

SENIOR ONE BIOLOGY note.**Instructions:**

1. Copy all the notes in this handout into your books (page 1-26)
2. Answer all question in exercise one.(exercise one, qn. 1-3)
3. For exercises two and three, don't answer. However, write the question and Leave enough space the answers. (You will answer them from school with the help of your teacher when you get back to school)
4. For diagram/pictures/drawing, you are advised to print so that you just stick them correctly into your book.

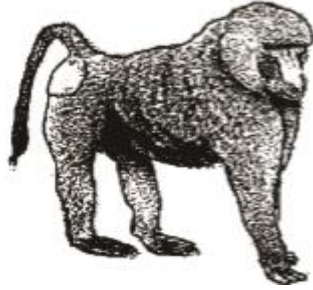
EXERCISE ONE:

1. (a) Write down **eight (8)** differences between living things and non-living things? (07 marks)
(b) Write **seven (7)** ways in which plants are similar to animals. (07 marks)
2. 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.

3. 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.

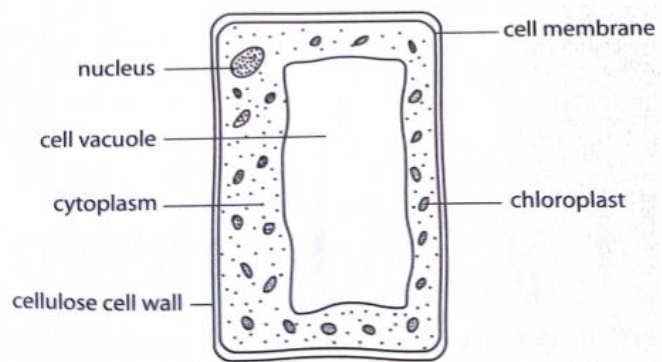
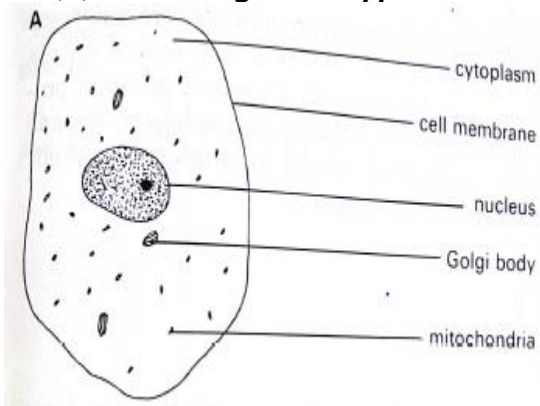


CHAPTER 2: CELL BIOLOGY

By definition, a cell is the basic structural and functional unit life.

CELL STRUCTURE:

(a) A drawing of a typical animal cell: (b) drawing of typical plant cell



Functions of the parts of cells:

1. **Cell membrane:** allows some substances to enter and leave the cell; & keeps the cell contents together.
2. **Cytoplasm:** is a site for many chemical reactions in cell.
3. **Nucleus:** Controls all cell activities & stores the genes/genetic material/DNA RNA.

Hint: A gene is the basic unit that carries information which determines the characteristics passed from a parent to the offsprings.

4. **Mitochondrion:** is site for respiration.
5. **Lysosomes:** destroy worn out organelles/digest unwanted structures.

6. **Ribosomes:** site for synthesis of proteins.

Part found in plant cells only:

7. **Cellulose cell wall:** give plant cell support/shape/ allows H₂O and dissolved substances to pass freely.
8. **Chloroplast:** site for photosynthesis, stores starch and chlorophyll.
9. **Vacuole:** stores air, water, food and waste materials/ maintains shape & firmness when turgid.

Exercise two.

1. Why are cells referred to as the basic units of life?

.....

2. Name four structures found in both plant and animal cells.

.....

.....

.....

3. What are the differences between plant cells and animal cells?

Plant cell	Animal cell
1.	
2.	
3.	

GROUPS OF CELLS/LEVELS OF CELLULAR ORGANIZATION:

In large organism, cells may be organized from the smallest to the biggest level as illustrated below:

Cell → Tissue → organ → organ system → organism.

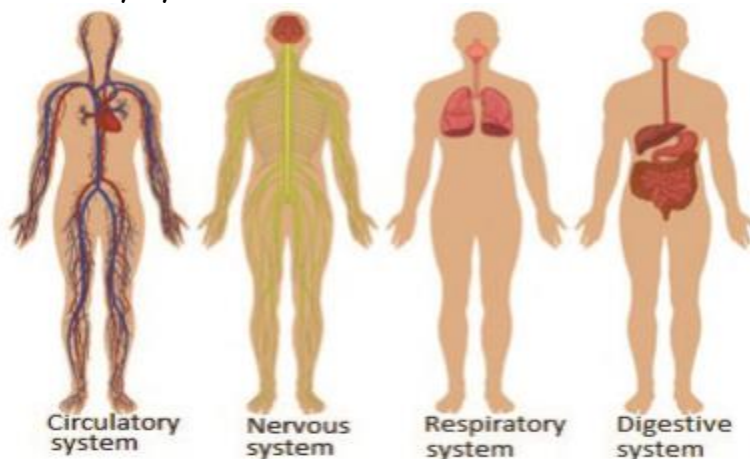
Definitions:

- i) **Tissue:** is a group of similar cells performing a particular function.
- Examples of tissues in animals are: epithelial tissue, muscle tissue, blood tissue, bone tissue, cartilage tissue, nervous tissue, connective/binding tissue etc.
 - The tissues in plants are: epidermal tissue, vascular tissues (forming vessels) which include

<i>Tissue</i>	<i>Function</i>
Xylem	Transports water and minerals.
Phloem	Transports food materials.

1. **Organ:** is a group of different tissues performing a particular function.
Example of animal organs: heart, eye, ears, nose etc.
Examples of plant organs are: stem, leaf, root, flower and fruit.

2. **Organ system:** is a group of different organs performing a particular function. There are two systems in plants: root and shoot systems. Examples of organ systems in animals are: circulatory system, digestive system, excretory system etc.



Guided question:

Name the organs in the organ systems named below and give the functions of each system.

