

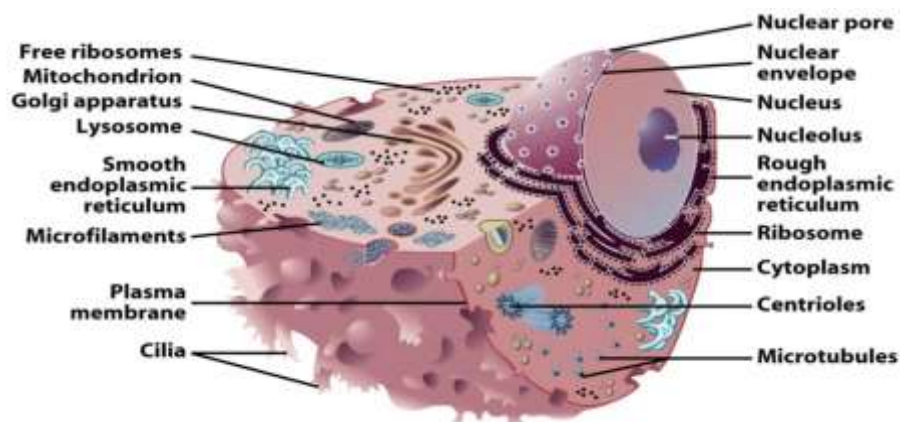
# Introduction to cell

## Brief information about the cell

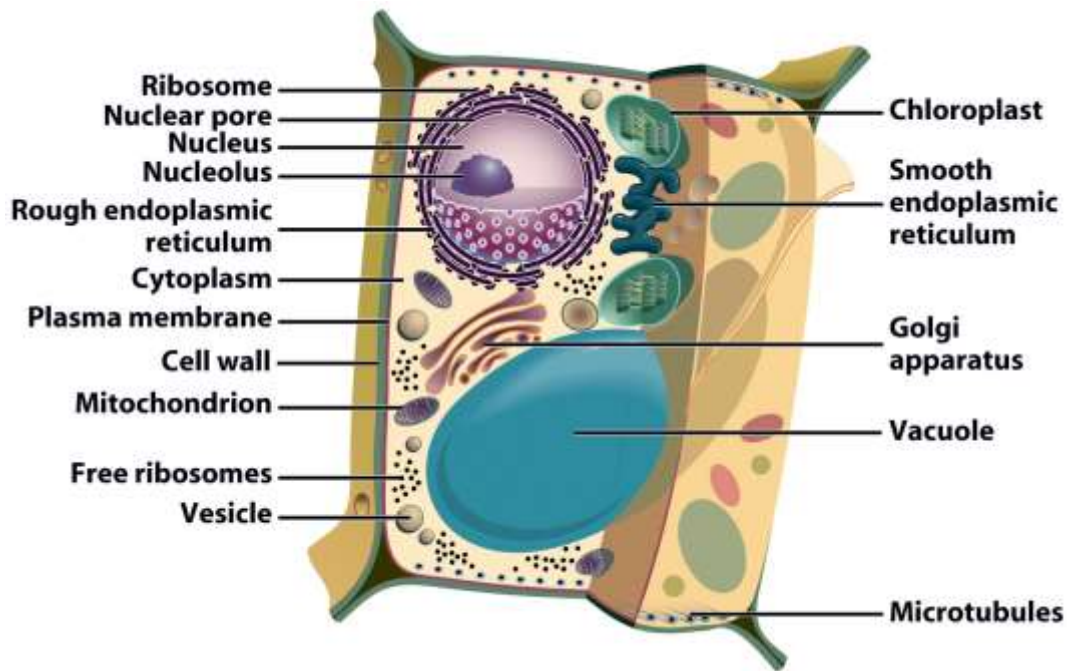
Cells are the basic unit of life, every living thing, from the tiniest bacterium to the largest Whale is made of one or more cells. The organisms are existing as a unicellular (Organisms that exist as single cells) or multicellular (organisms that are made up of groups of cells working together).

## Cell structure and internal organization

- ❖ Plasma membrane present around all types of the cells.
- ❖ Generally, the plasma membrane consists of lipids and proteins.
- ❖ Cell wall and capsule may be present according to type of the cell.
- ❖ Cells contain a variety of internal structures called organelles (except prokaryotic cells) which they perform a specific function for example mitochondria, endoplasmic reticulum (rough and smooth), chloroplast, Golgi apparatus.....etc
- ❖ The nucleus, mitochondria and chloroplasts of the cell surrounded by double membrane.



**Animal cell**



**Plant cell**

All living things are divided into two major groups these two groups are the Prokaryotes, and the Eukaryotes.

## Prokaryotic cells

- ❖ Prokaryotic cell doesn't have true nucleus.
- ❖ DNA concentrates in a region which called nucleoid.
- ❖ Prokaryotic cell doesn't have membrane bounded organelles.
- ❖ Example bacteria.

## Eukaryotic cell

- ❖ Has true nucleus that is mean DNA surrounded by membrane (nuclear envelope).
- ❖ Compartmentalization (membrane bounded organelles present).
- ❖ Example animal cell.

## Cell shape

Not all cells are alike. Even cells within the same organism show a number of diversity in size, shape, and internal organization. Your body contains around  $10^{13}$  to  $10^{14}$  cells of around 300 different cell types and they differ in shape and size. The shape of cells sometimes varies according to their function or location (shapes of cells vary from one tissue to another), cells can have the shapes as oval, spherical, rectangular, and polyhedral, spindle shaped, and star shaped, rod-shaped or totally irregular. Cell membrane as well as cell wall maintains shape of cell.

