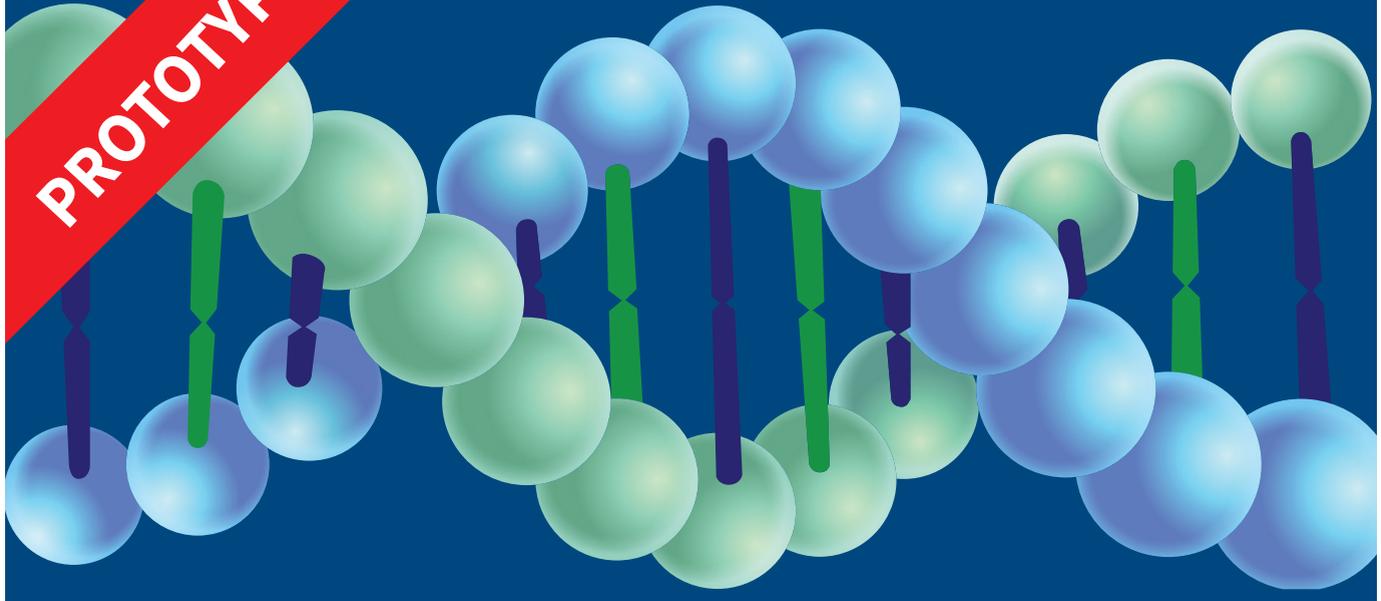


PROTOTYPE



BIOLOGY

PROTOTYPE

TEACHER'S GUIDE

SENIOR ONE

LOWER SECONDARY CURRICULUM



NCDC
NATIONAL CURRICULUM
DEVELOPMENT CENTRE

PROTOTYPE

BIOLOGY PROTOTYPE TEACHER'S GUIDE

SENIOR ONE

LOWER SECONDARY CURRICULUM



NCDC

*NATIONAL CURRICULUM
DEVELOPMENT CENTRE*



Published 2020

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.

This document is restricted from being reproduced for any commercial gains.

National Curriculum Development Centre
P.O. Box 7002,
Kampala- Uganda
www.ncdc.co.ug

Contents

Preface	iv
Acknowledgements.....	v
THEME: DIVERSITY OF LIVING THINGS.....	1
Chapter 1: Introduction to Biology	1
Chapter Overview	1
Introduction	1
Meaning of Biology	1
Biology in Everyday Life	2
Life Processes.....	5
Differentiating Between Animals and Plants.....	8
Chapter 2: Cells	12
Specialised Cells	14
Activity 2.2a: Relating the structure of specialised cells to their function	14
Groups of Cells (Levels of Organisation).....	15
Activity 2.2b: Identifying the tissues in your arm	16
Chapter 3: Classification	22
Levels of Classification	24
The Five Kingdoms of Living Organisms.....	28
Kingdom Plantae	30
Kingdom Animalia	31
Chapter 4: Insects	35
External Features of an Insect	35
The Head of an Insect	36
The Thorax of an Insect.....	37
The Beneficial and Harmful Aspects of Insects.....	39
Chapter 5: Flowering Plants.....	46

Preface

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

To ease the work of the teacher, 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 learners the key competences that are required in the 21st century while promoting values and attitudes and effective learning and acquisition of skills, to prepare the learner for higher education and eventually the world of work.

This book has been written in line with the Revised Lower Secondary School Curriculum. The book has incorporated knowledge and skills partly required to produce a learner who has the competences that are required in the 21st century; promoting values and attitudes; effective learning and acquisition of skills in order to reduce unemployment among school graduates.



Associate Professor Betty Ezati

Chairperson, NCDC Governing Council

Acknowledgements

National Curriculum Development Centre (NCDC) would like to express its appreciation to all those who worked tirelessly towards the production of the Teacher's Guide.

Our gratitude goes to the various institutions which provided staff who worked as a panel, the Subject Specialist who initiated the work and the Production Unit at NCDC which ensured that the work produced meets the required standards. Our thanks go to **Enabel** which provided technical support in textbook development.

The Centre is indebted to the learners and teachers who worked with the NCDC Specialist and consultants from Cambridge Education and Curriculum Foundation to ensure the Guide meets the needs of the target group.

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 Learner's Book.

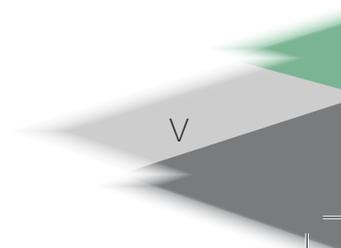
NCDC is committed to uphold the ethics and values of publishing. In developing this material, several sources have been referred to which we might not fully acknowledge.

We welcome any suggestions for improvement to continue making our service delivery better. Please get to us through P. O. Box 7002 Kampala or email us through admin@ncdc.go.ug.



Grace K. Baguma

Director, National Curriculum Development Centre





NCDC
NATIONAL CURRICULUM
DEVELOPMENT CENTRE

THEME: DIVERSITY OF LIVING THINGS

Chapter 1: Introduction to Biology

Ensure that by the end of this chapter, the learner:

- i) knows that biology is the science of living things.
- ii) can identify how biology is applied in everyday life.
- iii) can explain the importance of life processes and how they are manifested differently in different organisms.

Chapter Overview

The major focus of this chapter is the daily observations of living things and the processes that show that they are alive. Guide the learners to identify aspects of everyday life that are based on the knowledge of biology. Let them identify some of the branches of biology. Help them to identify vital plant and animal processes and why such processes are vital. Also guide learners to point out why some objects, though they do certain processes of life, are not living things. Then lead learners to point out how plants differ from animals.

Introduction

Introduce this chapter by reviewing what the learners know about science i.e. study of living and non-living things.

Meaning of Biology

Guide learners to differentiate living things from non-living things by use of any criteria from their experience. You may start with a stimulating key question.

Activity 1.1: Sorting pictures of things into living and non-living

Key question: *Is it possible for you to sort things as living and non-living things?*

Teacher preparation for Activity 1.1

Prepare a chart showing pictures of various living and non-living things arranged in a circle. (Apart from the pictures in the learner's book, you can use other relevant pictures that will bring out the same concept).

Teacher Instruction

1. Display the chart showing the pictures.



2. Guide the learners through the instructions for **Activity 1.1** in the learner's textbook.
3. Observe the learners as they identify the living things shown in the pictures.
4. Discuss with the learners to find out the criteria they used to distinguish between the living and the non-living things. Observe their ability to think critically.
5. Based on their work, lead the learners to develop and mention their understanding of the term *biology* as the study of living things.

Biology in Everyday Life

Activity 1.2: Identifying areas where knowledge of biology is applied

Use **Activity 1.2** to help learners identify day-today activities which employ knowledge of biology (branches of biology).

Key question: *What occupation or job or activity in your society requires knowledge of biology or deals with the wellbeing of living things?*

Teacher Preparation/Instruction for Activity 1.2



1. Prepare and provide learners with a chart showing pictures (or video clips) of various familiar occupations/activities based on the knowledge of biology (you may include more pictures/clips that are relevant to the learners or exclude some where necessary).
2. Guide learners through the instructions for Activity 1.2 in the learner's textbook.
3. Observe the learners as they identify the various occupations/activities shown in the pictures/video clips. Look out for the criteria the learners are using to distinguish the occupations.
4. Engage the learners as they study the pictures. For each picture, task the groups to state how the knowledge of biology is being applied.
5. Observe the group's ability to think critically and communicate with one another and with you.

6. After the discussion, let the learners present and discuss their findings to the rest of the class as you harmonize the discussions.
7. Observe the learners' ability to communicate effectively with each other and with the rest of the class during their presentation.
8. Probe the learners into comparing all the pictures to find out the common features. (When the learners identify common features like animals and plants, guide them to identify these branches of biology and display the chart with the definitions).
9. Observe the learner's ability to group the pictures under the three branches of biology.
10. Display on a chart and elaborate on the definitions of the terms, zoology, botany and physiology, and other branches of biology i.e. anatomy, genetics, ecology and taxonomy.
11. Let the learners write down short notes on their understanding of the new terms they have been introduced to.

Life Processes

In groups of 3 to 5, let the learners read through the text in the Learner's Textbook in order to familiarise with what life processes are. Ask guiding questions (build on their previous knowledge), clear misconceptions (for example death is not a characteristic of living things) and provide clarification where necessary.

Activity 1.3: Identifying a life process

In this activity, you will help learners to appreciate that a life process is one which is exhibited only by a living thing to enable it to continue living.

Key question: *What is a life process?*

Teacher Preparation/Instruction for Activity 1.3

Provide learners with two pictures showing a:



waterfall



lion eating a zebra

1. Guide learners through the instructions for **Activity 1.3** in the Learner's Textbook.
2. Observe the learners identify the living things shown in the pictures.
3. Discuss with the learners to find out the criteria they used to distinguish between the life and non-life processes. Observe their ability to think critically.
4. You may ask leading questions to help the learners discover with reasons which of the two is a life process and which one is not.

Examples of leading questions:

- i) What is happening in the pictures? (water is flowing and a lion is eating)
- ii) If water does not flow, will it stop existing? Why?
- iii) If the lion does not eat, will it affect its life? Why?
- iv) Which process in the pictures is a life process?
- v) What is a life process?

