

CELL- THE FUNDAMENTAL UNIT OF LIFE (Part-1)

CLASS-IX

Ref.: [NCERT Textbook Biology Class 9th Chapter 5](#)
or else copy- <http://www.ncert.nic.in/ncerts/I/iesc105.pdf>

INTRODUCTION

- Cell is the fundamental unit of life
- It can be considered as the smallest unit of all the living organisms.
- It is called as the structural unit of life because whole body of an organism is made up of cell.
- It is known as the functional unit of life because all functions regulates inside the cell and also because all those functions which are essential for life occurs inside each cell too.

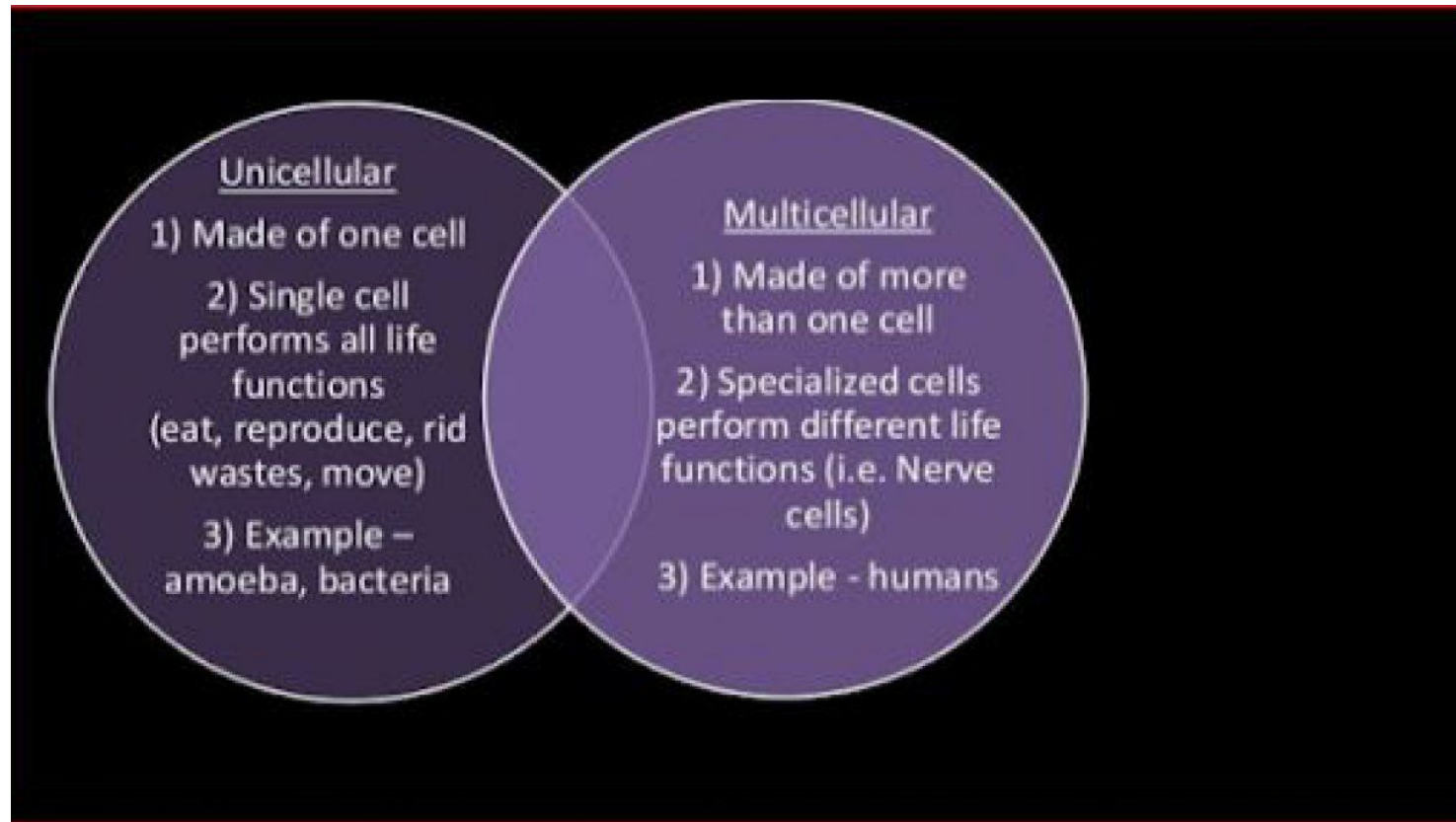
DISCOVERY

- In 1665, While examining a thin slice of cork through a self-designed microscope Robert Hooke saw that the cork resembled the structure of a honeycomb consisting of many little compartments. He called these boxes as cells. Cell is a Latin word for 'a little room'.
- Let's go through a simple experiment to observe the cells in an onion peel. click [here](#)
- else copy this link <https://youtu.be/cmnhBJKfvNw>

SOME FACTS

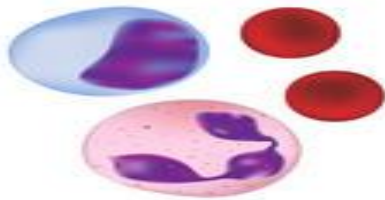
- 1665- Cells were discovered by Robert Hooke of a primitive microscope.
- 1674- Anton Van Leeuwenhoek built a simple microscope.
- 1831- Robert Brown discovered the nucleus in the cell.
- 1839- Purkinje coined the term 'protoplasm' for the fluid substance of the cell. he
- 1838 and 1839- Schleiden (1838) and Schwann (1839) presented cell theory, that all the plants and animals are composed of cells and that the cell is the basic unit of life.
