

General Biology

Module Code: BSC 1223
Component: Botany

Dr. Olumayowa Mary OLOWE

Attendance

Attendance is mandatory and It is necessary for students to attend all lectures and practical classes. Unexcused absences during CAT and Exams will not be welcomed

Course Outlines

- The Cell,
- Living Cell -Contents (The protoplast),
- The differentiated part of Protoplast
- The Tissue System
- Morphology and Anatomy of leaves
- Organography of Angiosperms (External Structure)

Vegetative System: Stem. Root and Leaf

Flower and Their Structural Variations

Female Reproductive System- Gynoecium

Male Reproductive System- Androecium

Fruit and Seeds

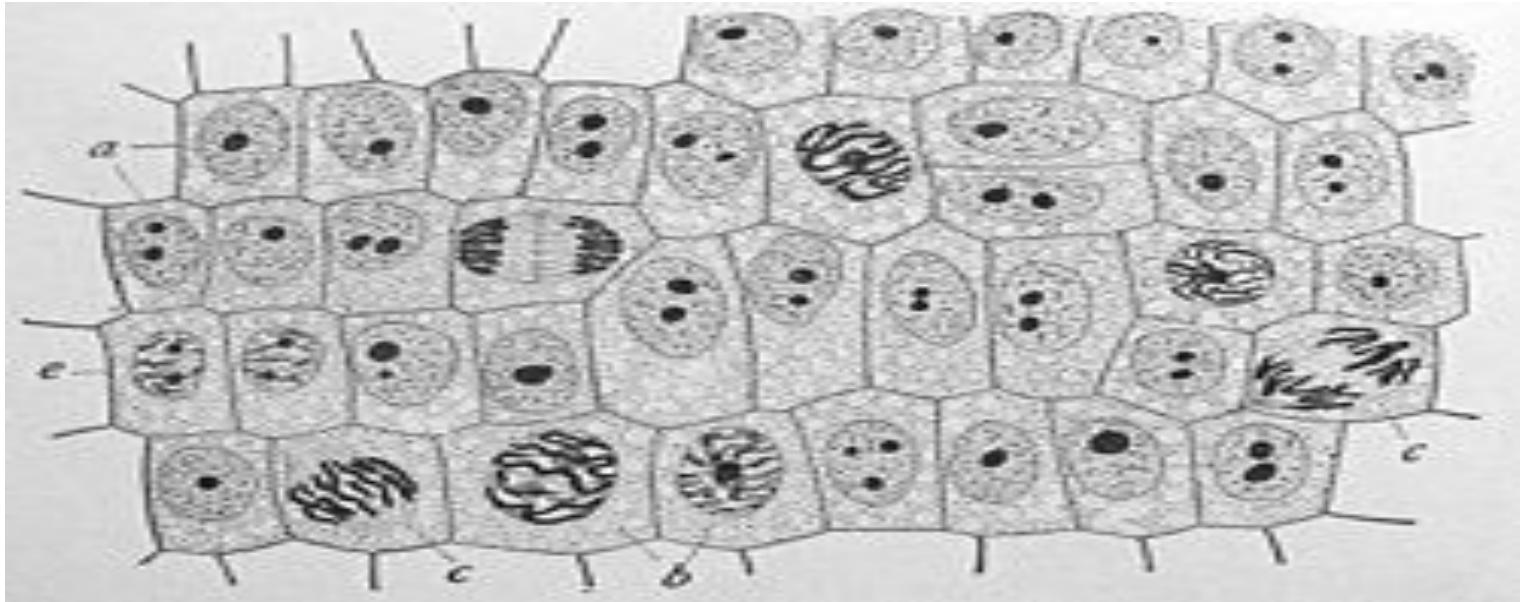
THE CELL

- A cell may be defined as a unit of protoplasm bounded by a plasma or cell membrane and possessing a nucleus. Protoplasm is the life giving substance and includes the cytoplasm and the nucleus. The cytoplasm has in it organelles such as ribosomes, mitochondria, golgi bodies plastids, lysosomes and endoplasmic reticulum.
- Every cell has three major components
 1. Plasma membrane
 2. Cytoplasm
 3. DNA (naked in bacteria and covered by a membrane in all other organisms)