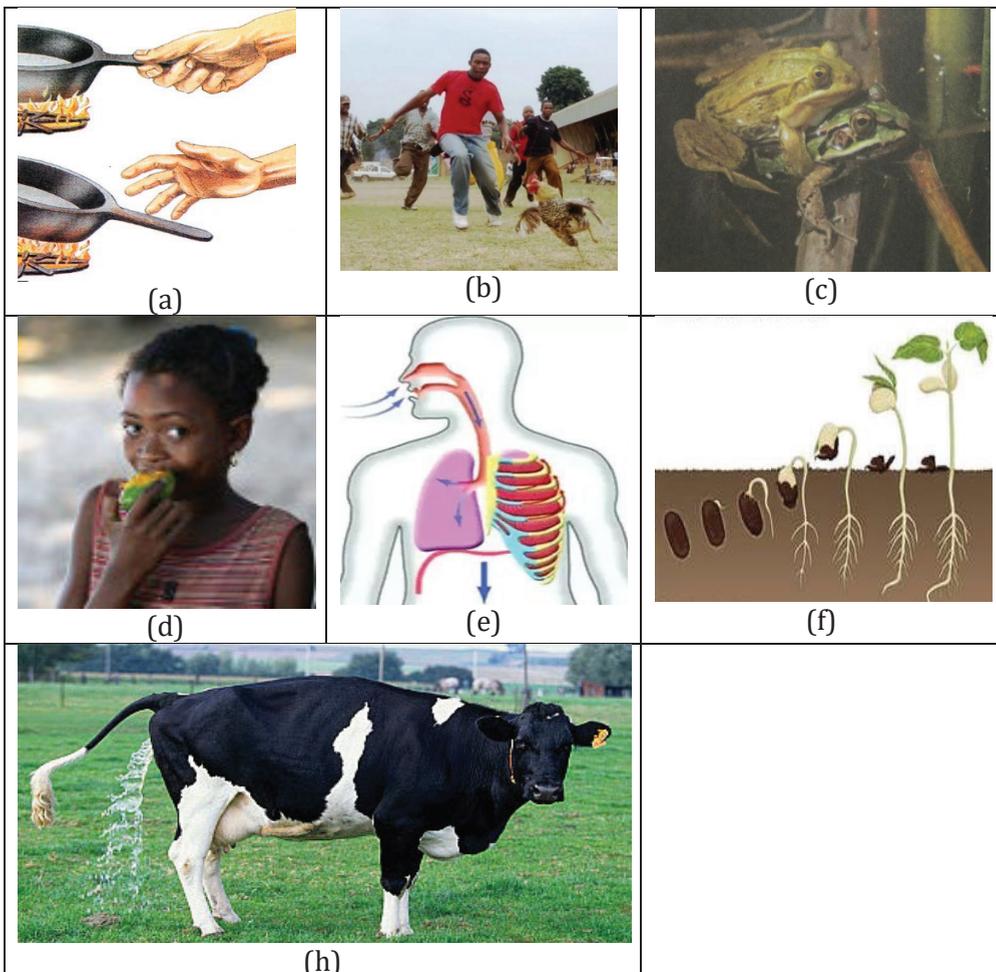
Activity 1.4: Finding out life processes and their importance

1. Use this activity to guide learners to identify the life processes that living things exhibit.
2. You may introduce this activity with reviewing the meaning of a life process and then pose a key question to focus the learners to the activity.

Key question: *What things do living things do that non-living things don't do?*

Teacher Preparation/Instruction for Activity 1.4

1. Prepare and provide learners with a chart showing pictures of various living things. The pictures should show the living things carrying out a life process. (Apart from the pictures in the learner's textbook, you can use other relevant pictures or video clips that will bring out the same concept).



- 
2. Guide learners through the instructions for **Activity 1.4** in the Learner's Textbook.
 3. Guide the learners to observe and describe what the living things showed in the pictures are doing to continue living.
 4. Base on the learners' work and lead them to develop and mention the life processes hence characteristics of living things.
 5. Engage the learners to help them focus as they study the pictures.
 6. Discuss with the learners to establish the role of each life process to living things.
 7. Probe the learners to express the reasons for the importance of life processes they have identified.
 8. Observe their ability to think critically.
 9. Ensure that learners present their discussion finding in class. Help the class to come up with a common list of characteristics of living things. Harmonize their views.

Note: For learners who are finding difficulty in remembering all the seven life processes, suggest that they develop a mnemonic of their own using the first letter of each of the life processes.

Exercise: Word Search

Let the learners search from the word puzzle for the life processes. Score it this way:

- i) Up to 3 words found and each used in a sentence – **Fair attempt**
- ii) Up to 5 words found and each used in a sentence – **Good work**
- iii) Up to 7 words found and each used in a sentence – **Well done**

Differentiating Between Animals and Plants

Activity 1.5: Finding out the differences in characteristics of plants and animals

Before the activity, remind the learners that from **Activities 1.3** and **1.4**, it was observed that both plants and animals are living things and have common characteristics. After the reminder, give the key question to introduce the learners to the activity.

Key question: *Do plants and animals carry out ALL the life processes in the same way?*

Teacher Preparation/Instruction for Activity 1.5

1. Prepare small potted plants covered in transparent containers (glass/polythene – one plant per container). Preferably use the *Mimosa* (touch me not) plants whose response to stimulus is visible.
2. Enclose small live animals e.g. rats in a cage or ants in a glass container (one animal per container/cage).
3. Distribute the potted plants and animals to the groups of learners.
4. Guide learners through the instructions for Activity 1.5 in the Learner's Textbook.

During the activity:

- i) Observe the learners as identify the life processes exhibited by the plant and animal.
- ii) Observe the group's ability to think critically, research about and communicate particularly in cases where the life process is difficult or impossible to observe.
- iii) Engage the learners as they record their results. Probe the learners to identify the differences in life processes of plants and animals.

Activity of Integration

You are a member of the Nature Club at your school. The club is developing an environmental campaign for members of a community that lives next to a forest which is home to a troop of baboons. The baboons regularly destroy the crops in the community's gardens. The community members plan to get rid of the baboons permanently. The Nature Club has to raise awareness about respect for living things. You are given these 4 organisms and you are to elaborate a message showing their relation:



Task: Using your knowledge of life processes, draw a poster including all 4 organisms to show their relations.

Evaluation Grid for Activity of Integration

	Criterion 1: Accuracy	Criterion 2: Coherence	Criterion 3: Relevance	Criterion 4: Excellence
Task/Output A poster	<p>The learner uses the life processes to show the ways by which organisms are important to one another. (6 marks)</p> <p>Indicator(s):</p> <p>Scores 6 if the learner names two correct processes showing interrelationship between at least three pairs of organisms in the poster.</p> <p>Scores 5 if the learner names two correct processes showing interrelationship between two pairs of organisms in the poster</p> <p>Scores 4 if the learner names two correct processes showing</p>	<p>The learner arranges the organisms and labelled arrows in a way that allows easy and logical interpretation. (3 marks)</p> <p>Indicator(s):</p> <p>Scores 3 if the direction of all the arrows between the organisms matches with the named process.</p> <p>Scores 2 if the direction of half of the arrows matches with the named process.</p> <p>Scores 1 if the direction of one of the arrows</p>	<p>The learner uses arrows to show the relationships between the organisms in the poster. (3 marks)</p> <p>Indicator(s):</p> <p>Scores 3 if the learner uses arrows to show a direct relationship between any three pairs of organisms in the poster.</p> <p>Scores 2 if the learner uses arrows to show a direct relationship between any two pairs of organisms in the poster.</p> <p>Scores 1 if the learner uses arrows to show a</p>	<p>The learner added any element unsolicited in the instructions in terms of pictures, processes and general layout that make the poster stand out.</p>

	Criterion 1: Accuracy	Criterion 2: Coherence	Criterion 3: Relevance	Criterion 4: Excellence
	<p>interrelationship between one pair of organisms in the poster</p> <p>Scores 3 if the learner names one correct process showing interrelationship between at least three pairs of organisms in the poster</p> <p>Scores 2 if the learner names one correct process showing interrelationship between two pairs of organisms in the poster</p> <p>Scores 1 if the learner names one correct process showing interrelationship between one pair of organisms in the poster</p>	<p>matches with the named process.</p>	<p>direct relationship between one pair of organisms in the poster.</p>	
	/6	/3	/3	/1

Total Mark = 13

Chapter 2: Cells

Ensure that by the end of this chapter, the learners:

- i) know what a cell is.
- ii) can identify the parts of a typical animal cell and plant cell, and their functions.
- iii) understand the structure of specialised cells in terms of their functions in an organism.
- iv) can distinguish the levels of cellular organisation.

Activity 2.1: Observing cells

Teacher Instruction for Activity 2.1

The learners have not used a microscope before so it is important to take 10 to 15 minutes before the activity to:

- a) display a chart showing a labelled microscope.
- b) use the chart to guide learners through the parts and use of the microscope.
- c) probe the learners to give the functions of the eyepiece, objective lens, rotating nose piece, coarse adjustment and the mirror. (Allow learners to have a hands-on experience of the parts of the microscope).
- d) observe learner's manipulation skills.
- e) observe the learner's ability to be patient as a member of the group uses the microscope.

Do not give notes to learners. The microscope is just an instrument to aid their learning. Allow learners access to the microscope with your supervision /the lab technician after class to improve their manipulation skills.

Activity 2.1a: Viewing an animal cell

Use this activity to enable learners appreciate that all animal cells are similar in structure.

Teacher Preparation/Instruction for Activity 2.1a

1. Carefully break the side of the raw egg where the airspace is. Gently cut out the white cell membrane. Slide out the content onto a clean petri dish/saucer.
2. Prepare a clear wet mount of unstained chick cells.
3. Provide each group of learners with a wet amount of an unstained chick cell.

4. Guide learners through the instructions for **Activity 2.1a** in the learner's textbook.
5. Observe the learners identify the layers of the egg. Look out for the criteria the learners are using to distinguish the layers e.g. in terms of position and colour.
6. Engage the learners to help them focus (e.g. touching the egg) as they study the specimen.
7. Observe the learners' ability to manipulate the microscope to obtain a clear image. Guide the struggling learners.
8. Engage the learners as they fill in the table. Probe the learners to comment on similarities or differences in their observations. (The learners should recognise that both are animal cells).

	Raw egg	Animal cell
Number of layers	Two	Two
Size of layers	Large outer layer Small central layer	Large outer layer Small central layer

9. Observe the group's ability to think critically and communicate with one another and with you.
10. Engage the groups as they draw the structure of the cell and label the different parts. Look out for the accuracy and correctness of drawing and labelling.

Activity 2.1b: Viewing a plant cell

Teacher Preparation for Activity 2.1b

Prepare a clear wet mount of unstained plant cells from epidermis of commelina leaf or inner epidermis layer of an onion leaf.

1. Guide learners through the instructions for **Activity 2.1b** in the Learner's Textbook.
2. Observe the learner's ability to manipulate the microscope to obtain a clear image. Guide the struggling learners.
3. Converse with the learners as they identify the different structures of the plant cell.
4. Observe the learners' ability to communicate effectively with one another.
5. Engage the groups as they draw the structure of the cell and label the different parts. Look out for the accuracy and correctness of the drawing and labelling.

Specialised Cells

Activity 2.2a: Relating the structure of specialised cells to their function

Ask the learners to recall and name the life processes. Let the learners think about and mention types of cells in their bodies that are used to carry out particular life process.

Key questions

1. What are the specialised cells in your body and in a plant?
2. How are they adapted to their function?

Teacher Preparation for Activity 2.3

Prepare four sets of cards/pieces of paper as follows:

Set one: Specialised cells



Set two: Features/structure of a specialised cell

- Has a tail
- Can change its shape
- Has a regular shape with many chloroplasts
- It is narrow and long providing a large surface area
- Flat biconcave shape and no nucleus

Set three: Function of a particular specialised cell

- To trap much sunlight to enable the cell carryout photosynthesis.
- To penetrate soil and absorb water and mineral salts.
- To provide a large surface area to absorb and carry oxygen from the lungs to respiring cells.
- To engulf foreign particles and destroy them in order to defend the body.
- To propel/swim to the egg cell and fertilise it.

Set four: Name of the cell

- Sperm cell
- Palisade cell
- Red blood cell
- Root hair cell
- White blood cell

Note: Ensure that cards can suffice the pairs of learners or small groups of up to 4 learners. Alternatively make charts on manila or flip paper to represent each set of cards to display in class.

