

PROTOTYPE



**NCDC**  
NATIONAL CURRICULUM  
DEVELOPMENT CENTRE



# GENERAL SCIENCE

## TEACHER'S GUIDE

### SENIOR ONE



LOWER SECONDARY  
CURRICULUM





# GENERAL SCIENCE TEACHER'S GUIDE

## SENIOR ONE



LOWER SECONDARY  
CURRICULUM



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This material has been developed as a prototype for implementation of the revised Lower Secondary Curriculum and as a support for other textbook development interests.

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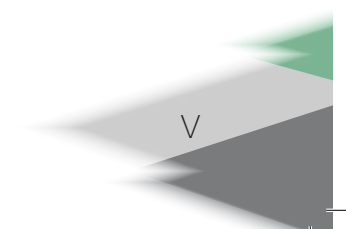
## Preface

This Teacher's Guide has been designed to enable you to interpret the revised curriculum and use the accompanying Learner Book effectively. The Teacher's Guide provides guidance on what is required before, during and after the teaching and learning experiences.

To ease your work, all the activities and instructions in the Learner's Book have been incorporated in this guide but with additional information and possible responses to the activities. The guide has been designed bearing in mind the major aim of the revised curriculum which is to build in the learner the key competences that are required in the 21st century while promoting values and attitudes and effective learning and acquisition of skills, and to prepare the learners for higher education and eventually the world of work.

**Associate Professor Betty Ezati**

Chairperson, NCDC Governing Council



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Last but not least, NCDC would like to acknowledge all those behind the scenes who formed part of the team that worked hard to finalise the work on this Teacher's Guide.

NCDC takes responsibility for any shortcomings that might be identified in this publication and welcomes suggestions that may effectively address the inadequacies. Such comments and suggestions may be communicated to NCDC through P. O. Box 7002 Kampala or email: [admin@ncdc.go.ug](mailto:admin@ncdc.go.ug).



**Grace K. Baguma**

Director, National Curriculum Development Centre



## Note to the Teacher

The General Science Syllabus for which the Learner's Book and this Teacher's Guide are prepared has been designed for a special category of learners with learning difficulties and cannot do the conventional laboratory experiments. You should therefore ensure that you use your experience in order to help these learners achieve the aims of the syllabus since much of the content is related to the main stream science subjects. Models, audios, pictorials and any other suitable forms of instructional materials are highly encouraged.

The new Learner's Book and Teacher's Guide follow the competence-based approach to learning as provided for in the new General Science syllabus. So what is the competence-based approach?

A competence is what enables someone to correctly perform a complex task. Take note that competence should not be confused with performance or competition. Although a good performer is referred to as the best in terms of outcompeting other learners sometimes in unhealthy circumstances, a competent learner is one who has been prepared through the curriculum to be able to know how to deal with daily life problems. For the learner to be able to be competent later in life means that you as the teacher must provide him/her with the tools which are called **resources** and teach him/her how to use these resources to solve a problem situation/activity/task.

The competence-based approach requires that competences should be clearly identified at the beginning of the chapter and assessed at the end. Based on these competences, we define what the learner needs to acquire in terms of the knowledge, which become the objectives and activities. Show the learner what this knowledge is good for and then finally give the learner situations so as to be able to put into practice what has been learnt. These situations should be related to their everyday lives.

The Teachers' Guide will be used alongside the Learner's Book. As a teacher, you should ensure that you are familiar with the contents in the Learner's Book for better follow-up. A number of tasks/activities will be provided in the textbook and others generated by you to help the learners acquire the resources. You should ensure that you assess a variety of abilities such as teamwork, communication, tolerance of differences, among others during these activities.

Below are examples of the General Science aspects under the 3 types of resources (**knowledge**, **know-how** and **know-being**), which the learners will need.

### a) Knowledge

- i) Knowledge of terminology and specific facts
- ii) Knowledge of **conventions and units** used in science
- iii) Familiarity with experiments suggested in the syllabus
- iv) Knowledge of common laws /principles and generalization identified in the syllabus
- v) Ability to explain standard phenomena from laws/principles and models and to describe standard experiments met with before
- vi) Using standard methods to solve familiar and unfamiliar numerical types of problems.

**b) Know-how (applying the acquired knowledge to different situations)**

- i) Application of knowledge/theory to practical situations
- ii) Devising experiments to test hypotheses and statements of models
- iii) Manipulation of the apparatus while performing experiments
- iv) Making and recording observations accurately in column tables, with proper units
- v) Treating data in appropriate form especially graphical, with properly labelled axes and using suitable scales
- vi) Determining gradient or slope, intercept or any other required points on the graph
- vii) Devising projects in which the products employ science principles

**c) Know-being (the values, attitudes, behaviours)**

- i) Analysing presented information and make sense out of it
- ii) Drawing conclusions from experimental procedures
- iii) Exercising evaluative judgment on suitability and results of scientific procedures
- iv) Assessing suitability of procedure, experiment and observations made in support of the conclusion
- v) Applying laws and generalizations already learnt to everyday life and new situations
- vi) Ensuring safety of equipment and experimenter
- vii) Ensuring integrity and honesty while studying science
- viii) Ensuring the proper use of the environment and natural resources in the study of science

**TERM 1****Chapter 1: Introduction to General Science****Duration: 10 Periods**

<b>Key Words</b>	<b>By the end of this chapter, the learner will be able to:</b>
<ul style="list-style-type: none"><li>▪ science</li><li>▪ natural sciences</li><li>▪ social sciences</li><li>▪ technology</li></ul>	<ol style="list-style-type: none"><li>a) highlight some of the science issues that were studied in the primary school.</li><li>b) understand the difference between natural science and social science, and between science and technology.</li><li>c) identify some daily phenomena that can be explained using scientific knowledge.</li><li>d) understand how science and technology affect society.</li><li>e) understand that in some instances in which science and technology have been misused.</li></ol>

**Overview**

The focus of this chapter is to reinforce in the learners the concept of science that has been studied in primary school and motivate them to study of science.



natural and social sciences with proper illustrations. Where there are similarities, help the learners point them out.

## Activity 1.2: Finding out about natural phenomena

### Teacher Preparation

Engage the learners to carefully examine the pictures in **Figure 1.2** in the Learner's Book and identify the different natural phenomena in each picture. By looking at the pictures in this activity, the learners identify as many natural phenomena as possible in the pictures. This is an opportunity to help them explore their environment and suggest other natural phenomena that depict science.

#### The Scientific Method

This lesson is supposed to develop the learners' understanding of how scientists work. Using the pictures, develop the concept of what is involved in the study of science in as far as scientific method is concerned. Use **Activity 1.3 (a)** and **(b)** to further explain what scientific method is about. Group the learners and instruct them to use the example to design an investigation by using the scientific method in other situations. Let the groups present to the class.

#### Social Science

Let the learners suggest the meaning of social science as opposed to natural science. Lead a discussion on the importance of social sciences to society.

## Activity 1.4: Finding out about social relationships

Using the pictures in **Figure 1.2** in the Learner's Book, ask the learners to brainstorm the social interactions that occur in their communities and their importance.

Allow the learners to discuss the difference between natural and social science.

#### Science and Technology

Using question and answer method, help the learners to distinguish these two terminologies that are used synonymously yet they have a slight difference. Where possible, display pictures/images or audios of some technologies made with the knowledge of science and their importance. Some of them are in **Activity 1.5**.

#### Effects of Science and Technology to Society

Using **Figure 1.5** in the Learner's Book under this heading, help the learners to identify the various ways in which science and technology can be harmful to their society. Then group them and ask them to suggest more ways in which science and technology has affected the world. The learners may present their findings to the class.

Discuss with the learners the issues highlighted in the summary and any other new things they have learnt in the chapter.

