as farming, harvesting, ploughing, weeding, drought and floods.

Answers to Check your progress 3.1

Refer to learner's book page 55

1. It facilitates agriculture and sustains aquatic ecosystem.
It results in the distribution of water on the land surface.
It purifies water.
It supports plant growth.
The water cycle promotes human civilization and development.

2. Straws of oat, hay, silage.
3. Dry season.
4. Ploughing, weeding, mulching, watering, harvesting.

3.2 Components of air and their properties

Activities 3.5 and 3.6 Refer to learner's book pages 55 and 56

Begin the lesson with a general discussion about air. Ask learners to define the term air and identify the components of air. You can then allow them to research using textbooks and other reference materials available on components of air and their uses. Let them write a short report and then compare their findings with the rest of the class. Go round the class to ascertain that each learner is doing the activity. Activity 3.6 is about determining the percentage composition of air by volume. Divide the class into pairs and ask them to predict the likely percentage composition of the following gases; oxygen, nitrogen, carbon dioxide and inert gases. Have them note in their notebooks their predictions. You can then allow the pairs to study table 3.1 and compare their results with the ones in the table. Ask them to represent the percentage composition of the gases in form of a pie chart. Go round the class and observe how the pairs calculate and summarize the information obtained in a pie chart. Let them analyse the pie chart and write a summary on how different components of air are distributed based on their percentages.

Assessment opportunities

Observation-look at how the pairs work. Are they able to calculate and draw pie-charts to represent the percentage composition of air by volume?

Conversation-ask learners probing questions such as; which component of air has the highest percentage of air by volume? Which component of air supports life?

Active part of air

Activities 3.7 and 3.8 Refer to learner's book pages 57 and 58

This is a class activity and it involves determining the active part of air. Let learners be in groups and take them through the procedure. Provide them with the materials and let them carry out the experiment on their own. Move round the class observing how learners set up the experiment as you ask them probing questions such as; why do we use sodium hydroxide instead of water? Explain to learners that sodium hydroxide solution is used instead of water because it absorbs carbon (IV) oxide formed when candle burns in air. Ask them to predict what will happen to the candle and the level of water in the bee-hive shelf and trough at the end of the experiment. Let them discuss in their groups and give an explanation on the results obtained.

Research

For activity 3.8 let learners work in pairs. Allow them to go through the procedure as outlined in the learner's book and carry out the activity using the materials provided. Ask them to give their prediction before they start the experiment and at the end of the experiment let them compare their results with their earlier prediction. Ask learners to explain the reason as to why the lime water turned milky at the end of the experiment.

Assessment opportunities

Observation-observe as learners carry out the activity. Are they able to carry out the experiment successfully? Are the results obtained similar to other groups?

Conversation-talk to learners as they carry out the experiment. Ask them probing questions such as; why does the candle go off after sometime? Why does the level of sodium hydroxide in the gas jar rise at the end of the experiment? What does this experiment tells us? Why does lime water turn milky?

Additional information for the teacher

Immediately the gas jar is lowered on the burning candle, it is exposed to a limited air supply. As soon as a certain part of air is exhausted, the candle goes off. This experiment shows that a burning candle does not use up all air, but only a portion of it. Air is, therefore, made up of two parts. One part supports combustion and the other does not. The part that supports combustion is the active part of air; it is called **oxygen**. Sodium hydroxide solution absorbs carbon (IV) oxide produced by the burning candle.

We breathe out Carbon (IV) oxide. When Carbon IV oxide comes into contact with Sodium hydroxide, limewater turns milky.

Answers to Check your progress 3.2

Refer to learner's book page 60

1. Oxygen
2. Refer to page 56 of the learner's book.

3.	Component of air	Uses
	Nitrogen	Used by plants to make nitrates.
	Oxygen	Breathing, germination of seeds, burning substance.
	Inert gases	In bulbs and fluorescent tubes.
	Carbon dioxide	Putting off fire and in photosynthesis

States of matter

Activity 3.9 Refer to learner's book page 61

Activity 3.9 is about identifying the three states of matter. Introduce the lesson by asking learners to discuss what various objects in classroom are made of. Let them write down in their notebooks. Point three learners at random to read the items in their notebooks as others pay close attention. Ask them to suggest which states of matter the items are. Now divide the class into pairs and let them discuss and do the activity in learner's book on their own. Move round the class as you observe how they are identifying different objects within and outside the class. Go round the class to ascertain that they are doing the correct think. Give them an opportunity to ask questions where they find difficulties and assist them where need be.

Activity 3.10 Refer to learner's book page 62

Allow learner's to go outside the class and pick stones of their choices. Provide each learner with a container and let them do the activity as you watch them. Let them compare their results in class. Are their results the same? Allow them to also look at their books, pens, rubber and a coin and compare with each other. Are the items the same? Conclude the lesson by telling learners that solids have fixed shape and fixed volume.

Activity 3.11 Refer to learner's book page 63

Activity 3.11 is a practical activity that involves investigating properties of solids when placed in water. Arrange learners into groups and provide them with the materials required for the activity. Let them go through the procedure and carry out the experiment on their own. Go round the class and observe as they discuss and perform the experiment. Ask them probing questions such as; which objects sinks in water fast? Which one floats in water? Which object takes time before sinking in water? Does their shape change? Why? This will enhance critical thinking among learners. You can then have a general class discussion with learners. Remind them to take notes in their notebooks.

