

# LIFE AND LIVING

## THE CELL

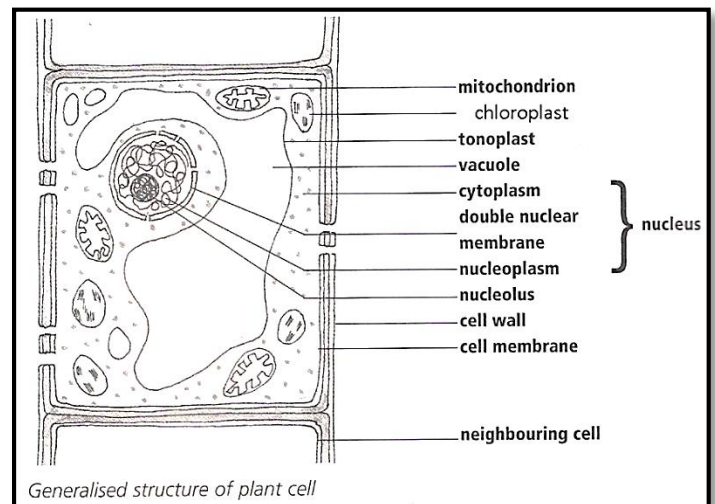
- Just as walls of a building are built from many bricks, all living things (organisms) consist of minute particles known as cells.
- Some organisms are so small that they consist of one cell.
- Other organisms, such as humans, consist of billions of cells.
- Therefore a **cell** can be defined as a basic unit of life.
- Cells differ in structure depending on their function.
- Most cells are too small to be observed with the naked eye.
- Cells are however larger than **atoms** and **molecules**.
- Cells have the same basic structure, they differ in certain regards.
- Plant cells differ from animal cells and cells in the roots differ from those in the leaves.
- Groups of cells with similar structure and specific function are called **tissues**.
- Tissues cannot function individually and are grouped together to form **organs**.
- An organism can only function effectively if all the organs work together.
- In a **multicellular organism**, heart organs are grouped together according to their function and form a **system** (digestive system)
- All systems together form **an organism**.

## THE CELL STRUCTURE

- Most cells are too small to be observed, except with a microscope.
- Each cell has a special function.
- The structure of a cell depends on its function but all cells have certain similar parts.
- **Cell membrane** forms the outer covering of the cell. It controls substances entering and leaving the cell.
- **Cytoplasm** is the living substance of the cell. Cell membrane forms part of the cytoplasm. All other parts of the cell (organelles) are found in the cytoplasm. Cytoplasm is a sticky, jelly-like fluid.
- **Nucleus** is the organelle that controls the function of the cell. It is the largest organelle and can easily be observed through a microscope.
- **Vacuole** is an organelle which contains cell sap and is surrounded by a membrane.
- **Mitochondrion** small rod-shaped structure referred to as the power house of the cell as they break down food to release energy. This process is called **cellular respiration**.

## STRUCTURE OF A PLANT CELL

- **Cell wall** – plant cells are surrounded by a cell wall. It consists of cellulose and is non-living, **rigid** and strong. The cell wall gives the plant cell **its shape** and provides **strength** and **protection**.
- **Cell membrane** – the cell membrane is found on the inside of the cell wall. It encloses the cytoplasm and is living, **thin** and **flexible**. It controls all substances **entering** and **leaving** the cell.