**Assessing the Situation of Integration**

<b>Expected Outputs</b>	<b>C1: Accuracy</b>	<b>C2: Relevance</b>	<b>C3 Coherence</b>	<b>C4 Excellency</b>
A description of how the items are harmful to the environment when poorly disposed of  <b>TOTAL /10</b>	<p><b>The learner scores 3 points</b> if he/she identifies up to six harmful products without describing how they cause harm to the environment when poorly disposed of</p> <p><b>The learner scores 2 points</b> if he/she identifies up to four harmful products without describing how they cause harm to the environment when poorly disposed of</p> <p><b>The learner scores 1 point</b> if he/she identifies up to two harmful products without describing how they cause harm to the environment when poorly disposed of</p>	<p><b>The learner scores 3 points</b> if he/she identifies up to six harmful ways in which the products cause harm to the environment when poorly disposed of</p> <p><b>The learner scores 2 points</b> if he/she identifies up to four harmful ways in which the products cause harm to the environment when poorly disposed of</p> <p><b>The learner scores 1 point</b> if he/she identifies up to two harmful ways in which the products cause harm to the environment when poorly disposed of</p>	<p><b>The learner scores 3 points</b> if he/she identifies up to six harmful products and describing how they cause harm to the environment when poorly disposed of</p> <p><b>The learner scores 2 points</b> if he/she identifies up to four harmful products and describing how they cause harm to the environment when poorly disposed of</p> <p><b>The learner scores 1 point</b> if he/she identifies up to two harmful products and describes how they cause harm to the environment when poorly disposed of</p>	<p><b>The learner scores 1 point</b> if he/she provides solutions to the harmful products</p>





# Chapter 2: Health Hazards and Safety

Duration: 26 Periods



Key Terms	<b>By the end of this chapter, the learner will be able to:</b>
<ul style="list-style-type: none"> <li>▪ hazard</li> <li>▪ accident</li> <li>▪ risk</li> <li>▪ safety</li> <li>▪ safety signs</li> <li>▪ first aid</li> </ul>	<ul style="list-style-type: none"> <li>a) understand the term hazard.</li> <li>b) know examples of hazards in the home and school.</li> <li>c) identify warning safety signs.</li> <li>d) understand safety precautions to prevent hazards.</li> <li>e) describe “first aid” and explain its role.</li> <li>f) know the contents of a first aid box and their uses.</li> <li>g) describe how to administer first aid to common hazards (scald, burn, cut, electric shock, fracture, fainting, bites, chemical contact).</li> </ul>

## Introduction

This chapter analyses the problems that occur at home and school, in relation to our health and safety. The learners will learn the common accidents, understand what causes accidents in the home and school, and how they can help someone who has had an accident.

## What is a hazard?

Introduce this concept by asking the learners what can cause damage either in the home or school. You may use the idea of cooking or washing glasses. From the discussion, you may seek the learners' knowledge about hazards and what causes them.

## Activities 2.1 and 2.2: Finding out the common hazards at home and at school

Lead the learners in a discussion so that they identify the activities that are possible hazards in the home and school.

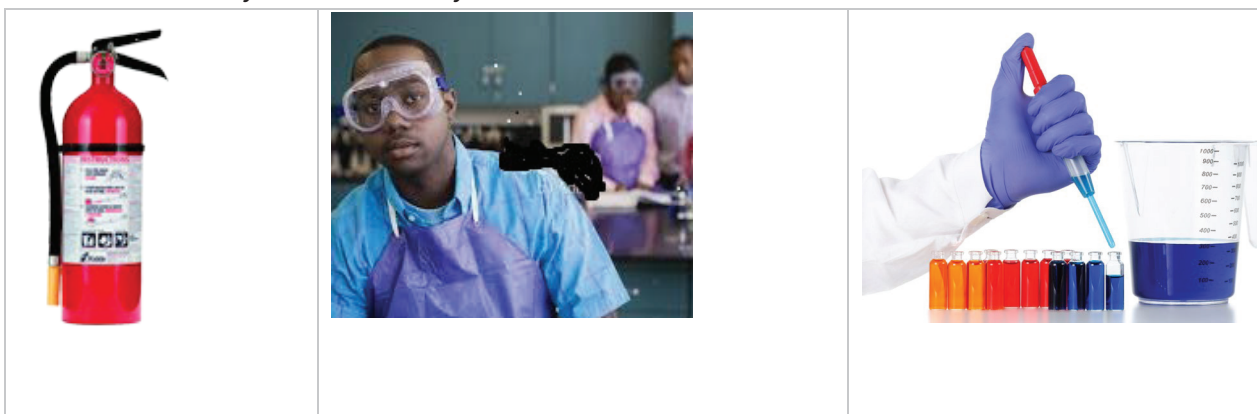
Allow the learners to explore as many possibilities as they can. If possible, they can even identify some hazards at some workplaces.

## Safety Signs

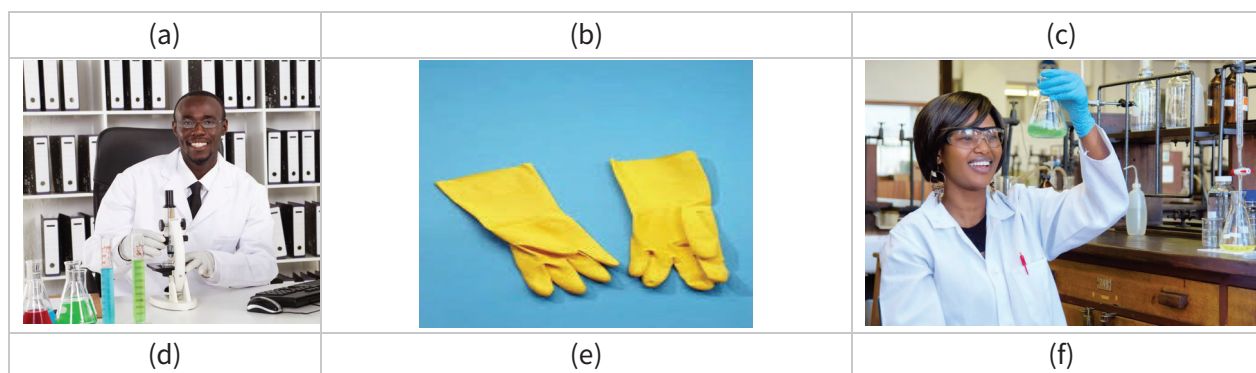
In places where there is likely to be danger, safety signs are put in order to help people avoid danger. If possible, use the signs on reagent bottles to explain this concept, in addition to the signs in **Figure 2.1** in the Learner's Book. Then lead a discussion on the interpretation of these signs.

## Some Safety Equipment in the School Laboratory

The school laboratory contains materials such as dangerous chemicals, acids, glassware, heat source and sharp metals. Enable the learners to understand that these are potential hazards to the laboratory users. Therefore, it is important to always use safety equipment to protect users from potential hazards when using the laboratory. The figure below shows some of the required materials for safety in the laboratory.







**Figure 2.2: Some safety equipment in the school laboratory**

In groups, ask the learners to identify the equipment displayed above and why the equipment is important. The learners should suggest any other equipment that would be required in the laboratory for safety.

## Accidents

Ask the learners to explain what an accident is in their own words. Let them state what accidents they have seen, if any. From this discussion, lead them to identify the common accidents that occur in the home and school, their causes and how to avoid them.

This should lead to a discussion on laboratory safety.

## First Aid

Allow the learners to state the meaning of first aid since it is taught at primary school level. Then in a discussion, ask them what the aims of first aid are.

In a discussion, display a first aid box (**Figure 2.3**), if possible and allow the learners to explain the importance of each component.

## First Aid Procedures

After identifying the components of the box, lead the learners through a long discussion on the various forms of first aid for different accidents. Some of them are indicated in the Learner's Book.

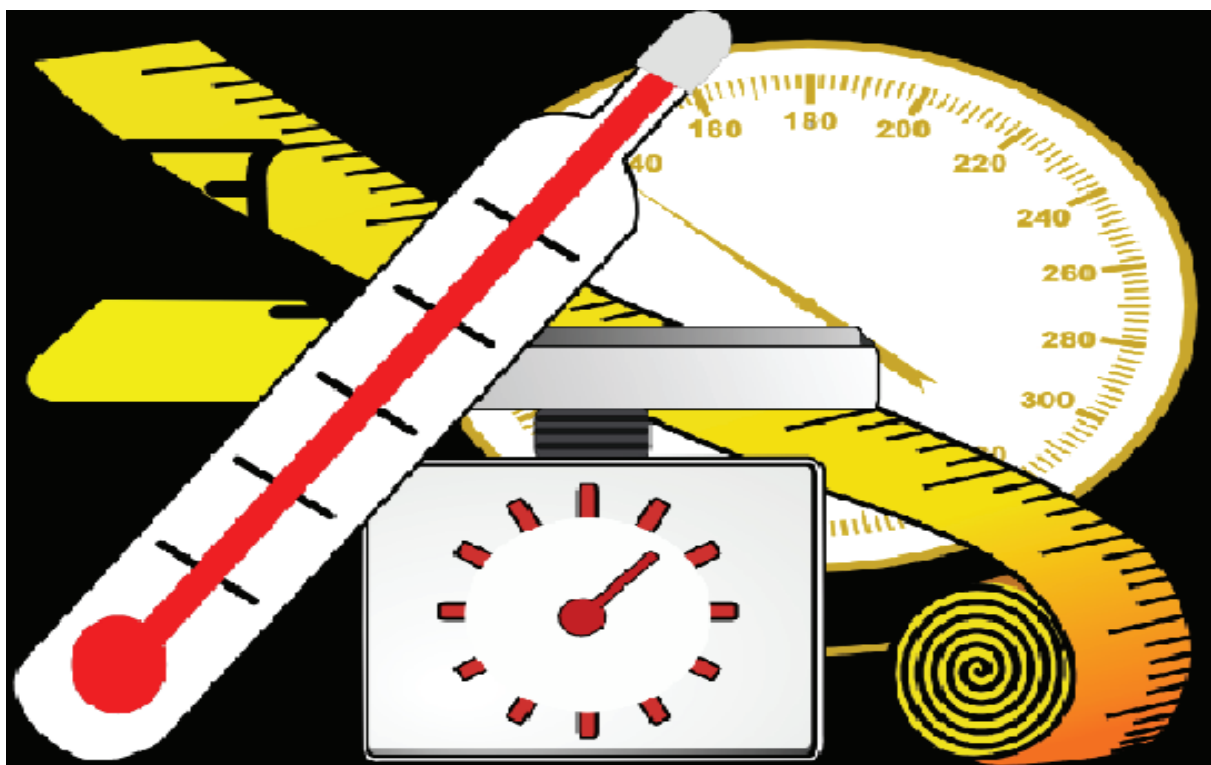
Where possible, allow for practical demonstrations of some of these first aid procedures as you wind up on this chapter. You can use toys and models for this activity.