Organ system	Organs present	Function
Circulatory system	Heart, blood vessel (arteries, veins and capillaries),	Transports materials around the body.
Nervous system	Brain and spinal cord	Transmits impulses around the body.
Respiratory system	Mouth, nose and lungs	Exchange gases between the body and the environment
Digestive system	Mouth, stomach, liver and intestines	Breaks down food substances for absorption
Reproductive system	Testes/ovaries	Produces gametes

- ii) A group of different organ systems working as a unit is an organism e.g. a human being.

There are two types of organism depending on their cellular composition

1. **A unicellular organisms:** are single-celled organisms/are organism whose entire body is made up of one cell e.g. amoeba, bacteria, paramecium and yeast.

2. **A multicellular organism:** is an organism whose whole body is made up of more than one cell e.g. man, hen, plants and cow.

Exercise three:

Aim: Identifying the tissues in your arm:

(a) What is the use of your arm?

.....

.....

(b) What is under the skin in your arm? i.e. name the various tissue in your arm .

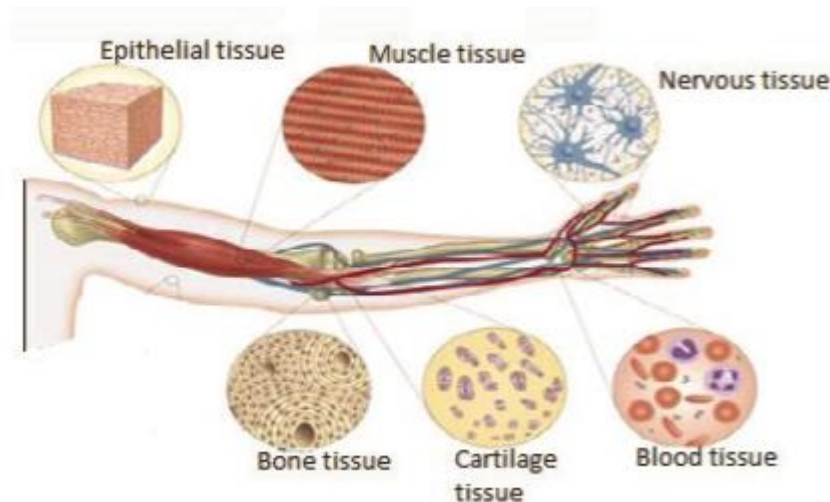
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(c) **What to do.**

- i) Make a sketch of your arm.
- ii) Try to name the parts of the arm.
- iii) What is the use of each part?
- iii) Compare your drawing with the figure below and suggest the importance of each tissue labelled.


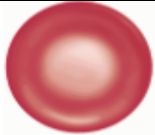



SPECIALIZED CELLS



These are cells which are modified in structure and perform a specific function.

(a) Examples of specialised animal cells:

specialized cell (drawing)	Adaptation		Name
	Structure/feature	Function	

	Can change its shape;	to engulf foreign particles and destroy them in order to defend the body.	White blood cell.
	Has a flat circular and biconcave shape. Has no nucleus;	to provide a large surface area for carrying more haemoglobin in order to absorb and carry enough oxygen from the lungs to respiring cells.	Red blood cell
	Has a tail	To propel/swim to the egg cell and fertilise it.	Sperm cell

(b) Examples of specialised plant cells:

specialized cell	Adaptation		Name of the cell
	Structure/feature	Function	
	Has a regular shape with many chloroplasts;	to trap much sunlight to enable the cell carryout photosynthesis.	Palisade cell
	It has narrow and long tubular extension providing a large surface area;	to penetrate soil and absorb water and mineral salts.	Root hair cell

OBSERVING CELLS AND OTHER TINY THINGS:

Cells are too tiny to be seen by unaided eye. You can only observe cells using a light microscope or an electron microscope.

LIGHT MICROSCOPE:

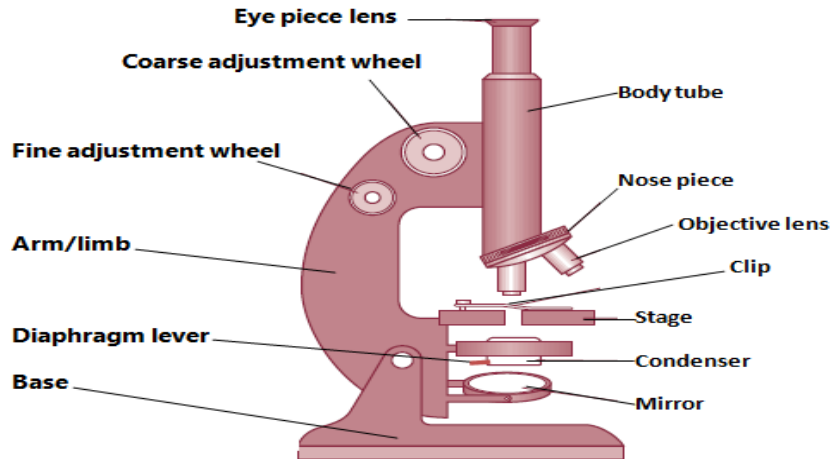
A microscope is an instrument used to observe things that are too small to be seen by an unaided eye by making them appear much larger and clearer. There two types of compound microscopes

1. Light microscope: uses a light beam to work.
2. Electron microscope: uses an electron beam to work.

Functions of a microscope:

- **Magnification:** makes small specimen bigger and visible.
- **Resolution:** a microscope enables one to see greater details in an image of a specimen.

A drawing showing the structure of a compound light microscope:



Functions of the parts:

- **Base:** provides firm support to the microscope of a flat surface.
- **Body tube (barrel or ocular tube):** holds the eyepiece and the revolving nose piece.
- **Coarse adjustment knob:** raises or lowers the body tube through longer distances to bring the image into initial focus.
- **Fine adjustment knob:** raises or lowers the body tube through smaller distances to bring the image into sharper focus. It is mostly used with the high power objective lens.
- **Diaphragm:** is an aperture that regulates the amount of light passing through the condenser to illuminate the specimen
- **Eye-piece (ocular lens):** contains a lens which contributes to the magnification of the specimen under view. It further magnifies the image formed by the objective lens.
- **Objective lens:** bring image into focus and magnifies it.
- **Mirror:** reflects light through the condenser to light up the
- **Revolving nose piece:** holds the objective lenses in place and enables the change from one objective lens to the other
- **Condenser:** concentrates light on the object on stage
- **Stage:** flat platform where the microscope slide is placed. it has two clips to hold the slide into position

NB: it called a light microscope because it use light beam to function. It is called a compound microscope because it has many lenses, the eye piece lens and the objective lenses.