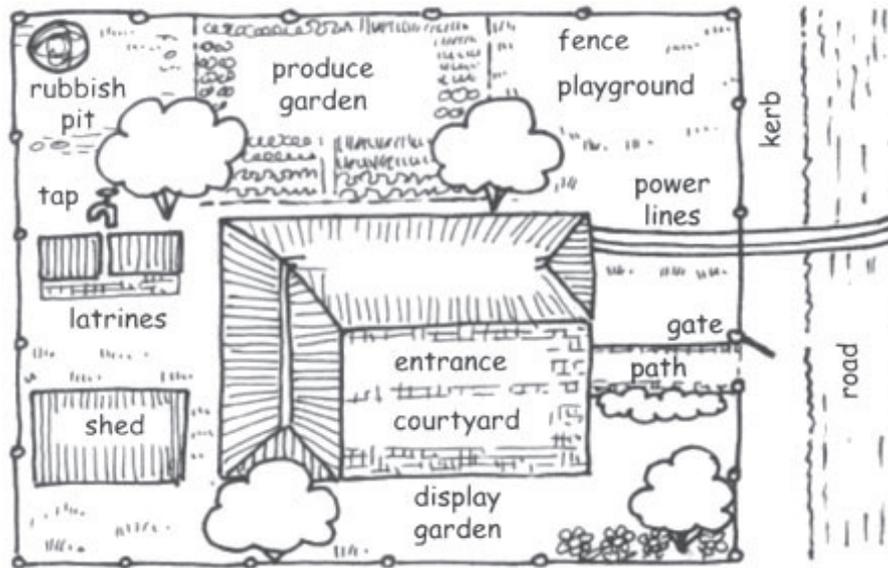
Activity 2.2a: Relating the structure of specialised cells to their function

1. Guide learners through the instructions for **Activity 2.2a** in the Learner’s Textbook.
2. Observe the learners as they sort and match the cards through effective communication, teamwork and critical thinking.
3. Engage the learners as they identify the structures (adaptations) of the cells, how they suit their functions and selection of names. Guide the struggling learners/pairs.
4. Observe the learners’ ability to communicate effectively with each other and with the rest of the class during their presentation.

Groups of Cells (Levels of Organisation)

Engage the learners in a discussion about the roles of the different people that make up a school system. This can be done by asking them the following guiding questions as they study in their groups the picture that follows.

1. Name the places/parts of a school that you see in the picture.
2. Which category of people do they expect to find in the places named?
3. What is the role of each of the named categories within the school system?
4. Can the school function normally without any one of the categories named? If yes, why? If no, why not?
5. List 8 different types of people and their roles that are needed for proper functioning of a school.



Possible Response for Analogy of a School

1. **Guards/gatekeepers** – ensure that the school premises are safe and secure and monitor people entering and leaving the school
2. **Administrators** – ensure the day-to-day running of the school (direct managers) giving instructions to all other staff members
3. **Teachers** – in charge of the teaching/learning process and co-curricular activities
4. **Learners** – use the facilities at school for learning and personal welfare
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 boy and girl child
8. **Gardeners** – look after the plants and animals on the school compound

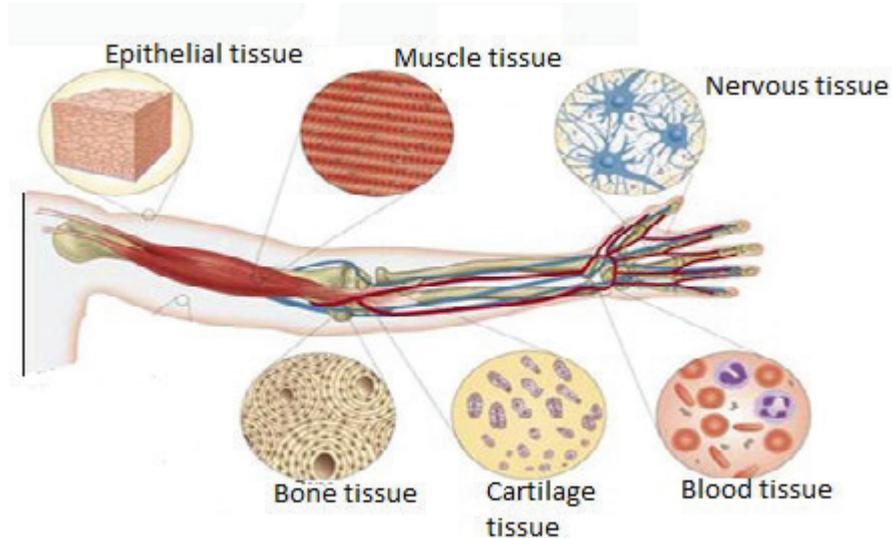
Activity 2.2b: Identifying the tissues in your arm

Through this activity, you will let learners mention the uses of their arm and what they think is responsible for the functions (uses) mentioned.

Key question: *What is under the skin in your arm?*

Teacher Preparation for Activity 2.2b

Prepare a chart showing the internal tissues of an arm as seen in the Learner's Textbook.

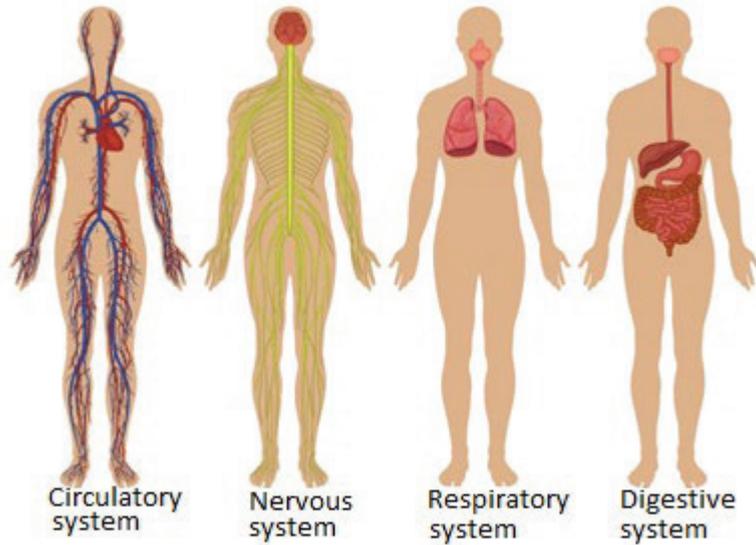


Teacher Instruction for Activity 2.2b

1. The learners will need a notebook, pencil and pen for this activity.
2. Guide learners through the instructions for **Activity 2.2b** in the Learner's Textbook.
3. Observe the learner's ability to reach a consensus on whose arm to be sketched.
4. Look out for the accuracy and correctness of sketch drawing and labelling of the arm.
5. Engage the learners as they discuss the names and functions of the parts of the arm. Guide them to identify the tissues and their role in the functions of those parts.
6. Observe the learner's ability to communicate effectively with each other and to the rest of the class as they present their work.

Exercise (Provide learners with clarification where need be as they do this exercise)

1. Identify the organs in the systems shown in the figure and state the function of each.



Possible responses

Circulatory system - heart, blood vessels (arteries/veins)

Nervous system - brain, spinal cord

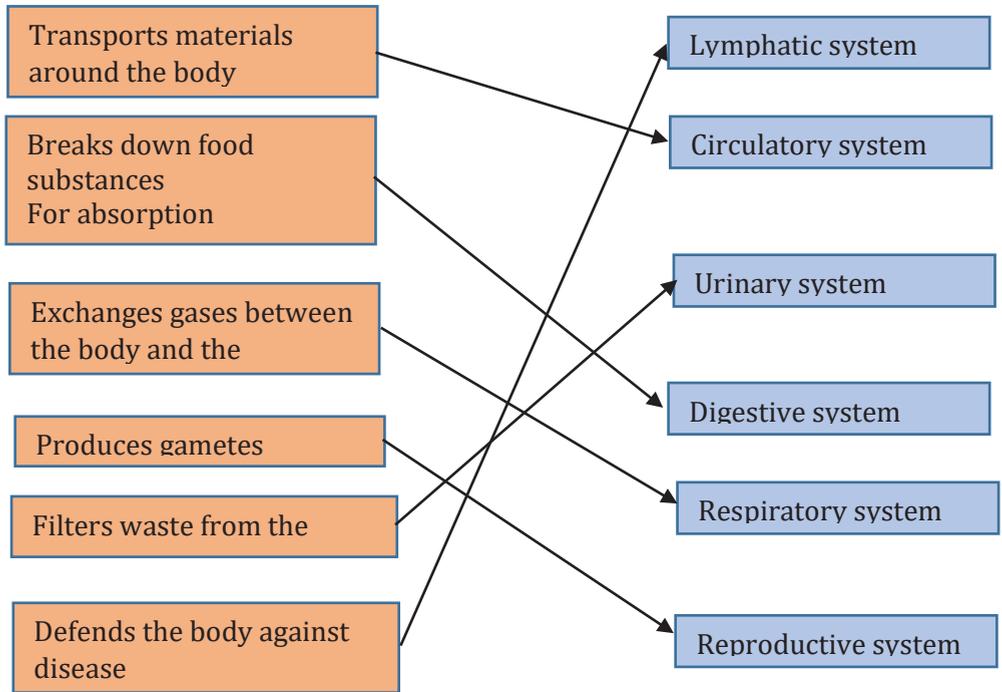
Respiratory system - mouth, nose, lungs

Digestive system - mouth, stomach, liver, intestines

2. Following is a list of some functions of systems in your body. Match the functions to the corresponding system.



Possible response



Activity of Integration

You have been asked to give a talk to the Primary seven class of your former school. The talk is about importance of plants to man. The Primary seven class already knows that plants make food but they do not know the details of the structures involved in the process. Your task is to write down (in not more than 100 words) how you would explain this in your talk using your knowledge of Biology. You can use the image below during your talk.



Evaluation Grid for activity of Integration

	Criteria 1: Accuracy	Criteria 2: Coherence	Criteria 3: Relevance	Criteria 4: Excellence
Task/Output Written talk	Learner: Names the plant structures/parts involved in photosynthesis. Indicator(s)	Learner: Correctly relates plant structures to their role in photosynthesis Indicator(s): Scores 3 if	Learner: Relates how the process is important to man Indicator(s): Scores 3 if Mentions 3 ways through which photosynthesis is	Learner: added any exemplary element unsolicited in the talk.

	Criteria 1: Accuracy	Criteria 2: Coherence	Criteria 3: Relevance	Criteria 4: Excellence
	<p>Scores 3 if Identifies at least four structures/parts (cells, tissues and organs) involved in photosynthesis that are shown in the image Scores 2 if Identifies 2 to 3 structures/parts (cells, tissues and organs) involved in photosynthesis that are shown in the image. Scores 1 if Identifies 1 to 2 structures/parts (cells, tissues and organs) involved in photosynthesis that are shown in the image.</p>	<p>Correctly relates three named structures/parts to their role in photosynthesis Scores 2 if Correctly relates two named structures/parts to their role in photosynthesis Scores 1 if Correctly relates one named structure/part to its role in photosynthesis</p>	<p>important to man Scores 2 if Mentions 2 ways through which photosynthesis is important to man Scores 1 if Mentions 1 way through which photosynthesis is important to man</p>	
	/3	/3	/3	/1

Total Mark = 10

Chapter 3: Classification

Ensure that by the end of this chapter, learners:

- i) understand how living organisms are grouped and the reasons why.
- ii) know that scientific names of living things have two parts.
- iii) can identify the characteristics and examples of organisms in kingdom monera, protocista and fungi.
- iv) can recognise the useful and harmful effects of bacteria and fungi.
- v) can identify the characteristics and examples of organisms in the plant kingdom.
- vi) can identify the characteristics and examples of organisms in the animal kingdom.
- vii) can describe viruses, give common examples, their mode of transmission, effect on infected plants or animals and their prevention.