**Assessing the Activity of Integration**

<b>Expected Outputs</b>	<b>C1: Accuracy</b>	<b>C2: Relevance</b>	<b>C3 Coherence</b>	<b>C4 Excellency</b>
A description of how somebody prepares for a journey and the first aid box contents  <b>TOTAL /12</b>	<b>The learner scores 4 points</b> if he/she identifies a maximum of four possible accidents	<b>The learner scores 5 points</b> if he/she identifies up to four possible accidents and mentions that a first aid box is required	<b>The learner scores 11 points</b> if he/she identifies up to four possible accidents and mentions that a first aid box is required, and identifies up to five of its components	<b>The learner scores 1 point</b> if he/she identifies up to four possible accidents, mentions that a first aid box is required, identifies up to five of its components and describes how the components of the box will be used in case of accidents

# Chapter 3: Measurements, Density

Duration: 36 Periods



Key Words	<i>By the end of this chapter, the learner will be able to:</i>
<ul style="list-style-type: none"> <li>▪ measurement</li> <li>▪ estimation</li> <li>▪ length</li> <li>▪ mass</li> <li>▪ weight</li> <li>▪ time</li> <li>▪ volume</li> <li>▪ estimating</li> <li>▪ density</li> <li>▪ floating</li> <li>▪ sinking</li> </ul>	<ul style="list-style-type: none"> <li>a) <i>understand the meaning and importance of measurement and state instances where it is applied.</i></li> <li>b) <i>know the fundamental quantities and the instruments used to measure them.</i></li> <li>c) <i>estimate and measure different physical quantities using appropriate equipment and express those using appropriate units.</i></li> <li>d) <i>determine volume of irregular objects.</i></li> <li>e) <i>understand the meaning of fundamental/ base and derived physical quantities and states their examples.</i></li> <li>f) <i>understand the meaning of density and solve simple numerical problems on density.</i></li> <li>g) <i>relate the density and relative density of substances.</i></li> <li>h) <i>determine the densities of different solids and liquid.</i></li> </ul>

## Unit Overview

The focus of this chapter is to estimate and measure quantities in the physical world. Measuring is a common phenomenon in everyday life, e.g. buying sugar, paraffin etc. So enable the learners to carry out as much estimation and accurate measuring as possible. There should be many hands-on activities in this unit. You should ensure that the learners record the readings appropriately with the correct accuracy.

## Introduction

Introduce this chapter by asking the learners to write on pieces of paper where measuring is done in everyday life and how it is done. Ask them to explain what measuring is and how measurements are expressed. Then introduce the basic idea of observing and recording and what is done in each case.

### Estimating and Measuring Physical Quantities

Introduce the concept of metric system and also the SI Unit system for the common measurable quantities such as height of a desk, classroom wall etc. to the learners.

Referring to the table of metric measurements in the Learner's Book, let the learners discuss instances in everyday life where each of the quantities is measured.

The learners can then identify what the instruments in **Figure 3.2** are used to measure.

#### **Measuring Length**

Ask the learners how far, how long, how tall, how wide something is and see the response. This is a way of bringing out length. Then ask them to explain the meaning of length in their own words.

Provide the learners with metre rules if possible and allow them to take several measurements for fun. Let them state their readings appropriately.

Help the learners to state the units and give them an exercise for **converting** the units of length.



## Activity 3.1: Put learners in groups of 5 – 10 and provide them with metre rules

Let the learners first estimate various lengths in the classroom such as length of a desk, length of the chalkboard and how long a stride is. Then let them use metre rules and rulers to measure the height of their friends. Let them compare the estimated and measured values.

Introduce a number of instruments used to measure length. Emphasize the:

- accuracy of each of the common instruments.
- inter-conversion of units.

**Note:** The heights of the learners should be used for measuring and not for criticism.

Ask the learners to measure the length of the playground or any other equivalent long length. Let them explain how they have done it.

## Science, Technology and Society

If possible, provide the learners with a micrometre screw gauge and Vernier callipers and show them how they work and what they are used for.

**Note:** Do not teach the learners how to read a micrometre screw gauge and Vernier calliper at this level.

## Measuring Area

Discuss with learners the meaning of area. Use a variety of illustrations with shapes. Ask the learners to measure the lengths/widths of different objects such as books, tabletops etc. and to use the measurements to find the area of these figures.

### *Regular Shapes*

Introduce the lesson by asking the formula of calculating area for common shapes like rectangle.

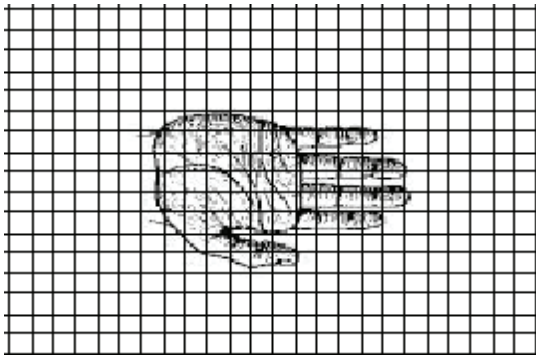
Let the learners draw various rectangles and squares on the board or newsprint and then measure their sides. They can use these distances to obtain area.

### *Irregular Shapes*

Ask the learners to estimate the area of their notebook or tabletop. Tell them to cut a rectangular piece of plain paper and measure its length and width, and find its area.

Tell the learners to shade an irregular shape on the paper and estimate its area in relation to the fraction the shaded area occupies.

Then lead them to the challenge assignment of measuring the area of their palm.



**Note:** Help the learners to carry out the inter-conversion of the units of area. Provide a variety of exercises to them on this concept. This should be done with the regular shapes such as square, triangle, etc.

## Measuring Mass

Introduce the concept of mass by availing a number of materials to explain the idea of “quantity of matter” or “amount of matter”. Use this to explain the concept of mass and its units. Avail the laboratory balances to the learners and allow them to practise how to measure the mass of different objects, e.g. the mass of a pen, ruler, and other small objects.

### Activity 3.2: The activity involves measuring mass of an empty jerry can

Put the learners in groups of 5 – 10 and provide the following to the groups:

- Bathroom scales (or a balance reading to 1 kg)
- 1 kg mass
- 20-litre jerry can
- 100 g mass

Let the learners go through the activity and then record their readings. Let the groups compare their results.

**Note:** Ensure you clarify the difference between mass and weight since they are often used interchangeably. Avail the learners both the beam balance and spring balance so that the difference can be noted with the measurements.

### Measuring Volume

Introduce the concept of volume by pouring water or sand in a container such as a measuring cylinder and asking how much space is occupied. Ask the learners whether they know any formula for calculating volume.

Provide rectangular blocks of different sizes (glass or wood) and ask the learners to measure the dimensions. Then guide them to calculate the volume of the rectangular boxes or blocks in their exercise books. If the blocks can sink in water, guide the learners on how to obtain their volume by the displacement method and let them compare their answers.

### Activity 3.3

In this activity, lead the learners (in groups) to estimate and accurately measure the volume of the rectangular section of the classroom. Relate this to rectangular tanks that are used to store water in reservoirs.

## Measuring the Volume of a Liquid

Avail a measuring cylinder, volumetric flask, beaker and burette to the learners and allow them measure volumes of water several times (**Activity 3.4**). Introduce the **litre** at this point because some of the instruments are calibrated in litres and millilitres.