Activity 3.12 Refer to learner's book page 63

Activity 3.12 is about investigating properties of liquid. Arrange learners into pairs. Provide them with the materials needed for the experiment and allow them to carry out the activity on their own. Move round the class and observe as they discuss in pairs and recording their results in their notebooks. Ask them probing questions such as; what are some of the properties of liquids? Let them answer the questions based on what they have observed. Summarize the lesson by leading learners in a general class discussion about liquids.

Activity 3.13 Refer to learner's book page 65

Activity 3.13 about investigating different properties of gases. Start the lesson by

asking learners what happens when a bicycle wheel is deflated? What about a ball which is deflated? Divide the class into pairs and let them discuss the questions. Provide learners with some balloons. Let them blow air and observe what happens to the balloon. Let them explain their observation. You may also come to class with charts showing a deflated balloon, ball, bicycle or car wheel. Listen at how learners discuss in pairs and allow some pairs to present their findings in class. Summarize the lesson by having a general class discussion about properties of gases.

Assessment opportunities

Observation- Observe as learners carry out the experiments on solids, liquids and gases. Are they able to obtain correct results?

Conversation -talk to learners about some properties of solids, liquids and gases.

Matter and mass

Activity 3.14, 3.15 and 3.16 Refer to learner's book page 66, 67 and 68

The above activities shows how different states of matter have a relationship with masses. For **Activity 3.14**, divide the class into pairs and let learners observe the pictures provided. Let them point out from the pictures the following; which object has a greater mass? Which one has the least mass? Let them give reasons and allow them to compare their results with those of other pairs. After the activity ask learners to define the term mass.

In **Activity 3.15**, take learners outside the class and arrange them in groups. Allow them to construct a simple balance using locally available materials within the school and use it to estimate the masses of different substances. Ask them to use the balance constructed to estimate the mass of a liquid using a known mass of a solid. Ensure learners work as a team in their respective groups and encourage them to take notes.

In **Activity 3.16**, provide each pair with a balloon. Let them blow air in the balloon and try to balance the balloons using the balance they constructed in activity 3.15. Allow them to use a pin or any sharp object like a pen to prick one balloon in the balance. Ask them what happens to the balance. Let the pairs brainstorm and give possible explanation to the observation made. Ask learners to tabulate their results by comparing the three states of matter in terms of mass, volume and shape.

Assessment opportunities

Observation -observe as learners work in pairs. Look at how learner's blow air into the balloon and using a balance to estimate masses of different objects.

Conversation -as learners do the activity, you can ask them probing question such as; what happens when a balloon is pricked using a pin or sharp object? Does its mass change? Why?

Product -check that the table they have completed is correct.

Effect of heat on matter

Activities 3.17, 3.18 and 3.19 Refer to learner's book pages 68, 69 and 70

Matter can exist in three different states depending on its temperature. When heat is applied to solids above its freezing point, it begins to melt becoming a liquid. Heat has a direct influence on all matter. Different types of matter react differently when subjected to heat. Heat can bring about changes in temperature, volume, physical properties, state or phase, electrical properties and magnetic properties of a substance. As heat flows into different types of substances, the molecules vibrate rapidly. The rapid vibration of heated molecules causes them to move away from each other, thus making the volume of the substance to increase. **Activity 3.17** is a practical activity and it seeks to teach learners the effect of applying heat on candle wax or candle. Provide learners with the materials needed for the experiment and let them carry out the experiment on their own in pairs. Move round the class and observe how the pairs discuss and design the experiment. Ask learners to come up with a different design of setting up the experiment.

For **Activity 3.18**, divide the class into groups. Ask the groups to go through the procedure as outlined in learner's book. Provide them with the materials and let them carry out the activity on their own. Move round the class to ascertain that each group are doing the experiment. Ask them probing questions such as; what happens when ice is heated? What happens when liquid water is left in a refrigerator overnight? Explain. Summarize the lesson by having a general class discussion. Make sure that the learners are clear to the task.

In **Activity 3.19** learners are required to determine what happens when water is heated. Allow learners to work in groups. Provide each group with the materials required for the experiment such as the candle, stove, water, cooking pot and a lid. Let them go through the procedure on their own and carry out the activity on their own. Go round the class and observe as the groups work. Ask them probing questions such as; what happens when water is heated? What forms on the lid after sometime? This will enhance critical thinking amongst learners. Summarize the lesson by telling learners that when water is heated, it changes to gas and it cools to form liquid in a process called **condensation**. Encourage learners to take notes and answering the questions in check your progress 3.3.

Assessment opportunities

Observation -observe as the groups and pairs carry out the activity. Are they able to design the experiment correctly?

Conversation -talk to learners as they carry out the activity. Ask them probing questions such as; how does solid change to liquid? What is condensation? What happens when water is heated?

Product -look at the answers provided in check your progress 3.3.Are they correct?

Answers to Check your progress 3.3

Refer to learner's book page 71

1. Solids, liquid and gases.
2. W-melting
X-evaporation
Y-condensation
Z-freezing
3. C
4. Melt
5. C
6. Space, mass
7. In cold water, the balloon will reduce in size while in warm water the balloon will increase in size. When in cold water the temperature is low and this results to the balloon contracting. In warm water, the air expands in the balloon making the balloon to increase in size.

