INTRODUCTION TO BIOLOGY

- **Biology** -It's the science that involves the study of living organisms
- The word Biology comes from the Greek words: ***bios-*** which means life and ***logos-*** which means knowledge hence Biology means the **knowledge of life**. Biology, therefore deals with the study of living things in terms of their **body structures, functions and how they interact with each other and their environment**.

Branches of biology

- There are two main branches i.e.

  (a) Zoology – it's the study of animals. A scientist who studies animals is called **zoologist.**

  (b) Botany- it's the study of plants. A scientist who studies plants is called a **botanist**. These two broad branches are further sub-divided into the following specialized branches.

Branch of Biology	**Name of the scientist that has specialized in the area**	**Nature of study**
Taxonomy	Taxonomist	The study of classification of organisms

Cytology	Cytologist	The study of cells and how they function
Ecology	Ecologist	Study of relationship between organisms and their environment
Microbiology	Microbiologist	Study of microscopic organisms
Biochemistry	Biochemist	Study of chemical changes inside living organisms
Entomology	Entomologist	Study of insect
Genetics	Geneticist	Study of inherited characteristics and variations among organisms
Parasitology	parasitologist	Study of parasites
pathology	pathologist	Study of how the disease causing micro-organisms attack the body cells and cause diseases.
physiology	physiologist	Is the of how the body systems functions
evolution	evolutionist	Is the study of gradual changes of simple life forms to a more complex life forms over a long period of time.

Importance of studying Biology

In studying biology one acquires very useful knowledge that can be used in many ways e.g.

- In solving environmental problems such as shortage of food, poor health services, pollution, misuse of environmental resources e.g. forests, wildlife, water and soil.
- Entry into careers such as medicine, agriculture, public health, veterinary practice, dentistry.
- The scientific skills that one develops while studying Biology such as **observing, identifying, recording, classifying, measuring, analyzing and evaluating** are all useful in everyday life.
- Promoting international cooperation in solving pertinent and emerging problems e.g.

  -Joint development of HIV/AIDS vaccine by Kenyan and British scientists.

  - The co-ordinated fight against severe Acute Respiratory Syndrome (SARS) Involving scientists all over the World.

  - The fight to save the ozone layer from depletion through various international agreements such as Kyoto protocol

  -Management of resources through international treaties such as the CITES (**Convention against International Trade in Endangered species**)

Characteristics of living things

Characteristics which can be observed in all organisms are also called **life processes** because they are the things that keep organisms alive e.g.

Nutrition

- It is the process by which living things acquire and utilize nutrients.
- Green plants manufacture food materials like glucose in a process called photosynthesis.
- Animals cannot manufacture their own food and they obtain from plants and other animals.

Respiration

- This is the process in which food substances are broken down chemically in the body cells to release energy. The energy produced enables the organism to carry out the life processes.

Excretion

- It's the removal of waste substances produced from the breakdown of certain substances in the body. Waste substances may be harmful if left to accumulate in an organism.

Growth and Development

Growth- it's the process by which organisms permanently increase in size and mass.

Development- refers to irreversible change in the complexity of the structure of living things.

Reproduction

- This is the process by which living organisms give rise to young ones of their kind.
- When living things reach maturity, they produce young ones by asexual or sexual reproduction. Asexual reproduction is where a single parent produces offspring's that are identical to itself.
- In sexual reproduction two parents are involved and the offspring are not identical with either parent.
- The production of offspring ensures that a species lives on or does not become extinct.

Sensitivity (irritability)

- This is the ability of organisms to sense changes of the environment and to respond to them e.g. living things react to changes in temperature, humidity, light, pressure etc.

Movement

- ***Movement-***It's a change in position by either a part of or the whole living thing. When a whole organism moves from one place to another, it is known as **locomotion** e.g. in animals.