There are two basic types of cells in which the Biologists recognize two basic types of cells which are the

- Eukaryotic cells
- Prokaryotic cell

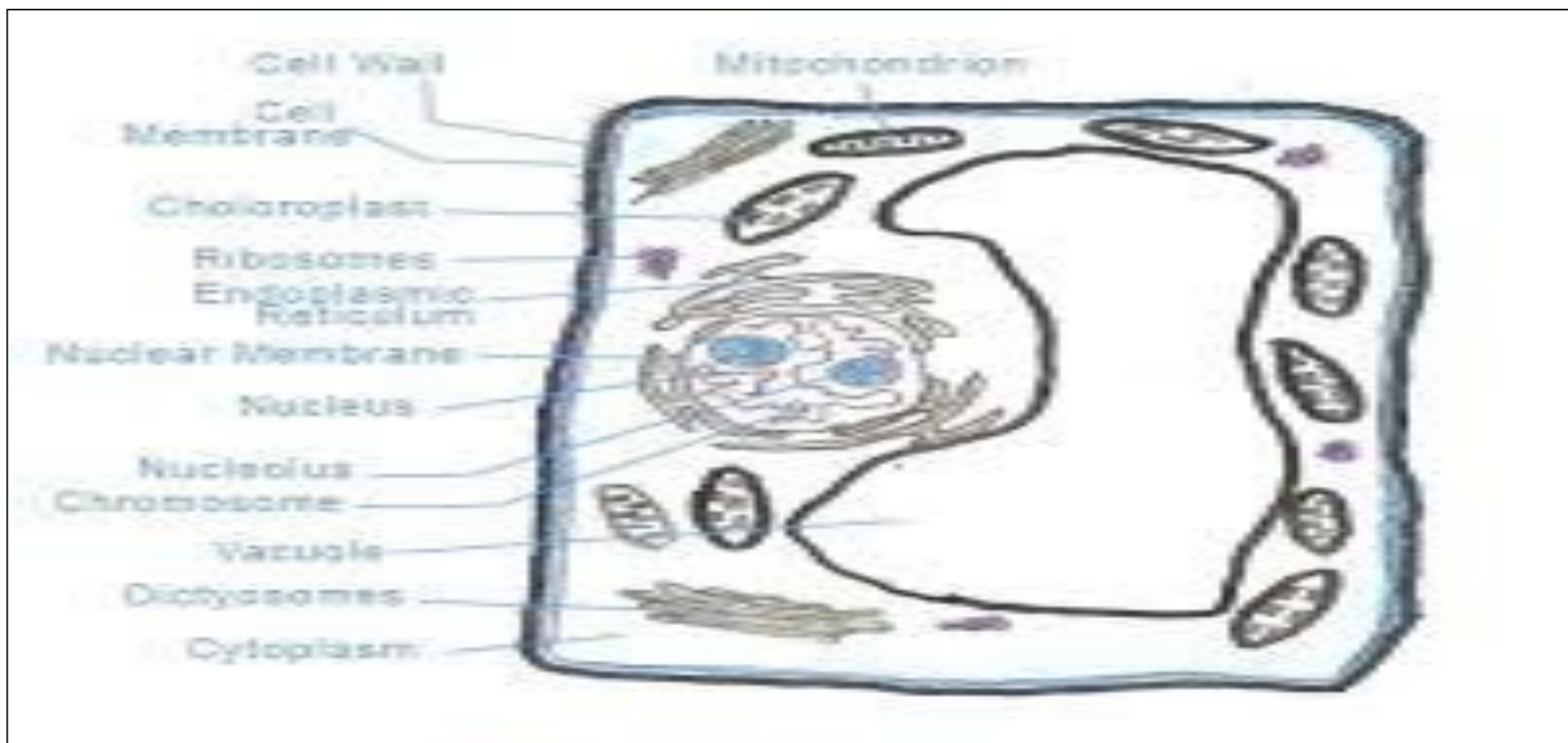
Organisms which do not possess a nucleus and membrane enclosed organelles are **Prokaryotes** such as the bacteria. While the **Eukaryotic** cells possess nucleus and other special parts, they are more advanced complex cells such as those found in plant and animal cells.



