

# THE CELL

Week 5

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## THE CELL AS A LIVING UNIT OF AN ORGANISM

The cell is defined as the simplest, the smallest and basic unit of life. It is the structural and functional unit of a living organism. The cell can carry out all life activities such as feeding, respiration, movement etc.

## CLASSIFICATION OF LIVING THINGS BASED ON THE NUMBER OF CELLS

All living things are classified into two major groups depending on the number of cells they possess. These groups are:

**1. Unicellular or Acellular organism:** Organisms which consist of only one cell e.g. Amoeba, Paramecium, Chlamydomonas and Euglena.

**2. Multicellular Organisms:** Organisms which consist of two or more cells, e.g. Hydra, Flowering plants, Fish, Bird, Man etc.

## Forms in Which Cells Exist

Living cells exist basically in four forms;

### ***1. As single and free living organisms***

These are organisms which possess only one cell and are able to live freely on their own. The single cell carries out all life processes such as feeding. Euglena, etc. Parts of the cell may be specialized to carry out a particular process, for example Paramecium.

**Paramecium** is a fresh-water protozoan. It lives in ponds and puddles and feeds mainly on bacteria. It is often described as having a slipper shape and is about 0.25mm long. It has a stiff outer-covering called the pellicle which gives it a fixed shape. Its cytoplasm is divided into a clear outer layer called the **ectoplasm** and a granular inner layer called the **endoplasm**. The endoplasm contains several food vacuoles, two contractile vacuoles and two nuclei. The larger one called the **meganeucleus** and the smaller one the micronucleus. It moves (swims) in the water by means of cilia. The cilia are tiny projections of the ectoplasm through the pellicle. The oral groove and gullet are specialized for feeding, while the contractile vacuole is specialized for water regulation.

## **2. As a colony**

A colony consists of many similar cells which are joined together. E.g. Volvox, Pandorina, etc. Diagram of volvox.

## **3. As a filament**

This consists of many similar or identical cells joined end to end to form unbranched filaments. e.g. Spirogyra, Zygnema, Oscillatoria and Oedogonium. Each cell in a colony or filament behaves as an individual. Each carries out life processes independently of its neighbours.

## **4. As a part of a living multicellular organism**

In multicellular organism cells which perform the same function are grouped together to form a tissue, e.g. tissues of the ileum wall, the retina, and the blood (a tissues which perform a specific function form an organ and a group of organism working together to perform a specific task form a system).

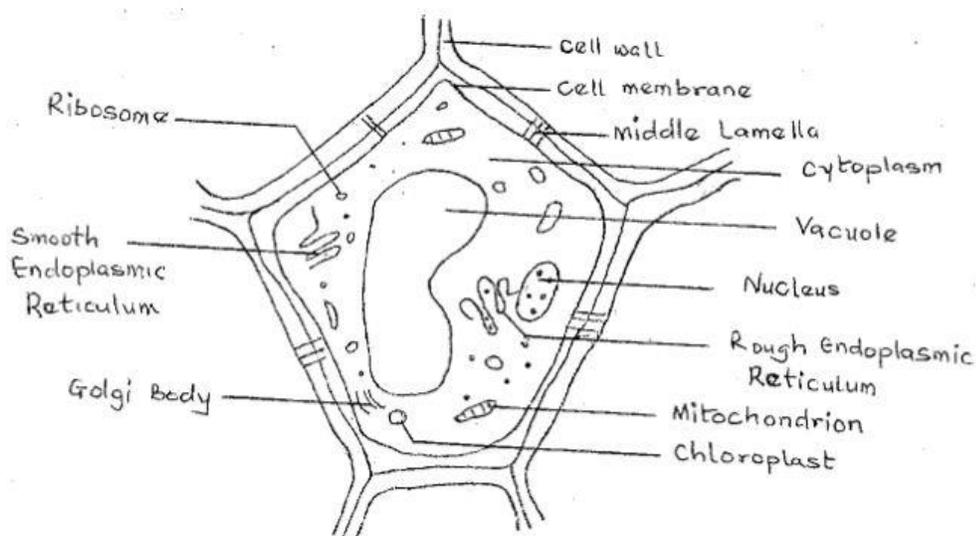
# **THE STRUCTURE AND FUNCTIONS OF THE CELL**

In Biology, the term cell is defined as the smallest, structural and functional unit of life having a nucleus at the centre and bounded by a cell membrane.

