FUNDAMENTAL UNIT OF LIFE

CELL

1. DISCOVERY OF CELL

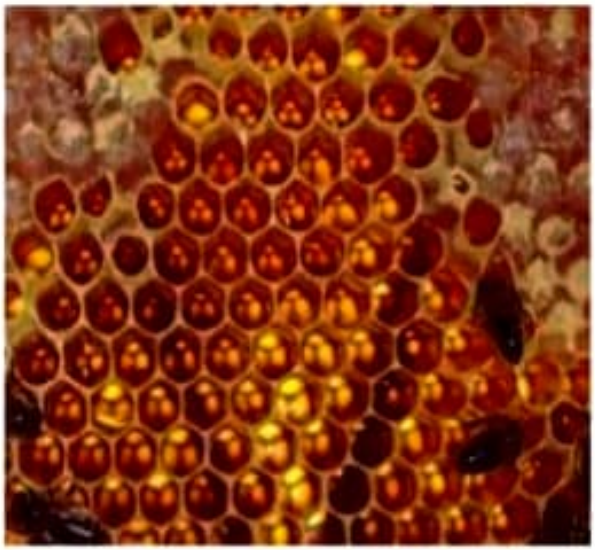
- Cells were first discovered by Robert Hooke, in 1665.
- He observed a thin slice of cork under his self designed microscope.
- This slice of cork resembled the structure of the honeycomb consisting of small compartments.
- He named these small compartments as cells.

ROBERT HOOKE

ROBERT HOOKE'S MICROSCOPE

ROBERT OBSERVED

CORK COMES FROM THE BARK OF THE TREE



HONEY COMB

ORGANISM

UNICELLULAR
or
Single Cell

E.g
1. Amoeba
2. Paramecium
3. Chlamydomonas

MULTICELLULAR
or
Many Cell

E.g
1. Human
2. Elephant
3. Cow
4. Oak, Pine Etc

UNICELLULAR ORGANISMS

PARAMECIUM

CHLAMYDOMONAS

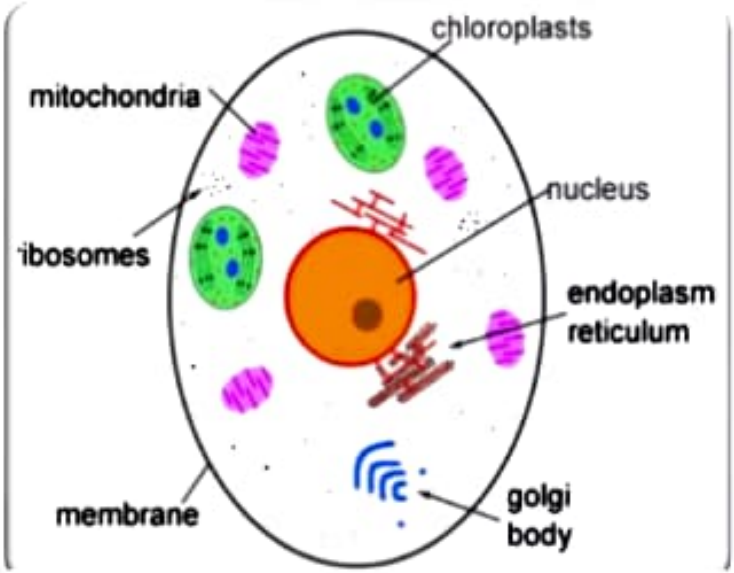
MULTICELLULAR ORGANISMS

ANIMALS

FUNGI

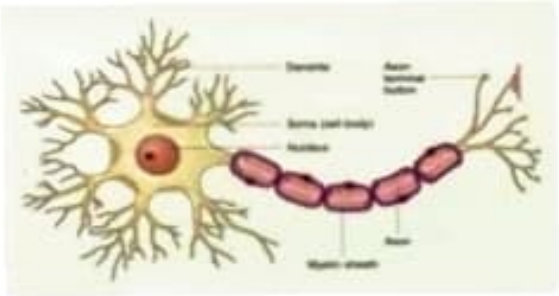
PLANTS

CELL

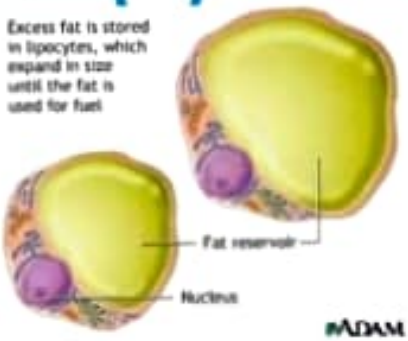


- A cell is the smallest unit that is capable of performing life functions.