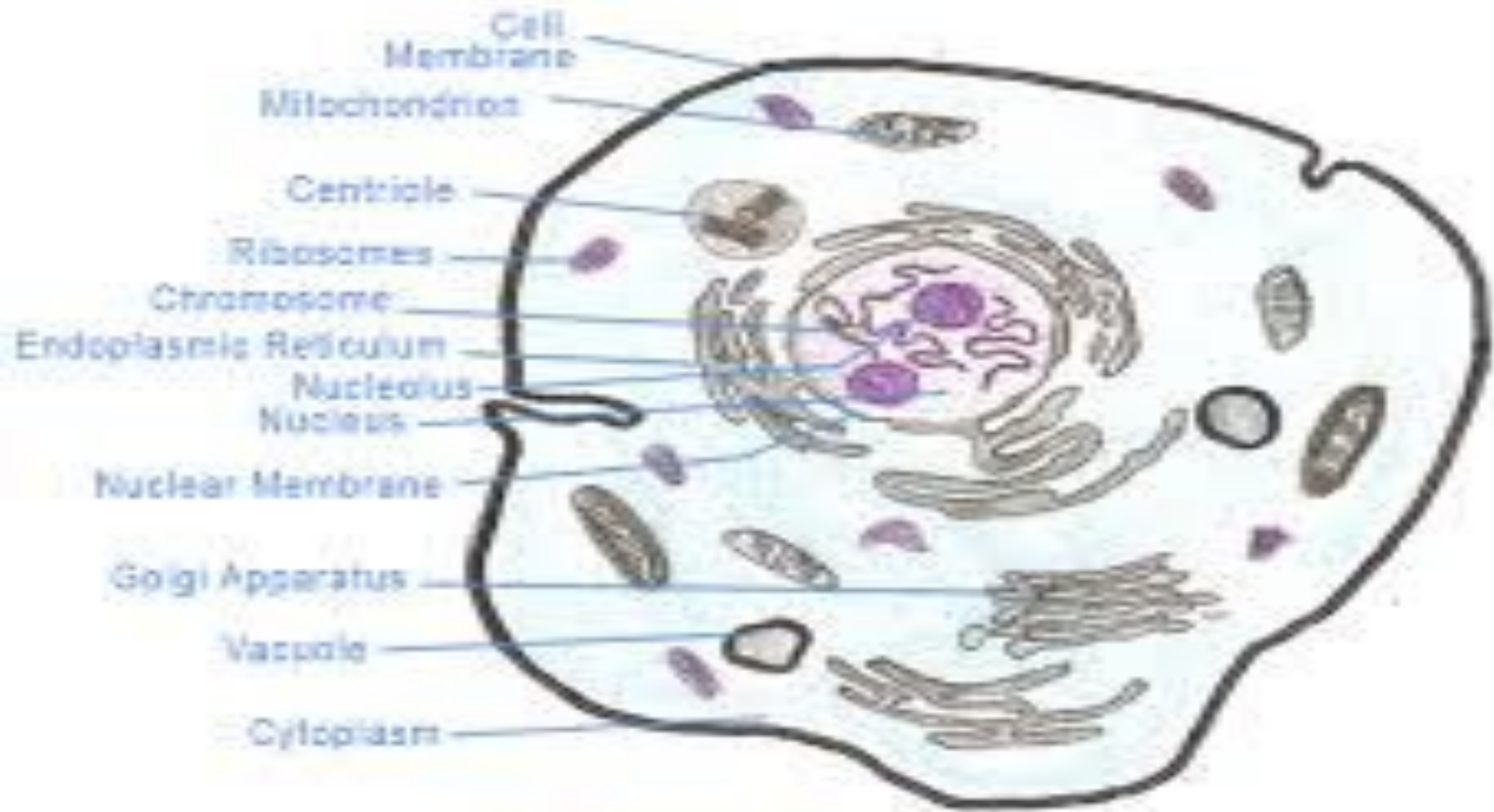
Onion (*Allium cepa*) root cells in different phases of the cell cycle