This chapter is aimed at enabling learners appreciate that in order to better understand living organisms, they have to be grouped and named based on similarities and/or differences in their features/characteristics.

Activity 3.1: Sorting books in a library

Teacher Preparation/Instruction for Activity 3.1

1. Show learners an image of a pile of disorganised books and guide them on the instructions for the activity.



Key question

How can you classify the books in the library?

2. Let the learners imagine they are in charge of a new library and government has delivered a number of different kinds of textbooks to their school. Someone is going to put the books on shelves in the school library, and needs instructions on how to sort the books.
Tell the learners to write in not more than 50 words the instructions to be followed in sorting the books so that the library users can easily get access to the book needed.
3. Use the following questions to let the learners **draw conclusions** for the activity.
 - i) What characteristics did you look at in order to decide in what group to place a book?
 - ii) Did any book fit into more than one group? Why or why not?
 - iii) Do you think that scientists use classification when they are studying things? If so, how?
 - iv) Why do you think scientists like to classify organisms?
 - v) Does classifying these organisms into certain groups help scientists study them?
 - vi) How does classification help scientists study organisms?

Possible Responses for Drawing Conclusions

1. The subject/class level
2. Yes, because some books are crosscutting. No, because some books have specific content.
3. Yes, scientists classify organisms based on similarities in characteristics.
4. For easy identification.
5. Yes
6. When a new organism is discovered, scientists use its classification to identify it.

Levels of Classification

Classification is the act of putting together living organisms into groups based on their common/similar characteristics. Each group of similar organisms is called a taxon (taxa-plural). The branch of biology that deals with classification of organisms is called **taxonomy**.

Activity 3.2: Finding out the seven levels of taxonomy of living things

In this activity, guide the learners to discover the different levels of organisation of organisms by relating a day to day scenario to a biological concept of classification. The levels are determined by the unique characteristics of the organisms, therefore at each level, the number of organisms differs.

Teacher Preparation/Instruction for Activity 3.2

Write the words; county, village, district, continent, world, parish, country on 2 or 3 charts to display during the lesson. Display the charts in the class or lab.

Key question

Ask a guiding question e.g. How are organisms grouped scientifically?

Guide the learners to do the following:

1. Draw a large inverted isosceles triangle in their notebooks and divide it horizontally into seven equal parts. The size of the triangle division represents a population size.
2. On one side of the triangle, write down the places (from the list of words provided) beginning with the biggest to the smallest in terms of population size matching with the divisions in the triangle.
3. On the other side of the triangle, starting from the top to bottom, place the following terms which are the levels of organisation in the following order; Kingdom, Phylum, Class, Order, Family, Genus and Species.
4. As the learners are going through **Activity 3.2**:
 - i) Observe the learners as they arrange the words according to population size through effective communication, teamwork and critical thinking.
 - ii) Engage the learners as they get acquainted with the new terms. Guide the struggling learners/pairs.
5. Of the terms they have written on the other side of the triangle, which one would contain the:
 - i) Largest number of organisms?
 - ii) Smallest number of organisms?

iii) What happens to the number of organisms in the levels as you move from kingdom to species? Explain your answer.

Possible Responses to Questions on Activity 3.2

- a. Kingdom
- b. Species
- c. The number of organisms decreases because at kingdom level, there are more organisms than at species level.

Let the learners do the exercise and task below. Assess them using their responses. Give guidance to learners finding difficulty with interpreting the exercise.

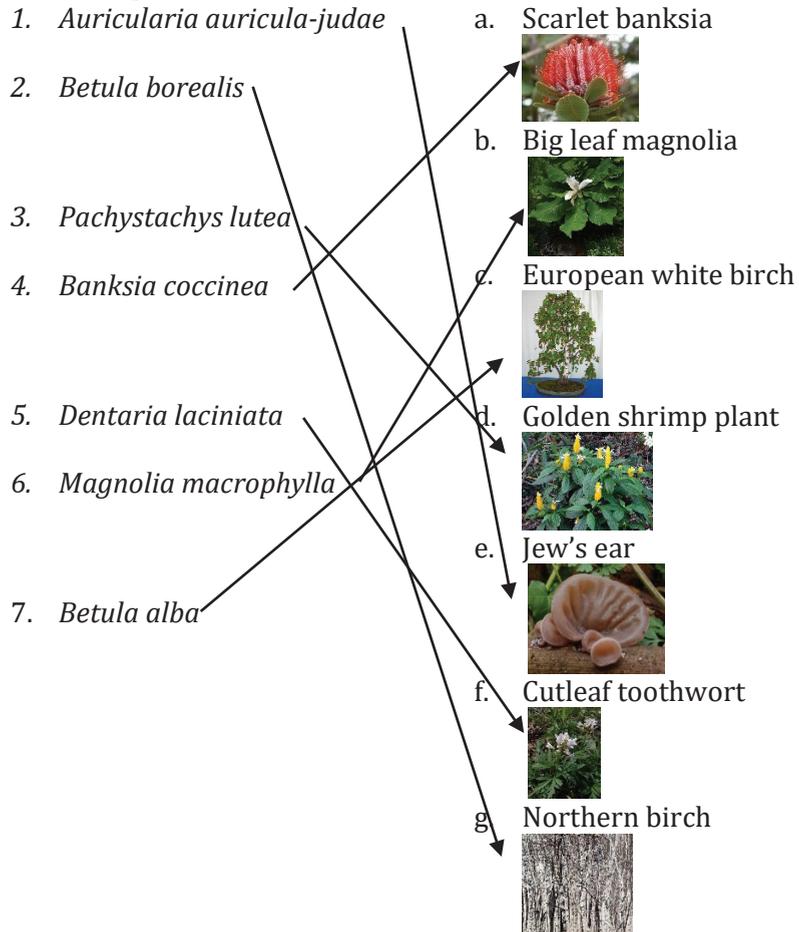
Exercise

The list below shows the meanings of several Latin prefixes, suffixes, or words that are frequently used in species names.

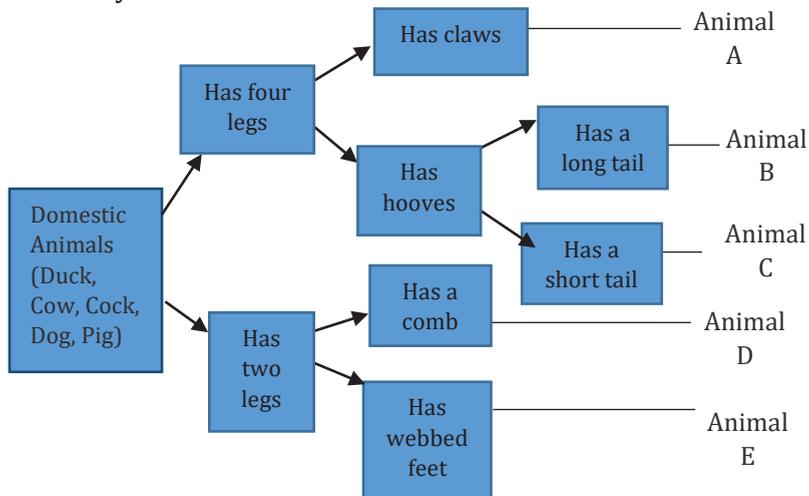
<i>alba</i> , white	<i>lamine</i> , edge or fringe
<i>borealis</i> , northern	<i>macro</i> , large
<i>lasio</i> , hairy	<i>ovi</i> , egg-shaped, oval
<i>auricula</i> ear-like	<i>-phylla</i> , leaf
<i>coccinea</i> , scarlet	<i>rubra</i> , red
<i>dentaria</i> , pertaining to the teeth	<i>suber</i> , cork

Using the information about Latin word parts, match the scientific name on the left with the correct common name on the right. Draw lines to match them. Then write each pair of names on a separate sheet of paper.

Possible Responses to Exercise



Task: Study the flow chart shown below and answer the questions that follow.



1. Which one of the domestic animals is a:

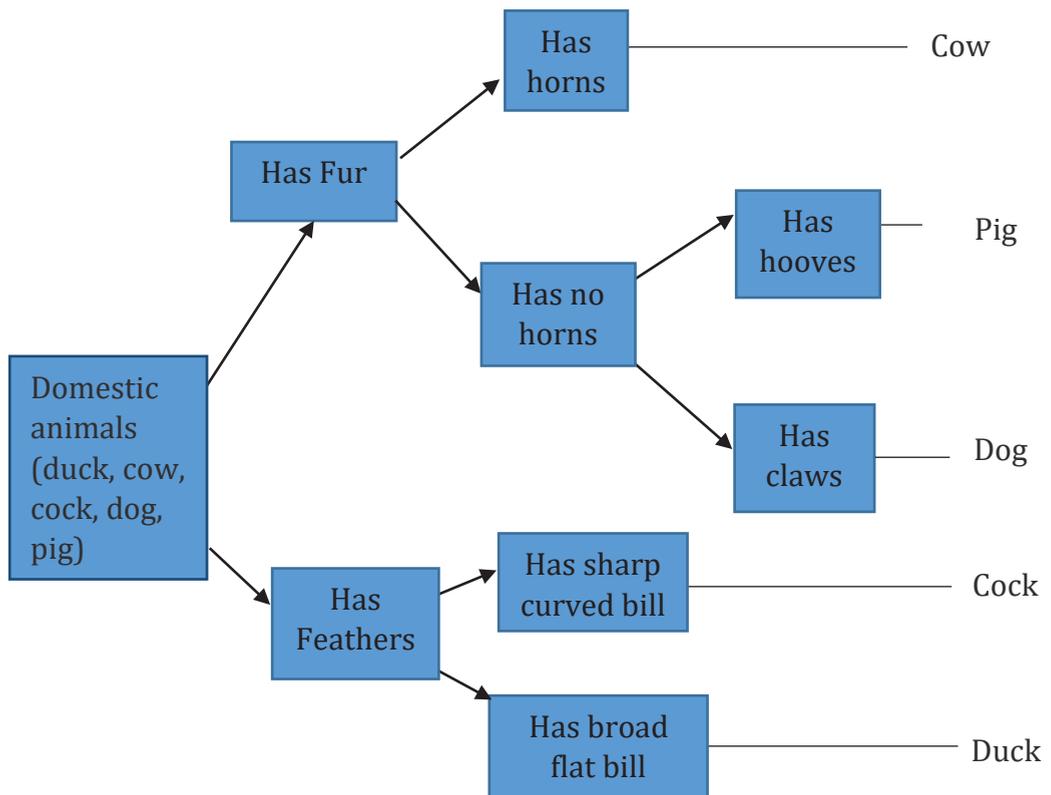
- i) duck
- ii) cow
- iii) cock
- iv) dog
- v) pig

Using the domestic animals in (1) above, create your own flow chart but with features/characteristics different from those given above.

Possible Responses to Task

1. Which one of the domestic animals is a:

- i) Duck Animal E
- ii) Cow Animal B
- iii) Cock Animal D
- iv) Dog Animal A
- v) Pig Animal C



The Five Kingdoms of Living Organisms

In groups of 3 to 5, let the learners read through the text in the learner's book in order to familiarise themselves with examples, characteristics and importance of organisms in kingdom Monera, Protocista and Fungi. Ask guiding questions (build on their previous knowledge), clear misconceptions (for example, all bacteria are harmful) and provide clarification (for example, much as bacteria and protocista are very small they are able to carry out all the life processes like any another "big" living organism).

