



CHAPTER 1

INTRODUCTION TO BIOLOGY



<p>Key Words</p>	<p>By the end of this chapter, you should be able to learn:</p>
<ul style="list-style-type: none"> • biology • life processes • zoology • botany • physiology 	<ul style="list-style-type: none"> • that Biology is the science of living things. • that Biology is applied in everyday life. • the importance of life processes and how they are manifested differently in different organisms.

Introduction

An introduction to biology will enable you to appreciate that biology is the study of life, and application of the characteristics of living things will enable you identify living things from the non-living things.

The practical nature to biology will help you acquire skills such as inquiry, observation, making conclusions and informed decisions about life/living things. Therefore understanding Biology will enable you to develop concern for yourself, the environment and promote its conservation.

Meaning of Biology

Do you remember the knowledge of science you studied in the Primary school? Some of the knowledge relates to living things while the other relates to non-living things.

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

Key question

Is it possible to sort materials into living and non-living?

What you need

- pictures of different items

What to do

Look at the items in the picture below.

- Draw lines to connect all the living things to the middle circle.
- Suggest any reasons why you chose those items.



Biology is a branch of science that deals with the study of living organisms.

Activity 1.2: Identifying areas where knowledge of biology is applied

Key Question

Name any occupation or job you know of that requires the knowledge of biology or deals with the wellbeing of living things?

What you need

- i) pens/pencils
- ii) notebook
- iii) pictures of various occupations based on the knowledge of biology

Zoology is a branch of biology that deals with the study of animals.

Botany is a branch of biology that deals with the study of plants.

Physiology is a branch of biology that deals with the study of functions and processes of living organisms or their parts.

What to Do

1. In small groups, look at the pictures provided, discuss and write down what work you can do after studying biology to improve your life and for those in the community.
2. Present what you have discussed.
3. Group the pictures under the following branches of biology i.e. zoology, botany and physiology based on the definitions provided.



Life Processes

In order to decide whether what we are observing is living or non-living, a set of characteristics called **life processes** are used. In the next section, you will find out the life processes.

Life processes are common to all living things. They feed (Nutrition), take in and use air (Respiration), produce and remove waste (Excretion), grow and develop (Growth), move (Movement), produce young ones (Reproduction) and respond to changes in their environment (Sensitivity). Each life process has particular functions that are important to living things for their survival.

Activity 1.3: Identifying a life process

Key question

Can you tell a life process?



Fig 1.1 (a): A water fall



Fig 1.1(b): A lion eating a zebra

What to do

Observe the pictures in Figures 1.1(a) and (b) above.

- Which of them is a life process and why?
- Which of them is not a life process and why?

Activity 1.4: Finding out life processes and their importance

Key question

Can you tell a life process?

