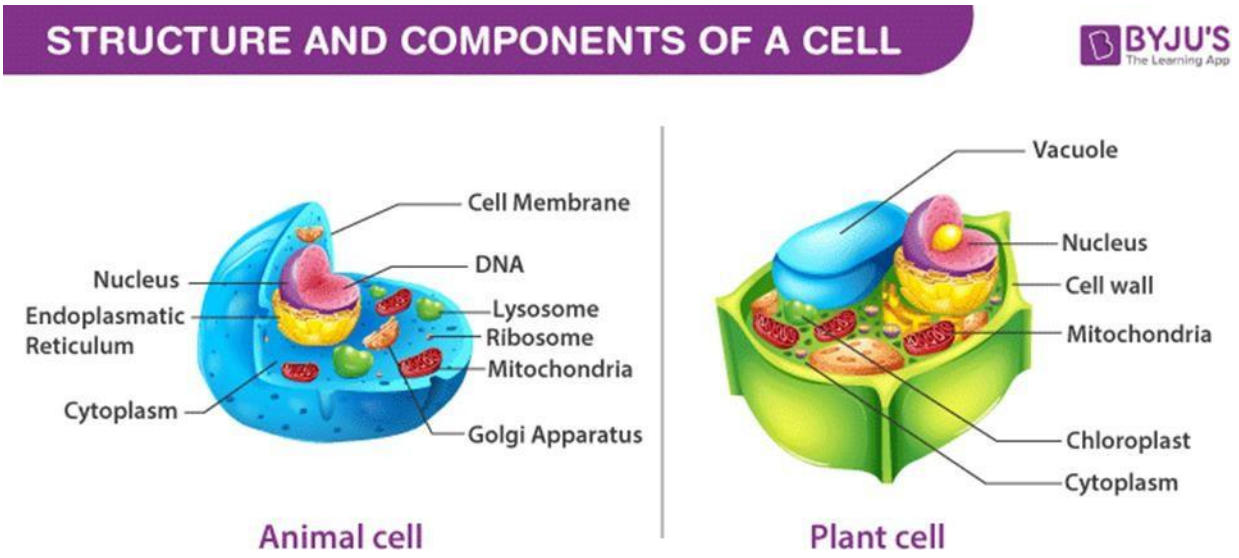
Practical Cytology

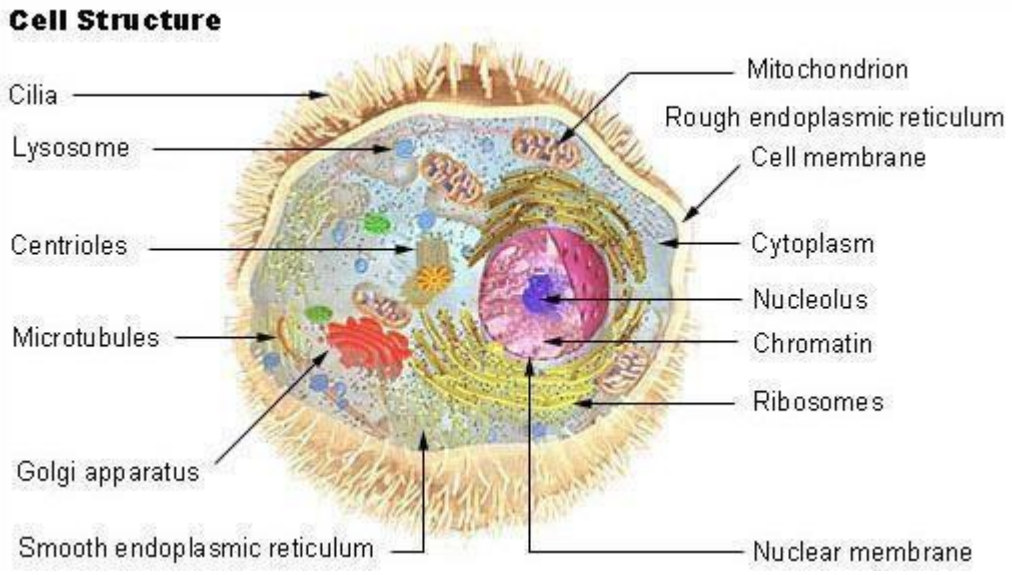
Living cellular components



The Cell Structure

Early biologists saw cells as simple membranous sacs containing fluid and a few floating particles. Today's biologists know that cells are infinitely more complex than this.

A cell consists of three parts: **the cell membrane, the nucleus, and, between the two, the cytoplasm**. Within the cytoplasm lie intricate arrangements of fine fibers and hundreds or even thousands of miniscule but distinct structures called organelles.

