

## Acknowledgement and Preface

Any accomplishment requires the effort of many people to achieve excellence together and this work is not different. We would like to express our gratitude to many people who saw us through this booklet, to all those who provided support, talked things over, read, wrote, offered comments, allowed us to quote their remarks and assisted in editing, proofreading and design. Also we beg for forgiveness of all those who have been with us over the course of preparation and we failed to mention their names.

***Summarized and Simplified Biology for form One;*** has been prepared to meet the needs of form One students. Students will use this booklet for references and clarification on different aspects, since language used is simplified so as to enhance profound understanding.

This booklet is resourceful and consists of many illustrations and examples as prescribed in the current syllabus. Hence it is expected that students and teachers will find the booklet interesting and educative in the course of teaching and learning.

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# TOPIC NO 1: INTRODUCTION TO BIOLOGY

## What is biology?

Biology can be defined as a branch of science which deals with the study of life. The term biology can also be defined as a branch of science which deals with the study of living things or organisms. Living things include bacteria, fungi, animals, plants etc.

Biology is derived comes from two Greek words;

- Bios — means “Life”
- Logos — means “study”

The people who study biology are called **Biologist**. Very small organism are called *microorganism*. The simplest living things are made up of one cell these are called *unicellular organism* e.g. bacteria, protozoan and amoeba (also are called microscope organism). Large organisms are made up of many cells these are called *multicellular organism* e.g. fish, trees, man.

## WHAT IS LIFE?

Life is the state of living which plants, animals, and other living organisms have before they die. The basic unit of life is cell. All living things are made up of cell, cell are so small that they cannot be seen with marked eye.

## Branches of biology

There are two main branches of biology

- **Botany** is a branch of biology which deals with the study of plants. A person who studies botany is called a *botanist*
- **Zoology** is a branch of biology which deals with the study of animals. A person who studies zoology is called a *Zoologist*

However there are many minor branches of biology. That deal with different aspects of living things  
**Example;**

BRANCHES	AREA OF STUDY
1. Anatomy	Physical structure of organism
2. Cytology	Deals with cells
3. Ecology	Relations between organism and their environment
4. Mycology	Deals with fungi
5. Taxonomy	How organism are named and grouped
6.	
7. Physiology	How organisms body parts function
8. Parasitology	Deals with parasites
9. Immunology	The body defense against infections and dideases

### IMPORTANCE OF STUDYING BIOLOGY

1. It helps a man to understand himself/herself better
2. Knowledge of biology enables human being to conserve the environment.
3. It helps man to evaluate environment uses such as pollution, global warming and environmental degradations.
4. Biology help to understand cause, symptoms, method of transmission, prevention, and treatment of diseases this improve the standard of living.
5. It provides answer to fundamental questions.
6. It helps us to enter in careers such as medicine, agriculture, reproductive, health and genetic Engineering.
7. Biology helps us appreciate nature.

### THE RELATIONSHIP BETWEEN BIOLOGY AND OTHER SUBJECT/FIELD

Biology related to many other field of study such as agriculture, medicine, pharmacy such as veterinary, medicine and nutrition.

1. **Agriculture:** Biology research finding on crops and livestock have led to improve agriculture production. Agriculture uses knowledge of biology to improve plant and animal breeding. Genetically modified organisms (GMOs) ensure better quality, early maturity and high yield products. Crop and animal diseases and pests can only be overcome by applying biological knowledge.

2. **Medicines and Pharmacy:** Medicine is the study of prevention and treatment and cure of disease. The drugs are made depending on the chemical composition of the body of an organism and how they can react with such medicines. Knowledge of biology also helps to know the effects of drugs on living things (pharmacology) and possible remedies to be taken.
3. **Nutrition:** Biology is used by dieticians to determine the kind of diets suitable for people with different health problems. Food also supplies energy for every action we perform. Knowledge of biology helps to identify the type of food required by an individual based on its quality and quantity.
4. **Forestry:** Biologists have developed varieties of trees that grow well in dry areas, also that mature fast so as to prevent desertification. The practice of forestry helps maintain an adequate supply of timber and management of such valuable forest resources such as water, wildlife, grazing areas and recreational areas. Biology helps in improving the qualities of the trees through manipulating the genetic constitution of the particular plant species.

## CHARACTERISTICS OF LIVING THINGS

### 1. Movement/locomotion

All living organisms are capable of movement. Movement is the change of position of the whole organism or just part of an organism. For animals and unicellular organisms the movement is of the whole body. This is known as *locomotion*. Most animals move about using legs, wings or fins. Unicellular organisms such as amoeba, paramecium and euglena use the locomotory structures pseudopodia, cilia and flagella respectively.

In plants only part of it may move towards different factors such as light, water, gravity etc. They move by growing. Their roots grow down in the soil and their shoots grow up into the air or towards a source of light.

