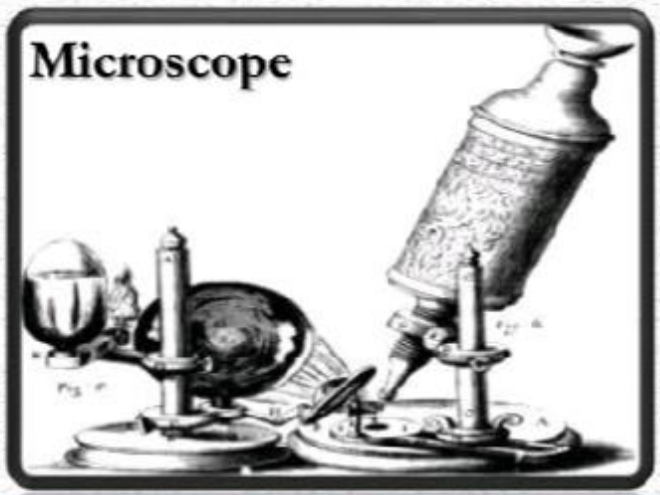
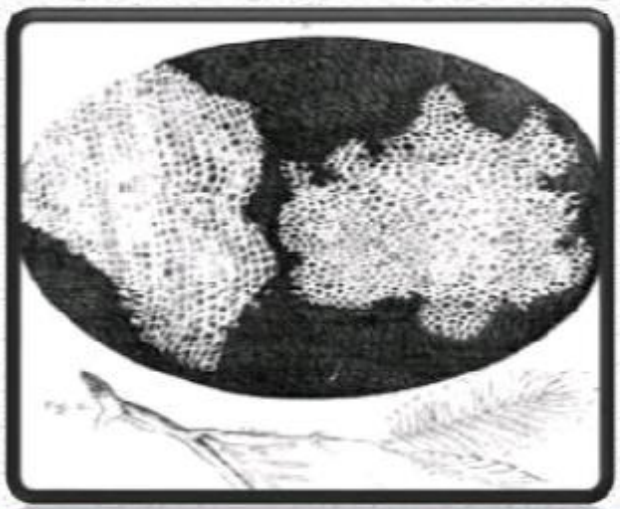
DISCOVERY OF CELL

SCIENCE

- In 1665 Robert Hooke – an English Scientist, Saw Cells in a thin slice of cork with his crude microscope.
- He observed as "Honey – comb" like Structure and named them as CELLULAE or CELLS
- His discovery indicated for the first time that living organisms consisted of number of small structures or units.





TO KNOW THE HISTORY OF CELL?

SCIENCE

- 1665- Robert Hook discovery of cell
- 1674-A. Van Leeuwenhoek-studied living for the first time.
- 1831-Robert Brown discovery and named Nucleus in a cell
- 1838-39-M.J.Schleiden & Schwann formulated Cell Theory
- 1855-Rudolf Virchow, Stated "*Omnis cellula-e-cellula*"

Leeuw enhoek

M.J.Schleiden

Rudolf Virchow

Robert Hook

Schwann

Robert Brown



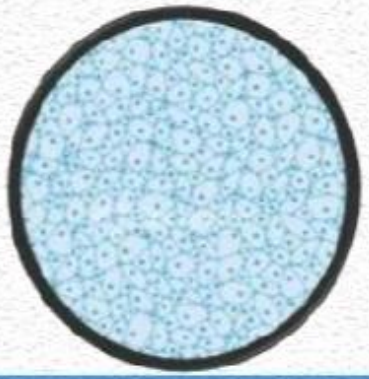



WHAT ARE LIVING ORGANISMS MADE UP OF?

SCIENCE

- Just as a building is made up of bricks the body of all living organisms made up of cells.
- Basing on the cellular organization some organisms are made of single cells "*Unicellular Organisms*" e.g. *Chlamydomonas, Amoeba, Paramecium*
- Organisms which are made up of more than a cell "multicellular"
- Irrespective of unicellular or multicellular organisms the cells perform similar basic functions for their survival.