3.4 Atoms, elements, molecules, compounds and mixtures

Activity 3.20 Refer to learner's book page 72

Different kinds of matter can be made to combine together in two ways to form complex substances. They can be brought together in any proportion to form a **mixture** or they can be heated or allowed to react chemically to form a **compound**.

In this activity, learners are challenged to carry out a research using the reference materials provided such as textbooks and Internet on atoms, element, mixture and compounds. Ask the learners to base their research on definition of atoms, element, mixtures and compounds. They should give an example in each case and how the molecules are bonded to each other. Let them also state if they can be split and if they can take part in a chemical reaction. Move round the class and observe how each learner carries out the activity. Challenge learners to ask questions where they don't understand. Allow each learner to compile a report based on his or her findings and allow them to present in class as you moderate their time.

Assessment opportunities

Observation -observe as learners use the reference materials to carry out the activity. Are they able to differentiate between an atom and an element?

Molecules, compounds and mixtures

Activity 3.21 *Refer to learner's book page 74*

For activity 3.21, divide the class into groups. Take them through the procedure and then allow the groups to choose from the materials provided the right material required for the activity. Let them do the activity on their own as you observe. Allow them to do mistakes as you correct them. This will make them understand the activity well. Ask the groups probing questions as they proceed with the experiment such as; what happens when salt is placed on water and stirred for some time? How can we recover our salt back from the solution? Explain. This will trigger learners to think critically. Encourage learners to take notes and summarize the lesson by asking learners to design a similar experiment using sugar. Let them compare the two experiments and present in class during the next lesson.

Assessment opportunities

Observation -talk to learners as they carry out the activity. Look at how learners put salt and stir it in water to form a solution.

Conversation -ask learners probing questions such as; what happens when a solution of salt is heated?

The structure of water molecule

Activity 3.22 *Refer to learner's book page 76*

Activity 3.22 involves determining the structure of a water molecule. Allow learners to work individually using the reference books provided and note down their findings in their notebooks. Ensure learners draw the structure of water molecule in their notebooks and let them compare with the drawing of other learners within the class. Provide one learner a chalk to draw his or her drawing on the black board. Ask him or her probing question such as; why is the structure of water molecule so? Let him or her explain. You may also pose the question to class and listen at how they respond to the question. Summarize the lesson by stressing to learners that a water molecule is made up of two hydrogen bonds and an oxygen atom held together by hydrogen bonds.

Assessment opportunities

Observation - observe how each learner progresses with the research. Is he or she able to draw the structure of a water molecule?

Product - look at their diagrams. Do their drawings reflect the structure of water molecules in textbooks?

Answers to Check your progress 3.4

Refer to learner's book page 77

1. An **atom** refers to the smallest particle of an element that can take part in a chemical reaction while elements are pure substances which cannot be split into anything simpler by chemical process.
2. A **mixture** refers to two or more substances that are not chemically combined while a **compound** refers to a substance that is made up of two or more elements combined together by chemical means.
3. (a) Compound
(b) Compound
(c) Compound
(d) Compound
4. Hydrogen bonds

3.5 Metals and non-metals

Refer to learner's book page 78

Metals are defined as a class of elements that are solid at room temperature, have a greyish color, a shiny surface, good conductors of heat and electricity and can be pounded into various shapes. Non-metals are elements that lack luster, do not conduct electricity or heat and that are not ductile i.e. are able to be drawn into thin wire or malleable i.e. can be flattened into sheets.

Activity 3.23 is a practical activity and is aimed at teaching learners the differences between a metal and a non-metal. Arrange learners into groups and let them choose from the materials provided the materials that suit this activity. Take them step-by-step through the whole procedure and allow them to carry out the activity on their own as you observe. Are they able to set up the experiment as the one shown in the picture in learner's book? Go round the class and pay close attention at how they discuss and set up the experiment. Ask probing questions such as; does a piece of chalk conduct electricity? Why? What about iron? Explain. Ask learners to tabulate their results in the table drawn in learner's book. Allow them to carry the whole activity on their own and assist them where they need help. Let them compare their results with those of other groups and ensure learners take notes and answer the questions in check your progress 3.5.

Assessment opportunities

Observation -observe as learners set up a simple electric circuit. Are they able to design the experiment?

Conversation -talk to learners as they carry out the experiment. Ask each group to connect the switch and observe if the bulb lights.

Product - Check that the tables they have completed are correct.

Answers to Check your progress 3.5

Refer to learner's book page 81

1. Wood-non metal
Gas-non metal
Plastic-non metal
Iron-metal
Copper-metal
Water-non-metal
2. Refer to learner's book page 79 – 80
3. Wires, bulbs, cells
 - Wires are good conductors of electricity. They are able to conduct the energy stored in cells and make the bulb light.
5. Hot metallic container is a good conductor of heat.