- 1855- Virchow further expanded by suggesting that all cells arise from pre-existing cells.
- 1940- discovery of the electron microscope.

UNICELLULAR AND MULTICELLULAR ORGANISMS



DIFFERENT KINDS OF CELLS IN A HUMAN BODY

The shape and the size of cells are related to the specific function they perform.



Blood cells



Surface skin cells



Bone cell



Columnar epithelial and Goblet cells



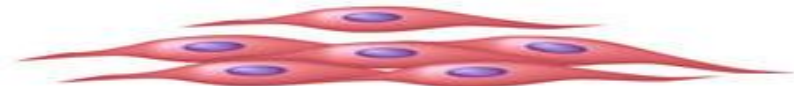
Cardiac muscle cell



Skeletal muscle cells



Neuron



Smooth muscle cells

DIVISION OF LABOUR IN ORGANISMS

- Each living cell has the capacity to perform certain basic functions that are characteristic of all living forms.

Division of labour in-

- Multicellular organisms such as human beings. This means that different parts of the human body perform different functions. The human body has a heart to pump blood, a stomach to digest food and so on.
- Unicellular organism has got cell organelles. Each kind of cell organelle performs a special function such as making new material in the cell, clearing up the waste material from the cell and so on.

A cell is able to live and perform all its functions because of these organelles. All the cells are found to have the same organelles, no matter what their function is or what organism they are found in.

THREE FEATURES IN A CELL

- PLASMA MEMBRANE
- NUCLEUS
- CYTOPLASM

All activities inside the cell and interactions of the cell with its environment are possible due to these features.