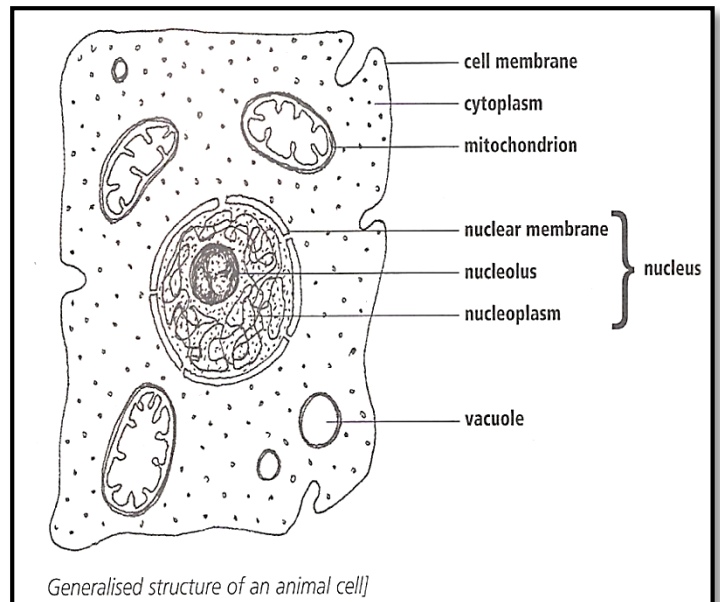


- **Cytoplasm** – it is found on the inside of the cell membrane. It is a **jelly like** and makes up most of the cell content. It contains a **large vacuole** and **many organelles**.
- **The vacuole** is surrounded by the tonoplast and the cavity is filled with cell sap. The cell sap consists of water, soluble nutrients, mineral **salts** and **waste products**. Important organelles found in green plant cells are **chloroplasts** which contain **chlorophyll**.
- **Chloroplast** – small oval structure found in plant cells only. Contains a green pigment called chlorophyll. Chlorophyll traps sunlight and changes it into chemical energy in a process called photosynthesis.. Photosynthesis is a process in green plants in which chlorophyll **converts** the **sunlight energy** into **chemical energy** stored in food by using **carbon dioxide** and **water**. **Oxygen** is released during this process.
- **Nucleus** – contains nucleoplasm and is surrounded by a nuclear membrane. It controls the vital functions and processes of the cell. It also plays a role in hereditary.
- **Mitochondrion** small rod-shaped structure referred as power house of the cell as they break down food to release energy. This process is called **cellular respiration**.

### STRUCTURE OF AN ANIMAL CELL

Animal cell have **no cell walls** and therefore have no **particular shape**. Animal cell seldom have vacuoles. If vacuoles are present though, they are usually small.

- **Cell membrane** – the cell membrane is found on the inside of the cell wall. It encloses the cytoplasm and is living, **thin** and **flexible**. It controls all substances **entering** and **leaving** the cell.
- **Cytoplasm** – as in plant cells, organelles are also found in animal cells but **no plastids**, such as **chloroplast**.
- **Nucleus** – contains nucleoplasm and is surrounded by a nuclear membrane. It controls the vital functions and processes of the cell. It also plays a role in hereditary.
- **Mitochondrion** small rod-shaped structure referred as power house of the cell as they break down food to release energy. This process is called **cellular respiration**.



### DIFFERENCE BETWEEN PLANT AND ANIMAL CELL

Characteristics	Plant cell	Animal cell
Cell shape	Rigid and fixed shape due to the <b>presence</b> of a cell wall.	Flexible or changeable shape due to the <b>absence</b> of cell wall.
Cell wall	Sturdy cell wall present.	No cell wall.
Vacuole	Has one or two large permanent vacuoles.	Usually no vacuole or many small one.
Chloroplast	Found in cytoplasm of certain cells (green leaves)	No chloroplast.

## CELLS IN TISSUES, ORGANS AND SYSTEMS

- In plants (and other multicellular organisms) **growth** occurs when the number of cells increases.
- The increase in the number of cells occurs through a special process in which a mature mother cell divides into two cells and each cell divides into two cells and each daughter cell develops to maturity and then divides again. This division is known as **mitosis**.
- During the early stage of division, enzymes (chemical substances that control various processes in cells) ensure that cells develop in such a way that they have different structures.
- These differences are known as differentiation which is aimed at cells having special functions. *In other word, the cells are specialised.*
- Certain cells protect the body against germs, cells in the skin; certain conduct impulses to and from the brain, e.g. nerve cells; certain cells can contract and relax, e.g. muscle cells.
- Differentiation thus gives rise to specialisation.
- Cells do not function individually in the body, but in groups. The following can be distinguished:

### **Tissue**

*A group of similar differentiated cells with intercellular matter with a common function is called **tissue**. The epidermal cells of an onion peel forms tissue that protects the underlying parts. In a similar manner muscle cell can function in groups to form muscle tissue and bone cells function together to form bone tissue.*

### **Organs**

*A group of differentiated tissues, each with its own specific function but with a common group function is called an **organ**. A plant leaf is an organ that consists of various types of tissues. According to the definition, a kidney, stomach, heart etc. can be classified as organs.*