They are two types of cells: Plant and Animal cells. See diagram below

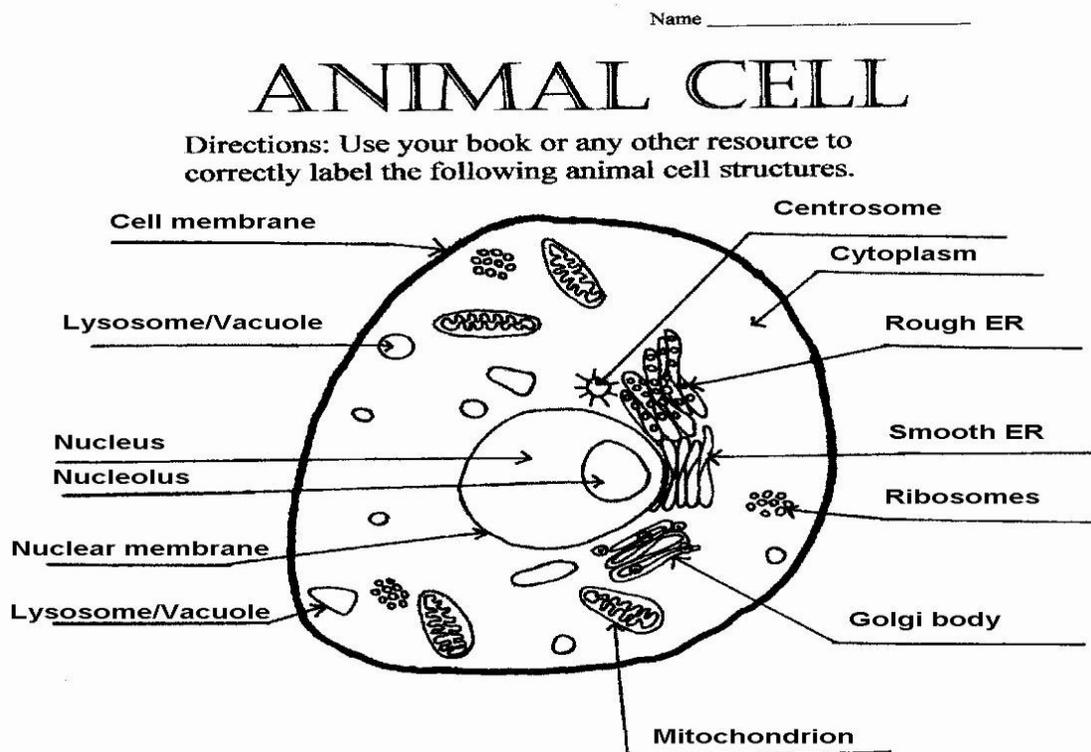
### **Plant Cell**

Plant cells contain a variety of membrane-bound structures called organelles. These include a nucleus that carries genetic material; mitochondria that generate energy; ribosomes and rough endoplasmic reticulum that manufacture proteins; smooth endoplasmic reticulum that manufactures lipids used for making membranes and storing energy; and a thin lipid membrane that surrounds the cell. Plant cells also contain chloroplasts that capture energy from sunlight and a single fluid-filled vacuole that stores compounds and helps in plant growth. Plant cells are surrounded by a rigid cell wall that protects the cell and maintains its shape.



## Animal Cell

An animal cell typically contains several types of membrane-bound organs, or organelles. The nucleus directs activities of the cell and carries genetic information from generation to generation. The mitochondria generate energy for the cell. Proteins are manufactured by ribosomes, which are bound to the rough endoplasmic reticulum or float free in the cytoplasm. The Golgi apparatus modifies, packages, and distributes proteins while lysosomes store enzymes for digesting food. The entire cell is wrapped in a lipid membrane that selectively permits materials to pass in and out of the cytoplasm.



cell membrane, centrosome, cytoplasm, Golgi body, lysosome, mitochondrion, nuclear membrane, nucleolus, nucleus, ribosome, rough endoplasmic reticulum (rough ER), smooth endoplasmic reticulum (smooth ER), vacuole

## THE CELL THEORY

The man who first discovered and described cell in living things is called Robert Hooke in 1665, he also invented the microscope, but the cell theory was proposed by another man called Mathias Schleiden, a German Botanist 1838, and Theodor Schwann, a German Zoologist, these two men postulated the theory known as cell theory in 1839. In 1855, another German Biologist, Rudolf Virchow stated that all cells comes originated from cells.

**The cell theory states that:**

1. All living things are composed of one or more cells
2. Cell is the structural and functional unit of all living things;
3. Cell originates from a pre-existing cell; and
4. Cell contains hereditary materials.

Another name for cell components are cell organelles e.g of an organelle is the nucleus of a cell as shown below.

## **Description and Functions of Cell Components**

### **1. Cell wall**

**Description:** Non-living, made of cellulose, permeable to water and substance

**Functions:** Provides rigidity to the cell and gives it a definite shape.

### **2. Cell membrane**

**Description:** Living and differentially permeable to water and substance.

**Function:** Allows selective movement of materials in and out of the cell.

### **3. Cytoplasm**

Semi-fluid mass enclosed within the cell membrane and contain many organelles.

**Functions:** The largest and liquid part of the cell in which metabolic reactions occur.

### **4. Nucleus**

Enclosed by a nuclear membrane, and contains chromatin and nucleolus.

**Functions:** It stores and carries hereditary information from generation to generation. It also translates genetic information into the kind of protein characteristic of the cell. It controls the cell's life processes

### **5. Vacuoles**

This is the fluid filled spaces in the cytoplasm.

**Functions:** Help in maintaining turgidity in the plant cell.

### **6. Mitochondria**

It is a double membrane system, found in all cells. It contains the enzymes for cellular respiration.

**Functions:** it carries out metabolism for all life processes. Kreb's cycle and electron transfer system take place in the mitochondria.

## **ASSIGNMENT**

1. List four men who contributed to the discovery of the cell
2. With a well labeled diagram describe the plant and animal cells.
3. State Five (5) differences between plant and animal cell.
4. Outline four similarities between plant and animal cell.