PLASMA MEMBRANE

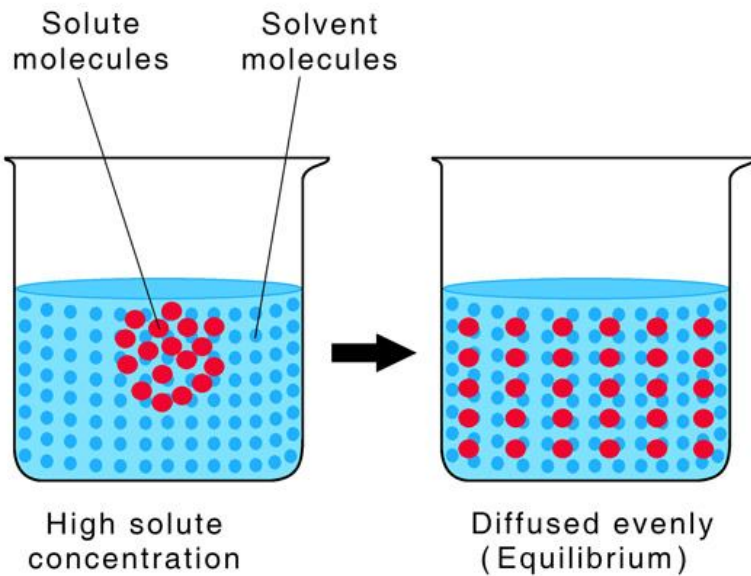
- This is the outermost covering of the cell that separates the contents of the cell from its external environment.
- It allows or permits the entry and exit of some materials in and out of the cell.
- It prevents movement of some other materials hence it is called a selectively permeable membrane.
- The plasma membrane is flexible and is made up of organic molecules called lipids and proteins. we can observe the structure of the plasma membrane only through an electron microscope. The flexibility of the cell membrane also enables the cell to engulf in food and other material from its external environment. Such processes are known as endocytosis. Amoeba acquires its food through such processes.
- Transport across the cell membrane occurs through Osmosis and Diffusion.
- DIFFUSION-It is a spontaneous movement of a substance from a region of high concentration to a region where its concentration is low. Movement of oxygen and carbon dioxide occurs through this process.
- OSMOSIS- is the passage of water from a region of high water concentration through a semi-permeable membrane to a region of low water concentration.

DIFFERENCE BETWEEN DIFFUSION AND OSMOSIS

Osmosis	Diffusion
It is limited only to the liquid medium.	Occurs in all mediums – Solid, Liquid and gas.
Requires a semipermeable membrane.	Do not require a semipermeable membrane.
Depends on the number of solute particles dissolved in the solvent.	Depends on the presence of other particles.
Requires water for the movement of particles.	Do not require water for the movement of particles.
Only the solvent molecules can diffuse.	Both the molecules of solute and solvent can diffuse.
The flow of particles occurs only in one direction.	The flow of particles occurs in all the directions.

Diffusion

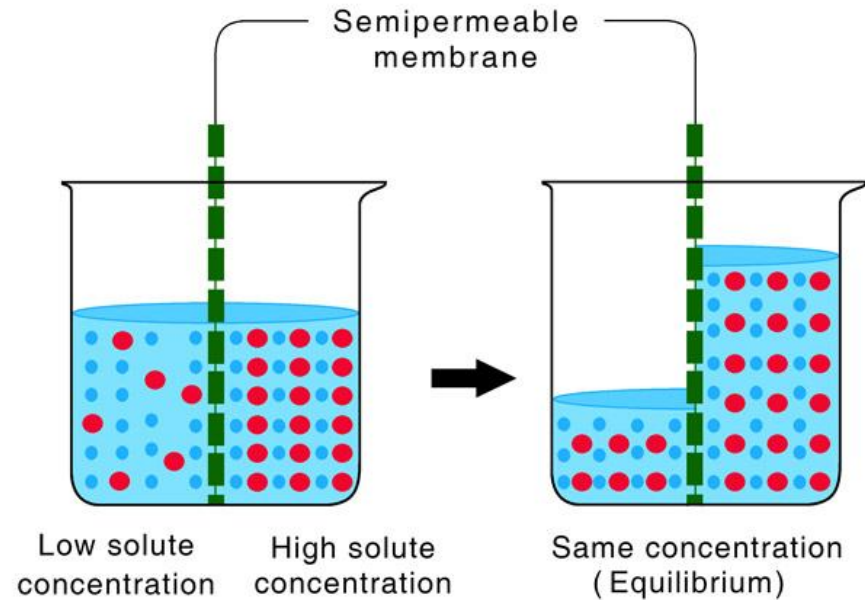
Solute molecules move from high to low concentration