DIFFERENT CELLS IN HUMAN BODY



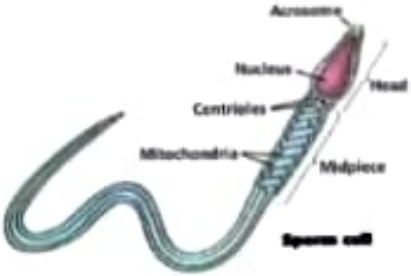
NERVE CELL



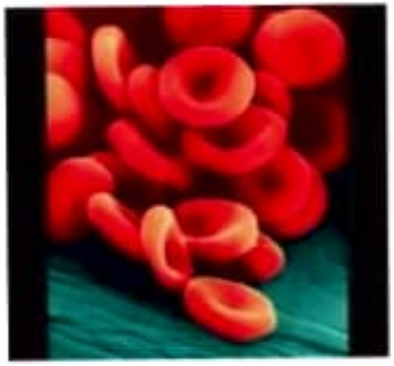
FAT CELL

BONE CELL

SPERM



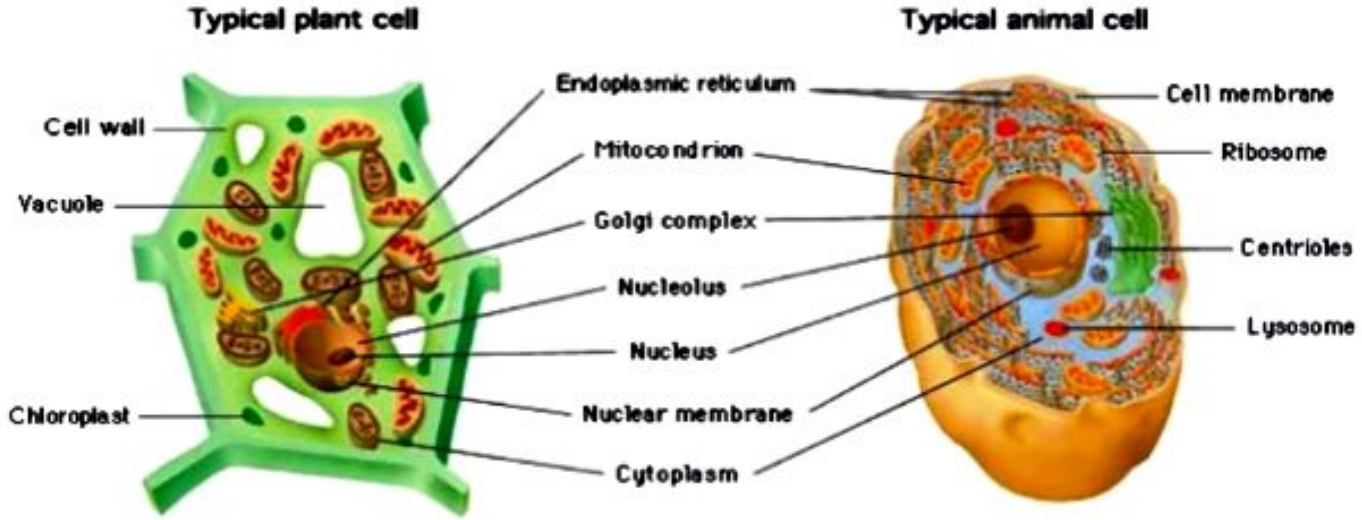
BLOOD CELL



OVUM

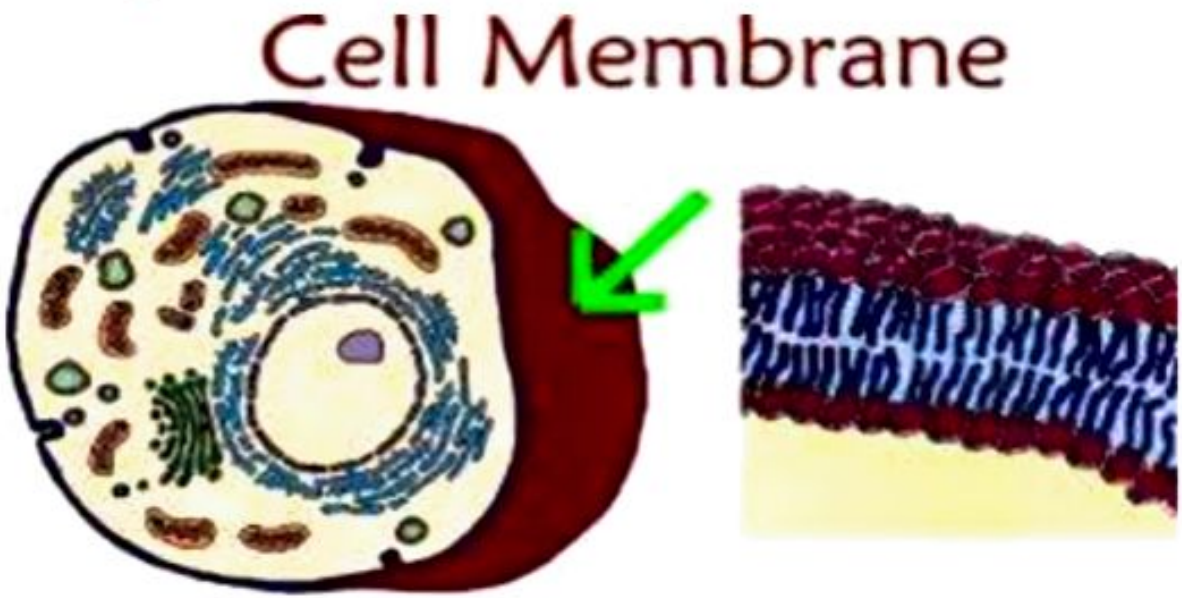
CELL

- The shape and size of cells are related to the specific function they perform.
- Each living cell has the capacity to perform certain basic functions.
- Cell contains a specific component called organelles.
- Each kind of cell organelle performs a special function.
- All cells are found to have the same organelles , irrespective of their function and which organism they are found in.



CELL MEMBRANE or PLASMA MEMBRANE

- It is the outermost covering of the cell that separates the contents of the cell from the external environment.
- Allows the entry and exit of materials in and out of the cell.
- It also prevents the movement of some other material and is therefore called a selectively permeable membrane.
- The plasma membrane is flexible and is made up of organic molecules like proteins and lipids.



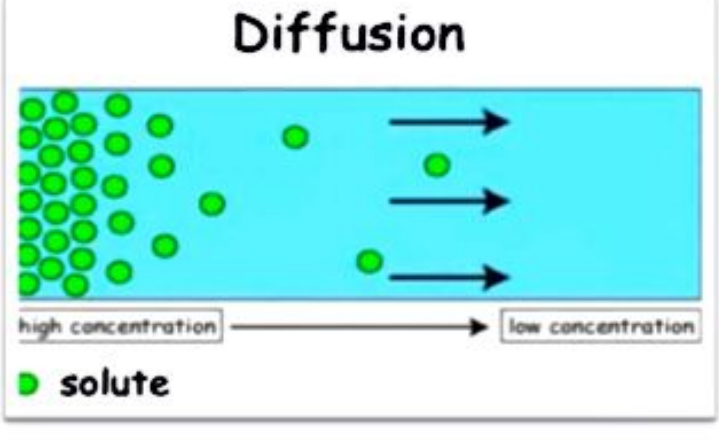
Movements of Materials through Cell Membrane:-

- Movements through Cell membrane by two types:-

1. Gaseous Exchange → Diffusion
2. Liquid Exchange → Osmosis

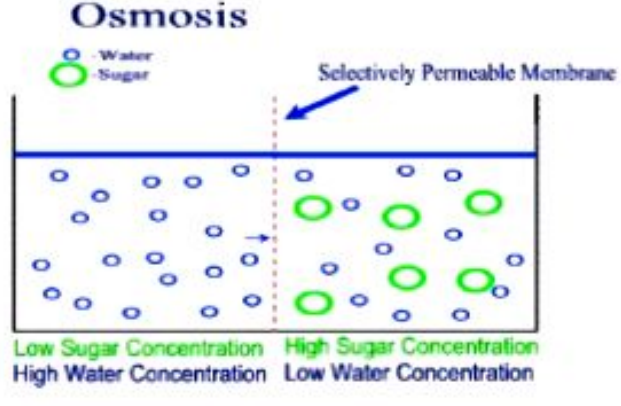
Diffusion

- Gaseous exchange takes place from a region of higher concentration to a region of low concentration.