- Animals carry out locomotion in various ways e.g. flying, walking, swimming, running etc.
- **Locomotion** enables animals to search for food or mates and escape from danger.
- In plants movement is limited to certain parts such as
  -Closing of leaves
  -Growing of shoot towards the light
  NB- since most of the plants make their own food they do not need to carry out locomotion.

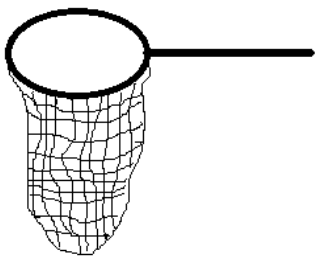
Gaseous exchange

- This is the passing of respiratory gases across the respiratory surfaces. Oxygen is taken into the cells for respiration and Carbon (IV) oxide is released outside the cells across a respiratory surface.

Collection, observation and preserving of specimens

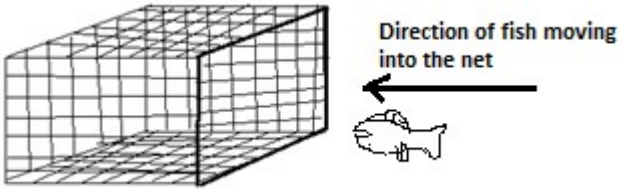
In order to differentiate between animals and plants, there is a need to **collect**, **observe** and **record** their external features. Some apparatus used in collection and observation of specimens include;

Sweep net



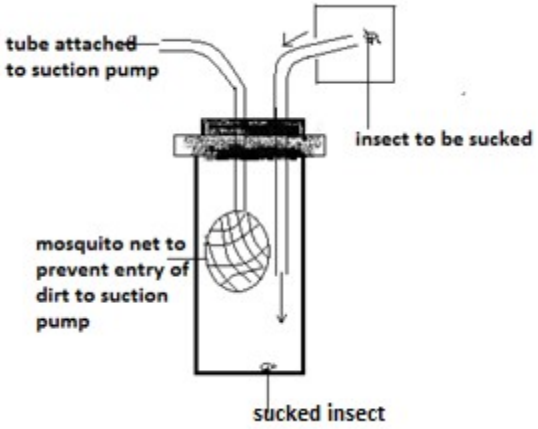
Its used for catching flying insects.

Fish net



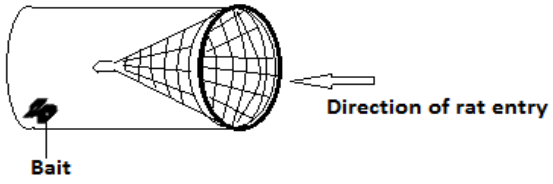
- used for trapping small fish and other small water animals.

Pooter



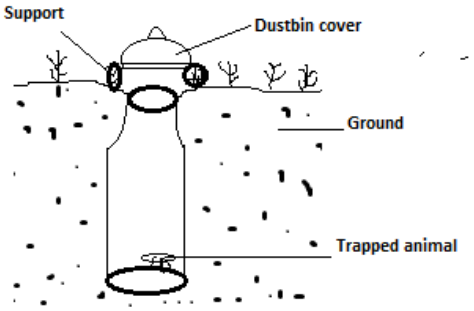
- -used for sucking small animals from rock surfaces or barks of trees

Bait trap



- For attracting small animals including rats.

Pitfall trap



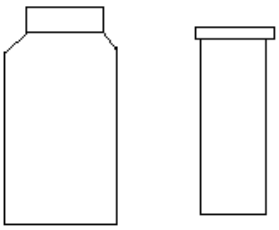
-for catching crawling animals.

- **Pair of forceps**



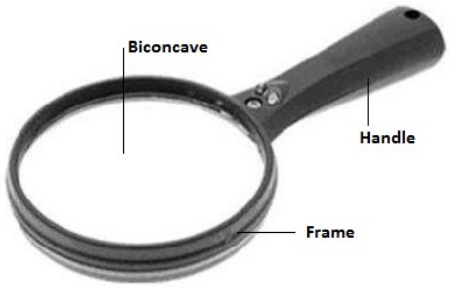
- Used for picking up small crawling animals e.g. stinging insects.

