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FREE LEARNING NOTES FOR ZAMBIA

FORM 1 · TERM 1

Biology

# Introduction to Biology

Lesson notes for learners · Competence-Based Curriculum

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Biology is the study of living things. You meet it every day: the maize growing in a field, the goat you pass on the way to school, the mosquito that spreads malaria, and your own body breathing and growing. In these notes you learn what makes something alive, the difference between one-celled and many-celled organisms, and why biology matters to farmers, doctors and families in Zambia.

**AFTER THESE NOTES YOU SHOULD BE ABLE TO**

- Explain what biology is and use basic biology words correctly
- Outline the seven characteristics of living things
- Tell the difference between unicellular and multicellular organisms and give examples
- Name the main branches of biology and say what each studies
- Explain why biology matters in agriculture, medicine and everyday life

**KEY WORDS**

| | |
|---|---|
| **Biology** | the scientific study of living things |
| **Organism** | any living thing, such as a plant, an animal, a mushroom or a bacterium |
| **Cell** | the smallest unit of life; all organisms are made of one or more cells |
| **Species** | a group of organisms of the same kind that can breed together |
| **Habitat** | the place where an organism finds food, water and shelter |
| **Unicellular** | made of only one cell |
| **Multicellular** | made of many cells |
| **Tissue** | a group of similar cells that do the same job together |

## 1 What biology is and its basic words

Biology is the scientific study of living things. A living thing is called an organism. A maize plant, a chicken, a mushroom, a fish in Lake Tanganyika and a person are all organisms. Things that are not alive, such as a stone, water or a bicycle, are non-living.

Every organism is made of cells. A cell is the smallest unit of life. Some organisms are made of one cell and others of billions. Organisms of the same kind that can breed together form a species. All the chickens in a village belong to one species. Organisms live in a habitat, the place where they find food, water and shelter. A termite mound, a pond and a maize field are all habitats.

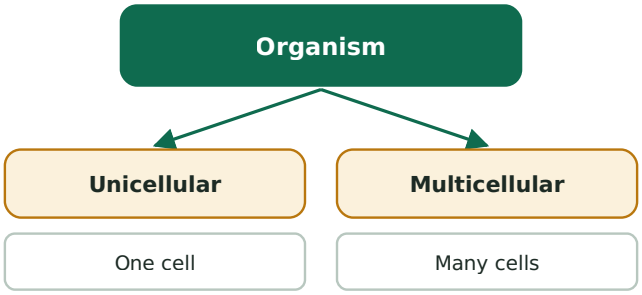



**Figure 1.** Organisms are made of one cell or of many cells

## 2 Characteristics of living things

All living things show seven characteristics. A non-living thing may seem to show one or two, but only living things show all seven. A useful way to remember them is the word MRS GREN: Movement, Respiration, Sensitivity, Growth, Reproduction, Excretion, Nutrition.

Movement: living things change position or move parts of themselves. Animals move from place to place. Plants move too, but more slowly: a sunflower turns towards the sun and roots grow downwards.

Respiration: all living cells release energy from food. This energy is used for movement, growth and keeping warm. Respiration is not the same as breathing. Breathing is bringing air in and out of the lungs. Respiration happens inside the cells.

Sensitivity: living things detect changes in their surroundings, called stimuli, and respond to them. You pull your hand away from a hot pot. A mimosa plant, which grows wild in Zambia, folds its leaves when touched.

Growth: living things increase in size and in the number of cells. A maize seedling becomes a tall plant. A calf becomes a cow.

Reproduction: living things produce new organisms of their own kind. Hens lay eggs, maize makes seeds, and bacteria split in two. Reproduction keeps a species from dying out.

Excretion: living things get rid of the waste made by their own chemical reactions. Animals excrete carbon dioxide through the lungs and urea in urine. Plants also excrete waste substances made in their cells. Excretion is different from egestion, which is removing undigested food as faeces. Faeces were never part of the body's chemical reactions, so egestion is not excretion.

Nutrition: living things take in food to get energy and materials for growth and repair. Animals eat other organisms. Green plants make their own food by photosynthesis, using light, water and carbon dioxide.

| Letter | Characteristic | Example |
|---|---|---|
| M | Movement | A sunflower turns towards the sun |
| R | Respiration | Cells release energy from food |
| S | Sensitivity | Hand pulled from a hot pot |
| G | Growth | A maize seedling grows tall |
| R | Reproduction | A hen lays eggs |
| E | Excretion | Carbon dioxide breathed out |
| N | Nutrition | A cow eats grass |

**Figure 2.** The seven characteristics of living things (MRS GREN)

**WORKED EXAMPLE**

A toy car with a battery moves across the floor. Is it a living thing? Test it against the seven characteristics.