Osmosis

- The movement of water from a region of high water concentration through a semi- permeable membrane to a region of low water concentration.



Difference Between
OSMOSIS & DIFFUSION

Osmosis

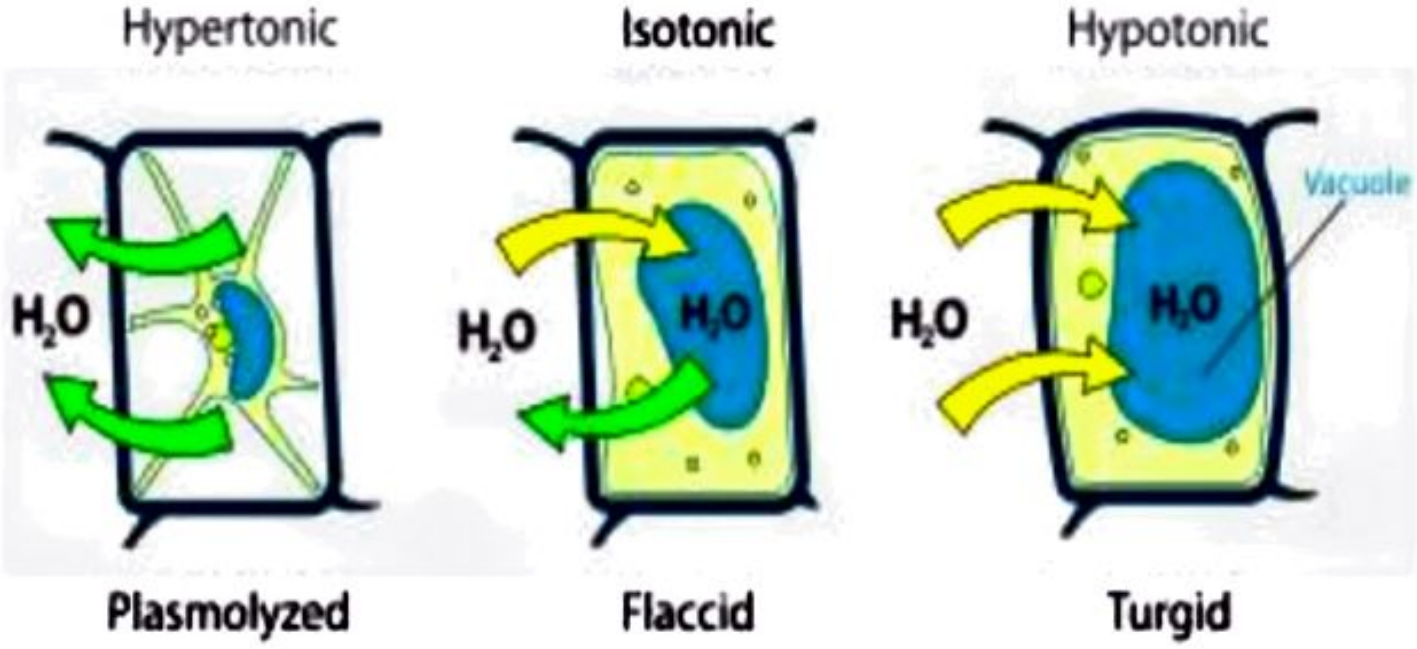
- It occurs only in a liquid medium.
- It requires a semi-permeable membrane.

Diffusion

- It can occur in any medium.
- It does not require a semi-permeable membrane.

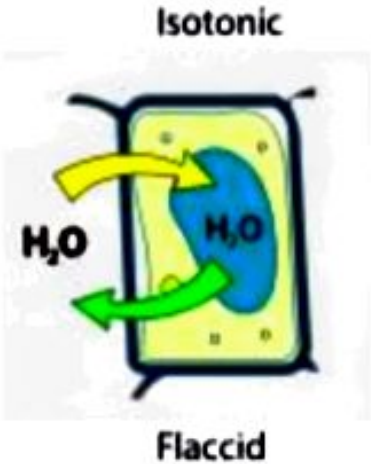
❖ Three Solutions that can come across while exchange of materials:-

1. Hypertonic Solution
2. Isotonic solution
3. Hypotonic Solution



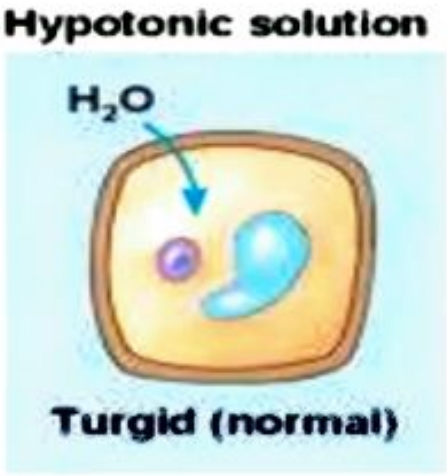
ISOTONIC SOLUTION

- When the medium surroundinga cell has the same concentration of water as that in the cell it is said to be isotonic.
- Water crosses the cell membrane in both the directions, but the amount going in is the same as the amount going out, so there is no overall movement of water. The cell will stay the same size.