Magnification of a microscope and drawings:

By definition magnification is the number of times the size of the drawing multiplies the size of the specimen from where it has been drawn. Magnification should be written at the bottom of the drawing with a multiplication sign in front of a number and it has no units since it's a ratio. Magnification can be calculated as below depending on whether the drawing is taken with naked eyes or hand lenses or light microscope

1. Total Magnification of microscope = magnification of the eye piece lens X magnification of the objective lens
2. Magnification of a drawing obtained with an unaided eye or hand lens
= size (length or width) of a drawing
Size (length or width) of the object

Exercise three.

1. Calculate the magnification of an image given the following information:

Magnification of the eye piece = x15

Magnification of the objective lens = x5

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2. What is the importance of using a microscope

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3. Specimen was viewed under a microscope using an objective lens labeled x40. What was the magnification of the eye piece lens used if the total magnification of the image was x200?

.....

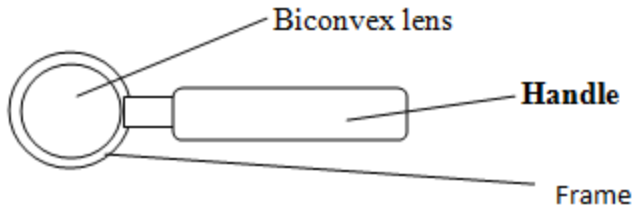
4. A student made a drawing whose length was 12mm. Find the magnification of the drawing if the length of the object was 3mm.

.....

Hand lens/simple microscope.

A hand lens is an optical instrument made up of a convex lens mounted on a frame, and is used to magnify object for clear observation.

Diagram of a hand lens



Describe how a hand lens is used correctly:

- Hold a hand lens with one hand.
- Place the specimen on flat surface.
- Bring the hand lens over a specimen.
- Look down through the lens.
- Move the lens up and down slowly until a clear and magnified image is focus

CHAPTER 3: CLASSIFICATION

The branch of biology dealing with naming and classification of living organism is called **taxonomy**.

Classification is the act of putting living things together into groups on the basis of the characteristics they have in common. A group of organism with similar characteristics is called taxon (the plural: taxa).

Importance of classification:

1. Makes it easy to study organisms by putting them into correct small groups with similar characteristics.
2. Makes it easy to understand the evolutionary relationship(phylogeny) between different organisms,
3. Prevents confusion around the scientific world by arranging information about organisms in an orderly way.
4. Provide a universal way of arranging information about organisms.

Levels of classification:

There are seven levels of taxonomy. From the smallest, they are:

1. **Species:** This is a group of organisms with similar characteristics that are able to breed freely among themselves and produce fertile offspring. This is a taxon/group with the fewest organisms.
2. **Genus:** This is a group made up of a number of similar or closely related species. (the plural of genus is genera)
3. **Family:** This group made up of closely related genera of organisms.
4. **Order:** This is group made up of closely related families.
5. **Class:** This group made up of closely related orders.
6. **Phylum:** This group is made up of closely related classes. (The plural of phylum is phyla)

7. **Kingdom:** It is a group of organisms belonging to closely related phyla. This is the highest taxon into which organisms are classified. This group contains the highest number of organisms. There are five kingdoms of living organisms today: *Monera, Protocista, Fungi, Plantae and Animalia*.

The binomial system of living organisms:

This is a system of naming which gives two unique Latin names to an organism, beginning with genus name followed by the species name.

Rules of binomial system (characteristics of scientific names)

- The first name is Genus, the second name is species.
- Scientific names of organisms are written in Latin, printed in italics or underlined separately when handwritten.
- The genus name always starts with a capital letter, and the species name is always written in small letters.
- Scientific names rarely change
- Scientific names are unique i.e. no two organism have the same scientific name.

Organism	Genus	Species	Scientific name
Onion	<i>Allium</i>	<i>cepa</i>	<i>Allium cepa</i>
Man	<i>Homo</i>	<i>sapiens</i>	<i>Homo sapiens</i>
Housefly	<i>Musca</i>	<i>domestica</i>	<i>Musca domestica</i>
Butterfly	<i>Papilio</i>	<i>demodocus</i>	<i>Papilio demodocus</i>
Cockroach	<i>Periplaneta</i>	<i>americana</i>	<i>Periplaneta americana</i>
Lion	<i>Panthera</i>	<i>leo</i>	<i>Panthera leo</i>
Honey bee	<i>Apis</i>	<i>mellifera</i>	<i>Apis mellifera</i>

The importance of binomial system:

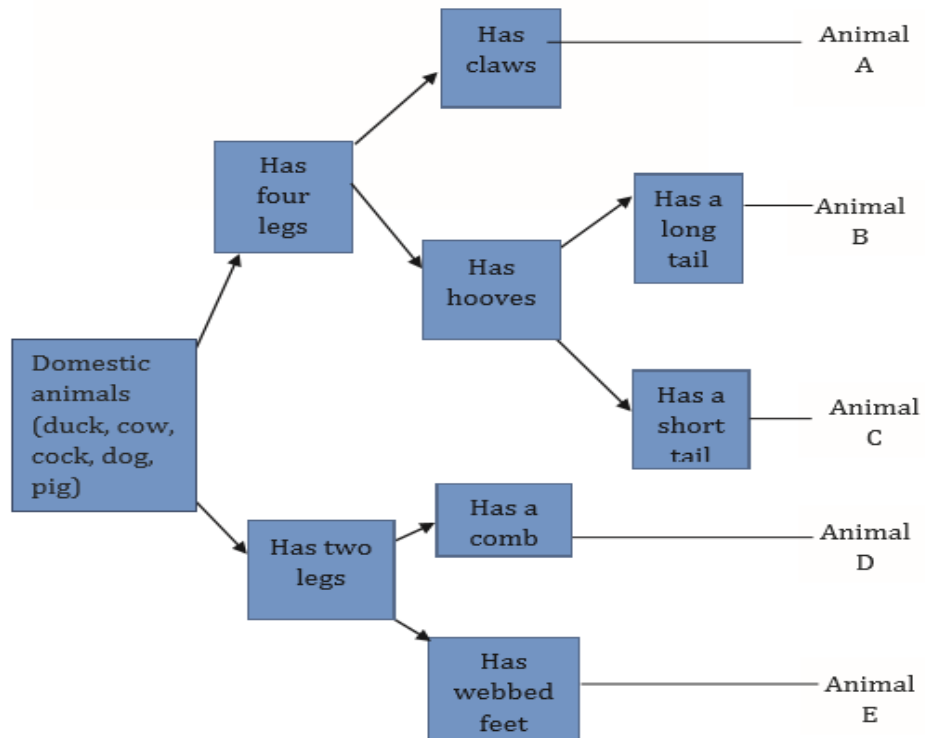
The binomial system is important because of the following reasons:

1. **Clarification:** each organism has a unique name that is specific to that organism and can be identified.
2. **Universal:** using same name everywhere to identify the specific organism.
3. **Education:** names are short and easier to remember and learn.
4. **Classification:** organisms are more easily categorized and the categories are easier to understand.

Using a flow chart for biological classification

The features/characteristics of organisms can be used to classify them using a flow chart. The chart usually begins with two distinct features that distinguish a group of organisms. Then other features/characteristics can be used to further separate the organisms until each individual in the group is identified independently.

Example: Take a look at the chart below and try to figure out the domestic animals based on their characteristics.



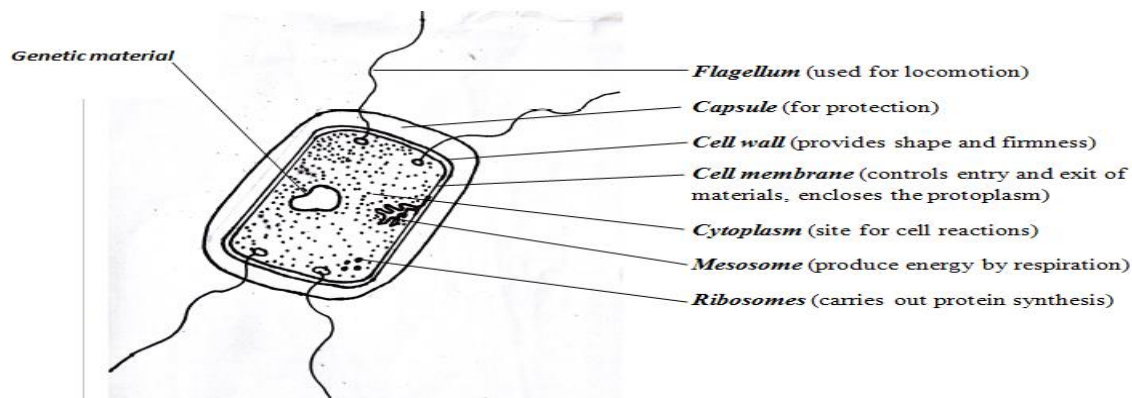
1. Which one of the domestic animals is a:
 - a) duck
 - b) cow
 - c) cock
 - d) dog
 - e) pig

3. Using the domestic animals in (1) above, create your own flow chart but with features/characteristics different from those given above.

THE FIVE KINGDOMS OF LIVING THINGS

1. Kingdom Monera:

This kingdom includes the simplest and smallest living organisms known as bacteria. The organisms are single-celled.



Characteristics of bacteria:

The bacteria have the following characteristics:

- Are unicellular (single celled) organisms
- Have no true nucleus. Their genetic material is not enclosed by the nuclear membrane.
- The bacteria exist in various shapes which can be rounded (cocci), coiled (Spirilla) or rod-shaped (bacilli)
- Exist singly or in colonies which can be in pairs (e.g diplococci and Diplobacilli), cluster (like staphylococci) or in chain form (e.g streptococci)

Economic (Useful and Harmful aspects) of importance of bacteria:

Some people may tend to fear bacteria, because they only imagine that bacteria cause harm. However biological studies show that bacteria can be both harmful and useful in nature.

Bacteria are harmful because:

1. They cause diseases e.g. Tuberculosis and cholera in humans.
2. Action of bacteria on food makes it rot.
3. Some bacteria reduce soil fertility by denitrification.

Bacteria are useful because:

4. They help in the process of decomposition by breaking up organic wastes. This is applied in the production of composed manure and biogas.
5. Some bacteria improve soil fertility by fixing nitrogen, causing decay of organic waste and through nitrification.
6. Some bacteria are used in treatment of sewage.

7. Some bacteria are used in industry e.g. in making of food like yoghurt.
8. Some bacteria are used in biotechnology and genetic engineering to produce medicine, hormones and genes.
9. Some bacteria in ruminants facilitate digestion of cellulose in grass by secreting Cellulase.

Adaptations of bacteria in nature (why bacteria are abundant or very common in nature)

1. Have Ability to live in adverse conditions.
2. Ability to respire aerobically and anaerobically.
3. Have various modes of feeding reducing competition for food.
4. Bacteria have many strains/mutate very fast.
5. Bacteria can easily be dispersed because they are very small.
6. Have higher reproductive rate which increases their chances of survival
7. Ability to thrive in various environments like water Air and soil.