Movement: the car moves, but a machine can move without being alive, so this alone proves nothing.

Respiration: the battery supplies energy, but no cells are releasing energy from food. The car fails this one.

Sensitivity: it does not detect and respond to its surroundings on its own. It only does what its mechanism is built to do. It fails this one.

Growth: it never gets bigger by itself. It fails this one.

Reproduction: it never produces new toy cars of its own kind. It fails this one.

Excretion: it makes no waste from chemical reactions in cells. It fails this one.

Nutrition: it does not take in food. It fails this one.

The car shows only movement, and a living thing must show all seven characteristics. Answer: the toy car is not a living thing.

## 3 Unicellular and multicellular organisms

Organisms are grouped by the number of cells in their bodies. A unicellular organism has one cell, and that one cell carries out all seven life processes. Examples are bacteria, yeast and Amoeba. Amoeba lives in ponds and can only be seen with a microscope. Most unicellular organisms are too small to see with the eye alone.

A multicellular organism is made of many cells. Its cells are not all the same: different kinds do different jobs, such as muscle cells for movement and root cells for taking in water. Cells of one kind working together form a tissue, and tissues working together form an organ. A leaf is an organ of a plant and the heart is an organ of an animal. Plants, fish, goats and humans are multicellular.

Multicellular organisms are usually larger because they have more cells. A human body has trillions of cells, while one bacterium has a single cell.

| Feature | Unicellular | Multicellular |
|---|---|---|
| Number of cells | One | Many |
| Size | Usually microscopic | Usually large enough to see |
| Cells | One cell does every job | Different cells do different jobs |
| Examples | Amoeba, bacteria, yeast | Maize, goat, fish, human |

**Figure 3.** Comparing unicellular and multicellular organisms

## 4 Branches of biology

Biology is large, so it is divided into branches. Botany is the study of plants. Zoology is the study of animals. Microbiology is the study of organisms too small to see without a microscope, such as bacteria, viruses and microscopic fungi like yeast. Ecology is the study of how organisms live together and depend on their surroundings. Other branches include genetics (inheritance) and physiology (how the body works).

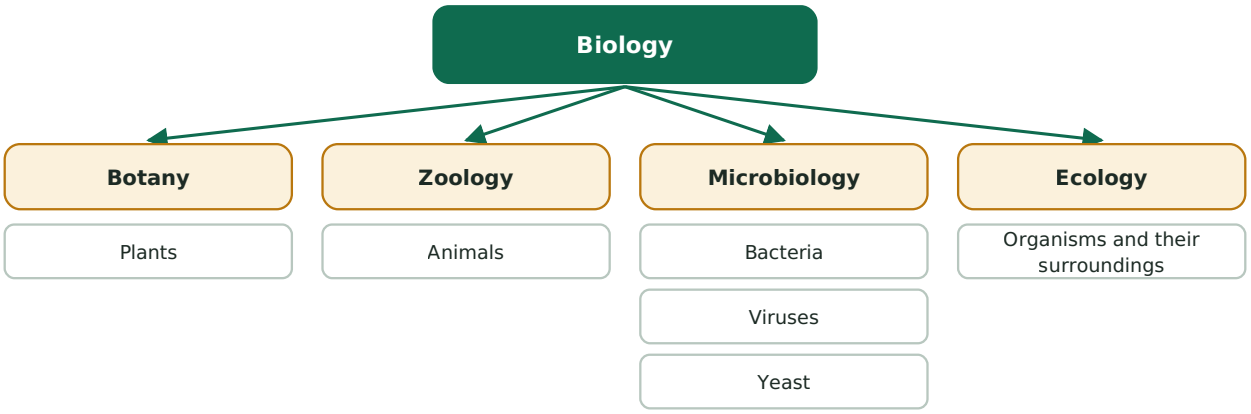



**Figure 4.** Biology and some of its branches

## 5 Importance of biology

Biology in agriculture: biology helps farmers grow more food. Knowing how plants take in nutrients helps farmers choose fertiliser. Knowing how pests and diseases spread helps farmers protect crops and cattle. Breeding better varieties produces maize that gives more grain and resists drought. Knowing how animals feed and reproduce helps farmers keep healthy livestock.