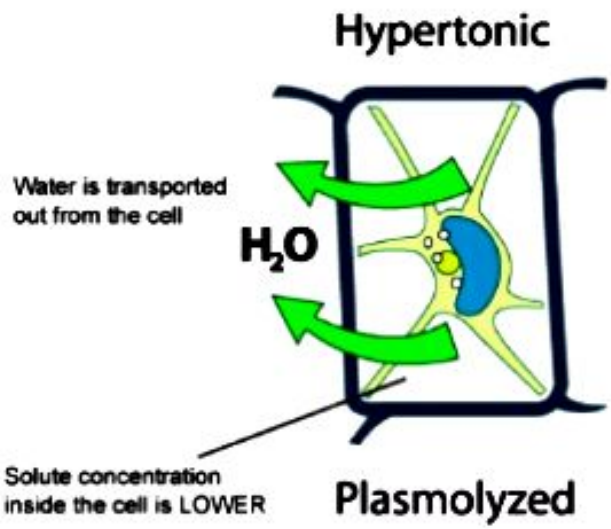
HYPOTONIC SOLUTION

- Hypotonic solution is the solution surrounding the cell which has higher water concentration than that in the cell.
- Water molecules are free to pass across the cell membrane in both directions, but more water will come into the cell than will leave. The net result is that the water enters the cell and the cell is likely to swell up.



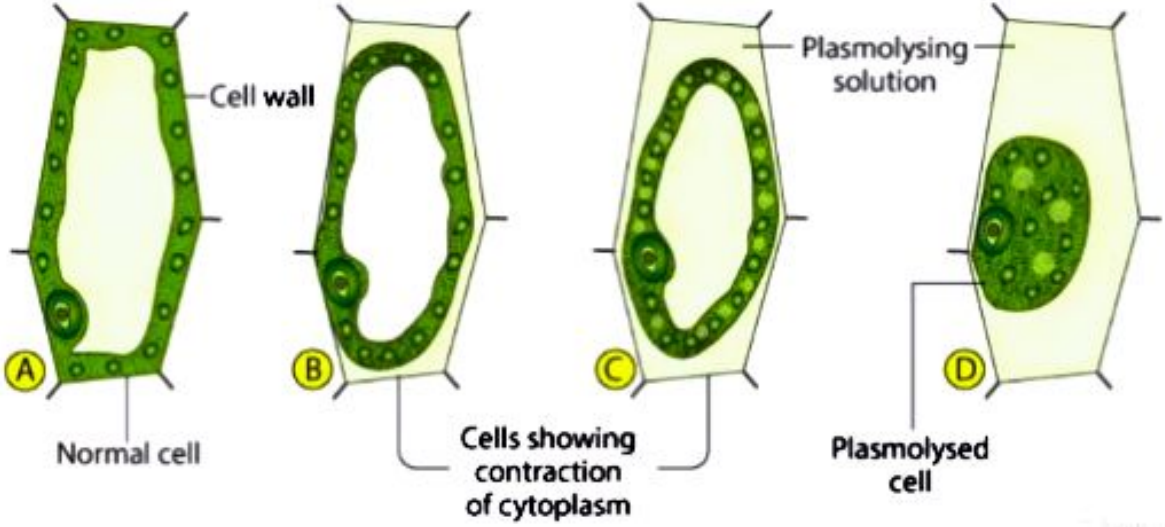
HYPERTONIC SOLUTION

- When the medium surrounding a cell has lower concentration of water than that in the cell it is said to be hypertonic.
- Water crosses the membrane in both the directions, but this time more water leaves the cell than enters it. Therefore the cell will shrink.



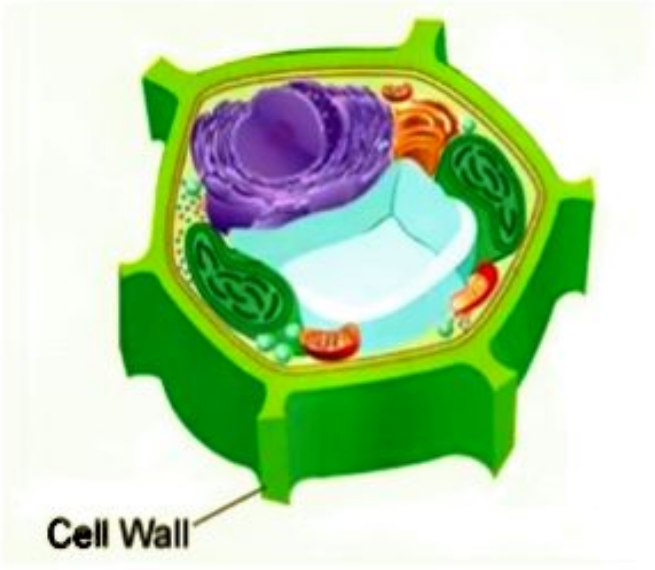
Plasmolysis

- Plasmolysis is the phenomenon by which a plant cell shrinks away from the cell wall when it loses water by osmosis.



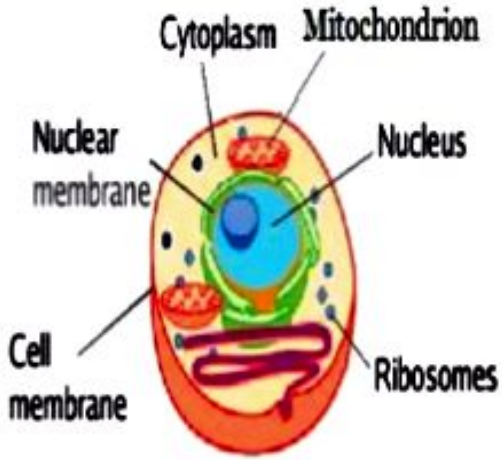
Cell wall

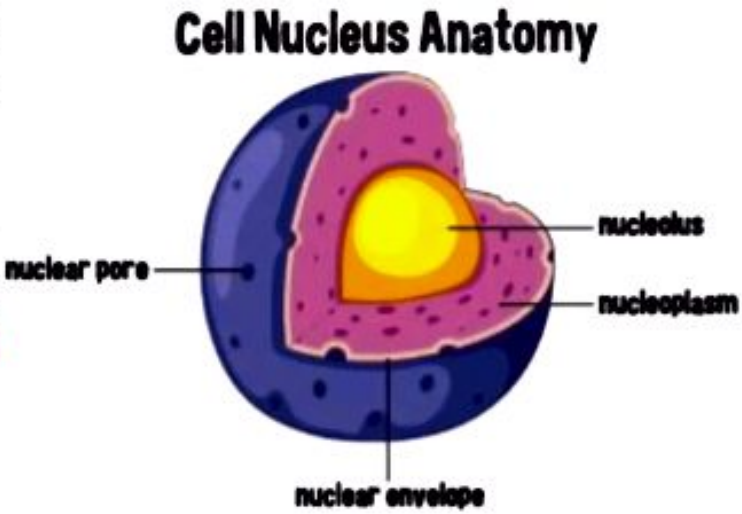
- Hard outer covering of the cell.
- Present outside the cell membrane.
- Cell wall is composed of cellulose.
- Cellulose is a complex substance and provides structural strength to plants.
- Cell wall is present in the plant cell and helps the plant to withstand the environmental changes.



