THE FUNDAMENTAL UNIT OF LIFE

Cell

The term **'cell'** was coined by Robert Hooke in 1665 in his book **Micrographia** after examining thin slices of cork under a self-designed primitive microscope.

Anton von Leeuwenhoek described free cells for the first time in 1674. Robert Brown in 1831 discovered **nucleus,** the most important component of every cell. By this time, it had also been known that the cells were surrounded by some sort of **limiting membrane.**

Cell Theory

Schleiden (1838) and Schwann (1839) gave the **'cell theory'**.

The cell theory is as follows

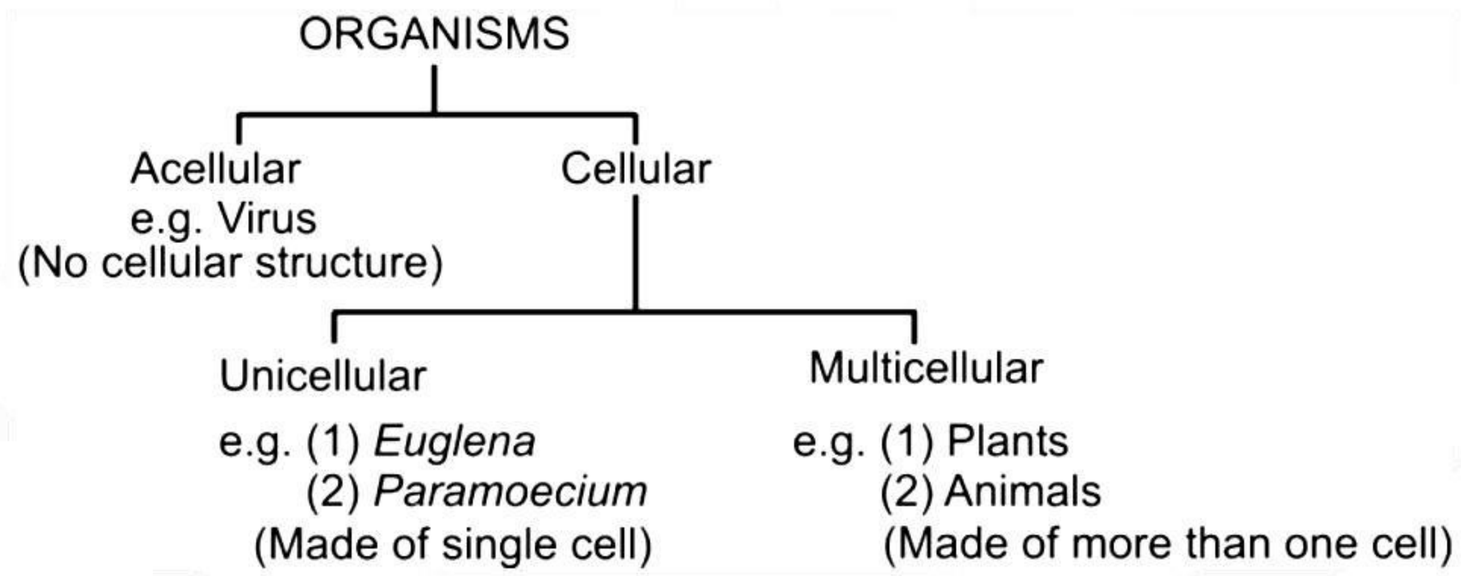
(a) All organisms are composed of cell and cell products.

(b) All metabolic reactions take place in cells. Thus, cells are structural and functional unit of life.

(c) All cells arise from pre-existing cells only.

(d) Every organism start its life as a single cell.

- Haeckel (1866) reported that **nucleus** stores and transmits heredity information.
- Discovery of electron microscope in 1940 made it possible to study complex structure of the cell and its organelles.