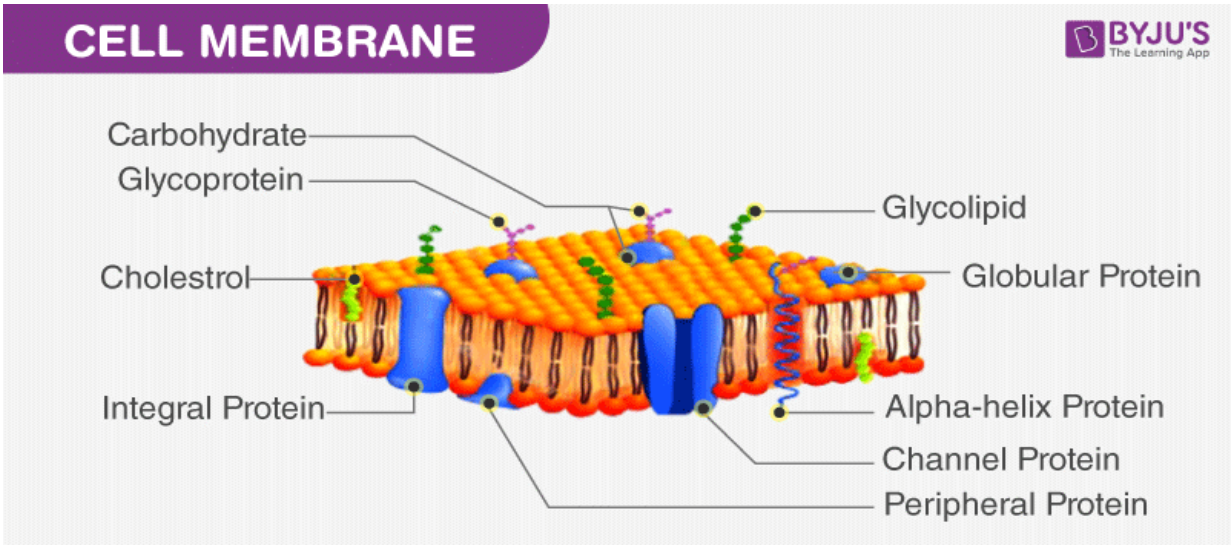


Cell organelles

The Cell membrane

Every cell in the body is enclosed by a cell (Plasma membrane). The cell membrane separates the material outside the cell, extracellular, from the material inside the cell, intracellular. It maintains the integrity of a cell and controls passage of materials into and out of the cell. All materials within a cell must have access to the cell membrane (the cell's boundary) for the needed exchange.

The cell membrane is a double layer of phospholipid molecules. Proteins in the cell membrane provide structural support, form channels for passage of materials, act as receptor sites, function as carrier molecules, and provide identification markers.



The Cytoplasm

The cytoplasm is the gel-like fluid inside the cell. It is the medium for chemical reaction. It provides a platform upon which other organelles can operate within the cell. All of the functions for cell expansion, growth and replication are carried out in the cytoplasm of a cell. Within the cytoplasm, materials move by diffusion, a physical process that can work only for short distances.

The Cell Organelles

The cellular components are called cell organelles. These cell organelles include both membrane and non-membrane bound organelles, present within the cells and are distinct in their structures and functions.

They coordinate and function efficiently for the normal functioning of the cell. A few of them function by providing shape and support, whereas some are involved in the locomotion and reproduction of a cell.

There are various organelles present within the cell and are classified into three categories based on the presence or absence of membrane.

1- Organelles without membrane: The Cell wall , Ribosomes , and Cytoskeleton are non-membrane-bound cell organelles. They are present both in the **prokaryotic cell** and the eukaryotic cell.

2- Single membrane-bound organelles: Vacuole, Lysosome, Golgi Apparatus, Endoplasmic Reticulum are single membrane-bound organelles present only in a eukaryotic cell.

3- Double membrane-bound organelles: Nucleus, mitochondria and chloroplast are double membrane-bound organelles present only in a eukaryotic cell.

Cellular Components

1-The Nucleus:

The nucleus is a double-membraned organelle found in all eukaryotic cells. It is the largest organelle, which functions as the control center of the cellular activities and is the storehouse of the cell's DNA.

By structure, the nucleus is dark, round, surrounded by a nuclear membrane. It is a porous membrane (like cell membrane) and forms a wall between cytoplasm and nucleus. Within the nucleus, there are tiny spherical bodies called nucleolus. It also carries an essential structure called chromosomes.

Chromosomes are thin and thread-like structures which carry another important structure called a gene. Genes are a hereditary unit in organisms i.e., it helps in the inheritance of traits from one generation (parents) to another (offspring). Hence, the nucleus controls the characters and functions of cells in our body.

The primary function of the nucleus is to monitor cellular activities including **metabolism** and growth by making use of

DNA’s genetic information. Nucleoli in the nucleus are responsible for the synthesis of protein and RNA.