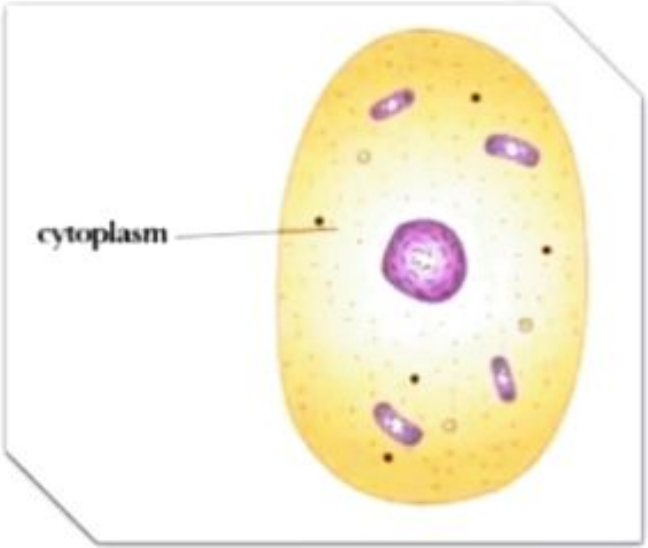
NUCLEUS

- Has a double layered covering called nuclear membrane.
- Nuclear membrane has pores which allow the transfer of material from inside the nucleus to its outside (cytoplasm).
- Contains chromosomes which are visib rod-shaped structures only when the c about to divide.
- Chromosomes contain information for inheritance of features from parents to the next generation in the form of DN molecules. (Deoxyribo Nucleic Acid).





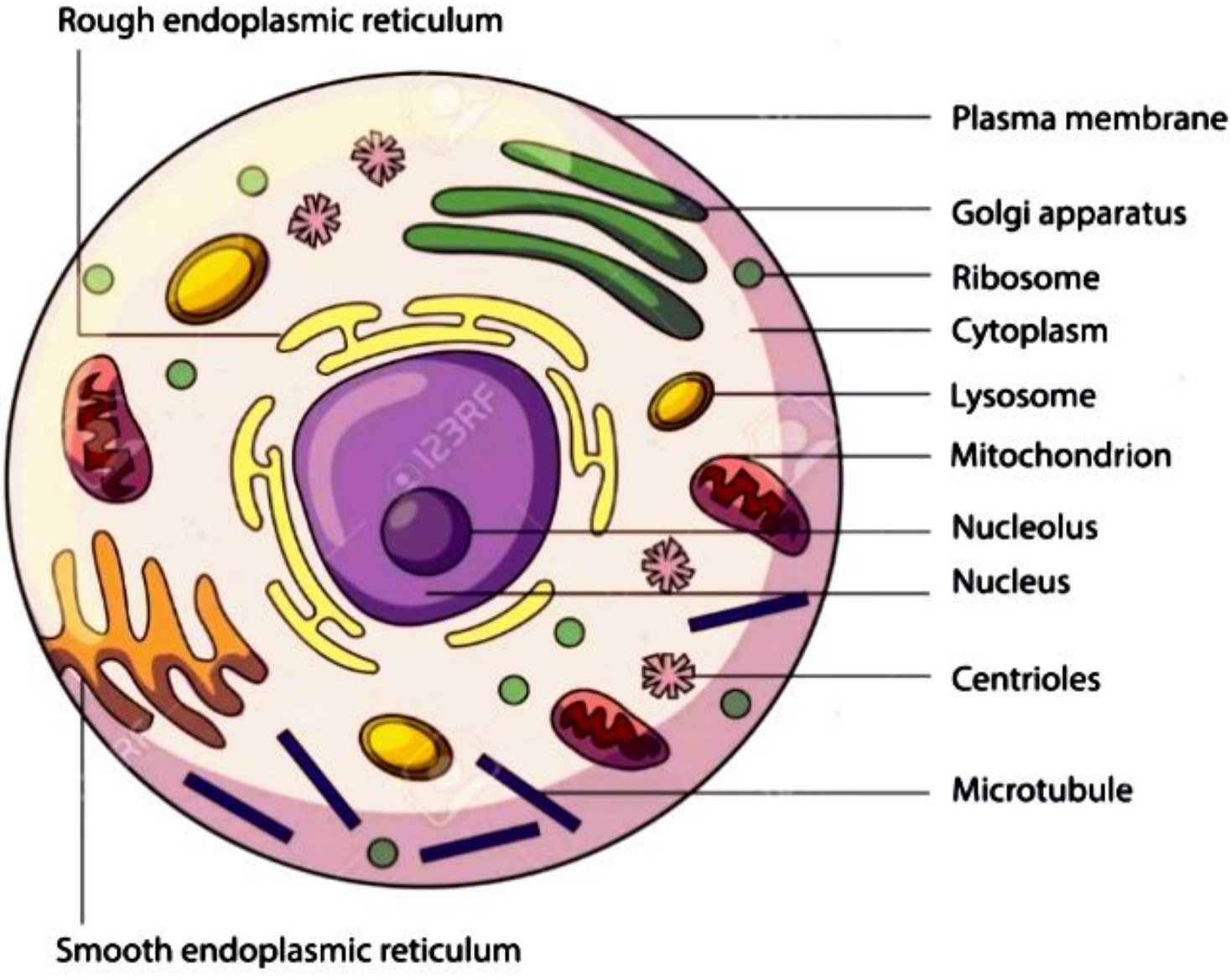
CYTOPLASM



- It is the fluid content inside the plasma membrane.
- Contains specialized cell organelles.

