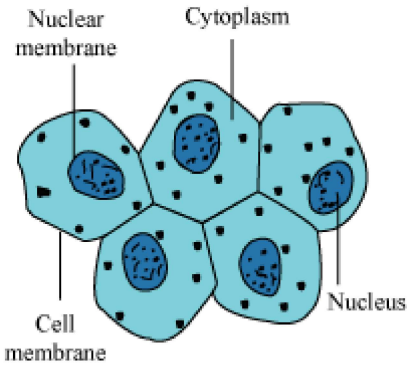
10. Cell and Cell Organelles

- **Components of the cell**



Human cheek cells

- **Cell membrane**
  - It is the protective layer that surrounds the cell.
  - Cell membrane selectively allows the entry of only some substances and prevents the movement of other materials. Hence, it checks the transport of substances in and out of the cell.
- **Cell wall**
  - In plants, an extra protective covering of a polysaccharide, cellulose is present.
  - It is called cell wall that protects plant cells from environmental variations.
- **Cytoplasm**
  - It is a jelly-like substance present between cell membrane and nucleus.
  - It contains various cell organelles such as mitochondria, Golgi bodies, lysosomes etc.
- **Nucleus**
  - It is a dense spherical body located at the centre of the cell.
  - It is surrounded by porous nuclear membrane.
  - It contains spherical body called nucleolus.
  - It also contains thread-like structures called **chromosomes**.
  - Chromosomes are the structures that carry genes and play an important role in inheritance.
  - **Genes** are the structural and functional unit of inheritance.
  - The entire living substance in a cell is known as **protoplast**.
- **Vacuoles**
  - Vacuoles are fluid-filled membrane-bound structures in the cell.
  - In plant cells, a single large vacuole is present.
  - In animal cells, numerous small vacuoles are present.
- **Plastids**
  - They are present only in plant cells.
  - Plastids that contain green colour pigment **chlorophyll** are known as chloroplasts. It is the chlorophyll that gives green colour to the leaves.
- **Chloroplast traps solar energy and utilizes this energy to manufacture food for the plant.**

- **Vacuoles**

1. Vacuoles are fluid-filled membrane-bound structures in the cell.

2. In plant cells, a single large vacuole is present.

3. In animal cells, numerous small vacuoles are present.
4. The membrane of the vacuole is called tonoplast. This membrane encloses a fluid called cell sap.

- **Plastids**

1. They are present in plant cells.
2. Chloroplast is a plastid containing green pigment called chlorophyll that is required in photosynthesis.
3. Plastids are of two types – leucoplasts and chromoplasts
4. Leucoplasts are colourless and are used to store food while chromoplasts are plastids containing pigments. Chloroplasts are a type of chromoplasts.
5. Chloroplasts consist of two regions – grana (stacks of sac like membrane bound structures that contain pigment chlorophyll) and stroma (ground substance containing enzymes and starch grains)

- **Endoplasmic Reticulum (ER)**

They are of two types:

1. Rough Endoplasmic Reticulum (RER) is important for synthesis and packaging of proteins.
2. Smooth Endoplasmic Reticulum (SER) acts as storage organelle. It also helps in lipid (fat) synthesis.

- **Golgi Apparatus**

1. It is made up of parallel arranged membrane-bound vesicles called cisternae.
2. It helps in storage, modification, and packaging of products in vesicles.
3. It helps in formation of glycoproteins and glycolipids.

- **Lysosomes**

1. It is a membrane-bound structure that holds variety of enzymes.
2. Rich in all types of hydrolytic enzymes, which are active at acidic pH.
3. It is involved in the digestion of carbohydrates, proteins, lipids, and nucleic acids.

- **Mitochondria**

1. It is a double membrane-bound structure.
2. The inner membrane of mitochondria is deeply folded to form cristae.
3. Cristae increase the surface area in the organelle.
4. It is the site of cellular respiration and hence known as ‘power house of cell’.
5. They have their own circular DNA.
6. They divide by fission.

Structural Organization of cell

Cell wall – It is the outermost membrane present in plant, fungal, and some bacterial cells; it is absent in animal cells. The main component providing structural strength to the cell wall is **cellulose**. However, the bacterial cell wall is mainly composed of **peptidoglycan**.

Functions of Cell Wall

- It protects intracellular organelles from the outside environment.
- It can withstand dilute hypotonic media and prevents bursting of cells.

Plasma membrane or cell membrane –It is the outermost covering of all animal cells and next to cell wall in plant cells. It separates the contents of the cell from the external environment.

Functions of cell membrane

- It protects intracellular organelles from the outside environment.
- It selectively allows the molecules to move in and out of the cell.
- It can also engulf or expel substances in and out of the cell through **endocytosis** or **exocytosis** respectively.
- It establishes communication between cells.

Process of Diffusion and Osmosis

- **Diffusion –** It is the spontaneous movement of molecules from a region of high concentration to a region of low concentration
- **Osmosis –**It is the movement of water molecules from a region of high concentration to a region of low concentration, through a selectively permeable membrane

Cytoplasm

The **cytoplasm** is the inner content of the cell membrane, which is separated from the nucleus. It includes cytosol, organelles, and inclusions. Cytosol is a soft and sticky, semi-transparent fluid in which various cell organelles are suspended.

Functions of Cytoplasm

- It is the region where many cellular activities take place.
- It mostly consists of water and it balances the water content in the cell.
- It contains **cytoskeleton**, which maintains the shape and movement of cells.
- Cytoplasmic streaming or circulation of the cytoplasm helps in the proper distribution of cellular organelles during cell division, growth, etc