## Pleomorphism

It is the ability of some cells to alter their shape or size in response to environmental conditions. This property is seen in many bacteria and fungi.

## Determination of the cell shape

Probably one of the most studied and yet less understood processes in cell biology are the generation and maintenance of cell shape. Cell shape changes are mediated by proteins of the cytoskeleton (microfilaments, microtubules and intermediate filaments). The mechanical properties of the cytoskeleton, as well as its organization, largely determine the morphology of the cells, actin directly participates both in the maintenance of cell shape and in membrane surface morphology, so that the cytoskeleton is necessary for the establishment and maintenance of cell morphology. If we more focus on the word of cytoskeleton we will see that Cyto means cell, so we are talking about the skeleton of the cell.

# Cytoskeleton

The cytoskeleton is an interconnected system of protein fibers and tubes that extends throughout the cytosol.

## Function of cytoskeleton

- ❖ Maintenance of cell shape.
- ❖ Chromosome movement in cell division.
- ❖ Cell motility.
- ❖ Serving as highways for transport of secretory vesicles within cell as well as movement of substances from one place to another place of the cell.
- ❖ Muscle contraction.

## The cytoskeleton has three distinct elements

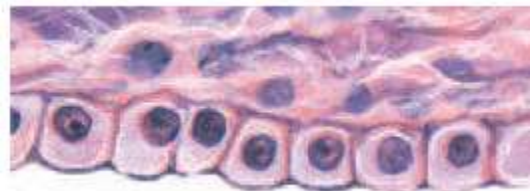
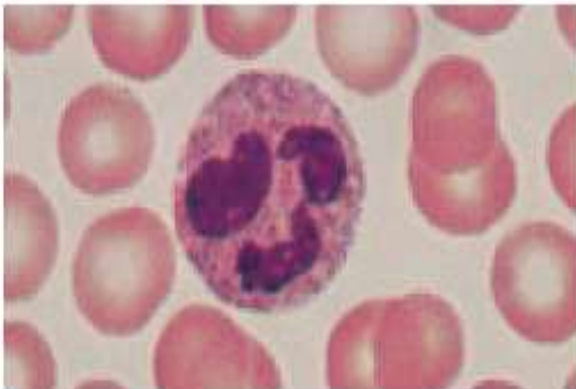
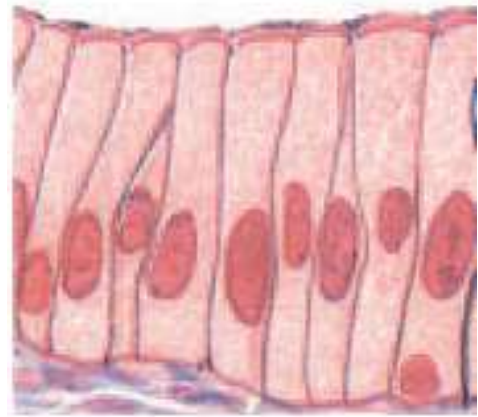
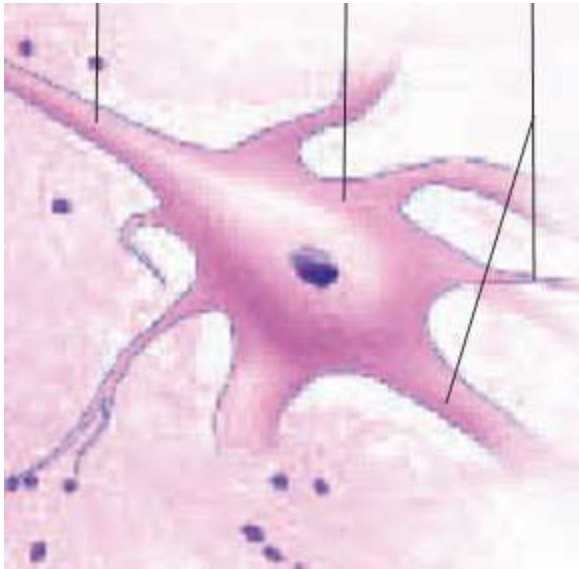
1. Microfilaments, the thinnest class of the cytoskeletal fibers.
2. Microtubules are the thickest of the cytoskeletal fiber.
3. Intermediate filaments (these are sized in between the other two).

## Importance of different shapes of plant cells:

- Extension of root hair cells help in both adhesion and absorption of water and ions.
- Shapes of xylem and phloem allow them to transport water and food respectively.
- Shape of guard cell help in gaseous exchange.

**Role of different shapes of animal cells:**

- Shape of neuron helps it to transport signals.
- Shape of RBCs helps them to flow through blood and protect them from pressure in the blood.
- Cuboidal, columnar shaped cells help epithelial tissues to protect the internal part of our body.
- Shape of the muscle fibers help in muscle contraction.



1. Rod shape (bacteria)
2. Spherical shape (bacteria)
3. Oval shape (yeast)
4. Rectangular (onion or plant)
5. Columnar shaped cell (epithelium)
6. Elongated in shape (skeletal muscle)
7. Fusiform in shape (smooth muscle)
8. Thread like in shape (neuron)
9. Star shape (osteocyte)
10. Polyhedral shape (hepatocyte)