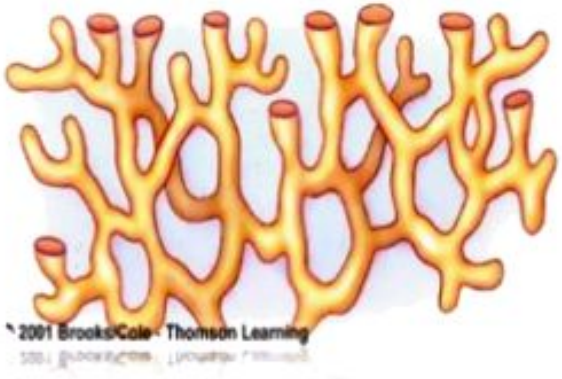
CELL ORGANELLES

- ENDOPLASMIC RETICULUM
- GOLGI APPARATUS
- LYSOSOMES
- MITOCHONDRIA
- PLASTIDS
- VACUOLES


Rough endoplasmic reticulum
Plasma membrane
Golgi apparatus
Ribosome
Cytoplasm
Lysosome
Mitochondrion
Nucleolus
Nucleus
Centrioles
Microtubule
Smooth endoplasmic reticulum

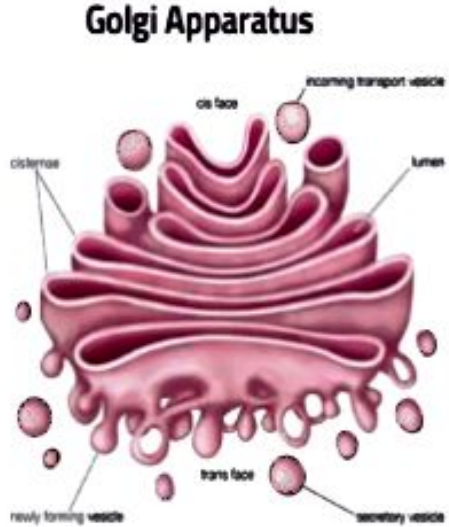
ENDOPLASMIC RETICULUM

- ER is a large network of membrane bound tubes and sheets.
- Extends throughout cytoplasm
- Two types - Rough Endoplasmic Reticulum (RER)
- Smooth Endoplasmic Reticulum (SER)
- Serves as channels for the transport of materials between various regions of the cytoplasm or between the cytoplasm and the nucleus.
- Functions as a cytoplasmic framework providing a surface for biochemical activities.



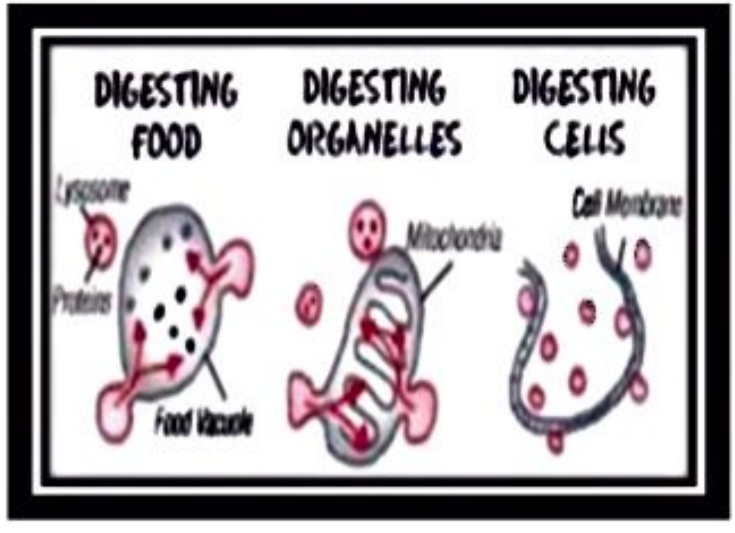
GOLGI APPARATUS

- First discovered by Camillo Golgi.
- It consist of a system of membrane- bound vesicles arranged parallel to each other in stacks called cisterns.
- The material synthesized near the ER is packaged and dispatched to various targets inside and outside the cell through the Golgi apparatus.
- Its functions include storage , modification and packaging of products in vesicles.
- Involved in the formation of the lysosome.



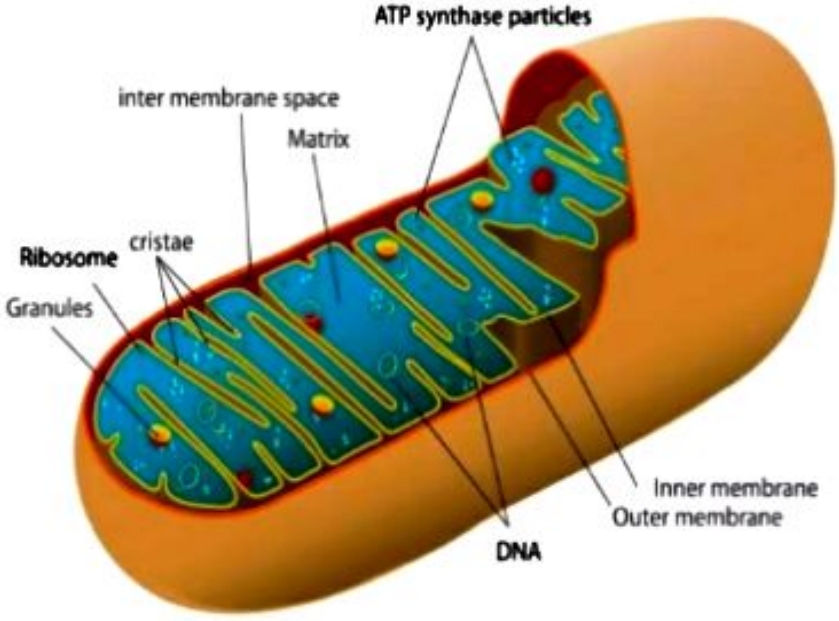
LY SOSOMES

- Waste disposal system of the cell.
- Keep the cell clean by digesting any foreign material as well as worn out cell organelles.
- Contain powerful digestive enzymes capable of breaking down all organic material.
- When the cell gets damaged, lysosomes may break open and the enzymes digest their own cell. Thus known as suicide bags of a cell.