Unit 4: The Earth and Space

(Refer to learner's book page 82-92)

Learn about		Key inquiry questions
<p>Learners should investigate and discuss the Earth in relation to its orbit round the sun. They should draw on information obtained from books and the internet to help their understanding about the seasons.</p> <p>Learners should know about the rotation of the Earth which create day and night and how the orbit round the sun and the axis creates seasons. They should be able to explain how the seasons in South Sudan are different from those in countries near to the poles.</p>		<ul style="list-style-type: none"> • How do we learn about the solar system? • How are seasons formed and why are they different at the poles from the equator?
Learning outcomes		
Knowledge and understanding	Skills	Attitudes
<ul style="list-style-type: none"> • Understand the Earth and space in relation to solar system. • Understand the seasons of the year. 	<ul style="list-style-type: none"> • Observe the different changes of the seasons in a year. • Record observation in an appropriate way. 	<ul style="list-style-type: none"> • Appreciate the relationship of the Earth to the Sun in relation to the change of seasons.
<p>Contribution to the competencies:</p> <p>Critical and Creative thinking: different activities carried by the people in different seasons of the year.</p> <p>Co-operation and Communication: group work.</p>		
<p>Links to other subjects:</p> <p>Social Studies: The seasons.</p>		

Introduction to the Unit

Earth and space explores the interconnections between the land, ocean, atmosphere, and life of our planet. These include the cycles of water, carbon, rock, and other materials that continuously shape, influence, and sustain Earth and its inhabitants. It also explores the cyclical interactions between the earth system and the sun and moon. Earth is the third planet from the sun. It is the only planet known to have an

atmosphere containing free oxygen, oceans of liquid water on its surface, and, of course, life. Earth is the fifth largest of the planets in the solar system.

Competences to be attained

1. Co-operation

Encourage learners to work as a team through group discussions. Allow learners to freely interact with one another. Let them associate with one's culture and abilities through resources sharing and exchange of ideas.

Communication

During group discussion, encourage learners to discuss in English. This way will build on the command for the language as well as ability to participate in other discussions. Ask them questions and give them a chance to attempt answering in the simplest way possible. This way, they will build on their confidence and soon develop the love and passion for the subject. Allow some room for learners to make mistakes and then correct them in nice way lest they will feel demoralized.

While studying the earth and space, learners will be provided with an opportunity to engage in scientific inquiry process aimed at enabling them to make observations, gather data, ask questions and draw conclusions about world around them. Learners will be able to explore the relationship between Science and technology and identify ways in which science can be used for human progress and development.

Cross cutting issues

1. Environmental awareness and sustainability

The earth's atmosphere protects us like a blanket from dangerous radiation from the sun. We should therefore protect the air, vegetation, waer and soil form getting polluted.

2. Peace and values of education

Throughout the unit, learners are actively involved in discussing issues as a group. Learners should be made aware of the need to accommodate everyone's ideas and opinions. Through the 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. Any form of intolerance should be highly condemned.

3. Life skills

While studying the earth and space, learners will be provided with an opportunity to engage in scientific inquiry process aimed at enabling them to make observations, gather data, ask questions and draw conclusions about

world around them. Learners will be able to explore the relationship between science and technology and identify ways in which science can be used for human progress and developments.

4 Critical and creative thinking

Introduce the unit by posing general questions to learners. Let them try to look for the answers to these questions. This will make them develop a thinking culture as they try to relate the unit with the questions given to them. These questions should however trigger the idea of what they should expect from the unit. Present photographs of planets and make learners discuss the arrangements of planets in the solar system.

5. Culture and identity

Make learners research on ways in which they can use the knowledge acquired from the unit in improving the living conditions of their communities. The greatness of a nation lies in the ability of its people to integrate skills and knowledge with national development and growth. Learners should know that knowledge and culture are mutually inclusive.

4.1 The earth as part of the universe

Activity 4.1 *Refer to learner's book page 82*

Activity 4.1 involves observing the sky by learners and identifying some components of the solar system. Allow learners to go outside the class and observe the sky. Let them write down what they can see. Caution them not to look at the sun directly since it may damage their eye sights. You may provide them with some dark lenses that they may use to observe the sky. Let them also carry the same activity at home during the night and note down what they have observed. You may also provide them with resource materials such as textbooks and allow them to carry out research on the solar system.

Activity 4.2 *Refer to learner's book page 82*

Activity 4.2 arrange learners into groups and let them observe the picture of the solar system. Let them discuss in their respective groups and identify different planets and their characteristics. Ensure that learners complete filling the table and allow them to compare their results with those of other groups. As they discuss you can move round the class and observe how learners work. Pay close attention at how they are identifying different characteristics from the picture. You can ask them probing questions such as, which planet has rings around it? Which is the biggest planet from the picture? You can then carry out a general discussion with learners. Summarize the lesson by telling learners that the solar system is made up of eight planets, the sun, the moon and other heavenly bodies like asteroids and comets.

Additional information for the teacher

You can bring charts and pictures to class having the picture of the solar system for learners to observe.

Let learners know that as we go deeper and deeper into the earth towards the core, it becomes hotter. It is so hot that rocks and minerals are melted.

Assessment opportunities

Observation-look at how learners work in groups. Are they able to identify the planets in the picture.

Communication- talk to learners as they discuss and observe the sky. Ask them what can you see from the sky?

Product-look at the table completed by learners. Have they completed the table correctly? Have they identified the characteristic of each planet correctly?

Answers to check your progress 4.1

Refer to learner's book page 86

1. Round like a ball i.e spherical
2. Molten rocks called magma.
3. Axis.

4.2 Rotation of the earth

Activity 4.3 *Refer to learner's book page 86*

The Activity involves a practical activity that seeks to teach learners how rotation of the earth takes place. Introduce the lesson by asking learners to describe the structure of the earth. You can then divide the class into different groups and provide them with the materials required for the experiment. Let them go through the procedure on their own as outlined in learner's book page 86 as you observe how they work. Ask them probing questions such as; what do you understand by the term rotation of the earth? What are some causes of rotation of the earth? Summarize the lesson by telling learners that the earth rotates from west to east and it causes days and night. Encourage learners to take notes in their notebooks and answer questions in check your progress 4.2.