**Emphasize how accurate readings may be obtained using a measuring cylinder** i.e. the no parallax.

*Emphasize to the learners that for more specific and accurate measurements of volume of liquids, they can use a burette and a pipette which you should avail to them. Allow them to measure volume of liquids using these instruments.*

### Measuring volume of irregular objects

Ask the learners to differentiate between regular and irregular objects. Then avail them shapes you think are irregular and lead them through **Activity 3.5**.

Provide the following:

- measuring cylinder
- overflow can, if available
- water
- stone (small enough to go into the measuring cylinder)

### Measuring Time

Ask the learners what they know about time, e.g. how they can tell time without watches, what measures it, how long it takes to bath, to travel a small distance etc.

Let the learners carry out **Activity 3.6**. Provide:

- clock or watch
- 1 m pendulum
- a thread

After the activity, allow the learners to mention various daily events and how long they take to occur.

Lead them into a discussion on the various ways of expressing time.

### Scientific Notation and Significant Figures in Measurements

Provide opportunities and a variety of numbers to the learners to ensure that they comprehend how to use decimal places and rounding off, significant figures and the scientific notation. These should be used for both measured and calculated values.

## Meaning of Density

Establish the idea of density by using the objects in the Learner's Book in **Figure 3.9**.

Where possible, ask the learners to measure the mass and volume as was seen in the previous section of this chapter and get the ratio of the mass to the volume. This should be the point at

which the meaning of density is established, and use the ratio to establish the units from those of the two quantities. Lead the learners to use simple figures to calculate the density for some objects.

Then use the cubes of different materials as indicated to compare the materials. Lead the learners to appreciate the fact that mass is not the best to use to compare objects but only density should be used.

### Activity 3.7: Determining the Density of Substances

In groups of 5 – 8, avail the learners the following materials:

- water
- sand
- regular solids with rectangular sides (pieces of metal or wood or plastic, specially cut, or objects such as a book or a brick)
- ruler
- measuring cylinder
- weighing scales

Lead the learners through the activity. After the activity, the learners can carry out a simple calculation to obtain the density of the objects.

Guide the learners on how to obtain the density of an irregular solid.

Then using ICT or other sources, let the learners compare their values with the quoted values of the densities of these substances.

## Density and its Application to Floating and Sinking

Ask the learners to name some of the objects which float in water and suggest the reason why. Then group the learners and provide them with the following:

- Pieces of metal
- Plastic
- Wood, etc.

Let the learners carry out **Activity 3.8**. Lead a discussion to establish a basic rule relating sinking/floating to density of the objects. Then the learners can explain why some objects floated and others did not.

Let the learners discuss the application of floatation in relation to ships and ferries, using **Figure 3.10** in the Learner's Book.



**Activity 3.9**

This is an activity comparing floatation in fresh and sea (salty) water. Provide the following, to groups of learners:

- small block of wood
- bowl
- water
- salt

After the activity, allow the learners to compare the floatation in both types of water.

Put the learners in groups to discuss why clouds float in air and why ice floats on water. **(This can be done experimentally.)**

**Density and Purity**

Lead the learners through a discussion on the importance of obtaining the accurate value of the density of substances. This is the basis for buying precious metals such as gold.

**Density and Relative Density**

Lead the learners in a discussion that compares the concepts of density and relative density, and why it is important to know both quantities.

Lead the learners into a brief discussion on the relation between density and relative density and why it is essential to determine relative density of objects.

Wrap up the chapter by going through the key points.

**End of Chapter Exercise**

Assess the end of chapter exercise by considering how the learners state the formulae, and how they substitute the quantities in the formula, and how they state the final answers.

**Scoring the Situation of Integration**

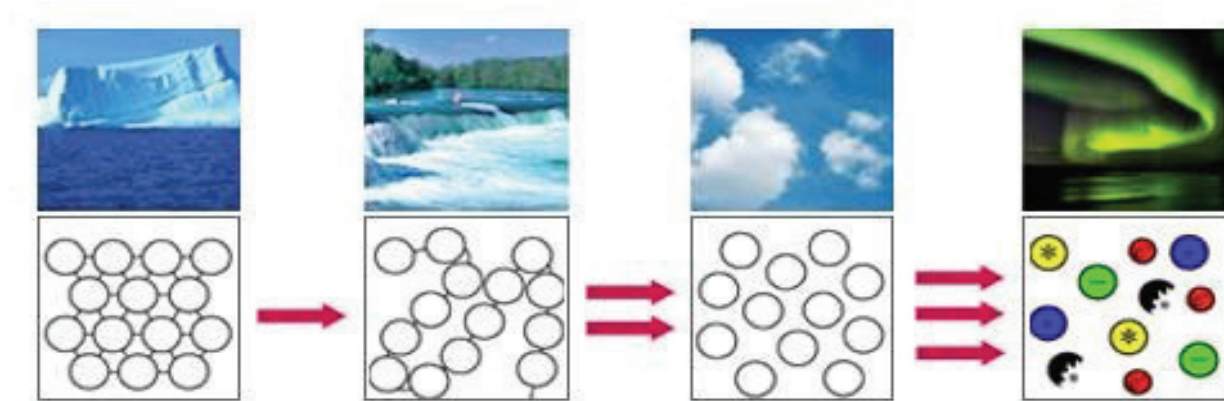
A learner who scores 2/3 of the maximum score will be taken as one that has achieved the competency of the chapter. Allow for remedial or corrections where necessary.

OUTPUT	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>
Written explanation indicating what should be done to show that the stone is gold or not	<b>The learner scores 1 point</b> if he/she states that the density should be determined without any further detail.	<b>The learner scores 2 points</b> if he/she gives detailed information about determination of the density of the stone.	<b>The learner scores 3 points</b> if he/she gives detailed information about determination of the density of the stone and how the obtained value should be compared with the actual density of gold in order to give the advice.

## TERM 2

# Chapter 4: Matter

Duration: 22 Periods



Key Words	By the end of this chapter, the learner will be able to:
<ul style="list-style-type: none"> <li>▪ plasma</li> <li>▪ diffusion</li> <li>▪ particle theory</li> <li>▪ Brownian motion</li> <li>▪ change of state</li> </ul>	<ol style="list-style-type: none"> <li>a) understand what matter is and identify different states of matter.</li> <li>b) use the knowledge of kinetic theory and particle nature of matter to explain the states of matter and their properties.</li> <li>c) know the factors that affect the rate of diffusion of a gas.</li> <li>d) use the scientific knowledge of the particle theory to explain common phenomena such as gas pressure, drying clothes, rain formation and making a cup of tea.</li> <li>e) understand the processes of change of state such as melting, boiling, evaporation, condensation, freezing and sublimation in terms of either heat gain or heat loss.</li> <li>f) compare physical and chemical changes.</li> <li>g) categorise processes in daily life as physical or chemical changes.</li> </ol>

### Overview

This chapter examines the properties of the states of matter using simple experimental models. The inter-change of states will also be examined using experimental models. You should ensure that the learners fully participate in the activities because the required apparatus is readily available, or at least can be improvised.

## Introduction

Begin the lesson by asking the learners what makes a heap of sand and the water in a basin and what is around the learners themselves; or ask them to breathe out. This may help introduce the concept of matter and how it exists in various forms.

Lead the learners through the assignment in the learner's book for classifying items into the states of matter.

Let the learners now give the properties of the states of matter such as shape, movement using smell etc. using tangible materials. Then explain the concept of plasma using examples.

### Arrangement of Particles in the States of Matter

This can be role-played by the learners. Arrange the learners as particles in solids, liquids and gases and let them discuss the arrangement of the particles according to the role-play. Then refer them to **Figure 4.3** in the Learner's Book to harmonise the learner's responses.

## Activity 4.1: Finding out if a gas or liquid can be compressed

Provide syringes to groups of learners. Lead them through the activity and allow them to state the observations that they make.

### Particle Theory of Matter

Introduce this section by asking the learners what they see when they look through smoke or dust, for example when sweeping. Use variety of examples that show existence of particles.

Lead the learners to the concept of molecules and atoms briefly.

### Activity 4.2

Put the learners in groups of about 5-10 and supply the balloons per group. Let them go through the activity and record their observations on manila paper or chalkboard. Lead a discussion on the results so that they can draw a conclusion.

### Activity 4.3

This is a learner-friendly activity. Provide the apparatus for the activity. Let the learners carry out the activity on their own. Ask them to make a report about the activity, including drawing the diagram.

### Brownian Motion

Introduce the concept of Brownian motion by using appropriate examples, such as dust particles after a car passing on a dusty road, or any other appropriate example. Then lead a discussion on the smoke cell experiment and its conclusions.