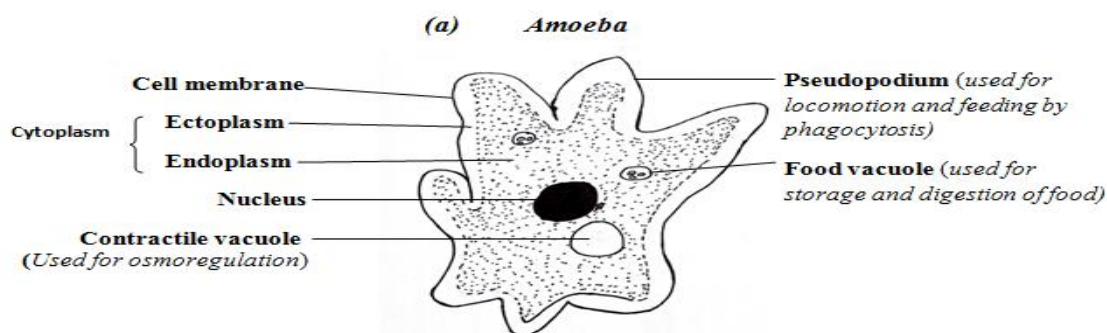
2. KINGDOM PROTOCTISTA:

This kingdom consists of single celled and simple multicellular organisms that possess a true nucleus unlike Monera.

Examples are:

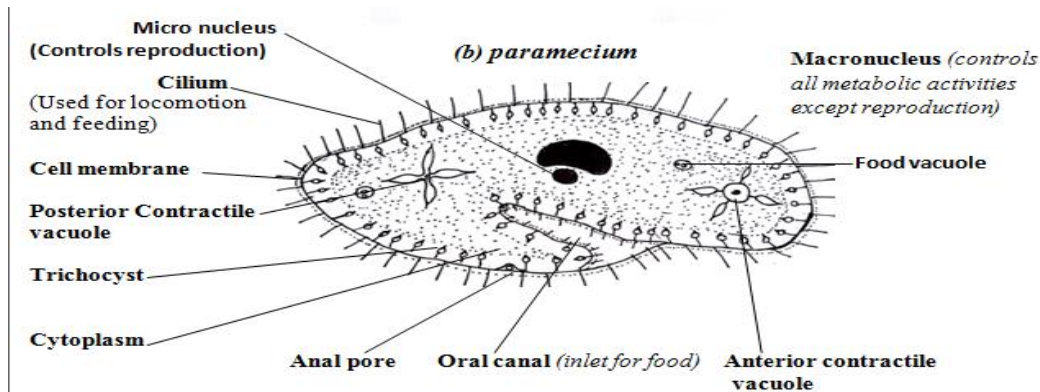
1. **Amoeba:**

- Does not have a permanent shape.
- Moves by use of pseudopodia (pseudo- means false while podia - means limbs).
- uses contractile vacuole for osmoregulation.
- It causes dysentery in man.



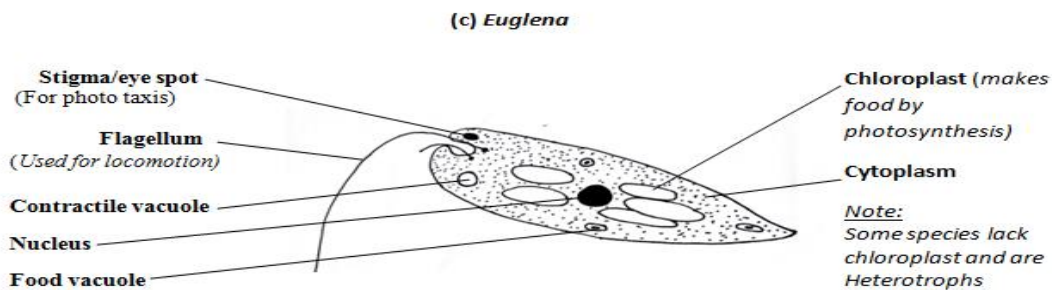
2. **Paramecium**

Paramecium is single celled, oval shaped, moves by use of hair-like structures called cilia and feeds on other microorganisms like bacteria.

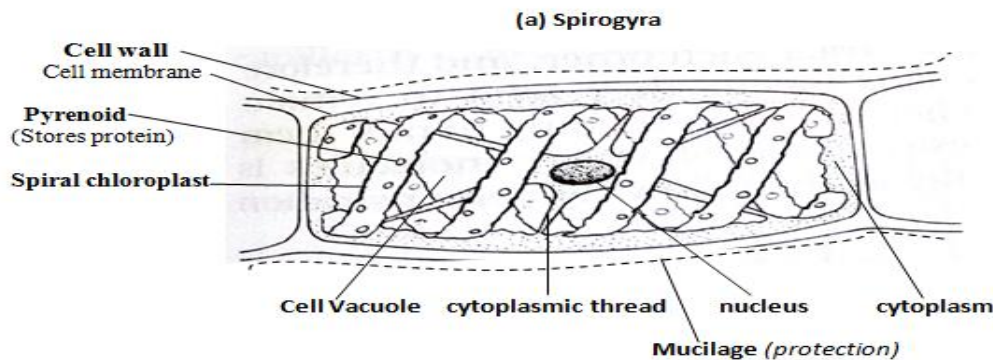


3. Plasmodium: causes malaria in humans.

4. Euglena



5. Spirogyra



Economic importance of Protoctists:

1. They cause disease e.g plasmodium causes malaria, trypanosoma causes trypanosomiasis, Coccidia causes coccidiosis, Theileria parva cause east coast fever and amoeba cause amoebic dysentery.
2. Some are used as food for aquatic animals like fish eats algae.
3. Algae add oxygen and absorb carbon dioxide in water when they carry out photosynthesis.
4. Algae provide agar used in making culture medium for micro-organisms.
5. Are also used as specimens for research.
6. Algae blooming brings about eutrophication which destroys aquatic life forms

7. Algae are used in production of food such as ice cream.

3. KINGDOM FUNGI

Kingdom fungi include mushrooms, yeast and moulds.

Some fungi grow in wood and soil, and develop from tiny spores.

Characteristics fungi:

- Fungi have a true nucleus and their cells have a cell wall made up of a substance known as chitin.
- They do not make their own food; instead feed on the decomposing organic matter of animals and plants.
- They store excess carbohydrates in form of glycogen just like animals.