Assessment opportunities

Observation-observe as learners work in groups. Are they able to model the earth rotating on its axis?

Conversation-listen as learners discuss in groups. Are they able to communicate effectively as they carry out the activity?

Product-look at their models. Do they depict the earth rotating in its axis?

Answers to Check your progress 4.2

Refer to learner's book page 88

1. Refer to learner's book page 87.
2. Rotation, axis, days, night.
3. West, east.
4. (a) True
(b) False
(c) False
(d) False
(e) True
(f) False.

4.3 Revolution of the earth

Activity 4.4 Refer to learner's book page 89

Activity 4.4 involves investigating how revolution of the earth takes place round the sun. Allow learners to be in groups and let them pick the materials that they may need for this activity as you observe. Move round the class and observe how learners are discussing and coming up with their models. Ask them questions such as; how can you move the earth round the sun? How does the earth move? What is the name given to the path the earth follows as it revolves round the sun? Challenge learners to come up with other ways in which they can model the solar system. Summarize the lesson by telling learners that revolution of the earth causes seasons such as winter, summer, autumn and spring. Ensure learners take notes and answer questions in check your progress 4.3.

Answers to Check your progress 4.3

Refer to learner's book page 92

1. Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.
2. Rotation of the earth is the spinning movement of the earth on its own axis while revolution is the movement of the earth around the sun.
3. Day and night, Seasons.
4. Summer and winter.

Unit 5:**Light, Heat and Sound**

Refer to learner's book page 93-118

Learn about		Key inquiry questions
<p>Learners should discuss and design simple investigations, which draw on their prior learning about mirrors and glass, to develop the concepts of reflection and refraction of light. They should use torches to investigate how light travels through some objects but not others and design tests to measure the level of opaqueness of thin paper. This should enable them to understand that light travels in straight lines and through some materials and not others.</p> <p>Learners should build on their learning about light to investigate how heat moves or is transferred through different materials. This should develop an understanding about conductors and insulators and they should design fair tests of to measure the heat loss of hot water in containers with different levels/types of insulation.</p> <p>Learners should build on their understanding about the characteristics of light and heat and design practical investigations to explore the nature of sound, how it travels through different materials (air, water and solids), and the notion of insulation.</p>		<ul style="list-style-type: none"> • How does light and sound travel through different media? • Why should we study the concepts of reflection and refraction of light? • How do we measure heat and what units do we use?
Learning outcomes		
Knowledge and understanding	Skills	Attitudes
<ul style="list-style-type: none"> • Understand the concepts of reflection and refraction of light. • Understand how light and sound travel through different media. 	<ul style="list-style-type: none"> • Predict how light, sound and heat travel. • Design fair tests to check their predictions. • Use appropriate measuring instruments. 	<ul style="list-style-type: none"> • Appreciate the importance of reflection and refraction of light.

<ul style="list-style-type: none"> • Understand the concept of heat and how it measured. 	<ul style="list-style-type: none"> • Record and analyse results in an appropriate way. • Draw conclusions based on their evidence. • Evaluate the effectiveness of their tests. 	
<p>Contribution to the competencies: Critical and Creative thinking: though investigations. Communication and Co-operation: group work.</p>		
<p>Links to other subjects:</p>		

Background information

In the previous classes, learners have come across light. They have learnt about sources of light, making shadows and uses of light. In this class, learners will explore more on light. They shall find out how light travels and what happens to it when it falls on different materials. They shall also learn more about reflection and refraction of light. They will learn more on how to design simple investigations, which draw on their prior learning about mirrors and glass, to develop the concepts of reflection and refraction of light. Learners should build on their learning about light to investigate how heat moves or is transferred through different materials. This should help them develop an understanding about conductors and insulators and they should design fair tests to measure the heat loss of hot water in containers with different levels/types of insulation. Learners should build on their understanding about the characteristics of light and heat and design practical investigations to explore the nature of sound, how it travels through different materials (air, water and solids), and the notion of insulation.

Competences to be attained

1. Co-operation

Encourage learners to work as a team through group discussions. Allow learners to freely interact with one another. Let them associate with one's culture and abilities through resources sharing and exchange of ideas as they discuss in pairs or in groups.

2. Communication

During group discussion, encourage learners to discuss in English. This way will help them build on the command for the language as well as ability to participate in other discussions. Ask them questions and give them a chance to attempt answering in the simplest way possible. This will help them build on their confidence and soon develop the love and passion for the subject. Allow some room for learners to make mistakes and then correct them in nice way lest they will feel demoralized.

3. Critical and creative thinking

As learners do the experiments on light, heat and sound, provide an opportunity for learners to design their own experiment and record their observation and results. You may also present pictures and photographs to guide learners design other experiments.

Culture and identity

Make learners to research on ways in which they can use the knowledge acquired from the unit in improving the living conditions of their communities. The greatness of a nation lies in the ability of its people to integrate skills and knowledge with national development and growth. Learners should know that knowledge and culture are mutually inclusive.