### Diffusion

Briefly lead a discussion on diffusion based on smells and other suitable examples.

#### Activity 4.4

**Caution: Bromine vapour is poisonous and so the learners should not inhale it directly.**

Lead the learners through the activity. At the end of the activity, introduce the concept of diffusion (movement of particles) as a fundamental difference between the states of matter.

Discuss the concept of force between the particles as a basis for motion of particles. You may use the learners holding one another in a small corner.

## Effect of Heat on States of Matter

Introduce this section by allowing the learners to represent solids, liquids and gases with simple sketches. Allow them to heat common substances such as wax and water and explain what happened. Then lead them through the assignment in the Learner's Book.

### Change of State by Heat Gain or Heat Loss

Ask the learners to state what happens when ice is left in the open or when water is heated. Ask them to name which processes occur. Let one of the learners draw up a chart that summarises the changes of state for water.

Lead the learners in a discussion on the change of state in terms of what happens during the process of change of state. Then let them identify economic applications of change of state and then make presentations.

## Physical and Chemical Changes

Build the concept of physical and chemical changes using the concept of change of state. Then ask the learners what happens during burning of wood and during boiling of water. Then guide them through **Activity 4.5**.

After the activity, let the learners observe **Figure 4.6**, and then allow them to distinguish between physical and chemical change, using real-life examples. Then sum up the chapter by assessing how the learners answer the questions.

### Scoring Grid for the Activity of Integration

OUTPUT	C <sub>1</sub> Accuracy	C <sub>2</sub> Coherence	C <sub>3</sub> Relevancy	C <sub>4</sub> Excellency

# Chapter 5: Temperature and Thermometers

Duration: 20 Periods



Key Words	By the end of this chapter, the learner will be able to:
<ul style="list-style-type: none"> <li>▪ temperature</li> <li>▪ temperature scales</li> <li>▪ thermometric property</li> <li>▪ upper fixed temperature</li> <li>▪ lower fixed temperature</li> <li>▪ clinical thermometer</li> <li>▪ digital thermometer</li> </ul>	<ul style="list-style-type: none"> <li>a) compare temperature and heat.</li> <li>b) understand the meaning of thermometric properties</li> <li>c) demonstrate how temperature scales are obtained from thermometric properties.</li> <li>d) solve simple numerical problems related to temperature scales.</li> <li>e) compare mercury, alcohol and water as thermometric liquids.</li> <li>f) demonstrate the construction and use of clinical thermometer.</li> <li>g) convert temperature from one scale to another.</li> <li>h) understand the daily variations in temperature of the atmosphere.</li> </ul>

## Introduction

Introduce this chapter by asking learners whether they have ever heard a weather forecast for the day or what they do when it is very cold or very hot. Then lead learners into a discussion that explains the meaning of temperature, how it is measured and how it is expressed.

Ask learners whether they have ever seen any thermometer or not. If yes, ask them to explain what it looks like and what it does. If no, show them one and help them to know how readings are taken.

## Activity 5.1: Measuring temperature

Group the learners and provide them with thermometers, if possible. If not possible, provide images of thermometers.

**Warning:** Thermometers are very fragile and mercury vapour is poisonous. So remind the learners to handle them with great care.

Let the learners go through the activity and present their results.

Then ask any of the learners who has ever heard a weather forecast to explain what was said. This should lead to a discussion on variations in temperature of different places.

### Thermometers

Provide a liquid in glass thermometer and use it to discuss with the learners the concept of thermometric properties.

Then ask the learners to identify the basic features of the thermometer and converse with them the importance of each of the features.

Where possible allow the learners to measure their body temperature using a clinical thermometer and present their answers.

Ask them to discuss the best ways of caring for the clinical thermometer.

### Temperature Scales

Lead the learners into a discussion on the temperature scales. Guide them as they share views on temperature scales, especially from the Kelvin to the Celsius and vice-versa. See **Exercise 5(a)**.

Evaluate their responses and make corrections where possible.



### Fixed Points on a Thermometer

These are the upper and lower fixed temperature points.

Lead the learners through a discussion on the determination of the fixed temperature points. If possible, you can determine the fixed points experimentally.

Guide the learners through the examples related to calibration of a thermometer like the one in **Exercise 5(b)**. Evaluate the learners' responses and assist those who may have difficulties.

### Thermometric Liquids

There are three liquids to be compared. These are mercury, alcohol and water. In a conversation, let the learners compare the merits and demerits of each of the liquids as thermometric properties.

### Daily Variations in Atmospheric Temperature

Lead a discussion on the changes in temperature during the day and night, and during the different months and seasons of the year. The learners should discuss their experiences with temperature differences and how it affects them. Let them write a report.

Wrap up the chapter by hinting on the key issues discussed in the chapter.

### Scoring Grid for the Activity of Integration

OUTPUT	C <sub>1</sub> Accuracy	C <sub>2</sub> Coherence	C <sub>3</sub> Relevancy	C <sub>4</sub> Excellency



# Chapter 6: Diversity of Living Things

Duration: 30 Periods



Key Words	By the end of this chapter, the learner will be able to:
<ul style="list-style-type: none"> <li>• life processes</li> <li>• classification</li> <li>• the cell</li> <li>• taxonomy</li> <li>• levels of organization</li> <li>• monera</li> <li>• protocista</li> <li>• arthropoda</li> </ul>	<ul style="list-style-type: none"> <li>a) know the processes that are characteristic of all living things and their importance.</li> <li>b) know the parts and functions of typical animal and plant cells.</li> <li>c) understand the levels of cellular organisation in multi-cellular organisms.</li> <li>d) know the seven levels of taxonomy.</li> <li>e) understand the two-word naming system of living organisms.</li> <li>f) know characteristics of organisms in the following categories of living things: monera, protocista, fungi, plantae, arthropoda, chordata and viruses.</li> <li>g) analyse the uses and harmful effects of organisms in kingdom monera and fungi.</li> <li>h) know the main characteristics of insects and understand the lifecycles of a housefly, cockroach, mosquito, bee and butterfly.</li> <li>i) appreciate the useful and harmful aspects of a housefly, cockroach, mosquito, bee and butterfly and devise methods of controlling them.</li> </ul>





## Introduction

Introduce this chapter by asking the learners to name as many animals or plants both in English and their local languages. Then remind them that this is part of the study of science: the study of living things.

# Characteristics of Living Things

Introduce the concept of life processes, those activities which living things are involved in, in order to survive. Allow the learners to use even the non-scientific words as you make corrections using the scientific language/terminologies where applicable.

## Activity 6.1: Identifying life processes

Lead a discussion based on **Figure 6.1** about life processes and why each process would be, or not regarded as a life process.

## Activity 6.2: Finding out life processes and their importance

Lead the learners through this activity. Let them identify the life processes in each picture and suggest why living things need this process. It is important to assess how they communicate and work in groups.

### Differences between Plants and Animals

Plants and animals are around us. Therefore, ask the learners whether there are any observed differences between plants and animals. Then lead the learners through **Activity 6.3**.

# Cells

Begin this section by asking questions such as these:

- What is the smallest administrative unit of a country?
- What is the smallest part of the human body?
- What is the smallest unit of a building?

Using the responses from the learners, develop the concept of a cell as the smallest unit of living things in which the basic processes occur.

Then use **Figure 6.2** to:

- develop the concept that though the cell is the basic unit, it is made up of different parts.
- discuss the uses/functions of each of the parts.
- identify differences between plant and animal cells.

### Groups of Cells (Levels of Organisation)

Introduce this by using an analogy of the departments in the school setting, where each group performs different functions by working together. Some of the groups may include:

1. **Board of Governors**– Make the overall policies that determine what happens at school
2. **Administrators** –ensure the day-to-day running of the school (direct managers)
3. **Teachers**– in charge of the teaching/learning process
4. **Parents** – monitor what/how the children are learning, pay fees to run expenses of the school
5. **Cooks** – prepare meals for staff and students
6. **Cleaners** – ensure that the school is neat and tidy
7. **Matrons** – take care of the welfare of the girl-child
8. **Guards** – ensure that the school premises are safe and secure

### Teacher Preparation

Prepare a chart showing the internal tissues of an arm as seen in the Learner’s Book. You may use any other tissue in the human body.

## Classification Systems

### Teacher Instruction

Show the learners an image of a pile of disorganized books (Figure below) and guide them on the instructions for organizing the books.



### Possible guidelines for organizing the books

1. The subject
2. Class level

Ask the learners why it is necessary to make a classification of the books.