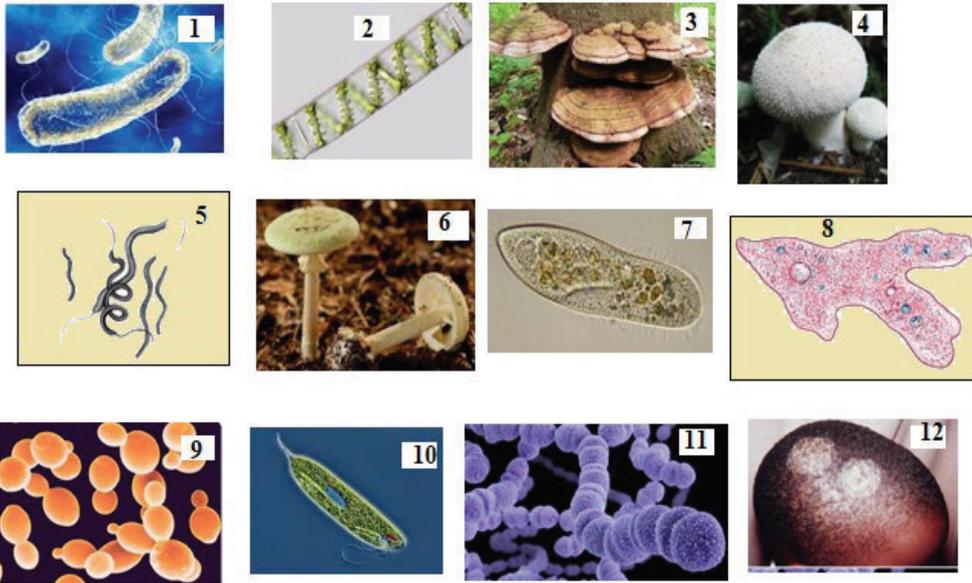
Activity 3.3: Sorting and identifying organisms in Kingdom Monera, Protocista and Fungi

Teacher Preparation for Activity 3.3

1. Obtain actual specimens or pictures of the following organisms: bracket fungus, amoeba, *bacillus*, spirogyra, puff ball, ringworm, *streptococcus*, mushroom, paramecium, yeast, *spirilla*, and euglena.
2. On a chart, write:
 - i) **Group names** i.e. bacteria, fungi, and protists
 - ii) **Characteristics of different organisms** i.e. single celled, multicellular, nucleus is not surrounded by a membrane, nuclear membrane present, cell wall made up of chitin, feed on decomposing matter.
3. Draw the table on a flip chart, manila paper or on the chalkboard.

Teacher Instruction for Activity 3.3

1. Display the charts in the class or lab.
2. Distribute the specimens or pictures to learners in small groups.



Guide learners through the instructions for **Activity 3.3** in the learner's textbook.

1. Observe the learners as they sort the specimens/pictures according to their characteristics through effective communication, teamwork and critical thinking.
2. Engage the learners as they get acquainted with the new terms. Guide the struggling learners.
3. Evaluate the filled-in table.
4. Engage the learners about the appropriate choice of characteristics when creating a flow chart.

Possible Responses

Pictures	Group name	Characteristic(s)
1, 5, 11	Bacteria	<ul style="list-style-type: none"> • Single-celled • Nucleus not surrounded by a membrane
3, 4, 6, 9, 12	Fungi	<ul style="list-style-type: none"> • Multicellular • Cell wall made up of chitin • Feed on decomposing matter
2, 7, 8, 10	Protists	<ul style="list-style-type: none"> • Single celled • Nuclear membrane present

Further reading: Provide learners who are interested with references for further reading about other characteristics of organisms in Monera, Proctista and Fungi.

Project work: Making Yoghurt

1. Make research about the process of making yoghurt. (e.g. visit www.practicalaction.org)
2. Identify and collect the resources required.
3. Try out the process beforehand in order to be familiar.
4. Explain to the learners the science behind the process as they carryout their projects.

Kingdom Plantae

In groups of 3 to 5, let the learners read through the text in the Learner's Textbook in order to familiarise themselves with examples, characteristics and importance of organisms in kingdom Plantae. Ask guiding questions (build on their previous knowledge), clear misconceptions (for example, only green plants make their own food) and provide clarification where necessary.

Activity 3.4: Sorting and identifying organisms in kingdom plantae

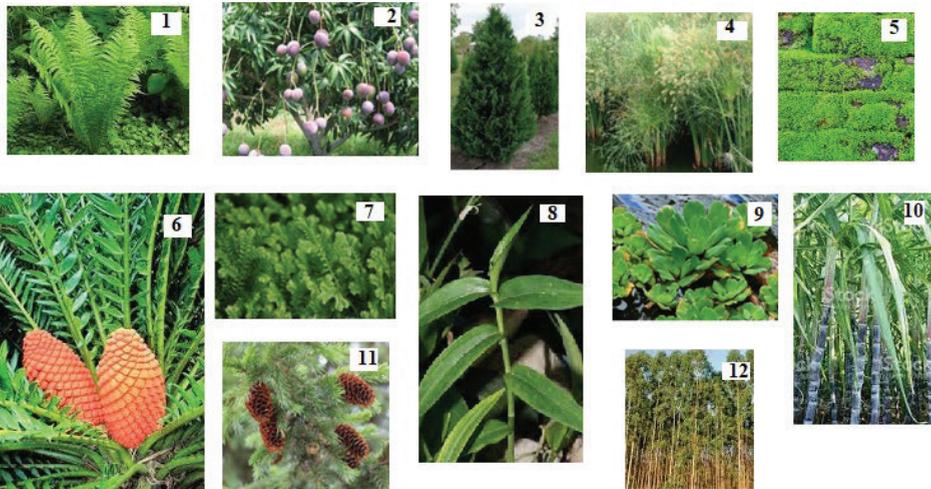
Teacher Preparation for Activity 3.4

1. Obtain actual specimens or pictures of the following organisms: cycad, mango, papyrus, fern, water cabbage, cypress, eucalyptus, sugar cane, hornwort, clubmosses and wandering Jew.
2. On a chart write:
 - i) **Group names** i.e. angiosperms, pteridophytes, gymnosperms, bryophytes
 - ii) **Characteristics of different organisms** 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.
 - iii) Draw the table below on a flip chart, manila paper or on the chalkboard.

Picture(s)	Group name	Characteristic(s)

Teacher Instruction for Activity 3.4

1. Display the charts in the class or lab.
2. Distribute the specimens or pictures to learners in small groups.
3. Guide learners through the instructions for **Activity 3.4** in the Learner's Textbook.



4. Observe the learners as they sort the specimens/pictures according to their characteristics through effective communication, teamwork and critical thinking.
5. Engage the learners as they get acquainted with the new terms. Guide the struggling learners.
6. Engage the learners about the appropriate choice of characteristics when creating a flow chart.

Possible Responses

Picture(s)	Group name	Characteristic(s)
2, 4, 8, 9, 10, 12	Angiosperms	
1, 7	Pteridophytes	
3, 6, 11	Gymnosperms	
5	Bryophytes	

Kingdom Animalia

In groups of 3 to 5, let the learners read through the text in the Learner's Textbook in order to familiarise themselves with examples, characteristics and importance of organisms in kingdom Animalia. Ask guiding questions (build on their previous knowledge), clear misconceptions (for example, starfish are a type of fish) and provide clarification where necessary.

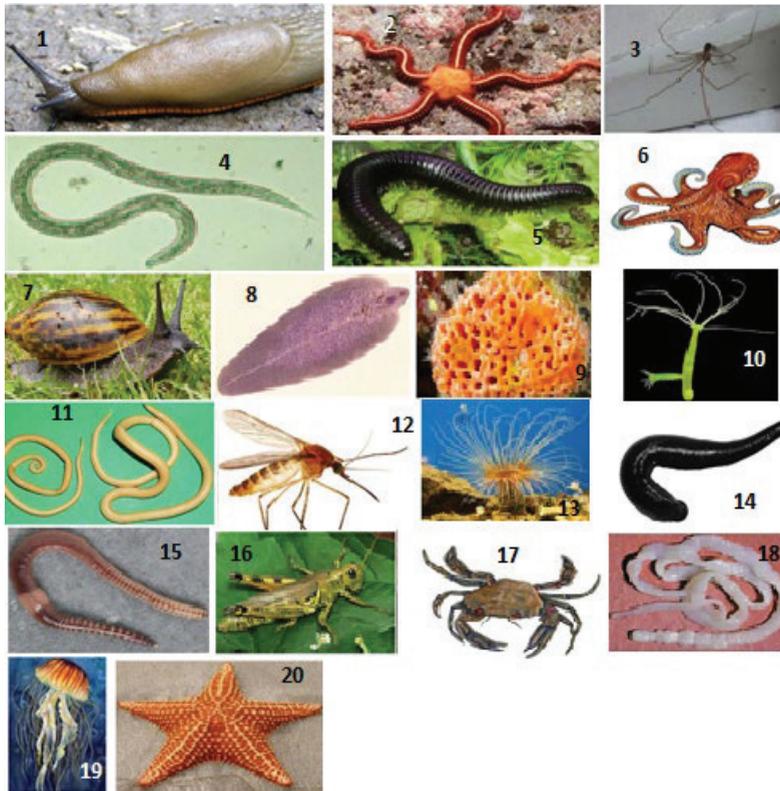
Activity 3.5: Classifying invertebrates

Teacher Preparation for Activity 3.5

Obtain preserved specimens or pictures of the following organisms: hook worm, tape worm, octopus, slug, jelly fish, sponge, mosquito, spider, starfish, earth worm, sea anemone, crab, hydra, millipede, *ascaris*, snail, leech, liver fluke, brittle star and locust.

Teacher Instruction for Activity 3.5

1. Display the charts in the class or lab.
2. Distribute the specimens or pictures to learners in small groups.



3. Guide learners through the instructions for **Activity 3.5** in the Learner's Textbook.
4. Observe the learners as they sort the specimens/pictures according to their characteristics through effective communication, teamwork and critical thinking.
5. Engage the learners as they get acquainted with the new terms. Guide the struggling learners.
6. Discuss with the learners the appropriate choice of characteristics when creating a flow chart.

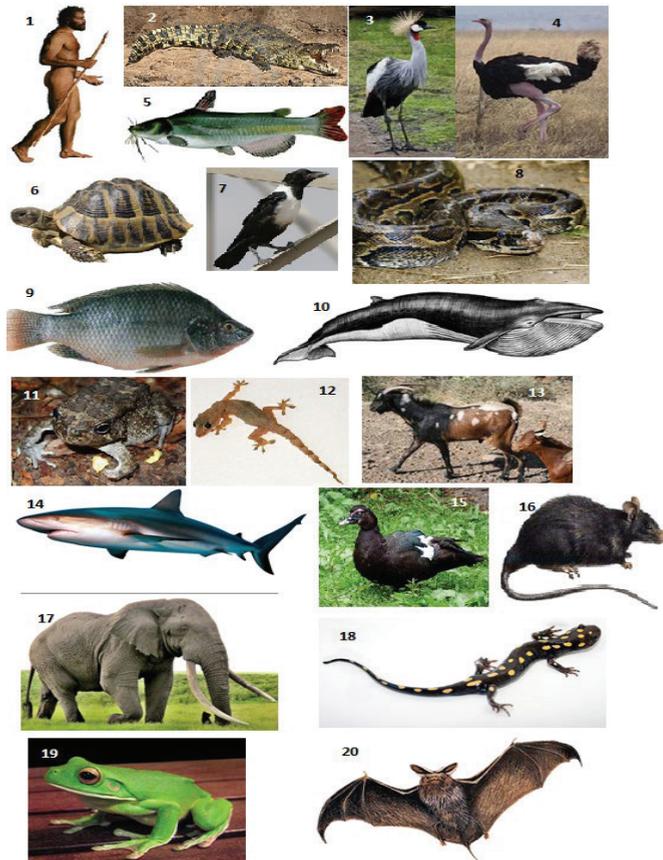
Further reading: Provide learners who are interested with references for further reading about characteristics of organisms in Porifera, Coelenterates, Platyhelminthes, Nematodes, Annelids, Echinoderms and Molluscs.