Specimen bottles



- For keeping collected specimen. Larger specimens require large bottles.

Magnifying Lens



It's used to enlarge objects. Is a special instrument made from glass. It is biconvex i.e. it is thickest in the middle.

- When this lens is fixed on a frame that can be held by the hand when being used, it is called a **hand lens**.

Activity: How to use a hand lens

- Hold the lens with one hand
- Place the specimen or object on a bench
- Bring the lens over and near the object
- Look down through the lens
- Move the lens up and down slightly until the image is sharp focus. This means that it can be seen clearly. What you see is a magnified image of the object.

Magnification = Size of drawing

Size of specimen

- A biologist collected a bone measuring 25cm in length. He then illustrated the bone in a paper. On measuring the length of the drawing, he found that it was 10cm. calculate the magnification of his drawing. Give the formula you use and then show your working.

Activity 1: collection of specimens

Procedure:

- Collect a wide variety of plant and animal specimens e.g. grasshopper, earthworm, grass, pinnas leaves.
- Place them in appropriate containers and carry them into the laboratory
- Observe the specimens collected and record common features observed in plants and animals.
- Preserve your collection

Precautions during collection and observation

- Collect only the number of specimens you need.
- Do not harm specimens during the capture(collection)

- Do not destroy the natural habitat of the specimen .After use return any live specimens back to their habitat whenever possible.
- Dangerous/ injurious specimens should be handled with a lot of care such include stinging plants or insects make use of forceps and hand gloves in such cases.
- For highly mobile animals they should be immobilized by spraying them with sedatives.
- Specimens should be put in bottles with perforated covers to avoid suffocation.

Comparison between plants and animals

Plants	**Animals**
Most plants have chlorophyll	They don't have chlorophyll hence can't make their own food
They store excess as starch	They store excess as glucose
They respond slowly to changes in their environment as it involves growth	They respond quickly to the stimuli as they have receptors
They don't move about since they are anchored to the ground	Most animals move about in such of food and shelter

They lack specialized excretory organs	Have complex excretory organs
Growth occurs throughout the life of a plant	Growth occurs during the early life and stops at maturity
Growth occurs at specific regions of the plant	Growth occurs over the whole organism
Plant body parts are spread out	Animal bodies are compact

Activity 2: external features of plants and animals

- Identify a mature small plant and dig it out.
- Using a sweep net provided, collect a grasshopper and put it in a specimen bottle
- Observe the external features of the two specimens. Record your observations for each specimen.
- Gently disturb the animal specimen and the potted plant with a blunt piece of stick or ruler. Record your observation.
- From the observation record the major differences between plants and animals.

Some common features to be observed in animals and plants

In animals;

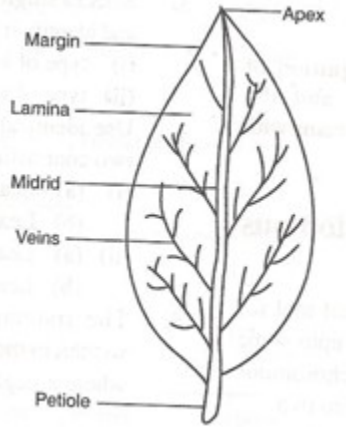
- Locomotory structures such as legs, wings and fins
- Antennae (presence and number)

- Presence of type of eyes i.e simple or compound eyes
- Number of body parts
- Body segmentation
- Body structures such as hair, fur or scales
- Feeding structures
- Type of skeleton present-exoskeleton, endoskeleton and hydroskeleton.