vs

Osmosis

Solvent molecules move from low to high solute concentration



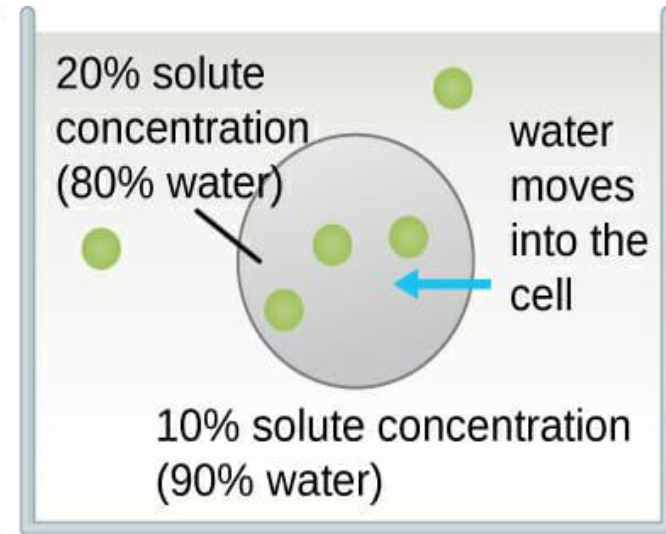
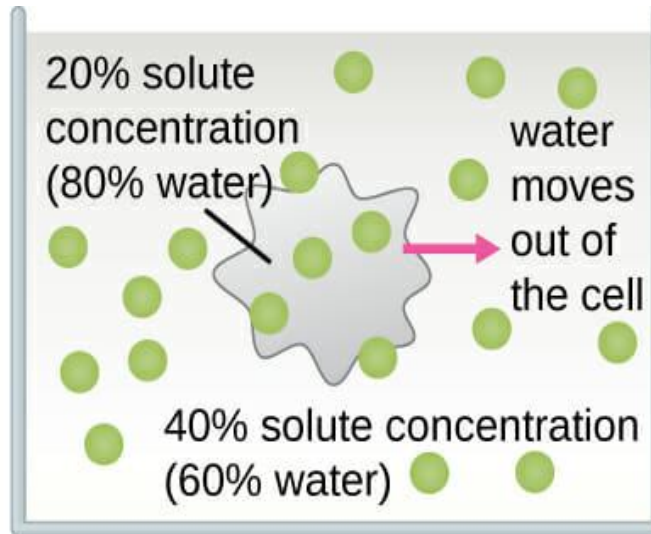
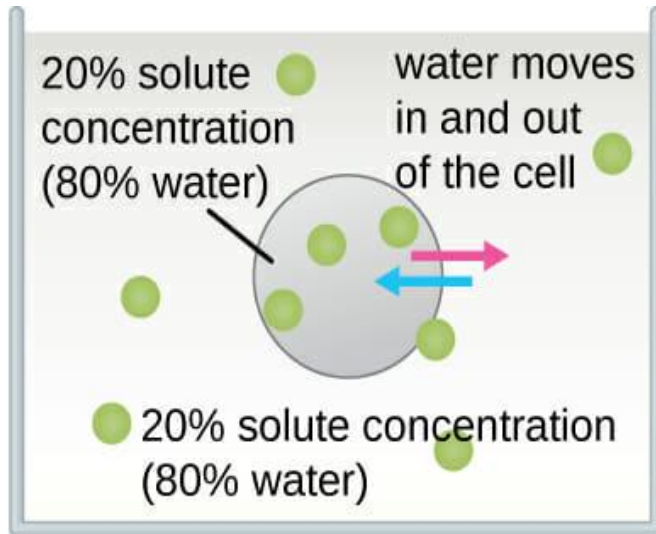
EXPERIENTIAL LEARNING (FUN WITH LEARN AT HOME)