GADGETS TO STUDY CELLS

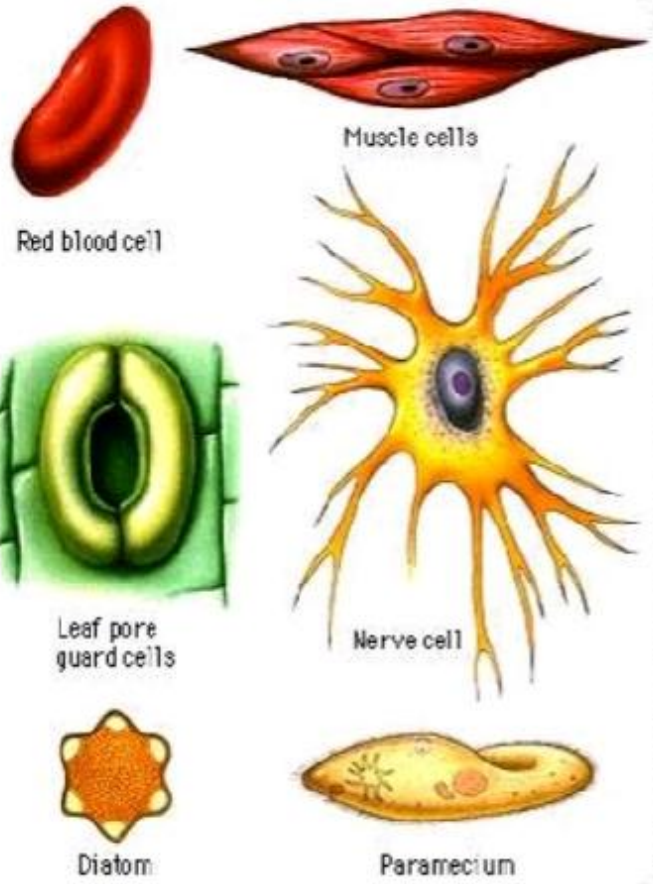
SCIENCE

- Cells are too small to be seen by necked eye. They are studied with the help of microscopes.
- Microscopes are high resolution instruments that are used for observing fine details of very small objects
- Two common types of microscopes
  - Light microscope-magnification range from 100-1500
  - Electron microscope- magnification range from 1 lakh- 5 lakhs

Shape and Size of cells

SCIENCE

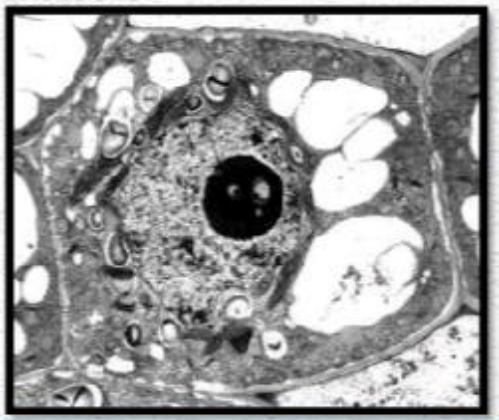
- Shape and size of cells vary but all of these are ultimately determined by the specific function.
- Some cell can change their shapes *amoeba*, WBC but plants and animals have almost fixed shapes.
- Smallest ell= PPLO(*mycoplasma*)
- Largest Cell-Ostrich egg
- Longest animal cell-Nerve cell
- A micrometer (µm) or micron is one thousandth of a millimeter.

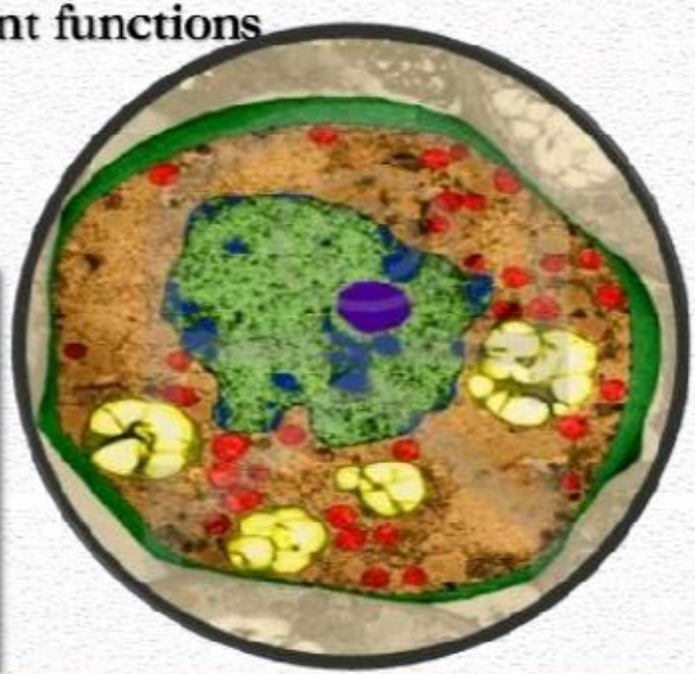


Cell is basic unit of life

SCIENCE

- It performs all life function like intake of food materials, excretion, metabolism, respiration, irritability, etc.,
- Division of Labour – Cell usually possesses a number of components called cell organelles.
- Each cell organelle performs different functions
  - Clearing waste material
  - Protein synthesis
  - Lipid synthesis