Economic importance of fungi:

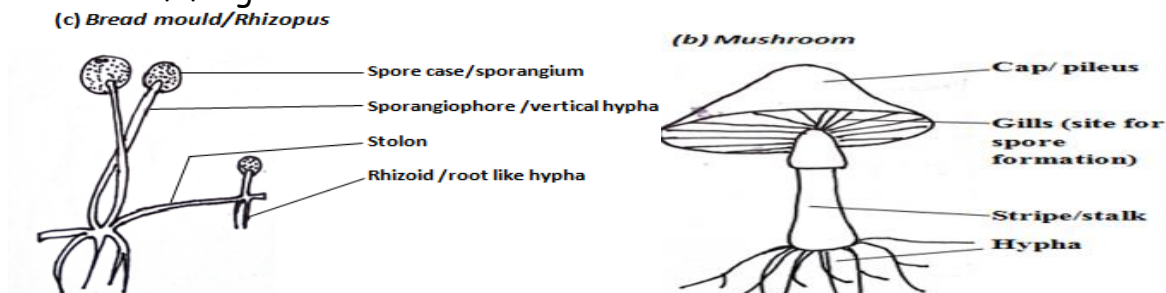
Useful Aspects of Fungi

1. Fungi keep soil fertile by recycling organic material through decomposition.
2. Some fungi are food for humans, for example, mushrooms.
3. They are used in the manufacture of medicine, for example, antibiotic called Penicillin
4. Yeast is used in baking of bread and brewing of beer in industries.

Harmful aspects of fungi:

5. Some fungi cause diseases e.g. ringworm, candida, athletes' foot (in animals), potato blight and leaf rust in coffee.
6. Action of fungi on food makes it rot.

Structure of fungi:



NB:

Body of Rhizopus is made up of a network of multinucleated threads called hyphae.

There are three hyphae namely

- ✓ Sporangiphore- vertical hyphae bearing a spore case at the tip. The spore case is called Sporangium (plural- sporangia)
- ✓ Stolon- horizontal hyphae
- ✓ Rhizoids-is the root-like hyphae for absorption of nutrients.

The total mass of hyphae is called mycelium.

4. KINGDOM PLANTAE:

Plants occur in different forms and size. They include mosses, ferns, grasses, shrubs and trees.

Characteristics of plants:

- Contain green pigment called chlorophyll.
- Have cells surrounded by cellulose cell wall.
- Are multicellular.
- Nucleus surrounded by nuclear membrane.

Classification of plants:

Plants occur in different forms and size and are grouped into four Divisions. A Division is an equivalent of a phylum.

1. Division Bryophyta:

Members of this group are called bryophytes, e.g: mosses, liverworts and hornworts.

Characteristics of bryophytes:

- Bryophytes are small, non-vascular and non-flowering plants.
- They bear stems, small leaf-like structures and rhizoids.
- They inhabit damp/moist and shady areas.
- They reproduce by producing spores

Division: Pteridophyta

Members in this group are called pteridophytes, e.g ferns.

- Pteridophytes are vascular and non-flowering plants.
- They have leaves, stem, and roots.
- They inhabit damp places and reproduce by means of spores. Their spores occur in clusters of sporangia called sori present on the underside of leaves.

Division: Gymnospermae.

Examples of gymnosperms/conifers include pine trees, cyads and cypress.

- Gymnosperms are vascular and non-flowering plants which produce seeds on structures called cones.
- They are called 'naked seed' plants because their seeds are not enclosed in an ovary.
- They have needle-like leaves.

Division: Angiospermae:

Angiosperms are well developed vascular plants which produce flowers and seeds enclosed in an ovary. Examples of angiosperms include: beans, maize, tomatoes etc.

Summary of plant divisions: 4 groups:

1. Non-flowering, non- vascular plants are called Bryophytes e.g mosses
2. Non-flowering, vascular plants are called Pteridophytes e.g. ferns.
3. Non-flowering, vascular plants that produce seeds on cones are called Gymnosperms/conifers e.g pine trees.
4. Flowering, well developed, vascular plants are called Angiosperms e.g maize and beans.

NB: vascular refers to having vessels and avascular refers to lacking vessels/being non-vascular.

All seed bearing plants (Gymnosperms and angiosperms) are collectively called spermatophytes e.g trees, shrubs and herbs.

Classification of angiosperms:

Angiosperms are divided into two groups;

1. Class: Dicotyledonae
2. Class: Monocotyledonae.

Comparing dicotyledonous plants from monocotyledonous plants

Dicots and monocot are both angiosperms. However both these groups show great variation as shown in the tables below

Feature	Monocotyledonous plants	Dicotyledonous plants
1. Seeds	Have one cotyledon in their seeds	Have two cotyledons in their leaves
2. Leaves	Leaves are long, narrow, parallel veined and attached on stem by means of leaf sheath.	Leaves are short, broad, network veined and attached on the stem by means of solid stalk.
3. Roots	Have fibrous root system	Have tap root system
	There is more than one xylem which is round shaped	There is one xylem which is star shaped.
	Xylem and phloem are arranged in a ring whereby they alternate with each other	Phloem is located b/n the arms of the star shaped xylem.
4. Stems	Vascular bundles are scattered and there is no cambium	Vascular bundles are arranged in a ring surrounding the pith and cambium.
5. Flowers	Their flowers have dull coloured petals in multiples of three.	Their flowers have brightly coloured petals in fours or fives.
6. Examples	Grasses, maize, millet, sorghum etc.	Beans, peas, groundnuts etc.