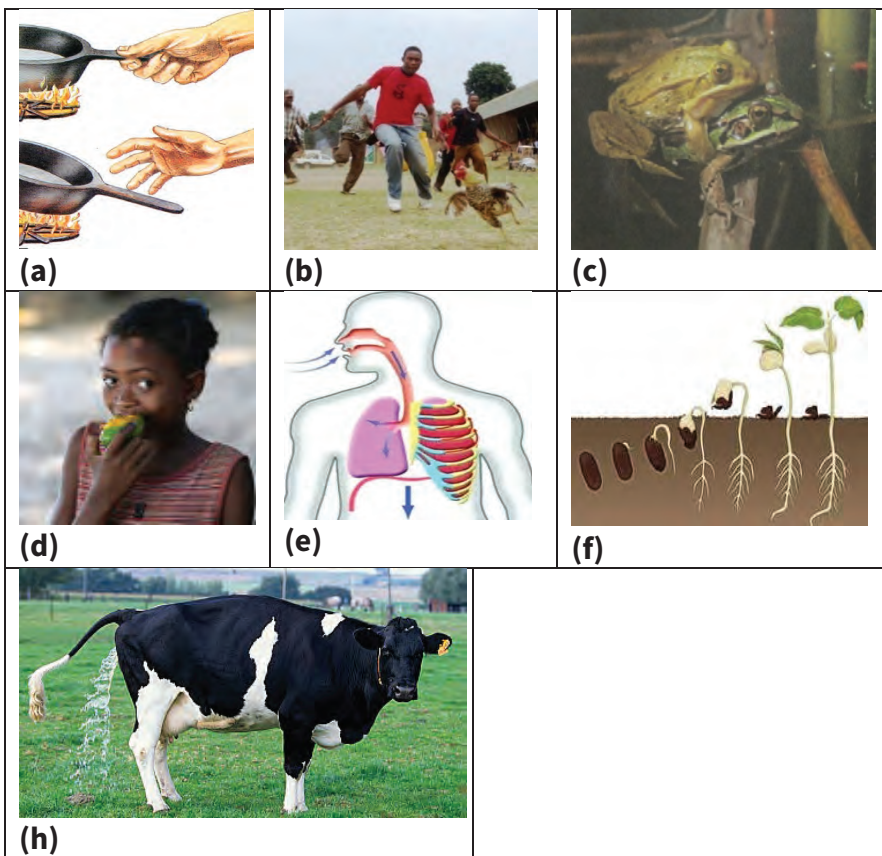
What you need

- pictures of living things involved in life processes

What you do

The pictures below show living things involved in life processes.

- In pairs, study the pictures carefully.
- Identify the life process shown in each picture and state its importance(s) to the living organism. Fill the answers in the table provided below the pictures.





Picture	Life process	Importance of the life process
(a)		
(b)		
(c)		
(d)		
(e)		
(f)		
(h)		

Exercise 1.0: Characteristics of living organisms' word search

Instructions: Search for and circle seven words that refer to life processes. The words may appear straight across, backward straight across, up-down, down-up, or diagonally.

A	X	E	B	H	F	H	T	W	O	R	G	P	D	J
N	Y	A	L	Q	Z	K	Z	C	N	I	D	R	N	I
S	E	N	S	I	T	I	V	I	T	Y	E	O	S	L
M	N	O	I	T	E	R	C	X	E	S	I	W	F	T
H	K	F	U	B	D	Z	P	Z	P	T	L	Q	N	I
N	C	W	G	X	C	K	G	I	C	F	Z	E	M	C
P	O	B	J	L	M	V	R	U	N	S	M	Q	R	S
U	D	I	M	X	Y	A	D	H	Q	E	I	X	V	J
H	Q	F	T	B	T	O	T	M	V	P	D	H	R	U
W	J	N	E	I	R	L	W	O	H	O	E	X	A	Y
E	U	C	O	P	R	N	M	C	M	D	N	Z	S	R
F	X	N	E	Z	C	T	S	K	P	A	Q	O	U	V
E	Q	R	C	D	K	G	U	Z	D	W	K	V	T	Q
H	C	Z	P	E	V	L	Y	N	T	A	T	G	X	L
U	W	K	W	N	I	F	I	D	W	U	I	B	T	H

For each word found, use it in a sentence or statement that makes scientific sense.

2.0 Adam says plants take in carbon dioxide during the day and give out oxygen. Eve says plants take in oxygen throughout the day and at night. In your opinion, who would you agree with? Give reason(s) for your response.

Differentiating Between Animals and Plants

From **Activity 1.3**, both plants and animals are living things and have common characteristics. However, some of the characteristics in plants and animals are carried out in different ways.

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

Key question

How do plants and animals differ in their life processes?

What you need

- A plant in a pot
- A small animal e.g. a rat in a cage or an ant in a glass container

What you do

In small groups, observe the life processes of the two organisms and record your observations. Write what you observe for the plant and animal. Describe how the organism will carry out the life process.

Note: in some cases it may be **difficult** or **impossible** to observe the processes. In that case use textbooks, the Internet to prepare your findings or consult a teacher for guidance.

1. Feeding

Plant _____

Animal _____

**2. Movement**

Plant_____

Animal_____

3. Sensitivity

Plant_____

Animal_____


4. Excretion

Plant_____

Animal_____

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.