Activity 3.6: Classifying chordates

Teacher Preparation for Activity 3.6

Obtain preserved specimens or pictures of the following organisms: goat, rat, bat, elephant, human, whale, tortoise, python, gecko, crocodile, crested crane, crow, duck, ostrich, tilapia, shark, catfish, toad, frog and salamander.

Teacher Instruction for Activity 3.6



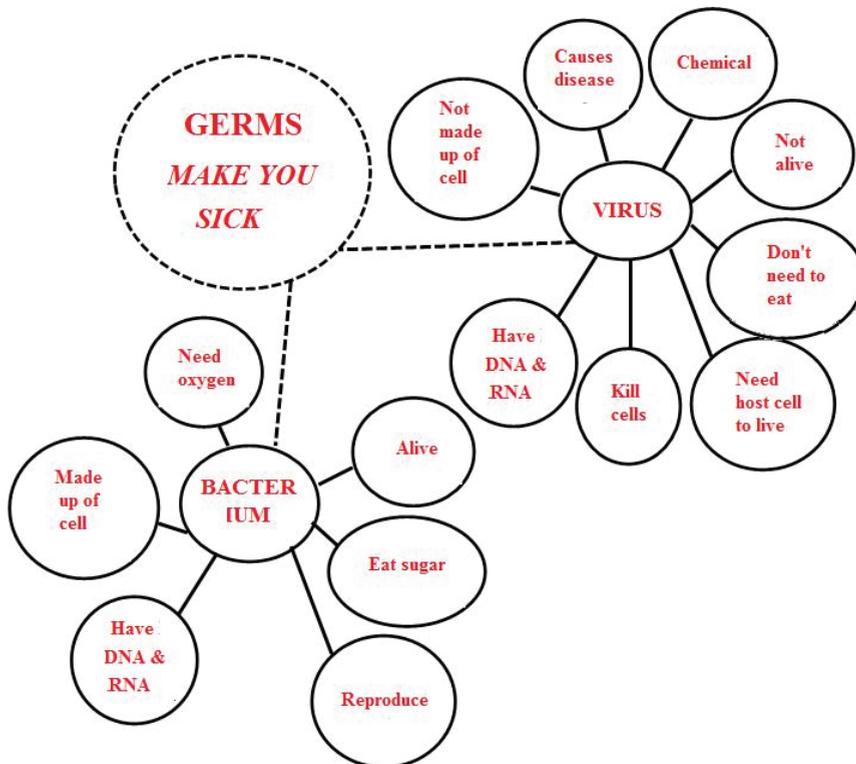
1. Distribute the specimens or pictures to learners in small groups.
2. Guide learners through the instructions for **Activity 3.6** in the Learner's Textbook.

3. Observe the learners as they sort the specimens/pictures according to their characteristics through effective communication, teamwork and critical thinking.
4. Converse with the learners as they get acquainted with the new terms. Guide the struggling learners.
5. Discuss with the learners about the appropriate choice of characteristics when creating a flow chart.

Activity 3.7: Comparing the characteristics of a virus and bacterium

Teacher Preparation for Activity 3.7

Prepare the chart below on 3 or 4 manila papers.



Teacher Instruction for Activity 3.7

1. Display the charts on the walls of the class or lab.
2. Guide learners through the instructions for **Activity 3.7** in the learner's textbook.
3. Observe the learners' ability to make a comparison table using the information in the chart.
4. Guide the learners through a discussion of 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.

Chapter 4: Insects

Ensure that by the end of this chapter, the learners can:

- i) identify the antennae, eyes, mouth parts, wings and legs of a cockroach, housefly, mosquito, worker bee, butterfly and worker termite.
- ii) appreciate the beneficial and harmful aspects of a housefly, cockroach, mosquito, worker bee and butterfly.
- iii) identify the different methods of controlling the harmful stages of a housefly, cockroach, mosquito, and butterfly.

External Features of an Insect

Activity 4.1: Observing and drawing the back (dorsal) view of a cockroach

Teacher Preparation for Activity 4.1

Prepare freshly killed cockroaches for the learners.

Teacher Instruction for Activity 4.1

1. Place learners in pairs and provide them with freshly killed cockroaches.
2. Let the learners place the cockroach (on a white background) on its legs with its head away from the learner (dorsal view). Tell the learners to pull all the wings upwards and outwards without plucking them off.
3. Instruct the learners to draw the structure of the whole cockroach and label the following parts: hind wing, leg, thorax, head, fore wing, abdomen, compound eye and antennae.
4. Guide the learners through the activity using the following aspects:
 - i) Observe the learners' ability to identify the dorsal view of the cockroach. Guide the struggling learners.
 - ii) Engage the learners as they identify the different structures of the cockroach.
 - iii) Observe the learners' ability to communicate effectively with one another.
 - iv) Engage the groups as they draw the dorsal view of the cockroach and label the different parts. Look out for accuracy and correctness of the drawing and labelling.

Caution

After completing the activity, remind the learners to **wash** their hands thoroughly with **clean water** and **soap**. Ask them why this is important.

The Head of an Insect

Activity 4.2: Identifying the features on the head of an insect

Teacher Preparation for Activity 4.2

1. Prepare freshly killed houseflies, cockroaches, mosquitoes, worker bees, butterflies and worker termites.
2. Organise hand lenses that will suffice the class.

Teacher Instruction for Activity 4.2

1. Place learners in groups of 3 to 4.
2. Provide the groups with the freshly killed insects.
3. Instruct learners to use a hand lens to observe and describe the features of the antennae, eyes and mouth parts of the insects provided.
4. Let learners record their observations as in the table below.

Insect	Description					
	Antennae		Eyes		Mouth parts	
Cockroach	<i>number</i>	2	<i>number</i>	2	<i>number</i>	3
	<i>length and shape</i>	long and tapered	<i>type</i>	compound	<i>type</i>	chewing
	<i>texture</i>	hairy			<i>shape</i>	curved and toothed
Housefly	<i>number</i>	2	<i>number</i>	2	<i>number</i>	1
	<i>length and shape</i>	short	<i>type</i>	compound	<i>type</i>	sucking
	<i>texture</i>	hairy			<i>shape</i>	coiled
Mosquito	<i>number</i>	2	<i>number</i>	2	<i>number</i>	3
	<i>length and shape</i>	long	<i>type</i>	compound	<i>type</i>	piercing and sucking
	<i>texture</i>	hairy			<i>shape</i>	long pointed
Worker bee	<i>number</i>	2	<i>number</i>	2	<i>number</i>	1
	<i>length and shape</i>	short	<i>type</i>	compound	<i>type</i>	sucking
	<i>texture</i>	segmented			<i>shape</i>	short coiled
Butterfly	<i>number</i>	2	<i>number</i>	2	<i>number</i>	1
	<i>length and shape</i>	long and clubbed	<i>type</i>	compound	<i>type</i>	sucking
	<i>texture</i>	segmented			<i>shape</i>	coiled
Worker termite	<i>number</i>	2	<i>number</i>	0	<i>number</i>	
	<i>length and shape</i>	short and tapered	<i>type</i>	no eyes	<i>type</i>	
	<i>texture</i>	segmented			<i>shape</i>	

- 
5. During Activity 4.2:
 - i) Observe the learners' ability to identify the head of the insect and observe it without removing it. Guide the learners who have difficulty using the hand lens.
 - ii) Engage the learners as they observe and identify features of the antennae, eyes and mouth parts of the insects.
 - iii) Discuss with the learners the appropriate terms used to describe the features of the antennae, eyes and mouth parts. Clear any misconceptions that may arise.
 - iv) Observe the learner's ability to communicate effectively with one another and with you as they respond to the questions below.
 1.
 - a) What is the function of antennae to an insect?
 - b) Among the insects provided, which one do you think has antennae specifically adapted to its way of life? Give reasons for your answer.
 2. Did all the insects have eyes? If no, which insect did not have eyes? Suggest a reason for your answer.
 3. Based on your observations, select the insects which have the following types of mouth parts and give a reason for your answer.
 - a) Biting-chewing mouth parts:
Reason
 - b) Piercing-sucking mouth parts
Reason
 - c) Siphoning mouth parts
Reason
 - d) Sponging mouth parts
Reason

Caution

After completing the activity, remind the learners to **wash** their hands thoroughly with **clean water** and **soap**. Ask them why this is important.

The Thorax of an Insect

Activity 4.3: Identifying the features on the thorax of an insect

Teacher preparation for activity 4.3

1. Prepare freshly killed houseflies, cockroaches, mosquitoes, worker bees, butterflies and worker termites.
2. Organise hand lenses that will suffice the class.

Teacher instruction for Activity 4.3

1. Place learners in groups of 3 to 4.
2. Provide the groups with the freshly killed insects.
3. Instruct the learners to use a hand lens to observe and describe the features of the thorax of the insects provided.
4. Let the learners record their observations as in the table below.

Insect	Description			
	Wings		Legs	
Cockroach	<i>Number</i>	4	<i>Number</i>	6
	<i>Texture</i>	Outer pair of hard and one soft membranous	<i>Texture</i>	Spiny
Housefly	<i>Number</i>	2	<i>Number</i>	6
	<i>Texture</i>	Membranous	<i>Texture</i>	Hairy
Mosquito	<i>Number</i>	2	<i>Number</i>	6
	<i>Texture</i>	Slender membranous	<i>Texture</i>	Hairy
Worker bee	<i>Number</i>	4	<i>Number</i>	6
	<i>Texture</i>	Membranous	<i>Texture</i>	Hairy
Butterfly	<i>Number</i>	4	<i>Number</i>	6
	<i>Texture</i>	Membranous with scales	<i>Texture</i>	hairy
Worker termite	<i>Number</i>	0	<i>Number</i>	6
	<i>Texture</i>	No wings	<i>Texture</i>	Smooth

5. During activity 4.3:
 - i) Observe the learner's ability to identify the thorax of the insect and observe it. Guide the learners who have difficulty using the hand lens.
 - ii) Engage the learners as they observe and identify features of the wings and legs of the insects.
 - iii) Discuss with the learners the appropriate terms used to describe the features of the wings and legs. Clear any misconceptions that may arise.
 - iv) Observe the learners' ability to communicate effectively with each other and with you as they respond to the questions below.

1. What are the legs and wings in insects used for?
 2. Did all the insects have wings? If no, which one(s) did not have and why?
 3. Was there an insect(s) with more than one pair of wings? If yes, which one(s) was it? Suggest the functions of the wings observed.
 4. (a) Which insects have special features on their legs?
(b) What are those features and what are they used for?
- v) Observe learners as they construct a dichotomous key. Provide guidance on choice of characteristics to distinguish the insects. Allow for variations in the keys constructed.

Caution

After completing the activity, remind the learners to **wash** their hands thoroughly with clean water and **soap**.

The Beneficial and Harmful Aspects of Insects

Activity 4.4: To find out the helpful and harmful aspects of insects

Teacher Preparation for Activity 4.4

Organise markers and charts/manila paper that will suffice the class.