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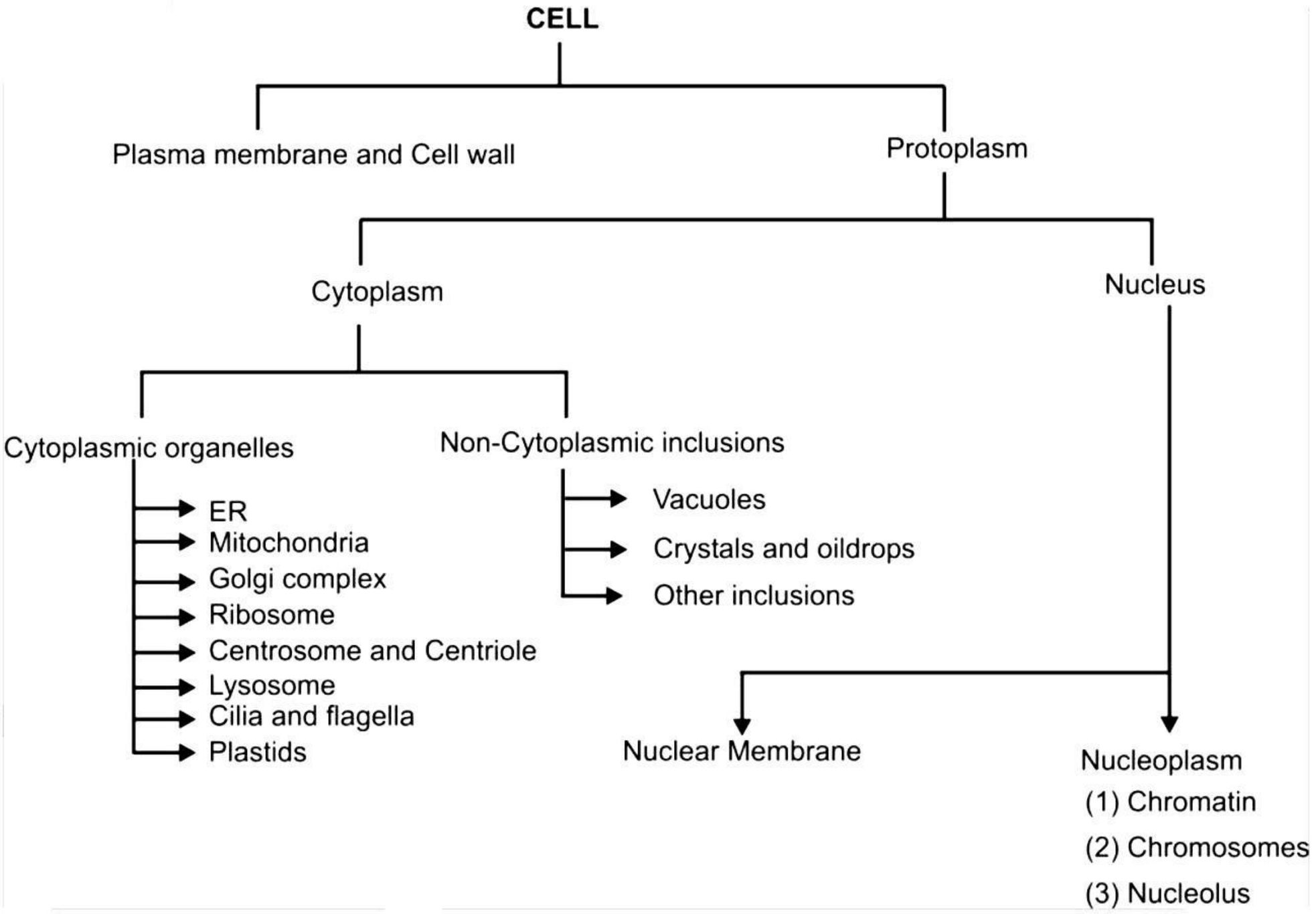
Components of Cell



All cells have three major functional regions :

- Plasma membrane (cell membrane) and cell wall
- The Nucleus
- The Cytoplasm

Prokaryotes and Eukaryotes

Difference between Prokaryotic cells and Eukaryotic cells

S.No.	Prokaryotic cell	Eukaryotic cell
1.	Size of cell is generally **small** (1-10 μm).	Size of cell is generally **large** (50 to 100 μm).
2.	Nuclear region is poorly defined, not surrounded by nuclear membrane and therefore called **nucleoid** and not nucleus.	Nuclear region is well defined, surrounded by a nuclear membrane. Therefore complete **nucleus** is present.
3.	Contains **single chromosome**.	Contains **more than one chromosome**.
4.	**Nucleolus is absent**.	**Nucleolus is present**.

5.	Membrane bound cell organelles absent.	Membrane bound cell organelles such as mitochondria, plastids, endoplasmic reticulum, golgi apparatus, lysosomes, peroxisomes etc. are present.
6.	Cell division takes place by fission or budding (no mitosis).	Cell division occurs by mitosis or meiosis.
7.	Centrioles absent.	Centrioles present in animal cells.
8.	Prokaryotic cells are found in bacteria and blue-green algae.	Eukaryotic cells are found in fungi, plant and animal cells.

Difference between Animal and Plant Cell

S. No.	Animal Cell	Plant Cell
1.	Animal cells are generally smaller in size.	Plant cells are larger than animal cells.
2.	Cell wall is absent.	The plasma membrane of plant cells is surrounded by a rigid cell wall of cellulose and hemicellulose.
3.	Except the protozoan (*Euglena*) no animal cell possesses plastids.	Plastids (Chloroplasts, Chromoplasts and Leucoplasts) are present.
4.	Animal cells have a single highly complex and prominent Golgi apparatus.	Plant cells have many simpler units called dictyosomes.
5.	Animal cells have centrosome and centrioles.	Plant cells lack centrosome and centrioles.
6.	Vacuoles are smaller but more in number.	Vacuoles are larger but less in number (1- 3)
7.	Nucleus is mostly in the centre.	Nucleus is mostly towards the periphery.