### Teacher Preparation

Write the words: county, village, district, continent, world, parish and country on 2 or 3 charts to display during the lesson. Ask the learners to put these words in order, starting from the smallest to the largest. This should help you to introduce the levels of organisms from the lowest to the highest.

## Binary Naming of Living Things

Introduce the binary system of naming as suggested by Linnaeus in 1735. Emphasise the reasons for the two names such as *homo sapiens* for man. Then lead the learners into the **five** kingdom groups of organisms and identify them.

## Kingdom Monera, Protocista and Fungi

### Teacher preparation for teaching these kingdoms

Obtain actual specimens or pictures of the following organisms: bracket fungus, amoeba, *bacillus*, spirogyra, puff ball, ringworm, *streptococcus*, mushroom, paramecium, yeast, *spirilla*, and euglena. Guide the learners with brief descriptions of the basic characteristics of organisms in the above kingdoms and their economic importance. Detailed description of their structures and modes of reproduction should not be emphasized. However, their harmful effects should be emphasized since they cause many of the human diseases.

Guide the learners through the discussion on common diseases caused by bacteria and viruses. For each organism, the learners should write about not more than three diseases caused by bacteria and viruses.

### Project Work: Making Yoghurt

This project is related to kingdom fungi. Make research about the process of making yoghurt. Identify and collect the resources required. Try out the process beforehand in order to be familiar with it. Explain to the learners the science behind the process as they carry out their projects.

## Kingdom Plantae

### Teacher preparation

Obtain actual specimens or pictures of some of the following organisms: mango, papyrus, fern, water cabbage, cypress, eucalyptus, sugarcane, hornwort, club mosses and wandering Jew and any other plants (**Figure 6.5**)

Lead a discussion on some of the differences between some of the plants in the above plants. Some of the differences should be based on:

- the nature of leaves.
- whether they produce flowers or not, etc.

On a chart and based on the above differences, write:

- group names** i.e. angiosperms, pteridophytes, gymnosperms, bryophytes.
- characteristics of different plants** i.e. have roots, stems and leaves, seeds are in an ovary, have flowers, have vessels, have no flowers, have no vessels, have no roots, seeds are not in an ovary.

## Activity 6.4: Finding out the features of plants

Basing on the above discussion, guide the learners through this activity and assess the responses as indicated in the table shown.

### Phylum Arthropoda

#### Teacher Preparation

Obtain preserved specimens or pictures of the following organisms: mosquito, spider, beetle, crab, and locust etc.

Lead an introductory discussion on the observable features of a spider, bee, housefly, and other related organisms.

Then ask the learners to do **Activity 6.5** and fill their answers in the table provided in the Learner's Book. Assess how they communicate.

#### Class Insecta

This is one of the commonest of the arthropods. Provide specimens of insects or their pictures and then lead the learners through **Activity 6.6**.

After assessing the learners' responses, lead them through the stages of development of insects. Draw from their experiences on the eggs of some insects, caterpillars and others to develop the concept of metamorphosis.

## Activity 6.7: Describing importance of insects

Wind up this section by allowing the learners to discuss how insects are:

- a) useful.
- b) harmful.

They should use specific examples and the pictures in the Learner's Book.

Assess how the learners express themselves and communicate.

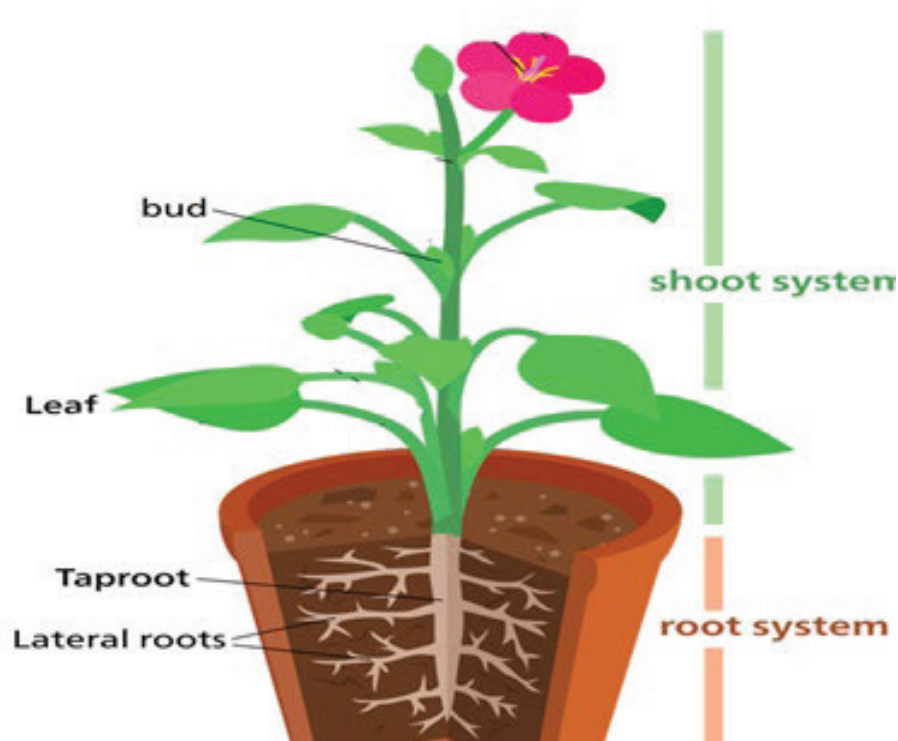
#### Scoring Grid for the Activity of Integration

OUTPUT	C <sub>1</sub> Accuracy	C <sub>2</sub> Coherence	C <sub>3</sub> Relevancy	C <sub>4</sub> Excellency

## TERM 3

# Chapter 7: Plant Structure

Duration: 14 Periods



Key Words	By the end of this chapter, the learner will be able to:
<ul style="list-style-type: none"> <li>▪ root system</li> <li>▪ shoot system</li> <li>▪ cotyledon</li> <li>▪ modified stem</li> <li>▪ modified roots</li> <li>▪ modified leaf</li> </ul>	<p>a) know the external parts of a typical flowering plant.</p> <p>b) know the functions of a root, stem, leaf, flower and fruit to a plant.</p> <p>c) understand the various ways by which different plant parts are used by the society.</p> <p>d) understand that there are modified roots, stems and leaves, and identify their functions to both the plant and the society.</p>

## Introduction

Introduce this chapter by reviewing kingdom plantae in Chapter 6. If possible, show the learners different plant shoots, even dry ones. Then ask them to state the general features of a flowering plant.

**General Structure of the Flowering Plant**

Flowering plants are either monocotyledons or dicotyledons. Ask the learners how they can distinguish between them.

**Activity 7.1:**

## Differentiating between Monocotyledonous and Dicotyledonous Plants

**Teacher Preparation**

Provide a bean plant and a maize plant or other suitable plants with similar features. Then let the learners do the activity and then assess their responses.

After the activity, allow the learners to observe a typical flowering plant (**Figure 7.1**) to identify the parts and their functions to man (**Activity 7.2**).

**Roots**

This is one of the features of plants. Ask the learners what they know about roots and their functions.

Then provide the learners with:

- two potted plants
- a plastic bag
- a piece of string
- water

Lead the learners through **Activity 7.3** and assess their conclusions. Then make clarifications where necessary.

## Types of Root Systems

It is good that you provide the learners with the three types of root systems and then lead a discussion on the characteristics and differences of the root systems. Let the learners note the key features in their notebooks.

Lead a brief discussion on the internal structure of a monocot and dicot root and the functions of the parts in the internal structure.

## Modifications of Roots

Although roots are meant to anchor plants in the soil and help to absorb minerals and water, they may be specifically modified to perform other functions.

Provide modified roots (where possible) or their pictures and then lead a discussion on the other functions that can be performed by the roots either to the plant or society. This should be done as **Activity 7.5**.

## Stems

### Teacher Preparation

Provide sections of stems for different plants and let the learners identify their key features. Then lead a discussion on the functions of stems to both the plant and society.

### Stem Modifications

Lead a discussion, using the pictures (or real specimens) on the modifications of stems. Ask the learners to suggest the functions of the modified stems to both the plant and the society.

## Activity 7.6: To show that an Irish potato is a stem tuber

Observe a fresh Irish potato tuber and identify the following parts of the stem: bud, node, and internode. What do you notice?

## Leaves

### Teacher Preparation

Provide leaves of different plants and let the learners identify their key features. This will be done in the **Activity 7.7**.

Then lead a discussion on the functions of leaves to both the plant and society.

### Leaf Modifications

If possible, provide real modified leaves or their pictures. Some of the modified leaves are illustrated below:







Then let the learners state the functions of the modified leaves to the plant and society.

Ask them to fill their responses in the table provided in the Learner's Book. Assess how they communicate scientifically.