MITOCHONDRIA

- Known as the powerhouse of the cell.
- The energy required for various chemical activities is released by the mitochondria in the form of ATP molecules.(Adenosine triphosphate).
- ATP is known as the energy currency of the cell.
- Mitochondria have two membrane coverings.
- Outer membrane is very porous.
- Inner membrane is deeply folded.
- Mitochondria are able to make their own proteins as they have their own DNA and ribosomes .



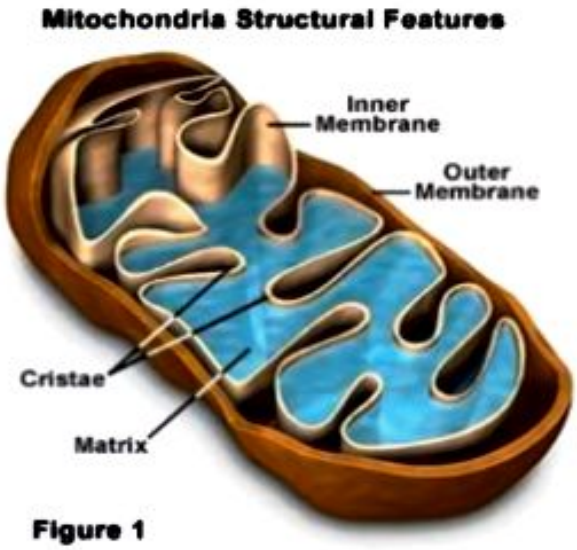


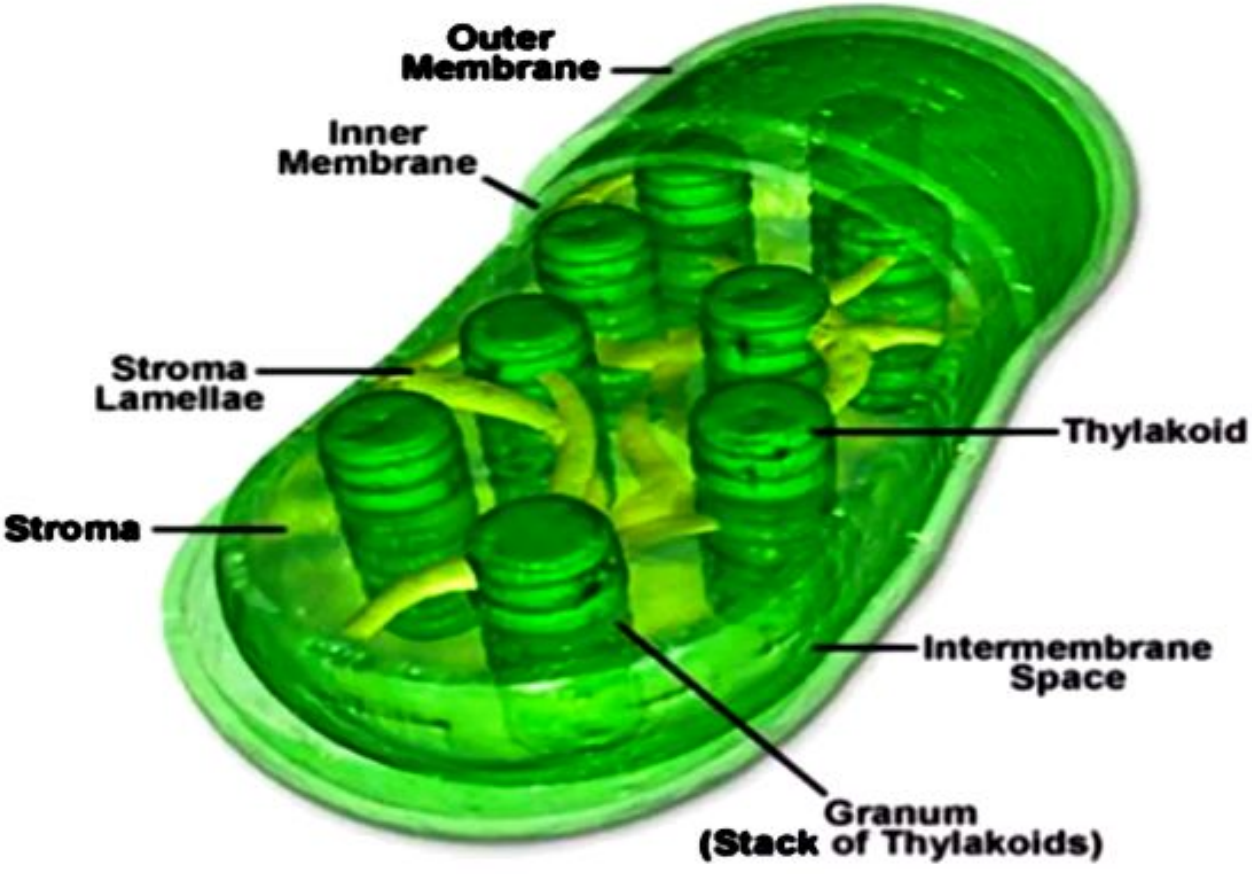
Figure 1

Mitochondria

PLASTIDS

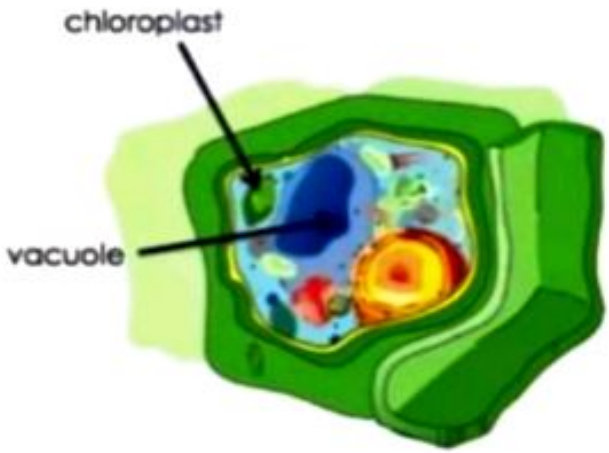
- Plastid is a membrane-bound organelle found in the cells of plants, algae, and some other eukaryotic organisms.
- Present in plant cells.
- Two types- 1) Chromoplasts (coloured)
  2) Leucoplasts (colourless)
- Plastids containing green pigment chlorophyll are called Chloroplasts.
- Leucoplasts store materials as starch, oils and protein granules.
- Plastids contain membrane layers embedded in a material called stoma.
- Has a similar structure like the mitochondria.
- Have their own DNA and ribosomes.