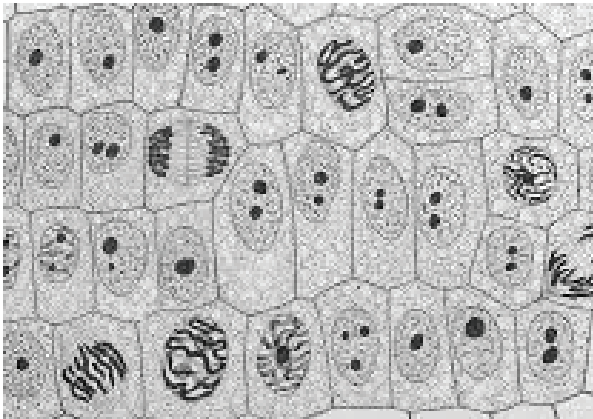
Chapter Summary

- Biology is a branch of science that deals with living organisms.
- Biology has several branches that can be applied in everyday life.
- All living organisms undergo/perform life processes that distinguish them from non-living things.
- There are seven life processes that enable all living organisms to survive.



CHAPTER 2

CELLS



<p>Key Words</p>	<p>By the end of this chapter, you should be able to learn:</p>
<ul style="list-style-type: none"> • cell • cytoplasm • cell membrane • nucleus • gene • cell wall • vacuole • chloroplasts • tissue • organ • specialized cell 	<ul style="list-style-type: none"> • what a cell is. • identification of the parts of a typical animal cell and plant cell and their functions. • explain the structure of specialized cells in terms of their functions in an organism. • distinguish the levels of cellular organisation.

INTRODUCTION

Have you ever wondered what organisms are made of?

Imagine if a house was carefully dismantled. What would you see piled up as the smallest components that were joined to construct the house? You will notice that they were the bricks/blocks that were joined several times in different ways to form a house. Likewise, organisms are made up of tiny building blocks of life that are called **cells**. The cells are organized at different levels to perform specific functions. The knowledge you will acquire about cell structure and organization will enable you to explain how an organism interacts with its environment to sustain its life. This same knowledge has enabled scientists to make important medical and agricultural advances in science.

Animal and Plant Cells

Activity 2.1: Observing cells

Cells are too tiny to be seen by unaided eye. You can only observe cells using a microscope. A light microscope is an instrument used to observe things that are too small to be seen by an unaided eye. It makes them appear much larger and clearer.

Activity 2.1a: Viewing an animal cell

Key question

What is found inside an animal cell?

What you need

- i) prepared slides of an animal cell
- ii) raw egg without a shell in a clear shallow container
- iii) microscope
- iv) notebook
- v) pen /pencil

What to do

1. Observe the raw egg in a dish. Identify the different layers.
 - i) How many layers are you able to distinguish?
 - ii) What is the relative position of the layers you have seen?
 - iii) Record the information from (i) and (ii) above in the table below. You will use it later in this activity.
2. Observe the prepared slide of an animal cell. (Ask the teacher to help you view the cell under a microscope).
3. Now compare the observation of the prepared slide with that of the raw egg.

	Raw egg	Animal cell
Number of layers		
Size of layers		
Position of layers		

The central part of the animal cell is called the nucleus. The fluid part surrounding the nucleus is called the cytoplasm. The outer boundary surrounding the cytoplasm is the cell membrane.

4. Draw and label the parts of the animal cell you have viewed under the microscope.

Functions of the Parts

Cell membrane: This is a thin, outer layer surrounding the contents of the cell. It allows some substances to go in and some to come out of the cell.

Cytoplasm is a mucus-like liquid in the cell. This is where some of the life processes take place.

Nucleus is the “brain” of the cell. It controls all the chemical activities that take place in a cell. This is because of the presence of genes that carry instructions and information on how the activities should occur.

2.1b): Viewing a plant cell

All cells are similar but not identical. Although plant cells have several structures in common with animal cells, there are also some differences.

Key question

Do you know what is found inside a plant cell?