Difference between cell wall and plasma membrane

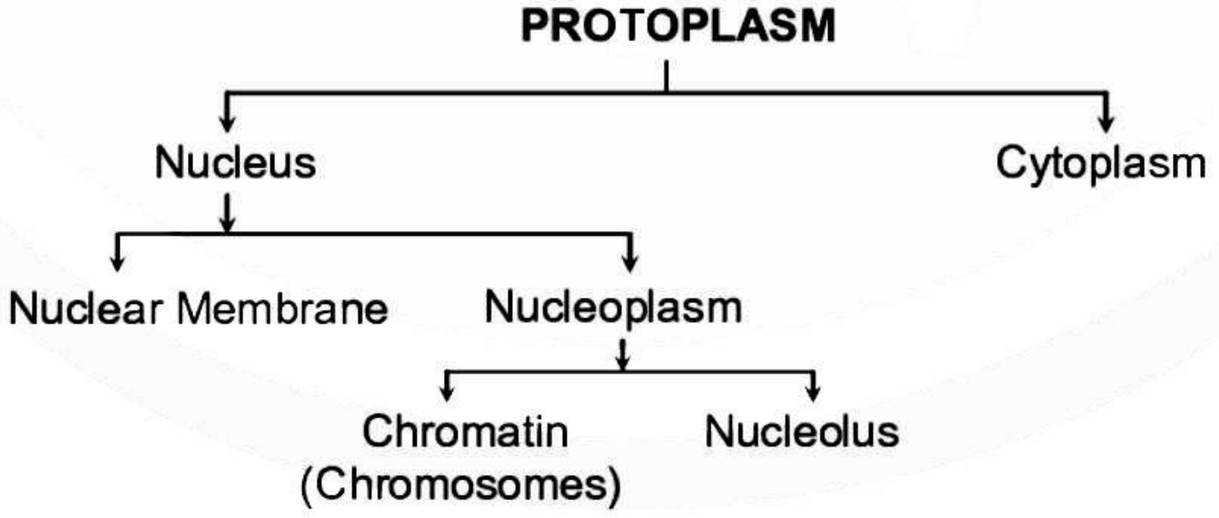
S. No.	Cell wall	Plasma membrane
1.	It is present in plant cells only.	It is present in both animal and plant cells.
2.	It is the outermost covering of plant cells.	It is the outermost covering of the animal cells.
3.	It is present outside the plasma membrane.	It is present outside the cytoplasm.
4.	Cell wall is rigid and comparatively thick.	It is comparatively flexible and thin.
5.	It is made up of cellulose.	It is made up of lipids and proteins.

6.	It is non-living and fully permeable.	It is living and selectively permeable.

Differences between diffusion and osmosis

S. No.	Diffusion	Osmosis
1.	Diffusion takes place in all mediums.	Osmosis occurs only in liquid medium.
2.	It is the movement of atoms and molecules from the area of higher concentration to the area of its lower concentration.	It is the movement of water from the area of its higher concentration to the area of its lower concentration.
3.	The diffusing molecules may be solid, liquid or gases.	It involves movement of solvent molecules only.
4.	It does not require a semi-permeable membrane.	It requires a semi-permeable membrane.
5.	An equilibrium in the free energy of diffusing molecules is achieved in the system.	Equilibrium in the free energy of solvent molecules is never achieved.
6.	It is dependant upon the free energy of the molecules of diffusing substance only, presence of other substances in the system is of no importance.	Though it is the diffusion of solvent molecules only, yet it is influenced by the presence of other substances (solutes) in the system.

Cytoplasm is a semifluid, jelly-like material having three components – **cytosol, cell organelles** and **cell inclusions.** Cytosol is nearly transparent ground substance called **cytoplasmic matrix** or **hyaloplasm.** It contains about 90% of **water,** various **cell organelles** and **inclusions** in it.



Difference between cytoplasm and nucleoplasm

S. No.	Cytoplasm	Nucleoplasm

1.	It is a jelly like fluid ground substance in the cells excluding the nucleus.	It is the jelly like fluid ground substance found in nucleus.
2.	It is covered by plasma membrane or cell wall in some cases.	It is enclosed by nuclear membrane.
3.	Cytoplasm contains the cell organelles, vitamins, RNA, enzymes, sugar etc.	It contains nucleolus and chromosomes etc.

Differentiate between leucoplasts and chromoplasts

S. No.	Leucoplasts	Chromoplasts
1.	Pigments are absent and are colourless.	Pigments are present and are coloured.
2.	Leucoplasts are found in underground parts like roots, rhizomes, tubers etc.	Found in aerial parts like leaves, flowers, fruits etc.
3.	They store reserve food.	They help in photosynthesis, pollination and dispersal of seeds and fruits.