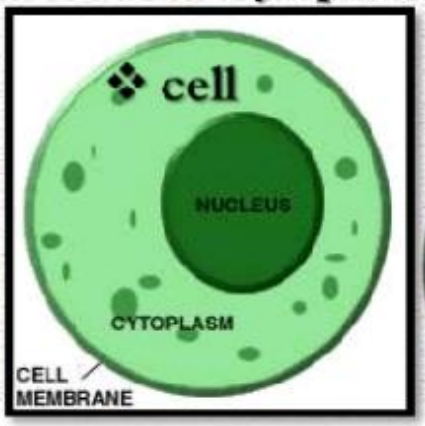


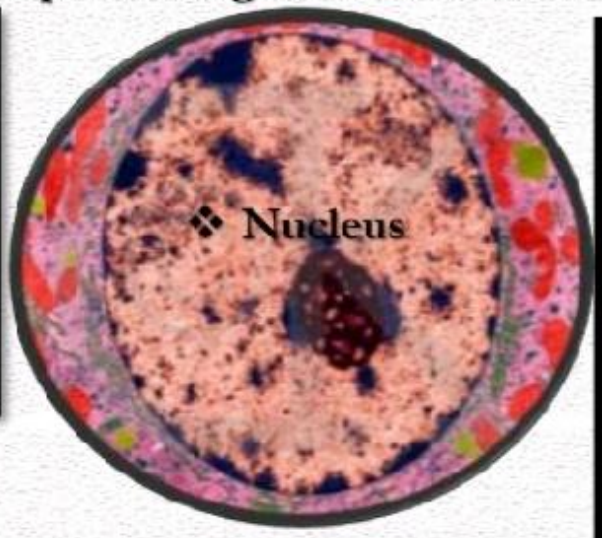


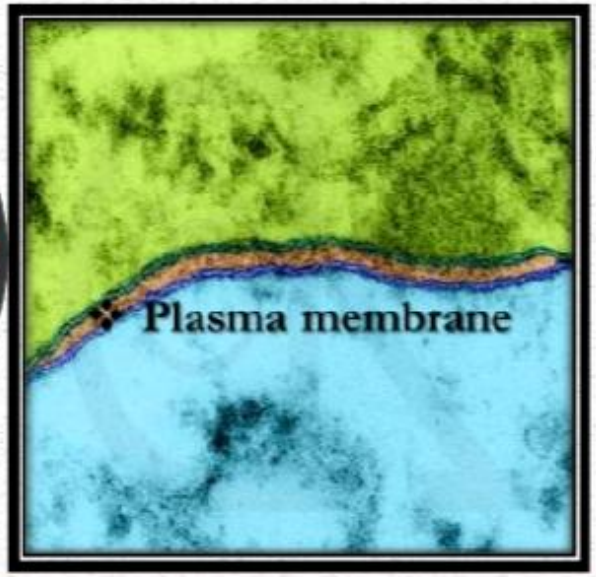
What is Cell made up of?

SCIENCE

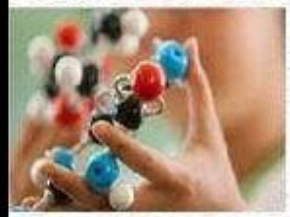
- *A cell is a tiny mass of protoplasm which is surrounded by a membrane and is capable of performing all function of life.*
- A typical cell is formed of three parts
  - Plasma membrane-to create separate environment
  - Nucleus-for its control
  - Cytoplasm-possessing metabolic machinery

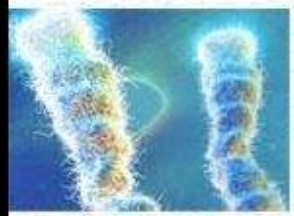













Plasma Membrane-Cell Membrane

SCIENCE

- The outer most delicate elastic membranous covering of the cell that separates its contents from the external environment is called Plasma Membrane
- Plasma Membrane is Selectively Permeable *(it allows entry of certain substance restricting others)*
- It is made up of a bi-lipid layer and proteins are integrated in out and inside.
- Small carbohydrates are attached at placed to outer surface of lipids and proteins.
- Functions- Shape to contents of cell, Mechanical Barrier, Semi-Permeable, Endocytosis, Recognition Centres, Flow of Information, Osmosis, Cell Continuity, Modified to perform special functions like absorption in microvilli.