### 2. Irritability (sensitivity)

Irritability is the ability of an organism to respond to a stimulus. Stimulus (plural; stimuli) is anything that causes a response in an organism. Examples of stimuli include: an alarm clock, a smell of breakfast cooking and a fly landing on your skin.

All living things are sensitive to certain changes in their surroundings, that is, they are aware of what is happening around them. This is possible because they have special organs known as sense organs by which they detect these changes. Examples of sense organs include: *eyes* for vision (sight); *skin* for temperature, touch, pressure detection; *tongue* for tasting; *nose* for smelling; and *ears* for hearing and body balance.

### 3. Feeding (Nutrition)

All living things need food to provide energy for such activities such as growth, repair and health. Animals get their food by eating other living things or food materials that were once

living things. Herbivores (e.g. rabbits) eat plants, carnivores (e.g. lions) eat other animals, and omnivores (e.g. humans) eat animals and plants. Plants make their own food through the process called photosynthesis.

#### 4. Respiration

Respiration is a process by which food substances are broken down to produce useful energy in a cell. Respiration usually involves the use of oxygen. All living things need energy for movement, growth and development, and functioning of body organs.

#### 5. Excretion

Is the process by which excess waste or harmful material resulting from the chemical reaction occur in body cell are removed out of body. All living things produce wastes such as carbon dioxide, water, urea, ammonia etc. Some of these chemicals if left to accumulate in the cells would seriously poison the living organism hence they need to be removed. Waste products are removed from the body by excretory organs such skin, kidneys, lungs and liver.

#### 6. Reproduction

Reproduction is the process by which living things produce new individuals of their kind. All living things reproduce, to replace organisms lost by death. If a group of organisms does not reproduce fast enough to replace those which die, the group becomes extinct. Reproduction ensures continuation of life when parent generation dies.

#### 7. Growth

Growth is defined as an irreversible (permanent) increase in size and dry weight of an organism involving differentiation. All living things need food in order to grow and build up their bodies. Animals grow until they reach certain adult size, but most plants can grow continuously throughout their lives.

### SCIENTIFIC PROCESS IN BIOLOGY

Biology is a practical science that involves carrying out experiment, observation, measuring and experimentation are skills that we need when studying Biology, and we use our sense organs to make observation.

These organs are:

1. The eyes for seeing
2. The nose for smelling
3. The ears for hearing
4. The tongue for tasting
5. The skin for feeling

Scientific measurements are taken using specific instrument and units.

**Some basic biological measures are**

MEASURE	INSTRUMENT	SI UNIT
Mass	Beam balance/Digital balance	Kilogram (kg)
Time	Watch	Second (s)
Length	Ruler	Meter (m)
Temperature	Thermometer	Kelvin (K) - Degrees Celsius -Degree Fahrenheit

In biological investigation like in any other scientific research, methods are listed. The scientific method is a set of steps that scientist use to study things.

Those methods are

1. Problem identification
2. Formulation of hypothesis
3. Experimentation
4. Observation and data collection
5. Interpretation of data.
6. Conclusion

### **1) Problem identification**

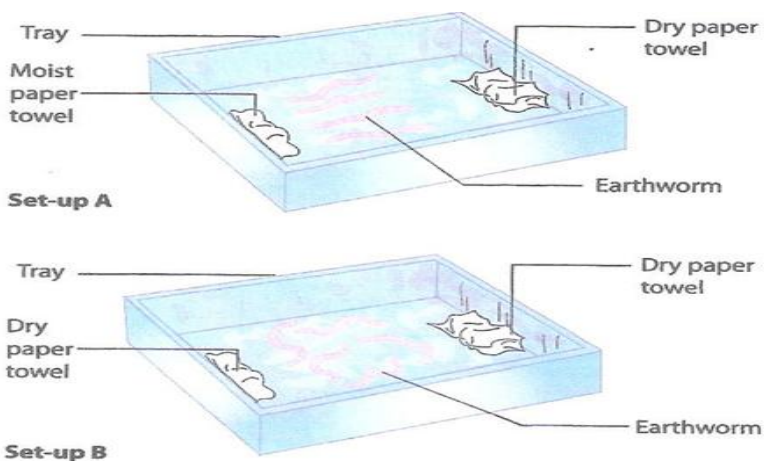
In day today life one time comes across question which require explanation or problem which needs solution or something to prove e.g. it is observed that buffaloes in Serengeti park are dying at great rate what would be the cause of death or there is poor harvesting or Earth worms are mostly found in the soil wells handed are as why?

### **2) Formulation of hypothesis**

A hypothesis is a suggestion of the answer to the question asked. It is an intelligent guess that tries to explain as an observation for example Earthworms prefer shaded areas because in the soil shaded there is more moist. A hypothesis can't be termed as a biological acceptable to explain action. Therefore experiment should be designed, proved or disapproved. If hypothesis is correct we say it is accepted, if disapproved we say rejected.

