

## **BIOLOGY**

### DEFINITION

Biology is the study of life.

Biology comes from two Greek words namely: Bios-life, and logos –knowledge or study of, hence Biology means the study of living things.

Biology as a science is very wide and has many specialized branches. These include:

Some of the specialized branches of biology

<b>Botany</b>	<b>Study of plants</b>
Zoology	Study of animals
Cytology	Study of cells
Morphology	Study of form and structure of organisms
Ecology	Study of organisms in relation to their environments
Entomology	Study of insects
Parasitology	Study of organisms which live on or in the bodies of other organisms and get their nutrients from them
Genetics	Study of heredity
Pathology	Study of diseases of animals and plants
Physiology	Study of process and functioning of body parts
Taxonomy	Study of naming, grouping and classifying of organisms

### **WHY DO WE STUDY BIOLOGY AS A SUBJECT?**

Biology as a subject is a single science based on the study of living things. Therefore by studying it helps us to:

1. Acquire knowledge which enables one to answer questions about life and living things e.g. can identical twins be of different sexes?
2. Acquire scientific attitudes and methods, which help to solve problems. This is achieved by increasing the powers of observing, which enables one to make critical evaluations hence drawing correct conclusions.
3. Understand the basic principles of life which influence all events in the world
4. Improve our general health standards through skills acquired in preventing germs that cause diseases.
5. Develop and promote conservation program which enables the use of available resources sustainably
6. Understand and explain the different behaviors showed by different organisms
7. Get introduced to different biological occupations and fields such as veterinary medicine, human medicine, pharmacy, forestry, agriculture, etc.

## **LIVING THINGS**

A living thing is biologically called an organism. Examples of organisms include: man, housefly, cockroach, maize plant, mushroom, etc. there is no absolute definition of a living thing. However, all living things share certain basic features called characteristics of living things.

## **CHARACTERISTICS OF LIVING THINGS**

There are seven basic characteristics of living things summarized as;

“MRS GREN”- Movement, Reproduction, Sensitivity, Growth, Respiration, Excretion, nutrition.

### **1. Movement**

This refers to the displacement in space all or part of an organism e.g. young shoot bending towards light, roots growing towards water. Animals move from one place to another and this type of movement is called locomotion. Plants and other organisms that are fixed in one place do not locomote but can move parts of their bodies. Movements of living things involve expenditure of energy derived from respiration.

### **2. Reproduction**

This is the production of new individuals similar to parents. This is important for the continuity of life and formation of new generations.

### **3. Sensitivity or irritability**

This is the ability of an organism to respond to changes in the environment and within themselves. Such a change in the environment is termed as stimulus. Some of the signs of sensitivity include locomotion of animal, crying of a child on seeing a fierce looking dog, growing towards light by a plant shoot. Sensitivity is very essential in the survival of an organism.

### **4. Growth and development**

Growth is the permanent increase in size of an organism. It is brought about by taking substances from the environment and incorporating them into internal structure of an organism. Growth results in changes in shape and form of an organism which causes development.

### **5. Respiration**

This is the release of energy into the body due to the breakdown of substances in the body. It often involves oxygen, which must therefore be obtained by the organism from the surrounding and in turn gives out carbon dioxide

## **6. Excretion**

This is the process by which waste products of metabolism are removed out of the body. Metabolism refers to the chemical reaction that occur in organisms. The disposal of metabolic waste products is important because some of the waste products are poisonous.

## **7. Nutrition or feeding**

This is the process by which a living things (organism) obtains nutritive substances from the environment. These substances are used to build up the organism and provide energy for various activities.

Food for thought

A motorcycle moves, takes in oxygen and gives out carbon dioxide, consumes fuel but nevertheless it is not the living thing

Discuss the truth of this statement.

## **LIVING THING AS MAINLY PLANTS AND ANIMALS**

Most of the organisms belong to two broad groups namely: plants and animals

Examples of plants: grasses, simsim, mosses, ferns, mango etc.

### **Examples of animals:**

Rabbits, cows, monkeys, goats, cats, man etc.