What you need

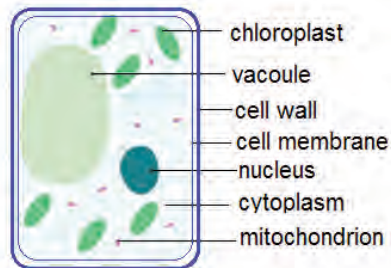
- i) prepared slides of a plant cell
- ii) microscope
- iii) notebook
- iv) pen /pencil

A gene is the basic unit that carries information which determines the characteristics passed from a parent to its offspring.

What to do

1. Observe the prepared slide of a plant cell. (Ask the teacher to help you view the cell under a microscope).
2. Draw only ONE plant cell you have viewed under the microscope and label its parts. The outer polygon-shaped layer is called the cell wall. The green round-shaped structures scattered in the cytoplasm are called chloroplasts.

Some parts of the plant cell may not be seen easily. The diagram below shows the parts of a plant cell.



Plant cell

Function of the Parts

The functions of the cell membrane, nucleus and cytoplasm are the same as those in the animal cell.

Cell wall: This provides support to the plant cell. This is because it is made up of a tough material called cellulose.

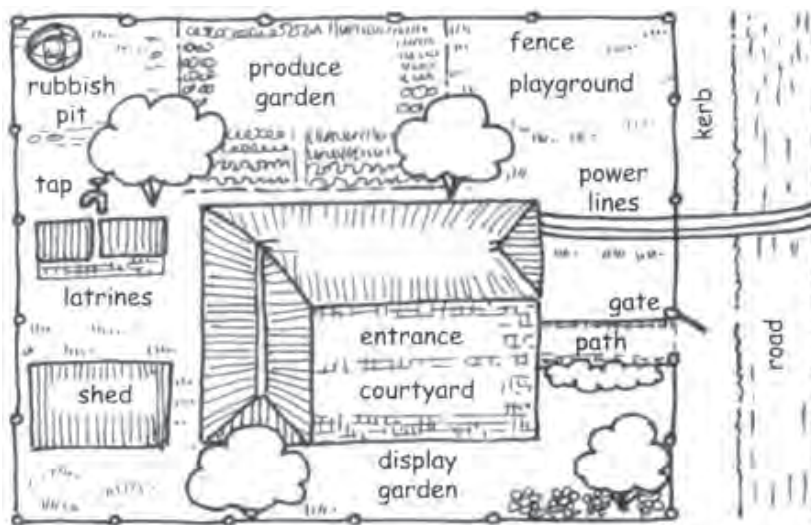
Chloroplast: This is where plants make their own food through the process of photosynthesis. Chloroplasts are green in colour because they contain a substance known as chlorophyll which traps sunlight energy needed for photosynthesis.

Vacuole: This is a storage area that may contain air, water, food and waste materials.

Groups of Cells (Levels of Organisation)

People in a group can perform more complex tasks than one person alone. Consider what happens in a school system.

Just like a body, a school carries out different activities. In order for a school to function properly, there have to be lots of different types of people performing different functions.



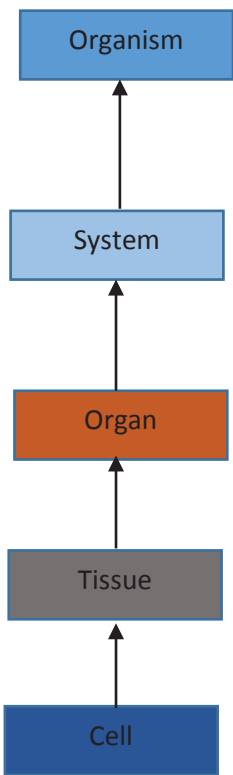





List 8 different types of people and their roles that are needed for proper functioning of a school.

Like people, similar cells in our bodies are organised into groups to make them work more effectively.

- A group of **similar cells** performing a particular function is a **tissue** e.g. muscle tissue

- A group of **different tissues** form an **organ** to perform a particular function e.g. heart
- A group of **different organs** form an **organ System** to perform a particular function e.g. circulatory system
- A group of **different organ systems** form an **organism** e.g. a human

Cell organisation at various levels carries out specific functions and key life processes in the body. This ensures efficient functioning of the body for the survival of the organism. For example, the reproductive cells (sperm and egg) fuse to develop into an organism that has tissues, organs and systems.