Biology in medicine: biology explains how diseases are caused and spread. Malaria is caused by a parasite carried by the female Anopheles mosquito, so sleeping under a treated net and clearing standing water help prevent it. Biology also explains how vaccines protect children, how medicines kill bacteria, and how the body works so that doctors can treat illness.

Biology in everyday life: biology teaches us to wash hands to stop germs spreading, to eat a balanced diet, to keep drinking water clean, and to protect forests, fish and wildlife so that they last for future generations.

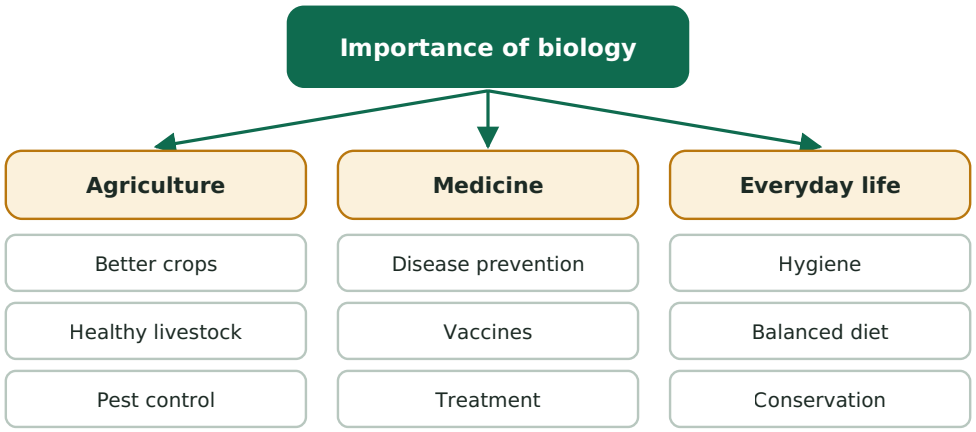



**Figure 5.** Three areas where biology is useful

### TRY THIS

Walk around your school yard or home and choose five things: for example a tree, an insect, a stone, a bird and a bucket. Draw a table with the seven characteristics across the top. Tick each characteristic that each thing shows. Which things get all seven ticks? What does that tell you about them?

### REMEMBER

- Biology is the scientific study of living things, which are called organisms.
- All living things show seven characteristics: movement, respiration, sensitivity, growth, reproduction, excretion and nutrition (MRS GREN).
- Respiration happens inside cells and releases energy; it is not the same as breathing.
- Excretion removes waste made by the body's chemical reactions; egestion removes undigested food and is not excretion.
- Unicellular organisms have one cell; multicellular organisms have many cells that do different jobs, grouped into tissues and organs.
- The main branches include botany (plants), zoology (animals), microbiology (small organisms) and ecology (organisms and surroundings).

## ? Check yourself

1. Define biology and organism.
2. List the seven characteristics of living things.
3. What is the difference between breathing and respiration?
4. A mimosa plant folds its leaves when touched. Which characteristic is this?
5. Give two differences between unicellular and multicellular organisms.
6. Give one example of a unicellular and one of a multicellular organism.
7. Name the branch of biology that studies plants and the branch that studies animals.
8. State two ways biology helps a farmer.

### ANSWERS

1. Biology is the scientific study of living things. An organism is any living thing.
2. Movement, respiration, sensitivity, growth, reproduction, excretion and nutrition.
3. Breathing is moving air in and out of the lungs. Respiration is the process in cells that releases energy from food.
4. Sensitivity. Touch is the stimulus and the folding of leaves is the response.
5. Unicellular organisms have one cell and are usually microscopic; multicellular organisms have many cells that do different jobs and are usually larger. Any two such differences are correct.
6. Unicellular: Amoeba, bacteria or yeast. Multicellular: maize, goat, fish or human.
7. Botany studies plants and zoology studies animals.
8. It helps the farmer choose fertiliser, control pests and diseases, grow better crop varieties and keep healthy livestock. Any two are correct.

Written by 25Schools to follow the Form 1 Biology syllabus of the Zambian competence-based curriculum. Free for learners to read, download and share. More notes and quizzes at 25schools.com.