Plant Cell Chloroplast Structure

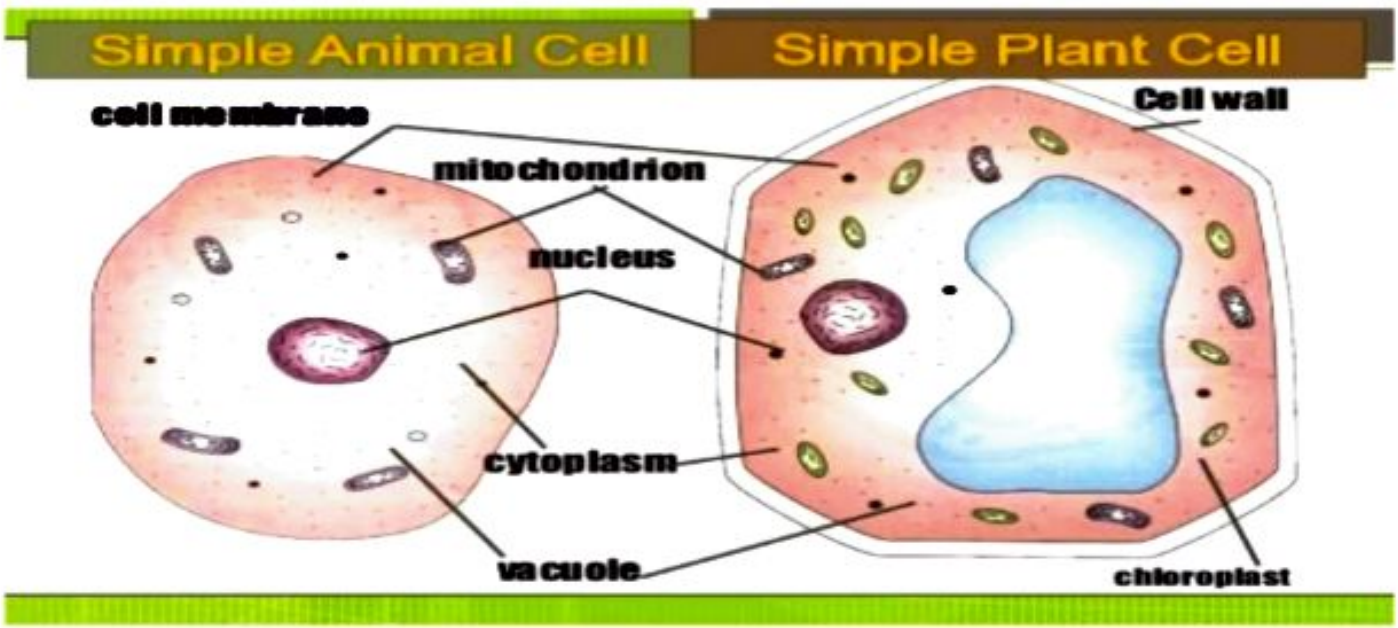


VACUOLES

- Storage sac for solid or liquid contents.
- Small size vacuoles are present in animals.
- Large in plants.
- In plant cells, vacuoles are full of cell sap and provide turgidity and rigidity to the cell.
- Vacuoles store amino acids, sugars, various organic acids and some proteins.
- In Amoeba, the food vacuole contains the food items that the Amoeba has consumed.
- Vacuoles play an important role in expelling excess water and some wastes from the cell.



Animal cell **Plant cell**

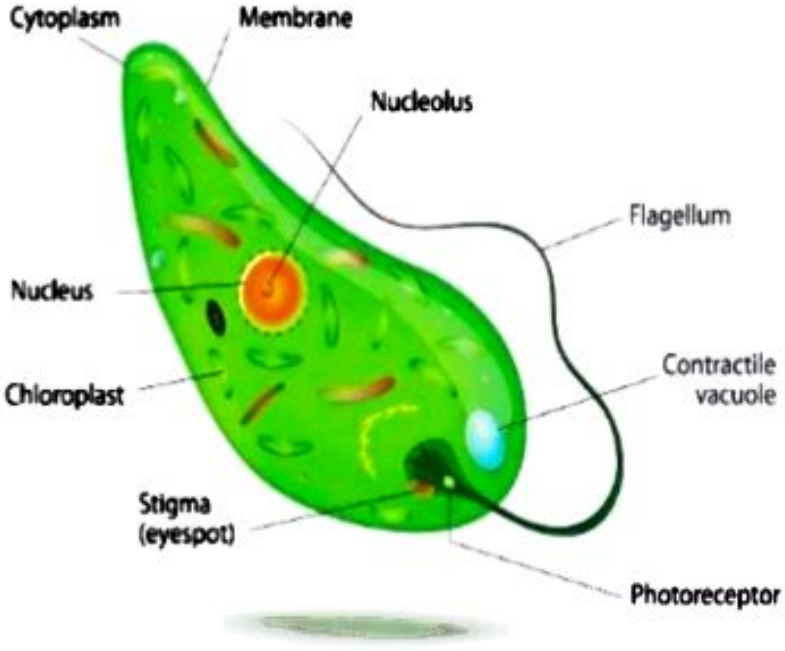


Animal cell

- Animal cells are generally small in size.
- Cell wall is absent.
- Except the protozoan *Euglena*, no animal cell possesses plastids.
- Vacuoles are smaller in size.

Plant cell

- Plants cells are usually larger than animal cells.
- Cell wall is present.
- Plastids (Chromoplasts and leucoplasts) are present.
- Vacuoles are larger in size.


Cytoplasm
Membrane
Nucleolus
Flagellum
Nucleus
Contractile vacuole
Chloroplast
Stigma (eyespot)
Photoreceptor

Euglena