1. Osmosis with an egg

- (a) Remove the shell of an egg by dissolving it in acetic acid (vinegar). The shell is mostly calcium carbonate. A thin outer skin now encloses the egg. Put the egg in pure water and observe after 5 minutes. What do we observe? The egg swells because water passes into it by osmosis.
- (b) Place a similar de-shelled egg in a concentrated salt solution and observe for 5 minutes. The egg shrinks. Why?
- Water passes out of the egg solution into the salt solution because the salt solution is more concentrated.
- (We can also try a similar activity with dried raisins or apricots using only water and then sugar. if you are using drinking water we can later eat the raisins too!!)
- 2. (A) Put dried raisins or apricots in plain water and leave them for some time. Then place them into a concentrated solution of sugar or salt. You will observe the following:
 - (a) Each gains water and swells when placed in water.
 - (b) However, when placed in the concentrated solution it loses water, and consequently shrinks

HYPERTONIC, HYPOTONIC AND ISOTONIC SOLUTIONS

- What will happen if we put living cells in a salt or sugar solution?
- Let's find out! click on this [video](http://youtu.be/FU9xE8rxnOo)
- else copy the link <http://youtu.be/FU9xE8rxnOo>



a Isotonic solution

A solution that has the *same* solute concentration as another solution. There is no net movement of water particles, and the overall concentration on both sides of the cell membrane remains constant.

b Hypertonic solution

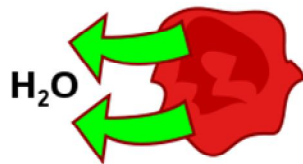
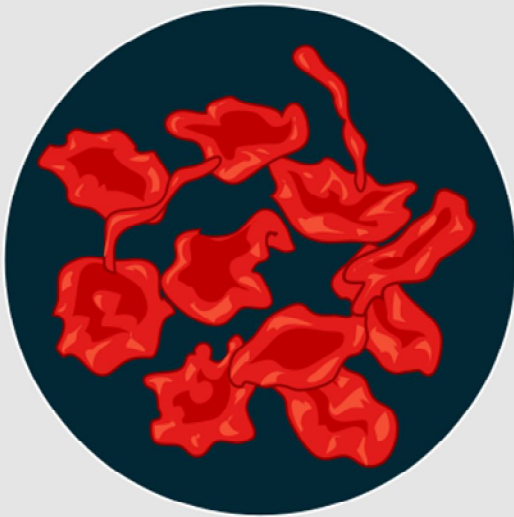
A solution that has a *higher* solute concentration than another solution. Water particles will move out of the cell, causing crenation.

c Hypotonic solution

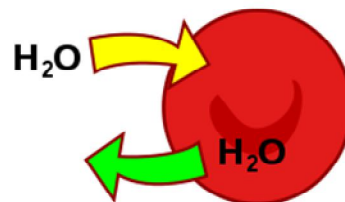
A solution that has a *lower* solute concentration than another solution. Water particles will move into the cell, causing the cell to expand and eventually lyse.

HUMAN RED BLOOD CELLS IN DIFFERENT MEDIUMS.

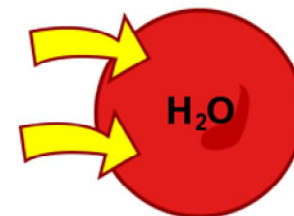
Hypertonic



Isotonic

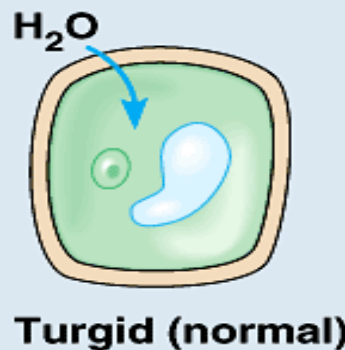
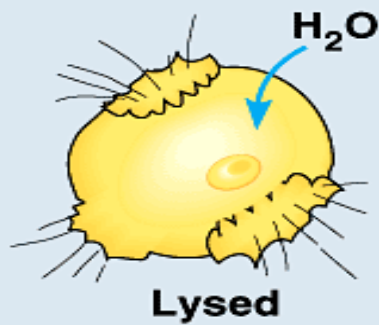