Active & Passive Transport

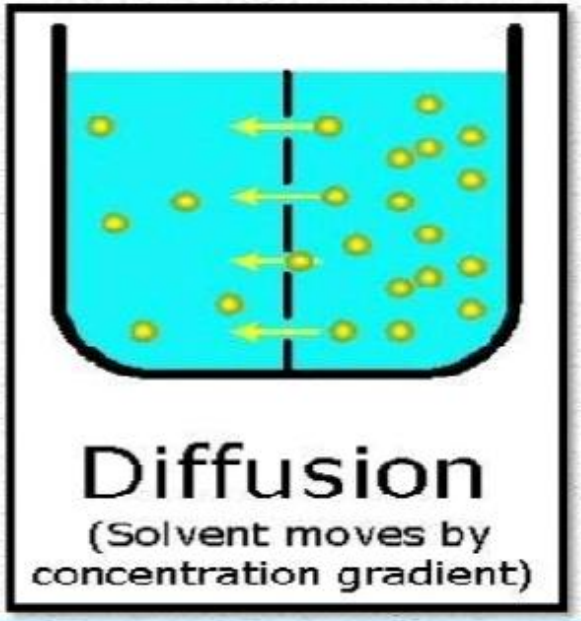
SCIENCE

- Substances may pass across the membrane without or with expenditure of energy-
- Active Transport - *substances pass the membrane with consuming ATP*
- Passive Transport-*substances pass the membrane without consuming ATP*
- Bulk Transport – Large amounts of substances and food particles across the plasma membrane
- The process of bringing the bulk of materials from outside by formation of endosomes is called endocytosis.
- Bulk expulsion of materials as in secretion and excretion is called exocytosis.

Passive Transport

SCIENCE

- Passive Transport is of two types
  - Diffusion
  - Osmosis
- Diffusion – The process of movement of substances (solid, Liquid or Gas)from the region of higher concentration to the region of its lower concentration till spread uniformly in the given space is called *diffusion*.



Diffusion – Demonstration

Importance of Diffusion

SCIENCE

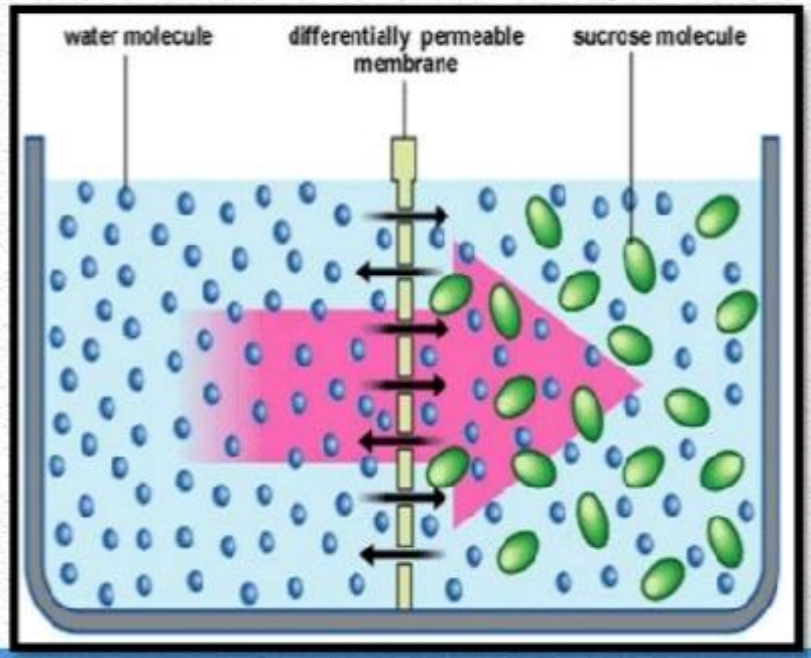
- Helps in spread of different substances throughout cytoplasm of cell.
- Osmosis is a type of diffusion where only solvent is allowed to diffuse.
- Diffusion helps in exchange of respiratory gases between the cells and their environment.
- Transpiration is diffusion process
- Flowers spread aroma through diffusion to attract insects and other animals for pollination.