5. KINGDOM ANIMALIA**Characteristics of animals:**

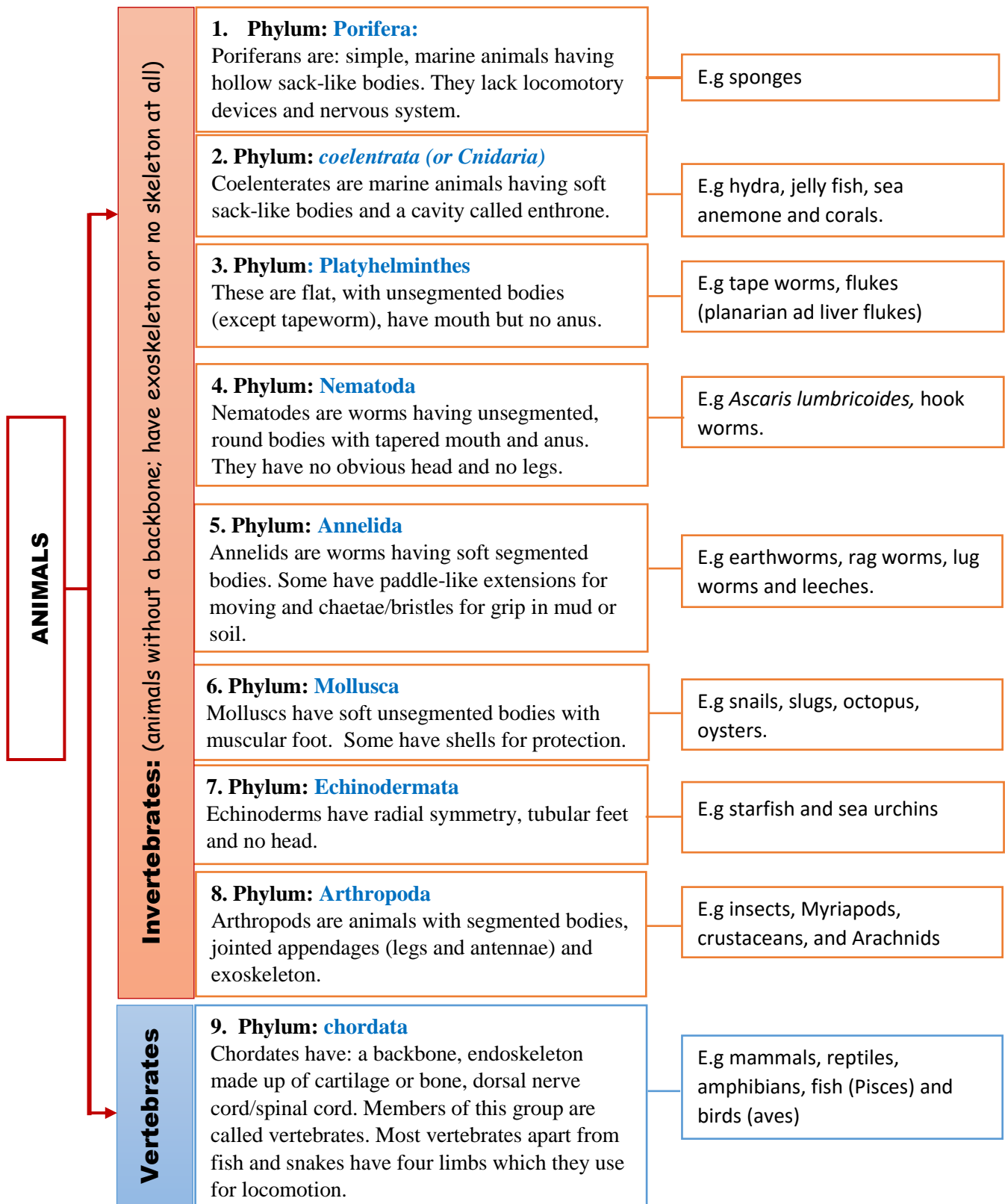
- Animals have locomotory devices like wings, walking legs, fins
- Have sense organ (well-developed nervous system)
- Have mouth for heterotrophic feeding.
- Are multicellular
- Nucleus is surrounded by a membrane

Classification of the animals:

The animal kingdom can be divided into 9 main groups (Phyla); eight of these groups are animals without a backbone (Invertebrates) and the other group comprises

animals that have a backbone (Vertebrates). All vertebrates have an internal skeleton made up of either bone or cartilage.

The eight (8) invertebrate phyla are: Porifera, Cnidaria/Coelenterata, Platyhelminthes, Nematoda, Annelida, Mollusca, Echinodermata and Arthropoda. The only vertebrate phylum is chordata.



Let us look at some animal phyla in more details.

Phylum: Arthropods:

This is the largest phylum in the animal kingdom. Members in this group (arthropods)

- Live on land, in water and in air.
- They have an exoskeleton that protects their bodies and prevents them from losing excessive water.
- Their bodies are segmented with pairs of jointed appendages (legs and antennae). The segmented body eases movement.

CLASSIFICATION OF ARTHROPODS

Arthropods can be divided into four classes:

- Myriapoda
- Crustaceans
- Arachnids
- Insects

Class	Feature/ main characteristics.	Examples
Insecta	Members in this group (Insects) have: <ul style="list-style-type: none"> - 3 main body divisions i.e. head, thorax and abdomen. - 3 pairs of legs - Thorax is divided into 3 segments i.e. prothorax, mesothorax and metathorax. 	Butterfly, housefly, cockroaches
Arachnida	Arachnids have: <ul style="list-style-type: none"> - two main body divisions i.e. abdomen and cephalothorax (fused head-thorax) - 4 pairs of legs - No antenna and no wings. - Have simple eyes - Breathe by means of book lungs. - Most of them are predators and live on land. 	Spider, tick and scorpion
Crustacea	Crustaceans have <ul style="list-style-type: none"> - Main body divisions (abdomen and cephalothorax) - 5 pairs of jointed legs. In some species the front pair is modified into claws or pincers. - Have two compound eyes. 	Crab, cray fish and prawn.

Myriapoda	Myriapods have: - Elongated bodies, several segments, several legs, simple eyes and one pair of antennae.	Centipedes and millipedes.
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Differences between centipede (class: Chilopoda) and millipedes (class: Diplopoda):

- Centipedes have poison claw while millipedes lack poison claw.
- Centipedes have one pair of legs per segment while millipedes have two pairs of legs per segment.
- Centipedes have dorso-ventrally flattened body while millipedes have cylindrical body.

Arthropod album:

Insects

Examples



grasshopper cockroach butterfly housefly

Arachnids

Examples



spider tick scorpion

Crustaceans

Examples



crab crayfish prawn

Myriapods

Examples



centipede millipede

More about phylum chordata:

Key words:

Ectotherm: An ectotherm is an organism whose body temperature changes with temperature of the external environment e.g reptiles, fish and amphibians.