### **3) Experimentation**

An experiment is a test that is carried out under controlled conditions to determine whether a hypothesis is correct or not. In any experiment there is control experiment and experiment test. Example of experiment; Earth worms prefer moist or dry condition.



#### 4) Observation and data collection

The scientists observe what happens from the time the experiment was set up to the time it ends. It is important to note all the changes made from the beginning to the end of the experiment and recording

#### 5) Interpretation of data

At the end of experiment the scientist analyses the observations and Data recorded. The scientist may look for pattern or in the data

#### 6) Conclusion

A conclusion is a statement that summarizes what a scientist has learnt from an experiment. When scientist read conclusion, they taste whether the data or information collected support the hypothesis (accepted) or not support the hypothesis (reject), if so another hypothesis must be formulated and repeat the whole experiment.

### BIOLOGY LABORATORY

A laboratory is a special room designed for carrying out scientific experiment. A biology laboratory is a special building designed for carrying out biological experiments. A laboratory should have adequate space for carrying out experiment, proper lighting, good ventilation, source of water, means of heating and adequate space for storing apparatus, chemicals and specimens.

### LABORATORY RULES

In biology laboratory we use hazardous chemical, fragile equipment or dangerous specimens. For this reason, it's important to follow a certain rules and regulation for our safety and safety for others.

**These rules are;**

1. Do not go into the laboratory in the absence of a teacher or laboratory technician.
2. Do not handle or use apparatus, chemicals or specimens in the absence of a teacher.
3. Do not taste eat substances during experiment

4. Know the location of all exits
5. Do not leave experiment unattended
6. Turn off gas and water taps when not in use
7. Do not burn substances towards other people in the laboratory
8. Do not take laboratory equipments, chemicals or specimens out of the laboratory
9. Do not play or run in the laboratory
10. Read the labels or containers before using the contents. Do not interchange label.
11. Dispose all waste materials after all experiment.
12. After each experiment cleans all the equipments you have used
13. Avoid touching yourself while performing experiment, clean your hands with soap and water after Experiment.
14. Do not touch electrical equipment with wet hands.
15. If you don't understand something ask your teacher.
16. Know the location and operation procedure of all safety equipment e.g. First aid and fire extinguishers.
17. Dress properly for laboratory activities, tie back long hairs. Do not wear dangling Jewelers, Sandals. Shoe must cover a leg completely.
18. Report all accidents immediately to your teacher or technician
19. Never use dirty chipped or cracked equipment.
20. Handle live spacemen carefully, if an animal bites or insect stings you, report the accident to your teacher

### **Distinguishing the biology laboratory from other facilities**

- The biology laboratory is different from other school facilities such as classroom, library or physics and chemistry laboratory.
- A classroom has desk and chairs, students are taught in a classroom.
- A library has variety of reading materials some libraries have tables and chairs where we can sit and read.
- A biology laboratory has models, specimens, cage, aquaria and chart which may not be in physics or chemistry laboratory.
- Some of unique things found in biological laboratory are preserved specimens of organisms such as insect, microorganism and plants.

### **WARNING SIGNS/SAFETY SYMBOLS**

These are warning signs that are found on apparatus and chemical containers in the laboratory. Some may be found in or on the boxes used to hold either chemicals or apparatus. These signs must be obeyed in order to ensure safety in the laboratory before one uses a chemical, one should know whether that chemical is Toxic, Corrosive, Flammable, Oxidant, Explosive, Harmful or irritant.

### **TOXIC**

Toxic substances are dangerous and may cause death immediately or after a few days. When handling toxic substances one should be very careful. In case a chemical gets into contact with your skin it should be washed out with a lot of water.





## **CORROSIVE**

Corrosive substances can burn one's skin. They can cause blindness in case they come into contact with the eyes. Example of corrosive are sulphuric acid, hydrochloric acid, nitric acid and concentrated alkalis e.g. Sodium hydroxide potassium hydroxide, ammonium hydroxide.



## **FLAMMABLE**

These are substances which can catch fire easily. The substances should never be brought near open flammable.



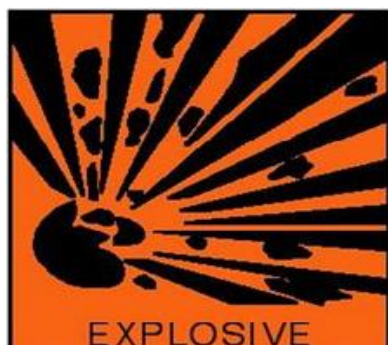
## **OXIDANT**

These are chemical that can accelerate burning in the presence of an oxidizing agent; a small fire can be made bigger. Example in the heating of potassium permanganate mixed with saw dust.