Teacher Instruction for Activity 4.4

1. Place learners in groups of 3 to 4.
2. Provide each group with a chart and marker.
3. For each of the insects in the table below, use questions (i) and (ii) to lead the learners into a discussion.
 - i) How is the insect helpful to other organisms/the surroundings?
 - ii) How is the insect harmful to other organisms/the surroundings?
4. Let the different groups fill in the table (on the chart/manila paper) with their discussion points and present to the rest of the class.

Insect	How it is helpful	How it is harmful
Cockroach		
Housefly		
Mosquito		
Honey bee		
Butterfly		

Note: Probe the learners into considering the different stages of the life cycles of these insects.

5. During Activity 4.4:
 - i) engage the learners as they discuss the helpful and harmful aspects of the insects given in the activity. Clear any misconceptions that may arise.
 - ii) observe the learners' ability to think critically and appreciate insects by the end of the activity.
 - iii) observe the learner s' ability to communicate effectively as they present their work to the rest of the class.

Methods of Control

Activity 4.5: To find out the methods of control of the harmful stages of insects

Teacher Preparation for Activity 4.5

Organise markers and charts/manila paper that will suffice the class.

Teacher Instruction for Activity 4.5

1. Place learners in groups of 3 to 4.
2. Provide the groups with a chart and marker.
3. Let the learners in their groups brainstorm:
 - i) the harmful (pest) stage(s) in the life cycle of a housefly, cockroach, mosquito, and butterfly.
 - ii) the methods that are used to control the housefly, cockroach, mosquito and butterfly in their environment.
4. For each insect, the groups should write down their discussion in form of a report and include information on:
 - i) The harmful/pest stage of the insect.
 - ii) Control methods that are harmful to the environment and those that are not harmful to the environment. Tell each group to present their work to the rest of the class.
5. During activity 4.5:
 - i) engage the learners as they discuss the harmful stages and the control methods used for that stage of the insects given in the activity. Clear any misconceptions that may arise.
 - ii) observe the learners' ability to think critically and appreciate the control methods that are harmful and those that are not harmful to the environment.
 - iii) observe the learners' ability to write a good report. Guide groups which are struggling.

- 
- iv) observe the learners' ability to communicate effectively as they present their work to the rest of the class.

Activity 4.6: To create an insect trap

Teacher Preparation for Activity 4.6

1. Organise markers and charts/manila paper that will suffice the class.
2. Provide learners with locally available materials that they may request for.

Teacher Instruction for Activity 4.6

1. Place learners in groups of 3 to 4.
2. Provide the groups with a chart, marker and locally available materials for making a trap of their choice.
3. Ask the groups to design and make a trap for any one of the insects they have studied that is a pest, using locally available materials.
4. Let the groups present their model traps to the rest of the class explaining how they work.
5. During activity 4.6:
 - i) Engage the learners as they discuss the design of the trap they plan to make.
 - ii) Observe the learners' ability to think critically during the design process.
 - iii) Observe the learners' ability to solve a problem by designing a trap that is effective and efficient.
 - iv) Observe the learners' innovativeness through their choice of locally available materials.
 - v) Observe the learners' hands-on skills as they build the trap. Guide groups which are struggling.
 - vi) Observe the learners' ability to communicate effectively as they present their work to the rest of the class.

Activity of Integration

The following is an extract from a media brief on control of the Fall Armyworm in Uganda by the Minister for Agriculture, Animal Industry and Fisheries. Read the extract and answer the questions that follow.



As a result of the climate change and climate variability, Uganda is experiencing an outbreak of new pests and diseases such as the coffee twig borer, banana bacterial wilt, cassava brown streak disease, tomato leaf miner, maize lethal necrosis and now the Fall Armyworm. This will negatively impact the nation’s food and nutrition security and wealth creation efforts.

In the second season of 2016, the Ministry of Agriculture received reports of a severe outbreak of “caterpillars” on maize plants in the districts of Kasese, Kayunga and Bukedea. A visit made to these districts found that almost 40% of the maize crops in the fields visited were attacked by an unknown pest. The National Agricultural Research Organization (NARO) has confirmed identity of the pest as a moth commonly known as the Fall Army Worm. The fall army worm is native to tropical and subtropical regions of the Americas. How it arrived in Africa is not clear. There is suspicion, however, that the pest could have been introduced as a result of increase in trade (imports) of Agricultural commodities across continents and the pest’s migratory nature of 2000km per annum could have facilitated its entry into Uganda.

First observed in Nigeria in January 2016, the pest is now reported in several other countries including Togo, Ghana, Zambia, Zimbabwe, South Africa, Malawi, Mozambique, Namibia and Kenya. In Uganda to date, the pest has been confirmed in over 54 districts.

*The pest is known to feed on more than 80 **plant species**, including **cereals (maize, millet, sorghum, sugarcane, rice and wheat), legumes (cowpea, groundnuts and soybean), cotton and many pasture grasses (Rhodes grass, Kikuyu grass, Lucerne and other pasture grasses).***



The destructive stage of the pest is the caterpillar. The caterpillar feeds aggressively on most parts of the plant including the leaves, stems of maize, sorghum, rice, Kikuyu grass, Napia grass and sugarcane crops. This feeding damage results in a reduction in both yield and grain quality

The adult moths move in large swarms at night with each female laying up to 2000 eggs and the emerging caterpillars are aggressive feeders with the potential to destroy a hectare within 72 hours in its later stages. The moths are strong flyers, when the wind conditions are right; they are capable of covering over 2000 km per year.

Tasks:

1. Suggest, giving reasons, whether the fall armyworm is an insect or not.
2. Apart from man, write down four other organisms that are affected by the destruction of crops due to the fall armyworm. Give a reason for your answer.
3. Write down four explanations why the fall armyworm is a hard/difficult pest to control.

Evaluation Grid for activity of Integration

	Criterion 1: Accuracy	Criterion 2: Relevance	Criterion 3: Coherence	Criterion 4: Excellence
Task 1	<p>Indicator(s)</p> <p>Scores 3 if: Identifies 3 features of the army worm that are characteristic of insects.</p> <p>Scores 2 if Identifies 2 features of the army worm that are characteristic of insects.</p> <p>Scores 1 if Identifies 1 feature of the army worm that is characteristic of insects.</p>	<p>Learner:</p> <p>Scores 3 if: Uses information from the passage to identify 3 characteristics used to classify the army worm as an insect or not.</p> <p>Scores 2 if: Uses information from the passage to identify 2 characteristics used to classify the army worm as an insect or not.</p> <p>Scores 1 if: Uses information from the passage to identify 1 characteristic used to classify the army worm as an insect or not.</p>	<p>Learner:</p> <p>Scores 3 if: Gives 3 reasons to distinguish the army worm as an insect.</p> <p>Scores 2 if: Gives 2 reasons to distinguish the army worm as an insect.</p> <p>Scores 1 if: Gives 1 reason to distinguish the army worm as an insect.</p>	<p>Score 1 if: produces any relevant information about the army worm that was not given in the extract .</p>
Task 2	<p>Scores 3 if: Names at least 3 other organisms that are affected by the army worm.</p> <p>Scores 2 if: Names 2 other organisms that are affected by the army worm</p> <p>Scores 1 if: Names 1 other organism that is affected by the army worms.</p>	<p>Scores 3 if: Relates effects of crop destruction on at least 3 organisms</p> <p>Scores 2 if: Relates effects of crop destruction on 2 organisms</p> <p>Scores 1 if: Relates effects of crop destruction on 1 organism</p>	<p>Scores 3 if: Explains 3 ways how the other organisms are affected by the army worm(</p> <p>Scores 2 if: Explains 2 ways how the other organisms are affected by the army worm</p> <p>Scores 1 if: Explains 1 way how the other organisms are affected by the army worm</p>	

Task 3	Score 3 if: Mentions at least 3 ways the army worm can be controlled Score 2 if: Mentions 2 ways the army worm can be controlled Score 1 if: Mentions 1 way the army worm can be controlled	Score 3 if: Relates at least 3 control methods to the biology of the army worm Score 2 if: Relates 2 control methods to the biology of the army worm Score 1 if: Relates 1 control method to the biology of the army worm	Scores 3 if: Gives 3 explanations why the worm is difficult to control. Scores 2 if: Gives 2 explanations why the worm is difficult to control. Scores 1 if: Gives 1 explanation why the worm is difficult to control.	
	/9	/9	/9	

Total Mark = 28

Chapter 5: Flowering Plants

Ensure that by the end of this chapter, the learners:

- i) know how to describe and outline the functions of a root, stem, node, leaf, internode, bud, flower and fruit of a typical flowering plant.
- ii) know how roots, stems and leaves are modified to suit their function.
- iii) classify the different types of leaves and fruits.

Activity 5.1: Identifying and comparing parts of a flowering plant

In this activity, learners will explore the monocotyledonous and dicotyledonous plants and appreciate that the two plants have similar structures of different forms.

Teacher Preparation for Activity 5.1

1. Get a freshly harvested bean plant (OR a dicotyledonous herb with complete root, stem, leaves, flowers and fruits)
2. Get a freshly harvested maize plant (OR a monocotyledonous herb with complete root, stem, leaves, flowers and fruits)

Features	Dicotyledonous plant	Monocotyledonous plant
1. Type of root system		
2. Leaf venation		
3. Leaf shape		
4. Leaf attachment to stem		
5. Flower appearance		

Teacher Instruction for Activity 5.1

1. Provide the learners with freshly harvested plants.
2. Instruct the groups to carefully observe the plants provided, and draw and label the parts of the plant.

- 
3. Tell the groups to compare the features of the plants and complete the table below using the structural features.
 4. During activity 5.1:
 - i) Observe the learners' ability to identify the external parts of a dicot and monocot flowering plant. Guide the struggling learners more particularly with the monocot plant.
 - ii) Engage the learners as they identify the different structures of the flowering plants.
 - iii) Observe the learners' ability to communicate effectively with one another.
 - iv) Discuss with the groups as they draw the external features of the flowering plants and label the different parts. Review the tips on making biological drawings with the different groups. Look out for the accuracy and correctness of drawing and labelling.
 - v) Observe the learners' ability to think critically about the descriptive terms to use when comparing the structures of the two plants. Guide the struggling learners. Clear any misconceptions that may come up e.g. difference between a fruit and seed.
 - vi) Review learners' work as they list different functions of the plant parts.

Activity 5.2: Identifying parts of a plant that are used as food by human beings

In this activity, learners will explore parts of plants that are used as food in their community.

Teacher Preparation for Activity 5.2

Collect and set up 2 or 3 central points (depending on the size of the class) to display the following healthy-looking **whole** plants (leaves, stem and roots) of the following foods: cabbage, water melon, bamboo, sugar cane, Irish potato, pumpkin, carrot, kale/sukuma wiki, onion, lettuce, tomato, groundnut, cassava, sweet potato, maize, yam, garlic.

Teacher Instruction for Activity 5.2

1. Provide the learners with the healthy plants.
2. Let each learner choose a partner to work with.
3. Instruct the pairs to carefully study each plant part provided. For each of the plant parts used as food in their community, the pairs should state whether they are fruits, leaves, stems or roots. Ask the pairs to fill the information in the table below.

Plant part	Food
Fruit	
Leaf	
Stem	
Root	

4. During Activity 5.2:
- i) Observe the learners' ability to identify the parts of each plant that is eaten as food. Guide the struggling learners.
 - ii) Observe learners' ability to think critically about the descriptive terms and give explanations to their reasons when identifying the parts of the plant used as food.
 - iii) Discuss with the learners to clear any misconceptions that may come up e.g. storage leaves, stems and roots.
 - iv) Observe the learners' ability to communicate effectively with one another.