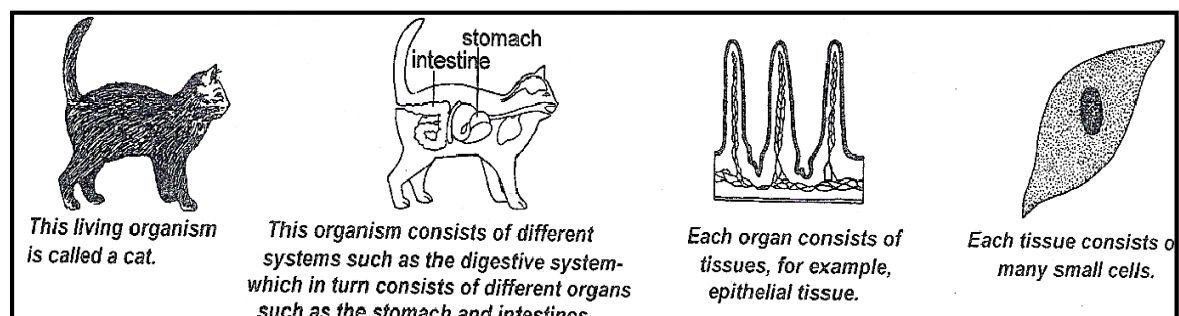
### **Organ systems**

*A group of different organs each with its specific function but with a common group function is called an **organ system**. The teeth, tongue, oesophagus, small intestines, large intestines, liver, etc. all have a digestive and together form the digestive system.*

### **Organisms**

*Different organ systems that function together and are dependent on each other form an organism. Plants and animals are organism. The body, consist of organ systems, is called an organism.*

*During the life of an organism there will be times when the body will degenerate due to use or become damaged in accidents. **Cell division, growth and differentiation** are used to repair this damage. Without these processes most organisms would have very short lives.*

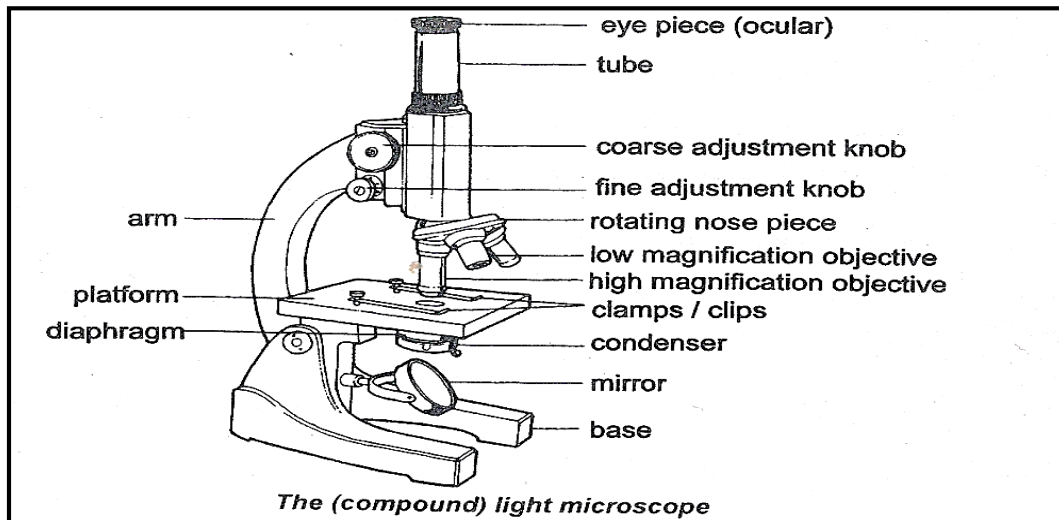


## THE LIGHT OR COMPOUND MICROSCOPE

- These cells include the yolk of birds' egg, frog's egg and fish egg.

- Most cells are however too small to be seen without a microscope.

Consider the following diagram for the most important parts of the light microscope



### Functions of the parts of a light microscope

Eye piece or ocular	Is the lens against which eyes is placed that enlarges the object observed, usually 10x.
Tube	Holds the lenses of the eye piece at the correct working distance apart.
Coarse adjustment knob	Moves the tube up and down to focus the object being observed.
Fine adjustment knob	Used for the final focus to obtain clear image.
Arm	Join the base and the platform to the tube and supports the adjustment screws.
Rotating nose piece	Holds the objectives with low and high power on a rotating disc.
Objectives	Lenses of the objectives help to enlarge image: - The shorter one gives a lower magnification x4. - The longer one give a higher magnification (10x and 40x)
Platform	Supports the microscope slide over the opening which transmits light from the mirror or electric source below.
Condenser and diaphragm	Controls the amount of light directed onto passing through the object; focuses light rays from the mirror of light source onto the object.
Mirror or electric light source	Reflects light upwards through the condenser towards the opening in the platform.
Base	It is firm and supports the weight of the microscope

- **Magnification:** If the magnifying power of the eye piece is 10x and that of the objective is 40x, then that total magnification of the object being viewed is  $10 \times 40$ ; or 400x.
- **Microscope slide:** Consist of a glass slide, the object (specimen) and a cover-slip.