Differences between Eukaryotic and Prokaryotic cells

Eukaryotic cell	Prokaryotic cell
1. Plants, animals, fungi, protist, algae 2. Nucleus distinct, with well formed nuclear membrane. 3. Cell membrane and membrane-bound organelles 4. highly structured by endomembranes and a cytoskeleton 5. Double-membraned cell organelles (Chloroplasts, mitochondria nucleus) and single membraned (Golgi apparatus, lysosomes vacuole endoplasmic reticulum) are present. 6. Distinct compartments in the cell i.e. the cytoplasm and the nucleus	1. Bacteria, Archaea 2. Nucleus not distinct, it is in the form nuclear membrane of nuclear zone 'nucleoid'. Nuclear membrane absent. 3. Cell membrane 4. Very few cytoplasmic structures 5. Single-membraned cell bodies like mesosomes present. Endoplasmic reticulum and Golgi body absent. 6. No compartments



A Well-labelled diagram of Plant Cell



A well-labelled diagram of Animal cell

COMPONENTS OF THE CELL

The major components of the cell are (1) cell membrane, (2) cytoplasm, and (3) nucleus.

1. Cell membrane (Plasma membrane)

- Each cell has a limiting boundary, the cell membrane, plasma membrane or plasmalemma. It is a living membrane, outermost in animal cells but next to cell wall in plant cells.
- It is flexible and can fold in (as in food vacuoles of Amoeba) or fold out (as in the formation of pseudopodia of Amoeba).
- The plasma membrane is made of proteins and lipids and several models were proposed regarding the arrangement of proteins and lipids.
- The **fluid mosaic model** proposed by Singer and Nicholson (1972) is widely accepted.

Functions

- (i) The plasma membrane encloses the cell contents.
- (ii) It provides cell shape (in animal cells) e.g. the characteristic shape of red blood cells, nerve cells, bone cells, etc
- (iii) It allows transport of certain substances into and out of the cell but not all substance, so it is termed selectively permeable.
- (iv) Synthesis of protein and their transport into membranes and organelles or out of the cell.
- (v) Detoxification of poison
- (vi) Metabolism and movement of Lipids

Transport of small molecules such as glucose, amino acids, water, mineral ions, can be transported across the plasma membrane by any one of the following three methods:

- Diffusion
- Osmosis
- Active Transport

- **Diffusion:** molecules of substances move from their region of higher concentration to their region of lower concentration. This does not require energy. Example : absorption of glucose in a cell.
- **Osmosis:** movement of water molecules from the region of their higher concentration to the region of their lower concentration through a membrane. There is no expenditure of energy in osmosis. This kind of movement is along concentration gradient.
- **Active Transport:** movement of a certain molecules from region of their lower concentration towards the region of their higher concentration, it would require an “active effort” by the cell for which energy is needed. This energy is provided by ATP (adenosine triphosphate). The active transport may also be through a carrier molecule.