Osmosis

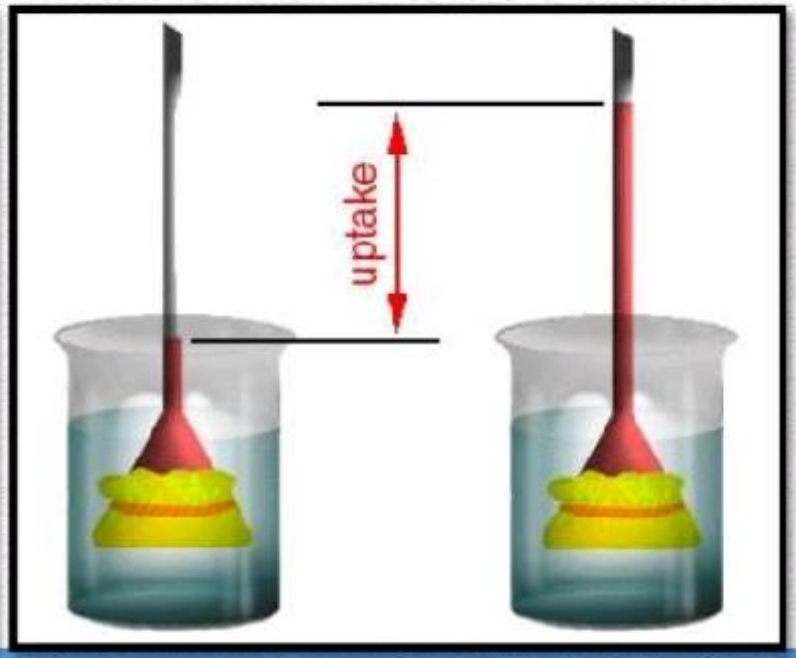
SCIENCE

- Defined as the diffusion of water or solvent across a semipermeable membrane from a region of its higher concentration to region of its lower concentration.
- Plasma membrane functions as semipermeable membrane.

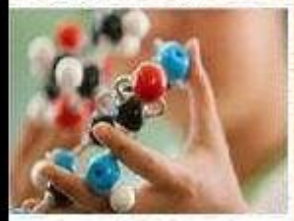
Osmosis



Osmosis - demonstration








How Diffusion differs from Osmosis ?

SCIENCE

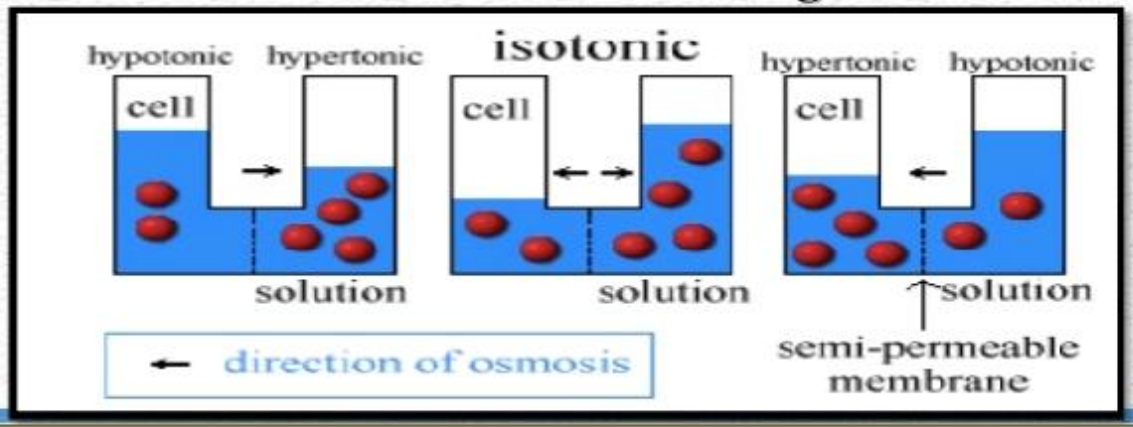
- Diffusion
- It can take place in solid, liquid and gases.
- It does not involve any semi permeable membrane.
- It equalizes the concentration of substances.
- Different substances diffuse independent of one another
- Diffusion is not much influenced by the presence of other substances

- Osmosis
- It takes place only in liquid medium
- It requires semi-permeable membrane.
- It does not equalize the concentration of solvent on the two sides of the membrane
- Only solvent undergoes diffusion
- It is influenced by the concentration and type of solute particles.