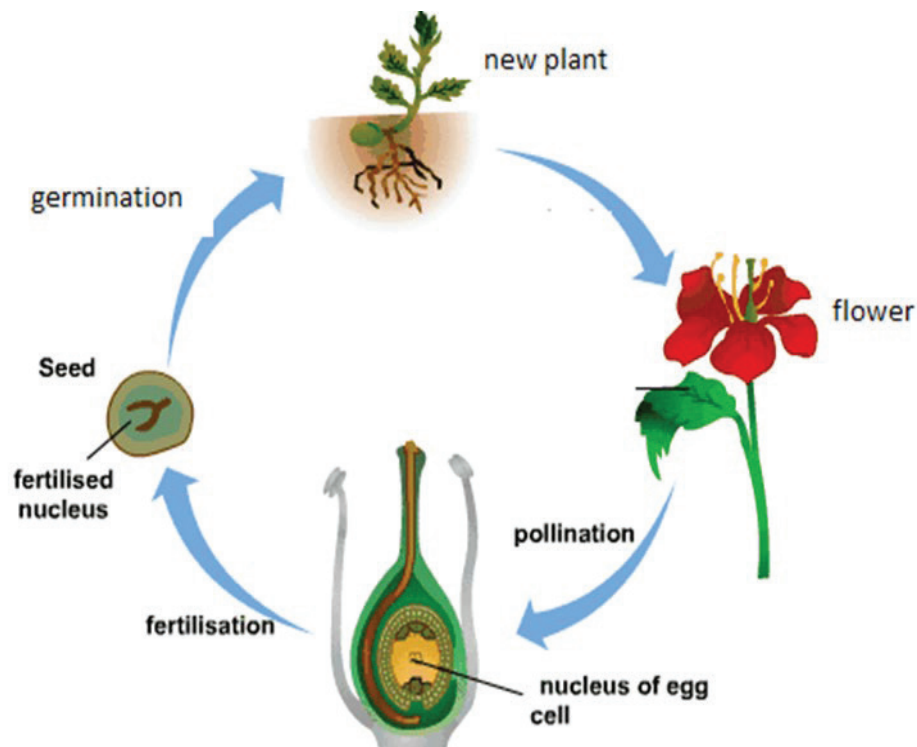
**Scoring Grid for the Activity of Integration**

<b>OUTPUT</b>	<b>C<sub>1</sub> Accuracy</b>	<b>C<sub>2</sub> Coherence</b>	<b>C<sub>3</sub> Relevancy</b>	<b>C<sub>4</sub> Excellency</b>



# Chapter 8: Reproduction in Plants

Duration: 14 Periods



Key Words	By the end of this chapter, the learner will be able to:
<ul style="list-style-type: none"> <li>▪ pistil</li> <li>▪ stamen</li> <li>▪ pollination</li> <li>▪ cross pollination</li> <li>▪ fertilization</li> <li>▪ dispersal</li> <li>▪ vegetative reproduction</li> <li>▪ grafting</li> </ul>	<ol style="list-style-type: none"> <li>a) understand the meaning of pollination and describe the types and agents of pollination.</li> <li>b) understand the meaning of fertilization and identify its products.</li> <li>c) compare seeds and fruits.</li> <li>d) understand the meaning of fruit/seed dispersal, its agents and importance to the plant species and farming.</li> <li>e) understand that there are other parts of a plant other than the seed that can develop into a new plant of the same kind.</li> <li>f) practise vegetative propagation by cutting, grafting and suckers and give examples.</li> <li>g) know the advantages and disadvantages of vegetative propagation.</li> </ol>

## Introduction

Introduce this chapter by referring to Chapter 7 where the structure of the plant was studied. Refer the learners to the particular uses of each of the plant parts. From their responses, develop the concept of reproduction in higher plants. Then lead a brief discussion on the importance of reproduction in plants to the farmer.

# Reproduction in Higher Plants

Reproduction occurs in all living things. So ask the learners to explain reproduction in their own words and why it is important to reproduce.

***Discuss with the learners the concept of sexual reproduction in relation to plants. Ensure that you use simplified yet clear words since sex issues are sensitive.***

## The Flower

Introduce the concept of male and female parts using a flower. Gather different coloured flowers from the compound, if possible. Allow the learners to identify as many parts as possible. Ask them to open up the flowers and identify the interior or hidden parts. This should be done as **Activity 8.1** and **Assignment 8.2**. Help the learners to identify the male and female parts of the flower.

After this activity, ask the learners to state the uses of flowers to the society, apart from the uses related to plant reproduction.

Possible responses include **decoration at functions, source of honey for bees, and providing good smells.**

# Pollination

## Activity 8.2: Identifying pollen grains

Let the learners try the activity and record what they observe. Based on their responses or their modifications, develop the concepts of pollen grains and pollination.

Based on **Figures 8.1** and **8.2**, discuss with the learners the types of pollination and ask them to explain how pollen leaves the anthers to the stigma. You should use the concept of bees visiting flowers.

Brainstorm with the learners the factors that:

- favour insect pollination.
- favour self pollination.
- prevent cross pollination.

This should be related to **Activity 8.3**.

## Fertilisation

Lead the learners through a brief discussion on the events that occur in plants after pollination. Use charts and other means to display this information as appropriately as possible. Help the learners to identify the products of fertilization.

### Fruits and Seeds

#### Teacher Preparation

Provide a maize and a bean seed, or other suitable seeds. Try as much as possible to help the learners identify the major parts of the seeds. Ask them to compare monocotyledons and dicotyledons (**Activity 8.4**).

After the discussion on seeds, provide common flesh fruits such as tomato, avocado and bean pod or any other suitable fruits. Allow the learners to open up the fruits and point out the differences between them in **Activity 8.5**.

## Fruit and Seed Dispersal

Ask the learners to explain, in their own words, what it means to ‘disperse’ fruits and seeds and who disperses them.

Using the diagrams in **Activity 8.6**, initiate a discussion on the agents of dispersal and ask the learners to suggest reasons for each agent of dispersal.

Assess how the learners communicate efficiently.

## Vegetative (asexual) Reproduction in Plants

Help the learners to distinguish between sexual and asexual reproduction in plants. Discuss both natural and artificial vegetative reproduction.

Ask the learners which part of cassava, onion, potato, yam, sugar cane etc. that can develop into new plants.

Discuss with the learners the advantages of this method of reproduction to the farmers.

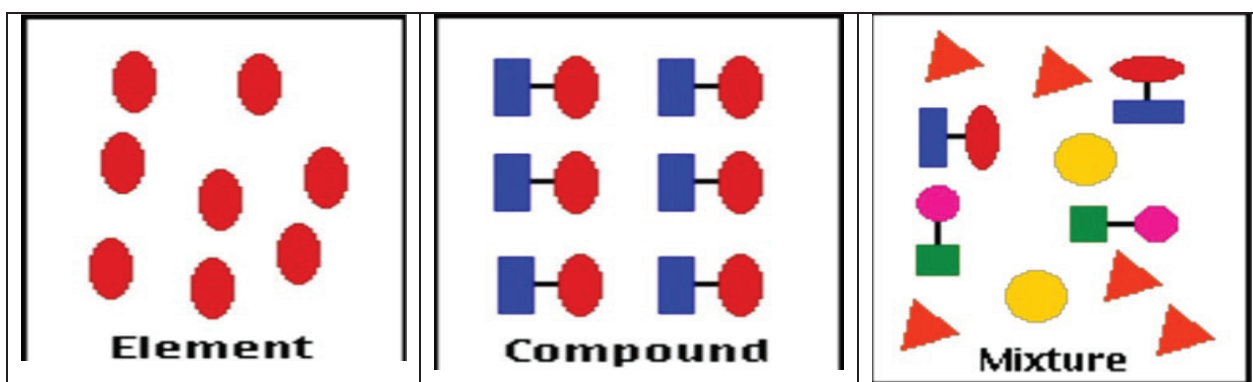
Wind up the chapter by asking the learners to do a project on any one form of artificial vegetative reproduction using a named plant.