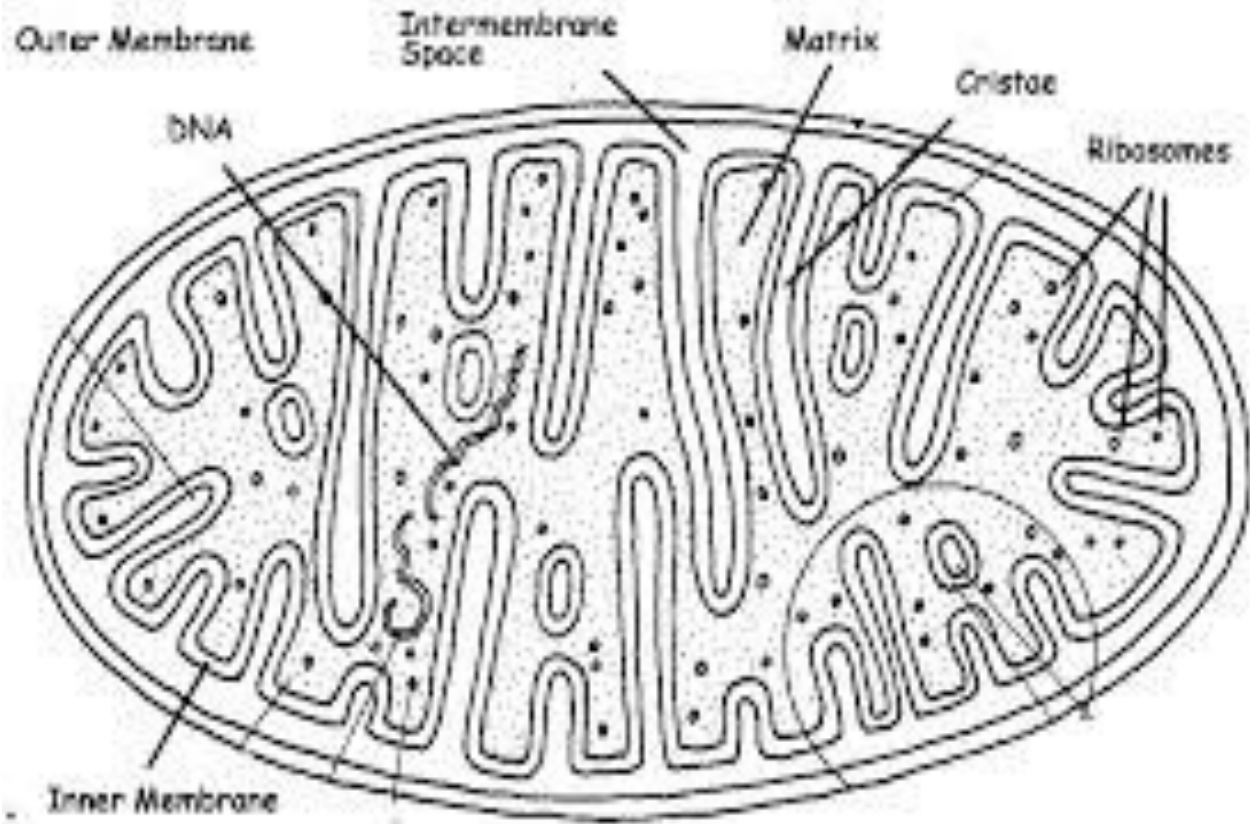
2. The Cytoplasm

The cytoplasm contains many cell organelles, which include:

a. Mitochondria and chloroplast - the energy transformers

Mitochondria (found in plant and animal cells) are the energy releasers and the chloroplasts (found only in green plant cells) are the energy trappers.

Function: Oxidises pyruvic acid (breakdown product of glucose) to release energy which gets stored in the form of ATP for ready use. This process is also called cellular respiration.