Activity 5.3: Finding out about modified roots

In this activity, the learners will observe modified roots and how they are adapted for other specific functions.

Teacher preparation for activity 5.3

Obtain actual specimens or pictures of the following organisms and place them in three groups: **Group 1** root tubers (cassava, carrot, sweet potato)

Group 2 prop roots, buttress roots, clasping roots

Group 3 aerial roots

Pictures of:

1. Root tubers

cassava



carrot



sweet potato



2.

prop roots



butress roots



clasping roots



3. Roots of mangrove tree



Teacher Instruction for Activity 5.3

1. Distribute the specimens or pictures to learners in small groups.
2. In their groups, let learners carefully observe the pictures 1, 2 and 3 provided. Lead the learners to discuss what makes the pictures of the roots different from the “normal” roots and ask them to identify the

possible uses of the roots in picture 1, 2 and 3. Groups should write down their discussions and present them to the rest of the class.

3. During Activity 5.3:
 - i) observe the learners as they sort the specimens/pictures according to their characteristics through effective communication, teamwork and critical thinking.
 - ii) engage the learners as they get acquainted with the new terms and identify the uses/adaptive features of the plant parts provided. Guide the struggling learners.
 - iii) discuss with the learners about the appropriate format and language (technical terms) when groups are presenting their work.

Activity 5.4: Finding out about modified stems

In this activity, learners will observe pictures of modified stems. The learners may be familiar with some of the plants from which the stems were obtained.

Teacher Preparation for Activity 5.4

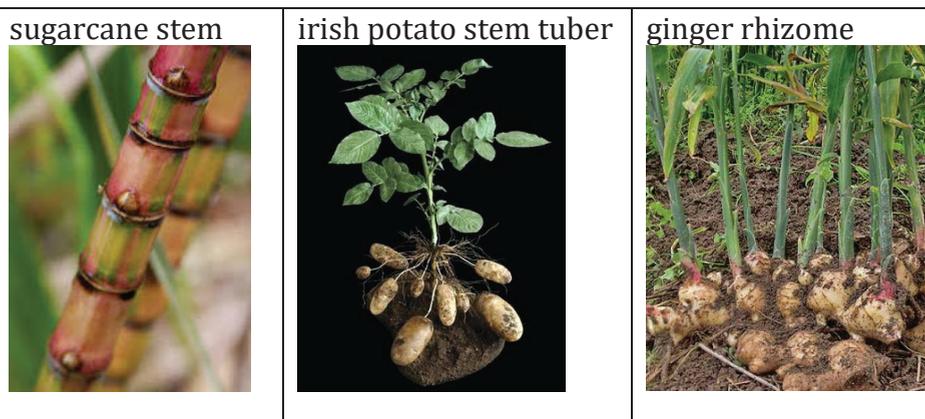
Obtain actual specimens or pictures of the following organisms and place them in four groups: **Group 1:** Underground stems: Bulb (*onion*), Stem tuber (*Irish potato*), Rhizome (*Ginger*)

Group 2: Runner (*couch grass rhizome*), Stem cutting (*cassava*), Sucker (*banana*), Stolon (*strawberry*)

Group 3: Climbers: *bean, morning glory*

Group 4: Prickly stems: *Acacia*

Pictures of:



<p>couch grass rhizome</p> 	<p>cassava stem cutting</p> 
<p>banana sucker</p> 	<p>strawberry runner(stolon)</p> 
<p>Bean plant</p> 	<p>Morning glory</p> 
<p>Kei apple</p> 	

Teacher Instruction for Activity 5.4

1. Distribute the specimens or pictures to learners in small groups.
2. In their groups, let learners observe carefully the pictures 1, 2, 3 and 4 provided.
3. Lead the learners to discuss what makes the pictures of the stems different from the “normal” stems studied earlier in this chapter and ask them to identify the possible uses of the stems in picture groups 1, 2, 3 and 4.

4. Groups should write down their discussion points and present them to the rest of the class.
5. During Activity 5.4:
 - i) observe the learners as they sort the specimens/pictures according to their characteristics through effective communication, teamwork and critical thinking.
 - ii) engage the learners as they get acquainted with the new terms and identify the uses/adaptive features of the plant parts provided. Guide the struggling learners.
 - iii) discuss with the learners about the appropriate format and language (technical terms) when groups are presenting their work.

Activity 5.5: Classifying leaves

In this activity, learners will observe different forms of leaves and classify them.

Teacher Preparation for Activity 5.5

1. Obtain actual specimens of a branch from the following plants with at least one pair of leaves attached to the branch: black jack, hibiscus, mango, cassia/indigofera, cassava, pumpkin, wild millet, *Lantana camara*, jacaranda/flamboyant, pawpaw/morning glory/sweet potato or yam
2. Draw the table from the learner's book on a flip chart, manila paper or on the chalkboard showing the different specimens and the different structural characteristics the learners are to observe.

Teacher Instruction for Activity 5.5

1. Display the chart in the class or lab.

Table of Characteristics for Five Leaves

Structural characteristics	SPECIMENS				
	A	B	C	D	E
	Black jack	Cassia	Cassava	Wild millet	Hibiscus
1. Leaflets/leaf lobes or not					
2. If leaflets are present, state the number					

3.	Texture of lamina					
	(hairy or non-hairy)					
4.	Type of venation					
	(parallel or network)					
5.	Leaf margin (entire or					
	serrated)					
6.	Leaf sheath or petiole					

2. Distribute the specimens to learners in small groups.
3. Instruct the groups to observe and sort the collected leaves according to:
 - i) Arrangement of leaves on the stem (opposite, alternate, whorl, and spiral)
 - ii) Leaf types (simple and compound) depending on whether the lamina is divided into leaflets or not.
 - iii) External structural characteristics – leaf petiole/leaf sheath, texture of leaf lamina (hairy or non-hairy), leaf apex (round or pointed), leaf margin (serrated or entire), leaf base (swollen or not swollen), type of venation (parallel or network). Groups should record their observations in the table.
4. Ask the learners to construct a flow chart for the leaves using the characteristics in table.
5. Let the groups observe, identify, draw and label the external parts of leaves A and E.
6. During Activity 5.5:
 - i) Observe the learners as they sort the specimens according to their characteristics through effective communication, teamwork and critical thinking.
 - ii) Engage the learners as they get acquainted with the new terms and fill in the table. Guide the struggling learners/groups.
 - iii) Discuss with the learners about the appropriate choice of characteristics when creating a flow chart.
 - iv) Discuss with the groups as they draw the external features of leaves A and E and label the different parts. Review the tips on making biological drawings with the different groups. Look out for accuracy and correctness of the drawing and labelling.

Activity 5.6: Finding out about modified leaves

In this activity, learners will observe pictures of modified leaves and how they are adapted for a specific function.

Teacher Preparation for Activity 5.6

Obtain real specimens or pictures of the following organisms and place them in five groups:

Group 1: Leaf tendrils: *watermelon* and/or *passion fruit*

Group 2: Leaves as insect traps: *venus flytrap*, *pitcher plant*

Group 3: Leaves for protection: *onion* (scale leaves), *cactus* (spines)

Group 4: Leaves for reproduction: *bryophyllum*

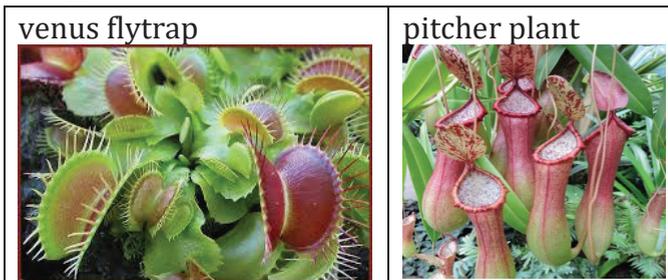
Group 5: Swollen leaves: *aloe vera*, *sisal*, *onion* (fleshy leaves)

Pictures of:

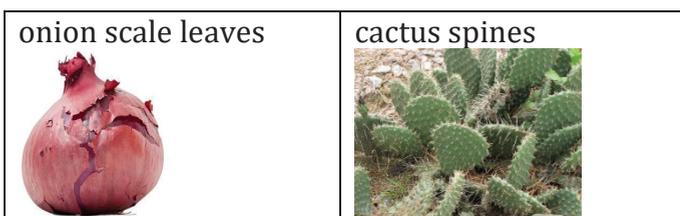
1. Leaf tendrils



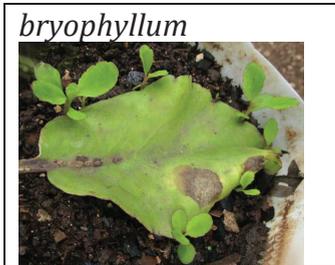
2.



3.



4.



5. swollen leaves

aloe vera



sisal



onion



Teacher Instruction for Activity 5.6

1. Distribute the specimens or pictures to learners in small groups.
2. In their groups, let learners carefully observe the picture groups 1, 2, 3, 4 and 5 provided.
3. Lead the learners to discuss what makes the pictures of the leaves different from the “normal” leaves and ask them to identify the possible uses of the leaves in picture groups 1, 2, 3, 4 and 5. Groups should write down their discussion points and present them to the rest of the class.
4. During Activity 5.6:
 - i) observe the learners as they sort the specimens/pictures according to their characteristics through effective communication, teamwork and critical thinking.
 - ii) discuss with the learners as they get acquainted with the new terms and identify the uses/adaptive features of the plant parts provided. Guide the struggling learners.
 - iii) discuss with the learners about the appropriate format and language (technical terms) when groups are presenting their work.

Activity of integration

One day, a group of children were walking through in their village. The children met a farmer at his garden, in one part of the garden, the farmer was growing *Amaranthus* (locally known as doodo/obuga) and kale/collard greens (locally known as Sukuma). The children noticed flowers on the plants and the farmer encouraged them to break the flowers off the plants. In the other part of the garden the farmer was growing orange trees which also had flowers. The children wanted to break off the flowers from the orange trees but the farmer stopped them from doing this. The children became confused.



Amaranthus (Doodo/Obuga)



Kale/collard greens (Sukuma)



Orange tree

Your task is to write an explanation to help the children understand why the farmer allowed them to break flowers off some plants and not others.

Evaluation grid for activity of integration

	Criteria 1: Accuracy	Criteria 2: Coherence	Criteria 3: Relevance	Criteria 4: Excellence
Task/Output Written explanation	<p>Learner: Scores 3 if States importance of flowers, leaves and fruits</p> <p>Scores 2 if States importance of flowers and leaves or flowers and fruits or fruits and leaves</p> <p>Scores 1 if States importance flowers or leaves or fruits</p>	<p>Scores 3 if Explains all the events that occur when the flowers are broken off or left on</p> <p>Scores 2 if Explains most of the events that occur when the flowers are broken off or left on</p> <p>Scores 1 if Explains some of the events that occur when the flowers are broken off or left on</p>	<p>Scores 3 if Mentions the effects of breaking off or leaving on flowers on the 3 crops</p> <p>Scores 2 if Mentions the effects of breaking off or leaving on flowers on the 2 crops</p> <p>Scores 1 if Mentions the effects of breaking off or leaving on flowers on 1 crop</p>	<p>Learner: added any exemplary element unsolicited in the explanation.</p>
	/3	/3	/3	/1



National Curriculum
Development Centre,
P.O. Box 7002, Kampala.
www.ncdc.go.ug