Cross cutting issues

4. Environmental awareness and sustainability

The Ozone layer in the atmosphere protects us from direct dangerous rays of the sun. When the air is polluted, the Ozone gets depleted. Air pollution should therefore be controlled. **Caution** learners should not to look at the sun directly as this can cause damage to the eyes. They should use dark glasses or expired films to observe the sun.

5. Peace and values of education

Throughout the unit, learners are actively involved in discussing issues as a group. Learners should be made aware of the need to accommodate everyone's ideas and opinions. Through the 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. Any form of intolerance should be highly condemned.

6. Life skills

A well-maintained atmosphere equals a fulfilling life. Learners should be sensitized on the need to conserve our environment. They should actively participate in activities such as: National tree planting day, National cleaning day. Learners should be made to understand the need to embrace one another regardless of

their cultural background or nationality. Involve them in activities that foster coherence, respect, gender exclusivity and patriotism.

5.1 Light

Activities 5.1 and 5.2 Refer to learner's book pages 93 and 94

Activity 5.1 is a practical activity that involves carrying out an experiment aimed at determining properties of light. Divide the class into pairs and provide learners with the required materials for the experiment. Take them through the procedure and allow the pairs to carry out the activity on their own. Pay close attention at how learners look at the source of light from the candle. Ask them if they are capable of observing light using a bent tube. Let them relate to the straight tube. Let learners give their findings based on the observation made. Summarize the lesson by telling learners that light are a form of energy and it travels in a straight line and in all directions.

In **Activity 5.2**, learners are to set an experiment to demonstrate how light travels in a straight line. Divide the class into pairs and provide them with the materials required for the experiment. Allow them to go through the procedure and set up the experiment as shown in the pictures on their own. Ask them probing questions such as; what does this experiment tell you about light? Go round the class and pay close attention at how the pairs discuss and perform the experiment. Are they able to set the experiment on their own? Ask learners to identify other ways that can be used to design an experiment that shows light travels in a straight line.

Encourage learners to copy notes in their notebooks and summarize the lesson by telling learners that the above experiment shows that light travels in a straight line.

Assessment opportunities

Observation- look at how the pairs observe light. Are they able to show that light travels in a straight line?

Conversation- talk to the pairs as they perform the experiment. Ask them if they can observe the light from the candle through the holes in the cardboard.

Effects of different materials on light

Activities 5.3, 5.4 and 5.5 Refer to learner's book pages 96, 98 and 99

The following activities involves a practical investigation aimed at finding out how light behaves when it falls on different media. Divide the class into groups for **activity 5.3** and in pairs for **activity 5.4 and 5.5**. Allow learners to collect different types of materials such as carton box, thin piece of wire, polythene paper, leaves and piece of wood outside the class and let them bring to class. For **Activity 5.3**, introduce the

term “opaque” to describe a material through which light cannot pass. Ask learners to choose from the materials in their desks the types of materials that they think are opaque. Ask them to write them down and provide each group with a torch. Ask them probing question such as how can we tell that the materials listed are opaque? Let them discuss and use the torch provided to design an experiment to prove that the materials listed are opaque. In **Activity 5.4**, introduce the term “translucent” to describe a material which allows only some light to pass through. Take learners through the procedure and allow them to carry out the activity on their own as you observe. Move round the class after sometime and choose a pair at random. Provide the pair with a clean sheet of paper. Ask pair probing question such as; how can you show that the paper provided is translucent? Observe at how the pair do the experiment and correct them where need be. Ask learners to design an experiment that will show if an object is transparent? In **Activity 5.5**, allow learners to work in pairs and let them use the results recorded in the previous activity to complete the table. Let them classify the materials as either transparent, translucent or opaque. Allow the pairs to compare their findings and allow them to present in class. Lead them in having a general class discussion and remind learners to take summary notes at the end of the activity.

Assessment opportunities

- Observation** - observe as learners collect different materials within the school compound. You can also observe how learners use the above materials to demonstrate effect of light on different materials.
- Conversation** - talk to learners as they carry out the activity. Ask them questions such as; do all materials allow light to pass through? Why?
- Product** - check that the tables completed by learners on effect of light on different materials are correct.

Additional information to the teacher

- Any solid or liquid through which light can travel is **transparent**. Clear glass, water, clear polythene are examples of transparent materials. We use transparent materials where clear vision is needed such as in spectacles, car windscreens and house windows.
- Any solid or liquid is said to be **opaque** if it blocks all light. For example walls of buildings. We use opaque materials where we do not want anyone to see through. Opaque materials can be used to block vision where total privacy is required.
- **Translucent** materials scatter light as it passes through. The result is that we cannot see objects through them clearly. Translucent materials come in handy

where we need some light through and yet attain some degree of privacy, for example in the bathroom.

Reflection of light

Activities 5.6 and 5.7 Refer to learner's book page 99-102

Introduce the lesson by shining some sunlight into the classroom using a mirror, Activity 5.6 Ask learners to state other materials that are able to reflect light. Provide each learner with a mirror and take him or her outside the class. Let them shine the mirror to the class room wall. You can then allow the pairs to play a game of chase my patch in Activity 5.7. Observe at how learners play a game of chase my patch and have them record their observation in their exercise books and compare their results with the class. Back in class ask learners to give an explanation on the reflected light on the wall. Allow them to discuss in groups and ask each group to present their findings.