Level of cell Organisation	Description	Example
 <p>Organism</p>	<p>A group of different organ systems form an organism.</p>	 Human
<p>System</p>	<p>A group of different organs form an organ system to perform a particular function e.g. circulatory system.</p>	 Circulatory system
<p>Organ</p>	<p>A group of different tissues form an organ to perform a particular function.</p>	 The heart
<p>Tissue</p>		 Muscle tissue
<p>Cell</p>	<p>A group of similar cells performing a particular function is a tissue The basic unit of a living thing</p>	 Muscle cells

Activity 2.2a: Identifying the tissues in your arm

a) What is the use of your arm?

Have you ever thought about what is below the skin of your arm?

Key question

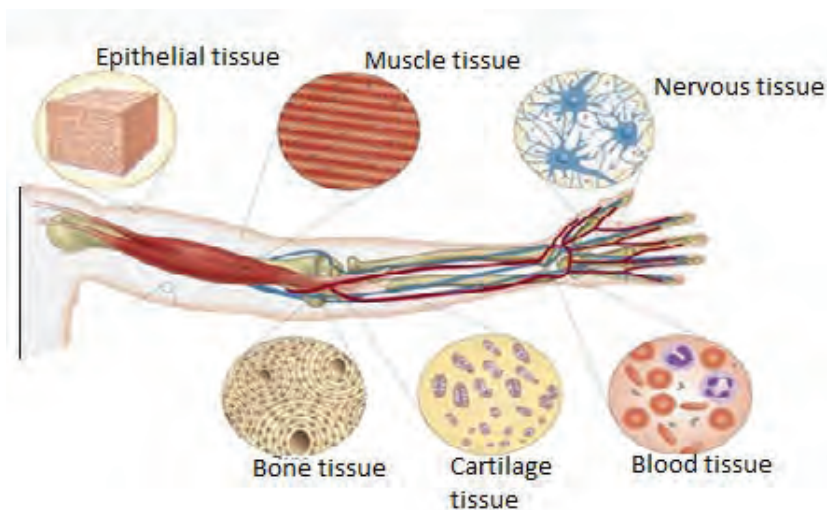
What is under the skin in your arm?

What you need

- i) Notebook
- ii) Pencil
- iii) Pen

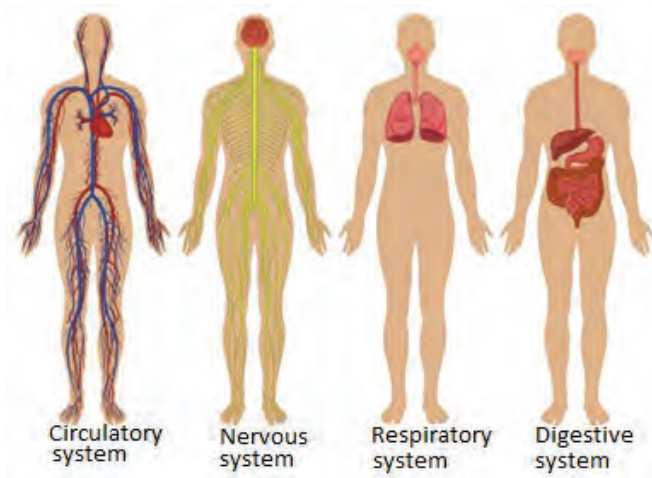
What to do

1. Make a sketch of your arm.
2. Try to name the parts of the arm.
3. Discuss with your neighbour the use of each part.
4. Compare your drawing with the figure below and suggest the importance of each tissue labelled.