Hypotonic

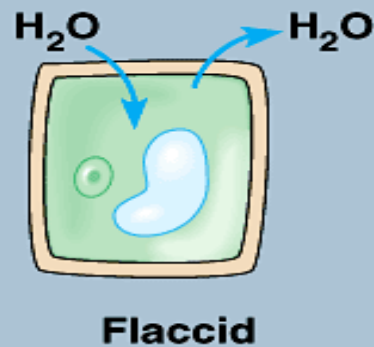
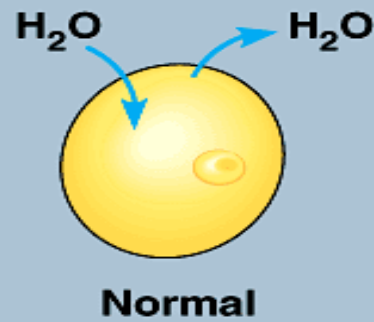


FATE OF ANIMAL CELL AND A PLANT CELL IN DIFFERENT SOLUTIONS.

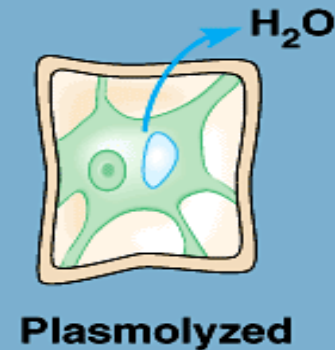
Hypotonic solution



Isotonic solution



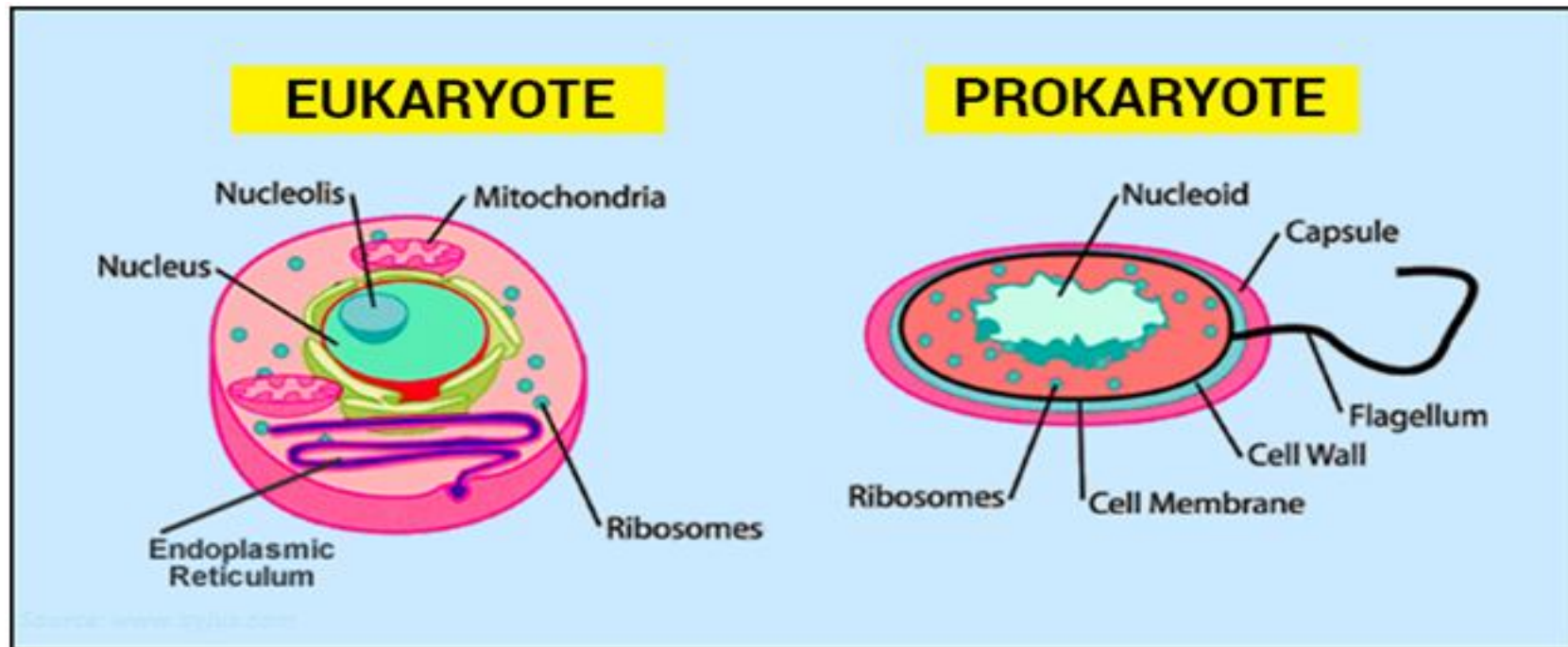
Hypertonic solution



Animal cell

Plant cell

EUKARYOTIC AND PROKARYOTIC CELLS



For more details, see video [here](#).

EUKARYOTIC AND PROKARYOTIC CELLS

Characteristic	Prokaryotic cell	Eukaryotic cell
Size of cell	Typically 0.2-2.0µm in diameter	Typically 10-100 µm in diameter
Example	Bacteria and Archaea	Animals and Plants
Nucleus	Absent	Present
Membrane-enclosed organelles	Absent	Present; examples include lysosomes, Golgi complex, endoplasmic reticulum, mitochondria & chloroplasts
Flagella	Consist of two protein building blocks	Complex; consist of multiple microtubules
Cell wall	Usually present; chemically complex	Only in plant cells and fungi (chemically simpler)
Plasma membrane with steroid	Usually no	Yes
Cytoplasm	No cytoskeleton or cytoplasmic streaming	Cytoskeleton; cytoplasmic streaming
Ribosomes	Smaller	Larger
Cell division	Binary fission	Mitosis
Number of chromosomes	One, but not true chromosome	More than one
Sexual reproduction	No meiosis; transfer of DNA fragments only (conjugation)	Involves meiosis

Prokaryotic cells, as well as eukaryotic cells, are covered with the plasma membrane, which is located on top of the cell membrane or mucous capsule. Despite of its relative simplicity, prokaryotes are typically independent cells. Table 4.1 presents the major differences between prokaryotic and eukaryotic cells.

CELL ORGANELLES