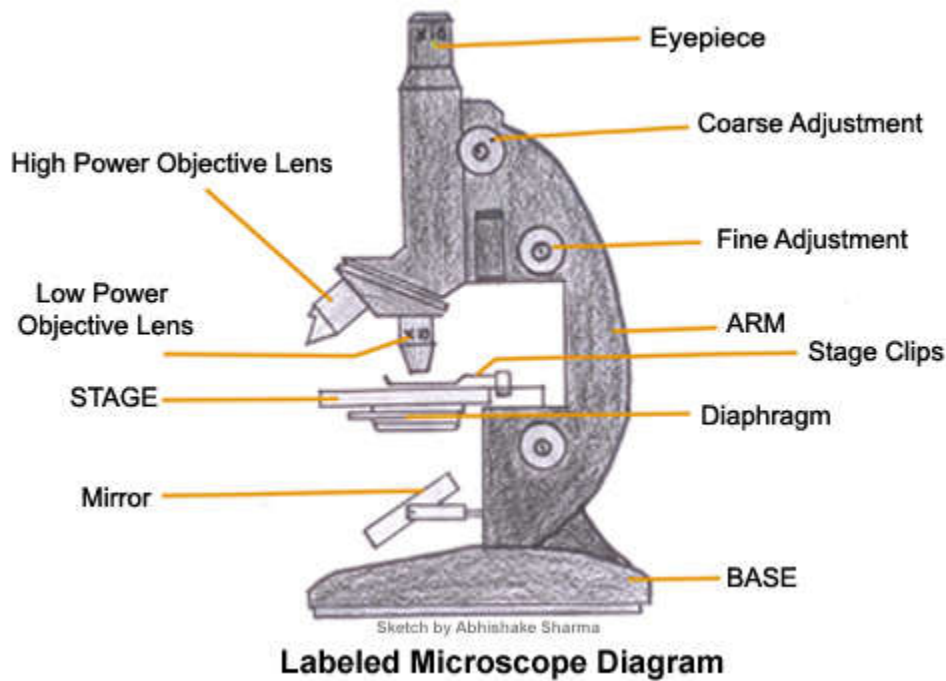
Plants and animals have in common the seven basic characteristics of living things (MRS GREN)

However, these two groups of organisms show fundamental differences between them as summarized below:

### **SOME OF THE DIFFERENCES BETWEEN PLANTS AND ANIMALS**

PLANTS	Animals
Have chlorophyll	Lack chlorophyll
Make their own food	Un able to make their own food
Do not locomote	Do locomote for various reasons
Have cell walls around their cells	Show a quick response to stimuli
Response to stimuli is slow	
Growth is localized to the tips	Growth occurs through out the body
Have external organs e.g leaves	Their organs are located mostly inside the body

### **Microscope**



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## **Parts of a microscope**

### **Eye piece**

It is through the eyepiece that we look at the specimen placed on the stage of the microscope. An eye piece is a removable part that can be interchanged with another one of a different magnification.

### **Objective Lenses**

There are more than one objective lenses. These are the primary lenses of a compound microscope and can have magnification of 4x, 5x, 10x, 20x, 40x, 50x and 100x.

### **Stage**

It is the platform below the objective lens on which the object to be viewed is placed. There is a hole in the stage through which light beam passes and illuminates the specimen that is to be viewed

### **Diaphragm**

It is located on the lower surface of the stage. It is used to control the amount of light that reaches the specimen through the hole in the stage.

### **The Adjustments**

There are two adjustment knobs, the fine adjustment knob and the coarse adjustment knob that refine the focus of the lenses. The coarse adjustment knob helps in improving the focus of the low powers whereas the fine adjustment knob helps in adjusting the focus of the lenses with higher magnification

Arm

For holding when carrying the microscope

Reflecting mirror

Reflects a beam of light through the specimen

### **RULES FOR HANDLING A MICROSCOPE**

- Use both hands to carry a microscope.
- Always place the microscope on the table carefully and gently or else you may break the mirror or lenses.
- Keep the microscope stage clean and dry using tissue and cloth.
- Keep the microscope in an upright position because you may break the mirror or lenses.
- The lens must be cleaned by wiping them with soft lens tissue or cloth moistened with ethanol.
- Note. Cleaning the lenses with rough coarse cloth scratches them .Do not touch the lens with oily fingers.
- Focus with the low power objective lens first to avoid breaking the lens.
- To reflect the light, use the concave side of the mirror if there's no condenser and the plane side if there's a condenser.
- Call the teacher if it does not work.