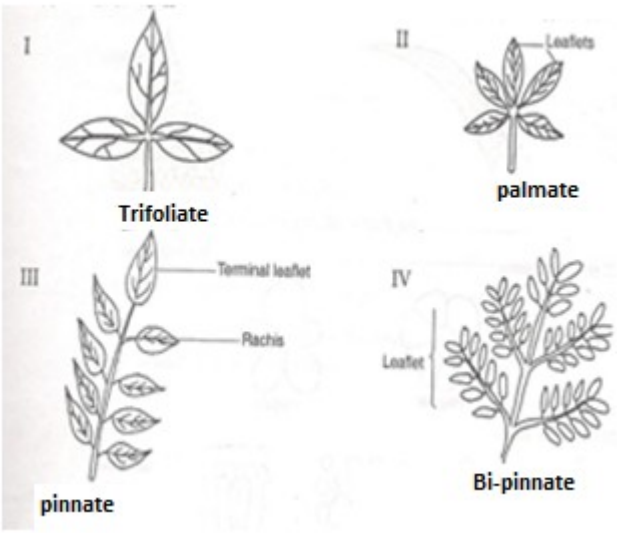
In plants;

Part of plant	Characteristics
Leaf	- Phylotaxy
	- Leaf type
	- Leaf venation
	- Margin
	- Lamina
	- Colour
Flower	- Inflorescence type
	- Flower shape
	- Number of floral types
Stem	- Type of stem(woody, herbaceous or fleshy)
	- Shape (Rectangular or cylindrical)
	- Texture of stem(smooth or spiny/thorny)
Roots	- Root system(tap root or fibrous)
	- Storage roots

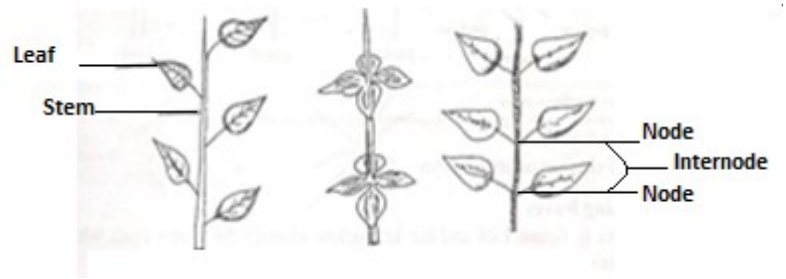
Simple leaf



Compound leaves

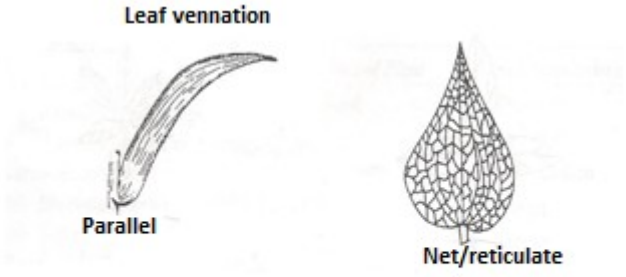


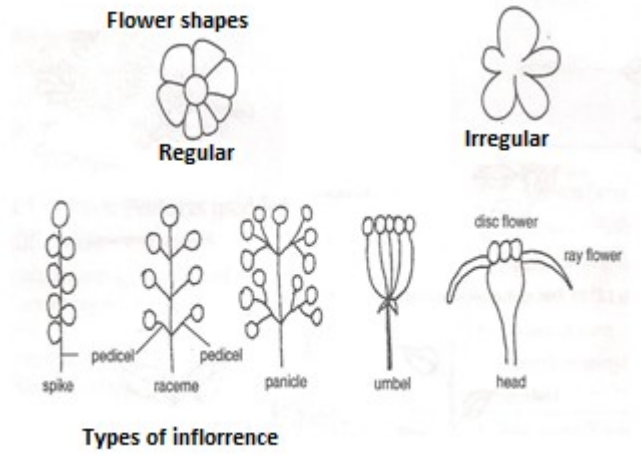
Phylotaxy (leaf arrangement)



Types of leaf margins







Types of inflorrence