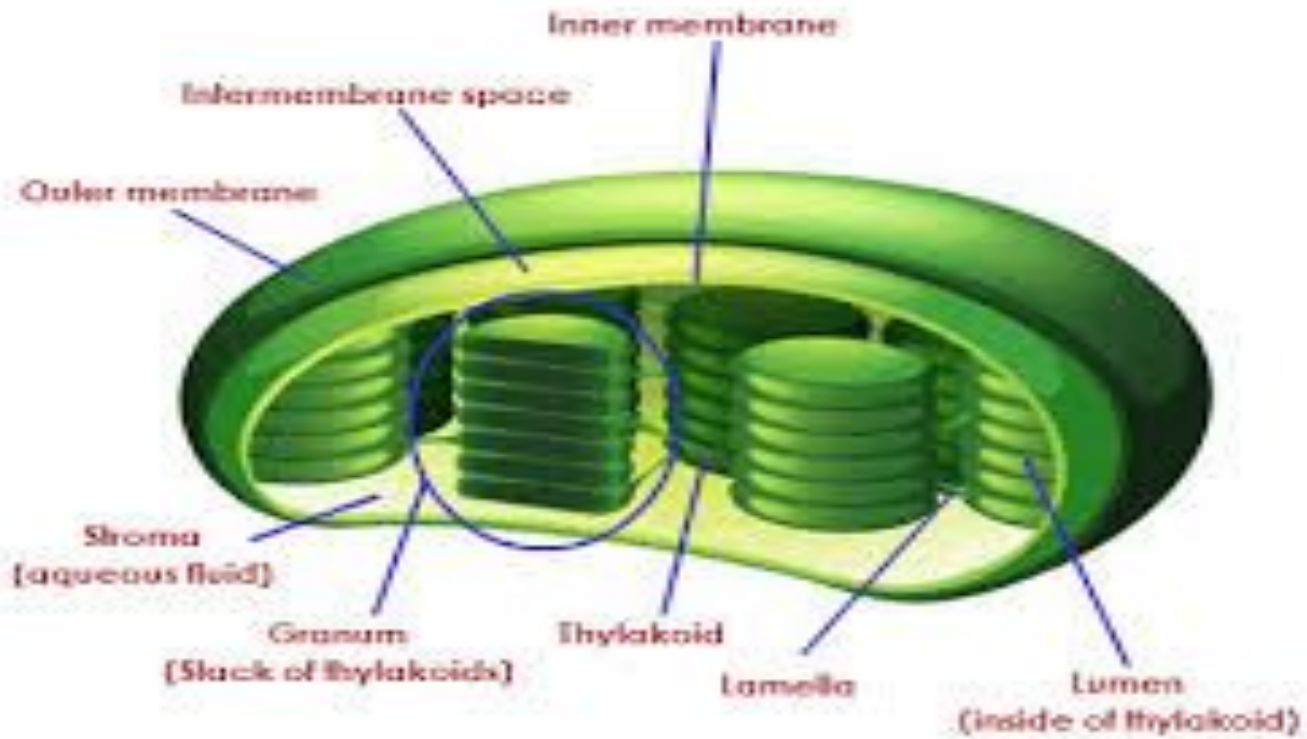
Structure of a Mitochondrion

b. Plastids

Plastids are found only in a plant cell. They may be colourless or with colour. Based on this fact, there are three types of plastids. (i) Leucoplast-white or colourless (ii) Chromoplast – blue, red, yellow etc. (iii) Chloroplast – green

c. Chloroplast

- Found in all green plant cells in the cytoplasm.
- Number 1 to 1008
- Shape: Usually disc-shaped or spherical as in most plants around you. In some, they are ribbon-shaped e.g Algae, spirogyra or cup-shaped e.g Chlamydomonas.



Structure of a chloroplast

3. The Nucleus (The Hereditary Organelle)

Its functions include maintaining the cell in a working order, coordination of the activities of organelles, reparation of the cells and the organelles, participation in cell division to produce genetically identical daughter cells called mitosis and production of gametes through another type of cell division called meiosis.

The part of a nucleus are given as:

- Nuclear membrane
- Chromatin
- Nucleolus