Types of Osmotic Solutions

SCIENCE

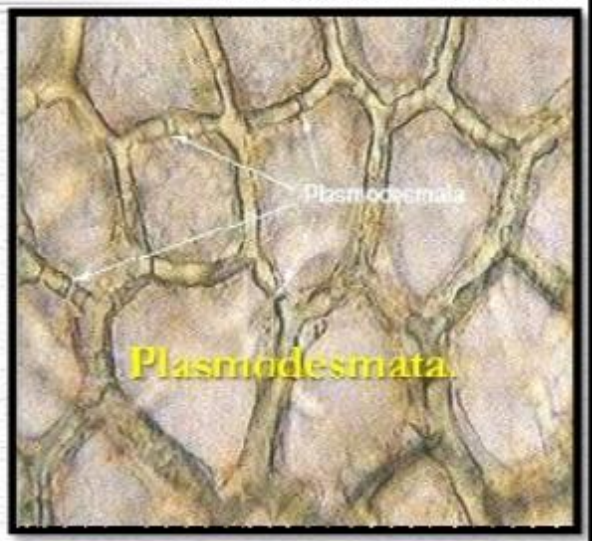
- Osmotic solutions are those solutions which can cause osmosis
- They are three types
  - Hypotonic Solution, Isotonic Solution and Hypertonic Solution
- Hypotonic – which has an osmotic concentration lower than another solution.
- Isotonic – The solution has an osmotic concentration similar to another solution.
- Hypertonic – which has an osmotic concentration higher than that of another solution.



Cell Wall

SCIENCE

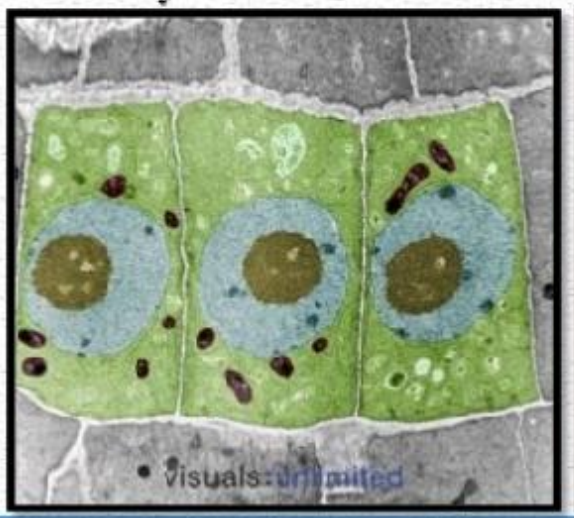
- Rigid, semi elastic, semi transparent and protective covering present outside the plasma membrane in plant cells, fungi and prokaryotes.
- Made up of Cellulose in plants, Fungal cellulose and Chitin in fungi
- Extra deposition of lignin, suberin and cutin may be present during secondary thickening
- A cementing layer called middle lamella is present between the walls of two adjacent cells
- Cell wall possesses small pores through which adjacent cells remain connected called Plasmodesmata.

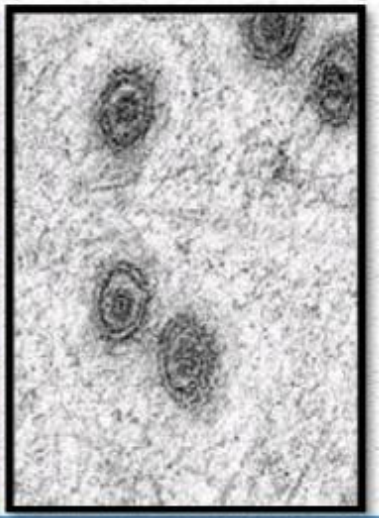


What is the role of cell wall?

SCIENCE

- It provides shape to the cells
- It provides mechanical strength to plants
- Protects against pathogens and mechanical injury
- Growth of the cell wall determines the growth of the cell
- Cell wall prevents bursting of cell on endosmosis
- Ability to withstand a lot of variation in nature.










Does cell wall & Plasma membrane are similar in function?

SCIENCE

- Cell Wall
- occurs in plant cells
- lies on the outside of the cell
- Rigid and thick
- Cell wall is permeable
- Formed of Cellulose, Hemi cellulose and Pectin.
- Provide protection and strength to the cell

- Plasma Membrane
- Occurs in plant & animal cells
- Lies on the outside of animal cells and inside in plants
- Flexible and thin
- Selectively Permeable
- Lipids and Proteins with small number of carbohydrates
- Hold cellular contents and control of passage materials