Exercise

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



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

Transports materials around the body	Lymphatic system
Breaks down food substances for absorption	Circulatory system
Exchanges gases between the body and the surrounding	Urinary system
Produces gametes	Digestive system
Filters waste from the blood	Respiratory system

Defends the body against disease

Reproductive system

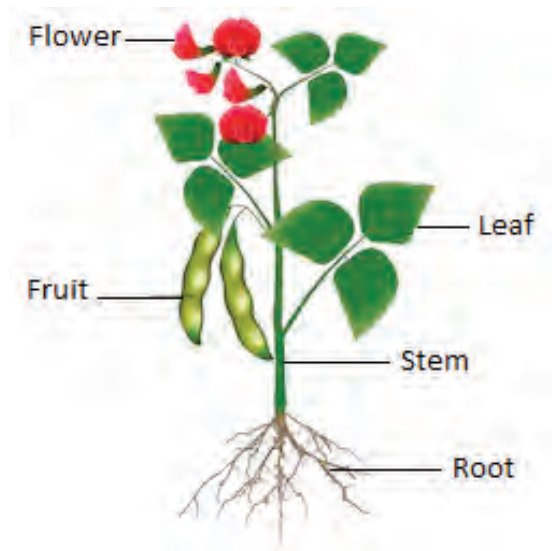
Tissues, Organs and Systems in Plants

A plant, like an animal is composed of tissues.

Examples of plant tissues and their functions

Tissue	Function
Vascular tissues (forming vessels) i) xylem	Transports water and minerals
ii) phloem	Transports food materials

Since plants have tissues then they too have organs. Have a look at the picture below.



The organs in plants are: stem, leaf, root, flower and fruit.

- i) Several leaves form a food making system for the plant.
- ii) Flowers make up the reproductive system of a flowering plant.

- iii) After fertilization, the flower changes into a fruit which is a food storage organ. The fruit bears seed that can grow into new plants.
- iv) The stem is the organ consisting of vessels which transport water and mineral salts from the ground to the upper parts of the plant. The stem also transports food from the leaves to other parts of the plant.
- v) The root is an organ for absorption of water and mineral salts from the soil into the plant. Some roots e.g. the carrot and sweet potato store food nutrients.

There are two systems in plants i.e. the **root** and **shoot** systems.

Specialized Cells

Most of the cells in the body of an organism carry out general functions like respiration, growth and excretion. However, some cells are modified in structure to perform specific functions.

What are such cells called?

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

As earlier mentioned, some cells have special structures/features that enable them to carry out particular functions. In your body, a number of life processes take place, e.g. nutrition, reproduction and respiration.

For some of the life processes to be performed, specialised cells are required.

Key questions

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

What you need

- i) Notebook
- ii) Pencil

iii) Four sets of cards:

- a. The first set is of pictures of five types of specialised cells
- b. The second set has the special features of each specialised cell
- c. The third set gives the functions of each specialised cell
- d. The fourth set has the names of each of the specialised cells

Set one: Specialised cells



Set two: Feature/ 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: Functions 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

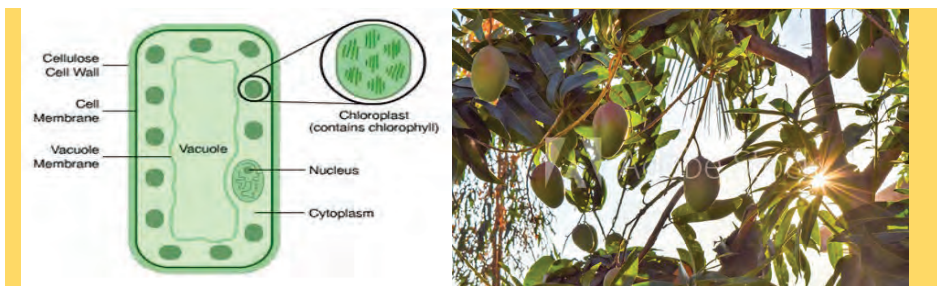
What to do

1. In pairs, study the cards carefully.
2. Observe each specialized cell, match it with the correct statement on the card of the specialised feature and the card with the particular function.
3. Select from the list of names, the one you think matches a particular specialised cell.
4. Record your work in the table below. Present your work to the rest of the class.

Specialised cell	Adaptation		Name
	Feature/Structure	Function	
			
			
			
			
			

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.



Chapter Summary

- A cell is the basic unit where most life processes take place.
- All living organisms are made up of cells.
- Cells have different shapes, sizes and structures to carry out specialized functions.
- In multicellular organisms, cells combine to form tissues that join together to form organs which group to form organ/body systems.