

THE CELL

We have arrived at the basic unit of structure and function in living organisms. The study of cellular structure and function (cytology) is the foundation upon which the science of biology is based. It began in the 1800s and continues to this day. Developments in the field have closely followed development in microscope design. The efforts of early scientists produced the **Cell Theory**.

The Cell Theory

- 1. All organisms are made up of one or more cells and the products of those cells.
- 2. All cells carry on life activities.
- 3. New cells arise only from other living cells by the process of cell division.

- Cells vary in size, shape, and function. They all, however, are organized along a similar plan.
- There are two basic cell types:
 - 1. **Prokaryotic**: Cells which lack any internal membrane bound structures.
 - 2. **Eukaryotic**: Cells which contain many kinds of membrane-bound structures.

Cell Structure

- The basic material from which all cells are made is called **protoplasm**. There are two forms:
 - 1. **Cytoplasm**: Protoplasm found between the nucleus and the cell membrane.
 - 2. **Nucleoplasm**: Protoplasm found inside the nucleus.

- Within the protoplasm of any cell many chemical reactions occur. The sum of all these chemical reactions is called metabolism. They fall into two large categories:
 - 1. **Dehydration Synthesis**: Large complex molecules are formed by the removal of water from two smaller molecules.
 - 2. **Hydrolysis**: Large complex molecules are broken into smaller molecules by the addition of water.

Major Organelles of a Cell

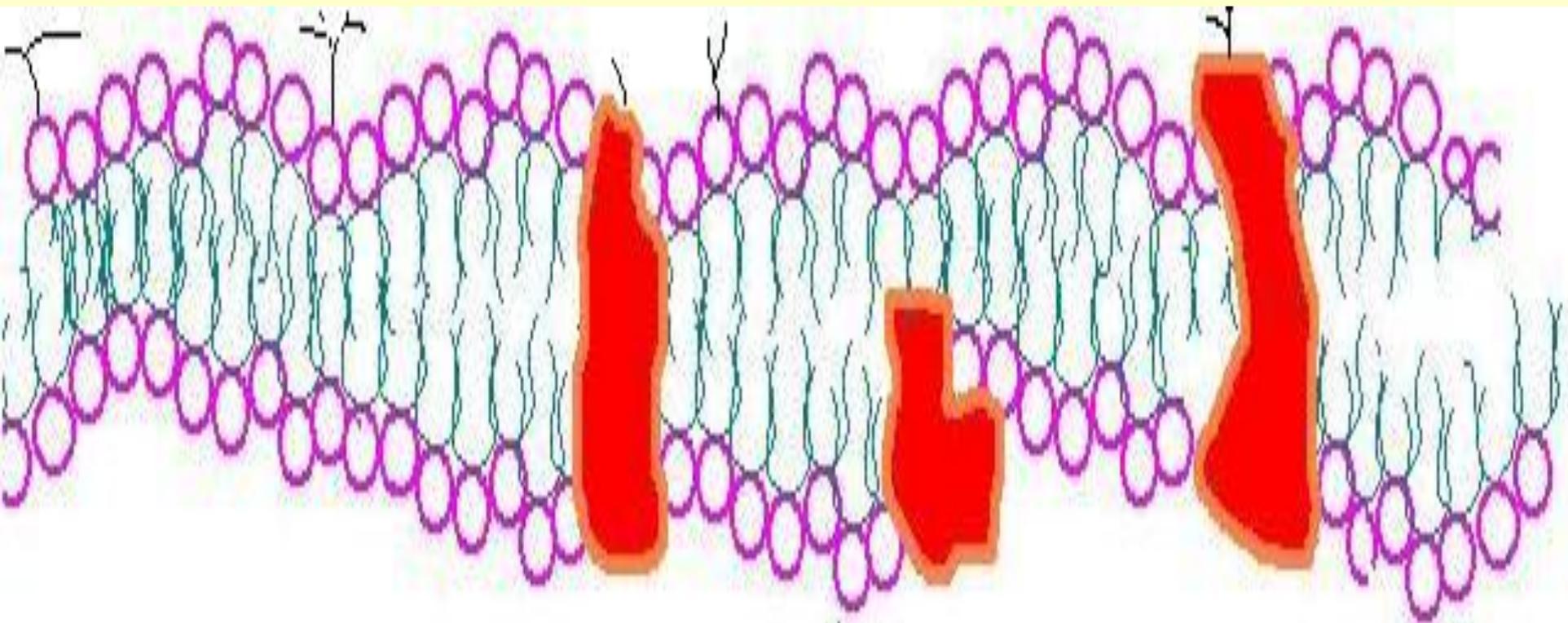
A cell must carry out a large number of activities to sustain life. These activities are carried out by specialized cell parts called organelles.

1. Cell Membrane

- Location: surrounds the cell.
- Structure: consists of two layers composed of lipids, proteins, and carbohydrates.
- 1. *Lipids*: There is a double layer of lipid molecules called a bilipid. This is the basic unit of the membrane.
- 2. *Proteins*: Some are on the outer surface of the membrane, some on the inner surface, and some extend through the membrane.

- Protein carries out the following functions:
- A. They control the movement of substances through the membrane (transport proteins).
- B. Binding sites for specific messenger molecules. These messenger molecules signal the cell to begin or stop some metabolic activity (receptor proteins).
- C. Acts as enzymes.
- D. Help bind the membrane to neighbouring cells or to structural elements in the cytoplasm of the cell.

- 3. *Carbohydrates*: Are attached to the lipids and proteins, and extend from the external surface of the membrane.
- Function: Membrane is semipermeable controlling what materials enter and exit the cell. Maintains homeostasis.



2. Nucleus

- Location: round membrane structure located in the cytoplasm.
- Structure: consists of a nuclear envelope (membrane), nucleolus, and chromosomes.
- Function: serves as the control center for metabolism and reproduction.