Endotherm: an endotherm is an organism whose body temperature remains fairly constant regardless of the fluctuations in environmental temperature e.g birds and mammals.

Chordates are classified into five classes: Pisces (fish,) birds (aves), Amphibia, Reptilia

Class	Key features (main characteristics)	Examples
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1. Pisces (fish)	<ul style="list-style-type: none"> - Live in water and have gills for gaseous exchange. - Body covered with scales. - Have fins and tails for movement and stability in water. - Are ectotherms. - Have lateral lines for detecting vibrations in water. 	Catfish, tilapia and shark.
2. Amphibia	<ul style="list-style-type: none"> - Young amphibians/tadpole entirely live in water and use gills for gaseous exchange. - Adult amphibians are able to live on land and return in water to mate and lay eggs. - Amphibians undergo external fertilization - Use lungs, buccal cavity and moist skin for gaseous exchange. - Have soft moist skins and no scales. 	Frog, toad, salamander.
3. Reptilia	<ul style="list-style-type: none"> -Reptiles Live on land. -Have tough dry scales on their bodies -Use lungs for gaseous exchange -Are ectotherms -Reproduce by laying eggs that have soft shells 	Tortoise, python, lizard and crocodiles
4. Aves (birds)	<p>Are endotherms.</p> <ul style="list-style-type: none"> - Live on lands. - Have feathers, beaks and scales on legs. - Reproduce by laying eggs with hard shells. - Fore limbs are modified into wings. Birds are able to fly because of their powerful and light strong bones. 	Cranes, ostrich, stork, cock etc.
5. Mammalia	<p>Mammals have:</p> <ul style="list-style-type: none"> - Have fur or hair on their bodies. - Are endotherms - Most of them live on land except whales and dolphins which live in water. - Use lungs for gaseous exchange - Female mammals give birth to live young ones and feed them on their own milk produced by mammary glands - Have a muscular diaphragm. - Have external ear lobes. 	Human beings, cow, rats, gorilla, kangaroo etc.

Chordate album:**Class Pisces (fish)**

Examples

*tilapia**catfish**shark***Class Amphibia (amphibians)**

Examples

*frog**toad**salamander***Class Aves (Birds)**

Examples

*crane**cock***Class Mammalia (mammals)**

Examples

*man**cow**ostrich**stork**kanaaroo**aorilla*

Class Reptilia (reptiles)

Examples



lizard



crocodile



python



tortoise

VIRUSES.

A virus is a very small microscopic non cellular particle that infects cells in order to multiply. They are made up of a genetic material (DNA or RNA) surrounded by a protein coat.

Viruses behave like living things in the following ways:

- Like other living cells, a virus has genetic materials.
- Multiplies inside living cells.
- Carry out metabolism inside living cells.
- They can change (mutate) into new strains.

Also, viruses behave like non-living things in the following ways:

- Not made up of cell.
- Do not need to eat in order to live.
- Need a host cell to multiply/reproduce.
- Need a host cell to carry out metabolism.
- Crystalize and become completely inert if isolated from host cell.

Viruses are not classified under any of the five kingdoms because they are non-living. However, though viruses are not living things, they exist in nature.

Economic importance of viruses: harmful effects of viruses:

- Kill cells and causes disease for example AIDS, Hepatitis B and Ebola in man, Cassava Mosaic in cassava plants.
- HIV weakens the immune system of the infected person making it easy to catch diseases e.g. TB (tuberculosis).

Why is it hard to destroy viruses/vaccinate against them/ develop medicine that cure viral infection: why are viral pandemics so harmful?

You need to understand that viral diseases are difficult to treat or have no treatment at all. Hepatitis B can be prevented by vaccination; however, Ebola and HIV have no vaccine

Viruses are so harmful, difficult to treat or have no treatment at all because they reproduce so quickly, do not respond to antibiotics and constantly change into new strains.

Examples of viruses:

HIV (Human Immunodeficiency Virus) is what causes AIDS (Acquired Immune Deficiency Syndrome) disease. The virus weakens the immune system of the infected person. The virus is transmitted through:

- having unprotected sex with an infected person,
- infected injections,
- blood transfusion from an infected person and
- From an infected mother to her child during pregnancy or birth.

Today, there is no scientifically known cure for AIDS but there are drugs that can make an infected person's immunity stronger allowing him/her to live a longer and productive life.

How to prevent spread of HIV:

- The most effective way to prevent the spread of HIV and AIDS is abstinence from sex more especially among people who are not in a permanent adult relationship.
- Use condoms during sexual intercourse
- Being faithful to your partner

Hepatitis B and **Ebola** are transmitted through body contact with fluids from infected persons e.g. kissing. As mentioned earlier, you need to understand that viral diseases are difficult to treat or have no treatment at all. Hepatitis B can be prevented by vaccination; however, Ebola and HIV have no vaccine.

The **cassava mosaic virus** affects the tubers of the plant resulting in low crop yields. This virus causes the cassava mosaic virus disease. It can be recognized on the cassava leaves which have spots ranging from light green to yellow. The disease is transmitted from plant to plant by the whitefly. This disease cannot be cured but it can be avoided. The cassava mosaic virus disease can be prevented by the use of cuttings which have not been attacked by the virus. Farmers are particularly encouraged to plant varieties which are resistant to the disease

The **corona virus** which caused covid-19 disease.

How the knowledge of biology can be useful in combating viral pandemics:

- Biology helps us understand the causes, modes of transmission, signs and symptoms, prevention and control of viral infections.
- Biology helps us understand how viral diseases can be managed by means a balanced diet, good nutrition and proper hygiene.
- Biology helps us understand the influence and effects of drug abuse on our bodies and its link to irresponsible sexual behaviour which lead to carelessness and hence contracting viral infections.
- Biology helps us understand that cultural practices like circumcision may hinder the control of viral infections.
- Biology helps us see the need to develop safer alternative rites of passage from childhood to adulthood e.g SMC.
- Biology enhances controlled sexual and social behaviour to combat viral infections.

CHAPTER 4: INSECTS OF ECONOMIC IMPORTANCE