#### Scoring Grid for the Activity of Integration

OUTPUT	C <sub>1</sub> Accuracy	C <sub>2</sub> Coherence	C <sub>3</sub> Relevancy	C <sub>4</sub> Excellency

# Chapter 9: Elements, Compounds and Mixtures

Duration: 20 Periods



key words	By the end of this chapter, the learner will be able to:
<ul style="list-style-type: none"> <li>• element</li> <li>• compound</li> <li>• mixture</li> <li>• miscible liquids</li> <li>• immiscible liquids</li> <li>• decanting</li> <li>• distillation</li> <li>• pure substance</li> </ul>	<ol style="list-style-type: none"> <li>a) understand the meaning of elements, compounds and mixtures.</li> <li>b) compare between metals and non-metals using laboratory tests.</li> <li>c) demonstrate how the purity of a substance can be determined.</li> <li>d) demonstrate methods by which mixtures can be separated.</li> <li>e) compare mixtures and pure substances; mixtures and compound.</li> <li>f) compare miscible and immiscible liquids.</li> <li>g) apply methods by which miscible and immiscible liquids can be separated.</li> </ol>

## Introduction

This chapter builds on the concepts of matter that were studied in Chapter 4. Ask the learners to talk about the states of matter. Then introduce the concept of the categories in which the states of matter are put by asking the learners to name substances that are solids, liquids or gases. From this discussion, introduce the idea of pure and impure substances; then the ideas of elements, compounds and mixtures as forms of all the states of matter.

## Elements

Ask the learners to identify any elements that they know. From the names provided, develop the concept of chemical symbols and how they come about. Help them to categorise elements into metals and non-metals, using common examples. Then ask them to distinguish between metals and non-metals, using simple illustrations before tabulating these differences.

### Activity 9.1: Comparing metals and non-metals

#### Teacher preparation

Group the learners and provide them with the following:

- a piece of iron
- a piece of wood
- copper wire
- water
- dry cells
- heat source
- aluminium source pan
- sulphur powder
- plastic cup
- beaker

Ask the learners to carry out simple tests that will help them classify the materials provided into metals and non-metals and then fill their responses in the table provided.

#### Atoms

An atom is the smallest piece/particle of matter. The word atom comes from the Greek word *atomos*, meaning ‘that which cannot be divided further’.

### Activity 9.2: Do atoms of elements have the same composition as the element itself?

Group the learners and provide them with the following:

- A piece of potato
- Petri dishes
- Knife

Allow the learners to carry out the activity and record their observations. From the responses, help them to explain the concept of atoms in simple terms.

## Compounds

Now that you have taught elements, you should be able to develop the concept of compounds, using simple terms such as ‘**what is formed when elements combine**’. Illustrate this by using

common substances such as water, salt, clothes, and medicines. For complicated compounds, do not give details of how they are formed, but rather emphasize simple compounds especially those found in the home and school. Ask the learners to mention some of the common substances in the home or school and help them understand whether they are compounds or not.

Try to demonstrate that these substances cannot be separated into the elements that make them up.

## Mixtures

### Teacher Preparation

Obtain some sugar, sand and water and any other suitable materials to use for the introduction to mixtures. Allow the learners to add some of these substances together to make mixtures. Use simple techniques to show that the substances are not chemically combined and can be separated into the original substances.

**Note:** You should use the illustration at the beginning of the chapter to explain the difference between elements, compounds and mixtures.

Emphasise mixtures of great importance such as paint, ORS, eye drops, polishes and vanishes etc.

## Methods of Separating Mixtures

This section should be done practically as much as possible.

The method of separation of any mixture depends on the nature of the mixture i.e. mixture between solids only, mixture between solids and liquids, mixtures between liquids or even mixtures of gases.

Let the learners have the opportunity to do **Activities 9.3 to 9.8** using the substances suggested in the Learner's Book, or any other suitable materials.

Ask the learners to suggest the **applications** of each of the methods of separation in the above activities. This is what will make each method of separation interesting to them.

## Purity of Substances

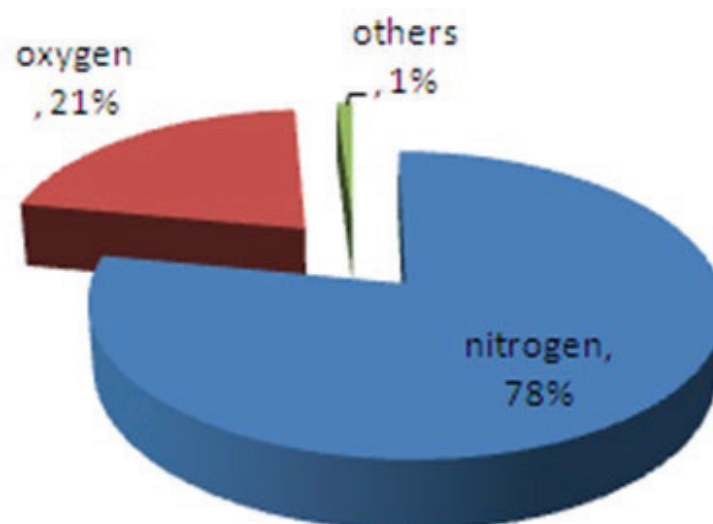
Try to sum up the chapter by asking the learners what pure and impure substances are and the criteria that can be used to identify pure substances. This can be done experimentally; for example, using the tests for density, boiling points and melting points, where possible.

### Scoring Grid for the Activity of Integration

OUTPUT	C <sub>1</sub> Accuracy	C <sub>2</sub> Coherence	C <sub>3</sub> Relevancy	C <sub>4</sub> Excellency

# Chapter 10: Air, Burning and Rusting

Duration: 24 Periods



Key Words	By the end of this chapter, learner will be able to:
<ul style="list-style-type: none"> <li>• Air</li> <li>• combustion</li> <li>• air pollution</li> <li>• exhaust gases</li> <li>• greenhouse effect</li> <li>• global warming</li> <li>• rusting</li> </ul>	<ol style="list-style-type: none"> <li>a) know the components of air, their proportions and uses.</li> <li>b) show how air is a mixture and not a compound.</li> <li>c) understand the methods of separation of the major components in air.</li> <li>d) determine the percentage of oxygen in air.</li> <li>e) demonstrate the properties of oxygen and carbon dioxide based on their reactions.</li> <li>f) know the uses of oxygen and carbon dioxide both in nature and industry.</li> <li>g) demonstrate how substances such as magnesium, sulphur and carbon undergo combustion.</li> <li>h) understand the meaning of rusting, how it affects iron materials/tools and the various methods of preventing it.</li> <li>i) understand the term air pollution, and identify the main examples of air pollutants.</li> <li>j) analyse the effects of air pollution and the steps needed to prevent, control or mitigate air pollution.</li> </ol>

## Introduction

Introduce this chapter by asking the learners to feel the air around them and then state what they feel. From the responses, develop the concept of air being around us, but cannot be felt because it is made up of gases.

Lead the learners into a discussion on the components of air using **Figure 10.2** in the Learner's Book. Allow them to summarise the importance of each of the components of air.

## Activity 10.1: Investigating what happens when a candle burns

Group the learners and provide them with the following:

- candle
- water
- beaker
- dropper
- test tube
- fresh limewater

Let the learners carry out the activity and note how they record their observations. From their observations, initiate a discussion on burning and its requirements.

### Making Oxygen in Industry

Based on the boiling points of oxygen and nitrogen, and also on the methods of separation of mixtures discussed in the previous chapter, ask the learners to suggest the method of separating oxygen and nitrogen as the major components of air.

Then initiate a discussion on the various uses of oxygen with real examples such as welding and life support in hospitals.

### Nitrogen and Carbon dioxide

As reinforcement to the initial discussion on the importance of the components of air in the introduction, ask the learners to summarise the importance of nitrogen and carbon dioxide, and how they are exchanged with the atmosphere.

## Air Pollution

This is a broad concept and many communities around the world are struggling with it. Allow the learners have broad and non-biased discussion on this topic. The discussion should be based on

- what air pollution is.
- what the causes of air pollution are.
- how to measure the amount of pollution by dust (**Activity 10.3**).
- how you can show that air is polluted.
- effects of air pollution.
- how we can minimize air pollution.

Assess how the learners communicate on this global issue.



**Rusting of Iron**

Ask the learners to look at the pictures in **Figure 10.10** in the Learner's Book and then state other instances where such a process may have occurred at home or at school. Then in a discussion, brainstorm the issue of rusting and what causes it.

**Note:** The complicated chemical reactions and equations of rusting should be left out.

## Activity 10.3: Investigating the conditions necessary for rusting of iron

Provide the requirements indicated in the Learner's Book. Let the learners do this activity in a project mode since it will take many days (about a week). Ask them to be patient with the project and record their observations at the end of the week.

Then sum up the topic by brief discussions on the effects of rusting and methods of prevention. Emphasis should be put on domestic materials such as farm equipment, cutlery and jewellery.

**Scoring grid for the Activity of Integration**

<b>OUTPUT</b>	<b>C<sub>1</sub> Accuracy</b>	<b>C<sub>2</sub> Coherence</b>	<b>C<sub>3</sub> Relevancy</b>	<b>C<sub>4</sub> Excellency</b>







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