Explain that after the sunlight falls on the mirror, it bounces off and travels into the classroom wall. Encourage learners to copy notes in their exercise books.

Assessment opportunities

Observation-look at how learners reflect light on the classroom wall and how they play a game of chase my patch in pairs.

Conversation-talk to learners as they play a game of chase my patch.

Additional information for the teacher

- When light falls on shiny surfaces, it is reflected. If the reflecting surface is smooth, we get regular reflection which results in an image being formed inside the mirror.
- Many mirrors are made of glass which has been painted with aluminum or silver coating. However, some of the best mirrors are made of highly polished metal. Such metal mirrors are usually made only for scientific studies. Some every day uses of mirrors include dressing mirror and rear mirrors in cars.

Refraction of light

Activity 5.8, 5.9 and 5.10 Refer to learner's book pages 102, 103 and 105

Activity 5.8, 5.9 and 5.10 are all practical activities involving refraction of light and formation of rainbow. For **activity 5.8**, divide the class into groups. Provide each group with a glass and some water. Explain the experiment to the class and ask learners to follow the steps in the procedure to design an experiment to demonstrate refraction of light. Ask learners to choose an object of their choice such as a pen, pencil, ruler or

a stick. Check that each group has followed the steps correctly. Move round the class and ask each group to demonstrate how they carried out the experiment. You can also look through to ascertain that the experiment designed in deed demonstrates refraction of light. You can then ask the groups to compare their findings.

In Activity 5.9, allow learners to work individually and carry out the experiment as outlined in learner's book. Let the learner investigate the formation of a rainbow using the material provided and compare his or her result with those of other learners. Allow some learners to present their observation in class. Remind learners the mnemonic used to remember the order of rainbow colours i.e. ROYGBIV which stands for **Richard of York Gave Battle In Vain** whereby the mnemonics stand for the colours Red, orange, yellow, green, indigo and violet.

Activity 5.10, involves forming a rainbow from a mirror. Arrange learners into groups and provide them with the materials required for the experiment. Take them through the procedure and allow them to carry out the experiment outside the class as you observe. Ask learners to record their observations and summarize the lesson by telling learners that when a basin with water is placed in sunshine with a mirror on it, the sun's rays hit the mirror in water resulting to the formation of rainbow.

Assessment opportunities

- Observation** - observe as learners work in groups. Are they able to demonstrate formation of rainbow using the materials provided?
- Conversation** - talk to learners whilst they are performing the activity. Can they design another experiment to demonstrate formation of rainbow?
- Product** - look at their experiments and their observations. Does their experiments result to formation of rainbow? Are their observations correct?

Additional information for the teacher

- When light travels in a uniform medium such as air, it follows a straight path. However when it enters another different material such as water, bending occurs at the boundary. This bending of light as it moves from one material to another is known as **refraction**.
- Rainbows are formed as a result of refraction of light. This happens when rays of light pass through water droplets. The water drops behave as tiny prisms. Prisms disperse white light into the seven colours, which we call rainbow.

Answers to check your progress 5.1

Refer to learner's book page 106

1. B
2. Light travels in a straight line.
3. C
4. We could not see things around us.
5. B
6. Refraction
7. Sunlight and rain (rain and sun)
8. C
9. A

5.2 Heat

Materials that allow heat to flow through them are known as good conductors of heat or heat conductors such as iron, aluminum, copper, silver, brass, lead and stainless steel. Metals are better conductors because they contain free electrons which move through the metal easily. They gain the kinetic energy from collisions with hot atoms and pass on the energy when they collide with cold atoms. This results to transfers of heat more quickly. Different metals vary in terms of conducting heat. For example, copper conducts heat faster than aluminum while aluminum conducts heat faster than iron.

Materials that do not allow heat to flow through them are known as bad conductors of heat or heat insulators. Insulators are poor conductors of heat. The poor conductors are good insulators and they are materials that heat cannot travel through. Heat insulators include wood, glass, paper, cotton wool, rubber, liquids, plastic, cork, vacuum and gases especially air. People benefit from air as an insulator material in keeping the heat in the cold countries and air is usually used in making the insulating glass windows. The insulating glass window is made by bonding two glass sheets and leaving a space filled with the air between them to prevent the leakage of the heat.

Activities 5.11, 5.12 and 5.13 Refer to learner's book pages 107 and 109

Organize learners into groups and pairs to carry out the activities as suggested in the learners' book. Guide them in following the laid out procedures. Caution learners to be careful when handling fire. Ensure learners do the experiment on their own and you move from group to the next observing their results. Ensure learners take notes.

Good and poor conductors of heat

Activity 5.14, 5.15 and 5.16 Refer to learner's book pages 110 and 112

Activity 5.14 is a practical activity and is aimed at investigating good and poor conductors of heat. Divide the class into groups and provide each group with materials required for the experiment. Guide them through the procedure and allow them to carry out the activity on their own. Go round the class and observe how the groups work. Ask probing questions such as; which materials conduct heat? Which material does not conduct? Why is this so? Explain. Make sure learners copy notes in their notebooks and summarize the lesson by telling learners materials that conduct heat are referred to as **good conductors** of heat while materials that do not conduct heat are known as **poor conductors**.

Activity 5.15 involves learners carrying out a research aimed at identifying some uses of good and poor conductors of heat. Provide learners with reference materials such as textbooks and allow them to carry out research on their own. Move round the class and observe how learners work. Allow them to compare their findings and make a presentation in class as you moderate their time. You can then have a general class discussion and encourage learners to take short notes in their notebooks.