Remove your slide, clean it and put it where you found it.

- Move the low power objective lens back into place.
- Always take the microscope back to the place where you found it.

### ***PREPARATIONS OF SLIDES.***

- Take a clean dry glass and cover slip.
- Place a drop of water at the center of the slide.
- Place the material to be observed on the drop of water.
- **Hold the cover slip to the slide at an angle of 45° using the thumb and first finger until it reaches water drop with material**
- Place the specimen under the microscope to be observed.

### **MAGNIFICATION OF AMICROSCOPE**

Magnification means how much larger the object appears compared to its real size. Therefore,

Magnification= magnification of eye piece X magnification of the objective lens.

**NOTE** An electron microscope can magnify upto 200,000 times.

An example

If the objective lens magnifies 40x and eye piece magnifies 10x, the total magnification of the microscope is

Magnification of microscope = Magnification of eye piece X Magnification of objective lens

$$=40 \times 10$$

$$= \times 400$$

Note: in writing magnification you start with X- sign (multiplication sign) then the figure.

## CELLS

A cell is the smallest basic unit of living organism. Living organisms that are made of one cell are called single celled organisms. The organisms made of many cells are called Multicellular organisms.

Examples of single celled organisms ; amoeba , paramecium , bacteria.

Examples of multicellular organisms ; man , goat, cow.

## DIAGRAMS OF ANIMAL AND PLANT CELLS.

### PARTS OF A

### CELL AND THEIR FUNCTIONS.:

- CELL MEMBRANE; It is a passage through substances enter and leave a cell. It regulates the shape of a cell and protects it. It keeps the contents of the cell within the cell.
- CELL WALL; It is only found in plant cells. It gives direct mechanical strength to a cell. It protects the inner parts of a cell. It allows movement of water in and out of a cell.
- NUCLEUS; It is found in the cytoplasm of a cell. It controls all activities of a cell. It is responsible for division of a cell. It stores the hereditary materials of a cell in form of chromosomes.
- CYTOPLASM; This is a fluid material found in a cell. It contains organelles. An organelle is a structure found in a cell and it carries out a particular function. eg. the nucleus, chloroplast, vacuole, mitochondria. It stores energy for producing material. It provides necessary medium for chemical reactions to occur. It receives materials, breaks them down to form useful substances and waste products are formed in it.
- MITOCHONDRIA; It is responsible for releasing energy from food by respiration.
- CHLOROPLAST; It contains a green pigment called chlorophyll. Chlorophyll traps sunlight used during photosynthesis.
- CELL VACUOLE; This contains a watery substance called cell sap. It is big in plant cells but small in animal cells. It stores waste material for the cell. It acts as a temporary store for food such as sugars .

### DIFFERENCES BETWEEN PLANT AND ANIMAL CELLS.

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|----------------------|----------------------|
| • <u>PLANT CELLS</u> | <u>ANIMAL CELLS.</u> |
|----------------------|----------------------|



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|----------------------------------|---|
| • Have a cell wall               | Lacks cell wall                         |
| • Have a large vacuole           | Usually have no vacuole                 |
| • Have a chloroplast             | Lacks chloroplast.                      |
| • Have a regular shape           | Have no regular shape                   |
| • Has a nucleus at the end.      | Has a nucleus at the center.            |
| • Stores such as starch          | Stores food such as glycogen.           |
| • Has a thin layer of cytoplasm. | Has much cytoplasm throughout the cell. |

Examples of specialised cells include;white blood cells, sperm cells ,red blood cells,nerve cells.In plants, guard cells, epidermal cells,parenchyma cells. .