## **EXPLOSIVE**

An explosion is a forceful rapid reaction, which involves throwing off of particles at high speed. Chemicals carrying the sign of explosive may cause explosion if not handled carefully and according to the instruction.



## **HARMFUL/IRRITANT**

These are chemicals which can make you sick but it does not kill you, it can cause illness. This substance may not kill immediately, but may have effects after long exposure.



## **BIOLOGY APPARATUS**

Biology apparatus are the tools and equipments needed in order to study Biological experiments effectively.

APPARATUS		USES
1	Hand lens	Used to magnify specimen/objects
2	Sweep nets	Used to catch small flying organism e.g. Butter flies, housefly etc.
3	Fishing nets	For catching fish and aquatic animals
4	Petri-dish	Is a shallow glass where specimen are put for close observation
5	Mortal and pestle	Is a small hard bowl used for crashing or grinding substances.
6	Crucible	Is a container in which substances are heated to very high temperature
7	Thermometer	Used to measure temperature
8	Disserting Kit	Is a kit that contain all tools for making dissection of specimen
9	Spirit – burner / Bunsen burner	Used as a source of heat
10	Dropper	Used to add liquid during experiment
11	Spatula	Used for making some substance from the container.
12	Test tube holder	Used to hold test tube
13	Test tube	Used to hold and heat chemicals
14	Test tube rack	Storing test tube
15	White tiles	Used to put specimen during experiment that involve color change.
16	Watch glass	Is a shallow dish that used as evaporating surface or cover for beaker

## THE MICROSCOPE

The microscope is an instrument used to magnify very small specimen so that can be seen clearly.

**There are two types of microscope**

- 1) Light microscope
- 2) Electron microscope

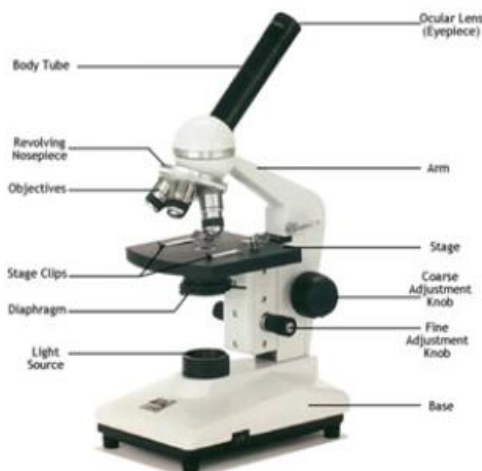
**Light microscope** can magnify object up to 2000 times. This is the type of microscope that is commonly used in school laboratory.

**Electron microscope** can magnify a specimen up to 50000 times.

## Parts of a light microscope and their function

1)	Eye piece	Has a lens which magnify specimen
2)	Body tube	Support the objective revolving nose piece
3)	Rotating nose piece	Support the objective lens
4)	Objective lens	Magnify the specimen under observation. It has three lenses, lower power, medium power and high power
5)	Course adjustment knob	Raises or lowers the body tube in order to bring the image into focus
6)	Arm	Support the body tube, knobs, stage diaphragm and mirror. It's one of the part which is held when moving the microscope
7)	Fine adjustment	Raises or lowers the body tube in order to bring the image into sharp focus
8)	Ocular tube	The tube allow light to pass straight from the objective lens to the eye piece lens

## THE STRUCTURE OF THE LIGHT MICROSCOPE



## How to use light Microscope

1. Place the microscopes on the laboratory bench or table make sure it's not near the edge,
2. Mount the specimen on a microscope slide, cover it with the cover slip.
3. Make sure that the low power objective lens is on line with the eyepiece lens.
4. Place the slide with the specimen on the stage.
5. While looking through the eyepiece, use your hand to adjust the stage so the light is directed at the specimen on the stage.
6. Adjust the course adjustment knob to bring the specimen focus.
7. Adjust the fine adjustment knob to brin2 the specimen into sharp focus.
8. Rotate the nose piece to a lighter power objective lens if you want to observe more details on the specimen.

## How to care for light Microscope

1. Turn the adjustment knobs slowly; always start with course adjustment knob.
2. Always lift microscope using both hands, one hand holding the arm and other holding the base.
3. When not in use cover the microscope with clean cloth and store it in a dry, dust free space
4. Clean dirty lenses using lens tissue or soft cloth.
5. Don't place the microscope at the edge of the table or bench as it could be knocked over.
6. When not in use for a long time remove the lenses and put them in desiccators.
7. Don't touch the microscope with wet hands
8. Don't touch the surface of the mirror of the lens with your fingers.
9. Lubricate moving parts regularly.
10. Always use a cover slip in order to protect the lens of the microscope from the substances in the specimen.
11. Remove the slides from the stage immediately after use.