Activity 5.16 is about measuring heat loss. Arrange learners into groups and provide them with the materials. Take them through the procedure step by step and allow the groups choose from the materials provided the materials that suit this activity. Let them discuss in their respective groups and set up the experiment. Ask each group to copy the table in learner's book and record their observations. Allow the groups to compare their work and allocate each group 5 minutes to present their findings in class. You can then have a general class discussion as learners take notes in their notebooks

Assessment opportunities

Observation- Check how learners work in groups. Are they able to set up the experiment on their own?

Conversation- talk to learners whilst they do the activity. Can they differentiate between good and poor conductors of heat?

Product-check that the values being recorded in the table are correct.

Additional information for the teacher

- Aluminum, copper and stainless steel are good conductors of heat as they are metals. They are used in making cooking pots and kettles that are used in the houses and the factories. The cooking pots get heated up quickly and the food can be cooked efficiently in shorter time.

- Plastic and wood are heat insulators. They are used in making the handles of the cooking pots, iron box and kettles. They help in holding them comfortably.
- Wool is a heat insulator which is used in making the heavy blankets and the wooden clothes. They are used during winter to keep the body warm and prevent leakage of heat. The hair and the fur of animals are bad conductors of heat and they protect them from cold.
- Vehicles carrying inflammable materials such as petrol are covered with materials that are bad conductors of heat to prevent petrol from heating up and catching fire.
- Building materials like the bricks, asbestos and mud are bad conductors of heat. They do not permit
- Heat and cold to pass through the walls of the bricks. The building materials keep the houses warm during winter and cool during summer because the roof sheds are made of asbestos for the same reason.

Answers to Check your progress 5.2

Refer to learner's book page 113

1.	Good conductors of heat	Poor conductors of heat
	Stainless steel	Wood
	Copper	Paper
	Aluminum	Rubber
	Iron	Plastic
	Brass	Cotton wool

- (a) Iron
(b) Air
(c) Hardened plastic
- They are insulators hence cannot conduct heat.
- Radiation
- Convection
- Marble 4

5.3 Sound

Activity 5.17 *Refer to learner's book page 115*

This is a practical activity involving investigating sound as a source of energy. Allow learners to work in groups. Provide them with the required materials such as a drum, small seeds and a stick. Let them read through the procedure and carry out the activity on their own as you observe. Ask them questions such as; why do small seeds vibrate when the drum is hit? How do the seeds vibrate when a drum is hit hard or slowly? Ask learners to come up with other ways of investigating sound as a source of energy and remind them to take notes in their notebooks.

Activity 5.18 *Refer to learner's book page 115*

This is also a practical activity involving investigating how sound travels in different materials. Allow learners to be in groups and provide them with the materials required for the experiment. Ask them to go through the procedure as outlined in learner's book and make a string telephone model. Let them use the string telephone model to communicate with each other. Ask them some questions such as; can you hear when one speaks in through the model? What do you hear when one hits a desk? How does sound travel in different media? This will trigger critical thinking among learners. Ask learners to design another experiment at home with the help of their parents and let them come with different models to class. Allow them to compare different models and use them to communicate. In activity 5.19 explain to learners how light can travel through liquids. Encourage learners to copy notes in their notebooks and summarize the lesson by telling learners that sound travels faster in solids compared to gases.

Activity 5.20 *Refer to learner's book page 118*

You may lead learners in carrying out a class discussion on importance of sound insulation. Begin the lesson by asking learners to give some examples of places that have a lot of noise. You may write their responses on the blackboard. Ask them to also mention places or institutions that are always silent. Let learners give their responses and write them on the blackboard. You may let them have an open discussion on the importance of sound insulation. Remind learners to copy notes in their notebooks and answer questions in check your progress 5.3.

Assessment opportunities

- Observation** - talk to learners as they carry out the activity. Look at how they make their string telephone models and how they discuss in groups.

Conversation - ask learners questions such as; in which medium does sound travels the fastest?

Product - check at the answers provided by learners in check your progress 5.3. Are they correct?

Additional information for the teacher

- Sound waves need to travel through a medium such as a solid, liquid, or gas.
- Sound waves move through each of these mediums by vibrating the molecules in the matter.
- The molecules in solids are packed very tightly. Liquids are not packed as tightly as solids. And gases are very loosely packed. The spacing of the molecules enables sound to travel much faster through a solid than a gas.
- Sound waves travel about thirteen times faster in wood than air. They also travel faster on hotter days as the molecules bump into each other more often than when it is cold.
- Sound is a vibration – it needs something to pass on these vibrations (unlike light which can pass through a vacuum). Some materials allow sound to pass through them very easily, especially hard rigid ones like metals.
- Other materials, especially soft ones like cotton wool, absorb sound.
- Ears are delicate and need to be looked after. They can easily be damaged in various ways: by very loud sounds especially if over a long time; by poking things in them; through old age or some disease. Most pop stars wear ear plugs to prevent damage of their ears by excessive sound.

Answers to Check your progress 5.3

Refer to learner's book page 118

1. Energy, vibrates, volume.
2. Sound travels through air, reflected sound called echo.
3. Bats
4. Hospitals, learning institutions and court rooms because sound is always insulated.