7.12D Cell Organelle Structure vs Function

Organelle	Structure – physical properties, like shape, color, and location	Function – job or role an organelle does for the cell	Kind of cell found in?
Cell Membrane (Plasma Membrane)	Surrounds the cytoplasm and other organelles	Allows things to enter and exit the cell; gets rid of waste	Both plant and animal cells
Cell Wall	Rigid; surrounds plant cells	provides support, protection	Plant cells only
Nucleus	Houses chromosomes / DNA – the genetic code (heredity material)	Control center, tells other organelles what to do	Both plant and animal cells
Cytoplasm	Gel-like liquid that fills the cell	Provides suspension to organelles so they move around easier	Both plant and animal cells
Mitochondrion (Mitochondria)	Double membrane organelle with inner folds	Converts glucose molecules into energy	Both plant and animal cells
Chloroplast	Filled with chlorophyll; Contains stacks of discs	Site of photosynthesis – which makes food for plant cells	Plant cells only
Vacuole	Much larger in plant cells than animal cells	Storage site of water, nutrients, and waste	Plant - large, central animal -small
Lysosome	Small, circular organelle that contains enzymes	Digest old cells parts; Aids with removal of waste	Animal cells only

PRACTICE QUESTIONS:

1. Differentiate between diffusion and osmosis with examples.
2. Differentiate between eukarotic and prokaryotic cells.
3. Make a table mentioning the functions of various cell organelles.
4. Differentiate between rough endoplasmic reticulum and smooth endoplasmic reticulum.
5. What is plasma membrane composed of?
6. What is the function of endoplasmic reticulum in liver cells of vertebrates?